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ABSTRACT

Eight papers making up Track VI of the 1989 conference of the Professional Association for the Management of Information Technology in Higher Education (known as CAUSE, an acronym of the association's former name) are presented in this document. The focus of Track VI is on academic computing issues, and the papers include: "Loan-a-Mac: A Successful Computer Literacy Program for Faculty" (R. Ann Zinck); "When Is a Site License Not a Site License? A Guide through the Maze of Large-volume Academic Microcomputer Software Purchasing" (Tony Townsend); "Technology/Pedagogy Integration as a Supported Multiple-Year Project" (E. Michael Staman); "Instant Microcomputer Labs: When Just Adding Water Is Not Enough" (Jacqueline D. Brown); "An Assessment of Computer Based College Writing Programs" (Max Kirsch, Harvey S. Wiener, and Michael Ribaudo); "Ohio Library Information System" (Len Simutis, Frank B. Thomas, and A. Jerome York); "Developing and Implementing a Systemwide Academic Mainframe Specialty Center (AMSPEC)" (Arthur S. Gloster II and Arthur J. Chapman); and "Meta-Lenses for Academic Computing in a Small University: Examining Past Progress and Problems, Future Promises and Perils" (M. S. Vijay Kumar). Most of these papers are preceded by an abstract. (DB)

November 28-December 1

SAN DIEGO

CAUSE89

Managing Information Technology: Facing the Issues

Proceedings of the 1989 CAUSE National Conference

TRACK VI: Academic Computing Issues

November 28 - December 1, 1989
The Sheraton on Harbor Island
San Diego, California

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Track VI
Academic Computing Issues

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Many colleges and universities are increasing investments in computing for instruction and research, and the growth in departmental computing continues. Papers in this track focused on such areas as: coordinating with administrative computing (including planning, managing, evaluating, and networking, as well as library automation and academic/departmental information systems); student and faculty computing access; instructional software development, use, and assessment (including incentives and support for faculty, standards, site licensing, copyright, and piracy); strategies for supporting research; distance education; and progress toward an international network for scholars.

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Loan-a-Mac
A Successful Computer Literacy Program for Faculty

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Loan-a-Mac is a program at San Joaquin Delta Community College that was designed to provide "hands-on" computer literacy development for the faculty. Twenty Macintoshes with software and carrying cases were provided to faculty on a 30 day check-out basis. This article desribes the process of implementing the program, the instructions shared with the participants, a profile of current users and the HyperCard Loan-a-Mac Checkout System designed by Computer Services. An analysis of why this program is successful (i.e., the Macintoshes come back on time, no politics or plea barginning, repeat requests) will be discussed.

Loan-a-Mac
A Successful Computer Literacy Program for Faculty

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San Joaquin Delta College: A Growing Network

As a result of the acceptance of Computer Services Five Year Plan 1988-92, San Joaquin Delta College will realize the vision of a computing environment that will transform the use of information technology in an educational setting. This plan establishes the ambitious goal of an Academic Computing Network parallel to the current Administrative Network. By harnessing the capabilities of information technology; managers, staff, faculty and students are empowered through the use of a computing and communication network for critical, creative, and collaborative activities. Thus, Delta College is creating an environment in which the use of computer technology will be the "matter of course" and natural way of doing business. It therefore becomes critical that the college community is ready for this evolution. The Loan-a-Mac program is one of the ways in which the college is addressing the need to provide faculty with the opportunity to develop the computer skills that will be essential to the basic functioning of the campus. In addition, the availability of the computer will help to encourage an interest in using the computer as a productivity tool and to explore ways to incorporate computer assisted instruction in the curriculum.

In the Beginning...A Network. In 1987, under the leadership of Lee Belarmino, Director of Computer Services, a local area network for administrative services was built. The purpose of the network was to provide access to the Student Information Systems (SIS), a new Business Information System (BIS) and electronic mail and file transfer capabilities from the various offices on campus. The primary requirements in the design of the network were to maintain the college's investment in the current SIS, residing on a Unisys (Burroughs 6930) mainframe, incorporate the new BIS on a VAX 8350, and create a "front-end" that would be easy for the user to operate. After researching many different options, the best solution was to design a custom network utilizing existing phone lines, but based on a new Ethernet backbone. The result was a network of Macintosh workstations that could access both the BIS and SIS using PacerLink. InBox became the solution for electronic mail and file transfer and Microsoft Works the standard office productivity package. The Macintosh provided the perfect solution for the design of an easy to use front-end to the BIS and SIS, as well as holding down on the investment in training on office productivity software. Computer Services has been recognized by Digital Equipment Corporation for the unique solution of using the VAX 8350 as a gateway to the Unisys (Belarmino and Zinck, 1988/89). Currently, over 130 Macintoshes are on the Administrative Network.

The Academic Connection. The benefits of the Administrative Network, particularly the E-Mail and file transferring features, are indispensable to the users. Faculty members are beginning to understand the benefits of electronic communication and want access to the capability as well. The proposed Academic Computing Network (ACN) will, within five years, provide both faculty and students with electronic communications on campus. The implementation of the network began this summer with the installation of a fiber optic backbone connecting four Business Computing Lab/Classrooms to the central Academic Computing Lab. A 3Com network now serves software applications and printing functions to five different locations. Over 3000 students per semester take advantage of these computing facilities. This phase of the ACN, is the first of three phases that will see six satellite labs located in a variety of divisions pulled into the network. In preparation for the implementation of the ACN, a critical component has been the providing of computer resources to the faculty.

Since 1987, faculty have had access to a Macintosh computer in their Division offices. In the

Summer of 1988, the Faculty Computing Center (FCC) opened with a Macintosh II (connected to a CD ROM and Scanner), LaserWriter, and two IBM PC's available for faculty use. The popularity of the Macintosh resulted in a reconfiguration of the FCC, replacing the IBM's with two Macintosh SE's. The goal of the Faculty Computing Center is to provide an environment where both novice and expert user can find the resources necessary to meet their computing needs. An interactive video development station, with a Macintosh IIci as the central component, will be made available in the FCC by December, 1989.

In January, 1989, Computer Services inaugurated what has been called "The Year of the Faculty." Beginning in 1989, Computer Services was in the position to focus attention on the development of faculty skills and resources in educational and productivity computing. With the vision of the ultimate campus network firmly in mind, the first concerns for its implementation was the development of corresponding computer skills and a network vision on the part of the faculty.

Totable Training--Loan-a-Mac. Delta College is not unique in facing the dilemma of providing computing resources (equipment, training, and software) to faculty, yet having finite funding for such endeavors. Armed with the understanding that the availability and accessiblity of computers are among the primary determining factors in developing computer literacy, funding was allocated for 20 Macintosh computers that faculty could take home for a period of time. Computer Services was given the task of defining the nature of this opportunity and how it was going to work. The result was Loan-a-Mac, defined primarily as a computer literacy program for faculty.

Making It Work. Considerable time was spent in the design of the Loan-a-Mac program. First, the eligible individuals had to be defined. Funding sources for the equipment required that the users be faculty members. Since computer literacy was the primary goal of the program, the next step was to determine a reasonable length of time for a user to keep the equipment. It seemed that 30 days would provide the user with a sufficient amount of time to become fairly proficient with at least one application. More than that, it was hoped that at the end of the thirty days, the user would find him or herself seeing the computer as a valuable tool. The other reason for the 30 day time period, is that realistically, Computer Services knew that proficient users would also participate in Loan-a-Mac and would want sufficient time to work on projects. The total number of faculty, including part-time instructors at Delta is over 600 individuals. Since full time faculty numbered around 200 individuals, Computer Services determined that limiting the use of the computers to full time faculty would greatly assist in availability of the resource, not to mention keeping the day to day operation of the program manageable.

Once these basic parameters were established, that is, Loan-a-Mac would be a 30 day check out to fulltime faculty, then the nitty-gritty of the total procedure had to be defined. Requirements for the successful operation of the program were brainstormed in Computer Services until solutions that were acceptable to both Computer Services and the Vice President/Assistant Superintendent were reached. The following were the initial requirements Computer Services established for successful day to day operation of the program.

The operation of the program must:

1. Be free of politics.
2. Function on a day to day basis without management involvement.
3. Provide an accurate status report on demand.
4. Be managed by a Macintosh application.
5. Insure that the user will return the equipment on time.
6. Allow a turn-around time for maintenance of the returned equipment.
7. Insure the user is skilled enough to do basic set-up and desktop functions.

Service First, Fairness Foremost. In the Loan-a-Mac program, we at Computer Services wanted a clean process that was fair to all and could not be corrupted by political games or favoritism. Computer Services' role on campus is that of a service organization that views all users as imr' tant customers. In all cases, the goal of the department is to be outside the political arena. Th. computers for the Loan-a-Mac program were funded by the Instruction Office as directed by the Vice President/Assistant Superintendent. Computer Services was given the charge of designing and defining the program. Input related to the requirements cited above were solicited from the area Deans. Suggestions from them related to the distribution process and authorizations for use of the computer. Quite honestly though, the suggestions didn't seem to meet the requirements we had established. Thus it was determined that Loan-a-Mac would operate simply on a first-come, first-served basis with no advanced or multiple reservations of systems being possible. Once the basic reservation policy was established, then a HyperCard stack was designed to manage the reservation and tracking tasks. The stack allows phone reservations to be entered and the requester is automatically entered into the queueing system. The stack also maintains an accounting of the software resident on the equipment. A status report can be printed at any time to determine who has Macs, who is on the waiting list, or an entire history of Loan-a-Mac users. One of the concerns about turn-around maintenance, the possibility that 20 Macintoshes would be returned at once, never materialized since when the program was initiated, the first users took up to a week to pick up their Mac. Now we have a policy that users must pick up their Loan-a-Mac within three days of being notified of its availability or it goes to the next person on the list.

Issues and Risks. A major concern in designing the Loan-a-Mac program related to l. bility in case of theft of the equipment or damage while it was off-campus. There was also a question of wha. recourse was possible should a Macintosh not be returned, i.e. the faculty member refused to return it on time. The campus Risk Manager was consulted with on insurance questions. The recommendation by the Risk Manager was to hope that the user's homeowners insurance would cover a theft. If not, Delta College is self-insured and thus responsible for replacement costs. The possibility of the Macintoshes not being returned wasn't considered until a colleague mentioned that this had apparently been a problem at another institution. What would we do if a computer didn't come back when it was supposed to? Everything from requiring collateral, to withholding paychecks, and legal prosecution was suggested. The bottom line was, we did not want to take a punitive stand. We decided that an agreement signed by the faculty member that represented an understanding of their responsibilities in the program would be sufficient. If a problem of an overdue computer came up, it was decided that notification of the Division Chair/Director would be the first recourse. The second would be informing the next person on the list that their computer was still held by the current user. It seemed that this was sufficient to act as appropriate pressure for timely returns. Thus the faculty are asked to sign an agreement upon checking out the Macintosh in which they agree to abide by the reservation rules, time limitation, all software licenses, etc.

As soon as the operation of the program had been specified, we were ready to present it to the Vice President for approval. He agreed with our centralized library type approach, limiting the program to fulltime faculty and the user agreement. We were given the "go ahead" to proceed with presentations to the major governance groups on campus.

Training Options. Computer Services through the Apple Computer, Inc.'s Higher Education Purchase Program II (HEPP), provides almost weekly on-campus training opportunities provided with assistance from the our HEPP Apple Computer Sales Representative. Faculty and staff have the opportunity to attend training sessions on such topics as introduction to the Macintosh, Microsoft Works, HyperCard, Ready Set Go, and SuperPaint. In addition, faculty and Computer Services offer training on Micrograde, PowerPoint, and MindWrite. An extensive library of training tapes for such Macintosh applications as Excel, Works, HyperCard, PageMaker, Using the Macintosh, and Filemaker offer the user many opportunities for training on their own time. The truly novice Loan-a-Mac user is required to take the introductory Macintosh workshop (2 hours) or complete one of the introductory tapes prior to checking out the computer.

A library of popular software is maintained for the Loan-a-Mac user to check out with the computer. A separate HyperCard stack was created to manage this library since faculty and other users not involved in Loan-a-Mac request use of software. Some software titles that are included in the library are MicroTest III, Wingz, Adobe Illustrator, PageMaker, Word, Excel, and Statview.

A Profile of Success. Loan-a-Mac will celebrate a year of success in February, 1990. The first twenty Loan-a-Mac recipients were selected by a random drawing from requests that were called in by phone during the week of February 13-17. Since then, 70 faculty members have had a Loan-a-Mac at least once. In October, 1989; I sent out a survey to find out how the program was going from the user's perspective. The results indicated that the program is an unquestionable success. Highlights of the survey are summarized below. Forty surveys, 57 per cent, were returned out of the total of 70 sent. Not all respondents answered all of the questions.

Tables 1-3 below provide a general profile of the faculty participants in Loan-a-Mac according to experience and use of the computer. Table 1 provides confirmation that most Loan-a-Mac users are repeat customers. Table 2 shows that most of the users consider themselves to be at a "Beginning" level in terms of computer use. Fifty-two per cent of the respondents (n=31) described themselves as having a little skill in a Macintosh application, while 42 per cent (n=26) had comparable skill with a different brand of computer. Thirty-nine per cent of the respondents described themselves as having an Intermediate level of skill by being familiar with several Macintosh applications, 39 per cent also had comparable experience with a different brand of computer. Table 3 provides data related to how the faculty used their Loan-a-Macs. Word processing was the tool of choice for 83 per cent of the respondents (n= 36). Forty-one per cent of the respondents (n=36), noted that they used Loan-a-Mac to learn new software. The remaining applications: spreadsheet, database, electronic gradebook, and desktop publishing were uaed about equally.

User satisfaction with the service provided was high. Eighty-seven per cent of the respondents (n=39) indicated that they had encountered no difficulties with the reservation or return process. Of the five who cited problems, one circled yes for problems, but said ,"Very nice to deal with." A second had problems because she was trying to manipulate her reservation time to insure that she would have a computer in September instead of August when her name came up. One individual was upset because he was first told as a part-time faculty member he wasn't eligible, however, after checking with the Personnel Office, it was verified that he was 52% faculty and 48% classified staff. The remaining two said the problem was that the computers were, "hard to carry." All in all, considering the scope of the program five rather minor complaints appears to be an excellent record. Computer Services is considering purchasing some inexpensive luggage carts to help in transporting the computers. A second question asked about satisfaction with the technical support provided in the Academic Computing Lab. Approximately 79 per cent (n=33) of the respondents said they asked for assistance from the Lab and of that, 96 per cent were satisfied with the assistance. The one dissatisfied individual said he simply could not understand the computer, but everyone was helpful.

A final question dealt with the respondents interest in applying for a MacNet project which would give them a Macintosh SE in their office for a year. Ten of the 38 who answered that question already had a MacNet computer. In response to a question about plans for applying for a MacNet computer, fifty-two per cent (n=29) said they intended to do so. It would seem logical that repeat users of Loan-a-Mac would apply for a MacNet computer. It is interesting also, that some MacNet faculty continue to get a Loan-a-Mac on a regular basis.

Table 1: Use Profile of Loan-a-Mac

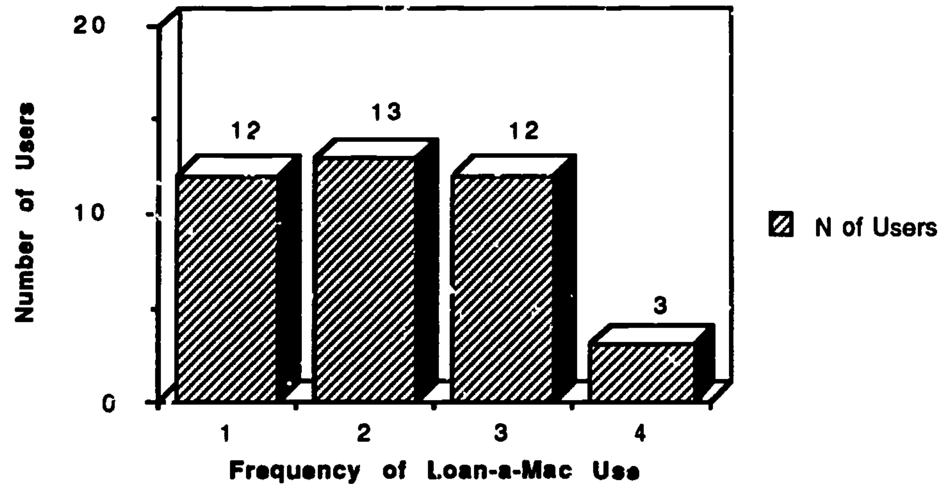


Table 2: Skill Level of Participants on Macintosh and "Other" Computers

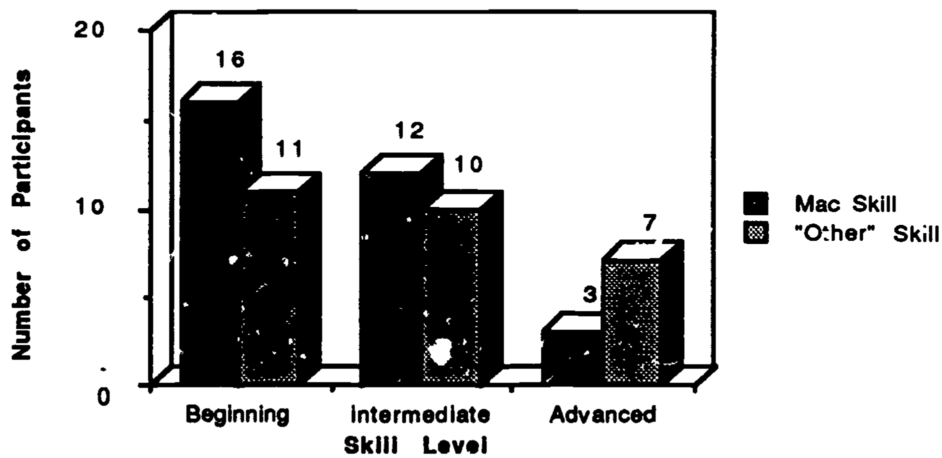
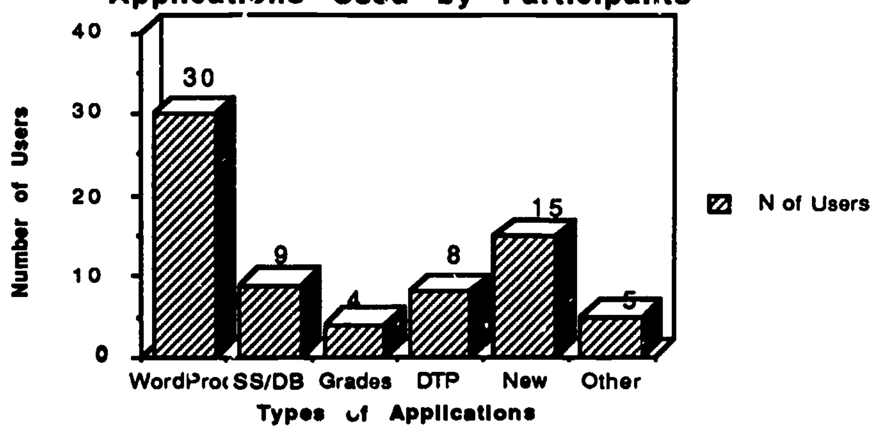


Table 3: Applications Used by Participants



An area left open for comments resulted in 33 of the respondents writing comments about the overall benefits of the program. All of the responses were positive. A few examples were: "Excellent opportunity," "Wonderful, enjoyed having it," "Gained skills and convenient," "Super program," "Only game in town," and "Helped a great deal."

Conclusions and Recommendations. In doing this "retrospective" of Loan-a-Mac, it was interesting to think through why this program is so successful and what recommendations can be made to other colleges that may want to initiate their own "Loan-a-Mac." It is my belief that Loan-a-Mac's success has several key contributory factors behind it.

First, the system was designed to function smoothly in a non-political manner. Computers are "hot property" on this campus. Besides being a limited resource, there is also certain degree of ego and status that come into play when computer users are vying for this resource. In Loan-a-Mac, everyone is treated equally, just as if they were checking out a book in the library. The program was presented as the best possible way to spread around a limited resource, and the campus users accepted this reality. The "red tape" for getting the computer is minimal. On the first request there is one form to sign and a training requirement to meet. After that, it is a matter of a phone call to enter a second request.

Second, Loan-a-Mac fits into the flexible work habits of the college faculty. Whether it is the first-time user learning an application, or the more experienced individual working on a project; the ability to take these computers home has provided a valuable resource that fits into the inherent work-time flexibility of a community college instructor. Instructors have stated that being able to take the computer home insures that they are able to spend quality time on the computer. Another advantage is that for some, it showed them how essential to their work a computer becomes and as a result, they have purchased their own Macintosh.

Third, the program is clearly a "no strings attached" benefit or "perq," if you will. Generally, the policy on any State Community College employee on taking home equipment has been extremely restrictive. The Loan-a-Mac is revolutionary in that regard. This is recognized and appreciated by the users.

Finally, the Loan-a-Mac program is totally consistent with Computer Services' Five Year Plan. The faculty recognizes that the campus will become an electronic village of sorts with the installation of the Academic Computing Network. Loan-a-Mac provides those that are interested in participating in the "electronic revolution" with the opportunity to learn and become comfortable with the coming technology. It provides them with the opportunity to be skilled enough to participate in the MacNet program The MacNet program began in July, 1989 and provides faculty with the use of a Macintosh for the period of one year to complete a definable curriculum improvement project. This program operates very much like a competitive grant program. A written proposal is required and rated by a committee. Those who achieve a minimum criterion score are eligible for the MacNet computer. The use of the Macintosh is for one year in the faculty member's office. At the end of the year, it will be possible to renew a project based on a continuation plan or proposing a new one.

Based on the success of the program on Delta's campus, it would seem to fit a need for colleges that see it as important to provide computer access to the faculty for both learning and project type functions. When considering the implementation of such a program, the following recommendations are made:

1. First and foremost, spend time developing and defining the operation of the program. Our library type of program is very successful, there may be other options that a college may consider.

No matter what the delivery system is, I cannot stress enough that it should be mechanical, not political. Even our MacNet program is based on a rating system that effectively removes politics, plea bargaining, and favoritism.

2. Focus on service with the system. Provide the software which will do the tasks instructors will want done. It is not necessary to have all software on all equipment. Everyone uses Works, but only a few may want or need Ready Set Go. Additional software is loaded on and removed based on the needs of the user. We provide help-line service through Computer Services and the Academic Computing Lab. Encourage users to use that instead of trying to fix it themselves.

3. Provide adequate training opportunities for the users. Training tapes are an ideal companion to the Loan-a-Mac. Users can sometimes only get time to learn new software at home, outside of assigned work time. In recognition of this and the overall success of the program, Delta's College-Wide Staff Development Committee has allocated funds for the purchase of eight Macintosh SE's for classified employees to check out on a two week basis.

4. Visit the key governance bodies to explain the benefits and intent of the program. This pre-implementation activity insured an understanding of the program by the campus leaders and allowed Computer Services to stress the benefits and value of the program as it was designed.

5. Remember that the success of the program is very probably due also in a large part because this is a Loan-a-Mac and not Loan-a-PC. The ease of learning the Macintosh contributes to the enthusiasm and success that the new faculty use on campus are experiencing. This program is designed primarily as a new user program. The relative ease and independence associated with learning Macintosh applications makes the program manageable because fewer resources are needed to support the learning experience. A significant and rapid increase in productivity is experienced, thus the use of the Macintosh becomes a reward in and of itself. Of the 40 surveys, only one person gave up on the computer because he just couldn't understand how to use it and a second just wanted to stick to using a secretary. In either case, it is quite likely that a DOS computer wouldn't have been a better solution.

References

Belarmino, Lee and Zinck, R. Ann "At San Joaquin Delta College, Network Increases Collaboration, Productivity." edu Magazine, Winter 1988/89, pp. 13-15.

When is a Site License Not a Site License? A Guide Through the Maze of Large-volume Academic Microcomputer Software Purchasing

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Many microcomputer software companies profess to offer a site license for their products. The term site license, however, is loosely defined and can mean any number of different licensing and financing arrangements. This presentation will examine the different types of such arrangements, explain the differences between them; and offer guidelines as to what to look for when negotiating a site license agreement with a software vendor.

I. Introduction

The answer to the question, "When is a site license not a site license?" is deceptively simple -- almost never. Almost any microcomputer software company, when asked if they offer a site license, will respond in the affirmative. Upon further inspection, however, the great majority of these site licenses turn out to be something other than their name would have you think. In this paper, we will take a look at what is and is not a site license, give specific examples of each category, and offer some guidelines on what to look for in a volume-purchase of microcomputer software for an academic institution.

II. Types of Licensing Agreements

A. True Site Licenses

A true site license is just that -- the institution pays a fee, either one-time or annual, and the software company allows unlimited use of its package at that institution. Even within the framework of the true site license, however, there can be a distinction.

This difference lies in where the software will be used.

True BASIC and WATCOM, for example, license their BASIC and FORTRAN languages, respectively, for use by any student, faculty or staff member anywhere on the campus of the licensing institution.

Datastorm Technologies, on the other hand, issues a site license for its Procomm and Procomm Plus packages to be used by a student, faculty or staff member in any location, as long as they are using the software to communicate with the institution's computers on campus.

This difference can be seen as reflecting the type of software being licensed.

Procomm, because it is an asynchronous communications package, would be of limited value licensed solely "on-campus", as on-campus computers are usually already in communication with each other over a faster medium, such as Ethernet. There may be certain on-campus sites that would need such a package and these are covered by this true site license as well.

True BASIC and Watcom's WATFOR, however, are licensed to be used in classroom situations, as teaching tools. The companies who market these products also know that students who have their own computers will want a copy of the program for their home machine, which will help the company sell more copies of the software (probably at a reduced rate, as we will see later).

B. Volume and Educational Discounts

In a majority of cases, when a software company says that they offer a site license, what they are really talking about is a volume discount. Like the volume discount in other parts of the economy, the larger the number of items you buy, the less each item costs per unit. As with a true site license, there are variations here as well.

The first kind of volume discount involves a purchase threshold. For example, up to a certain amount in sales, a software package costs 100 dollars, beyond that certain amount of sales volume, the price drops to 75 dollars. Claris, the Apple software company, operates in this way, with purchase thresholds at 5,000, 10,000 and 15,000 dollars.

A variation on this is offered by Microsoft for some of its software. Packages that are likely to be used in a teaching situation, such as Word, are sold in "Academic 10-packs". These groupings have enough disks for 10 computers, but only one set of manuals. This of course saves Microsoft money by cutting down duplication costs. It is also logical from the point of the instructor, who will supposedly be teaching the students about the program, so that manuals for each student would be redundant. WordPerfect uses a variation of this, as we will see later.

The second kind of discount has no purchase threshold. Here a special educational price is offered by the company making the package, no matter how much business you do with them in a given time-frame. This price may only apply to those packages used in a teaching situation, or any person affiliated with an educational institution may purchase the package at the reduced rate.

An example of the former scenario is AutoCAD by AutoDesk. Copies of AutoCAD used for instruction may be purchased at about 35% of the retail list price. Each copy is identical to the full retail version.

An example of the latter is the School Software Program of the WordPerfect Corporation. Under this plan, any product offered by WordPerfect can be purchased by student, faculty or staff of any educational institution for about 25% of the retail list price. As with AutoCAD, each copy is identical to the full retail version. Through a third party, WordStar offers the same arrangement.

The third variant of the volume discount is the "master fee-minimum number" plan. Here, the educational institution pays a master license fee for a software package, then pays a fee per copy of the software bought and agrees to buy at least a certain number of copies.

This variant is used by WordPerfect, which calls it their Site Volume Pricing Agreement. For example, to buy version 5.0 of WordPerfect for the IBM PC under this program, an institution pays a master license fee of $75, then pays a per-copy fee of a maximum of $40 each (a cost which further declines as the number of copies increases). For each copy of the program, you get a quick reference card and a keyboard template. The master license fee entitles you to one copy of the manual, as well as allowing you to purchase more copies of the manuals for a fee.

C. Resale Agreement

Several software companies offer a site license which operates very much like a department store. The institution buys the software at wholesale, adds its profit margin and then sells to the consumer. College bookstores will frequently offer such packages to students. Companies encourage faculty to adopt their software by offering such plans, in hopes that the teaching staff will require students to purchase a copy of the software. This kind of licensing is very similar to that used for textbooks for many years.

One company that offers this kind of arrangement is Borland. Through their Scholars' Program, students can purchase any Borland product at a discount of about 50%. College bookstores and computer stores can buy the software at about a 70% discount, so even with a reasonable markup, the software can still be sold for the same price as the student could purchase it at retail. In addition, for a certain number of copies of the software bought, Borland supplies a free copy to the faculty member who will be teaching the course.

Even if specifically required for a course, Borland will still offer a discount to students through a special coupon. This coupon, usually distributed at the start of the semester, entitles them to the 50% (or more) discount. The only requirement is that an instructor suggest that the software would be valuable in a certain course, and that a course number be noted on the coupon.

Addison-Wesley is also in the resale agreement line. The difference is that Addison-Wesley offers "student editions" of popular packages. These editions are smaller, or have fewer features than the regular retail versions. For instance, the student edition of Lotus 1-2-3 can only handle 256 rows by 64 columns. A special manual is also included with the student editions. This manual is more of a tutorial than a reference text. Once again, college bookstores and campus computer stores can purchase the student editions at a greater discount, mark it up and resell it to students for the same price as the student would normally pay. Addison-Wesley also does not sell software of its own, as does Borland, it only markets the special editions.

III. What to Look For in a Licensing Agreement

With all the different programs offered by vendors, it's easy to get confused and quite possibly wind up with a sales agreement that isn't what you had thought it would be. In this section, we'll suggest some guidelines for buying software in large quantities.

A. Intended Audience

Before conducting negotiations for a site license, ask yourself what group will benefit from the package. If it will only be used in an instructional setting, it's wasteful to buy a license that lets anyone associated with the institution use the application at no cost. If it is a program that will only be used administratively, don't spend extra dollars making it available to students as well.

On the other hand, it never hurts to get as wide a coverage as possible for the least cost. If a site license costs the same whether or not its distribution is restricted (and the vendor doesn't want to negotiate a lower price for fewer users), you have no choice. You may find that having faculty, staff and students a use the package helps the computer support staff by creating a de facto campus-wide standard.

B. Hardware Environment

Take some time to identify where the software will be used. Vendors frequently license software for a single computer, so if you want to run it on a network, you may find yourself paying a higher price. On the other end, if the network version of the software is the package you want, see if the vendor will decrease the price normally charged if a product will be used on both stand-alone and networked machines.

C. Types of Fees

There are as many different ways to pay for a site license as there are things called site licenses. In general, there are four categories of payment, listed below in order of preference to educational institutions:

1) One-time fee. You pay once and the software is licensed to the institution in perpetuity. This option is so rare as to be non-existent.

2) Yearly fee. Here the institution pays a yearly fee to the vendor, with no per-workstation or other incremental costs. This variant is quite similar to the next one below.

3) Initial fee with yearly maintenance fee. Here a one-time cost buys you the ability to pay the company an annual cost, in order to keep your site license current. This option is common and has its roots in the pricing arrangements for minicomputer and mainframe software.

4) Master fee with per-workstation license cost. Much like #3, except instead of paying an additional fee each year, you pay an additional fee for each computer on which you intend to use the software.

Of course, the best kind of fee is the smallest one possible, no matter what its terms.

D. Packaging

Especially with volume discounts, you should give some thought to how the software will be distributed. If all you really want is the legal ability to run a package on say, 100 computers, why get 100 copies of the manual, disks and assorted paraphernalia? Ask the company if you can reduce the cost of such volume pricing further by only getting one copy of the actual product. This will also save you from having to open 100 packages, throw out the manuals, and re-format the disks. (Why re-format? You could be held legally liable if someone went through the trash, picked out the program disks and used them on a computer that wasn't covered under the license agreement.)

On the other side of the coin, if your intent is to make a full-blown copy of the software available to anyone in your institution who wants it, it is to your advantage to have them get all the parts of the application that come with it if you had paid full price. Otherwise, your computer support staff will end up spending more time and money answering questions about the package than you saved with the site license.

E. Technical Support

Ask the vendor you're buying from how the site licensing agreement will affect the vendor's technical support. Will end-users of the program still be able to call the company, just as if they had paid full price for the package? This luxury may be one of the things the vendor wants to do away with, in order to save money.

The technical support for a site license (if end-users can't call directly) often involves a designated support person at the institution. This support person fields questions from end-users, answers them if possible, and if not possible, calls the vendor for help. In an effort to make this system more usable, vendors may make available a database of commonly-asked questions with their answers, a bulletin board system or other support aids.

As a basic requirement, make sure the vendor from whom you are considering licensing a product at least has a technical support department accessible to your institution. There are cases of companies who only allow dealers to call them directly and your site license does not make you a dealer.

F. Upgrades

When figuring the cost of a site license, always ask if upgrades and/or bug fixes are included in the cost. Sometimes, upgrades and fixes are an additional expense (payable per workstation license or as a lump sum annually). Some vendors offer free bug fixes, but the institution has to request them. Other vendors may throw in a year's worth of product updates with a license of that term.

G. Error Determination and Resolution

As we all know, the software package that is completely free of errors has yet to be marketed. With a site license, an institution may well find itself in a situation much like that of a vendor: the more users who work on an application, the more bugs will be uncovered. If the vendor of a particular package prohibits end users from calling the company directly, users who encounter flaws will call you instead.

Always have the vendor specify how such problems will be handled. There may be different ways to resolve problems depending on the severity of the bug. If a bug prevents a program from working as advertised, the vendor should provide a fix promptly. If a bug only requires that a work-around be used, the vendor may wait until the next official release to change the product. In either event, spelling out such conditions before paying the license fee can save time and hassle later.

H. Methods of Distribution

Every vendor who offers a site license has their own way for distributing legal copies. SPSS, a statistics program, requires that every person who receives a copy of SPSS-PC sign a license form, which the institution must keep on file. Other companies only ask that the institution verify that a person is legally entitled to receive the software. Other firms only let people use their product while on institution business; copying is forbidden.

Remember that one of the advantages of a site license from the standpoint of the software vendor is less administrative overhead. Very often, this manifests itself in such overhead being done by the institution in place of the company.

When negotiating a site license, check that the method of distributing the software won't cause a burden to your institution that you don't have the staff to handle.

IV. What to Avoid in a Licensing Agreement

Just as there are many things to look for in a site license, there are items to avoid as well.

A. Having One Person as a Vendor Contact

Even though many firms may want only one technical contact at an institution, it is important that this support person be different from the person handling the administrative dealings with the vendor. Even with small volumes of software licensing, the amount of work involved in both technical support and organizational record keeping can crowd out any other tasks a staffer is expected to handle.

Also, with more than one person as a contact, you have a backup in case of illness or other absence from work.

B. Non-cancelable Agreements

As with any contract, be sure there is a clause allowing your institution to terminate the agreement on written notice. This clause should not have further stipulations and should allow you to get out of the agreement for whatever reason you see fit. Agreements that only allow you to terminate them with the vendor's approval should be avoided at all costs.

Here's an example of why you need this safety outlet: your fiscal year does not correspond with the term of your site license. The licensing agreement requires you to make quarterly payments. Your budget for the new fiscal year gets cut drastically and one of the items you decide to cut is the rest of the payments on the site license. If your contract didn't allow you to exit without vendor approval, you might find your institution running a deficit.

C. Putting Your Institution at Risk For Misuse

A very touchy subject with all vendors is who will be pay for unauthorized copies made from your site license. Although it is reasonable for institutions to be responsible for such piracy (they are, after all, supposed to enforce the terms of the license), the thing to watch out for is any liabilities above the cost of the stolen software. By this, we are referring to court costs, lawsuits, or criminal charges. In general, a paragraph or two stating that the institution will do its best to prevent illegal copying may well satisfy most vendors.

Although the burden of uncovering such illegal copies is almost always the vendor's, it would be a good idea to verify this as well before signing any agreement. Once again, a good faith effort on the part of the institution to prevent piracy from happening in the first place is the best defense.

V. Conclusion

Although what may be called a site license is most likely another beast altogether, there are still many advantages to using such arrangements.

The most important thing to do with any volume purchase of microcomputer software is to compare the dollars saved in the short-term with the labor costs incurred by your institution in the long-term. The site license that appears on the surface to offer you an application at 1/3 of retail list price may turn out to cost you 25% above list after you add in staff time for support and administrative record-keeping. Only by doing a comprehensive analysis of both costs, both immediate and long-range, can you make the right decision.

TECHNOLOGY/PEDAGOGY INTEGRATION AS A SUPPORTED, MULTIPLE-YEAR PROJECT

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INTRODUCTION

The problem of integrating technology and pedagogy is not easily solved. In almost every case, successfully integrating technology into an existing course is hard work, probably involving a multiple-year effort, hundreds of hours on the part of an individual faculty member, and the coordination and support of a number of different units within the University. It is not, as was once suggested, simply a matter of "buying a package and placing it on the network for students to use."

Indeed, the problem (irregardless of the solution) is not well understood by many members of university faculties, staffs, or administrations. Each has a different role in the process, and each set of roles must be fulfilled if a university is to benefit from the widespread integration (as opposed to today's relatively isolated instances) proposed by proponents of the use of technology in teaching/learning environments. One can begin to understand the difficulty of the problem by attempting to develop an environment which would truly encourage such integration, hence the purpose of this paper.

The initial section of the paper contains a section entitled "General Nature of the Problem", which is defined in more detail in the section on "Specific Aspects". In the section entitled "Implementation", a solution is proposed within the perspective of a supported, managed effort designed to create an environment in which interested faculty can, if they choose, successfully integrate technology into a classroom environment. A financial model and several conclusions appear at the end of the paper.

GENERAL NATURE OF THE PROBLEM

It is important to note that most faculty are users, not developers, of teaching/learning materials. They use resources such as textbooks developed by their peers, audio/visual materials frequently developed by vendors, and libraries and information technologies developed and/or supported by their institutions. In the case of written material, the use of resources prepared by others as tools for instruction has been occurring since the beginning of time; in the case of stored program computers, since the middle of this century. The first professor to use the first IBM 704 sometime in the early 1950's probably began envisioning the instructional potential of the technology as soon as the power of the resource was understood, and certainly there are many examples of computers in the classrooms in the early 1960's.

Thus efforts to develop courseware are not new. What is new is that the key barriers of excessive cost and the lack of a sufficient amount of acceptable software are rapidly being overcome. Given the number of successes reported in recent years it would seem that by now the use of technology in teaching and learning environments would be as common as the use of other resources available to faculty, or that we would at least see momentum in that direction sufficient to convince us that the use of such resources would become commonplace during the next few years. But the use of technology in pedagogic environments is not commonplace, and what momentum that does exist is developing at an excruciatingly slow rate.

Efforts to develop the momentum have focused on a series of perceived, tangible obstacles. For example, both the Silicon Basement Seminars and the NCRIPTAL Awards evolved because their developers correctly believed that major obstacles included a lack of awareness both of the potential offered by technology and of successful examples of the use of technology in disciplines of all types.

But more fundamental than these kinds of obstacles, however, is the question of what truly happens when a member of the faculty walks in front of a class and begins to teach. It (the act of teaching) is a very special event, highly individualized, unique to a given professor in a given environment, teaching a given lecture in a given course. The issues are curriculum restructuring and courseware portability (in the pegagogic, not the technical sense) because the way in which a particular course is actually taught depends upon a specific professor at a specific university and is typically a function of the specific tools available.

When we then recognize that the problem is further exacerbated by more mundane things such as a lack of detailed technological expertise on the part of most faculty, insufficient staff support, lack of resources, minimal or no administrative support or commitment, and a general lack of focus on the problem, it is not surprising that the results have not been good. Simple problems become incredibly complex: which software package to choose for a given segment of a course, whether the package will run on existing hardware, what the use of the package will do to the existing continuity in the course, and even how to load memory, get started, and recover from a myriad of potential technological-based failures.

Finally, in some cases the problem may be made more complex if an administration makes incorrect assumptions about whether and how a given segment of the faculty will want to change, and then proceeds to install resources which may not be appropriate to the pedagogic environment at the time. Integrating technology into the curriculum is not an administrative process. It is a faculty process which requires a great deal of administrative support, possibly in the form of released time, and certainty in the forms of staff assistance and financial support.

SPECIFIC ASPECTS OF THE PROBLEM

Successfully creating an environment in which interested faculty can integrate technology into the curriculum is a relatively complex problem. The problem can best be described as a series of needs. In this section of the paper the needs are defined, and an approach to meeting these needs is described in the next section.

NEEDS

ITEM	WHY
1. A plan	The project spans about thirty-six months, involves many different activities and constituencies, and a not insignificant financial commitment.
2. Interested faculty	Volunteers will have a much higher probability of staying with the project for its duration.
3. Sufficient interest to impact a number of courses (ten, for example)	One aspect of the problem is critical mass. Multiple success stories across several divisions has a better chance of building momentum than one or two "apostles".
4. Faculty identified courses	obvious
5. Staff support for faculty in the selection of software	1. Software evaluation requires knowledge of not only its functionality, but also its operational environment; 2. Sources of software are not generally known to faculty.
6. Staff support for faculty during the acquisition/ purchasing phase	Bureaucracies can quickly destroy an initiative.

7. Staff or intern support for faculty during initial implementation	1. Software is often not well documented; 2. There may be components which do not work as advertised. 3. New technologies or technologies unfamiliar to faculty may be involved. 4. University procedures (access, establishing student accounts, etc.) may be problematical.
8. An opportunity for faculty training in the early stages of the project	1. Additional use of technology (e.g.: spreadsheets, data bases, word processors, etc.) may be assumed by the authors of the selected packages; 2. Expanded use of technology may be highly useful in either the teaching or learning process.
9. Possibly a defined amount of released time for faculty to make modifications to the curriculum	May be necessary if significant changes to the pedagogic process is contemplated. Source materials, course sequences, changed quantity of course content, examinations/evaluation tools, assignments, etc. are impacted.
10. Documentation support	1. Students will need user guides; 2. Demonstration examples will need to be constructed. 3. Staff will need to learn how and at what level to provide consulting support.
11. Evaluation process (project oriented)	In return for administrative and staff support, meaningful feedback on how well the project worked should be part of the process. The focus with respect to this need is on how better to support future faculty projects.

12. Intern support during first sequence through a course	Identify, help fix problems, failures in the process, failures in documentation, administrative needs, etc.
13. Two to three post-course faculty conducted seminars presented to other faculty within the university	1. The focus is on pedagogic impact at this point. Disseminate information to peers; what works, what didn't work, etc. 2. Build critical mass; attract other interested faculty. Obtain agreement from faculty to present seminars in exchange for released time and support.
14. Staff support for an update cycle	Post course evaluations will reveal problems and areas where modifications/additional support is required.
15. Planning for sustained efforts	University administration can assist in expanding successes, by building on or repeating the cycle.

Thus there is not one, but many problems to be solved. The successful incorporation of technology into the curriculum includes faculty becoming engaged in self-directed uses of technology, the creation of new approaches in curricular presentation, and the development of specific expertise, and examples of the use of technology in the classroom so that other faculty will follow by example.

IMPLEMENTATION

The key is to put together a team of academic professionals. To have a impact on the institution, a "critical mass" is required -- one or two projects will not do. The support of the University's Academic Computing Services is also vital to the success of the project. This support needs to include assistance in: the identification of appropriate software, management, documentation, training, evaluation, and dissemination of successes to other faculty. A three-year developmental project is envisioned.

The actual process may be summarized as follows: For purposes of example, we suggest that approximately ten faculty members be identified, each to spend about 25% of their time for one year developing material to be applied to a specific, targeted course during the next year. The intent is to successfully integrate technology into a total of ten courses. Each faculty participant will then present two seminars to the university community during the third year (twenty seminars).

Each individual who volunteers for the project will go through a process of identifying software and/or technology which, because of the documentation, review, and/or national recognition, appears to be an excellent candidate for a particular course. The process of identifying the technology, acquisition, learning how to use both the software and the hardware, and developing initial approaches to the targeted course will be conducted during the initial year of the project.

The second year (first actual classroom implementation) is also developmental in nature. Problems, knowledge of what works and what does not work, and ideas about how to improve on the use of the tools developed in the first year will become apparent only through classroom pilot and evaluation efforts. Faculty will teach the course one semester, make revisions in curriculum and technology use, and re-teach the revised course to complete pilot work.

The final, very important developmental aspect of the project is the two seminars that participants will conduct during the third year. Each seminar need be only a few hours in duration. The successful "experiences" of faculty can be discussed and used as catalysts to cause other members of the faculty to seek ways to integrate technology into their courses. That is, proof by a known colleague that the use of technology truly improves the teaching process, or that students learn better (this means that they learn more from a given course, gain different insights, retain the material for longer periods of time, learn faster, etc.) will generate more interest on the part of the faculty than any number of papers, reviews, or sales efforts by people external to the University. Third year seminars will be offered under the auspices of Academic Computing Services, and Faculty will lead seminars without release time as part of their project commitment.

CALENDAR

Tasks	Primary Participants	Estimated Months Duration	Calendar
Planning begins: Identify faculty volunteers.	Provost, Deans, Faculty	1-1	July #1
Identity courses	Faculty	2-2	
Identify software sources and universities who have used software.	Academic Computing Services Staff and Faculty	3-3	Sept #1
Select student interns for involvement in the project.	Academic Computing Services	3-3	
Review software documentation, demo disks, manuals and installation requirments.	Academic Computing Services Staff and Faculty	4-6	
Contact universities using software that is finally chosen.	Academic Computing Services Staff and Faculty	4-6	
Order and install software.	Academic Computing Services and student interns.	7-9	Jan #1
Faculty training in use of software.	Academic Computing Services; interns; faculty participants.	10-14	
Curriculum design, demonstration, applications and preparation integrating software use. Revise syllabi.	Faculty participants.	3-17	
Assemble final project packages: - user guides for faculty - classroom demonstration examples. - course lectures/syllabi - class assignments	Academic Computing Services staff; faculty participants interns.	13-14	July #2
Courses taught	Faculty, interns.	15-18	Sept #2
Course modifications. Training documentation for faculty updated; project packages updated;	Faculty participants, Academic Computing Services staff.	18-19	

Courses taught	Faculty, interns	19-23	
Evaluation of process	Faculty, staff	24-27	Jan #2
First seminar conducted	Faculty participants; Academic Computing Services.	28-28	Oct #3
Second Seminar	Faculty participants; Acad-Computing Services.	32-32	Feb #3
Planning for project continuation.	Provost, Dir. Academic Computing; Deans Council, Faculty	25-34	

FINANCIAL MODEL

The figures below assume that the project involves ten courses, ten faculty released 1/4 time for one academic year to learn the technology and to modify a course, ten students (one for each faculty for a two-year period), an average of $3000 per faculty for software and equipment, and $200 per faculty for miscellaneous expenses. In Year #1 the major activities are acquisition, learning, and curriculum modification; in Year #2 the activities are teaching and evaluation, and in Year #3 each faculty member presents two seminars. Actual budgets could vary significantly, depending on items such as local costs, equipment and software. Figure 1

	YEAR #1	YEAR #2	YEAR #3	TOTAL
Ten Faculty - @1/4 time ea.	$100,000			$100,000
Equipment	30,000			30,000
Student support	20,000	$20,000		40,000
Supplies	2,000	2,000	2,000	6,000
Totals	$152,000	$22,000	2,000	$176,000

Estimated cost per course: $17,600

SUMMARY

From the standpoint of university administration, the problem of how best to integrate technology into the pedagogic process must ultimately evolve into the question of how best to create an environment in which interested faculty can, if they choose, create change in individual courses, one course at a time. There are a number of difficult, and sometimes complex implementation issues, such as: where to start the process, how best to provide support, how to fund initiatives, how to sustain the project, and how to disseminate the results. That is, where to begin, how much does it cost, who does what, and who pays?

There are examples where highly motivated individuals have, through often extraordinary efforts, developed courseware modules for some aspect or another of a course. The more general case however, and the conclusion suggested by this paper, is that the successful incorporation of technology into a teaching and learning environment is a two-to-three year process requiring a great deal of hard work on the part of a principal and significant support on the part of the university. Furthermore, should a university want to have an environment where the use of technology in instruction is more the general rather than the special case, and it (the university) is not willing to wait until the middle of the next decade for this to occur, then a way to build momentum must be found. One such way might be to .pa initiate a sufficient number of projects so that critical mass is established, with the idea that the successful experiences of a core group of individuals will become the foundation of a more widespread use of technologies in teaching and learning environments.

Instant Microcomputer Labs: When Just Adding Water is Not Enough

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Abstract: When novice planners of microcomputer labs have either received a hardware grant from a vendor or have located funds to acquire hardware, they sometimes think that their task is almost completed. This presentation will provide the beginner (and, we believe, the more seasoned) planner with a series of steps and a list of items to consider in the creation of a lab as well as in its operation and management.

This session could have fit in most tracks at this conference, from Strategy and Planning to Policy and Standards, but I am delighted to have been selected for the Academic Computing track since this will allow me to address most freely the broad range of issues governing public facilities.

The paper will address the general strategic questions, the implementation stages, and the day-to-day operations of microcomputer labs.

I will lead you through a checklist of items you need to include when you plan a facility, a checklist compiled over five years of trial and omissions.

First, how do public facilities figure into your institution's computing strategy? At Princeton, their main purpose is student computing, but the labs are open to all members of the Princeton University community -- students, faculty and staff. Our strategic plan calls for a ratio of twenty-five underclassmen per public microcomputer and fifteen upperclassmen and graduate students per microcomputer.

Our student population is 4,524 undergraduates and 1,770 graduate students. We currently have sixty-nine workstations in residential colleges serving 2,263 undergraduates, or thirty-three students per workstation and 267 workstations serving the other 4,031 students, or fifteen students per workstation. In other words, we haven't reached our goals for underclassmen.

We have also made microcomputer ownership attractive by negotiating discount agreements with, among others, Apple and IBM and by providing loans to students at one percent above prime rate.

Public facilities fall into two categories at Princeton: (1) general, where students do their homework (wordprocessing and other) and (2) classroom, where faculty teach using commercial or custom software. The latter facilities revert to general use outside of class hours. Two of our facilities are high-end graphics classrooms used for instruction and research. The others vary from IBM PS/2 30/286 and Apple Macintosh SE to IBM PS/2 mod 70 and Apple MacIIx.

Where, then should those labs be installed? At Princeton, it is usually the most difficult problem to solve. Our campus buildings are quite old and have very little space to spare. The spaces relinquished are often basements, used for storage. One of our last facilities was converted from a civil defense shelter. These renovations become very expensive. If you have the good fortune of being able to include a computer classroom when a building is built, so much the better.

Ideally, one would locate the clusters where students are taught and where they study. Where are they taught? In the academic buildings. In this case, it is a question of negotiating with the departments for space.

Your second option is to install clusters where students study. In the libraries and in the dorms. You are well aware of the close relationship we need to form with libraries as we shift from the computer age into the information age. A lab in the library is one of the many ways to foster that approach. We have opened our first facility in the main library this year. Others have done the same. Boston College has a superb facility in their library and I recently visited Stanford where a few MacIIs have been put on study tables in the stacks of the undergraduate library.

On most of our campus, crime is unfortunately on the increase and we need to think more about the safety and security of our students. Providing dorm computing facilities helps. It also fosters collaboration and camaraderie between students as they work together and help each other use the equipment and software. In a recent survey, we found that fifty percent of students own a micro but do not own high quality printers. So the demand on cluster printers is great. Currently students use "sneakernet" from their rooms to the cluster printer. However, we are wiring the dorms for data and next year, the students will be able to send files from their own room computer to the cluster printers or to special print stations. Our strategic plan calls for free printing for students.

One would like to see the clusters evenly distributed between dorms, libraries and academic buildings, but one utilizes the space as available.

Let us go down the checklist (see Appendix). I will not comment on each item as a number of them are self-explanatory, but are there as a tickler.

Cluster Planning Checklist

Cluster name: Usually building name and room number are sufficient for identification. Occasionally, a working code name becomes the lab's official name. For instance, the Macintosh lab in the basement of the math-physics library which is located in Fine Hall is known to all as "MacFine."

Department(s): The academic department(s) who own(s) the building.

Department Contact(s): The departmental administrator or the faculty member responsible for computing.

Project Manager: Usually the manager of Public Facilities Services who, with a staff of three, is responsible for the planning, implementation, and the operation of public facilities.

Planning representative: the representative of the university facilities department.

Estimated starting date and estimated completion dates are self-explanatory.

The Drop dead date is usually determined by a curricular need. For instance, if Professor Smith is scheduled to teach a class using Mathematica on the second Monday of the Fall Semester and the new lab is the only one which will run the software, then the second Monday of the fall semester *is* the drop dead date.

Hardware

The choice of hardware depends on strategic decisions you have made for your campus and about the actual hardware you will support. Occasionally a vendor who is not a part of your strategy will offer a gift of their hardware. This is a time to consider the support implications of the gift. It is necessary to examine your support commitment and decide if you can afford to add another vendor without diluting the support of those vendors already in your plan. We are a multi-vendor campus as are most institutions. We try to balance the distribution of the various vendors around the campus. The minimum configuration for IBM is a model 30/286 and for Apple an SE, but we will move as rapidly as we can to 386-class machines. Our hardware ranges from fairly low-end in our general use clusters to much higher-end in classrooms used mostly for engineering and scientific teaching and research. It must be said, however, that although many believe that high-end hardware is wasted on humanists and social scientists, I do not subscribe to that doctrine and, in fact, a humanities course is using one of the Iris graphics labs and we are about to install a small NeXT cluster in the Music department.

We amortize workstations over three years and printers over two. When we replace the workstations in a lab, we overhaul the equipment we remove and resell it to departments for its residual value. There are still enough departments that do not have any hardware or for whom used cluster equipment is an upgrade.

How many machines we install is obviously dependent on the size of the room. Ideally, we would like five feet between workstations but we will often squeeze a few more in an area of the campus that has fewer labs. We have one printer for every fifteen to twenty workstations and we have standardized on Postscript printers.

In each lab we equip one machine with the means of conversion from 3.5" disk to 5.25" and vice versa.

We offer a variety of services from true file servers where we register the users, give them private disk space etc., to software servers, to simple print sharing devices like Avatar Alliances or even switch boxes in the case of the smallest clusters. Our smallest cluster occupies a little typing room in the Art library, where two Macs share the space with an electric typewriter.

We use Northern Telecom "Memorybank" for backing up our servers. The question of local (i.e., near the cluster) vs. centralized file servers (i.e., near our system programmers) is a hotly debated question.

Network

Our networking consists of standard 8 pair, 4 shielded, 4 unshielded data cable. We have generic faceplates at each workstation. We offer 9600 Baud serial connections, AppleTalk, Ethernet, Token ring, video and alarm connections. Workstation cabling is from the workstation to the wall plate. Bridges and gateways is the equipment needed for the cluster to communicate with the campus network.

Software

We equip our labs with base software sets consisting of operating system, network software, communications and word processor. To this we add spreadsheet and course software as appropriate to each lab.

Physical Renovations, Furniture, Security, Teaching Technology, Miscellaneous

Considerations of physical renovations, furniture and teaching technology may seem obvious, but are surprisingly easy to overlook. Overlooking them can make life difficult later on. Security arrangements are tailored to each particular cluster. Video surveillance is one we have not used but are considering.

Maintenance and Management

This is where questions of turf come most into play at Princeton. Departments will give us their space to create a lab, but although we spell out very carefully that equal access needs to be given to all members of the university community, memory losses are very frequent. However, we work closely and well with most departments and get a lot of cooperation from them.

Our hardware is maintained internally. Vendors can also provide this service. The Public Facilities Services staff refresh the hard disks periodically and do backups of the servers. We support the EDUCOM code and advertise it, but illegal software crops up on machines all too frequently. We also have signs indicating that personal files found on hard disks will be erased.

Network administration comes out of our Systems group.

Paper and toner is stocked as close to the facility as possible. Again the Public Facilities Services staff is responsible for this function. We recycle toner cartridges and purchase refilled ones.

Access depends on the hours of the building in which we are guests. The two facilities in the computing center are open twenty-four hours a day. We don't have a summer school, so we close some facilities during the summer.

Handicapped access is another issue at Princeton. Our old buildings are not easily accessible to wheelchairs. As we become aware of special needs, we accommodate students as well as we can. We are now working toward better facilities for sight impaired students. California State, Northridge, and the University of Missouri at Columbia have done pioneering work in this area.

We cannot afford professional staff for our twenty facilities. Our residential college facilities (for freshmen and sophomores) are staffed by student consultants twenty hours per week. They are coordinated by a student site manager who provides input on consultant scheduling as well as signage and documentation. Our Information Centers consultants provide assistance by telephone.

Scheduling of the facilities is not done centrally. Rather it is done separately in each academic building, usually by the person who schedules seminar rooms or lounges. The departments prefer it this way but I am not sure that scheduling by the registrar might not be more efficient. We rely on the same people to post closings, software changes, changes in hours, etc.

We like to maintain a Faculty (courseware) liaison whose function it is to submit proposals for the purchase and installation of new courseware. Our requests for these purchases and installations often come in a week before classes start. We would like to adopt the library reserve model, e.g. in the spring, faculty are asked to submit reserve lists for the fall semester. If those lists are late, the faculty have come to realize that the books they requested may not be on the reserve shelves.

The building managers are great allies in that they provide day-to-day help with routine problems such as temperature control, blown light bulbs, etc.

In summary, no, just adding water is not enough. Careful planning is essential in undertaking to provide public computing facilities on your campus. But as you know, the best laid plans, etc....

In 1985, our computer science department received twenty Macintoshes ten days before they intended to start teaching their introductory Pascal course. We rose to the challenge and ten days later, the class was taught in our first public Macintosh facility. I was given a small bottle by the leader of the team who accomplished this miracle. Its label reads: Jacqueline's Instant Macintosh Cluster Pills. *Just add water.*

Appendix. Cluster Planning Checklist

- Cluster name
- Room number
- Building
- Department(s)
- Department contact(s)

- Project manager
- Planning representative
- Estimated start date
- Estimated completion date
- Drop dead date

Hardware

- Workstations or terminals
- Diskette conversion
- Printer(s) & cable(s)
- File server
- Software server
- Print sharing
- Server backup device
- Other

Network

- Network type
- Network cabling
- Workstation cabling
- Bridges, gateways, etc.

Software

- Operating system
- Network software
- Communications
- Word processing
- Spreadsheet
- Course software
- Other

Physical Renovations

- Heating, vent, air conditioning
- Painting
- Cleaning
- Carpeting
- Lighting
- Electrical circuits & outlets
- Cable housing & connectors
- Storage
- Inspection, Certificate of Occupancy
- Other

Furniture

- Built-in counters, etc.
- Tables
- Chairs
- Closet or coat area
- Paper storage cabinet
- Cabinet locks
- Clock

Security

- Workstation alarms (local)
- Workstation alarms (remote)
- Equipment locks
- Video surveillance
- Door locks
- Fire extinguisher (electrical)
- Other

Teaching Technology

- Projector
- LCD projection panel
- Projection screen
- Black or white board
- Other

Miscellaneous

- Telephone
- Bulletin board
- Mouse pads
- Document rack
- Documentation
- Wastebaskets
- Signage
- Other

Maintenance & Management

- Hardware
- Software
- Network administration
- Paper & toner
- Access (hours, etc.)
- Handicapped access
- Student staffing/site manager
- Class reservations
- Publicity/notification/closings
- Faculty (courseware) liaison
- Building manager
- Other

An Assessment of Computer Based College Writing Programs

Max Kirsch, Harvey S. Wiener and Michael Ribaudo
The National Project on Computers and College Writing/ The City University of New York

Background

Perhaps more than any other discipline, composition studies all over the country have generated considerable excitement for computers as teaching aids. Indeed, many campuses are considering regular computer use the foundation of writing classes. However, many composition teachers are uncertain about how to use computers in the writing classroom. Interesting programs do exist at some post secondary institutions; yet these programs are generally unknown to most English teachers. Further, reports on the benefits or dangers of word processing on the teaching of writing have been highly generalized, based largely on impressionistic observations of classroom outcomes, or driven by anecdotal remarks made by instructors. None of these, unfortunately, is particularly valid as a research commentary. The effects of microchip technology on the teaching and learning of college-level composition has neither been adequately investigated nor appropriately showcased.

The promise that computer technology offers dramatic new means for the teaching of writing has consequently been tempered by a growing concern that the fate of the computer will follow that of other technologies with powerful educational potential such as overhead and opaque projectors, televisions, movie projectors and cassette recorders. Because of a lack of systematic training, teachers never adequately integrated this equipment fully into classroom methodology; and the new-then, old-now technology is collecting dust on storeroom shelves. Indeed, very little practical material exists to help those classroom teachers who want to transform computer hardware and software into regular instructional realities. Other than the technical manuals that accompany software packages. very little guidance and even less computer-based curriculum and teacher-produced materials, have enabled instructors to integrate programs effectively into classroom use.

The National Project on Computers and College Writing

In 1986, the U.S. Department of Education's Fund for the Improvement of Post Secondary Education (FIPSE) invited the City University of New York to propose a wide reaching project to assess microcomputers in the college composition class. In response, the University's Office of Academic Computing and the Office of Academic Affair's Instructional Resource Center proposed the National Project on Computers and College Writing, which was funded for a three year period beginning in the fall of 1987. The initial goal of the project was to identify a number of representative institutions across the country that had already integrated computers into the writing curriculum, design a research model that could assess the effectiveness of this technology for instruction, and develop ways of disseminating the results to other institutions embarking on computer based approaches to writing instruction.

Word processing methodology varies widely from one college program to another. We set out to examine the nature of that methodology on diverse campuses. Then, we wanted to study the effects on student writing of particular uses of the computer in the composition classroom, thereby linking methodological strategies and assessment.

It was clear from the beginning that dissemination was as important as the empirical assessment. From the perspective of an English department or a writing program, the "how-to" needs to precede the investigation of programmatic outcomes. By looking at how various institutions have implemented computer-based approaches to writing instruction, and by providing information on daily activities in writing classes, we felt that we could be of significant help to the writing community as a whole. There were too many stories of instructors returning from summer break, handed a set of keys to a newly-acquired state-of-the-art computer laboratory, and asked to implement a computer-based writing class.

Project Methodology

The activities of the first year of the National Project included identifying a set of institutions that could be included in the research design and whose efforts could later be highlighted through curriculum materials development and dissemination. Over 90 institutions responded to a call for proposals that was distributed to institutions of higher education in the Fall of 1987. FIPSE had funded the project for six institutions, and the project's Board and staff was unable to pare the proposals submitted to that number. Realizing that the project needed to be larger than anticipated, we approached Apple Computer Inc. for additional funding to include 15 schools. They responded affirmatively, allowing the project to expand to its present size. The discussions about what institutions to include helped us to clarify our goals and strategies. We focused on schools with mature--if any new program can be deemed mature--programs with well articulated goals grounded in a clear theory of writing instruction. We were also conscious of providing geographical representation and of representing the diversity of higher education in the United States. Based on these criteria, the following institutions were chosen and agreed to participate:

Ball State University/ Indiana
Blue Mountain Community College/ Oregon
Bowling Green State University/ Ohio
Colorado State University/ Colorado

Columbia College/ Illinois\
University of California, Santa Barbara/ California
Fairleigh Dickinson University/ New Jersey
Greenfield Community College/ Massachusetts
Indiana University/Perdue University/ Indiana
Laguardia Community College,CUNY/ New York
Massachusetts Institute of Technology/Massachusetts
Mercer University/ Georgia
Ohio State University/ Ohio
University of South Carolina/ South Carolina
University of Southern California/ California

Once the sites were chosen, staff and advisory board members finalized a research design that could be applied across the institutions involved. The research focused on many questions that needed attention. Can for example, pencil and paper methods be combined with computer technology in the same classroom? Are there advantages of one over the other? Does fascination with the computer detract from the business of writing? How are the utilities of word processing -- spell checkers, formatting, style checks -- affecting the work of revision? Are students writing better? How does the word-processed paper influence the teacher's perception of good or bad writing? How do collaborative and process writing, enhanced by the computer, affect the notions of authorship and assessment? And how does the introduction of this technology change the role of instruction and curriculum in the classroom? What additional resources are needed?

The research plan called for each site to identify six sections of Fall 1988 freshman writing classes for inclusion in the project. In theory at least, the six sections included similar students, three sections employing computers and three sections using more traditional teaching modes. We urged the sites to use caution in assigning faculty to the experimental and control sections in an effort to minimalize the "teacher effect" that could introduce additional bias in the data, and to be sure that all sections followed a uniform curriculum as feasible.

The study design incorporated multiple measures, including attitudinal and performance criteria. Chosen was a one semester, pre-test/post-test format. Essay prompts combined with the Descriptive Test of Language Skill's Sentence Structure subtest, writing anxiety and attitudinal questionnaires, and a background questionnaire. Faculty were solicited for information on their teaching experience and philosophy, the experience with computers and their attitudes about their use in the classroom. A team of readers scored the essays holistically with a subset scored analytically as well. Project staff were sensitive to the problems of measuring change over the course of one semester, but the alternative of following students through their coursework proved logistically and financially impossible. We also realized that the classroom cannot be constructed as a laboratory; we could account for some sources of group difference by, for example, typing a subset of written essays for readers and vice-versa, asking teachers and students to keep logs, videotaping student-teacher interaction and employing other qualitative instruments. Still other potential sources of bias exist that cannot be controlled.

Each site had an advisory board member assigned in order to promote discussion and to customize the research design to the institution's particular needs. We are now in the process of coding and sorting out the data that will be analyzed and investigated during 1990.

The sites having completed their experimental work are now preparing curriculum and showcasing materials to present at the Project's National Conference, *Computers and College Writing: Curriculum and Assessment for the 1990's*, which will be held at the Vista International Hotel in New York City June 1-3, 1990. These materials include "how-to" guides for writing teachers who want to use computers regularly in the classroom; film and video demonstrations of student-teacher interaction; reports, papers and articles; and instructional software for classroom use.

What has already emerged from the National Project is a cohesive network with the use computer technology in the writing classroom at the post secondary level. The National Project's monograph, *Computers and College Writing: Selected College Profiles* presents descriptions of forty-nine writing programs around the country that incorporate word processing in composition classes. It is clear from these descriptions that schools are eager to maintain a discussion of the use of technology in education, and the assessment that is thereby warranted and necessary.

What has also emerged is the need for educational leadership in developing computer uses. The fifteen colleges and universities involved as sites have met on a regular basis and have shared their experience of the assessment and demonstration process. The sites also noted the growing number of requests for assistance from both institutions of higher education and secondary schools in their area. Educational institutions need help in planning and implementing instructional efforts involving computer technology, and these needs point to the future of the Project.

With or without experimental confirmation, we suspect computers are here to stay in the English classrooms. Used well, the computer seems to engender more cooperation from students who like it more, write more, and revise more. The results of the study will be reported on at the National Conference. Staff and site personnel are actively engaged in discussions about the future of the Project. One approach may be to establish regional centers where secondary and post secondary institutions can come together to discuss common concerns and implement programs. Another will be to establish technical assistance programs for colleges and universities that require outside help in implementing programs. The aim of the Project is to propagate a national discussion on these issues, and to further the kind of collaboration between colleges and universities that will produce the best methodologies and materials for this effort.

OHIO LIBRARY INFORMATION SYSTEM

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ABSTRACT

In 1986, all of Ohio's institutions submitted a capital budget for increasing space for their libraries. The Ohio Board of Regents formed a Library Study Committee to investigate the sharing of library space for non-circulated material. As a result of this investigation, a recommendation was made to investigate a statewide library system as well as the creation of shared warehousing for non-circulated materials.

This paper will discuss the results of the Library Study Committee and the formation of a Library Steering Committee to look at the goals for the Ohio Library Information System (OLIS). The Steering Committee was responsible for the specifications for RFP as it defined the library assumptions, workstations, architecture, external data bases and the network requirements. As a result of the work of the OLIS Steering Committee, an RFP has been completed. This paper will discuss the specifications for OLIS as they pertain to the function of a central facility that has a combined catalog of all institutions, networked to the local institution library, and how external data bases will be accessed through advanced workstations.

Introduction and Background

Indications of a serious need for additional library space surfaced during Ohio's 1986 capital budget requests from Ohio's colleges and universities. For the three biennia for which capital plans were solicited (1987-1992), library related requests amounted to $121.7M. The universities were requesting not only the addition of traditional facilities to support new or expanded programs, but also the replacement of obsolete or worn out facilities. A significant portion of the requests for new library buildings however, were related to the large and annually expanding number of published materials which academic libraries are expected to store in order to support educational programming.

Ohio Library Study Committee - 1986-87

In 1986, the Ohio Board of Regents (OBR) appointed a 17 member library study committee. The committee spent one academic year examining the issues outlined in its charge from Chancellor William B. Coulter which stated in part:

"While the purpose of the study is a direct consequence of the need to make informed decisions on the capital budget, the scope of the Committee's work will necessarily cover a broad range of issues affecting the operation of academic libraries. In particular, rapidly changing technologies and concomitant changes in the conceptual approaches to information storage and retrieval will require careful examination."

As a result of this year long study, the committee concluded that the need for a statewide library strategy for higher education was needed and that it should be visionary, collaborative and space efficient. With these important thoughts in mind, the Library Study Committee recommended that the State of Ohio restrict construction of academic library space and require public universities to explore, and, if at all feasible, pursue solutions to library space problems other than the construction of conventional library buildings. It was recommended that universities develop plans for use or construction of high-density storage space in either local or regional configurations and include them in future capital improvement requests, since studies showed that high density space could provide storage for about one-sixth of the cost of traditional low-density storage.

A prototype facility is currently being built at Ohio State University. It is believed that no more than three or four such facilities will need to be constructed, and in fact such a cooperative effort is currently being jointly proposed for Southwestern Ohio by Cincinnati, Miami & Wright State. The minimum capacity of each facilities should be on the order of 1.5 to 2 million volumes. A second facility is now proposed for Youngstown, Akron and Kent State.

Library Committee Recommendations

The following are the major recommendations of the Ohio Library Committee (OLC):

1. The OBR should use the OLC defined criteria for evaluating capital requests for conventional library construction, the rehabilitation of existing space and the construction of alternative storage or program space.

2. The OBR should monitor developments in information technology which affect the operations and services of the state's academic libraries. In addition, the Ohio Board of Regents should initiate and fund, with State, Federal or Foundation money, a study and/or pilot project to explore the uses of new library technology.

3. The Library Study Committee recommended that the State of Ohio develop, as expeditiously as possible, a statewide electronic catalog system complementing the existing local systems, and, to the extent feasible, be accessible thorugh them.

4. The OBR designate a broadly based steering committee to advise and assist and report regularly on the implementa'ion of the first phases of these recommendations.

OLIS Steering Committee

The proposed committee was formed in 1987 and included Library and Computer Center Directors from six of the 17 institutions of higher learning plus members from the Board of Regents, one consultant and a member from the State Library. It is important to note the mix of members which were intended to represent three distinctly different points of view; the users, the librarians and the systems managers. For those of you who have worked on library projects, we are sure you understand the significant differences.

As the committee began its deliberations, certain goals and expectations were established for OLIS.

Goals for OLIS

The Ohio Library and Information System will, as the most powerful statewide library and information system yet developed, respond effectively to all of the problems and opportunities of the emerging "information society". OLIS will connect people, libraries and information in a network of unparalleled sophistication and efficiency. In particular:

OLIS will link university libraries throughout Ohio in a manner that will allow them to appear to the user as a single resource of some seventeen million volumes. Students, faculty will have direct access to a share of published knowledge far larger than that otherwise available.

OLIS will be a gateway to the rapidly expanding world of information that is stored in electronic formats. Users will access these new sources with the same computer and computer interface as for the online catalog.

OLIS will use advanced software and hardware technology to provide researchers with a comprehensive and intelligent guide to the effective use of the library and information resources.

OLIS will recognize that the need to know is immediate. Researchers who want to borrow materials from other OLIS libraries will know their status within minutes and will receive loaned materials within three days for books or similar materials and within hours for journal articles sent by telefacsimile.

OLIS will be a major factor in improving the quality of education and research in Ohio; it will also provide for more cost effective use of existing resources.

Because most materials held by OLIS libraries will be available to all in a matter of a few days, faculty, librarians and administrators will have the option of managing the purchase of new books and journals in a significantly more efficient manner. Universities will be able to rely on others in the system for items of peripheral interest at their institution, thereby focusing available funds on materials of particular importance to their core programs.

Subscriptions for computer-based information services can be negotiated on a statewide scale rather than at an institutional level.

Ohio's public and principal private research universities now purchase expensive software maintenance agreements with a wide variety of vendors. In addition, they provide highly skilled staff to support several different library computer systems from different vendors. OLIS will bring economies of scale to both.

OLIS will be important to Ohio's economy both directly and indirectly. Ohio is often called an information state because it is home to a world leading core of providers of information in electronic formats: Chemical Abstracts, CompuServe, Mead Data and OCLC are the best known. The presence of OLIS in this dynamic group will benefit all.

Further, OLIS will be an information resource enormous benefit to existing and future research-based manufacturing corporations and to the growing services sector. Finally, OLIS will significantly strengthen all of higher education by helping to attract outstanding students and faculty and assisting in the winning of research grants and contracts, thus, OLIS will help to attract and retain those leading elements of business and industry which rely upon an educated work force.

OLIS Systems Assumptions and the Role of Workstations

Faculty and students have come to appreciate the value of access to the card catalog in electronic format for search and retrieval of bibliographic records, and for access as well to circulation information to determine the availability and location of books and periodicals. With these first-generation library automation systems, however, the user is merely provided with more powerful tools to search and manipulate bibliographic information. What the user searches is not the information itself, but keywords or descriptors in the title or subject as catalogued which describes the information contained in the book. Article abstracts, tables of contents for books, much less the full-text, are simply beyond the scope of library automation systems developed and implemented through the 1980's.

But OLIS promises, and must deliver, far more. As information become increasingly and economically available in electronic format both within and outside traditional libraries, and as the speed and linkages among networks of mainframes and microcomputers continue to grow, faculty and students will come to depend on rapid access to a variety of information resources to support instruction and research. While not slighting the enduring value of printed materials, it is assumed that OLIS should be designed to take advantage of publishing in electronic and optical formats that will characterize the information-intensive environment of scholarship and research in the '90's. OLIS must also accommodate the increasing power and storage capabilities of workstations that will be in general use by faculty and students over the next five years. Finally, OLIS must include delivery mechanisms for both traditional books and for information in electronic image formats.

Key Elements for OLIS

The four elements--sophisticated tools for bibliographic search and retrieval, a distribution and delivery system for printed and electronic text, access to a variety of full-text data bases in electronic and optical formats, and powerful faculty and student workstations connected to a high speed statewide network--are the crucial building blocks of OLIS. Consequently, a wide range of information sources must be accessible through the system, including books, periodicals, bibliographic data bases, full-text data bases, other media such as sound and images held by participating OLIS libraries, as well as links to other information sources in electronic format available commercially or in the academic library systems of other states.

Central to OLIS will be the ability to access bibliographic records and circulation data for books held by OLIS libraries. A search for a particular book will begin with a query to the user's local library system. If the book is not available locally, the query will be transmitted to the central OLIS site where records will be maintained of the location of books for all participating OLIS libraries. The central system will then attempt to locate the book and, if found, and authorized to do so, the user will be able to initiate a request for shipment of the book to his home campus within 48 hours.

For periodicals in print format, the process will be similar to the search and access procedure for books. The user will first search the local university library catalog to determine whether a particular periodical issue or number is available locally. If not, the search request will be forwarded to the OLIS central site which will identify which OLIS libraries have copies of the periodical. If authorized, the user will then be asked to identify the articles they wis' :o receive and in what format--in photocopy form, or in Fax format to be sent to a local Fax system or computer workstation via the Ohio Academic Resource Network (OARnet).

External Data Bases

The OLIS system is expected to have a number of bibliographic data bases available for access in electronic format. These data bases, such as Current Contents, Agricola or PsychLit, will be accessible using the same search techniques and protocols as with other bibliographic records for a consistent user interface. Some of these bibliographic data bases will be stored and maintained at the central OLIS site; others may be located at local or regional OLIS sites. Some may be available through commercial or government distribution; others may be created at a local library--e.g., an index of correspondence for manuscripts held in a local special collections library.

The location and distribution of full-text data bases will parallel bibliographic data bases. The central OLIS site will likely hold a large percentage of full-text data bases initially, but as electronic publishing becomes more widespread, local OLIS libraries are likely to acquire them to satisfy the specialized scholarly and research interests of their faculties. Thus, full-text electronic versions of certain periodicals in law, medicine, public administration, artificial intelligence or robotics might be acquired and maintained by libraries to meet special local needs on a continuing basis, but they will be made available generally to participating OLIS libraries.

Over time, OLIS is likely to have materials which will be stored in electronic or video format either for archival or access purposes. A number of examples come to mind, including compressed digital audio for works of music or speeches and compressed digital video for an art museum collection or copies of maps or photographs. Both display technologies and data transmission speeds on networks will need to increase substantially so that digital audio and video storage and retrieval will become commonplace in systems such as OLIS. Current experiments with multi-media workstations that integrate high resolution displays with advanced audio technology suggest the real promise of these machines for instructional and research use, certainly well within the next decade.

From the user's perspective, OLIS will open up access to the scholarly and research materials available in Ohio's public university libraries. It will also provide access to materials in electronic or optical form that are not currently available or affordable for an individual library. Of considerable additional importance, however, will be the ways in which OLIS and its supporting network in OARNet will serve as a gateway to he holdings of non-OLIS libraries and to special interest data bases. Currently, OARNet can provide access to authorized users at CIC (Big Ten) universities. Via OARNet and the file access protocols provided through TCP/IP, authorized users are now able to view the bibliographical records for dozens of university libraries. An increasing number of professional organizations are establishing electronic publishing and information clearinghouses. These includes the Association of Computing Machinery (ACM), the Modern Language Association (MLA), the National Science Foundation, and the National Institutes of Health. As the number and disciplinary range of these efforts continue to expand, the gateway and networking capabilities of OLIS and OARNet will become increasingly important.

Access to OLIS through Advanced Workstations

Users will be able to access the OLIS system in a variety of ways. Of necessity, OLIS will be initially accessible from terminals typically connected to library automation systems to provide a minimum level of functionality for bibliographic searching and for information on book availability. These terminals may either be physically connected to the local library system or by dial-up line on the local campus. The OLIS central system will also be accessible via dial lines either directly or through a campus data switch, modem pool, or as a connection to OARNet. All currently available library automation systems designed for university libraries are based on simple terminals for keyboards and displays. No large library automation systems are designed based on PC technology as the platform for interaction by users, reflecting both the relatively recent introduction of PC technology and their high cost relative to terminals. In fact, since current library automation systems are designed to work from terminals, attaching to the systems from a PC adds little or no value to the functional capabilities of the system.

But PC technology has advanced astonishing quickly in the past five years, and the pace will quicken in the next five years. Users will expect to have substantial online help, high resolution displays, stereo sound, pull-down menus, multi-tasking, large amounts of memory, disk space, high-speed local and wide area networks, and very large data bases on CD ROM and erasable optical disk. Some already do who use high-end "workstations" from Sun, Apollo, DEC and NeXT. OLIS system design must take into account the functionality that will be available in workstations at a reasonable cost in the 1992-1994 time frame. The system design must also take into account emerging standards and protocols for data base search and retrieval, communications, and operating systems for advanced PCs and workstations. A sophisticated and powerful workstation, not a "dumb" terminal, must be the basis for designing a library and scholarly information system for the 1990's, for it will more clearly reflect user's work habits and computing preferences.

System Architecture

The key to OLIS is the system architecture. Theoretically it will function very simply. The heart and control of the system will lie with a central computer (referred to as OLIS Central) and then distributed between OLIS Central and the local library system that will reside on each campus.

OLIS Central will function in two modes; one as a router of information and transactions between itself and the local library systems and, secondly, as a high speed search engine. Each local library will have a full library system with cataloging, circulation and acquisitions. OLIS Central will have a combined catalog of all seventeen institutions and the location of the material that is referenced in each bibliographic record. Besides the combined catalog, OLIS Central will have the ability to search external data bases that reside at OLIS Central. Users of the system will have the ability to request information from external data bases at OLIS Central or from any other OLIS local system.

How it Works - Cataloged Material

The local library patron will sit at his or her workstation and request a search on the local system. If the material is available at the local site, then the transaction is completed. However, should the material not be available at the patron's library, he or she may hot key this request to OLIS Central. OLIS Central will search the combined catalog and notify the requestor that it has found (or not found) the material within the seventeen institutions. If the material is found to be in the combined catalog, the system will ask the requestor if he or she would like to know the circulation status of the material. If the requestor replies yes, OLIS Central will broadcast transactions to all the institutions that indicated they had the material. The local sites will return the circulation status to OLIS Central, which will return the information to the requestor asking if he or she would like to request an inter library loan. Should the requestor reply that they want the material, the local system will inform OLIS Central, who, in turn will request the local system to initiate the loan. The material will be delivered to the requestor within 48 hours.

Access to External Data Bases

Should a requestor wish to find information on a particular subject that resides in an external "data base", he or she may issue the command find "data base." The local system will route the command to OLIS Central, in turn, will search it's system catalogs for location of "data base." If it finds the "data base", OLIS Central will request the user to provide the search criteria. If the "data base" does not reside at OLIS Central, the request for "data base" will be broadcast to all local sites and, if found, the search will take place at an OLIS local site.

The information, when found, may be routed back to the requestor in various formats depending on the size. The ability to display by video, hard copy by facsimile, downloaded to the user's workstation or transported by truck will all be available. Naturally, the size of the data and the format that the information appears will help to determine how it is transmitted or transported to the requestor.

OHIO ACADEMIC RESOURCE NETWORK (OARNET)

In the Spring of 1987, the first Supercomputer, a Cray XMP was installed in Columbus on the Ohio State campus. Access was provided and funded by the Supercomputer Center to all the Ohio institutions of higher learning that had at least one researcher using the Center. Presently there are seven T1 lines, sixteen 56 Kb lines and seven 9.6 Kb lines to the Supercomputer Center (See Figure A) running TCP/IP and DECNET, Phase IV.

As OLIS becomes an operational system, it is the State's intent to fund and manage one Ohio network for all of Ohio's researchers. The present plan is to upgrade OARnet to all T1 lines by January, 1991 (See Figure B) and build redundancy into the network. We definitely want each institution to have an alternate path for linking the Supercomputer Center in Columbus. Our long range plans include migrating to DECNET/OSI after which we will have TCP/IP and OSI.

To facilitate the implementation and provide direction, a steering committee is in place. Presently we are discussing the proposed backbone (See Figure C), areas of responsibility between OARnet and the local campus and the funding issues, outside of the support by OLIS and the Supercomputer Center.

FIGURE A - Present OARnet Backbone Topology, 1989

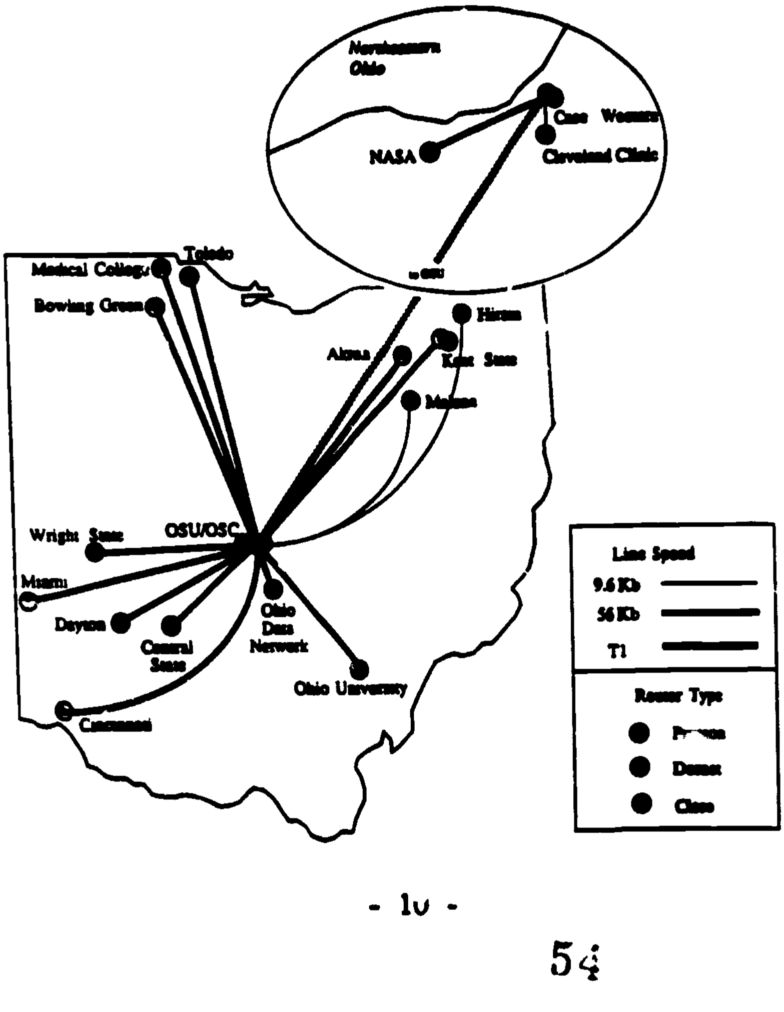


FIGURE B - Proposed OARnet Backbone Topology, Winter 1990

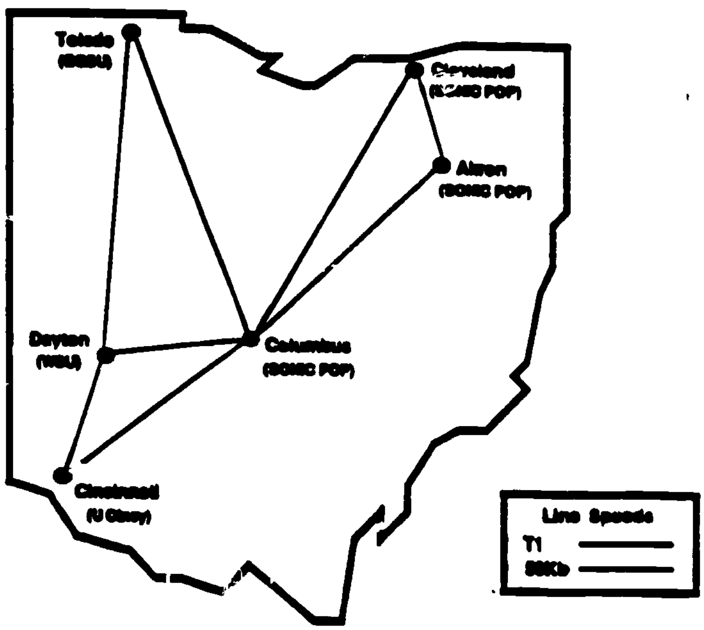
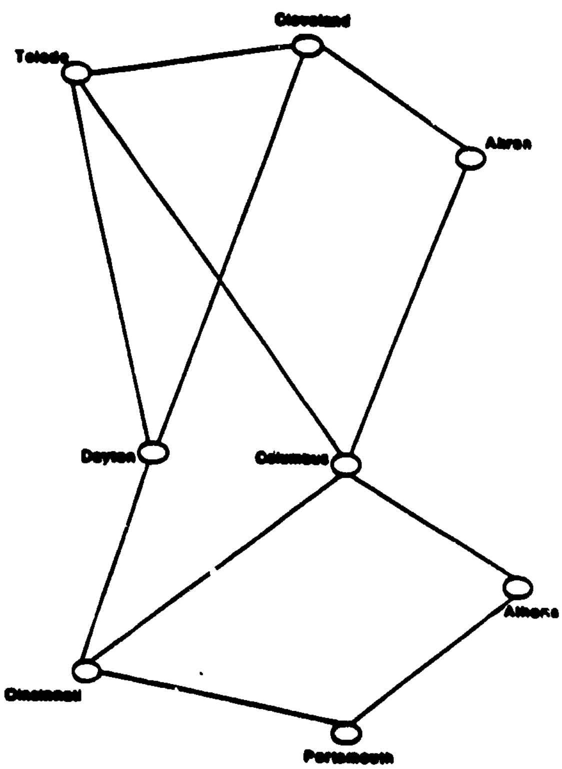


FIGURE C - Proposed OARnet Backbone Topology, 1991



Governance

What is currently evolving as a governance model for OLIS is one which provides reasonable participation from the library constituents.

We are currently recruiting an executive director who has extensive experience with the acquisition, implementation and maintenance of a large sophisticated automation system. Interviews are planned for the American Library Associates (ALA) mid-winter conference in early January.

In order to ensure institutional commitment and involvement, a governing board will be established and will comprise a number of University Provosts (five to seven). A policy advisory committee will recommend strategies and proposals to the governing board which will provide guidance and direction to the Executive Director. It is felt that this group should represent all constituencies, not just the librarians. In addition, a library advisory council is required to insure the industry and technical guidance which can be provided by library directors. There is overlap of membership on those committees to insure the appropriate checks and balances that a governance structure like this requires.

Conclusion

We have completed the planning phases and issued the RFP. The bids have been returned for the Steering Committee to review as to the Library, Software and Hardware specifications. OARnet has submitted their proposal for upgrading the statewide network. A RFI has been issued for the software to run on an advanced workstation that will support the researcher in his quest for information.

The Board of Regents expects to submit a completed budget to the General Assembly for their approval by the end of April, 1990. Within this same time frame, the Steering Committee will recommend a vendor to the Board of Regents. The Steering Committee will be selecting a short list of candidates for Executive Director over the next four to five months. Sometime in late May the Steering Committee will cease to exist and the Policy Advisory Committee and Governing Board will begin on or about June 1, 1990 to hire the Director.

The Steering Committee has done an outstanding job. We look forward to the 1990's and making Ohio a leader in the information world.

Developing and Implementing a Systemwide Academic Mainframe Specialty Center (AMSPEC)

CAUSE 89

by

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California

Abstract

Cal Poly, San Luis Obispo operates one of seven systemwide specialty centers providing unique academic computing services and resources to the 20 campus California State University system. Originally dedicated to research and instruction in computer-aided design, drawing and engineering analysis, the Center recently expanded its services to include critical IBM mainframe support to CSU's approximately 77,000 business students. Through its long-term partnership with IBM Corporation, Cal Poly has acquired state-of-the-art hardware and software to support the Center's functions, including an IBM-3090 supercomputer. Seven business schools are currently linked via the AMSPEC mainframe, while five more campuses are expected to be involved during the 1989/90 academic year. This paper explores the successes (and hurdles) encountered, advantages gained, the role played by industry, and the innovative approaches used by the campus to successfully develop and implement the new service.

CSU Specialty Centers

In the mid-1980s, the California State University (CSU) system adopted the concept of information resource management (IRM) which seeks to improve the effectiveness of every CSU participant -- students, faculty, administrators and support staff -- in performing their respective functions as learners, teachers, institutional managers, public servants and researchers through the appropriate uses of information and technology resources. To meet this goal, the CSU set two major strategic objectives: (1) to infuse appropriate information technology resources into CSU programs, and (2) to provide universal connectivity to all available information resources.

A key component of this strategy has been the creation of systemwide specialty centers. These specialty centers are designed to meet the needs of multiple campuses by permitting scarce resources, such as new technologies or expensive data bases, to be shared via CSUNET, the systemwide data communication network (**see Figure 1**). Specialty centers may focus on meeting the program needs of a specific academic discipline or on providing support to many academic disciplines. Regardless, the intent is to maximum service and minimize costs.

Examples of CSU specialty centers include the Chancellor's Office Systemwide Computing Center which supports large instructional data bases and expensive software packages that are too costly to replicate for every campus; the Computational Chemistry Center at CSU Fullerton which provides access to molecular design software for CSU chemistry departments; the multiflow software environment supported by an Elexi mini supercomputer at Sacramento State University which emphasizes computational chemistry applications; and the multidisciplinary Geographic Information Systems Center at San Francisco State University. In addition, CSUNET provides access to non-CSU resources such as the San Diego Supercomputer Center and the University of California's MELVYL library catalog service.

The CSU Academic Computing Enhancement (ACE) Institute has been a major supporter in the effort to develop systemwide specialty centers. The Institute was established specifically to foster the introduction of new computing technology into CSU instructional programs. The ACE Institute promotes acquisition, development and dissemination of new or existing computing technologies and instructional materials not widely available in the CSU by funding seed projects with the potential to develop into specialty centers and receive on-going State support.

One such project was the Academic Mainframe Specialty Center (AMSPEC) at Cal Poly. AMSPEC represents a mutually beneficial and highly successful collaboration between the Chancellor's Office, the Computer-Aided Productivity Center (CAPC) at Cal Poly, several CSU campuses, and the IBM Corporation. Computing and Communications Resources (CCR) at the Chancellor's Office has been instrumental into identifying campus needs and promoting interest in AMSPEC, providing systemwide communications, and seeking ongoing funding from the State. Cal Poly's role involves coordinating and implementing services on the campuses, and acquiring and supporting the mainframe environment. CSU campuses are responsible for remote campus coordination and classroom instruction. IBM has provided significant financial assistance in the form of discounts and equipment upgrades, as well as technical support at the campuses.

Why Cal Poly?

Cal Poly was ideally suited to take on the AMSPEC project. It was already designated as a CSU specialty center. A long-standing and highly positive relationship with the IBM Corporation had resulted in the acquisition of substantial IBM mainframe resources and expertise on campus. Beyond that, by assuming a leadership role and expanding services to other CSU campuses, the local university community would benefit as well.

Developing and Implementing a CSU Specialty Center

The seeds of a specialty center at Cal Poly were planted 10 years ago with strong faculty interest in computer-aided design and manufacturing applications in classroom instruction and research. This interest resulted in CAPC being designated as the systemwide CAD/CAM Specialty Center charged with sharing its educational resources and expertise with other CSU campuses. Combining industry donations with nominal State funding, CAPC built a state-of-the-art CAD facility on the San Luis Obispo campus, providing an array of high resolution drawing and analysis packages to many disciplines.

However, supporting remote CAD/CAM activities at six other CSU campuses proved difficult due to inadequate communications. CAPC did provide the campuses with IBM PCs and site-licensed CAD software. By 1986, it was readily apparent that Cal Poly would have to increase support to other CSU campuses to ensure continued support from the State for eight positions and operating expenses associated with the CAPC lab and mainframe equipment.

In October 1987, CSU business deans identified access to IBM mainframes as their most critical academic computing need and voted unanimously to promote this service within CSU. Specifically, those deans indicated a need for IBM mainframe service in computer languages, data base management systems, and application programs in accounting, finance, real estate, business law marketing, expert systems and human resource management and simulation.

To meet this need, CSU broadened CAPC's mission of supporting CAD/CAM applications to include IBM mainframe support for CSU Schools of Business. After initially announcing the concept of AMSPEC in January 1988, CCR requested proposals from campuses interested in participating in a pilot project. A total of 11 CSU Schools of Business responded and three (San Francisco, Los Angeles and Pomona) were chosen to begin as pilot sites. Classroom instruction via AMSPEC began at these campuses and San Luis Obispo in 1988/89. Based on the success of the pilot effort, AMSPEC service was expanded to two more Schools of Business (Fresno and Stanislaus) shortly afterwards. Five more business schools are in the process of commencing AMSPEC service (Humboldt, Sonoma, Hayward, Long Beach, and San Diego) (see **Figure 2**).

Several key concerns had to be overcome in order to successfully implement the new service, including gaining campus commitment, upgrading the mainframe hardware and software, coordinating services to campuses, upgrading communications, campus equipment configurations, and support services. A brief discussion of each area and the problems encountered follows.

Gaining Campus Commitment. While interest was very high on the campuses, there was some concern over the long-term viability of AMSPEC. Deans were reluctant to commit to using a resource that might not be there in a year. Thus, gaining their trust in Cal Poly's ability to deliver and sustain services was a key factor initially.

Mainframe Hardware and Software. Through CAPC, Cal Poly had been designated as one of IBM's favored "Grantee Schools" for academic computing. This relationship resulted in several generous donations from IBM, including one donation and one "permanent loan" of two IBM-4341 computers, eight IBM 3380 disk drives, 21 high resolution graphics terminals, assorted peripheral equipment, software, and maintenance costs. The Cal Poly-IBM partnership extends beyond mainframe hardware. For example, IBM funds research, employs students through the university's cooperative education program, supports CAI/CBE programs, and is working with CSU and Information Associates to develop a fully integrated administrative computing environment using DB2 and IA software.

To facilitate AMSPEC, IBM replaced their "loaned" IBM-4341 mainframe with an IBM-3081 KX machine in August 1988 as an interim solution. With assistance from IBM, the campus will upgrade to a single large IBM-3090/400 level mainframe with vector processing capability in FY 1989/90 (**see Figures 3–4**). This upgrade should enable Cal Poly to extend mainframe service to all CSU disciplines and investigate the possibility of offering services to non-CSU institutions.

For the most part, mainframe software has been acquired through IBM's Higher Education Software Consortium (HESC). HESC offers operating system, business and engineering applications at substantial discount. AMSPEC applications currently run under VM/SP. In the near future, VM/XA and AIX, IBM's new state-of-the-art UNIX product, will be added. A wide variety of languages, data base management systems, statistical packages, CAD and other applications are currently supported. Due to the expense involved, it has been difficult to acquire the large data bases required for various business courses.

Remote Campus Coordination. Each campus is expected to appoint a campus coordinator who can serve as a single point of contact for AMSPEC services and support. This individual advises Cal Poly regarding software needs, implements and manages campus equipment and accounts, and consults and trains faculty, staff and students on AMSPEC software and database issues. For the most part, this has been a faculty member in the business school rather than a representative from the campus computer center. In general, campus computer centers have been reluctant to support equipment designated for a single discipline. In many cases, CSU campuses have no experience with IBM equipment and cannot provide the necessary support. This has meant an increased workload for Cal Poly staff in delivering, installing and maintaining equipment on the campuses.

Upgrading Communications. To facilitate access to AMSPEC services, CSUNET had to be upgraded and enhanced. The CSU Chancellor's Office has been very supportive in this regard. As shown in **Figure 1**, all 20 CSU campuses are now or soon will be equipped with high-speed communication links (56KB lines) to CSUNET. An inter-campus data network pilot project now links the CSU System to the California Community College System (CCC). The CCC Chancellor's Office in Sacramento and four community college campuses (Cerritos, Mount San Antonio, San Jose Evergreen and Santa Rosa) in strategic locations across the State are already linked to CSUNET (**see Figures 1 and 5**).

Campus Equipment Configurations. Cal Poly purchased, configured and installed IBM-3174 controllers at each participating campus. Once connected, these units permit faculty and students to access the IBM mainframe at Cal Poly. Perhaps the most significant problem in this regard has been the long leadtime required for ordering equipment. After Cal Poly commits to providing AMSPEC service to a remote campus, several weeks or months may elapse before the necessary equipment arrives from IBM to make the connection possible. A secondary problem involved getting various types of workstations and PCs to communicate properly with the 3174. It took many manhours to work out the "bugs" associated with mapping the various keyboards and modifying the 3174s to work at each campus. (The Hayward and Long Beach campuses plan to access AMSPEC via an IBM-9370.)

Support Services. Initial attempts to hold training at the remote sites proved unworkable. So many factors (communications, documentation, software, etc.) had to be covered that it proved to be more cost-effective to bring campus coordinators and CSU faculty to Cal Poly for training than it would be to transport a large group of Cal Poly employees to each remote campus. To distribute account numbers, a system was established whereby faculty could request and receive accounts via facsimile machine. A large number of user guides were developed by Cal Poly faculty and staff in conjunction with the campus' migration to an IBM environment. These were provided on disks to remote campuses for local adaptation and use. A telephone "hot-line" service was established to answer questions and resolve problems. In start-up mode, AMSPEC had to rely on other Information Systems staff to assist in each of these areas. Now that AMSPEC has proven to be successful, budget and staff increases are expected to support these and other services, including on-site visits to resolve local problems.

How Cal Poly Benefits

Some of the benefits already realized by the campus are improved off-campus communications and mainframe performance and capacity. Providing access to mainframe UNIX was identified as a critical need by the university's computer science and engineering programs. With IBM's new AIX product, the campus will have access to a new state-of-the-art version of the operating system that is standard in scientific and engineering circles. Most important of all, the campus will benefit from continued State funding designated to support mainframe computing, and the potential for increased State funding and external revenues to support expanded services to CSU and non-CSU users.

Future Goals and Objectives

Having overcome the initial problems identified in the pilot project, Cal Poly is looking forward to expanding AMSPEC service to meet other critical instructional needs (**see Figure 6**).

First and foremost is the need for expanded service to CSU campuses. It is hoped that in the near future, CAPC can offer mainframe service to any CSU discipline with an interest and need for such assistance. For example, several CSU Schools of Engineering have indicated interest in accessing engineering analysis packages available only on the IBM mainframe, as per the original mission of the CAPC. Specifically, they need access to finite element analysis, computer languages and expert system analysis programs.

Another area to be expanded is the integration of supercomputing applications in CSU undergraduate programs, particularly in scientific fields such as chemistry and physics which require access to advanced simulations and complex modeling software. The vector facility on the IBM-3090/400 can readily support the use of these large-scale software products.

With the expansion of CSUNET, Cal Poly is exploring services to non-CSU institutions, such as California Community Colleges and K-12 school districts. Possible services include facilitating articulation between CSUs and CCCs, supporting electronic conferencing and bulletin board activities, supporting an electronic library of K-12 software for statewide evaluation and distribution, and supporting classroom instruction and funded research activities.

In parallel with industry's need to develop and use new technologies to remain competitive, applied research projects within CSU are expanding. These activities could also benefit from having access to the increased mainframe capacity at Cal Poly. Therefore, a fourth goal is to expand research services to industry through CAPC's CAD research facility.

To support these as well as the instructional and administrative needs of the university, it is anticipated that the campus will upgrade to an IBM-3090/600 with 150 gigabytes of storage within the next year or two.

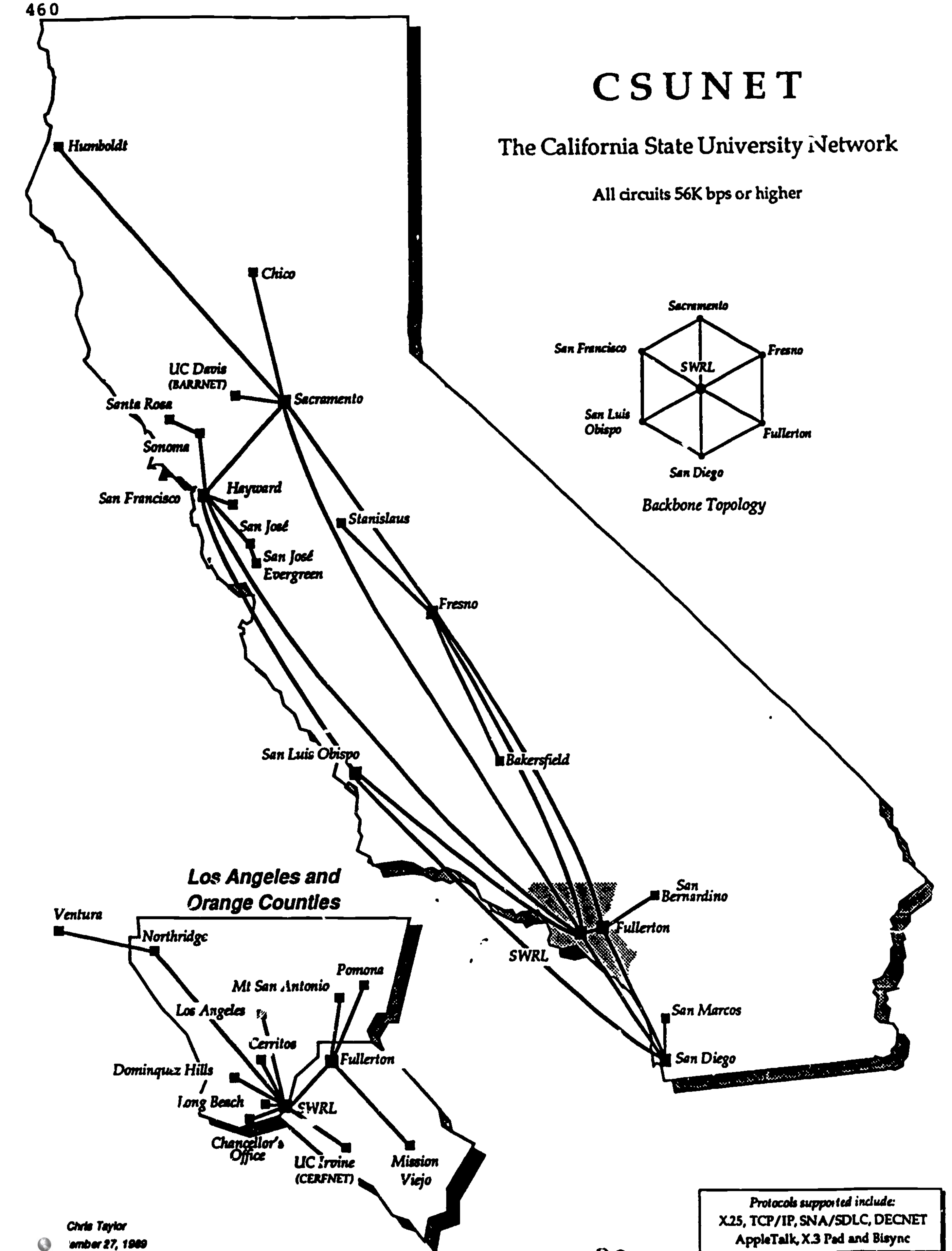
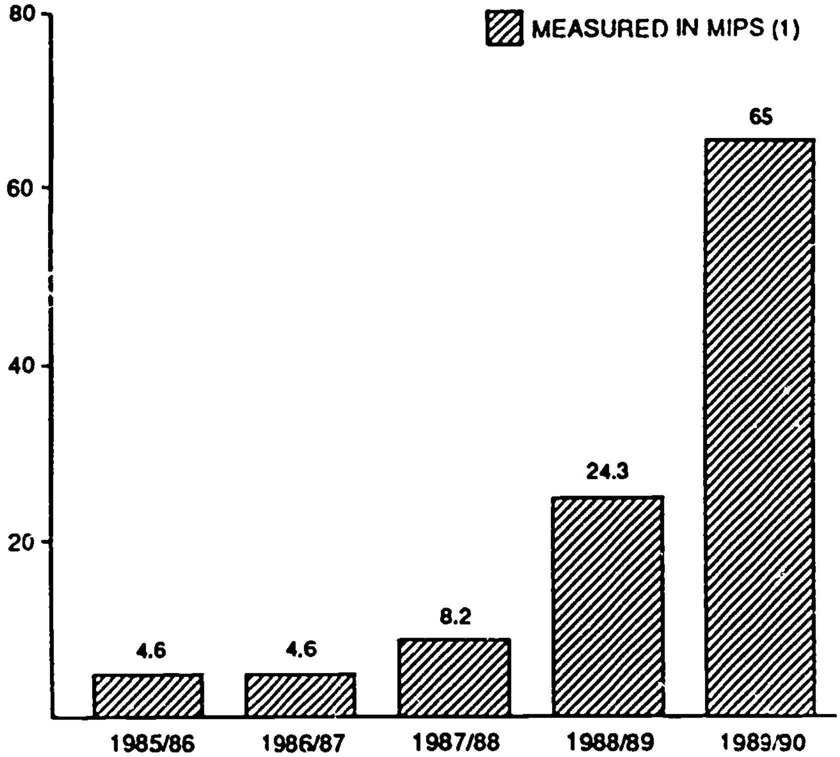

CSUNET
The California State University Network
All circuits 56K bps or higher
Humboldt
Chico
UC Davis
(BARRNET)
Sacramento
Santa Rosa
Sonoma
San Francisco
Hayward
San José
San José Evergreen
Stanislaus
Fresno
Bakersfield
San Luis Obispo
San Bernardino
Fullerton
SWRL
San Marcos
San Diego
Sacramento
San Francisco
Fresno
SWRL
San Luis Obispo
Fullerton
San Diego
Backbone Topology
Los Angeles and Orange Counties
Ventura
Northridge
Pomona
Mt San Antonio
Los Angeles
Cerritos
Fullerton
Dominquez Hills
Long Beach
SWRL
Chancellor's Office
UC Irvine
(CERFNET)
Mission Viejo
Protocols supported include:
X.25, TCP/IP, SNA/SDLC, DECNET
AppleTalk, X.3 Pad and Bisync
Chris Taylor
ember 27, 1989

Figure 1

THE CALIFORNIA STATE UNIVERSITY

Figure 2

Figure 3 GROWTH IN MAINFRAME COMPUTING POWER AT CAL POLY

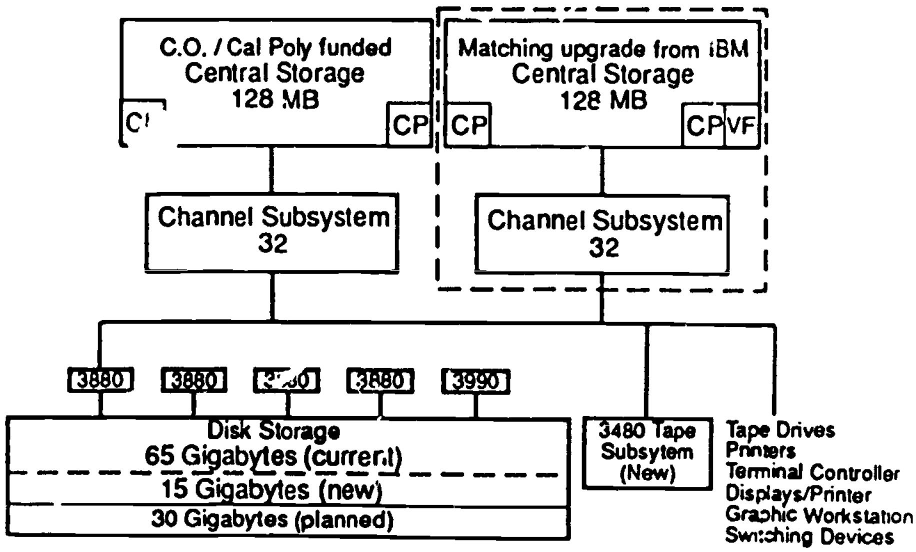


MEASURED IN MIPS[1]

COMPUTER SYSTEM	ACQUIRED	1985/86	86/87	87/88	88/89	89/90
CYBER 170-730	1980	1.90	1.90	1.90	1.90	
IBM-4341	1984	.90	.90	.90		
IBM-4341	1985	.80	.80	.80		
PRIME 9755	1985	.60	.60	.60		
PRIME 9955	1986	.40	.40	.40		
IBM-4381	1987			3.60	6.50	
IBM-3081	1988				15.50	
IBM-3090	1989					65.00
CUMULATIVE TOTAL		4.60	4.60	8.20	24.30	65.00

(1) MIPS = Millions of Instructions Per Second (For comparison purposes only)

Figure 4 IBM 3090 400E w/ VECTOR FACILITY



The California Community College System
Inter-Campus Data Network Pilot

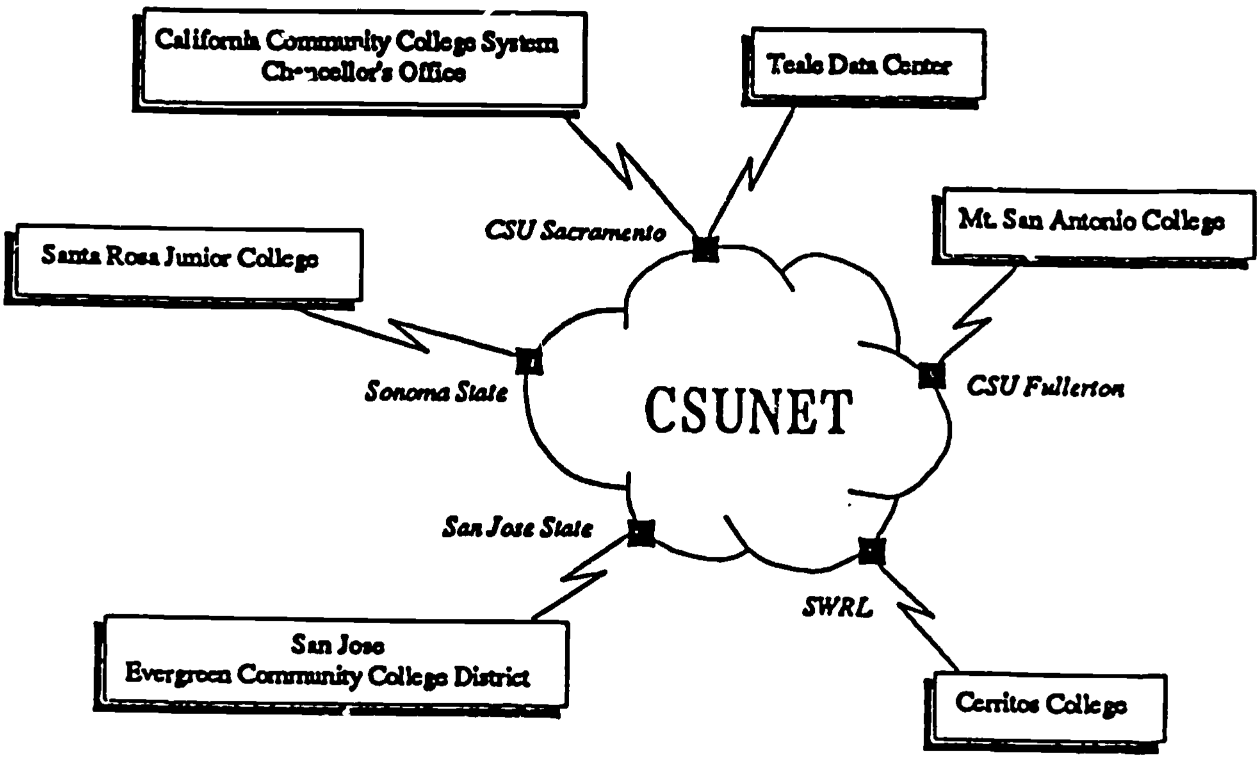
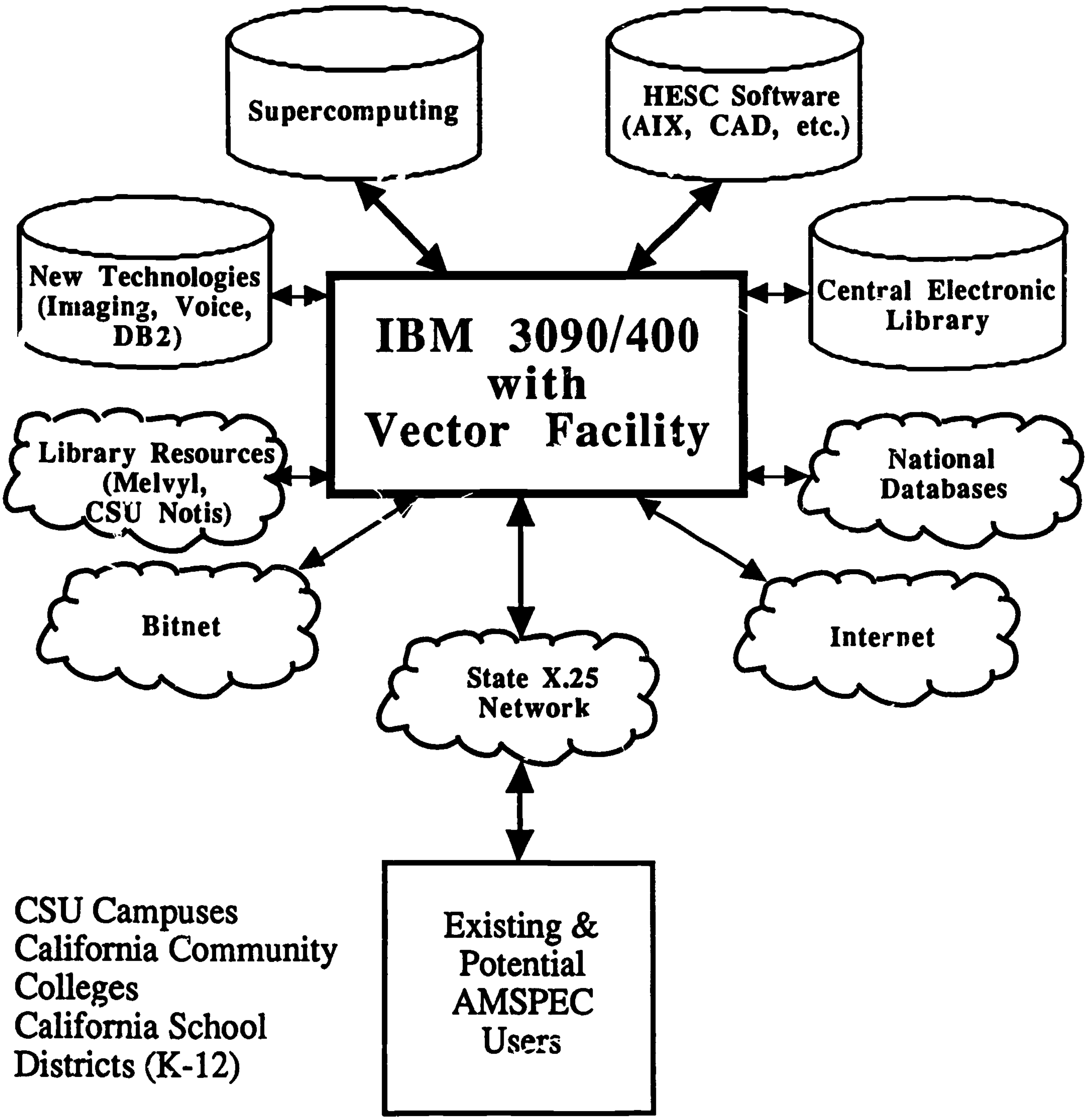


Figure 5

AMSPEC Services



- CSU Campuses
- California Community Colleges
- California School Districts (K-12)

Figure 6

Meta-Lenses for Academic Computing in a Small University: Examining Past Progress and Problems, Future Promises and Perils

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The initial stages of the information technology diffusion process at the University of Maine at Machias have resulted in the transformation of this innovation, from an abstract concept to a somewhat extensive level of applications. The measure of initial success that has been attained can be mainly attributed to maintaining a meta-perspective in introducing and implementing technology use, through: a) stressing curricular augmentation rather than technology inclusion (integration?) and b) maintaining an "Organizational Focus".

There are indications that the infusion of technology is capable of catalyzing several changes in the University's educational process and environment. How can a small University such as UMM sustain this initial momentum and manage the evolving impacts? An examination of the current situation reveals that to do so, there are several "application" needs to be addressed. More importantly, the University needs to prepare for the implied changes in the dimensions that constitute an "organizational" focus.

Background - Initial Success and Impacts

The initial stages of the information technology diffusion process at the University of Maine at Machias have primarily involved the introduction of the innovation to the campus' culture and context, directing the energies of early adopters and efforts to define the Academic Computing concept. The process so far, despite growing pains, has been successful both in terms of the leapfrogging in the level of use of the technology, as well as the degree of overall preparedness in adopting this technology in the educational process of the University. Developments in the computing infrastructure and activities of the campus over the past three years, present several visible indicators of the initial success of the technology adoption process·

--**The wide availability of and access to computing resources** through: stand-alone and networked microcomputers in various campus locations, for students and all faculty; a variety of software resources for general as well as course specific applications; and campus wide networking to provide one-stop access to local and remote computer and communication services.

--**The range of instructional computing activities being undertaken on campus:** several courses, across disciplines, incorporating computer use (forty-four, according to a survey conducted in Spring, 1988); fourteen computer augmented courses developed over the past two years, as part of a federally supported Title III project. Multimedia is a major component of four of these courses; a concentration in Computer Applications for students from all disciplines is being offered as part of the University's program; collaborative projects with area school systems in the use of technology are being developed; the university is undertaking curriculum research to better coordinate and integrate its computer based offerings.

--**The increasing interest on campus in planning and developing systems to close the gap between instructional and administrative computing.**

Equally significant as indicators of success are, the not so readily quantifiable impacts of the technology adoption process, such as providing new perspectives to the teaching/learning process, as well as a unifying theme for linking diverse groups in the university. The following excerpt from a report based on an external evaluation of the Title III supported microcomputer activity on campus illustrates the nature of these impacts:

"Perhaps most important is the impact on faculty and the changes they perceive in themselves and their colleagues as a result of the microcomputer activities. As one faculty member said, 'there is more talk about pedagogy.' Or another, 'the lunch conversations have changed.' People talk about the process of teaching. They talk about their trials and errors in the use of the technology with other users and in many cases with those outside their discipline-based division. The excitement has extended beyond the campus to local school personnel and business people who now see the college as a regional resource in the use of the microcomputer. Additionally, the college is becoming known as a center of excellence in this area for the University of Maine system...Without question, this activity has had a fundamental impact on the fabric of the institution and curriculum."[1]

Perspectives on the Process

An examination of the technology diffusion process at UMM (through metalenses), provides the themes and strategies adopted, as derived from: 1) the nature of the educational tasks to which technology has been applied and 2) the means through which an understanding of technology and its use has been promoted among those unfamiliar with it.

Technology Application Tasks

As with other sectors in society and educational institutions, information technology was originally introduced at UMM for administrative functions. Initial uses of technology in the academic areas were based on directions recommended by a 2 year plan describing the Needs, Outcomes, Activities, and Assessment (NOAA) for computer use. This plan, developed by the computer committee, proposed computer applications to be incorporated in courses based on an identified set of computer related skills considered important for students to possess. A majority of the uses proposed and adopted, were based on simple applications of productivity tools (wordprocessing, database packages and spreadsheets) and reflected the nature of use in administration. Not surprisingly, computer usage was limited primarily to some business courses and as an add-on component in a few others.

Shifting the thrust of technology application towards augmenting the instructional process, from merely providing computer related skills, catalyzed an increase both in the level of use of technology and the overall appreciation of its role in the educational process of the campus.

The Title III project mentioned above, provided considerable momentum to the campus' efforts in technology use with the intent of improving the learning in existing courses. Courses augmented through this project involved faculty-student pairs to develop the computer-based augmentation components. The process of augmenting the courses involved the following steps: 1) Defining those components of the course which could be enhanced by the use of the computer; 2) Defining the subskills that would be required, both in terms of content and computer use; 3) Identifying and evaluating needed software/courseware and technology processes with respect to their curricular fit; 4) Modifying the materials or their use and restructuring the course as necessary, to derive the maximum benefits of the computer augmentation, without compromising learning objectives.

The instructional augmentation approach, as exemplified through the Title III process, has transformed and strengthened the technology diffusion process in several ways. It has encouraged a variety of approaches for incorporating technology use across disciplines, such as the use of computer communications in Meteorology, simulations for Marketing, Hypermedia in Art and English and use of courseware to address the needs of specific audiences as in remedial mathematics and basic writing courses. It has made available an inventory of interactive tools and resources that bring excitement to the learning environment. The process has served as a model for integrating computer use in other courses and provided the basis for a creative faculty development effort.

Keeping the instructional mission of the campus as a focal point for Academic Computing efforts has provided a valid context for technology application on campus. It has provided a campus-wide sense of purpose for developing strategies and plans, and shaped decisions regarding the ty_e of technology and its use.

Technology Diffusion - Means

In looking at the strategies and tactics (means) to promote information technology use at UMM, it becomes evident that maintaining an "organizational focus", in contrast to merely an "application-focus", has contributed in large measur , to increased acceptance and utilization. An Application Focus suggests a preoccupation with innovation characteristics independent of context, such as processing speed, graphic capability and decreasing costs. On the other hand, an Organizational Focus suggests that strategies for promoting technology take into account factors, such as the contextual relevance of innovation characteristics (e.g. affordability and access); attributes of the innovation's recipients (e.g. users'technology orientation, fears, motivation and training required); and organizational characteristics of the context (e.g. administration's stance on technology use; the university's ability to support increasingly complex demands of technology; and the organizational structure).

The dimension of an Organizational Focus are comprehensively captured in the six themes proposed by Havelock and Huberman (1980), for planning and predicting the outcomes of innovations: 1) Object; 2) Resources; 3) Authority; 4) Consensus; 5) Linkage; and 6) Environment. For mnemonic convenience, the composite framework was referred by the acronym ORACLE. A discussion of each of the themes follows:

O: "Object"-- a concept which included both the substance of the proposed change and the objective or intent of the change effort. The object dimension comprise five sub-dimensions, which related to the characteristics of the innovation as they facilitated or impeded acceptance by the receiving culture. These five dimensions were:
1) **Relevance** of the innovation to the needs of the receiving culture; 2) **Promised Benefit** - the magnitude of the innovation's impact on improving upon the status quo; 3) **Resource Demand** -the extent to which the innovation required the mobilization of scarce, external or local resources; 4) **Complexity** - the intrinsic complexity, social complexity or the complexity of implementation associated with the innovation;
5) **Compatibility** - the extent of congruence of the innovation with attributes of the receiving culture;
R: Resources - Resources included financial, material, human and knowledge resources, required to introduce and sustain the innovation;
A: Authority - Authority included both legal support and leadership of officials at local, district and national levels;
C: Consensus--Consensus referred to the extent to which participation and understanding was achieved at all levels of personnel involved in the innovation;
L: Linkage--Linkage was largely synonymous with the human and organizational infrastructure needed for an innovation;
E: Environment--Environment included the dominant features of the setting in which the reform took place, such as compatibility with the local settings and timing of the innovation.
The academic computing strategies adopted at UMM so far, as described below, have concentrated to a large extent, on the Object, Resources, and Linkage dimensions of ORACLE. The essence of these strategies is best represented through what I have termed as the SPCA paradigm.

SPCA: Strategies for Promoting Computing in Academia (or Suggestions for Preventing Cruelty to Academics!) at UMM.

According to this bifocal paradigm, which addresses both technology and process related aspects, for successful promotion of technolgy in academia,

1. the technology should be Simple, Proven, Compatible, and Adaptable.
2. the process of introducing technology should be through a process involving Success, Participation, Consensus and Advancement.

Implementing SPCA

Simple: Our efforts have been directed towards simplification of the equipment (hardware and software), the skills required for using the technology and the computing environment.

Simplification of the equipment was effected by limiting diversity in the type of hardware and using simple productivity tools and courseware for specific topics in disciplines.

Ensuring that computing resources are both, available and easily accessible, has been the thrust of our initiatives in the simplification of the environment. The University, despite limited funds, has taken steps to provide each faculty with a personal computer. For facilitating accessibility, the University with support from AT&T, has implemented a project that allows easy, friendly access to MS-DOS™ and UNIX™ based resources from networked PCs, through a simple menu interface. The menu system, along with the network, serves the purpose of providing a uniform environment through a standard look and feel in computers across campus.

Strategies for simplification in the skills domain include: 1) adopting an approach to training and development which involves incremental stages of increasing complexity; 2) providing model solutions and 3) establishing relevance between computer skills being learned and discipline areas.

Proven: The need for small colleges to be close followers rather than pioneers in the use of technology for small colleges has been mentioned by others (Smallen, 1988).

The important elements of our efforts at ensuring proven technology have been: 1) basing hardware and software decisions on what had been used successfully at other campuses and our own; b) procuring courseware from other universities and University consortiums (e.g., WISCWARE, University of Wisconsin, Madison) and c) evaluating software operability before distribution to faculty, in order to minimize any surprises and ensure their efforts were directed towards applications.

Compatible: Particular attention has also been given to issues of compatibility in relation to the available skills and resources on campus. The time, energy and cost of major transitions in hardware and software as well as the possibility of users' disillusionment with technology in the transition process directed us to seek compatible solutions.

Adaptable: Making technology adaptable, through encouraging and supporting use in a variety of learning contexts and modes, continues to be the approach taken Rather than insistence on any specific ways to incorporate computing in the teaching/learning process, faculty are encouraged to pursue their preferences, be it as an aid to broadcast instruction (e.g. CAI drills and tutorials), providing interactive tools and resources (e.g. Hypermedia, Simulation) or for instructional advising through asynchronous communications, a use that is currently evolving on campus.

Success: Successful initial experiences being an important determinant of continued use, a considerable amount of our energies have been directed toward ensuring success. Strategies for simplification have been important elements in ensuring initial success.

Participation: Participatory processes have brought the synergy of collaboration and aided the technology integration process in several ways. As indicated earlier, most of the instructional computing projects have been developed by faculty-student teams with students bringing computer skills and the learner's perspective to the enterprise. Student collaboration in developing and managing academic computing services, as well as assisting in consultancy, have helped provide essential support that would otherwise have not been possible, given the limited staff; "Show and Tell" activities of instructional computing projects, along with small group discussions and training sessions, have facilitated the exchange of ideas and served the purpose of providing reinforcement and the motivation to faculty in undertaking computing activities.

Consensus

Consensus, on the role of computing in the education process of the college, was seen as an important factor affecting the quality of implementation of plans and strategies. The energy and enthusiasm of faculty and administrator's was indicative of a high degree of concerns. Factors attributed to the consensus achieved include: interpreting academic computing directions to administrators and faculty with a focus on the academic mission of the campus: information dissemination and discussion of plans and projects, in formal and informal forums, which was facilitated by the small size of the campus; strong support of the leadership for technology-based efforts.

Advancement

Convincing evidence of individual and institutional advancement are being demonstrated through faculty's personal use, the instructional augmentation projects and in faculty development/training programs. Targeting computing projects on need areas specific to the UMM context, specially in relation to its size, location and the nature of its student population, has been a central theme in our strategies and is reflected in the following areas of perceived improvement: 1) Faculty's abilities to manage their correspondence and publication needs without relying on the limited secretarial assistance available; 2) A conferencing system and E-Mail which allows cutting down on meetings--a boon in terms of time for faculty in a small campus who wear several hats; 3) One-stop easy access to local and remote resources, including the automated library catalog, which is a necessity given the campus's remote location; 4) Improved learning/teaching environments with the potential of alternative strategies for remedial education, increased flexibility in the scheduling of instructional advising especially needed for the non-traditional students, the larger inventory of interactive instructional tools/resources made possible and most importantly the excitement brought into the learning environment.

The ORACLE themes have been represented to varying extents in the SPCA based strategies for an Organizational Focus at UMM. The impact matrix presented in Figure 1 summarizes the contribution of SPCA strategies towards strengthening the Object, Resource and Linkage dimensions.

Future Promises and Perils

As indicated earlier, the initial success of the technology infusion efforts have had several impacts on the educational process and environment of the University.

The application of information technology is making the educational process more efficient and richer. More importantly, it is initiating a revision of the teaching learning process and a redefinition of disciplinary boundaries. Emerging directions of technology-use, such as the use of local and wide area networks for providing instructional support and advising, as well as the implementation of statewide Instructional Telecommunication Networks in the University of Maine System, are making possible the geographical extension of the teaching/learning environment. Technology use is encouraging the investigation

STRATEGY	IMPACT on Strengthening		
	OBJECT	RESOURCES	LINKAGE
Simple (in equipment, skills, environment)	Complexity reduced; Resource demand reduced; Relevance and promised benefit increased.	Accessibility increased.	More practical/ appropriate solutions
Proven (through evaluation; successful experiences in other contexts)	Reduced resource demand; promised benefit increased; verification of relevance.	Increased availability.	Improved, manageable support; few unanticipated outcomes.
Compatible (with existing equipment, skills and environment)	Reduced resource demand.	Increased availability, accessibility	Practical, appropriate solutions; better support; speedy implementation
Adaptable (to learning situations)	Increased promised benefit; relevance; need.	Improved utilization.	Appropriateness of solutions
Success (in initial experiences; graduated skills method)	Reduced Complexity; promised benefit		Practical solutions.
Participation (Collaborative efforts in instructional computing & service)	Promised benefit; relevance; reduced complexity.	Increased accessibility.	Improved support; better understanding of need; more appropriate and practical solutions.
Advancement (of individual and institution	Promised benefit.	Better resource utilization	

Figure 1: Impact Matrix.

of mechanisms for cooperative processes between the traditionally separate areas of instruction and administration. These impacts are significant in terms of their implications for the University's future.

However, a look at the elements that have contributed to the successful process so far, also suggest the fragile nature of this initial success, if several factors that are needed to sustain this effort are not addressed. These factors imply strengthening the Resource, Consensus and Linkage dimensions of the ORACLE framework as discussed below:

Resources: Ensuring the availability and accessibility of resources has been an important a ect of the strategies adopted so far. The support made available initially through a state bond referendum and subsequently through grants hae been critical for stregthening the resource dimension hitherto.

A renewed marshalling of resources locally is required to: sustain the increasing interest in information technology activity; to accommodate technological advances, obsolescence and maintenance, and to compensate for the time-intensive nature of instructional computing activities. For small campuses, especially those in a multi-campus system, both the size of the overall pie and the computing demands on it limit resource availability for Academic Computing. A stated commitment to information technology use through an understanding of its strategic importance to the University leading to a departure from traditional resource allocation mechanisms will be needed to rectify this. The recent inclusion of an informatior technology statement in the prioritized list of goals of the University, as well as current efforts on the development of a long range plan for providing technology related capital resources, are constructive steps being taken in this area.

Consensus: As is becoming evident, the diverse set of applications and users that are evolving necessitate a more complex degree of consesus that is difficult to achieve. Mechanisms tc promote/generate consensus are required on issues related to the prioritization of academic computing resource allocation, standardization and future directions of Academic Computing. The formation of a campus wide advising and user group committee for this purpose is being encouraged. Consensus will also require a greater degree of reliance on formal policies than at present.

Linkage: The fact that no formal organization for academic computing existed at UMM three years ago, coupled with UMM's location in a remote area where physical and communication facilities were underdeveloped, made for a weak linkage situation initially. The evolution of an Academic Computing unit with a director and technical staff, have helped create the basic organizational infrastructure and somewhat strengthen the linkage dimension. The increase in the level and complexity of operations are making apparent, the need for a greater degree of formalization with respect to differentiated and articulated configurations of people, roles and responsibilities. An example is the need to make programming assistance available for courseware development efforts and faster in-house systems, given the absence of a computer science department on campus.

The convergence of information technologies (e.g. computers and telecommunications) and that of applications (e.g. instruction and administration), also suggest the need for a convergence of the technology-related decision making units. University-wide mechanisms need to be established to insure coordination in decision making for minimizing the potential for missed opportunities and actions at cross-purposes.

Conclusion

In general, the interaction of an innovation system with the educational system could result in three possible outcomes: 1) mutual withdrawal with no change: 2) superficial or temporary change; 3) fundamental/systemic change. In the case of information technology at UMM a vision of the last outcome has been seen, through maintaining an Instructional Augmentation and an Organizational Focus. The fragility of this vision and the possible reversal to the second outcome (i.e. superficial, temporary change) if factors relating to an Organizational Focus are not addressed is also evident.

Footnotes:

[1] "Summative Evaluation Report, Strengthening Program, Title III Grant, 1986-1989, University of Maine at Machias, October 1989, pp. 8-9.

Reference:

Havelock, R.G. and Huberman, A.M., "ORACLE TIMES FOUR: Predicting the Generalization of Innovation." Working Document. IIEP. UNESCO, 1980 pp. 11-28.

Smallen, D., "Computing at the Small College -the Computer Services Perspective." EDUCOM Bulletin 22(3), 1987 pp. 8-9.