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IDENTIFIERS *CAUSE National Conference

ABSTRACT

Proceedings of the 1989 national conference of the Professional Association for Computing and Information Technology, formerly known as the College and University Systems Exchange (CAUSE) are recorded in this document. Papers are organized according to seven concurrent tracks in the following areas: (1) planning and strategy issues; (2) funding and accountability issues; (3) organization and personnel issues; (4) policy and standards issues; (5) telecommunications and networking issues; (6) academic computing issues; and (7) applications and technology issues. The 52 papers are preceded by four general session presentations: the keynote address, "Uneven Marriage: The University and the Management of Information Technology" (Frank Newman); "Transformation of Information Technology in the Modern Higher Education Institution" (Richard Nolan); "Changing Ethics and Values in America: Implications for Information Technology" (Charles Nesson); and "Information Technology: Should Your President Continue To Buy It?" (James Rosser). Sessions called "Current Issues" and "Ask the Experts," as well as constituent group meetings and a seminar on "Writing for CAUSE/EFFECT" are summarized. Also provided are a listing of corporate participants, descriptions of CAUSE activities of 30 corporations, and pictorial highlights of the conference. (DB)

Managing Information Technology: Facing the Issues

Proceedings of the
1989 CAUSE National Conference

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

CAUSE89

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CAUSE, the Professional Association for the Management of Information Technology in Higher Education, helps colleges and universities strengthen and improve their computing, communications, and information services, both academic and administrative. The association also helps individual members develop as professionals in the field of higher education computing and information technology.

Formerly known as the College And University Systems Exchange, CAUSE was organized as a volunteer association in 1962 and incorporated in 1971 with twenty-five charter member institutions. In the same year the CAUSE National Office opened in Boulder, Colorado, with a professional staff to serve the membership. Today the association serves more than 2,300 member representatives from over 850 campuses representing 590 colleges and universities, and 36 corporate members.

CAUSE provides member institutions with many services to increase the effectiveness of their computing environments, including:

- the Administrative Systems Query (ASQ) Service, which provides to members information about typical computing practices among peer institutions from a data base of member institution profiles;
- the CAUSE Exchange Library, a clearinghouse for documents and systems descriptions made available by members through CAUSE;
- association publications, including two bi-monthly newsletters, *Manage IT* and *CAUSE Information*, the professional magazine, *CAUSE/EFFECT*, and monograph and professional papers series;
- workshops and seminars; and
- the CAUSE National Conference.

We encourage you to use CAUSE to support your own efforts to strengthen your institution's management and educational capabilities through the effective use of computing and information technology.

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INTRODUCTION

The CAUSE national conference is maturing into a major influence in the profession of information technology management in higher education. As the scope of our profession widens on campuses across the country, the CAUSE staff and conference program committee are challenged to formulate a timely, pertinent conference agenda; to create programs of immediate and practical value; to find dynamic speakers to inform and inspire; to promote the sharing of ideas and camaraderie among members. Judging by the enthusiastic response on conference evaluation forms, the committee members and staff involved in planning CAUSE89 met all of those challenges.

The 1989 theme, "Managing Information Technology: Facing the Issues," would not have been as appropriate ten, or even five years ago. However, we find ourselves faced more and more with such issues as organization, accountability, standards, funding, ethics, and security, in addition to the ever-present, ever-changing technical considerations. The CAUSE89 program was designed to address all of our professional concerns. Three distinguished featured speakers—Frank Newman, Richard Nolan, and Charles Nesson—brought perspectives from academic, technical, and philosophical spheres. Forty-nine professional presentations offered a wide range of topics, from planning and strategy to applications and technology. Preconference seminars, "ask the experts" sessions, constituent groups, current issues sessions, corporate presentations and exhibits—all the components of our national conference have grown and matured along with the CAUSE membership.

Of course, San Diego offered a magnificent setting for some unique social activities, like the multiple ethnic atmospheres of the Fat City registration reception, sponsored by Digital Equipment Corporation, and the harbor-side Thursday evening Beach Ball at the 'B' Street Pier, sponsored by IBM—not to mention our golf tournament at the lovely Coronado Course, hosted by Information Associates.

Professionalism was the hallmark of this conference, from the outstanding conference communications systems—the Hyper-Card-based messaging system called CAUSENet, and the *Daily CHAT* newsletter—sponsored by Apple Computer, to the quality and diversity of the presentations, the talk among attendees, and the logistical preparation. It was a great pleasure for me to have been part of this exciting effort.

I hope this publication of the substance of CAUSE89 will be a valuable continuing resource throughout the year, both for conference-goers and for those who will be reading about the conference offerings for the first time.

Martha Fields
CAUSE89 Chair

ACKNOWLEDGMENTS

The success of the CAUSE National Conference is due to the contributions of many people and supporting organizations, several of whom deserve special attention:

▲ The CAUSE89 Program Committee

Front row, left to right: Deborah K. Smith, CAUSE; Carolyn Livingston, Tufts University; Martha Fields, State University System of Florida; Jill Tuer, University of Michigan; Ken Blythe, Pennsylvania State University; and Gary Devine, University of Colorado. Second Row: Daniel A. Updegrove, University of Pennsylvania; Jack Tinsley, Florida Community College/Jacksonville; Mark A. Olson, Columbia University; Michael Naff, Virginia Tech; and Ernest L. Jones, Appalachian State University. Not shown: Phyllis Sholtys, Northern Kentucky University.

This committee, under the chairmanship of Martha A. Fields and vice chairmanship of Ernest L. Jones, spent many hours working with the CAUSE staff to produce an outstanding conference. CAUSE gratefully acknowledges their enthusiasm, time, and efforts, and the generous support of their institutions.

CAUSE President Jane Ryland thanks Martha Fields for her outstanding work as chair of CAUSE89.

▲ 1989 CAUSE Board of Directors

Seated, left to right: Arthur J. Krumrey, Loyola University of Chicago; Jane N. Ryland, CAUSE President; A. Jerome York, University of Cincinnati; Carla T. Garnham, Medical College of Wisconsin; and immediate past Chair M. Lewis Temares, University of Miami. Standing: Secretary/Treasurer Jeffrey W. Noyes, Mercer University; Carole Barone, Syracuse University; Chair David L. Smallen, Hamilton College; Cedric S. Bennett, Stanford University; and Vice Chair Robert C. Heterick, Jr., Virginia Tech.

The generous contributions of time, insights, and creative energy of the CAUSE Board of Directors are gratefully acknowledged and appreciated.

Retiring from the CAUSE Board in 1989 were: Cedric S. Bennett, Director of the Applications Support Center at Stanford University and a past Board chair; M. Lewis Temares, Chief Information Officer, University of Miami, and a past Board chair; and Michael R. Zastrocky, former secretary/treasurer of the CAUSE Board and currently CAUSE Vice President for Information Resources in the national office. David L. Smallen of Hamilton College, whose Board term ended in 1989, will serve for a year in an ex-officio capacity as immediate past chair.

1989 Board Chair Dave Smallen thanks retiring member and past chair Lew Temares for his years of enthusiastic service to the association.

▲ CAUSE Member Committees

Neither the conference nor the other association activities could continue without the contributions of the six creative and active CAUSE Member Committees. CAUSE appreciates the time and energy contributed by the volunteers who carry out the duties of these committees.

At the Wednesday luncheon, CAUSE President Jane N. Ryland acknowledged the many people who supported the association in 1989 through participation on association committees. Plaques containing certificates of appreciation were given to the following retiring committee members:

Current Issues Committee
James Hill, Dallas County Community College
James H. May, California State University/Chico
Phyllis Sholtys, Northern Kentucky University
Anne Woodsworth, University of Pittsburgh

Editorial Committee
Kenneth Klingenstein, University of Colorado
Gerald McLaughlin, Virginia Tech
John True, San Francisco State University

Election Committee
George L. Adler, Bentley College
Floyd R. Crosby, West Virginia University
Ronald J. Langley, University of Alaska
Stephen Patrick, Bradley University
Andy W. Wehde, University of Iowa

Recognition Committee
Erwin Danziger, University of North Carolina System
William Mack Usher, Oklahoma State University

Member Liaison Committee
Tom Archibald, University of Georgia
Douglas E. Hurley, University of Kentucky
Allan B. MacDougall, Saddleback College
Philip Philips, Massachusetts Institute of Technology
Janet K. Price, Kalamazoo College
John W. Streeter, Kansas State University
Clyde R. Wolford, LeMoyne College

CAUSE89 Program Committee
Ken Blythe, Pennsylvania State University
Gary D. Devine, University of Colorado
Martha Fields, State University System of Florida
Ernie Jones, Appalachian State University
Carolyn Livingston, Tufts University
Michael Naff, Virginia Tech
Mark A. Olson, University of Southern California
Jack Tinsley, Florida Community College/Jacksonville
Jill Tuer, University of Michigan
Daniel A. Updegrove, University of Pennsylvania

▲ Corporate Contributions

CAUSE thanks all those corporations who set up exhibits, gave corporate presentations, and provided evenings of hospitality. Their contributions add an enormously valuable dimension to the conference experience.

Special thanks go to

- **Apple Computer** for developing and sponsoring the CAUSE89 messaging and information system, CAUSENet, with assistance from **HyperPro**; for supporting printing of the conference newsletter, the *Daily CHAT*; and for providing Macintosh II and desktop computers and LaserWriter IINTX printers for on-site registration needs and production of the *CHAT*;
- **Digital Equipment Corporation** for sponsoring the opening night welcome reception at Fat City;
- **The IBM Corporation** for sponsoring Thursday evening's Beach Ball at the 'B' Street Pier;
- **Information Associates** for sponsoring the CAUSE Recognition Awards and the CAUSE89 golf tournament;
- **Systems & Computer Technology Corporation** for sponsoring the *CAUSE/EFFECT* Contributor of the Year Award; and to
- **CKA, Sun Microsystems, Coopers & Lybrand, EDUTECH International,** and **Ernst & Young** for sponsoring refreshment breaks.

CAUSE89

GENERAL SESSIONS

CAUSE89 general session presentations challenged conferees to re-examine their own responsibilities and the function of computing in education.

On Wednesday morning, Frank Newman, President of the Education Commission of the States, focused on the need for fundamental change in the educational process in his session, *Uneven Marriage: The University and the Management of Information Technology.*

In Thursday morning's session, *Transformation of Information Technology in the Modern Higher Education Institution,* Richard L. Nolan, Chairman and co-founder of Nolan, Norton & Co., claimed that today's hierarchical corporate structures are obsolete and incapable of supporting the change to an information/service economy that information technology has precipitated.

At Thursday's luncheon, Harvard Law Professor Charles Nesson led six panelists through a Socratic dialogue on major ethical issues facing managers and users of information technology in his session, *Changing Ethics and Values in America: Implications for Information Technology.*

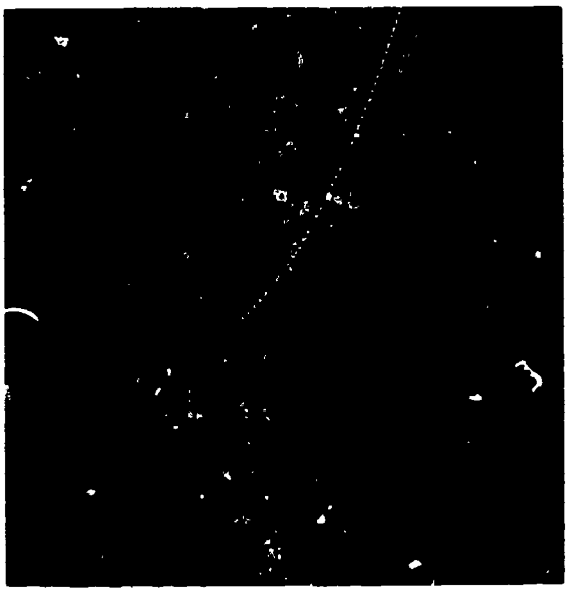
The final general session of CAUSE89 was the Current Issues Forum, *Information Technology: Should Your President Continue to Buy It?* in which university presidents James Rosser (California State University/Los Angeles) and Diether Haenicke (Western Michigan University) shared divergent perspectives about the growing demand for information technology on campus.

Other general sessions throughout the conference allowed recognition of individual contributions to the association and the profession, and transaction of association business. Recipients of CAUSE awards were honored during Wednesday's Awards Luncheon, with special recognition for members of the six association member committees and contributors to *CAUSE/EFFECT* magazine. New Board members and officers were introduced at the Thursday luncheon. CAUSE voting members decided on several association bylaw changes during the Annual Business Meeting at a Friday-morning breakfast.

WEDNESDAY MORNING KEYNOTE ADDRESS

"Uneven Marriage: The University and the Management of Information Technology"

Frank Newman
President of the Education Commission of the States



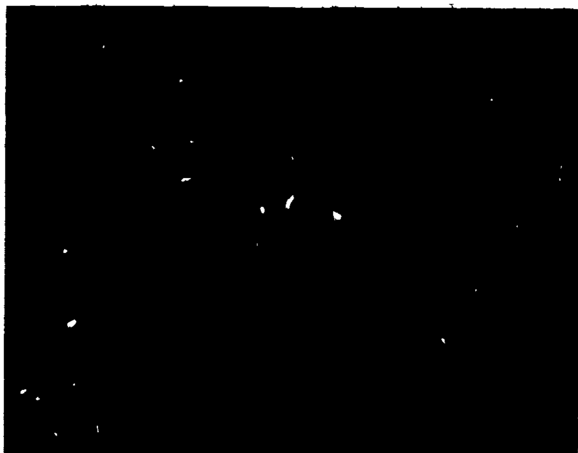
Dr. Frank Newman opened the 18th annual CAUSE national conference with a challenge to build new incentive systems into education that will encourage innovative uses of technology. Dr. Newman claimed that the most important element of our universities—teaching and learning—has taken the least advantage of our new technological era: Compared to the enthusiasm with which the administrative, scientific, and library sides of higher education institutions have greeted new technologies, academia shows little recognition of new opportunities to turn education into a vital, participatory process.

To change the existing static system, Dr. Newman said, educators must adopt the style of the research world, with competitive rather than hard funding, intense peer (including student) review, problem-oriented learning, and the reciprocal, cumulative process of learning through teamwork.

WEDNESDAY LUNCHEON

Award Presentations

Highlighting this luncheon were the presentations of the 1989 CAUSE Recognition Awards and the *CAUSE/EFFECT* Contributor of the Year Award, with special acknowledgment of award sponsors Information Associates and Systems & Computer Technology Corporation.



Recognition Award for Institutional Leadership

Winner of the 1989 CAUSE Recognition Award for Institutional Leadership was David Roselle, President of the University of Kentucky, for his achievements as a "high-tech" administrator who understands not only the requirements of technology but also how it can be used to support the mission of an institution. Pictured (left to right) are John Robinson, CEO of Information Associates; Roselle; and CAUSE Chair Dave Smallen.

Recognition Award for Distinguished Service

A special award was presented at CAUSE89 for unique, distinguished, and dedicated service to CAUSE. This one-time award went to Charles R. Thomas, Senior Consultant for the National Center for Higher Education Management Systems, for his 15 years of leadership as the first CAUSE executive director and his foresight in establishing an enduring focus for this member-driven association. Pictured at left are John Robinson, CEO of Information Associates; Thomas; and CAUSE Chair Dave Smallen.

The CAUSE recognition awards have been sponsored by Information Associates since 1980.

CAUSE/EFFECT Contributor of the Year

The 1989 CAUSE/EFFECT Contributor of the Year Award went to Richard D. Howard of North Carolina State University, and Gerald W. and Josetta McLaughlin of Virginia Tech, for their article, "Bridging the Gap between the Data Base and User in a Distributed Environment," which appeared in the Summer 1989 issue of CAUSE/EFFECT *magazine. Pictured are CAUSE Chair Dave Smallen; Howard; and Michael J. Emmi, Chairman and CEO of SCT.*

Systems & Computer Technology Corporation has sponsored this award since 1982.

WEDNESDAY LUNCHEON

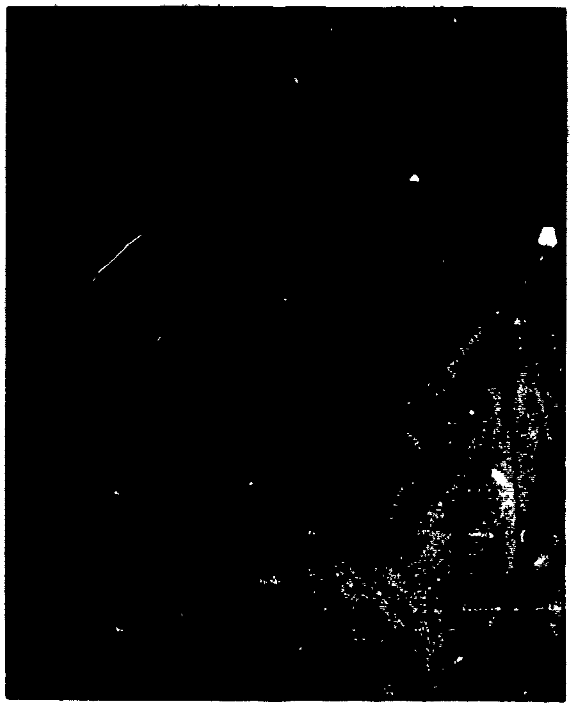
Committee Recognition

Retiring committee members received special acknowledgment for dedicated service at Wednesday's luncheon. At left, Clyde Wolford of LeMoyne College accepts plaque and thanks for his activities on the Member Liaison Committee from CAUSE Director of Membership Denny Farnsworth.

THURSDAY GENERAL SESSION

"Transformation of Information Technology in the Modern Higher Education Institution"

Richard L. Nolan
Chairman, Nolan, Norton & Co.

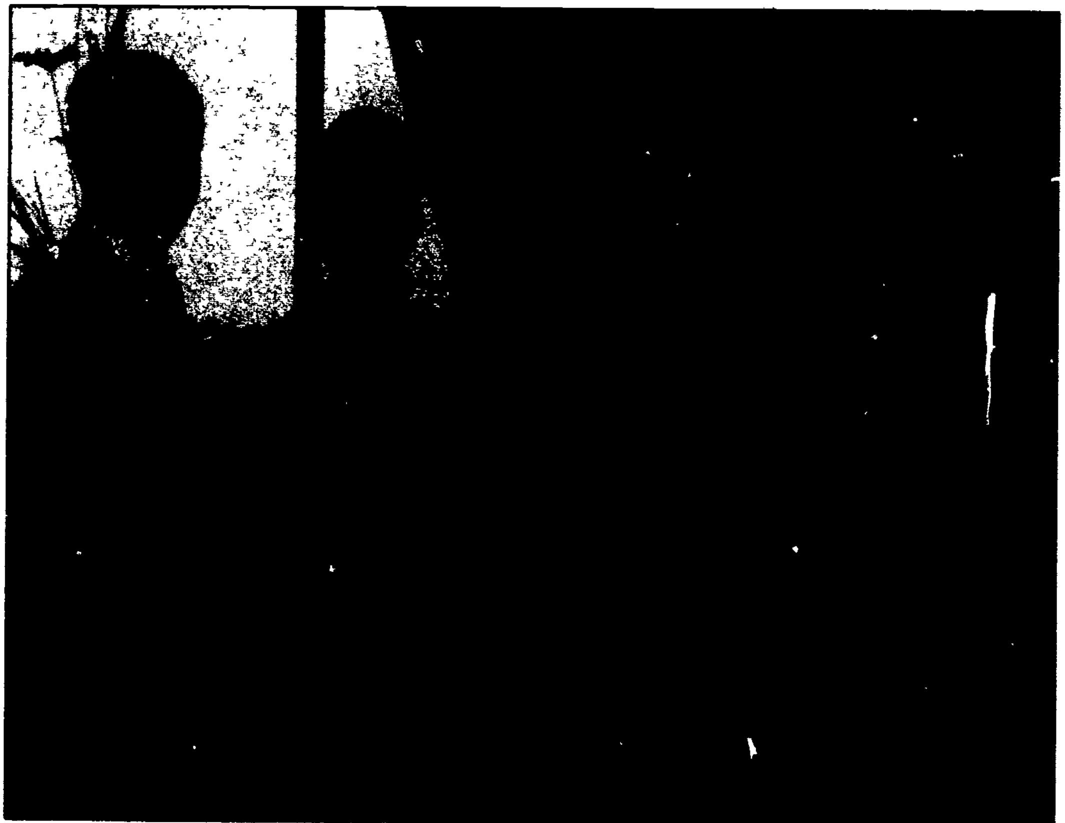


In Thursday morning's general session, Dr. Richard Nolan told conferees that today's hierarchical organizations are obsolete. Information technology, he said, is sparking a fundamental transformation in our economy for which we are unprepared As we move out of an industrial economy into an information/service economy, American industry is moving to a networked style of organization that is "proving much more effective for operating at the levels of sophistication we hav to deal with."

Dr. Nolan cautioned that leaders of corporations and institutions must participate in the information technology revolution rather than simply observe from the sidelines. With participation will come understanding of the depth and breadth of the Information Technology Era, and how organizations must adapt to succeed in it.

THURSDAY LUNCHEON

Introduction of 1990 CAUSE Board

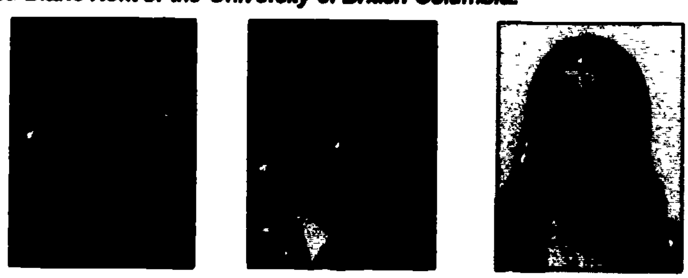


1990 Officers

Left to right above are the 1990 officers of the CAUSE Board of Directors: Secretary/Treasurer A. Jerome York of the University of Cincinnati, Vice Chair Carole Barone of Syracuse University, Chair Robert C. Heterick, Jr. of Virginia Tech, and immediate past Chair David L. Smallen of Hamilton College, who will serve in an ex-officio capacity during 1990.

New Members

Newly elected to the Board are (left to right) Lee R. Alley of Arizona State University, Kenneth C. Blythe of Pennsylvania State University, and Diane Kent of the University of British Columbia.



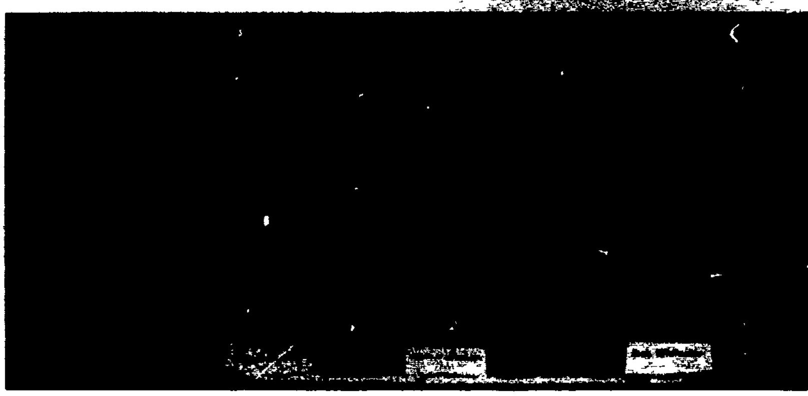
THURSDAY LUNCHEON GENERAL SESSION

"Changing Ethics and Values in America: Implications for Information Technology"

Charles Nesson

Distinguished Professor, Harvard Law School

Dr. Nesson focused his Socratic dialogue with six IT directors and vice presidents on ethical issues of software copyright and piracy, censorship of electronic mail, network viruses, and equal access to technology resources. After leading panelists through an hour-long process of discussion and re-evaluation, he pointed out the necessity of stopping to question our direction in this fast-moving field.

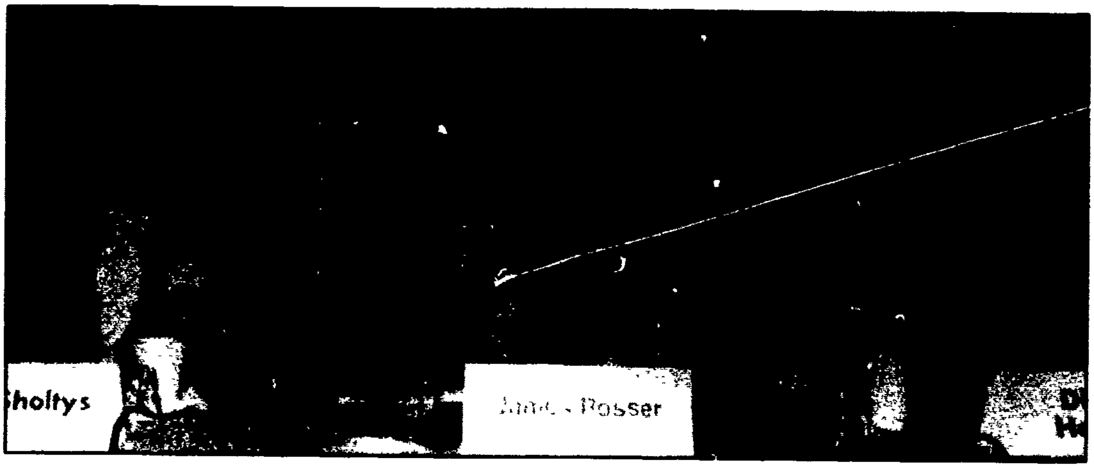


FRIDAY GENERAL SESSION
CURRENT ISSUES FORUM

"Information Technology: Should Your President Continue to Buy It?"

James Rosser
President, California State University/Los Angeles

Diether Haenicke
President, Western Michigan University



At this closing session of CAUSE89, coordinated by CAUSE Current Issues Committee Chair Phyllis Sholtys of Northern Kentucky University, two university presidents expressed their different perspectives about the growing demand for information technology on campus.

CAUSE President Jane Ryland moderated the exchange, in which Dr. Rosser defended the importance of heavy investment in technology to assure equity among students and educate successful citizens, while Dr. Haenicke questioned the benefits of being on the "bleeding edge" of fast-moving technologies, and the extent to which computing needs assessments are based on self-interest.

CAUSE89

PROFESSIONAL PROGRAM

The CAUSE89 theme, *Information Technology: Facing the Issues*, was addressed through 49 professional presentations in seven subject tracks, as well as through many other professional development opportunities. Four Current Issues Sessions allowed conferees to converse about subjects of topical interest, and four Ask the Experts sessions, new this year, allowed participants to question experts from education and industry about some of the most complex current issues in our profession. Eleven Constituent Groups met to exchange information and experiences pertaining to specific working environments.

Printed in the following pages are summaries of the Current Issues and Ask the Experts Sessions and Constituent Group meetings, along with papers from the professional presentations categorized according to the seven conference tracks.

CAUSE gratefully acknowledges those individuals who agreed to present professional papers on a moment's notice. Although they were not called on to present, their papers are included in these Proceedings.

Current Issues Sessions

Four scheduled Current Issues Sessions provided informal opportunities for conferees to meet and exchange ideas on topics of special interest or concern. The topics were chosen from issues which have been of interest to the profession in the past year.

The Changing Relationship between Libraries and Information Services
Moderator: Paul Willis
University of Kentucky

Desktop Publishing on Campus
Moderator: James Netherton
Baylor University

Information Technology for Decision Support (EIS, ESS, DSS, and IC)
Moderator: Dennis Viehland
University of Arizona

National Networking
Moderator: Michael Roberts
EDUCOM

CURRENT ISSUES SESSION SUMMARY

The Changing Relationship Between Libraries and Information Services

Moderator: Paul Willis, Director of Libraries, University of Kentucky

Moderator Paul Willis opened this session with the following comments:

"I am sure that nearly everyone here can remember when libraries and computing centers operated independently of one another. This is, of course, no longer the case. Sometimes when we discuss the impact of computers on libraries, I think we fail to consider communications technology. It is this area which drives networking, and it is networking which, I believe, will bring libraries and computing centers ever closer together in the future.

"Others (e.g., Sack) see the library/computing center relationship differently and suggest that the library might disappear through disuse. They point out that scholarly communications are shifting away from libraries, that computers are rivaling books and journals as information storage and dissemination devices. Frank Newman reports that scientists are moving away from regular library use. What impact will scholars communicating with one another electronically have on the scholarly journal?

"If we accept the view that libraries will diminish in importance, we could go home and begin the orderly transition of library services to the computing center. But this direction is not in the best interest of our institutions, in my opinion. The professionals in all of the information units have skills and expertise to contribute to managing information on campus, and I think the preferred solution is to utilize the talents of our professional staffs in a collaborative way.

"How do we do this? First, I believe that we must consider getting into one organization (perhaps under a CIO or similar position) all of the major campus units that are in the information business. At a minimum I consider this to be libraries, computing centers, and communications. Short of this, we must develop strategies to get the staffs from these units working together—not just on specific projects, but on future services—and we must involve the teaching faculty in this process.

"Others have suggested that computing centers and libraries be merged, or that a new organization be created. Instead, I prefer to approach this with a view of integrating the traditional library, computing center, and communications functions in a library/information center where both library and computing user services are placed. I think that on many campuses this integration might be easier to start in colleges and departments with existing branch libraries serving as the base. I believe, too, that at this level the college or departmental information center could play a key role in integrating technology into the curriculum, as Frank Newman has said is needed. Such a library/information center might allow us to begin a shift from library and computing center-oriented information services to user-oriented information services."

Discussion among session participants covered the following issues:

(1) Will libraries disappear through disuse?
(2) What changes can libraries make to respond to this possibility?
(3) Should the library be integrated into an organization with other information technology units?

Those favoring this view suggested that this would have a positive impact on information planning on campus: that the changing and complex working environment requires consultation among the information units, and that the need to coordinate technology decisions could be facilitated by a common organizational structure.

Those opposed to change felt that it was not necessary: that libraries and computing centers must work together, but organizational change is not required. The view was also expressed that the library should stay in the same organizational structure as the academic units.

Desktop Publishing on Campus

CAUSE89 Current Issue Session

Moderator: James S. Netherton
Baylor University

Discussion of the status, benefits, and challenges of desktop publishing (DTP) on campus attracted about 15 participants including a couple of vendor representatives. The moderator began by identifying some of the reasons people commit to DTP and some of the unanticipated problems which occur.

Various attendees then offered a status report for DTP on their home campuses identifying any special uses or benefits as well as what problems were encountered and how these were being addressed. The level of commitment varied from "considering how we might begin" to "producing most major campus publications with DTP."

In these discussions, one of the most striking elements was the diversity of various campus situations. Not only were there the normal hardware and software diversity, but issues involving level of sophistication, technical support, training, standardization, organization, accounting, funding, staffing, and central control varied dramatically from campus to campus. Whether DTP was even a computing issue was not agreed upon since on some campuses primary responsibility rests with the printing plant or central duplicating (the campus photocopying organization).

There was agreement, however, on two themes: DTP, despite its many problems, is making a substantial contribution on many campuses, and campuses are coping with the problems of DTP better than a year ago. As the session ended, one participant suggested that DTP was changing from a current issue to a part of the daily routine. While associated rewards, challenges, and frustrations were still abundant, the novelty and urgency which make an issue "current" were waning.

Summary of Current Issues Session:
Information Technology for Decision Support
CAUSE89, San Diego, November 29, 1989

Moderator: Dennis W. Viehland, University of Arizona

The moderator began by briefly discussing the Executive Information Systems Special Interest Group (EISSIG), an electronic mailing list on BITNET for discussing the application of information technology for decision support. Conferees interested in participating in EISSIG were advised to contact the list owner, Dennis W. Viehland (VIEHLAND@ARIZRVAX).

In his brief prepared remarks, the moderator presented to the group a table that compared executive support systems with previous generations of information systems--electronic data processing, management information systems, and decision support systems. He noted the confusion about EIS vs ESS in the literature and offered his own definition of ESS (mental modeling + EIS + office automation). The group discussed the table and several suggestions for expanding and improving the table were made.

Resources examining executive information systems was discussed. Books such as Rockart and DeLong's *Executive Support Systems: The Emergence of Top Management Computer Use* (Dow Jones-Irwin, 1989) and Paller and Laska's *The EIS Book: A Guide to Top Management Computing* (Dow Jones-Irwin, in press) were noted, as well as the Fall 1989 issue of *CAUSE/EFFECT* that featured executive systems. Another important source of information in this rapidly changing field is monitoring what the vendors are doing. Dennis Viehland agreed to post on the EISSIG a list of EIS vendors serving both private industry and higher education markets.

There was considerable discussion about the cost of EIS. The group agreed these systems are expensive, and it is difficult to know how to justify the cost. No definitive answer emerged; most agreed the return on investment cannot be calculated and it requires a "leap of faith" that the expense will be worth it.

One member of the group raised "heresy" that maybe we should not pursue EIS because it can only lead to trouble for us. Specifically, executives are not data savvy enough to know how to interpret the data they get via an EIS. For example, executives may confuse fiscal year data with academic year data, include graduate students when they should be excluded, use FTE data when headcount is more appropriate, etc. As a result, the information they get is not what they expect or it is interpreted incorrectly. Unfortunately these discoveries often are made when questions are raised after the executive has cited these data in public. There was concensus that this is a problem, but one that can be overcome. One solution is to emphasize the need for "data education" when the EIS is installed. There also was a comment that rising executives at the VP and dean level are generally more computer literate and data savvy than current executives, hopefully this will be less of a problem in the future.

National Networking

Current Issue Session
CAUSE89

Moderator:
Michael Roberts
Vice President, EDUCOM

Telecommunications are reshaping the way that universities will teach, research, and collaborate in the future. This session provided an opportunity to discuss national networking initiatives, including CREN (the new corporation operating the merged BITNET and CSNET), NSFNet, and the coming National Research and Education Network (NREN). Participants in the session were interested in the national legislative and funding issues that are shaping higher education networking for the future, and how campuses will be affected by these initiatives.

Of special interest at the session was NREN, the "information superhighway of tomorrow," a proposed national initiative which would create a high-capacity, state-of-the-art computer network linking supercomputers, libraries, national data bases, and academic and industrial researchers into a unified information infrastructure. The Coalition for the NREN—a group sponsored by EDUCOM's Networking and Telecommunications Task Force—has produced a brochure examining the benefits of the NREN with a network plan, an outline for funding, and ideas for implementation. Free copies of the brochure are available from the Coalition for the National Research and Education Network, 1112 16th Street NW, Suite 600, Washington DC 20036; phone (202) 872-4215.

Ask the Experts Sessions

Four new, interactive sessions allowed audiences to question experts from education and industry about complex current issues in our profession:

- **New Technologies:**
  Artificial Intelligence and CASE
  Moderator: Linda Fleit,
  EDUTECH International

  Fred Forman of American Management Systems and Theresa Kushner of Texas Instruments answered questions in this session about the impact of AI and CASE technologies on campuses.

- **New Technologies:**
  CD-ROM and Hypermedia
  Moderator: Joel Kolbensvik
  Academic Computing magazine

  Phil Farley of Hewlett-Packard and Doug Doyle from Apple Computer, Inc., shared their views of the implications for higher education of these technological advances.

- **Changing Ethics and Values in America**
  Moderator: Sally Webster
  Syracuse University

  CAUSE89 featured speaker Charles Nesson of the Harvard Law School responded to questions from the audience as a follow-up to his luncheon session.

- **UBIT and Unfair Competition**

  Robert Gillespie of Gillespie, Folkner & Associates summarized current Congressional action on these issues, and explained how pending legislation relates to higher education. Sandra Dennhardt from the University of Illinois, Thomas Mueller of Washington State University, and Richard Mann of the University of Kansas shared their experiences in facing unfair competition suits regarding microcomputer sales.

Constituent Group Meetings

Eleven subgroups of CAUSE members and conferees met at CAUSE89 to focus on issues unique to their shared work environments. These Constituent Groups are organized to encourage communication among professionals who share specific problems and functions. The groups meet during the National Conference, and occasionally at other times during the year, and the number and focus of the groups change according to members' needs.

Chief Information Officers

Convenor: Joseph Catrambone, Loyola University of Chicago

At the CAUSE89 CIO Constituent Group meeting, 54 conferees discussed the importance of university committees and policies supporting the role of the CIO.

Joseph Catrambone presented the importance of university committees and policies which support his role as CIO at Loyola University Chicago. His CIO's mission statement is "to provide the leadership and expertise to design, implement, support, and manage information technologies to foster the teaching, research, and health care mission of Loyola University Chicago." The committees at Loyola Chicago supporting this mission include: Information Systems Steering Committee, Capital Budget Committee, Information Systems Administrative Users Committees, committees on Academic Computing Services, and major implementation project committees. The specific roles and support from these committees were identified and discussed.

Mr. Catrambone identified the Loyola Chicago policies regarding the use of computing resources which supported his role as CIO. These policies include: authorized uses of public computing facilities, rules of ethical conduct for computer use, mainframe resource allocations, employee off-premise use of computer equipment, computer networks, copyright laws and software license agreements, procurement of computing resources, data administration, ownership and use of data, and the redeployment of computer equipment.

Following this discussion, other conferees identified the committees and policies supporting the role of the CIO at their institutions.

Community/Two-Year Colleges

Convenor: Gordon Mathezer, Mount Royal College

A larger-than-usual group met in San Diego, and had lively discussions on a number of topics. To open the session, the group revisited such basic issues as, "How are two-year/community colleges different?" and "What could CAUSE do to help such institutions?"

The majority felt that, while our institutions were smaller, did not do research, were more vocationally oriented, etc., one of the key distinguishing factors was that people responsible for information technology "had to wear many hats at the same time" and "had to take a closer, more hands-on approach to technology." This naturally led to suggestions that CAUSE could help our institutions by making available more specific "how-to" information. There were calls for more substantial and more technical articles in CAUSE/EFFECT. People expressed interest in a wide variety of topics—for example, who is using SQL on what computer and with what results, or how are people connecting dissimilar computers on a LAN—and in receiving copies of proven procedures, etc.

All supported the concept of MIPS and ASQ strongly. There were even suggestions that such a clearinghouse of information should be specialized by member institutions type (i.e., there should be one for two-year/community colleges only).

Several other areas of possible cooperation and coordination were also discussed. These included:

– more frequent get-togethers, perhaps on a regional basis, to exchange task/issue-oriented questions;

– organizing a Peer Review service, whereby managers from other institutions would come in to provide professional advice to the person in charge of information technology at the host institution;

– publishing monographs on a fairly regular basis to make reasonable current information on tasks and issues of interest generally available;

– ensuring that everyone knows how they can use BITNET on a "pay as you go" basis (via 800 telephone number).

Mike Zastrocky and Denny Farnsworth attended the meeting on behalf of the CAUSE staff, and indicated that the National Office was anxious to provide new and more useful services to the membership. Gordon will follow up with them on the preceding suggestions, so that a report may be made to members of the group in Miami in 1990.

Data Administration

Convenor: Richard D. Sheeder, Pennsylvania State University

The meeting of the Constituent Group on Data Administration, attended by 67 people, was a particularly active one, with wide-ranging discussion and many questions generated during several informal presentations. The meeting is summarized in the following paragraphs.

Richard Sheeder, the chairman, reviewed the purpose of the Constituent Group and summarized the meeting of the Special Interest Group on Data Administration which was held at the Association for Institutional Research (AIR) Forum in Baltimore in May 1989. He emphasized the concern of institutional researchers that administrative data be both accurate and complete, and that training in the meaning of the data be available. The Group felt that the training could be provided best by the stewards who work most closely with the data on a day-to-day basis.

Sheeder and Sue Borel reported on the current status of the DASIG electronic mail Distribution List established and maintained at the Syracuse University SUVM node on BITNET. The list was started a year ago to encourage communication among higher education professionals interested in data administration. As of the CAUSE meeting date, there were 172 members on the list representing 92 U.S. institutions, five Canadian institutions, and one institution each in Puerto Rico and Taiwan. Sue Borel oversees the list, and is developing a detailed set of instructions on how to use it. She has drawn on the work of Dennis Viehland from the University of Arizona, who wrote an excellent set of instructions for the Executive Information Systems SIG which he chairs.

Many institutions interested in formally establishing a data administration function find it helpful to refer to job descriptions and related materials from institutions who have already established such a function. Julia Rudy from the CAUSE office has arranged to have the CAUSE Exchange Library serve as a central distribution point for providing materials to institutions which need them, and is asking institutions to send job descriptions, organization charts showing where the DA function resides, and institutional policies governing data access and security to the CAUSE Exchange Library. These documents will be available to all CAUSE members, and to AIR members who belong to DASIG.

Three informal presentations were made:

(1) Leonard Brush, the Director of Administrative Systems at Carnegie Mellon University, summarized progress to date in establishing security policies and procedures at CMU. He noted that no data administration function has been organizationally established yet, but the implementation of formal data security policies may provide sufficient impetus to do so.

When new administrative systems were being proposed at CMU the University auditors expressed a need for both security and disaster recovery plans. A Security Task Force has been established to draft a policy for administrative systems security, develop a disaster recovery plan, and develop recommendations and oversee the implementation of each. Training programs will be an important part of the Task Force's recommendations.

The security policy will include (a) policy on password usage, with specific verbiage addressing requirements for students, (b) a requirement for employee confidentiality agreements, (c) a requirement for a periodic survey of employees regarding security, and (d) statements about training to use data appropriately.

(2) Frank Gose, Director of Student Data Administration at the University of Colorado, discussed the Data Access and Use Agreement being drafted at the University. The agreement contains statements that (a) institutional data belongs to the University; (b) qualified users should use the data in a responsible and ethical manner; (c) campus coordinators (offices with functional or custodial responsibility for data) must sign off in order for a requestor to access data; (d) users will not release sensitive data to other parties without the agreement of the campus coordinator; and (e) the user will abide by the provisions of the Family Educational Rights and Privacy Act of 1974. The user must identify the data requested, the form and content of the output, the final disposition of the data, and to whom any output or analyses drawn from the data will be sent.

(3) Dick Sheeder, Assistant Director for Information Resource Management within Management Services at Penn State, described a paradigm for accessing computerized institutional data to be used for ad hoc analyses and reporting. The paradigm included the following steps: (a) establish data access and security policies; (b) assign responsibility for each data element in the institutional data bases to a data steward; (c) establish a Data Administrator's Advisory Group consisting of the data administrator, selected data users, selected data stewards, and the manager of the information center. The advisory group should have responsibility for defining: types of files to be made available for ad hoc use, data dictionary requirements, file content and subsetting requirements, procedures for appointing file stewards, supported software tools for data retrieval, supported modes of output, security standards for the output, training programs for interpretation and use of data and supported software, and procedures for requesting access and securing data.

In closing, all Constituent Group members were urged to stay actively involved and suggest how the DASIG distribution list could serve them better. An archive of messages will be accessible to current and new DASIG members. The AIR SIGDA is scheduled to meet in Louisville at the 1990 AIR Forum, where the dialog will continue.

Executive Information Systems in Higher Education

Convenor: Dennis W. Viehland, University of Arizona

Approximately 80 conferees attended the EIS Constituent Group meeting at CAUSE89. Each member received a handout that described the Executive Information Systems Special Interest Group (EISSIG), an electronic mailing list on BITNET for discussing the application of information technology for decision support. Members interested in participating in EISSIG were advised to contact the list owner, Dennis W. Viehland (VIEHLAND@ARIZRVAX). The handout also included definitions of terms commonly used in EIS discussions (e.g., EIS, DSS, critical success factors).

Robert Glover of the University of Hartford provided the group with an overview of the EIS developed at Hartford. UH uses various microcomputer packages (e.g., Foxbase, Lotus 1-2-3) on an IBM PS/2 Model 80. Henry Stewart discussed the use of FOCUS on a VAX at Williams College to generate a financial-oriented EIS.

There was some discussion about the driving force behind EIS development. An informal poll of the audience showed about 50 percent had primary interest coming from executives; 40 percent had interest originating from the computer center; and 10 percent from other sources (e.g., institutional research).

Robert Glover suggested two things that need to be done before proceeding with EIS implementation:

– get your databases in order

– cultivate the interest of the executives.

A member of the group asked how historical data can be maintained in an EIS. Glover noted that UH only has data since 1984, running on the PC. Thomas Quinn (Information Associates) noted that IA's EIS product stores historical data on the mainframe, to be accessed when it is needed by the microcomputer.

Several commercial EIS vendors were mentioned, and information packets provided by Execucom were made available to members of the group.

Dennis Viehland noted that EIS packages for private industry were little used in colleges and universities because:

– they are very expensive, $250,000 and up

– Executive information systems in business tend to be used for applications that are time critical (e.g., cash flow, changes in inventory, stock prices). College and university executives, on the other hand, tend to use EIS for strategic planning for improving their mental model of the institution.

The group agreed to meet again at CAUSE90. A roster of all who attended the meeting would be circulated via BITNET.

Four-year Colleges/Universities (over 10,000 FTE)

Convenor: John W. Eoff, New Mexico State University

Approximately 25 conferees participated in the four-year college/university meeting. This year, very little discussion was held on purchased software packages. The constituent group had lively discussions on data authority issues and voice response systems.

Under the general topic of voice response systems, several institutions noted their success in the use of these systems for admissions, financial aid, and registration. Of interest to many institutions was the fact that some institutions charge students a nominal fee for registration. Apparently students are happy to pay a reasonable fee to avoid lines and to have the convenience of registering for classes via their home telephone. It was the consensus of the participants that voice response systems are becoming common throughout colleges and universities.

The data authority issue is a difficult problem with no resolution satisfactory to all institutions. The "ownership" and "authority to view/update" is, unfortunately, in the eyes of the beholder. The issue will be around for some time.

One participant inquired if anyone knew of any institution that had migrated their IMS files to DB2. The answer was no. Hopefully next year's meeting will bring forth at least one example.

IBM Higher Education Software Consortium

Convenor: Arthur J. Chapman, California Polytechnic State University / San Luis Obispo
Speakers: Arthur J. Chapman and Dave Blanchard, IBM-ACIS

This was the second meeting of this constituent group. The primary focus was on providing introductory and update information on the Higher Education Software Consortium (HESC) offering from IBM.

Arthur Chapman presented the following overview:

The HESC offers to educational institutions IBM mainframe, mid-range, PC-RT, and PS/2 software at about 2 percent of the commercial rate. In addition, IBM is attempting to motivate this consortium of schools to cooperatively form partnerships for the benefit of higher education.

Major HESC software additions over the past year include mainframe AIX/370 (UNIX), the mainframe operating system product VM/XA, and the PS/2 AIX (UNIX) products.

The HESC Executive Committee consists of the original 17 founding universities and colleges plus, over the past year, the addition of university and college representation from the 12

IBM-ACIS marketing areas and representation from a number of newly-formed HESC Special Interest Groups. These special interest groups include CAD/CAM, Automatic Control Systems, CIM in Higher Education Alliance, Business, and Operating Systems. The mission, as identified by the Executive Committee, is the following:

1. Represent the HESC member schools to the IBM-ACIS organization.
2. Lobby IBM-ACIS for additional and improved HESC software offerings.
3. Implement a yearly poll of HESC membership to ascertain HESC software and service requests.
4. Provide vehicles for HESC membership to communicate on HESC matters.
5. Encourage the development of educational materials and workshops dealing with HESC software.
6. Provide vehicles for the coordination of HESC Special Interest Groups.

In addition, Art Chapman presented the university and college costs involved and methods of becoming involved in HESC activities.

This was followed by numerous questions addressed to Art Chapman and Dave Blanchard regarding current HESC offerings and future HESC plans.

There were approximately 35 attendees. This constituent group continues to be important as a vehicle to inform CAUSE membership of the HESC offerings and allow CAUSE members belonging to HESC to voice concerns and meet with IBM-ACIS personnel.

Institutional Researchers and Planners

Convenors: Richard D. Howard, North Carolina State University, and Deborah J. Teeter, University of Kansas

This group of about 30 participants determined the agenda for the meeting when the group was convened. Issues raised included:

- computing administrators want to know what institutional researchers need from them
- how do institutional researchers use data

Institutional researchers attending the meeting described typical activities of an IR office, which include:

- providing raw data
- data administration
- writing reports
- answering questionnaires
- doing studies
- doing planning and projections

Furthermore, institutional research offices often:

- report to a provost or president
- do not have enough hardware or software
- employ computer programmers/analysts

Issues facing institutional researchers include:

- data quality
- use of census files
- on-line audit checks
- improving quality of process
- use of data to improve quality
- integrating data bases
- users groups
- how long should data be retained

Medical/Health Science Schools

Convenor: Carla T. Garnham, Medical College of Wisconsin

The Medical/Health Science Constituent Group met on Wednesday, November 29, during CAUSE's annual conference. Professionals representing medical schools, schools of public health, health science, hospitals, and interested vendor organizations discussed common concerns. A primary theme was the need for increased interaction and exchange among professionals in medical computing and informatics.

An electronic bulletin board will be established by Sandra Colombo of the University of Michigan. To join, contact Sandra at SANDY_COLOMBO@UM.CC.UMICH.EDU.

Topics discussed included the National Library of Medicine's IAIMS projects, medical library automation, Johns Hopkins' medical library's research, alternative plans to communicate using the NSF network or a separate national medical network, and imminent changes in national medical testing procedures.

A symposium on medical computing to be held in May 1990 at the University of Tennessee-Memphis was announced.

Participants were enthusiastic about the opportunity to meet with each other at CAUSE and other conferences. Future meetings will be planned through the electronic bulletin board at the University of Michigan.

Multicampus and State Systems

Convenor: Robert R. Blackmun, University of North Carolina / Charlotte

The Multicampus/State Systems Constituent Group meeting at CAUSE89 was attended by 19 representatives of colleges and universities in nine states along with 13 vendor representatives located in six states.

Topics discussed by the group included:

- system-wide contracting for micro-computers and software, maintenance of equipment and software,
- auditors and disaster planning/recovery activities,
- the role of system-wide standards in contracting, software maintenance, and reporting,
- issues relating to the management of networks.

As a part of the discussion, it was suggested that CAUSE might be an appropriate sponsor or facilitator of a study of the costs of central vs. distributed maintenance and support. It was also suggested that the statewide activities of the University of North Carolina system (UNC CAUSE) might be a topic for a future CAUSE session, to assist other state or multicampus systems in establishing similar organizations.

Small Institutions (under 5,000 FTE)

Convenor: Clyde Wolford, Le Moyne College

The 1989 meeting of the Small Institution Constituent Group provided an exciting exchange of ideas between the representatives of nearly 40 institutions in attendance. Several interesting statistics were presented to the group, followed by a list of suggested discussion topics. Interest centered on reviewing the organizational structure of computing services on various campuses (i.e., combined vs. separate structures for academic and administrative computing), how to provide access and encourage use of computing resources among faculty, and how to obtain better funding for the operation.

Key conclusions to the ensuing discussions included the need for campus computing leaders to enhance their knowledge of how to manage technology effectively and incorporate it into the strategic mission of their institutions, the need for these leaders to gain better knowledge of how their institutions operate, and the need to understand, and relate to other campus administrators, that the role of computing centers is changing from one of data processing to one of providing information services. Emphasis on any review of campus computing resources should focus not on their cost, but rather on their value as an asset to the institution. In this regard, the requirement for a CIO at small institutions was discussed. Whether or not such a title exists, the need to manage information resources and their strategic value to the institution was principal among the conclusions reached.

User Services

Convenor: Penny Peticolas, Oakland Community College

The Constituent Group Meeting for User Services consisted principally of presentations by three members who discussed the challenges and successes they had during the past year.

Penny Peticolas of Oakland Community College described the growth in microcomputing from 230 discipine-lab-centered micros to 525 micros throughout the college. Claire Gorman of Tufts University explained hcw reorganization of their services had permitted them to serve more users without increasing staff. Carol Bratton of Southwestern Baptist Theological Seminary detailed the particular challenges of meeting special research needs of graduate students and also described the equipment maintenance fund which provides for maintenance and partial replacement of microcomputer hardware.

Following each presentation there was an exchange of questions and answers between the audience and the presenters. A follow-up session was held later in the week for those who wanted to discuss problems and solutions in more depth.

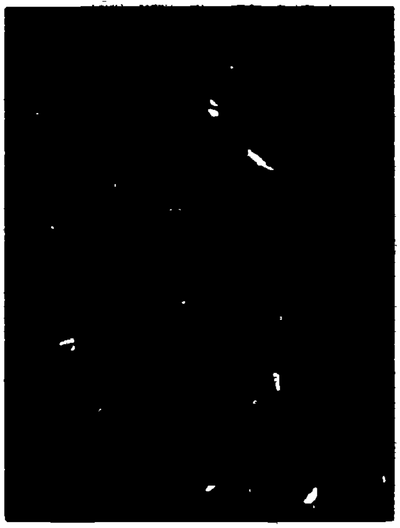
"Writing for *CAUSE/EFFECT*"

This hour-long seminar, hosted by the CAUSE Editorial Committee for all interested CAUSE89 conferees, offered guidelines on writing for *the association magazine, CAUSE/EFFECT*, as well as advice on writing for a variety of purposes, from intracampus reports, plans, and proposals to formal publication in magazines and journals.

Three speakers—CAUSE Director of Publications and Editor Julia Rudy, and the chairs of the 1989 and 90 Editorial Committees, Gerald McLaughlin and Mark Perkins—discussed structural aspects of publishing and style, described the personal benefits of writing (to help form ideas, attract others of similar interests, invite input from peers), and listed the types of information and topics that are valuable to readers in our profession.

The heart of the session, attended by more than 50 people, was a talk on "Writing Beyond the Memo: Ten Commandments" offered by guest speaker Carolyn J. Mullins, Director of Communications at RightSoft, Inc. Pointing out that the average professional spends two-thirds of every workday writing, she shared ideas on how to make that writing as easy and effective as possible. She stressed the importance of understanding the needs and interests of the intended audience, and suggested such tips as copying existing text when you can, working with a partner, choosing small, simple, colorful words, and using the "ear" test to judge the final product. Mullins has written nine books and dozens of magazine articles, one of which earned her the 1983 *CAUSE/EFFECT* Contributor of the Year Award.

Immediately following this seminar was a reception for seminar participants and authors of articles published in the 1989 volume of *CAUSE/EFFECT* magazine.



Carolyn Mullins, RightSoft, Inc.

Gerry McLaughlin, Virginia Tech

November 29–December 1 SAN DIEGO

CAUSE89

Track I
Planning and Strategy Issues

Coordinator.
Jack Tinsley
Florida Community College at Jacksonville

Issues related to planning and strategies for information resource management remain important as the decade comes to a close; many institutions have initiated or are considering undertaking long-range planning efforts. Presentations in this track included: effectiveness of various planning methodologies; importance of executive support and the involvement of a wide variety of constituencies in information technology planning; planning in the culture of higher education; information technology planning as a part of institutional planning; how technology contributes to the planning process itself; and ways information technology can be used for strategic competitive advantage in the higher education marketplace.

Chandler Whitelaw
Southern Utah State College

Strategic Information Planning in a Higher Educational Institute

Doug Dunwoody
Sheila Newel
Terry Smith

Southern Alberta Institute of Technology
Calgary
Alberta

The Southern Alberta Institute of Technology has completed the development of a Strategic Information Plan. This plan will enable SAIT to manage its corporate data as a resource by providing a stable foundation of computerized data that supports the ever changing information needs of the Institute. The computer applications developed as a result of this planning effort will address the information needs at all levels of the organization, from the day to day operational needs through the information needs of senior management. This paper will review the methodology and planning process that was utilized in developing the plan.

Introduction - Why Do a Plan?

Highly sophisticated computer systems are being used to manage information, but their use is often scattered and redundant; they grew out of previous record keeping systems designed for individual departments in an organization. But, rather than addressing the application needs of individual user departments, the focus of information systems should be on corporate data needs shared across the organization. The development and implementation of a strategic information plan will help educational institute administrators make the transition into the information age and meet the challenge facing their organizations: to be distinctively better than the competition.

Few organizations have a more complex structure than educational institutes. Within that complex structure, the number of individuals requiring access to accurate, timely information is growing as more faculty and staff discover the value of computer systems. The number of student clients is also increasing and expanding with the educational trend toward retraining, second or third careers, personal education opportunities through continuing education, and industry emphasis on computer use. The result: the number of requests for accurate information and the number of requests for computer support services received by Information Systems Departments within educational organizations is growing. There may be some additional concern that the objectives and priorities for these requests received by Information Systems may not be the same as objectives and priorities of the Institute. We need to ensure that the objectives of Information Systems Departments are helping the organization meet its objectives.

Some sectors of the institute purchase computer systems independently based on their unique needs -- systems that meet section or department requirements, but do not necessarily satisfy corporate needs. The repercussion is corporate decision making based on data that comes from systems <u>not</u> designed to provide corporate data. Because those long term implications are so important to the health of an organization, executive computer support systems designed for use by upper management have become essential tools for measuring the organization's pulse and keeping the organization moving toward the future. Immediate and effective information management is crucial to educational administrators if they are to accurately forecast student enrollment requirements, project revenue requirements, and assess material and human resources needs. The Southern

Alberta Institute of Technology has developed a Strategic Information Plan that will help them do just that.

SAIT Background

SAIT is a post-secondary institute that offers up-to-date, career related training in a rapidly changing environment. It serves career training needs on campus (in Calgary, Alberta), on company or business premises (local or overseas), on satellite campuses, or by long distance. Instruction can be traditional (in the classroom with or without the aid of computers) or non-traditional (individual telephone tutoring or written correspondence and group instruction by conference call). Instruction is delivered in the daytime, in the evening and on weekends.

SAIT has approximately 646 full time instructors and 760 support staff for a total of 1406 FTE staff members. SAIT also has approximately 300 part time instructors teaching in the Continuing Education program. There are 10,683 students enrolled in SAIT's traditional programs and 41,881 Continuing Education students.

SAIT has several DEC Vax computers, 4 - 785's, 1-8650, 1-8700, 18 - Vax 3100's and 1 - Micro Vax II. We have an Ethernet based campus network linking terminals, MacIntoshes, IBM PC's and workstations to our central resources. We are running VMS, Unix (Ultrix) and Oracle on several platforms in a distributed client/server type configuration.

Strategic Information Plan Objectives

Information Systems provides service to three client groups-- those whose business functions are strategical, tactical, or operational -- who need to have easy access to various types of information to manage

- the instructional process,
- financial resources,
- human resources,
- student enrollment,
- material, facilities and space.

The best way to meet strategic, tactical, and operational needs is to implement a Strategic Information Plan that will allow the sharing of corporate data among systems through a network of terminals, workstations and personal computers on and off campus. There must be a clear understanding of corporate data and corporate systems, with consistent definitions throughout the organization.

The Strategic Information Plan that will meet these objectives must provide stable, well defined corporate data, yet be flexible enough to meet clients' needs while not infringing upon their sense of information ownership.

The objectives of the plan are:
- integrated corporate computer applications
- subject databases where data redundancy is reduced
- consistent definitions throughout the organization
- single official source of information
- effective use of end user tools

Some Benefits of Implementing a Strategic Information Plan

The use of computerized information will directly support SAIT's business (people and resource management) and academic (quality of instruction) needs in these ways:

1. Time spent determining and implementing company strategies will be reduced because implementation of a strategic information plan, will allow senior administrators and managers at SAIT to access
   - o institute & personnel performance data,
   - o financial data for forecasting,
   - o information on materials, space and facilities use and availability,
   - o curriculum details to avoid repetition across academic departments and to ensure that learning objectives are consistent.

2. Corporate data will be available to meet the random inquiries for information from outside sources and to support executive decision making.

3. Understanding of SAIT's business functions will be increased because, during the process of designing and building a Strategic Information Plan, the organization's business functions are clearly defined, a process that results in improved understanding of the role, responsibilities, and resources involved in each function and how it contributes to the organization's mission.

4. Analyzing the efficiency and effectiveness of instruction will be possible. Students' progress through the institute and their successes or failures could be tracked in relation to
   - o previous training and experience,
   - o program changes,

- o courses taken,
- o type and style of instruction received,
- o participation in learning.

What managers and instructors discover about student learning could be used to encourage successful patterns in the learning environment and to eliminate unsuccessful patterns.

5. Creating and maintaining records will become much less time consuming. Currently, academic staff spend a good deal of time on clerical and administrative duties. After the implementation of a strategic information plan, time spent on non-instructional tasks can be redirected, increasing the amount of time an instructor can spend preparing or delivering instruction. The more instructional interaction students have with instructors, the greater the opportunity for students to be successful learners and the greater the opportunity for instructors to be successful learning managers.

What approach should be taken?

Few organizational design projects can begin before the organization and its individual departments have clearly defined their mission, goals and objectives. A SAIT-wide strategic planning session and renewal conducted in 1985 ensured that SAIT's mission,

> to be an innovative organization equipping people to compete successfully in a changing world of work by providing relevant, skill-oriented education,

was clear.

Some of the conceptualizing of a workable strategic information plan occurred during Information Systems personnel and SAIT Administration's discussions of business functions. Representatives from each division on campus were questioned about

- o what business functions they perform,
- o what information data they need or would like to access, and
- o what kinds of computer systems they were currently using

Information Systems personnel then drafted a document that seemed well suited to their clients' business function needs. Two key products were the BUSINESS MODELS and the DATA MODELS. These models were validated and revised through a series of interviews and presentations. The next step was to look at the existing computer systems. These existing systems were rated from 1 (low or poor) to 5 (high or excellent) based on 11 criteria.

The technology available when most of SAIT's current computer applications (third generation language tools) were developed did not easily lend itself to integrated applications or data sharing. Currently, SAIT computer business applications are a mixture of custom developed software and purchased software run on a large mainframe system, mini-computers, or on personal computers. Over time, as individual user computer system needs were fulfilled, the amount of duplicate data being created and stored was inadvertently increased.

The resultant problem was inconsistent and redundant corporate data. For example:

- course data is stored in 6 or more systems,
- student data, some as simple as student numbers, is stored in as many as 8 systems,
- employee/instructor data is stored in as many as 13 systems,

and so on. The result is costly. Manpower is wasted, time is lost, and information retrieved is contradictory. For instance, the questions "How many students are registered at SAIT?" or even "How many instructors are employed by SAIT?" could be answered several ways, depending on the person asked, the storage systems used, and the need for the information. In some cases, the answers to questions posed by senior executives are either not obtainable or cumbersome to obtain.

A further problem surfaced with expanded use of personal computers: faculty and staff wanted to use PC based tools to massage and manipulate data that currently resides in the mainframe. This led to more data entry and more data duplication.

After operational information needs, current systems, and system problems were analyzed, the validity of the strategic information plan was assured in the minds of SAIT Information Systems personnel. The design phase outlining the evolution of an integrated computer environment was completed, culminating with the future goal of a system in which

- all data that needs to be shared would be centralized on the mainframe computers (possibly distributed and client/server based using Vax computers and Oracle Relational DBMS),
- transfer of information between PC based systems, powerful workstations and VAX mainframe based systems would be possible,
- new system development would be compatible with existing computer technology,

- o summary information would be timely, accurate, and easy to retrieve, and
- o ad hoc reporting would be accomplished by end-users creating their own customized reports or on line queries.

Implementing the Strategic Information Plan

It would be a Chief Executive Officer or Information System Director's dream come true to be able to implement the perfect strategic information plan in one fell swoop; needless to say this is not a realistic hope in the educational world of budget restraint and inconsistent use and application of computers across campus. Therefore, a logical accomplishment of the plan had to be devised. The Information Systems team decided that, theoretically, computer applications that create data should be implemented before applications that use data. Consequently, they decided to set these implementation priorities:

1. Financial Resources System
2. Human Resources System
3. Facility Management System
4. Materials Management System
5. Educational Resources (Library) System
6. Student Information System
7. Alumni Donor System

Changes in the recommended order could result in additional costs because temporary interfaces between the old and new applications would have to be developed. As these old applications are replaced by new systems, the temporary interfaces would be thrown out resulting in a waste of time, effort, and money. Naturally, though, should senior management priorities require that the order be changed (for instance, should the creation of an Alumni Donor System lead to increased funds for the institute in general, and for further strategic information plan development, in particular) modifications will be made. Through a Computer Advisory Committee with representatives from several departments, a review of the order of implementation was done and matched with a "Business Priority Order". This order will vary from institution to institution, but in our case, the Alumni Donor System was moved to the top because of the potential return in investment.

Whenever possible, appropriate software packages compatible with SAIT's management strategy will be purchased. If there are no suitable software packages available for purchase, computer applications will be custom developed.

From inception to completion, implementation of this integrated computer system would vary depending upon availability of

- o financial resources,
- o human resources (end users and systems people), and
- o computer resources.

Any completion deadline Information Systems sets will allow for a phase-in strategy which would increase access to data as each system becomes operational. The data will be implemented in a building block approach with shareable subject databases. It will also incorporate a training schedule that will ensure appropriate use, understanding, and acceptance of an integrated system.

As users learn to access information through a new integrated system, the role of Information System Departments will change from being a central unit responsible for

- o the designing, developing, and maintaining of all systems,
- o the retrieving of information and generating of reports for end users.

to an administrative unit whose role is now to help end users do those tasks themselves more efficiently on an ad hoc basis. Users will have something more important than access to information; they will have access to the right information at the right time.

The Corporate Bottom Line

The estimated cost to SAIT for purchasing software packages, upgrading central computer hardware, and enhancing user workstations to implement the strategic information plan is approximately $3,000,000, excluding manpower and depending on the order of implementation. The expected time frame is 5 to 6 years depending upon funding and staffing resources.

The cost of not implementing the plan is greater: old systems will eventually have to be replaced by new systems for a similar dollar figure, but, for anyone working above the operational level within the organization, frustration with the inability to access timely, consistent, and accurate information for forecasting will not have been eliminated. Information requests critical to business planning will continue to go unanswered while time is spent compiling data from different sources. Operating inefficiencies as a result of duplication will continue and possibly increase when old systems are replaced piecemeal

Ultimately, implementing a strategic information plan like this one is no more expensive than meeting maintenance and upgrading needs over time, but the bulk of the expense occurs up front. As is often the case, it doesn't really cost any more to do it the right way than it does to implement short term solutions that will not meet long term needs and that will have to be replaced eventually.

The Future -- Implementation Challenges

Major challenges for Information Systems personnel will be

1. to secure and to sustain campus wide commitment to the plan,
2. to overcome the natural resistance to change
3. to implement a long term solution in the form of an information strategic plan while still meeting short term needs, and
4. to obtain the funding to implement long term solutions.

Users would also need to recognize the value of an open approach to corporate data. For instance, in an educational institute those users who determine a student's grade (instructors), could record that grade directly into the system rather than filling out a paper report which is sent to a secretary who photocopies the record and passes it on to the registrar's office where it is changed from the paper report into an on-line record when it is keyed into the system.

The value of an open system will not be recognized until users are convinced that

- o the integrity of data will not be contaminated as a result of direct input,
- o that security of private information will be maintained, and that
- o the way people do their jobs will change, but not their purpose -- providing, either directly or indirectly through support, relevant, skill-oriented education.

For most educational and training organizations, the cost of implementing a strategic information plan is prohibitive, so the challenges relating to funding and finding long term solutions can be met only through an innovative and progressive approach. One that

- o keeps the changes to existing systems to a minimum,
- o appropriately uses interim support systems,
- o establishes optimal user cooperation, and
- o maintains the kind of high standards expressed in

SAIT's Information Systems' mission statement.

The need for innovative and progressive approaches to solving educational funding problems raises interesting questions for administrators: Could inter-institutional cooperation reduce the cost of implementing an advanced and valuable Strategic Information Plan? Are governments prepared to fund systems that will provide better reporting and institutional support systems? Would colleges and post secondary institutes share expenses while exchanging skills and expertise? Is there an international market for successful Strategic Information Plans? Once organizations begin to discuss their common problems and common needs, they will be able to answer these questions and discover new ways to meet funding challenges.

Conclusions

Many attempts have been made to resolve the problem of providing accurate, pertinent, and immediate information to the senior managers of post-secondary institutes. Needs have been analyzed and systems designed in an attempt to meet those needs. Information systems' personnel have attempted to store data in a building block fashion, adding to previously developed discreet systems, adapting them, or creating new systems as each new type of data or request became apparent. But data that is not integrated, data that is stored in different ways, never will be universally reliable.

Senior executive information needs' change from day to day and the only strategy that can meet changing and sometimes undefined executive needs is the establishment of a corporate data base supported by a responsive system that will process that data. The system that will effectively resolve business management problems has to be based on a business model: a Strategic Information Plan like the one described here. Organizations must use sophisticated information gathering systems as part of their corporate decision making or they will be inadequately prepared to meet the future. The challenge that faces far seeing educational administrators who implement a strategic information plan is overcoming resistance to change. The challenge for educational administrators who choose not to implement integrated corporate data systems will be to keep up with those who do.

TRANSFORMATION: INFORMATION TECHNOLOGY AND THE COMMUNITY COLLEGE

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ABSTRACT

This paper covers the background, planning, implementation and current challenges facing Oakland Community College (OCC) as it transforms its operations through information technology.

The 1986 starting point reflected benign neglect of information technology: low capital spending, obsolete technology, little involvement in college decision-making, no recent systems development, minimal workstation deployment, and no user services function.

New top administration, combined with vision and planning, transformed Information and Telecommunication Systems (ITS) into an integral part of the college environment.

Significant challenges remain. Tight budgets and conflicting priorities have curbed spending. Rapid changes in the college's orientation require that the added value of I/S initiatives be defined. Most importantly, ITS continues to pursue meaningful and predictable involvement in college-wide strategic planning.

Overview of the Oakland Community College District

Oakland Community College is a multi-campus two-year institution of higher education located in Oakland County, Michigan, one of three counties comprising the greater Detroit metropolitan area. The College provides a comprehensive program to meet the diverse and changing needs of the citizens of a district with a population of more than one million. OCC serves 29,000 students at five campus sites and ten extension centers. It is one of the ten largest multi-campus community colleges in the country, and the fifth largest provider of undergraduate education in the State of Michigan.

Oakland County covers an area of approximately 900 square miles; its assessed valuation is over $16 billion. The Oakland Community College District is identical with the Oakland Intermediate School District and generally coterminous with the county boundary.

OCC's five campuses are located throughout the county in Auburn Hills, Farmington Hills, Union Lake, Royal Oak and Southfield. The administrative center is located in Bloomfield Hills, and an additional site is maintained in Pontiac.

The Office of Information and Telecommunication Systems is responsible for administrative computing, academic computing and communications for the College District. Formed in December 1986, this office provides information system services including operating the computer center, supporting business systems, instruction and instructional support, voice, data and video communications, personal computing, and office systems.

The Challenge

Though once enjoying a position of national leadership in the field of information systems, the College had fallen behind in those endeavors. By the mid '70's, the computer center had become a maintenance organization. Essentially it had served two major users, the registrar's office and the data processing instructional program, though payroll, financial aid and some accounting functions were supported as batch operations.

The information technology arena could be characterized as suffering from benign neglect. Organization size remained static and there was little capital investment in technology for nearly ten years. When such investment was made, it was always the "cheapest" (in terms of capital) rather than the best solution. As a result, the College became saddled with inadequate hardware, software and services.

The staff was entrenched in a maintenance posture with few opportunities for professional growth. Furthermore, staffing was inadequate to carry out new initiatives. Reasons for this situation are complex, but probably rest with leadership, interest levels and understanding of technology. The CEO of the institution was a "bottom line" former industry executive; the computer center director wore two hats, as a faculty member in the data processing curriculum and as manager of the computer center.

Strategies, Tactics and Planning

Late in 1985, a new CEO arrived at OCC. Recognizing the state of affairs and committed to the use of technology, Chancellor R. Stephen Nicholson initiated a review of the OCC information systems environment. To accomplish the review he chose the IBM Application Transfer Study (ATS) approach, and called for the convening of an ATS team in October 1986.

The Application Transfer Study process is a free consultative service offered by IBM to its clients. An IBM specialist acts as facilitator for a team of customer participants. Through a system of questionnaires and interviews, the ATS team identified seventeen root problems in the information systems environment. To address these root problems, it made eleven strategic recommendations.* The College has used this study as the blueprint for its information systems strategy.

OCC APPLICATION TRANSFER STUDY RECOMMENDATIONS

1. Develop and Adopt Board Policy
2. Establish User Advisory Council
3. Disseminate Information
4. Provide Tools for Users
5. Acquire Additional Workstations
6. Install Comprehensive Telecom System
7. Upgrade Central Site Computing
8. Upgrade System Software
9. Establish Computer Services Institute
10. Enhance Computer Center Staff and Improve Application Systems
11. Provide Relational Data Bases

Although the team devoted most of its time to discovering problems and developing recommendations, it also suggested a nple implementation schedule. This provided the basis for estimating the cost of the initiative, calculated at approximately $13.9 million over five years. That amount did not, however, include telecommunications.

Coincident with forming the Application Transfer Study team, a new chief information officer was hired in December 1986. Faced with the a forementioned problems, and given the responsibility for computing and communication technologies for the College district, the new vice president began forming plans based on the Application Transfer Study.

The results of the ATS were presented to the Board of Trustees in March, 1987. Although specific funding was not requested at that time, the Board lodged, and subsequently passed, a policy endorsing improved information technology at the College in direct response to the ATS recommendations:

BOARD POLICY

"In order to maximize its resources, Oakland Community College is committed to the development and maintenance of an information and telecommunications system which is at the leading edge of available technology and which serves as a participating partner in all operations of the College.

Such a system will provide accessible data bases and easily available interactive capacities which will effectively expand the capabilities of the staff and significantly enhance educational services and offerings to the community."

* Copies of the OCC ATS report are available from CAUSE.

A new organizational structure for information technology was proposed and approved by the College's top oversight committee, the Chancellor's Council. Known as Information and Telecommunication Systems (ITS), the new organization reflected the ATS recommendations and was comprised as follows:

ITS ORGANIZATION

Vice President--ITS

+------------------+--------------------+

Director User Services	Director Computer Services	Director Communications

This structure provided for support of end-user computing and recognized the need for strong network planning and management. An advisory Structure for ITS management was devised as well, which featured Information Technology Advisory Groups (ITAGs) at each of the campuses and two college-wide groups --- one for Instruction and one for Administration. Composition of the college-wide groups drew from the campus groups as well as including at-large representatives.

Thus, strategies or recommendations, endorsements of improved technology, an organization and an advisory structure were in place. OCC then began to undertake the task of tactical planning based on the guidelines of the ATS.

<u>Hardware, System Software</u>

Many of the ATS findings represented needs in the infrastructure, i.e., the very foundation of information technology. We therefore started our process by addressing hardware and software, which were old, unsupported and lacking sufficient capacity.

The first step in rebuilding the College infrastructure was the replacement of the College's two 4341 processors. By combining processing needs and planning to support our campus-based Computer Integrated Manufacturing lab with T-1 communications lines, and with the benefit of IBM price incentives, we selected IBM's 3090 Model 120-E as our platform. Following Board of Trustees approval in September, the 3090 was installed in November, 1987. OCC was the second community college in the country to install a 3090 processor, and the $1.9 million technology initiative was the largest non-construction proposal passed by an OCC Board.

The system software operating on the 4341 included IBM's OS/VS1, DATACOM/DC telecommunications monitor and ISAM database. Our system software objective was to insure that the College operated with supported IBM software maintained at current levels. We installed CICS and VSAM as part of the 3090 upgrade, managing a major software conversion while planning for the hardware cutover. We chose to first install extensions to the OS/VS1 operating system, and then migrate to MVS following the 3090 installation; MVS became a production operating system in October 1988. The VM environment, the most modern of the system software in place at the start of the initiative, has been continually maintained; we are now testing VM/XA SP2 as part of our future migration activities.

OCC has had a major Computer Integrated Manufacturing (CIM) partnership with IBM, Cross and Trecker, Kennametal, and other corporations since 1985. The OCC project was the model upon which IBM's "CIM in Higher Education" program was based. The

Auburn Hills CIM lab has 12 IBM 5080 3-D graphics terminals connected by T-1 circuits to our central site and a lab of IBM Model 50Z microcomputers. Software includes CADAM, CATIA, MICROCAD, and SLAM/II.

Software costs continue to be a major problem facing higher education. OCC therefore became one of the first participants in IBM's Higher Education Software Consortium, an arrangement that provides access to a wide range of VM software products for a fixed annual fee. As a result of the HESC program, OCC faculty members are now evaluating such VM products as PASCAL, C, SQL/DS and Expert Systems.

Applications

Once the infrastructure was in place, we focused on a small number of application development projects that demonstrated the added value possible with the new system. While most projects were indicated by the ATS study, we selected those that would not be adversely affected by implementation of new integrated administrative software for the College.

Touch*Tone Registration

OCC was a pioneer in online registration systems, implementing its first version in 1967. The registration and records system is our oldest and most robust administrative application, and the registration process itself had not changed substantially for a number of years. We viewed Toucn*Tone registration as an opportunity for the College to provide an innovative student service to a changing student community at a relatively low cost.

We began our Touch*Tone research by commissioning a CAUSE survey of large colleges and universities which indentified 50 institutions that had implemented such systems. From the survey we established a field of six vendors who responded to a detailed RFP.* A college-wide task force evaluated the proposals and selected Computer Communications Specialists (CCS) as the hardware and software provider.

The strengths of the CCS offering included an excellent C-based development environment, the ability to locally record and modify text and IBM 3174 emulation. To our host system, the PC-AT based CCS equipment appears as a remote cluster of CICS terminals; no host programs are used to translate Touch*Tone registration requests.

OCC contracted CCS to assist with the development of the initial Touch*Tone registration script. This speeded implementation while providing valuable training for OCC staff. Comprehensive information messages and registration system interfaces were designed by a college-wide team. Students can obtain information on admissions, financial aid and other services; they are able to register for courses, drop, add, search for open course sections and check their fees and schedules.

A randomly selected group of 5,000 students was asked to participate in the system pilot during Fall Term, 1988. The results of the pilot were overwhelmingly positive, with 98% of the students indicating that they would register via Touch*Tone in the future. Touch*Tone registration was offered to the full student community during the 1989 winter term. The service is available from 7 a.m. - 10 p.m., Monday through Friday and

* Copies of the OCC Touch*Tone RFP are available from CAUSE.

8 a.m. - 2 p.m. on Saturday. By the summer term, 50% of the College's early registrants were using Touch*Tone, as opposed to mail-in registration. Mail-in registration has been eliminated for the winter term, 1990.

ITS is presently developing an extension to the Touch*Tone registration system that enables students to pay tuition and fees by credit card. Students will enter credit card numbers and confirming data to store credit card payment information. Credit card transactions are passed to a Visa processor after the close of business and prior to nightly tuition batch processing. Approved credit card payments are then applied to the student's account, and rejected transactions result in a letter to the student.

Touch*Tone registration has been a great success with OCC students (despite a "soft sell" approach), and we anticipate a similar response to credit card payment. Aside from convenience and service for the student, Touch*Tone registration and credit card payment will reduce demands on College staff, diminish dependence on cashiering technology and provide the basis for additional financial services in the future.

Faculty Pay

A second high-visibility/application project addressed enhancements to the faculty pay system of the College. OCC possesses a complicated faculty load system which was managed in the past by turnaround of paper documents. OCC staff designed and implemented online entry screens to input assignments, stipend and department chair information. Online displays enable deans to view teaching schedules and load information on the screen. Load documents are now produced with a number of edits and error checks which alert deans to potential problems. As a result of these enhancements, the percentage of load documents needing manual processing has dropped from approximately 35% to less than 5%.

Electronic Mail

With Touch*Tone registration services provided for students, and improvements to the faculty pay system provided for the faculty and deans, the rest of the College community needed high visibility applications. Electronic mail and a library circulation system were the vehicles for ITS to help connect OCC's multiple campus communities and sites.

A college-wide task force evaluated five electronic mail systems in the spring of 1988. Vendors responded to a comprehensive RFP, made on-site presentations and worked with ITS staff to install all five systems on the College 3090 processor for a true side-by-side evaluation by task force members. In May 1988 the task force recommended IBM's PROFS as OCC's electronic mail system.

Chancellor Nicholson recognized the importance of electronic mail to his leadership team of approximately 45 administrators at seven sites. It was decided that PROFS would be initially implemented among administrators and their principal support staff. Equipment was acquired to insure that each administrator and principal support staff person had a networked workstation on his or her desk.

BITNET

At the same time, OCC became the third community college in the country to become a member of BITNET. We decided to develop a seamless interface between PROFS and BITNET as part of our electronic mail product. We also addressed a number of known shortcomings in the PROFS product, including centralized distribution lists, multiple note log management, disk space warnings, bulletin boards and a staff directory. All OCC enhancements were designed to incorporate the "look and feel" of PROFS. A comprehensive user guide was developed to accompany the product.* PROFS was implemented in November 1988 with 90 users. After one year, there are now over 350 OCC PROFS users.

Building from its initial BITNET link with Wayne State University, OCC has established leased lines with neighboring Macomb Community College and the Oakland Intermediate School District, which provides electronic mail and administrative services to most public school districts in Oakland County. These links provide OCC with the unique opportunity to develop information technology applications with K-12 districts, sister community colleges and four-year institutions in the Southeast Michigan area. OCC is already using an IMS of placement application running on the Oakland Schools mainframe.

Libraries

The OCC libraries, known as Learning Resource Centers (LRC's), fell victim to the same lack of interest and investment that had befallen information system. After a task force reviewed alternatives, OCC decided to join a library consortium, Detroit Area Library Network (DALNET) operated by Wayne State University with NOTIS as the software product. ITS is supporting the technology and networking part of the effort. While most DALNET users have established an independent point-to-point network to support NOTIS, OCC has chosen to connect WSU's and OCC's front-end processors. This enables any terminal on the OCC data network to access DALNET using a full-screen session manager. Users need not know that NOTIS is operating on another institution's mainframe.

Data Network

The first stage of infrastructure building involved the mainframe computing system. The second stage involved replacement of the aging Dimension telephone system with a more modern telecommunication system. Prior to this activity, however, some networking basics had to be addressed.

ITS management decided that it was in the best long-term interest of the College to defer any large expansion of the College data network until after the new telecommunication system cutover. We did, however, decide that any network expansion would consist of VTAM communications and intelligent workstations. We therefore converted the College data network from BTAM to VTAM in several phases, the last of which has only recently been completed. The PROFS initiative provided the opportunity to implement SDLC connectivity over twisted pair media, and the DALNET project enabled us to use interactive applications on remote mainframes.

We also faced the challenge of "buying time" with the communication technologies already in place. Three different technologies were employed, firmware and software were obsolete and inconsistent, wiring was substandard and capacities were exceeded. Furthermore, movement of the data center several years before had left network topologies in disarray. To further complicate matters the obsolete network provided users the opportunity to intervene in network operation and occasionally cause full network failure.

* Copies of the OCC PROFS Guide are available from CAUSE.

The network was upgraded through the purchase of additional equipment, firmware and software upgrades, telephone line conditioning, network reconfiguration, and the VTAM implementation. The last step in the short-term data network activities was adoption of SIM/GCS as the College session manager and 3270 emulation product. Today each workstation in the College now displays the same multi-session menu.

Telecommunications

The problem of the aging and inadequate Dimension voice communication system was addressed in mid-1988. Informal discussions and proposals quickly led to the conclusion that a county-wide Digital Centrex solution provided by our local telco was the most cost effective solution for the College. The savings generated in line costs and, most especially in leased line data circuits, coupled with release of space and a single source vendor interface were the significant reasons for the choice.

In February 1989 the Board approved a proposal for installation of Digital Centrex. The savings generated provided the opportunity to include voice mail, automated attendant, station message detail recording and in-house moves and changes. In addition, our sites are being rewired with shielded twisted pair wiring to accommodate voice and data, as well as jacks for video.

Our data network will migrate to Datapath services, providing significant improvements in speed. Likewise, the price of the Datapath service makes growth possible without inordinate cost increases. The choice of Digital Centrex permits an easy migration to ISDN when feasible. The flash cutover of nearly 1000 stations will take place in February 1990.

Personal Productivity and Laboratory Enhancements

Many of the infrastructure initiatives revolved around central-site hardware and software. Coincident with those activities, we worked to improve the penetration of micro computers at the College. Three separate major proposals amounting to more than $1 million have been approved by the Board. The majority of these initiatives have involved improvements in vocational/technical discipline areas.

Prior to 1987 our only student laboratories were in vocational/technical areas. For this reason we began improvements here. This permitted the College to take advantage of Perkins Act matching funds and to redistribute older technology into support areas where no technology had previously existed. This "trickle-down" approach is employed whenever possible in order to make the greatest penetration.

During this period ITS also established software standards of WordPerfect and Quattro, and installed those packages and a standard menu on nearly 100 machines. For dial-up users, ProComm was selected and installed. Pell-link and SNAP-II software was provided for Financial Aid.

Again in response to ATS recommendations, considerable training in all standard packages and PROFS has been conducted or coordinated using both user computing consultants and faculty. Faculty training in courseware development tools was coordinated with an outside consultant.

Support Services

The ATS called for increased distribution of information and help for users. A newsletter approach was chosen as one vehicle for spreading the word. Named by a faculty member in a college wide competition, TIDBITS (Timely Information Dispensed By Information and Telecommunication Systems) is now published quarterly.

ITS is in the process of releasing its first user guide to information technology at OCC. This publication provides users with a "how to" approach to using our varied technology services. In addition to the user guide, we are developing a document listing all production reports received by each administrator. This document will provide users with an overview of the types of reports available upon request.

Designed to improve responsiveness to information technology problems and questions, a Help Desk, instituted in 1988, currently responds to nearly 800 calls per month. Help Desk calls are screened for urgency and assigned and tracked to completion. A standard request form for services is also tracked by an online application; ITS processes over 1,200 work requests each year.

Selection of a college vendor for microcomputer maintenance and repair has improved service while reducing costs. Users call the Help Desk with a repair request, and the Help Desk then dispatches the service to the site. Billing is coordinated by ITS.

As penetration of personal computers progressed, a campus rotation schedule for user computing consultants was instituted. The scheduled rotation times are published to users who may request "hands on" help by placing a call to the Help Desk.

Personal purchase discounts have been arranged with IBM, Apple and Zenith. Numerous license site agreements have also been arranged for personal computer software.

In 1988, The League for Innovation in the Community College and IBM sponsored a "Competition for Excellence." We encouraged our faculty to submit proposals and helped edit and finalize the forms. As a result, OCC had more entries than any other community college, and two winners.

Where We Are

Until 1988, ITS had relied heavily on the recommendations of the ATS and internal annual tactical planning to build the infrastructure and support services previously mentioned. The ATS had identified the lack of comprehensive information systems planning as one of the key root problems. ITS believed that information systems planning had to be an integral part of college-wide strategic planning. However, since the college-wide activity had not begun, we engaged in an internal planning process that would eventually become incorporated into the college-wide plan.

Early in 1989, the College began its overall strategic planning process. Because of the centrality of the academic mission to the institution, the first phase was preparation of an Academic Master Plan through the goals stage only. Administrative units have just responded to the Academic Master Plan, with ITS being responsible for developing college-wide information technology plans. Early in 1990 the combined academic and administrative plans will be turned into strategies for the College to follow over the next five years.

Our internal planning and the ATS have served us well. We found little conflict with earlier planning efforts once the Academic Master Plan was released. Our earlier activity readily fit into the administrative planning effort and, in fact, made our work easier.

Both our day-to-day involvements and our long-term objectives require considerable expenditures. The College was recently blessed with a one-time lump acquisition of capital, but shrinking state funding will continue to put pressure on operating revenues. Thus human resources and all recurring funding items are left shortchanged.

The College has now been in existence for 25 years. Bricks and mortar are deteriorating; all units of the College have less than adequate support staff; the College Faculty Master Agreement and corresponding pay and overload requirements seem to require all new recurring dollars. Information technology improvements thus compete for scarce resources. To this point we have been fortunate in putting forth adequate plans so that our initiatives have been supported. But the future promises no resources for which to compete, unless alternate sources of funds are identified.

What Have We Learned?

- Progress in the implementation of technology is far easier without the "excess baggage" of the past practice--in other words, if there is less penetration of technology the opportunity for change and transformation are easier. Conversely, the process of educating unsophisticated users is time-consuming and difficult.

- The absence of a sophisticated and integrated institutional planning process has not necessarily hampered our activities. An advocacy plan works, at least for a while. In the case of OCC, the Application Transfer Study served that purpose.

- Some of our initiatives might have been easier if we had known our climate and culture better. From the lay Board of Trustees to the custodian, the College has long held a "small" view of itself. Although the current administration understands the fallacy of that perspective, dealing with the autonomous processes at seven sites in the application of technology was a staggering problem. In our efforts to provide service we often suffer from a misconception on the part of users that we are seeking power.

- Without appropriate leadership in information technology our efforts would have failed. Although hampered by lack of support staff, the overriding vision and experience of the ITS management team is essential. Filling the leadership positions first has proved to be an overwhelmingly successful strategy.

- The combination of in-house and outside experience can make up for lack of staff size and depth. OCC has made judicious use of consultants, but finding the right group is key. Once identified, consultants can provide services in many areas—performing in-house technical training, working side by side with staff, analyzing specific problem areas and conducting mini-needs assessments.

- As noted earlier, ITS established a system of advisory councils. While this process works for ITS-related business, the integration of technology into other college functions required a different approach. Effective this year, ITS administrators now sit on all major college councils: administrative services, student services, academic services and research. Thus ITS is apprised and involved at early stages of activities in other areas that may require technology.

What Do We Face?

- System and network integration, and managing the technology behind this integration, loom as our biggest challenges. "Islands of technology" still exist, though they are not as pervasive as in more mature institutions.
- Given the dispersal of our campus sites, the network must provide the conduits that bring technology to classrooms, desktops, libraries and support service areas. We believe our digital Centrex decision is a sound one. The ability to migrate to Integrated Services Digital Network (ISDN) is particularly appealing since incremental costs will not be as great as if another solution had been chosen.
- Integrated information systems, currently being proposed, will bring technological improvements to the management of the College. These systems will bring to the OCC administration a common base of information to operate the College. These systems may also induce significant and positive organizational change.
- The OCC faculty has been slow to adopt technological approaches in the classroom. Faculty members are even more reticent in the area of courseware development. We have concluded that we must provide some incentives to faculty in order to achieve a greater infusion of technology into the instructional process, e.g., personal computing capability, release time for curricula development, readily available consultation and training on instructional technology issues. We must also guarantee and demonstrate that the needed infrastructure is in place. To address these issues, the college-wide instructional advisory committee membership will be broadened to include more faculty.
- Finally, we must continue to develop advocates for the creative uses of technology and push for the integration of technology planning into the College's strategic planning efforts. These activities promote value-added applications for the end user.

The progress made in applying technology to OCC's goals and mission over the short span of three years has been remarkable, bringing major transformations in the work performed and services delivered throughout the College. The technology infrastructure and direction is in place, and support services are now expected. The foundation has been laid for the future.

IMPLEMENTING A CAMPUS COMPUTING PLAN

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ABSTRACT

This paper describes a comprehensive computing master plan for academic and administrative computing, including interfacing with existing technology, goals and objectives, networking approaches, organizational impacts, and resource strategies that have been implemented at a mid-size, four-year college. Three years of consensus building and education among various campus constituencies were invested in the plan. Physical design, functional requirements, organizational issues, and policy issues are described. The process of developing and implementing the plan, as well as six months experience with it in place, are reviewed and analyzed. This paper is directed to computing and planning administrators from small-sized and medium-sized institutions.

IMPLEMENTING A CAMPUS COMPUTING PLAN

Background: The Southern Utah State College Environment

The Institution and Computing

Although computing has taken a central role at nearly every institution of higher education, each struggles with the pressure to provide modern computing services with limited resources and with competing priorities. Southern Utah State College is no exception to this common problem. With enrollments growing as high as five percent each year (jumping by 22 percent this year), in a state with severely limited resources for higher education, SUSC has had to respond with a deliberate plan for campus computing. The College is a comprehensive, four-year institution with 3,600 students, 130 faculty, 80 baccalaureate and vocational degree programs, and two master's degree programs. The College is about 200 miles from any similar institution.

Seven years ago, SUSC obtained all administrative computing services via a microwave umbilical to a sister institution 300 miles away. As computing evolved, its fractional development prompted the College to a unified, cohesive approach for all computing. Because of its size and limited resources, the College was unwilling to allow separate planning or completely independent functions. Thus a comprehensive master plan for campus computing was developed and implemented. Under the framework of the plan, administrative computing occurs on the campus VAXcluster, academic computing is decentralized with local area networks, phase 1 of a fiber optic network is in place, and a student-to-microcomputer ratio of 18:1 has been achieved. Equally important, SUSC is organized for computing and for its future in systems integration.

Academic Decentralization

Talking, tension, and consensus building, particularly as the computing master plan was developed, resulted in decentralized academic computing shaped to the needs of academic departments. With the assistance of an ad hoc committee of faculty and staff, and an outside consultant, the administration was persuaded that a student fee, as well as state appropriations, should fund academic computing. On this basis, a request for proposals was issued to install an Ethernet fiber optic network connecting the major academic facilities and to purchase microcomputers and peripheral equipment for three new local area networks (LANs). Figure 1 illustrates the present physical layout of computing under the master plan. In future years, as resources allow, the fiber network will connect all buildings; and all computing will be linked to the network.

Academic computing is distributed through LANs and laboratories. Five LANs are operational, including three in the School of Business (one of which is for computer assisted design), one in the School of Science, and one in the Library. The School of Science also operates an Apple lab and a VAX terminal lab. The School of Arts and Letters and the School of Education provide Apple labs that have not yet been connected to the network. Further, faculty offices in the School of Business and in some of the other departments of the College have microcomputers connected to the network. Departmental and open access hours of use are published.

Decentralization has evolved as campus computing matured. Each department has wanted to shape its own computing destiny, but resources have been limited. What has emerged for the academic departments is centralized computing in a distributed environment. Technical support is centralized in one or two staff; applications support is provided by several faculty members. As a result, users look to the central services of academic computing for training, maintenance, and general support.

Administrative Centralization

In 1984, SUSC acquired the Series Z administrative software from Information Associates (IA). A year later, the State of Utah contracted with IA for statewide licensing of the software for higher education administration. In addition, FOCUS has been added as the fourth generation language and report writer for the campus. All of the major software modules that IA has developed are installed at SUSC and supported by a staff of about 2.5 full time employees (FTE). The college has placed responsibility on the users for the applications of IA software. The Student Information System (SIS) is a responsibility of the registrar's and financial aid offices; Financial Records (FRS) is a responsibility of the controller's office; Human Resources (HRS) is a responsibility of the business and personnel offices; Alumni/Development (ADS) is a responsibility of the development office; and Loan Management (LMS) is a responsibility of the loan collections office.

Campus Computing Network

The fiber optic backbone network connects the major campus buildings. The buildings contain a variety of local area networks connected to building backbone networks. These building networks are connected to the campus fiber optic network through bridges.

The fiber optic network is supplemented in two ways. First, the microwave system of the State of Utah connects SUSC to the University of Utah and from there to the Internet. Faculty, staff, and students can, thereby, access national networks. Interlibrary loan and information exchanges can also be expedited through the microwave system. The link reduces SUSC's geographic isolation and makes possible improved services to the campus.

The second supplement to the fiber network is a terminal network that was initially installed about six years ago. Managed by a DCA 355 communications processor, this network has about 300 terminal lines to residence halls, terminal labs, administrative offices and classrooms. Various applications can be accessed through the terminal network. As the campus grows, additional terminal lines can be added to the terminal network or to the fiber optic network through terminal servers.

Through the campus fiber network, faculty and staff can access on-line course, financial, and other management information. In addition, all users have access to various VAX/VMS tools such as word processing, database management, fourth generation report writers, and statistics packages.

A variety of academic services are also supported through the campus network. The College provides programming languages such as COBOL, FORTRAN, BASIC, Pascal, C and LISP; computer assisted drafting, and a variety of word processing, spreadsheet, graphics, desktop publishing, statistics, and database packages. Electronic mail is available campus-wide, and a variety of specific courseware and public domain applications are also provided.

Functional Organization and Support Resources

Figure 2 illustrates the functional organization of SUSC computing in a stack diagram that begins at its base with hardware and concludes at the top with separate application "arms," one administrative, the other academic courseware. Providing service for hardware platforms, operating systems, network communications, and some utility software has been the responsibility of two FTE staff and many student operators in the Office of Campus Computing Services. Two additional staff are dedicated to the administrative applications, and two are responsible for academic computing.

Ideally, each operating system should have staff support. Network communications and software applications might, likewise, have dedicated, specific staff support. The College is unable to provide levels of support that are demanded by everyone, but much has been done to meet basic levels of operation.

While the diagram illustrates the integration of SUSC's computing functions, it also highlights the complexity of academic computing applications. Courseware is curriculum specific. One or two FTE staff cannot by themselves support, maintain, and integrate all of the courseware appropriate to the curriculum. One or two FTE staff can, however, coordinate courseware technical support and provide needed assistance with network communications to augment academic computing.

The key to the success of integrating computing in the curriculum is the faculty. As faculty members feel comfortable with technology and with the instructional applications of computing, integration begins. Thus, SUSC determined that position announcements for new faculty would include duties regarding computing. Further, a fraction of at least one faculty FTE position in each "computer-active" department would be assigned to courseware implementation and support. Therefore, at least one member in each computer-active department would have a specific duty to support courseware and integrate computing in the department's curriculum.

A dilemma for the College, and perhaps for all small/medium-sized institutions, is how to distribute computing with limited resources and competing priorities. Every department cannot be adequately supported. Technical support for computing trails in priority the need for better faculty salaries, more library books, and modern instructional equipment. Broad-based planning and extensive coordination has been necessary to balance resources and priorities and to recommend a feasible direction.

The Planning Process

Computing Steering Committee

In 1987, the College established a computing steering committee, comprised of faculty and staff, to recommend computing policy and to coordinate computing activity in a planned, cohesive fashion. Two users groups--administrative and academic--were also formed. The Steering Committee developed the computing master plan, assisted by a graduate class in management information systems. The graduate students provided research on specific issues which the Steering Committee suggested. As a class, each student made a presentation to the committee, and many of their recommendations have been included in the master plan.

Computing Survey and Data Collection

With the encouragement of the Steering Committee, the academic users group surveyed each department to determine the extent of computing activity on campus. The survey found that nearly 18% of the curriculum was "computer-active" with faculty requiring or recommending computing in their classes. Other specific findings, included in the plan, formed a database and point of reference for future assessment. Further, the master plan included exhaustive data for two years of VAXcluster utilization. For the first time, the College had data on all its computing services.

Goals and Objectives

The master plan contains the following goals and objectives for the next three years.

1. Extend the fiber optic network to all buildings.
2. Develop all the capabilities of IA software.
3. Complete LANs in three buildings.
4. Implement internal maintenance and repair functions.
5. Compile and analyze student LAN utilization data.
6. Develop through FOCUS a menu-driven decision support system.
7. Assist users with training and reference materials.
8. Continue to improve computing access for faculty and students.
9. Assist faculty in integrating computing into the curriculum.
10. Prepare a budget detail and configuration for processor upgrade.

Problems

The computing master plan encountered three major problems. The first, impacting administrative computing, was one of matching the physical limits of the central processors with user demands in a fiscal environment that will not allow a processor upgrade for 18 months. Usage constraints and other management actions have been taken to "get by," and increased support from the State is being requested.

Academic computing has the difficulty of not clearly understanding all its needs and objectives in terms of workstations and applications. It is further handicapped by a lack of funding to fully operate LANs and provide service in other areas of the campus. The plan recommends increasing student fees for equipment acquisitions and seeking State support for operating funds.

The third problem is the human relations of computing and planning. Individual preferences on issues of philosophy, resource allocation, organization--indeed, nearly every topic, created some discord and distrust. To some people, the plan was a challenge of control. In the end, academic computing decentralized in order to govern itself; yet now, even that decentralization has been "re-centralized" to some degree.

Planning Outcomes

Organizational Implications

The master plan recommended an organizational change to better reflect actual lines of responsibility. The Steering Committee proposed that administrative computing remain under the direction of the Executive Vice President for Financial Affairs, that academic computing be a responsibility of the Provost, and that computing services (computer center and campus network) report to College Relations. Figure 3 illustrates the new organizational structure. The Steering Committee provides a coordination and policy role.

Policy Issues

Implementing the master plan raised several issues of policy which the Steering Committee addressed. The first was how to place usage constraints on the VAXcluster. Without a processor upgrade for 12 to 18 months, action was needed to extend the capacity of the existing processors. The master plan recommended a number of constraints, including limiting IA applications, batch processing and tape back-up to off hours, limiting FRS closings and reports to weekends, and acquiring alternate equipment for Series Z reports.

A unified approach to the standardization of hardware, software, and peripheral equipment was adopted not only to assist with acquisitions of equipment, but also to simplify repairs and servicing under a new, internal maintenance program.

In the past, the College has been unable to accurately identify all expenditures for computing. With the encouragement of the Steering Committee, the Management Information Systems (MIS) class of graduate students researched resource allocation models and procedures and recommended improvements in the structure of the College accounting object codes.

Finally, more responsibility was placed on revitalizing the users groups to determine their objectives and needs. The Provost, for example, actively works with the academic users; and each users group has taken its role more seriously.

Conclusion

With a singular approach to campus-wide computing services, SUSC has implemented a plan within a campus environment of limited resources and competing priorities. The plan is an essential guide for all types of computing and will allow SUSC to remain competitive in the dynamic world of computing technology.

FIGURE 1
PHYSICAL ORGANIZATION

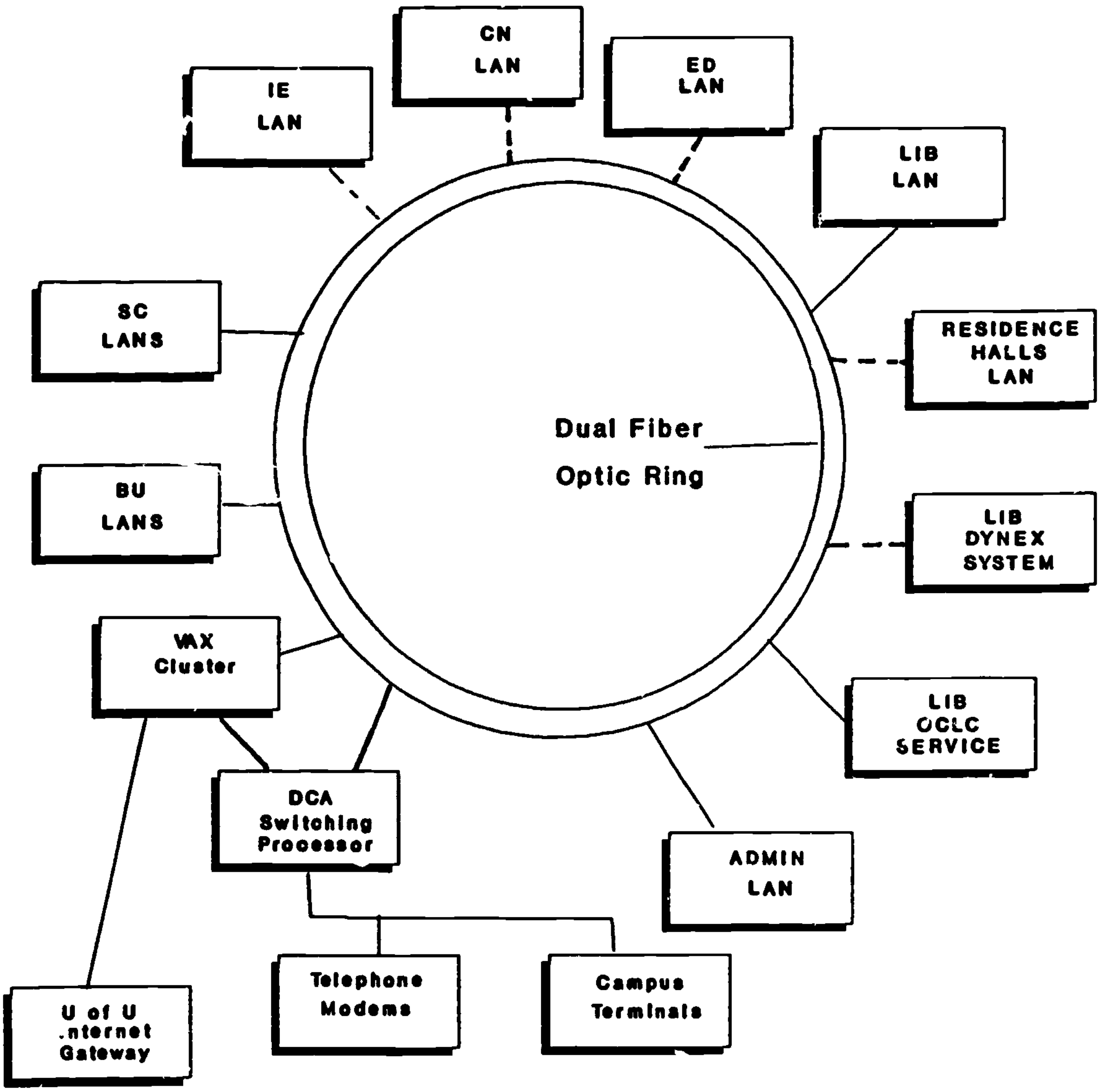


FIGURE 2

FUNCTIONAL ORGANIZATION OF CAMPUS COMPUTING

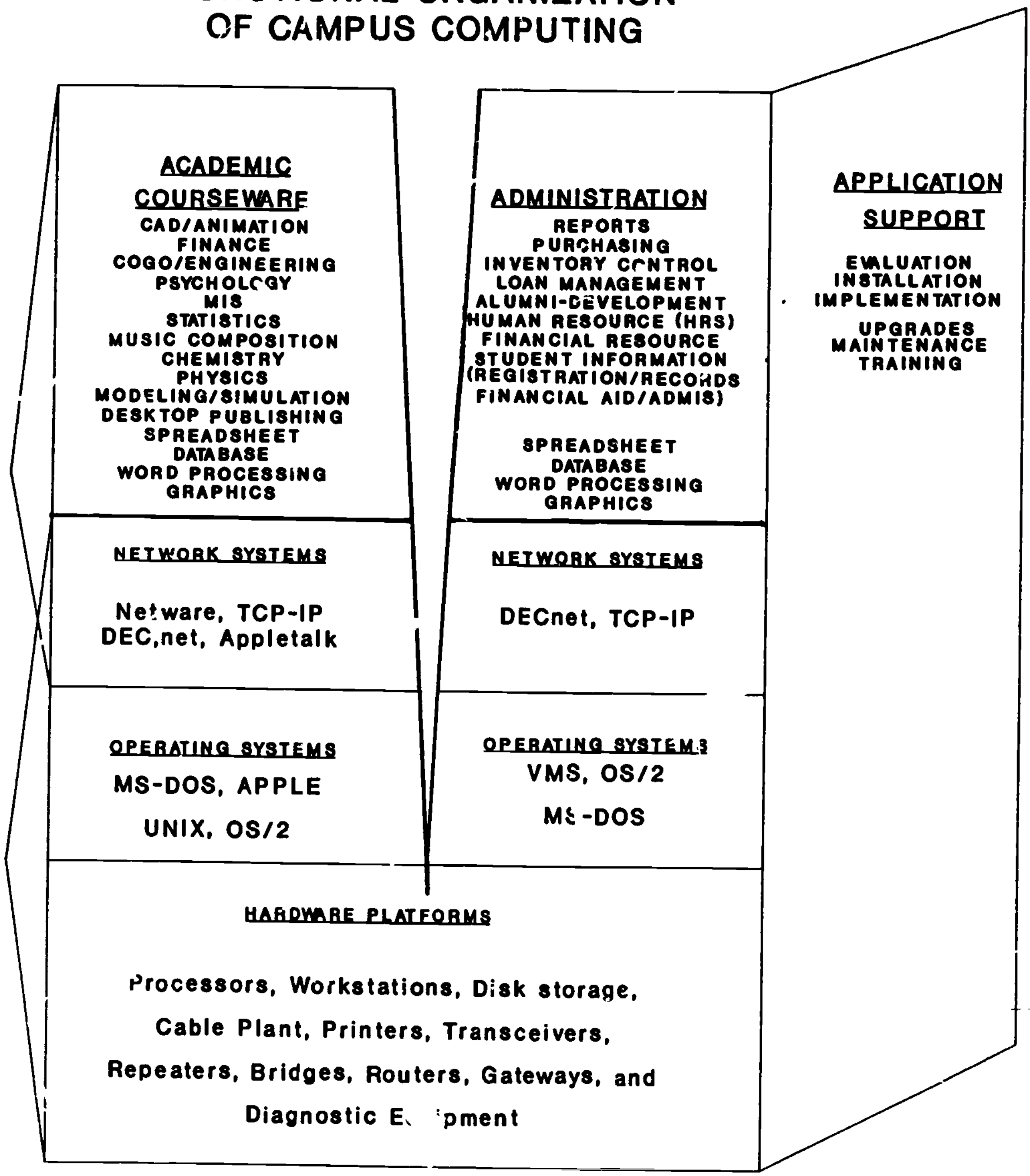
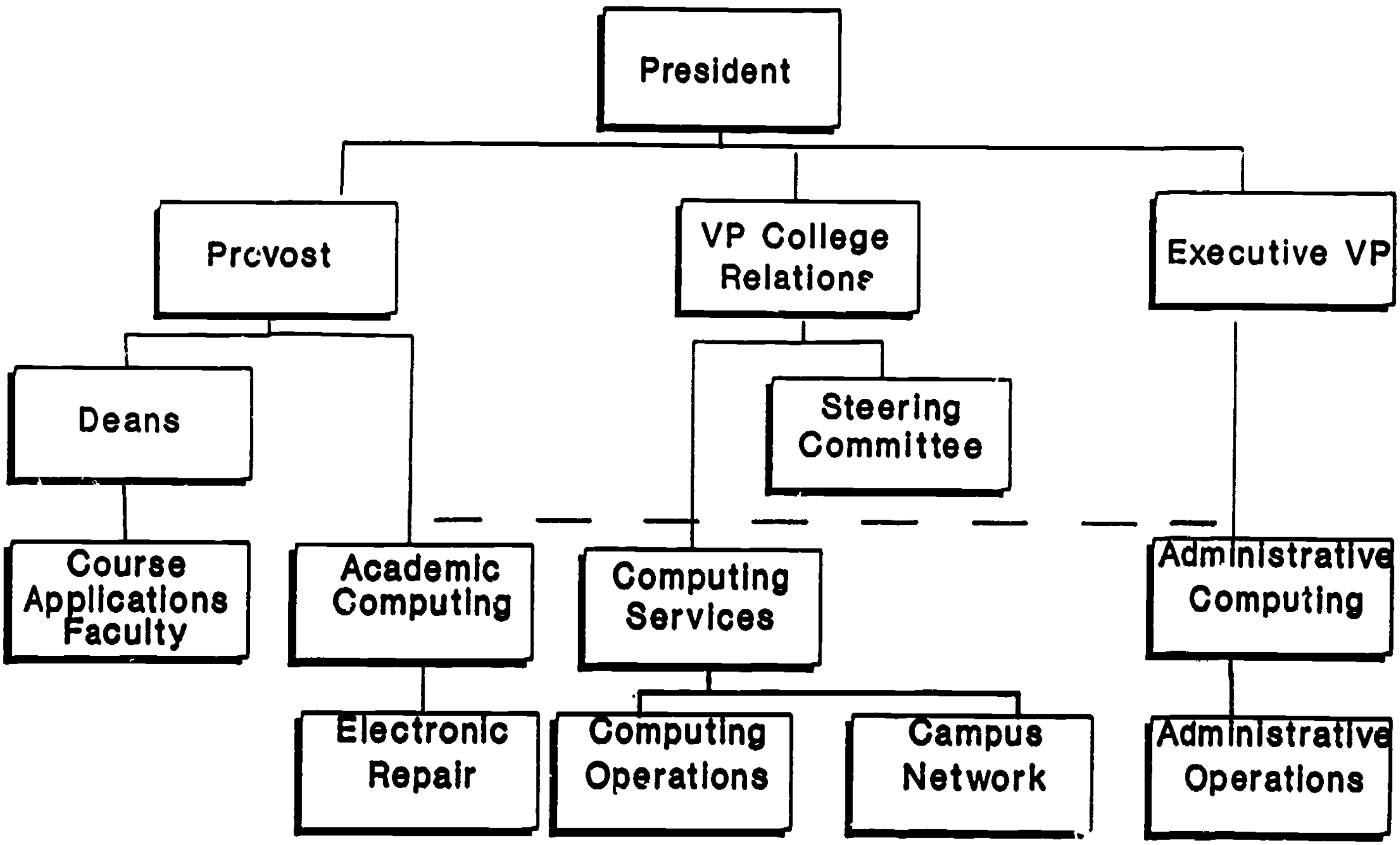


Figure 3
COMPUTING ORGANIZATIONAL PATTERNS



A Case of Successful Integration of Technology in a Liberal Arts Environment through an Integrated Voice and Data Network

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Abstract

Drew University is a militantly liberal arts school that has implemented a pervasive technology system that includes computing and a fully integrated voice and data network (all students, faculty, and staff have pc's, voice and data connections, voice and data mail systems, and a range of network services). This system was designed and implemented within the context of general university plans. In addition, all technology operations report to the same person (who is also the chief university planning officer) that results in a more coordinated, powerful, and cost effective decision process than otherwise possible.

In general, when technology is seen as a tool rather than as technology per se, when implementation is seen as a human rather than as a technological endeavor, and when technology can lead demand rather than react to it, the role of technology systems becomes central to institutional strategies.

The Context

The fundamental goal of liberal education is to teach people to think. An educated and thinking person systematically, logically, and creatively assesses available information. With the glut of information (the "information age") education has tended to become specialized and narrow.

The possibility for educational revolution through computer and network related technology is substantial. The nature of this revolution has to do with effective access to broad areas of knowledge, and the ability to communicate efficiently about them. Computer and networking technology is a tool for liberal education. This tool is not the personal computer or the library automation system or software or the academic computing center; rather it is the integrated use of all these components. In addition, if we are to prepare our students to make a contribution to an increasingly technological world, they must make use of technological tools a part of their lifestyle. This does not make our liberal arts students technologists; it does make them more capable, thinking people in their everyday life.

Drew is an independent university of 2200 students, including an undergraduate school, a graduate school, and a theological school. The university is described as "militantly liberal arts," and has exhibited the usual unwillingness to support any undergraduate degree program that smacks of professionalism. Indeed, the decision to allow a major in Computer Science within the mathematics department was made relatively recently and only after much faculty agony.

The seeming anomaly, then, is that in 1983, the college faculty voted, with only one dissenting vote, to implement the "Computer Initiative." This initiative was taken as a result of research and planning efforts that identified the widespread use of personal computer technology as an educationally important and valuable strategic opportunity. The CI, as it is called, provides every entering freshman with a complete computer package: a fully configured pc system, printer, and software. This package, including hardware and software, is the personal property of the student. The CI was followed in 1987 with a decision to implement the Knowledge Initiative: a pervasive implementation of a communications and information processing network system that optimizes every individual's ability to access, process, and communicate information.

Implementing the Knowledge Initiative

While it is typical to think entirely in terms of text-based communications systems (e.g. computers and data networks), this approach overlooks the obvious fact that spoken language is an important, rich, and indeed necessary form of communication. Indeed, since computer technology has now been applied to voice communication, this form of communication may for the first time be integrated in a meaningful way into communication network design. Current generation telephone instruments are in fact computers, digitizing voices before sending any signal over the wires. Feature-buttons (e.g. hold, transfer, conference, forwarding, etc.) are actually digital signaling that send a command over those same wires. Similarly, turning lights on next to buttons is a command signal. Voice processing technology (e.g. voice mail, audiotex, automated attendants) is in reality computer CPU's with disk drives rated in hours (of voice) rather than in megabytes or gigabytes of storage. Thus, not only is the control of voice based information more akin to that which we are used to using effectively with text based systems, but the possibilites for true integration of functionality with data systems very high.

Our general concept is twofold: a) information processing and exchange is the most fundamental activity of an educational institution; and b) one should be free to choose the information exchange method (voice or data, immediate or delayed) which best fits the communication need. Thus, for example, a library search would logically be an interactive data session; the submission of a student paper would be delayed (electronically-mailed) data session; a clarification of a course assignment would be simultaneous voice communication; and a clarification to a class of an assignment by a faculty member would be delayed (voice-mail) voice communication. And of course, the ability to have simultaneous voice and data communications would be a real value in some contexts, such as for a professor and student to be discussing a library automation search reference list on-screen.

We were guided by both the educational and the technological principles as we examined communication network alternatives. The typical choice for data communication is a broad band network of some form. Fiber and Ethernet are among the common university buzz words. Similarly, telephones are telephones and are generally believed to be low-tech twisted-pair creatures. Rather than starting with technology, however, we began with our needs. In our environment, we projected that the typical situation would be a relatively high proportion of our 2100 users active at any one time, but they would be carrying out relatively low volume data transfer tasks (e.g. smaller text files, not multiple screens of high resolution graphics). Our ultimate design need was to allow all 2100 users to simultaneously send several hundred bytes without system response degradation. Packet-based data networks (e.g. Ethernet) are notoriously poor performers in this type of many user/moderate traffic situation; they perform superbly in the reverse situation (relatively few users sending large "chunks" of data). Contrarily, switched networks can handle the many user/moderate traffic scenario easily because moderate transmission rates (e.g. less than 64 kb) handle smaller amounts of information easily. In addition, because current phone systems also use switched network technology we had an opportunity to develop the integration of voice and data services in a way that would not be possible with a separate voice and data network.

Serious planning for this system began with a lengthy national search for telecommunications/networking consultant support. After careful evaluation we selected Telegistics, Inc. as having the best match of capabilities with our needs, and we began using their services in 1987.

The first step was the development of a "request for information" (RFI). Rather than invest heavily in the development of detailed technical specifications applicable to the many switch vendors, we put out an RFI that described what we wanted to accomplish, what our concerns were (e.g. virtually non-blocking switch, digital technology, integration of voice and data, timeline, etc.) and had vendors inform us of what they had to offer, optimal design scenarios, etc. From these response we examined hardware and software, and put out an RFP to those who appeared to have the technical capability and support apparatus necessary to implement the project. The RFI responses were a binding part of all following RFP responses.

Evaluation of the proposals and selection of the vendor was based on a multitude of factors. In general, three factors were used to screen and rank vendors; for the highest ranked on these two additional factors were applied. The first factor was the user interface. Of primary concern to us was the "humanness" of the system. While there are many aspects to this critical dimension, one example of this is that people are not effective users of "pound/star" commands on telephones (e.g. to pick up a call dial *6). For this reason, we specified that telephone station equipment must have software defined and labeled feature keys (e.g. a separate button on the phone labeled "transfer"). We ultimately concluded that there must be at least 10 such keys available. Similarly, establishing a network data connection had to be not much more complicated than turning on a pc with communications software loaded.

Second was the system performance. In this category fit various aspects of the technology itself: data throughput rate; number of simultaneous users of voice and data services; degree to which system balancing or engineering had to be continually done to maintain adequate performance; the ease of use of network management software; etc. Again, we were less interested in specifying the technical attributes of the system than specifying the performance standards of the system.

The third general evaluation factor was future potential. This included two components: the adequacy of the design for the middle-term future (e.g. ease of ability to support ISDN, availability of software development tools on the switch, etc.); and the second was the service and maintenance availability, longevity, and cost. We required evidence of a prior history of satisfied maintenance customers, guarantees of long-term availability of parts for expansion or enhancement and repair, and governors on maintenance cost escalation.

For the top five RFP respondents, a fourth and fifth evaluation factor were applied. The fourth was partnership potential. We knew that we would need an active and on-going relationship with the vendor(s) to develop system enhancements appropriately and keep the system reasonably current for the longer term. We could not afford to be supporting the needed development activities alone but wanted a vendor who would be willing to use our system as a location to cooperatively develop and test software and hardware. We described this as an interest in partnership.

The final factor was price. As with any educational institution, price matters; moreover, we needed a system that optimized the price/performance/humanness trade-off.
We were not willing to make significant concessions on any of these factors.

We evaluated proposals from 14 corporations, including switching and telecommunications hardware from ATT, IBM, Intecom, NEC, and Northern Telecom; and computing hardware from DEC and IBM. Ultimately we chose to forge a partnership with Bell Atlanticom, Intecom, Octel, and Digital, and later with MCI for network services and DRA for library automation. All were committed to creating a one-of-a-kind national showcase demonstrating a fully integrated educational data and voice communications network. While many very visible high technology universities have implemented components of this system, no school has to date implemented a completely pervasive system that provides full functionality to every student, faculty member, and staff office.

The system we installed is a simultaneous voice/data network that is fully non-blocking (that is, all 2100 people can have a simultaneous voice and data connection with no network performance degradation), and that provides a "connection" for every person on campus. The system provides the following four functional components: (1) a data network linking the three computing centers (academic, administrative, and library), all PCs on campus, and external networks (including BITNET); (2) a network server that provides electronic mail, various databases and information services, etc.; (3) a more effective voice system that allows full and timely communication among all members of the campus community through an expansion of current phone service, direct inward dialing, improved forwarding/answering, cost accounting, etc.; and (4) a voice processing facility including voice mail, audiotex (to deliver standard information to internal and external publics), automated call routing, etc. The system includes an Intecom S80 with about 5000 ports (2500 flex-IM ports), an Octel Aspen voice mail system; and a VAX 6330 running All-in-1, DRA library automation software, Alexis call accounting software, and other network services.

In very concrete terms this system is visible to the individual on campus through a "station" that includes a fancy phone with function buttons and the student's personal computer. The phone is in fact digital and uses the same binary communication method that computers use. It gives the student full-featured voice capability (e.g. conference calling, forwarding, etc.) and voice mail, while simultaneously connecting the pc to every other pc on campus, to a data network that includes All-in-1 as the e-mail system, library automation, network connections to other campuses around the world, and a variety of other services including telling you how full the moon is.

The system, including an entirely new cable plant, all new building wiring, building of a new network center, installation of all hardware and software was completed in 10 weeks through heroic efforts of all involved, beginning on about May 25. We began training of faculty and staff on about August 15, and with all students on about September 1. In all cases, voice and voice mail were taught first, followed by network services.

Impact and Implications

There are six outcomes of this system worth special note. First, the system has further blurred the distinction between academic and administrative technology services. While the extremes can still be identified (e.g. the payroll database is clearly administrative and the use of symbolic equation manipulation software is clearly academic), most technology services (networking, pc's, etc.) are used by all faculty, staff, and students. As such, staffing has been largely merged and traditional distinctions among areas largely eliminated.

Second, the system at this time may be thought of as a fairly complete roadway with many vehicles on it; at the same time it is clear that we have hardly begun the process of putting up the roadsigns (appropriate software applications) and building exit ramps (to special purpose processors, e.g. unix or graphic stations). This will develop with time, out of the imaginations of our people.

Third, one should anticipate demand and put in hardware and software before it is universally demanded. This is important for two reasons: a) in the typical case, one or two departments begin experimenting with the use of information systems technology and invest in hardware and software; the general interest grows and the university tries to put in a coherent system, but must fight turf-like battles over which technology is best, and then whether to spend enormous amounts of money trying to link dissimilar systems or throw away the investment by tossing out existing systems; and b) putting in networking systems piecemeal is very expensive on a per unit basis compared with fully designing and implementing a network system designed to optimize needed functionality and minimize compatibility issues. In our case we have acted on personal computers, networking, and telecommunications systems before the demand curve rose. As a result we have established the standard that, though not everybody agrees is the one best one, is certainly in everyone's interest to be compatible with. We have done all this at a cost of perhaps one-third that which would normally be expended for similar functionality in a more typical situation.

Related to the first three is the fourth: never underestimate the potential need for additional staff support. As line distinctions blur, the need for the development of hardware and software integration grows. Similarly, given a versatile network, the opportunities for new applications to make more effective use of the network grows. Both of these are natural and important. One must then balance the new unmet need against the potential cost of development. We, frankly, have tremendous demand for software development that we cannot meet without a number of staff development additions that we cannot now afford. To our way of thinking this is not a crucial problem. This problem would not exist if we had a less capable network. Should we, therefore have put in a less complete network? We could have done that, but at significant longer term cost. Must we immediately meet all need? As long as everyone recognizes that the current system accomplishes much that was never before possible, and that there will be systematic development of software over time, then the answer is no. However, this is a non-trivial credibility and political issue that must be attentively managed.

Fifth, the system is complex and expensive to run; on the other hand these expenses were largely anticipated and, because of the inclusion of phone service in the network system, self-amortizing by the application of phone use fees. We would not have been able to afford to put in and maintain a data-only system because fees for its use would not have been appropriate; however, by applying normal residential rates to telephone service sufficient revenues are generated to largely cover system cost over a seven to ten year period.

Finally and most importantly, always remember that the key to the successful integration of technology into an educational environment lies not with technology but with the people. Avoid being unduly excited by technology itself, but do become excited by what technology can do for education and for the preparation of educated people. Pay more attention to preparing people through preparatory information, accessible training, and ready support. Certainly some hardware or software is easier to learn to use than others, but based on current options this is a minor concern. The important factors are not ease of use or quality of graphics display; rather they are how educated people think and approach information. This is not to say that the technology is irrelevant, but that the key to success is to look at all technological endeavors as human endeavors.

CAUSE '89

The Best Laid Plans... An Implementation Retrospective

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Abstract

Three years ago a paper was presented which discussed the establishment of an IRM organization at Cal State L.A. and initiated a strategic planning process for information technology defining parameters for three major projects (a new digital telecommunications system; OASIS, a new administrative system; and instructional technology). At this point, the University is well into implementation of these multi-year projects.

The University continues to be serious about meaningful strategic planning and in an effort to learn more from our experience, both successes and failures, this paper offers a retrospective view. This analysis is a deep view of what was done, how it was done, what worked, what did not, and what might have been done differently.

The Best Laid Plans . . .
An Implementation Retrospective

Introduction

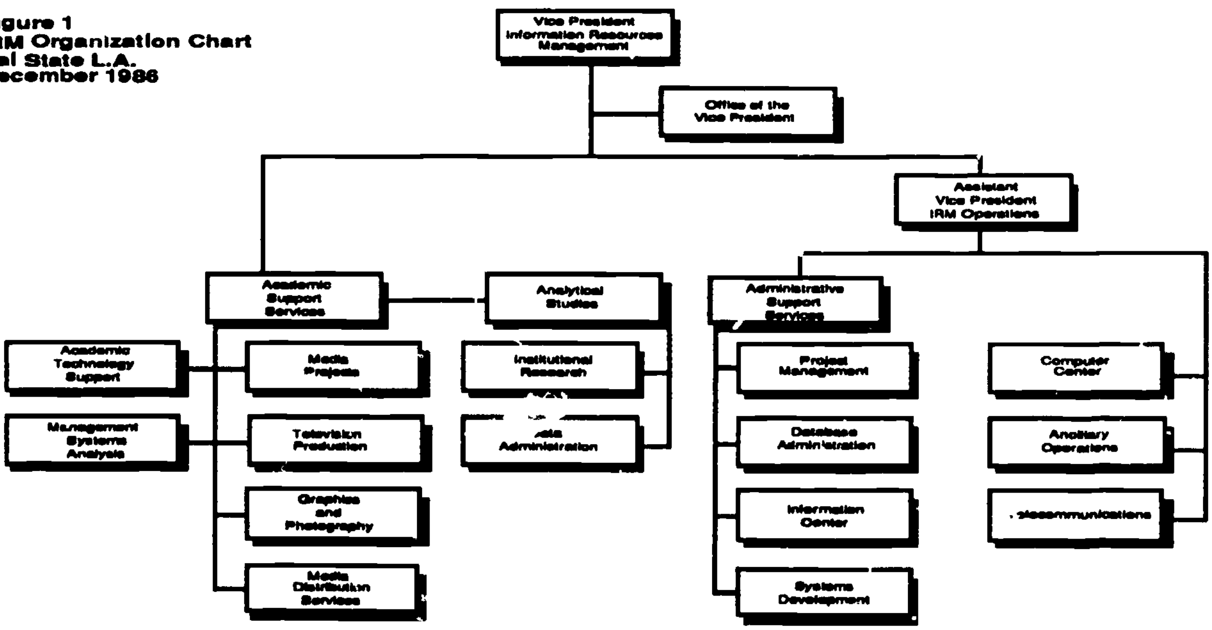
Three years ago, the process of establishing an Information Resources Management (IRM) organization, introducing a participative strategic planning model for information technology (IT), and initiating three major multi-year information technology projects at California State University, Los Angeles (CSLA) was documented.[1] In the ensuing thirty-six months, the IRM organization has matured, the strategic planning process has evolved, and the projects are well on the way to completion. This paper will examine the organizational experiences of the past three years, note how the planning process has changed, and list the major successes and failures from the information technology projects.

Organizational Development

The IRM organization at CSLA was first established in late 1985 by combining several information resource functions previously located in Academic Affairs and Administration into a single unit led by a Vice President for Information Resources Management.

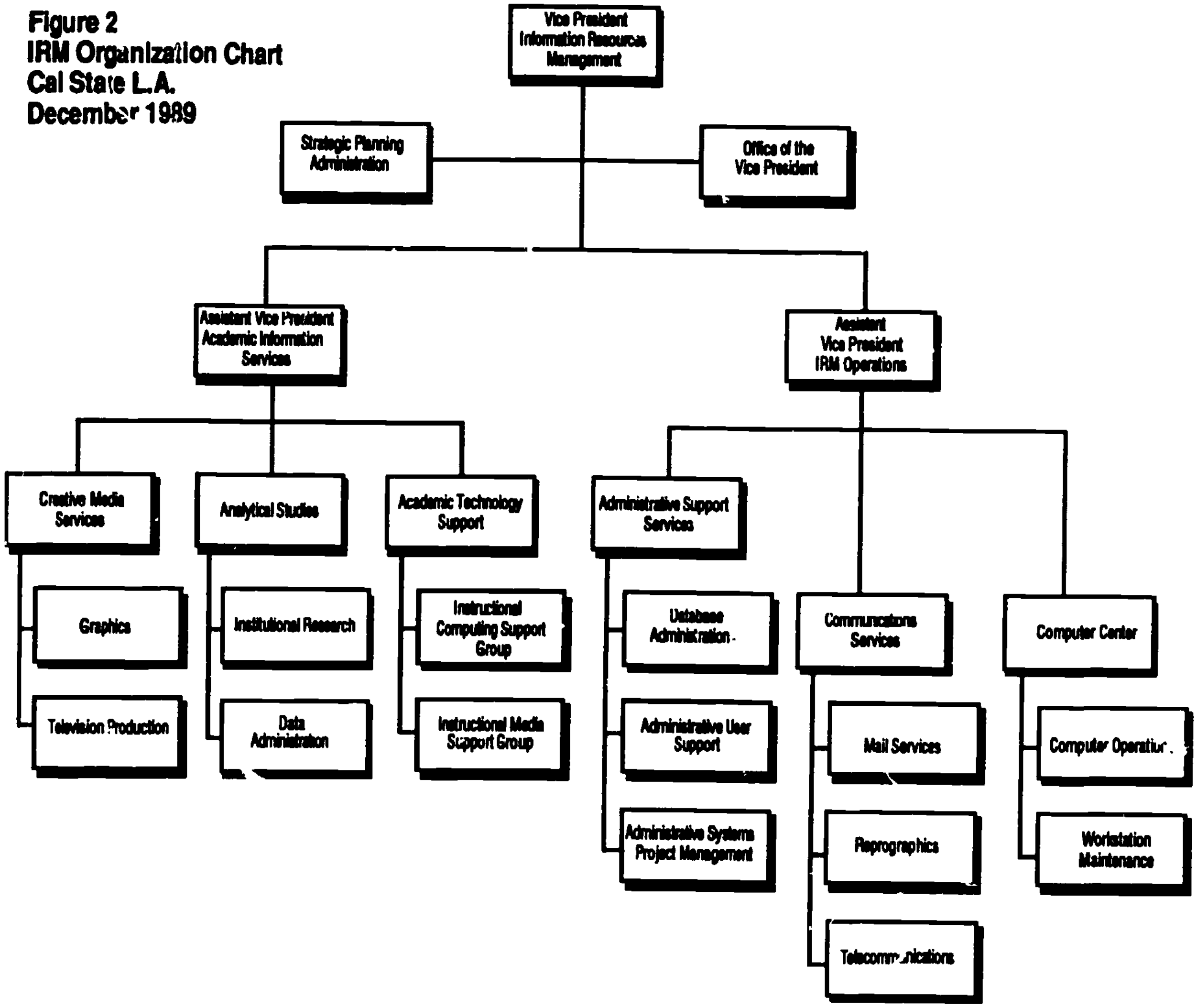
A comparison of the current organization chart to that of Fall 1986 (See Figures 1 and 2) reveals that some "settling in" and regrouping have occurred but that basic functions have changed little. Four significant changes do appear: (1) Telecommunications, Reprographics and Mail Services now form a Communications Services unit; (2) Academic Technology Support now incorporates both instructional computing and instructional media support departments; (3) the Academic Information Services leader has been elevated to an Assistant Vice Presidency; and, (4) strategic planning administration has become a formally defined function within the Office of the Vice President.

Figure 1
IRM Organization Chart
Cal State L.A.
December 1986



The establishment of Communications Services reflects the installation of the telecommunications system and its importance to the campus as a whole. It also indicates the growing impact the campus network has on both Reprographics and Mail Services. The second change, the fusing of media and instructional computing into an academic technology unit, accommodates both the planning and the delivery of instructional support. Media and computing tend to blend as images are created, stored and transmitted. Third, the creation of an Assistant Vice President for IRM, Academic Information Services recognizes the need for a policy level support person to focus upon

Figure 2
IRM Organization Chart
Cal State L.A.
December 1989



information technology issues that are of primary importance in instruction and research. Finally, dedicating a director level position within IRM to strategic planning illustrates the institutional commitment to planning and to closely linking IRM goals and objectives to the institutional mission.

Perhaps the most important changes, however, have occurred in the organizational culture of the IRM unit. The Assistant Vice Presidents (AVPs) and Directors have come to function reasonably well as a team and employ a matrix approach to problem solving and resource allocation with some skill. Personal integrity, a desire to serve clients, forthright communication, and hard work can be legitimately claimed as organizational values. The necessity to find the time to plan and to follow-up activities with meaningful evaluation is recognized as an important part of the fabric of the IRM unit.[2]

The Evolution of Planning Methodology

The first *IRM Strategic Plan* for CSLA utilizing the Shirley planning methodology was produced in early 1986 and predated the adoption of a formal planning model by the institution. After examination and evaluation of various models, the campus chose the Shirley strategic planning methodology in October 1986. The adaptation of the model to campus needs began with the plan to plan which called for the development of ten campuswide tactical plans to provide operational parameters for carrying out the mission and goals of the institution. IRM was one of the designated tactical planning areas.[3]

In Fall 1989, the *CSLA Strategic Plan* was approved and made available to the campus community. The strategic plan sets forth the mission of the University and elaborates upon it through statements of relative emphasis. A long term focus for action is provided through seventeen institutional goals. Drafts of the various tactical plans were also completed and circulated. The IRM plan is carefully aligned to support areas and issues which are emphasized in the CSLA mission statement or specified in formal campus goals.

Unit level plans which collectively encompass all of the goals and objectives in the IRM plan were developed and are now in place. There are seven such documents, e.g., Academic Technology Support (ATS), Administrative Support Services (AdSS), Analytical Studies (AS), Communications Services (CS), Computer Center (CC), Creative Media Services (CMS), and the Office of the Vice President (OVP). Additionally, each manager produces an annual work plan which contains measurable objectives directly linked to the unit plans.

To summarize, in Fall 1986 the *IRM Strategic Plan* contained goals and objectives felt to be supportive of institutional perspectives. Its format was generally determined by guidelines from the systemwide Chancellor's Office which mandated an annual *Campus Information Resources Plan* (CIRP). By Fall 1989, the *IRM Tactical Plan* provided a summary of the *IRM Strategic Plan* (part of the CIRP), conformed to campus guidelines for institutional tactical plans, was directly linked to the *CSLA Strategic Plan*, to the IRM unit plans, and to annual administrator work plans. It was a campus document reflecting policy, priorities, and resources devoted to information technology at CSLA. Goals reflected a three to five year horizon and were accompanied by a projected five year budget. The objectives were written for the current fiscal year and paralleled budgeted expenditures.

Project Review

One of the purposes in creating an IRM unit was to provide leadership in building an integrated information infrastructure which fully supports the instructional, research, communications and administrative needs of the campus. These information technology needs are being addressed through three projects.

The three major multi-year information technology thrusts are summarized in the following goal statements: (1) to plan, coordinate and assist faculty in building an academic computing infrastructure to meet the needs of CSLA through the 1990's; (2) to plan, justify, procure, install and operate a state-of-the-art telecommunications system and campuswide network; and (3) to plan, design, procure, install and operate integrated, relational based administrative applications systems.

Academic Infrastructure

In Fall 1986 the CSLA academic computing environment consisted of about 400 student workstations/terminals in 14 labs or classrooms with 2 LANs, 60 faculty workstations, 14 mini/super minicomputers, a Cyber 730 (shared with administrative computing), 200 ports on a Gandalf PACX system, four full time support staff, and about 20 student assistants.[4] This Fall the academic information technology environment has 630 student workstations in 33 labs or classrooms with 16 LANs, approximately 300 faculty workstations, 28 mini/super minicomputers, an Alliant mini supercomputer, 340 ports on two Gandalfs and an Infotron INX with a bridge to a Proteon Pronet-10, 17 full time support staff (11 are in ATS and six are in Schools/Departments) and 45 student assistants. Additionally, annual academic information technology donations to the campus have tripled to a sum of about one million dollars.

Telecommunications

A Pacific Bell Central Office Centrex providing approximately 2225 telephones which coupled with a Gandalf PACX port selector based data network with about 450 connections made up the communications resources for CSLA in Fall 1986.[5] The campus now has a telecommunications system from Centel Communications Systems consisting of a Northern Telecom Meridian SL-1 PBX with about 2670 telephones, an Infotron INX 4400 medium speed data switch with 250 connections, a Proteon Pronet-10 fiber optic high speed network which supports Ethernet, Token Ring, Starlan 3BNet and Appleshare LANs, a Digital Sound voice server with 555 voice mail boxes, and ComSoft system management software running on a Microvax 3600. Additionally, the Gandalf PACX with approximately 750 connections is linked to the Infotron INX. [6]

Administrative Systems

The administrative computing environment in Fall 1986 consisted of a variety of CSU developed Cobol systems, and an Information Associates integrated business system/financial accounting system (that was significantly modified), operating on the campus Cyber 730. The majority of applications were batch processing, and there was little integration between different modules. There were about 250 administrative connections on the the Gandalf. Today, through project OASIS, a joint development project between IBM, Information Associates (IA), CSLA, California State University Long Beach, and Cal Poly San Luis Obispo, the institution has the alumni development system (ADS), the financial records system (FRS) (with a CSU developed front end), and the student information system (SIS) from Information Associates Series Z applications. A few other Cobol administrative applications have been converted and a property management system has been developed in FOCUS. All applications now run on an IBM 4381 T92E. The Series Z applications are fully integrated and provide on-line access to about 700 administrative users and academic departments.

Prescriptions, Preventatives, and Postmortems

Strategic Planning

The rapid technological change evident in higher education today, as illustrated by the examples just enumerated, almost demands that some form of strategic planning be utilized in implementing information technology initiatives. Such a process must fit the environment of the institution where it is utilized. At CSLA, the Shirley planning methodology provided a guideline that led to the development of a process that has adapted well to campus needs, directions and uniqueness.

The planning model called for an internal and external assessment of the campus, including a values analysis. From this baseline examination and the definition of a vision for the future an extended mission statement, goals and measurable objectives, broadly based operational strategies, and detailed actions plans were developed and put into place. Strong support from the President and Executive Officers, a focus on University-wide priorities, and broadly based participation have been essential elements in the planning resulting in pertinent decision making which has led to the development of meaningful polic_ and procedures, and most importantly, enhanced services to the University.[7] There is a strong belief at CSLA in strategic planning in general and that strategic planning for IRM works!

Organizational Initiatives

After the establishment of an IRM unit at CSLA in July 1985 and the employment of a Chief Information Officer (CIO), the first order of business was to pull diverse units of the new organization together into a cooperative, cohesive, service oriented group. Through the strategic planning process, immediate emphasis was placed upon an analysis of campuswide information technology needs, client expectations, existing and potential opportunities/constraints, values of the newly formed IRM administrative team, and strengths/weaknesses of both the campus and the IRM unit. This series of exercises resulted in a shared understanding and appreciation of the magnitude of challenge, some ideas for possible early successes, and a commitment to define and infuse a culture into the organization that would be supportiv of the CSLA mission and also be meaningful to IRM employees as individuals.[8]

The basic characteristics that the new IRM organizational culture strives to attain are: a recognition that responsibility to one's clientele is inherent; to establish an environment where all individuals are treated with courtesy and respect; fostering a balance between organizational and individual needs; tying rewards to productive performance; maintaining personal integrity at all times; maintaining an atmosphere of professionalism; individuals accepting responsibility for contributing to the solution of problems; an organization providing equitable and consistent service at defined levels; maintenance of security and integrity of campus data bases; and the observance of sound fiscal procedures in all activities.[9]

The approach defined here has proven to have been very successful. Overall, good progress has been made in establishing a culture with similarities to the ideal described above. The morale of IRM staff members is good, the unit is regarded with respect by the University community, and there is broad agreement that positive institutional change has taken place in a relatively short time.

Other factors contributing to organizational initiatives, more fully described elsewhere, are: the usage of carefully selected advisory committees; a broadbased participation in decision making; the employment of a campuswide evaluation structure that involves every IRM unit on a monthly basis; frequent internal evaluation of administrative projects and unit objectives; and providing external and internal feedback on a regular basis.[10]

In hindsight, there are two initiatives which, had they been done, very probably would have enhanced the progress made to date. The first involves the establishment of user liaison positions in AdSS. This was initially planned but put on hold when requested positions were not forthcoming. The role and function of these positions are demanded and are not carried out as well as they might be by project managers and programmer/analysts whose primary focus is elsewhere. Secondly, systems seminars, a set of consciousness-raising, change oriented group exercises for users, were proposed and discussed but not done due to an already extensive primary user training schedule. Had these group exercises been conducted, some unrest and resistance to change deep within client organization could have been lessened as process and procedures were altered.[11]

Academic Infrastructure

When the CSLA IRM unit was formed and three strategic information technology thrusts were set forth, there was a conscious decision by the President to focus first on the academic infrastructure. This was the area of greatest need and visibility, where cooperation between IRM, Academic Affairs, Schools and Departments could most easily be ac ie ed (a concept essential to the success of all major projects at CSLA) and where the reallocation of institutiona' sources was best accepted. The soundness of this action has been shown again and again. Early successes here established an openness to the possibilities the other information technology projects offered. The cooperative efforts worker exceptionally well leading to an expectation of cooperation as the basis for systems implementation. Given the focus on information technology in academic endeavors faculty members have been very receptive to innovation and to incorporating meaningful information technology applications into the curriculum.

Several other de ons were made early in e project that seem to have been useful. These include: (1) a determination to move to a gh'y distributed, networked, academic environment with the individual workstation as the basic access device; (2) allowing diversity but standardizing application packages whenever general agreement could be attained; (3) providing basic student access through general labs before focusing on broadbased faculty access; (4) developing targets based upon an annually constructed course-by-course matrix showing computing requirements within the curriculum by discipline; and (5) establishing the director ATS as the focal point for planning, funding, implementing and operating the information technology infrastructure.

There are implementation strategies that have also had positive impacts. The cooperative model, referred to earlier, has allowed functionality and defined needs to drive design as opposed to turf issues or politics. Having a plan in place, one central contact, and the ability to leverage funding from va ious sources has made it far easier to work productively with vendors. The primary mode of faculty training has been to use highly qualified faculty as instructors in formal classes with hardware/software loaned over an extended period (two quarters). These programs have been set up in such a manner, that when the training is finished participating faculty may submit proposals which, if accepted, allow them to keep the workstation and software. 'henever possible, matching funds are provided, usually by central administration, allowing less affluent departments to buy into the distribution of information technology resources.

As mentioned early in this paper, Academic Technology Support now includes both instructional computing and media support personnel. In addition to the advantages already listed, organizational blending has permitted media staff to be cross trained and to augment the small instructional computing staff in support of lab facilities. It has also provided needed networking expertise in this area s ce media technicians historically provided support for the campuswide video network.

Although a long list of academic infrastructure needs could be complete l, they are felt to be more related to meager state funding than to prior decisions that might have been made differently.

Telecommunications

Both of the other major information technology projects could not be successful without an operational network being in place within a specified timeframe. Thus, in a very real way, the telecommunications project is at the center of the information technology strategic thrust at CSLA. Given that the major elements of the campuswide network ha been installed close to the implementation schedule and well within the its needed to support academic and administrative users, that the voice system provides significantly enhanced functionality over the centrix, that it has been very reliable, and that the voice mail system has been a popular and useful addition, this very complex project has gone well.

There are many reasons that have contributed to the success of this undertaking. Due to a window of state funding, this project was underway before the arrival of the CIO. A draft of a generic request for proposal (RFP) was provided by the State to CSLA. The campus was then asked to modify that document to fit specifications of the institution. A telecommunications consultant with significant experience in higher education, with the CSU and the State of California was retained. The CIO selected by the campus had been involved in two other telecommunications projects at other universities. The AVP for IRM Operations who was recruited by the CIO had led the implementation of a telecom system at another institution. The manager of telecommunications hired by the AVP was a professional in the area with over fifteen years of experience. The basic RFP was modified to include as many mandatory bid options as possible within the guidelines. The RFP review committee consisted of representatives from all areas within the University who were involved in either the procurement or the installation. The client community was briefed well before the project began regarding its complexity, its importance, and potential problems which could arise. Trenching and wiring were done primarily at night and on weekends to avoid, as much as possible, the disruption of classes and administrative work. A train-the-trainer approach was taken so that every academic and administrative department on campus had their own "expert." Beyond this, extensive hands-on training was provided for anyone who would attend (most people did!) just before cutover, and continues on an "as requested" basis. The telecom staff worked with each department to design their own functionality. Once an office configuration was agreed upon, a formal signature by the department head was obtained. As many classrooms (about one in five) and offices were wired for data as the budget would allow. Within guidelines, all new instruments were provided to departments without additional costs to them. Where chargebacks were made, they were set to cover actual expense and were one time charges, i.e., the actual additional cost of an upgraded instrument, $300 for a data connection, $100 for a voice mail box, etc. Finally, ongoing equipment and maintenance costs were covered "off the top" of the state allocation and are not passed on to departments.

Although the overall assessment of the telecommunications implementation was positive, there were a number of things that in retrospect could have been done differently and quite possibly would have made it even better. The generic RFP should have been revised well beyond providing campus specific numbers and adding mandatory options. In some places the layout was confusing to vendors, in others it was vague allowing bidders too much latitude (this was especially true regarding the management system), and the evaluation criteria could have been somewhat more rigorous. The consultant was probably kept on retainer for too long and the new manager of telecommunications was not brought on early enough. The usefulness of the consultant lessened after the vendor was selected and the contract was finalized. The new manager, clearly, should have been involved in the contract negotiation phase. The contract calls for one full time, on site, vendor supplied, technical support position. The needs, at least for the first two years, indicate that a second position should have been specified. The number of secondary vendors involved in the bid probably should have been limited. There are a total of five companies represented in the complete system, and that is too many for a small staff to easily handle. Six weeks were allotted to conduct the station review and to design the department configurations, a minimum of two to three more weeks should have been allowed. The management system was far more critical than initially believed. It should have been in place for three months before cutover and tested with a full compliment of data instead of being available at cutover with limited test data. Finally, the most critical timing issue was related to the voice system; this inadvertently resulted in the other components receiving a somewhat lower level of attention. The same level of intensity was needed until all elements of the total system were in place and completely operable.

<u>Administrative Systems</u>

Project OASIS has enabled CSLA to move away from a 20 year old data processing philosophy for administrative systems into an integrated information systems environment residing on an IBM platform. The second phase of OASIS calls for the installation of a completely integrated DB2 based on-line set of administrative applications. The total project is scheduled for completion in 1992.

This joint development project has progressed very well to date. There were a number of actions that helped account for the success of OASIS. The commitment of the Chancellor's Office and the three CSU campus Presidents set the stage initially and continue to provide a driving influence for the project. The cooperation between the information systems and application area staffs of the campuses have been extraordinary. The support and expertise supplied by IBM and Information Associates have been excellent. An oversight committee structure consisting of a Steering Committee (focusing on policy and contract issues), an Operations Committee (focusing on major implementation issues), and a Technical Committee (focusing on day-to-day technical issues) has worked well.

At the campus level, the implementation has been guided by task forces made up of users and IRM staff. Each major module had an affiliated task force. A policy level task force which included two senior faculty members provided liaison with the Academic Senate. This model provided excellent communication and played a significant role in maintaining an ambitious schedule. A hands-on training room was set up, and extensive training was provided for systems implementers and end users on an on-going basis. Hardware, software and data connections were supplied to every academic and administrative department in the institution allowing almost immediate broadbased access to the database. A voice registration system was installed permitting many students to register via touch-tone telephone creating enough good will to more than overcome any expected "glitches" inherent in a new system. Finally, as this list indicates, the macro level project management was handled with skill.

As anyone who has ever been involved in a major systems implementation realizes, there are always lessons to be learned. Although several senior managers had prior experience in a systems conversion effort, many of the staff did not. Only a few individuals had experience in moving from one hardware vendor to another while doing an applications system conversion. Consequently the magnitude of the transition from the Cyber to the IBM mainframe and the data conversion efforts were underestimated. In like manner, as mentioned earlier, greater effort was needed to prepare the user community to fully understand issues such as data integrity, coordination and timing that are critical in integrated systems. Due to these difficulties and to the fact that the campus experienced a major earthquake early in the implementation, "catch-up" became an emphasis and project management at the micro level suffered. Although documentation was better than with the replaced systems, more is needed. This is especially true with Computer Center operations and in procedure development in some user areas. The Information Associates Z-writer provided enhanced ad hoc data retrieval capability but was not easily used by a user community without significant experience in doing ad hoc retrieval before. This was one of the areas where user liaison positions were greatly needed. Better coordination between Computer Center operations staff and Facilities Management staff was needed. The new information systems environment required a far more timely response than was true before, and there have been difficulties with environmental systems, i.e., water, power, and air conditioners, that have negatively impacted the implementation effort.

The largest single problem resulted from an over ambitious development schedule for a front end point-of-sale (POS) system for Cashiering. IBM provided hardware, Information Associates mainframe software, Sales-Point (a third party vendor) software for the cash registers, network, and servers, and CSLA did the alpha and beta tests. Due to slippage in delivery of the third party software, the system was put into operation before being thoroughly tested--and predictable difficulties ensued.

Miscellaneous Observations

By any measure, the progress in IRM at CSLA over the three year period from Fall 1986 to Fall 1989 has been reasonably impressive. Eight critical success factors were initially listed as being crucial to the success of the strategic information technology projects. Those factors were: (1) *Top Management Support*: The President and Executive Officers have provided direction, encouragement and resources which offer a very visible context for all to see. (2) *Project Leadership*. Both IS professionals and end users have performed well. Macro project management has been excellent and micro level project management is steadily improving. (3) *Participative Planning*. It is difficult to envision CSLA being where it is today in information technology without the effort that has gone into the planning process and the significant involvement of many people across the campus. (4) *Significant User Involvement*. The task forces have been mentioned and are of great importance. Another aspect of user involvement focuses on the monthly evaluation of IRM units by their clients. All units have been evaluated monthly for two years now and the user response rate remains at over 50%. (5) *Education and Training*. A great effort, with meaningful results, has been devoted to training. This area remains a challenge, and it is clear that further efficiency, effectiveness and innovation are possible if additional resources can be found. (6) *Process, Policy and Procedure Development*. It was anticipated that this would be one of the most difficult challenges. Although much remains to be done, and must be done, adequate progress has been made. Both the task forces and the IRM advisory committee structure are credited with major contributions. (7) *Timely Telecommunications Installation*. All deadlines were met with time to spare. The basic building blocks for the CSLA information technology infrastructure are now in place. The challenge now is to tie as many individuals to the infrastructure as quickly as is possible. (8) *Funding*. To date, through sacrifice, careful planning, good management and extraordinary cooperation, funding has been secured for these projects. The demands are on going, and the campus must look to the State to recognize the importance of information technology in ways beyond what has been historical if the rate of progress is to be sustained over a period of years.[12]

In concluding this section, it must be noted that the comments here have not attempted to address overall needs of any of the information technology projects. Rather, they have been limited to actions basically under fairly direct, short term control by the campus. For example, it would not be recommended that newly formed organization with a new leader from the "outside" tackle three simultaneous multi-year, multi-million dollar projects. It was done because not doing it would have meant missed opportunities not likely to have been replicated in the foreseeable future.

Conclusion

> The fact that the world is rapidly changing need not mean that we are destined for a future of disorder, disruption, and dysfunction; but higher education administrators must realize that they not only manage finances, curricula, or services -- they also manage change.[13]

This quotation catches the essence of much of what has been reinforced through the IRM projects at CSLA over the last three years. The strategic planning process provided a framework that linked institutional mission and goals, tactical objectives, unit actions, and administrative work plans, thus avoiding disorder, disruption, and dysfunction. It also fostered a process for meaningful analysis of options, strategies and tactics. Indeed, it has been through strategic planning and management that the rapid changes have been controlled and focused upon campus priorities.

The creation of a new IRM unit offered the opportunity to redefine the culture of the information technology organization. The ability to manage an organization's culture as a strategic resource leads to successful change management. Culture -- the beliefs, behaviors, and assumptions of individuals in an organization -- is one of the most powerful forces an administrator confronts.[14] Using culture to drive change rather than to impede it has been key to CSLA.

An IRM approach has played a significant role in what has occurred. One of the added values of IRM is the emphasis on planning. The concept of IRM also includes the vision of capitalizing on existing and new investments in information-related resources, and it includes disciplines required to ensure sound management of these resources.[15] The IRM approach has been far more important than what was reflected in an organization chart since many aspects of technology projects require coordinated involvement across the entire IRM unit.

It is very important to make good early decisions in macro management. If that happens, these decisions often can easily overcome failures at the micro project management level which almost assuredly will occur at some point. Personal experience may be significant at the micro level. For example, developments in the CSLA information technology projects lead the authors to advise administrators to use techniques that have been successful in similar situations in other environments unless strong evidence is presented that "it won't work here" despite advice to the contrary.

Finally, it is prudent to take advantage of major opportunities when the chance occurs even if the organization is not completely prepared if the risk trade off is appropriately weighted. Identifying critical success factors, publicizing them, and working hard to obtain support to meet them goes a long way to overcoming the risks, despite their magnitude.

FOOTNOTES

1. Penrod, J. I. and Michael G. Dolence, "Strategic Planning for Information Resources - Putting the Build[illegible]g Blocks Together," *Pr[illegible]ceedings of the [illegible]986 CAUSE National Conference*, Dec[illegible] 1986, pp. 131-141.

2. Penrod, J. I. and Michael G. Dolence, "Development of IRM at California State University, Los Angeles," *Information Management Review*, 3(2), Aspen Publishers, Inc., 1987, p. 16.

3. Penrod, J. I., "A Report to the Campus: Strategic Planning at California State University, Los Angeles, Fall 1986," A CSLA Report, pp. 5-8.

4. Penrod and Dolence, "Strategic Planning for Information Resources. . . ," p. 134.

5. Ibid

6. Stromgren, Paul, "A Hybrid Approach to Data Communications," *CAUSE/EFFECT*. Vol. 12, Number 1, Spring 1989, p. 30.

7. Penrod, J. I. and Thomas West, "Strategic Planing for Computing and Communications," *Organizing and Managing Information Resources on Campus*, EDUCOM Strategy Series, Digital Press, Bedford, MA, 1989. p. 136.

8. Penrod, J. I. and Michael G. Dolence, "IRM A Short Lived Concept?" *Proceedings of the 1987 CAUSE National Conference*, December 1987, p. 177.

9. Penrod, J. I. and Michael G. Dolence, "Technological Synergies Are No Accident!!" *Proceedings of the 1988 CAUSE National Conference*, December 1988. p. 503.

10. Ibid, pp. 500-502.

11. Penrod, J. I. and L. N. Craft. "Thinking New System(s)? Some Action Items," *CAUSE/EFFECT*, Vol. 1, Number 5, September 1978, pp. 13-15.

12. Penrod and Dolence, "Development of IRM at California State University, Los Angeles," p. 21.

13. Conner, Daryl, "Key Factors for Change and Concepts for Managing it Successfully," *Management Issues*, KPMG Peat Marwick, November 1989, p. 3.

14. Ibid

15. Owen, Darrel E., "IRM Concepts: Building Blocks for the 1990's," *Information Management Review*, 5(2), Aspen Publications, Inc., 1989, p. 27.

Planning for Information Resource Management at the University of Pennsylvania: Searching for a New Paradigm

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The University of Pennsylvania, like all other major research universities, must harness current and emerging information technology to achieve its missions of teaching, research, patient care, and public service. At Penn planning and management of computing and information systems are especially challenging, because of the autonomy of the twelve school deans. A major strategic planning effort now underway seeks to leverage school investments and initiatives in order to create a University-wide data, systems, and support infrastructure. Key elements of this strategy are a new cooperative planning structure, a new client-centered program management process, and a new data and systems architecture. To succeed, these initiatives will require not only substantial resource commitments, but also a major change in organizational culture.

A year-long effort to define information technology objectives and strategies is underway at the University of Pennsylvania. Although Penn's planning is informed by technology trends and forecasts, the focus of this effort has been on process—how the University should plan, develop, and manage its information resources. Major changes are called for, both within the Office of the Vice Provost for Information Systems and Computing (ISC) and in relationships between the twelve schools and the central administration. This paper represents a snapshot taken near the end of this planning effort.

Vision of the Future

Current planning for information systems and computing at Penn is shaped by a vision of the University in the 1990's. This vision anticipates:

- Enhanced personal productivity, with appropriate information resources and computing tools, on campus and elsewhere, that are easy to use and readily available to faculty, students researchers, and administrators.

- Increased collaboration, within and across disciplines, between students and faculty, and in administrative areas, for example as the University network, PennNet, is enhanced by new information services, extended to dormitories, and interconnected to a more robust, world-wide academic network.

- Invigorated teaching and learning, with support for development and use of state-of-the-art presentations, demonstrations, simulations, tutorials, and access to semantically-organized knowledge bases.

- Excellence in research, scholarship, student services, patient care, and public service, as Penn's ability to attract the best faculty, students, and staff is supported by our reputation for an outstanding yet cost-effective information infrastructure.

- A cohesive University, as an increasingly diverse population of undergraduates and graduate students, dormitory and off-campus residents, faculty, researchers, clinicians, and staff come to value Penn as more than the sum of its world-class parts. Campus-wide access to new information services and to an integrated administrative data encyclopedia will contribute in important ways to this cohesion.

To understand the relevance of this vision requires background on the institution and its management of computing.

The University of Pennsylvania· A History of Innovation

Two hundred and fifty years ago, a charity school was founded in Philadelphia that was to become the University of Pennsylvania. Benjamin Franklin, who helped found the school, proposed a new kind of institution for students to "learn those things ... most useful and most ornamental, regard being had to the several professions for which they are intended."

Over the years, Penn has carried out Franklin's spirit of innovation in a number of ways: with this country's first liberal arts curriculum, first medical school in 1765, first law courses in 1790, first university-owned teaching hospital in 1874, first collegiate school of business in 1881, first psychological clinic in 1896, and first electronic, general purpose, digital computer, ENIAC, in 1946.

Penn Today

Penn (not to be confused with Penn State, the larger, multi-campus land grant institution) is a private, research university of 22,000 students with a strong commitment to undergraduate education. Its compact, 260-acre campus enhances the unique interdisciplinary focus of the university. For example, faculty members in the School of Veterinary Medicine regularly teach undergraduate neuroscience courses in the School of Arts and Sciences (SAS); the Laboratory for Research in the Structure of Matter includes faculty from Physics, Chemistry and Materials Science; and the new Center for Cognitive Sciences brings together colleagues from Computer and Information Sciences, Linguistics, Psychology, and Philosophy.

Contrasting with the interdisciplinary intellectual tradition is Penn's administrative decentralization, exemplified by "responsibility center budgeting" instituted in 1972. Each of the twelve schools in the university has its own income and expense, and all central expenses are allocated to schools as indirect costs. Responsibility center budgeting has succeeded in maintaining balanced budgets for the university each year since 1972 but has encouraged schools to be more independent and, occasionally, even antagonistic to each other and to the central administration. Fiscal responsibility is very important for Penn, in part because its endowment is modest compared to most peer institutions. A one billion dollar capital campaign was launched in fall 1989 to help address this issue.

Computing at Penn and the Role of the Vice Provost

Computing at Penn is a reflection of the decentralized nature of the university. All instructional and research computing is funded and managed by the schools, with substantial centers in Arts and Sciences (including an IBM 3090-200 with vector processors and an IBM 4381 managed for the University Library's NOTIS system), Engineering (numerous minis and UNIX workstations), Medicine (a small center but many departmental facilities), and the Wharton School (VAX cluster). Some centers have substantial computing facilities, such as the three mini-supercomputers in the Laboratory for Research in the Structure of Matter. Additional research computing is performed at the national supercomputer centers, accessible to the University via JVNCnet and PREPnet, mid-level components of the NSFnet.

Administrative computing is more centralized, with major systems running on an IBM 3090-180. Nevertheless numerous administrative units operate minicomputers to support transaction processing and office automation, and some school facilities support administration as well. Also centralized is installation, maintenance, and management of PennNet, which now connects over 100 buildings via fiber optic backbone. Over 3,000 end nodes can access some 100 host computers via PennNet, which uses the TCP/IP protocol required for NSFnet. PennNet also provides a gateway to BITNET.

Administrative computing and PennNet are the two largest groups reporting to the Vice Provost for Information Systems and Computing, a position established in 1983. The other two units are the Computing Resource Center, which provides campus-wide end user services, and Data Administration and Information Resource Planning. The Vice Provost's budget, roughly $10 million, compares with $10 million for computing at Wharton, $4 million for Arts and Sciences, $3.5 million for Engineering, and $750 thousand (central facility only) for Medicine.

To achieve the vision for the 1990's outlined above will require cooperation and partnerships among the central organization and the schools. The role of Information Systems and Computing (ISC) is to coordinate planning and management from a University-wide perspective and to provide a versatile, powerful, and easy-to-use information and computing infrastructure. As this infrastructure is developed, ISC must see that policies and standards are created and adopted, which requires the many University constituencies to be part of the development and control processes. Accordingly the Office of the Vice Provost has been engaged in a wide-ranging planning process, seeking input from every major constituency of the University.

Objectives

Although the planning process is by no means finished, there is consensus on a set of twelve ISC objectives. The five primary objectives are:

- Enhance access to scholarly information in partnership with University libraries. Provide consistent, easy, fast access from the desktop computer to Penn and other universities' library catalogs and databases.

- Ensure computing capacity for the research community—from resource sharing within the University to participation in regional and national supercomputing centers.

- Support school initiatives in instructional uses of computing.

- Provide students with information, network services, and computing tools. Enable students to become partners in the information environment, using the same tools available to faculty and researchers.

- Provide administrators with the information and systems needed to do their jobs. Design new systems and their underlying data structures from a University-wide perspective to promote integrated management of University resources.

Two organizational objectives are:

- Facilitate, coordinate, and support the computing activities of schools, centers, libraries, and administrative offices.

- Make planning and management of that portion of Penn's information environment under the purview of ISC more widely representative and more responsive to Penn's computing community.

The remaining objectives involve creation of the necessary infrastructure:

- Enhance the University network, PennNet, and connect more faculty, staff, and students, via PennNet, to the world-wide network of colleagues, libraries, academic and administrative information databases, remote supercomputers, and experimental instruments.

- Establish an integrated, campus-wide architecture of selected hardware and software to enable cost-effective system development and data sharing among microcomputers, minicomputers, and mainframes.

- Provide a consistent, intuitive user interface to the selected hardware and software, to encourage easy access and use.

- Establish an accessible, widely-understood base of University data, identified and defined in a University data encyclopedia.

- Enhance user support services, including education, technical assistance, consulting, problem identification and resolution.

Whether these objectives are achieved in five years or ten years depends on the soundness of the strategies proposed to achieve them.

Strategies

Nine strategies have been identified to achieve these objectives:

- Early Follower. Stay close behind the leading (some say "bleeding") edge of information technology in higher education so as to be positioned to integrate components developed elsewhere and build upon Penn's unique strengths as an interdisciplinary institution. Much Penn research will continue to develop and use state-of-the art technology, but University infrastructure will rely on proven technology.

- Funding. Seek increased funding from government, corporations, and foundations, as well as from central University funds and from leveraging initiatives at the School level.

- Representation. Create a widely-representative Information Resource Management Committee (IRMC) with four active subcommittees focused on instruction, research, administration, and infrastructure, to replace the current, disjointed committees and advisory boards.

- Planning. Establish a broad-based planning process that coordinates the information planning of ISC, the schools, centers, and libraries—and that serves as input to the budgeting process.

- Partnerships. Form partnerships internally, with schools, libraries, centers, and administrative offices, and externally, with other universities, industry, and government.

- Organization. Reorganize Information Systems and Computing to ensure leadership and advocacy for the major initiatives required.

- Quality. Taking the needs of end-users into account, establish quality standards and a process for evaluating and improving services.

- Staff Development. Improve each stage of ISC human resource management: recruitment, job assignment, compensation, training, performance evaluation, and career-path planning and development.

- National Recognition. Encourage faculty, staff, and students to seek national recognition for excellence in the use and management of information systems and technology.

Aspects of a New Paradigm

Four aspects of these strategies represent major departures in the way Penn plans and manages its information and technology resources. Although there is growing realization that managing this much change will be a formidable task (to say nothing of the need to keep the network up, get payroll out, *et al.*), there is also genuine excitement expressed by those who foresee substantial benefits from these new directions.

First the Information Resource Management Committee (IRMC) will be charged with reviewing all significant information technology initiatives, whether or not they are to be centrally funded and managed; planning and coordinating development of information systems and services; and serving as a University forum for review of technology-related policy. Subcommittees on research, education, administration, and infrastructure will set objectives and priorities in their areas and, once an initiative is approved, an IRM subcommittee will monitor its progress. Ad hoc subcommittees will be formed as needed when issues such as office automation and information security cross functional boundaries. The IRMC and its subcommittees, drawn from central and school administrators, faculty, and students, will be the first such committee to have institution-wide responsibility for technology.

Second, a Program Management process is being created to oversee individual development projects or "programs." Program team roles and responsibilities are spelled out, along with the steps needed to produce systems on time, on budget, and as users intended. The Program Management process is characterized by end-user authority and responsibility as well as strict documentation of management and design decisions. Each program team is headed by a "Program Manager" usually from the user area. All central initiatives will be managed this way, and the approach will be strongly recommended for decentralized programs as well.

Third, other schools will be encouraged to follow the lead of the School of Arts and Sciences (SAS), which has, since March 1989, been planning for computing with support from the (central) Office of Data Administration and Information Resource Planning. One of the major goals of the SAS planning process is to integrate and enhance the services of its separate academic and administrative computing groups. SAS also plans to integrate the audio visua' center. A successful joint school-central planning effort will be an important exemplar for other schools and centers.

Finally, no new major central systems will be developed until a University-wide data and systems architecture is put in place. Current applications, built without benefit of such an architecture, are proving difficult to use and expensive to maintain. Moreover they take little advantage of either the increasing power of desktop workstations or the widespread connectivity of PennNet. The next steps in this key area are to share the "Strategic Directions" document with current and potential corporate partners, and to initiate discussions with other major research universities facing a similar need to integrate a multi-vendor environment.

Conclusion

Many key stakeholders in the Penn community have expressed support for the vision and new approaches, but much remains to be done. Although a portion of the billion-dollar Campaign for Penn is earmarked for computing, these funds are not yet in hand so additional fund-raising strategies must be pursued. Moreover a nationwide search for a new Vice Provost for Information Systems and Computing has not been concluded. Fortunately the interim Vice Provost, Ronald Arenson, has vision, energy, and strong support from senior management. In fact University management is not only supportive of change, they are demanding it. We predict that Penn will be a very interesting place to watch— and work—in the months and years ahead.

Acknowledgements

Our colleagues Ronald Arenson, Carl Abramson, Bill Davies, Linda May, Jeff Seaman, and Frank Topper have contributed much work and inspiration to the planning efforts reported here. We have all hung together, perhaps because none of us relishes the prospect of hanging separately!

References

Arms, Caroline (ed.) *Campus Networking Strategies*. Bedford, MA: Digital Press, 1988.

Arms, Caroline (ed.) *Campus Strategies for Libraries and Electronic Information*. Bedford, MA: Digital Press, 1989.

Bok, Derek. "Looking into Education's High-Tech Future." *EDUCOM Bulletin* 20, Fall 1985.

Emery, James C. "Issues in Building an Information Technology Strategy." *EDUCOM Bulletin* 19, Fall 1984.

Heterick, Robert. *A Single System Image: An Information Systems Strategy*. Professional Paper Series No. 1. Boulder, CO: CAUSE, 1988.

Keller, George. *Academic Strategy*. Baltimore: The Johns Hopkins University Press, 1983.

Kiesler, Sara B. and Lee S. Sproull (eds.) *Computing and Change on Campus*. Cambridge: Cambridge University Press, 1987.

King, Kenneth, M. "Toward a University/College Systems Architecture." *EDUCOM Bulletin* 22, Fall 1987.

Spinrad, Robert J. "The Electronic University." *EDUCOM Bulletin* 18, Fall/Winter 1983.

University of Pennsylvania, Academic Computing Committee. "A Strategic Plan for Academic Computing at the University of Pennsylvania." *Almanac Supplement*, November 29, 1989.

University of Pennsylvania, Information Resource Management Planning Team. "Strategic Information Resource Management Plan of the University of Pennsylvania." November 1987.

University of Pennsylvania, Information Systems and Computing. "Program Management at Penn: A Manual for Participants." Fall 1989.

University of Pennsylvania, Information Systems and Computing. "Strategic Directions for Information Systems and Computing at the University of Pennsylvania." February 1990.

ACADEMIC DEPARTMENTAL ADMINISTRATIVE COMPUTING
VISION FOR THE 1990s

John A. Bielec
Assistant Vice President for Administrative Affairs

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Telecommunications Engineer

USER CHALLENGES

- Need to Access Mutiple Networks with Varying Protocols and Procedures
- Requirement to Utilize Multiple Applications Products and Vendors
- History of Multiple Vendor Standards and Interfaces. Standardization Efforts have generally been unsuccessful
- Growing Diversity as a result of Globalization
- Requirement for a New Operating Vision for the 1990's

GUIDING PRINCIPLES

1) The user's knowledge station should become the center of a network universe consisting of concentric spheres of information access.

2) The network services and resources available should be logical extensions of the already familiar environment of the user's knowledge station.

3) The interface to the network services should be user friendly and should transcend the hardware platform and operating system.

4) The network environment must be as reliable and as promptly responsive as the telephone system.

5) Commercial products should be used whenever possible in order to assure reliability and to reduce support costs.

GUIDING PRINCIPLES (Cont.)

6) Connectivity to intra campus, state, national, and international networks is essential.
7) Security of data must be a primary consideration for any network strategy.
8) Distributed processing services should be available to assure maximum efficiency.
9) The University must limit the hardware and software families which it supports.

GUIDING PRINCIPLES (Cont.)

10) **A coupled support strategy combining centralized and decentralized support for networking is essential to guarantee long term success.**

11) **Defining standards and University endorsed protocols is essential in defining a network strategy.**

12) **Individual departments must be given options for their local network environments in order to meet their own needs within the parameters which they face.**

13) **The interface to all network services should have the same "look and feel" for all hardware environments that are supported.**

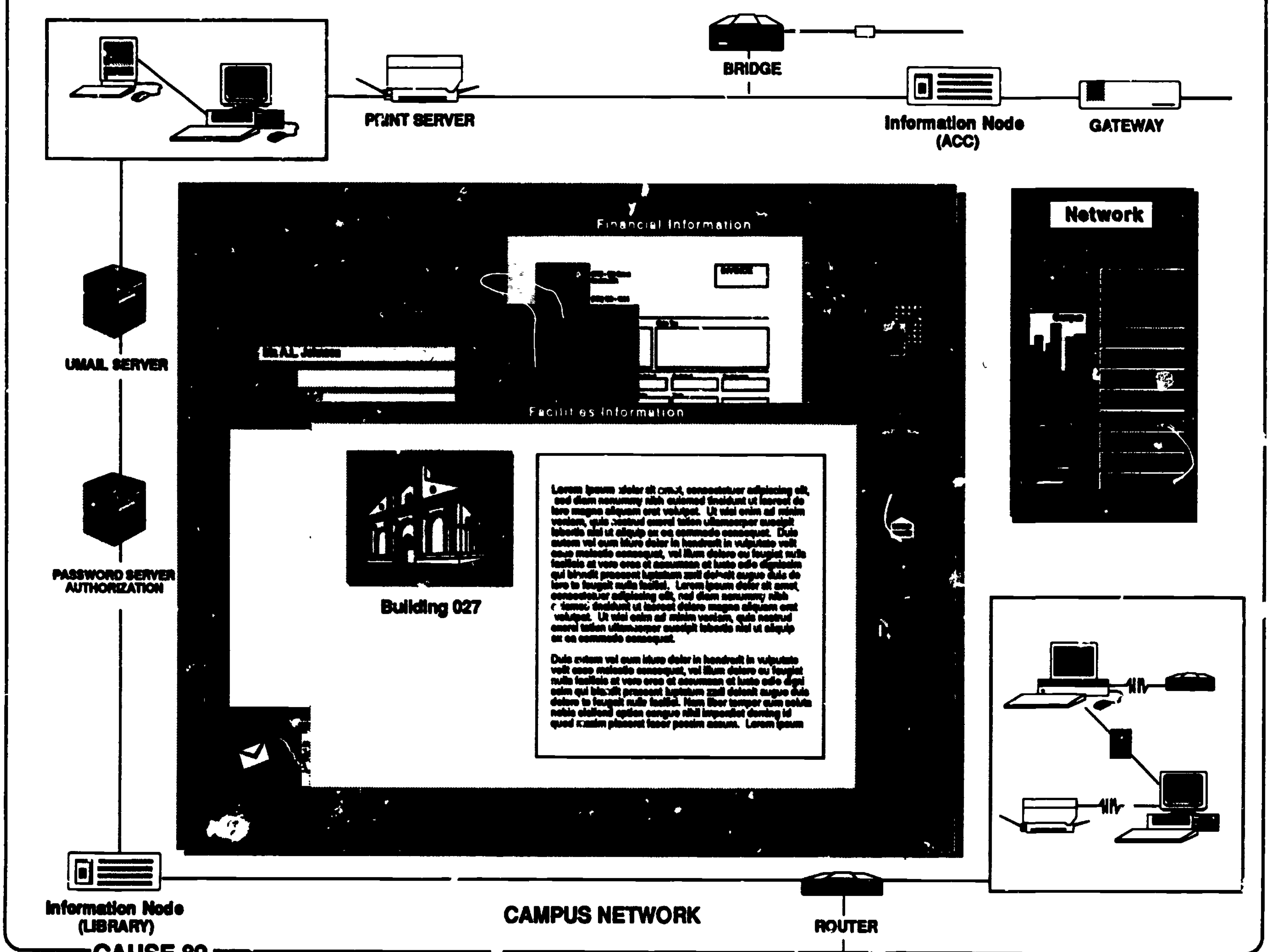
14) **The network strategy must be designed to assure maximum flexibility for evolutionary changes in technology.**

Liberally Adapted from Brian L. Hawkins, *Academic Computing,* January 1989

REQUIREMENTS

- MULTI PROGRAM "KNOWLEDGE STATION©"
- SINGLE NETWORK IMAGE— HETEROGENEOUS NETWORK ENVIRONMENT
- EASILY NAVIGABLE ACROSS NETWORKS
- SEAMLESS ACCESS ACROSS APPLICATIONS
- INFORMATION SERVERS
- SUPPORTED FAMILY OF HARDWARE AND SOFTWARE STANDARDS

ACADEMIC DEPARTMENTAL ADMINISTRATIVE COMPUTING *VISION FOR THE 1990s*



CAUSE 89

MULTI PROGRAM KNOWLEDGE STATION (PC BASED)

- 5 MIPs Processor Speed
- 10 Megabytes Memory
- Multi-Tasking Operating System
- 40 Megabytes Hard Drive (low access time)
- Mega-Pixel Display
- I/O Processors
- Audio (MIDI) Ports
- Built-in Network Adapter
- CD-ROM
- Scanner

SEAMLESS ACCESS ACROSS APPLICATIONS

- Application Interfaces Based on Supported Family Software Standards via Network Servers
  - ACC, Library, CSC, UMSA, MINC, etc.
- Movement Across Applications Independent of Physical Network Residence
  - Software Driven Directories/Servers
- Intelligent Information Transport
  - Intelligent Information Link across Different Applications
- Paperless On Screen Forms — Document Transfer
- Electronic Signatures
- Security Standards No More Rigid than Standards for Paper Security

RESOURCE REQUIREMENTS

- Adequate Funding for Creation of Knowledge Station Environment, Hardware, Software, and Access
- Establish Resources for Minimum Level of Universal Service
- Trained Personnel
  - Flexible Personnel Classifications
  - Competitive Salaries
  - System of Rewards
- Creation of Maintenance Structure
- User Support for Family Products
- Space
- Security

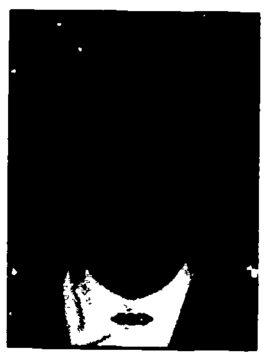
CAUSE89

Track II
Funding and Accountability Issues

Coordinator:
Mark A. Olson
University of Southern California

Demands for information resources are on the rise, life cycles for equipment are shortening, and total costs continue to increase. Requests for funding must compete for scarce resources. Managers of information technology have a responsibility to continually review methods and procedures for cost-effective and efficient solutions. Presentations in this track covered such topics as innovative strategies for dealing with these challenges and marketing them to top management; strategies utilizing industry partnerships; the evaluation of information technology needs on campus and the role of assessment; development of budget formulas for information technology resources; cost/benefit analyses for applications, equipment, and staffing; and ways to demonstrate accountability within institutions.

Cynthia Cross, University of Michigan; Donna Morea, AMS; Richard Legoza, SCT; Charles R. Thomas, NCHEMS; John Gwynn, IA



Betty Le Compagnon, University of New Hampshire

A CHECKLIST FOR INSTITUTIONAL INFORMATION SUPPORT

by

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Associate Director of Institutional Research
Virginia Polytechnic Institute and State University

and

Richard D. Howard
Director of Institutional Research
North Carolina State University

ABSTRACT

Planning and decision support processes are tools which, ideally, are designed to contribute information to individuals responsible for the operation of our institutions of higher education. In this paper a checklist of activities and critical attributes are presented which help to enhance the usability and effectiveness of institutional data and information in planning and decision activities. Three primary personnel responsibilities and five primary activities are identified, which define a process spanning key operational aspects of the development and maintenance of information support. The focus of the paper is on the human and management side of the enterprise, rather than the technical elements of hardware and software.

Presented at the CAUSE Annual Meeting in San Diego
November, 1989

A CHECKLIST FOR INSTITUTIONAL INFORMATION SUPPORT

INTRODUCTION

Distributed computing environments place unique requirements on information support at a college. In order to insure the value of support, it is necessary that those who provide information carefully consider both quality of the data bases and also requirements for support. In "Bridging the Gap between the Data Base and User in a Distributed Environment"[1] quality of institutional data bases was defined in the terms of reliability and validity. It was shown how these two aspects can help evaluate the problems which impact on decentralized database creation, management, access, and use. The article also noted that:

> "As information systems become more decentralized, they will tend to move from a state of order to disorder. Our challenge is to focus our efforts on areas that will simultaneously strengthen an information system's state of order while strengthening its ability to provide information to our decision makers."

Before quality information for decision making and planning support can be created, reliable and valid baseline data must be established. The article ended with the following quote from _Entropy_:[2]

> "Strangely enough, it seems that the more information that is made available to us, the less well informed we become. Decisions become harder to make.... As more and more information is beamed at us, less and less can be absorbed, retained, and exploited. The rest accumulates as dissipated energy or waste...."

In summary, the reader was reminded that decision makers and planners are confronted daily with a great deal of information. The first step is to insure that the information comes from data bases which are reliable and valid. Even if the data bases are reliable and valid, the data from them must be considered in terms of the process of information support to insure that they are of value to the users.

The value of information from institutional data bases is limited by the quality of the information support process. In this paper we provide a model and checklist for the development of USEFUL information support for the strategic planning and management activities on the campus. The creation of an information support process is a two-step process, the first of which is the collection of data.

> "Data are raw facts from which information can be constructed. The quality of data is determined by their validity, accuracy, and reliability, all of which are properties related to measurement."[3]

(See Howard, McLaughlin, and McLaughlin, 1989, for a discussion of the issues associated with the collection and maintenance of quality data.)

The second step, addressed in this paper, is the evaluation of the information support process. Many of the same reliability and validity concepts that are critical in the creation of quality data are used to insure the creation of useful information support.

> "Information consists of data that have been combined and given a form in which they convey to the recipient user some useful knowledge. Information is created when data are selected, organized, and analytically

> manipulated, and the result is given a form that informs and serves the needs of users."[3]

A MODEL

In order to monitor the quality of information support processes, both personnel responsibilities and information support functions must be considered. A model which interfaces personnel responsibilities of information support and the five functional steps in an information support process[4] is presented below. Once the personnel responsibilities and functional steps of the model have been defined, a checklist of activities and responsibilities are identified which can act as a guideline in the evaluation of useful decision support information. **Again, it should be stressed that the utility of the model and checklist proposed in this paper are totally dependent upon the desire and ability of the institution to create reliable and valid data bases.** Without motivation to improve the process, the old "garbage in, garbage out" rule for computing will apply to the information support system.

Also, it is within the context of the distributed computing environment[1] that the following personnel responsibilities and five functions are especially critical in the development of information support. These five functions provide the basis of the checklist for monitoring the information support process. The checklist, following a description of the model, is an example of a checklist which others are encouraged to modify according to the specific situation found at their institution. The use of a checklist, focused on the characteristics of a specific institution, will help insure reliable, valid, and useful information from all components in a distributed environment.

Information Personnel

In general, there are three types of people associated with the creation of information. While each has a specific role, all must be interdependent if the information development process is to be successful in creating useful information.

Technicians: These individuals are typically responsible for the collection, maintenance, and storage of the data. In general they are responsible for the hardware and software issues and have tended to not be involved in data quality issues. Recently, however, the appearance of data administration functions and information centers reflect increased pressures on the traditional "computer center" to address data quality issues with the users. This is a direct response to increased demands for decentralized processing capabilities.

Analysts: Typically, it is through these people that the integration and manipulation of the data occurs and information is created and disseminated. Before the technical capabilities that make distributed processing feasible, these people where usually found in institutional research offices. The result of their activity was to provide the link between the computer center technical people and the users of the information they created.

Users: Once information is created, these people apply it in decision making and planning activities. As they are the primary beneficiaries of the information development process, it is critical that they be involved in the identification of the initial data that feed the process. Responsibility for the quality of information falls upon the personnel involved in the information support process. Technicians have major responsibility for the reliability of the data that feeds the process. Both internal and external validity are the primary responsibility of the analysts. The users of the information must take direct responsibility for construct and content validity. While the above identifies the primary responsibilities of the individual personnel types, it must be emphasized that the overall quality of the information is dependent on the integrated efforts of all three types of personnel.

Functions of Information Support

The three types of personnel responsibilities, identified above, are responsible for the following five functions of information support development:

Selection: What processes and events are sufficiently important to measure? Selection involves positioning information development activities by identifying key areas or events and selecting data elements which measure or define the structures of those areas or events. Some measures should be taken from census data bases, others are valid when taken from the dynamic operating files.

Capture and Storage: How and when does one capture and store the data? Data elements should be captured at their source and coded consistently in categories which can answer questions. Data must be stored securely and still be accessible to those needing it. It is critical that the capture of data be coordinated through a central unit to insure that characteristics of each data element is known by all users. This function is often referred to as the data administration role.

Manipulation: What do the data mean? The interpretation of data requires the full documentation of their capture--the sample, the conditions, and timing. Standard analytical procedures are used to translate data into information. Often manipulation requires the integration of various data bases. The specific analysis is heavily dependent on the analysts' perception of users' needs.

Delivery: How is information presented? Delivery provides the user with qualitative and quantitative information. Timing involves having the information available when it is needed. The needs, analytical capability, and decision making ability of the user must be consistent with the reports. Standard reports and graphs support ease of interpreting results.

Influence: How can the information be made more useful and valuable? There are certain key points in organizational activities where the use of information can influence the direction or outcome of the activity. Presenting information at these critical points reduces uncertainty, influences or creates power, and focuses future events. Evaluation of the usefulness of the information for various purposes during this function, provides insights into the selection function.

These five functions are the process by which information support is developed from those data typically collected to support various operational functions of the institution. It is a closed loop, with the usefulness of information contributing to the criteria for selection and hence capture of appropriate data elements. It is a dynamic process which, in a decentralized or distributed environment, occurs at many points across the campus.

THE CHECKLIST

Based on the interaction of personnel responsibilites and information support functions, a series of checklist items are presented which can be used to monitor information support activities. For each functional area, these statements identify a generic set of activities and responsibilities that should be addressed within the specific organizational and management structure of each institution.

Selection:

o Technicians and analysts are involved in goal setting at all levels of the institution.

o There are multiple measures in most key areas.

o Everyone has a good idea of the management processes for the institution.

o Most user questions can be answered from census date data bases or the factbook.

o Standard definitions exist for key concepts such as "faculty" and "student."

o There is a set of written guidelines for IRM available to users.

Capture and Storage:

- A data element dictionary is readily available to analysts.
- Responsibility for data is assigned to key administrators.
- Input is audited as it is entered.
- There is an administrative systems group which coordinates data bases.
- Inconsistencies in data bases are identified and resolved.
- RFP's require compatibility with local standards.

Manipulation:

- Written procedures for coding data are available to analysts.
- Those who analyze the data use standard packages.
- User groups contain users, analysts, and technicians for all major data bases.
- Census date data bases are widely available to users.
- Administrators have analytical perspectives and computer confidence.
- Distributed data bases are easy to integrate.

Reporting:

- Standard graphic and analysis packages are used.
- A calendar of key decision dates is available to technicians.
- Periodic reports are in a standard format.
- Reports tell users the extent to which results can be generalized.
- The reports from various groups on the same topics have the same numbers.
- There are resources on campus for those who want to learn to use the information system.

Influencing:

- Members of the faculty use the information system.

- Users see the information as unbiased and reputable.
- Analysts are considered ethical.
- Key administrators often meet with those who provide the information.
- Vice Presidents and the President make frequent use of the information.
- Information providers include those who share the values of higher education and who understand the management of the college or university.

WHAT'S NEXT?

The purpose of the checklist is to insure that the information support process is reliable and valid in a distributed computing environment. To develop the checklist we have (1) identified the three personnel responsibilities associated with the development of information; (2) described the five functions which make up the information support process; and, (3) identified the relationship between interdependent personnel responsibilities and the functional components of an information support process.

If you want to monitor the quality of information support on your campus, we suggest that you build a checklist; and propose that you use the one presented in this paper as a starting point to develop your own, institutional specific, information support monitoring program. As you develop a checklist for your institution, remember that you may need to develop specific checklists for different situations within a campus-wide distributed environment.

REFERENCES

[1] Howard, Richard D., McLaughlin, Gerald W., and McLaughlin, Josetta, "Bridging the Gap between the Data Base and User in a Distributed Environment", CAUSE/EFFECT, Vol. 12, No. 2, Summer, 1989, p.20.

[2] Rifkin, Jeremy and Howard, Ted, Entropy: A New World View, New York: Bantam Books, 1980, p.43.

[3] Jones, Dennis P., Data and Information for Executive Decisions in Higher Education, Boulder, Colorado: National Center for Higher Education Management Systems, 1982, p.7.

[4] McLaughlin, Gerald W. and McLaughlin, Josetta, "The Organizational Context of Information Use", Information and Decisions, Peter Ewell (ed.), New Directions for Institutional Research Series, in press.

CAUSE PANEL DISCUSSION

COLLEGES AND UNIVERSITIES AS A MARKET FOR ADMINISTRATIVE APPLICATION SOFTWARE

ABSTRACT

The purpose of this session was to address the following:

- From the point of view of software developers, what is the college and university market like as a customer for administrative systems.
- What is the outlook for the coming decade?
- What systems (Student, Personnel, Alumni-Donor, Admissions, etc.) are likely to be strategic?
- How will the changing technology affect the situation?
- What is the outlook for industry/university partnerships to develop new administrative applications?
- Are these relationships likely to be different in kind or scope from past arrangements?

Panelists:

John Gwynn, Vice President -
Advanced Research Technology
Information Associates

Richard Legoza, Director
Western Region Sales
Systems and Computer Technology (SCT) Corp.

Donna Morea, Vice President
Deputy Manager College and University Systems Group
American Management Systems, Inc.

Charles R. Thomas,
Senior Consultant - NCHEMS

Moderator:

Cynthia S. Cross
Systems Development Coordinator
The University of Michigan

COLLEGES AND UNIVERSITIES AS A MARKET FOR ADMINISTRATIVE APPLICATION SOFTWARE

The purpose of this session was to address the following:

- From the point of view of software developers, what is the college and university market like as a customer for administrative systems?
- What is the outlook for the coming decade?

The moderator requested each panelist to address a specific question and then invited comments from the other panelists. Questions from the floor followed. The following is a distillation of the discussion as taped.

I. **Compared with "commercial" customers, do colleges and universities behave differently?**
   Are they less likely to see administrative systems as strategic?
   Are they more (less?) cost conscious?
   More (less?) resistant to changes in hardware and technology?
   Are they slower to make decisions?

Donna Morea, Vice President
Deputy Manager College and University Systems Group
American Management Systems, Inc.

Yes, they are slower to make decisions, but that's the only bad part. I've worked in a number of industry areas within our organization, and find that colleges and universities score very well in other respects.

My company and Carnegie Mellon University jointly sponsor an award which honors people from a variety of industries for strategic visions in information technology. One of the winners this year was Lou Herman of Waubonsee Community College. He has really brought the electonic campus to Waubonsee and even extended its reach to high schools in the community. I think it is also worth noting that the first DB2 implementation of one of our financial products was not done by American Express, Citicorp, or someone from one of the other industries, but by one of our college and university clients.

COMMENTS

Legoza: I agree that colleges and universities are more open to new technologies, strategic systems, etc. - especially compared with government, which is my company's other vertical market.

Thomas: I agree with Donna, although I think that on the point about moving slower, some of the schools - particularly in the private sector - can make decisions faster than she suggests.

Gwynn: I disagree in part. It seems to me that colleges and universities are interested in being on the leading edge, but not necessarily on the "bleeding" edge - especially for administrative systems. The planning horizon for most schools is two or three years out. That's why they are so interested in having vendors use the latest technology. They figure by the time they have the funding and planning in place what is now bleeding edge will be established technology. That was my observation regarding technologies such as databases, MIS, etc.

II. Colleges and Universities vary widely in size, complexity, management styles and relative resources.

How do colleges and universities vary in their receptivity to purchasing vendor software - rather than in-house development - when compared by those characteristics?

How do they compare in successful use of purchased systems to support critical operations?

Richard Legoza, Director
Western Region Sales
Systems and Computer Technology (SCT)

When I was a consultant for many years, I saw a profile of successful systems implementation:

- the customers took ownership (it was "OUR" system),
- there was end-user leadership for the project, including technical leadership,
- there was full-time project management, and
- there was executive level support.

Above all, when the institutions take projects seriously, and when the customers and the vendor are not naive about the implementation, we see successes.

As for the criteria of size, complexity, resources, and management style, I'm seeing fewer differences in the purchase versus buy decision because of size of the institution. Small schools tend to have more problems getting resources for implementation, but I've been seeing equally severe resource constraints at some big schools because of budget cuts.

All schools think they are different and complex. We are seeing a new generation of highly flexible systems, with rules based processing, which can be made to respond more quickly to changes in academic policy.

As for management style, I don't believe it's always easier to mandate a system. I've seen presidents and vice-presidents mandate a system, but the people who have to use the system in the end impact the success of a system. Purchased systems appeal to risk takers in management, those who want to see changes happen very quickly.

As for resources, when institutions take these questions seriously, they find that they can justify the dollars to buy the system. Where they fall short is in allowing for the people resources, particularly for implementation. Somehow they seem to think "I'll just work 80 hours a week, rather than my present 60 hours and that will get the system installed." That is not appropriate.
I think institutions have personalities, like people, and it is more useful to look at those factors - risktaking, leadership and commitment etc, rather than size, complexity and resources as predictors of success in systems implementation.

COMMENTS
Morea: I agree with Rick. I am seeing many pressures among large, complex institutions to force people who previously developed in-house to look at packaged systems. While the fact that vendors are now developing systems which can be more easily tailored to individual needs and the pressure on managers to meet timetables are both important, I find that two other factors are now critical. First, the cost of maintaining these systems is enormous. Schools are spending 85 - 90 percent or more of their budgets to maintain old systems. 2) Technology is changing at a faster rate than ever and schools want insulation against changes in technology. They see vendors as an ally in providing that insulation.

Thomas: One pattern I've seen is that smaller institutions buy entire integrated systems, whereas the larger schools buy application by application and adapt them to the local environment. Partly that's because you can't change everything at once in a large place. These schools will replace application by application on a cycle, doing the integration by themselves. Then by the time they've replaced all their systems, it's time to start all over again.

Gwynn: In my observation bigger schools buy hardware and then they buy software; smaller ones buy software and then hardware. I worked on the institution's side for a number of years and now I've been with a vendor for several years. In my experience schools which form partnerships with their vendors and work in an environment of mutual trust are more successful than those who take the attitude that the vendor is trying to rip them off. The vendors work with many schools and it is to their advantage to have the school succeed.

III. **As we look to the future, what administrative computing systems are likely to be critical to the success of colleges and universities in preserving their financial and intellectual viability? Why?**

Charles R. Thomas.
Senior Consultant - NCHEMS

There are two critical areas. The first is the transactions systems which "have" to be done, i.e. the student systems, the financial systems, et cetera. The issue is how to do it with the minimum grief and cost. If you look at the CAUSE member profile, they list about 155 different systems in 11 categories. The vendors don't begin to cover all the categories. I expect to see an increase in the number of those but there will still need to be some areas developed in-house. What I see in the way of development in that area are strategic alliances of two kinds - one is the traditional one of a school and vendor working together to build a system to be marketed elsewhere. Then I see groups of schools, consortia or groups of large schools, commissioning systems for their own use which may or may not be sold elsewhere.

Of this class of transactions system I see two types as critical: the first is Admissions (You've got to get them in the front door), and second is the Alumni system, especially in private schools - and even some publics. Those two systems drive the production function of the institution. Then next is Human Resources.

Then there is the whole area of Strategic Systems - these are systems which make information from transactions systems available to department heads and others so they can use it. What I see happening is that schools are not putting people online to their transactions systems but are extracting data on a cycle to another database system of some kind. This prevents them from modifying the records, and provides time-date stamped files for analysis using standard PC (workstation) tools.

The next level emerging in Strategic Systems are Executive Information Systems which combine snapshots of the institutional data with external information for analysis at the workstation by department heads and others.

In the future I foresee the introduction of Expert Systems, taking the skills of the best people such as benefits counselors, admissions, and financial aid counselors, and then developings way to get the right information to the right people. Another strategic issue is getting libraries and computing centers to work together.

IV. How will the changes in technology which we can foresee affect the characteristics of administrative systems colleges and universities want/need? How will these factors affect the ability of software developers to provide systems which will fill the needs of many different customers?

<u>John Gwynn, Vice President
Information Associates</u>

We are right on the threshold of a major revolution in the way information can be accessed and processed. Higher education is not unique in being affected by many of them, but it is the combination of these factors which makes the situation so difficult. These are the factors which will shape the information environment of the 90's.

INFORMATION ENVIRONMENT OF THE 90'S

1. Relational Database
2. Ad hoc query and report generation.
3. Workstation based.
4. Cooperative/Distributed Processing
5. Homogeneous user interface
6. SAA ... NAS
7. Transparent operating system
8. Transportable software
9. Increased faculty and departmental involvement in administrative processes.
10. Non-homogeneous environment
11. Rapidly changing technology
12. More in hardware and operating system
13. More generic porducts
14. More productivity products

As I see it vendors will need to build the very difficult, complex products - like LOTUS. The fragmentation and variety of higher education institutions means that vendors don't get multiples in their applications software. To get beyond this, the vendors need to move into a technology which will provide as much flexibility as possible in adapting to individual institutional needs.

Also -

- We will see more and more use of productivity tools such as CASE.
- There will be more off-loading from mainframes into the workstation, which leads us into the UNIX environment.
- We are seeing more and more faculty involvement in student counseling and guidance which leads to more need to access student information and more need for academic support systems.
- Standards are an important issue because otherwise we are into a standard of product survival.
- We pressured by a need to deal with non-homogeneous hardware and a concurrent demand for a homogeneous user interface.

I see a rapidly changing technology which will be jerking everyone around, and that the vendors are going to be major players.

COMMENTS

Morea: In the next decade I see that vendors need to develop delivery methods for systems, i.e. training. We have gotten smarter about developing systems, and adapting to new technology. We are talking about giving access to all these systems to faculty and staff all across the campus. We now have to figure out how to teach users to use sytems - and how to use use technology such as video and expert systems to do so.

Also digital imaging and optical disk technology is now at the point of stabilization and ready for use. I see a lot of applications possible, for example collecting all the paperwork for financial aid applications so that it can be routed electronically.

Legoza: It is exciting to see the technology arrive so that institutions can take 70 - 80 percent solutions and modify them to meet their needs. I think that is affecting the types of institutions we vendors are talking to these days. We are seeing more institutions which used to develop their own systems looking at vendor packages.

QUESTIONS FROM THE AUDIENCE

How will CASE tools fit in on campus?

Gwynn: Many institutions will want to modify systems bought from vendors. They will want to use the same productivity tools as vendors. Vendors will have to use CASE tools becuase campuses will use them. The only way vendors can compete with in-house development is if we sell multiples and spread the cost across several institutions.

Also CASE will be important for modifying and maintaining systems. Consider how desireable it would be to maintain systems at the design level rather than at the code. The next generation of vendor applications systems will be designed in case.

Legoza: One spinoff of the desire to use CASE is that, whereas Chuck Thomas mentioned the tendency of the larger schools to install new systems one at a time, we are now seeing some larger schools buying whole set of systems because they want to use these standards and this technology.

Morea: I'd like to add that CASE tools solve a lot of problems in customizing at client sites. When you look at what is wrong with systems, it's usually a design problem. Being able to do the work once and propagate from the design to the screens and the code and also integrate development with documentation is a key advantage of CASE.

Which CASE tools are being used at your firms?

Morea: AMS is using Excelerator at the design stage, with local enhancements "around the edges" to generate screen maps, code, and documentation and development. Systems are being developed on LANs of networked PS/2's.

Legoza: SCT is using Oracle's CASE tools and design dictionary.

Gwynn: For analysis IA is using PRISM from Index Techology; for design we use Excelerator (one of IBM's strategic alliances), and APS from Sage for code generation.

Institutional Governance: An Albatross or A Gold Mine

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In 1983, the Department of Computing Services at the University of Arkansas moved to new facilities located at the southwest corner of our 319-acre campus. This physical isolation from the heart of the campus dramatically represented the psychological separation between Computing Services and University administration. In 1987, Computing Services set out to determine how other organizations had approached this "us versus them" problem and discovered academic research results indicating that the "role and contribution" of information support organizations ranks as one of the top five key issues in information systems management. Along with this tidbit, we found a couple of management mechanisms that seemed very apropos for higher education. Although 1989 finds us in the same facilities, the psychological separation has lessened dramatically. We feel this is a direct result of implementing several of the techniques we uncovered, and that the same techniques may benefit other colleges and universities.

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Sandra M. Statham
University of Arkansas

When Computing Services moved into its new facilities in 1983, we were excited. After all, we were moving off of the first, fifth, and eighth floors of a men's dormitory building into a facility that had been built just for us, and we would all finally be physically located together. Although there was some grumbling about the fact that we would be located over a mile from the administration building, most felt that the improved facilities would more than compensate for the distance problem. That may have been true at another time, but what no one foresaw was the effect on the campus of the microcomputer revolution. Computing Services was no longer a monopoly, and users no longer felt the need to hike to either their cars or to our building simply to be able to access our services. It was not long before the physical isolation became a symbol of our psychological separation from the rest of the campus community.

All efforts to remain part of the day-to-day functioning of the University during this time frame were initiated by individual managers. A coordinated effort was not pursued until early 1987 when Computing Services' new director arrived. After sizing up the situation, he made the mainstreaming of our services a departmental priority. Part of the strategy was to determine how other computing organizations were actively coping with similar problems, and a "lit review," an idea taken from our academic brothers and sisters, was initiated.

In 1986, the Society for Information Management and the MIS Research Center at the University of Minnesota jointly conducted a Delphi survey to determine what information systems executives and corporate general managers considered as top issues in information systems management (Brancheau and Wetherbe, 1987). The survey results identified the following top five issues:

- Strategic Planning—Information support organizations need to engage in strategic planning in order to adapt to changing technologies and environments in a timely fashion. In addition, long-range planning, if it is to be successful, must be aligned with the company's strategic business planning.

- Competitive Advantage—Information systems can and do provide weapons to fight the competition. In order to take advantage of potential opportunities, information support organizations must become more responsive to the needs of their companies.

- Organizational Learning—Future prosperity is tied to the use of appropriate technology. In order for users to determine the appropriate technology, they must first learn about alternatives. Information systems professionals are expected to take a leadership role in providing the necessary training.

- Role and Contribution—Information support organizations are generally considered as "back office" functions rather than as vital, contributing components of a business. Information support organizations must work with corporate managers to assist them in appreciating a more integrated role.

- Alignment in Organization—The effectiveness of an information support organization can be either helped or hindered by the formal reporting relationship it faces.

The bad news was that we had weaknesses in all of these areas. The good news was that we now had a foundation for a turn-around strategy since all five issues contained two common elements: top management involvement and education. The next step was finding the appropriate mechanisms for implementing our strategy. The question now became, could proven business techniques be useful in a university environment?

CHARACTERISTICS OF UNIVERSITY ENVIRONMENTS

Although sources could be found that detailed the differences between higher education and business (e.g., Birnbaum, 1988; Wyatt, 1989), none were found that addressed the similarities. One possible reason for this could be that the similarities are not considered important. Robert Birnbaum implies this in his book, *How Colleges Work*, when he says, "The differences between academic institutions and business firms are significant enough that systems of coordination and control effective in one of these types of organization might not have the same consequences in the other" (p. 21). Although Birnbaum does go on to adapt current organizational behavior theory to the higher education environment, he continues to minimize similarities when he quotes *Policy Making and Effective Leadership: A National Study of Academic Management* written by J. V. Baldridge, D. V. Curtis, G. Ecker, and G. L. Riley: "the organizational characteristics of academic institutions are so different from other institutions that traditional management theories do not apply to them" (cited in Birnbaum, p. 28). Since so much attention is devoted to the importance of the differences, a review of a few of the characteristics that distinguish colleges and universities from the business world is warranted.

Institutional Governance

Institutional governance is one of those phrases that I have heard bandied around ever since I got my first job in higher education over 20 years ago. Although it was years before I finally saw a definition in print, the phrase itself was pretty descriptive, particularly when used by a faculty member to justify his or her rights in a decision-making situation. Birnbaum refers to the "Joint Statement on Government of Colleges and Universities" published by the American Association of University Professors in *Policy Documents and Reports, 1984 Edition* when he says, "The document articulated the concept of governance as a shared responsibility and joint effort involving all important constituencies of the academic community" (cited in Birnbaum, p. 8). What this really means is that, with institutional governance, authority/power is diffused. Management is generally by consensus. Just because you have administration on your "side" does not mean that you will be successful in pursuing a particular course of action. Also, depending on the particular issue, administration's backing alone could prove a detriment.

The concept of multiple constituencies is a key to understanding institutional governance. The obvious constituencies are faculty, administration, and students. In reality, these groups only touch the tip of the iceberg. Several years ago, I was involved as a graduate business student in a research project that attempted to measure organizational effectiveness in higher education by looking at the expectations of multiple constituencies. Our first assignment was to identify these constituencies. Of course, we added several other obvious groups to the above list such as alumni, the community, donors, employees, and the government. Our next step was to design and administer a survey instrument. In addition to collecting information related to the demographics of each respondent, our questionnaire solicited the individual's feelings concerning 130 statements related to desirable characteristics for an educational institution.

The results of our initial research highlighted the fact that even within the major constituency groups, different expectations existed. For example, the results for tenured faculty differed from those for non-tenured faculty. Rank also had a significant impact. Graduate students viewed the institution differently than undergraduates, etc. In every case, however, each constituency felt that its role was important to the successful functioning of the institution. Actually, this was not a surprise. Human nature is such that each individual wants to feel that he or she is important. Although the concept of institutional governance may cause university personnel to feel that they have more of a "right" to be involved, human nature is the same no matter where you are employed.

Academic Freedom

Academic freedom fuels the concept of institutional governance. Whereas institutional governance indicates that each constituency should have a voice in how the institution is managed, academic freedom removes some of the limitations associated with that voice in other environments. There is little fear of retribution. From my own rather limited view, I have seen university administration criticized much more frequently and harshly by other university personnel than their counterparts in business or government. A recent article in *The Chronicle of Higher Education* was describing "bad times" in one university's recent past and referenced "unproved charges of sexual harassment" against its former president and faculty accusations that the former president had shut "them out of the policymaking process" (Harrison, 1989, p. A3). When it rains, it pours. Of course, it is always easier to talk about people after they have left. One thing is fairly obvious, if the college or university community is not given the opportunity to have a say-so in the governing of the institution, they will still use their voices, just somewhere else.

Academic freedom not only relates to what one says inside or outside of the classroom and to which research interest one pursues, it also relates to where time is devoted. Time is a valuable commodity. For every issue, there will be those who do not place enough importance on it to devote time to it. However, this does not necessarily mean that they do not want to take part in any decision making that takes place related to the issue. Birnbaum states, "Faculty may fight for the right to participate in committees and then not attend meetings" (p. 170). Often, the opportunity for expression or involvement is more important than the actual partaking. On the other hand, there are also issues that are important enough to the individual that significant time would be invested if the opportunity for involvement was there. The major difficulty is in predicting which issue falls into which category.

Business or "Hobby"

Another major difference between higher education and business that could actually explain a number of the other differences relates to the definition of the organization's purpose. Most businesses place significant importance on increasing shareholder wealth. There is little ambiguity here. On the other hand, there is much ambiguity when colleges and universities try to define their purposes. In the grand scheme of things, the purpose of an educational institution is to prepare individuals to contribute to society. Although this romantic view is comforting, in reality, our institutional missions are much more complex. Depending upon one's affiliation with a specific constituency, different, sometimes conflicting, goals of the institution may be emphasized. A joke I have heard in various forms throughout my computing career goes something like, "This would be a great place to work if it weren't for the students," or "... the faculty," or "... the administration"—depending on the perspective of the speaker. There are at least as many perspectives as there are constituencies.

PARTICIPATIVE MANAGEMENT

There are, of course, many more differences between specific institutions of higher education and the business world, but there are also many differences among individual colleges and universities themselves. Since the majority of my formal education took place in a College of

Business Administration, I was decidedly prejudiced and determined to steal and adapt any mechanism that I perceived as having even the slightest chance of working, despite the differences. Furthermore, my favorite technique, stolen from the human resource management discipline, appeared to have the necessary characteristics to work in the higher education environment of institutional governance. I started pursuing participative management.

What is it?

Rosabeth Moss Kanter defines participative management as "the building and nurturing of a collaborative team that is more fully consulted, more fully informed than the ordinary—one that shares responsibility for planning and reaching outcomes" (1985, p. 197). In her book *The Change Masters* (1983, pp. 34-35), Kanter states:

> Participative teams are not equivalent to 'groupthink,' or inaction without consensus, or management by committee—three negatives to many American managers. They are action bodies that develop better systems, methods, products, or policies than would result from unilateral action by one responsible segment, or even from each of the team members working in isolation from the others.

When should you use it?

Kanter (1985, p. 198) describes twelve situations when the use of participative teams could have a positive impact on the organization:

- To gain new sources of expertise and experience.
- To get collaboration that multiplies a person's effort by providing assistance, backup, or stimulation of better performance.
- To allow all of those who feel they know something about the subject to get involved.
- To build consensus on a controversial issue.
- To allow representatives of those affected by an issue to influence decisions and build commitment to them.
- To tackle a problem that no one 'owns' by virtue of organizational assignment.
- To allow more wide-ranging or creative discussions/solutions than are available by normal means.
- To balance or confront vested interests in the face of the need to change.
- To address conflicting approaches or views.
- To avoid precipitous action and explore a variety of effects.
- To create an opportunity and enough time to study a problem in depth.
- To develop and educate people through their participation: creating new skills, new information, and new contacts.

When should you ignore it?

Kanter (1985, p. 198-199) also describes eight occasions when the use of participative teams could have a detrimental effect on the organization:

- When one person clearly has greater expertise on the subject than all the others.
- When those affected by the decision acknowledge and accept that expertise.

- When there is a 'hip pocket solution': The manager or company already knows the 'right answer.'
- When the subject is part of someone's regular job assignment, and it wasn't his or her idea to form the team.
- When no one really cares all that much about the issue.
- When no important development will result or others' knowledge would neither contribute to nor be served by their involvement.
- When there is no time for discussion.
- When people work more happily and productively alone.

How does it relate to today's issues?

I am reassured by the fact that the concept Kanter, and others in the human resource management discipline, refer to as participative management is growing in popularity. Recent publications from only a handful of sources extol the virtues of developing partnerships to improve the probability of success in computer-related projects (Alter, 1989, p. 56; Bruce, 1989, p. 56; Currid, 1989a, p. 81; Currid, 1989b, p. 91; Freund and Schlier, 1989, p. 45; Inmon, 1989, p. 24; May, 1989, p. 4; Ryland, 1989, p. 14; Scheier, 1989a, p. 91; Scheier, 1989b, p. 91; Stone, 1989, p. 74). Surely participative management, shared responsibility, teamwork, partnerships, or however else you might label the concept of involving users, would work in an environment where institutional governance reigns.

UNIVERSITY OF ARKANSAS STRATEGIES

As noted above, our strategy contained two major facets: top management involvement and education. We chose to implement it using a participative management approach. The implementation itself consisted of several activities that were somewhat dependent upon one another. At a minimum, they worked in concert with one another to achieve our objective.

Executive Symposium on University Computing

Top management commitment and support has been cited as a prerequisite for any organization to successfully implement a program that crosses territorial boundaries (Freund and Schlier, 1989, pp. 45-46; Glover, 1988, p. 19; Marks, 1989, p. 14; Nolan, 1982, p. 75; Scheier, 1989a, p. 91; Stone, 1989, p. 76). The need for computing organizations to adopt a marketing philosophy has also experienced recent popularity in the literature (Bouldin, 1989, p. 26; Bruce, 1989, p. 44; May, 1989, p. 4; Moad, 1989, p. 100; Ryland, 1989, p. 14). At the 1988 CAUSE National Conference in Nashville, our director described how these ideas came together one day while he was reviewing his "junk mail" (Zimmerman, 1988, p. 105). The result was a half-day "free seminar" for the University's Chancellor and vice chancellors that we called the Executive Symposium on University Computing. If you were able to attend Dr. Zimmerman's session last year, you may remember the acronym he used to describe it—ESUC. In addition to providing our administration with some needed information, the symposium also increased Computing Services' credibility. It was so well received that the Vice Chancellor for Academic Affairs requested that we repeat it for the Deans' Council. It was later repeated for the university-wide Computing Activities Council and for our departmental staff.

Individual Partnerships

One thing is certain in a university environment. There is an ample supply of expertise. Although I cannot speak for all colleges and universities, the ones that I have experienced have uniformly encouraged faculty to share their expertise with the outside world via consulting.

Our strategy included trying to find expert faculty with goals similar to ours that would lend support to some rather hefty projects in the "inside" world. For example, a faculty member in the College of Engineering was very interested in the concept of networking the campus since he had recently been involved in networking his college. He had also served as a consultant in this area. We developed a partnership with him where he contributed the ideas, and we did the leg work. When it came time to brief the Chancellor, he delivered the presentation. Simply by virtue of the fact that a well-respected faculty member made the presentation, the Chancellor knew that at least one academic college was behind the project. The next thing we knew, we had a budget (albeit not all we asked for) and an ad hoc committee appointed by the Chancellor to implement phase one of a campus-wide backbone network.

Another partnership we developed with a faculty member had similarly dramatic results. We already knew that we needed to engage in strategic planning for computing resources for the entire campus. We also knew that our academic colleges would not be too receptive to the idea of Computing Services "telling" them what to do. Since one of our major topical areas in the ESUC was the need for coordinated planning, we had also received feedback that the Chancellor and vice chancellors recognized this need too. The problem was determining how to proceed without alienating our academic brothers. This time, a faculty member in the College of Business Administration came to our rescue. He had just accepted the chairmanship of the University's Computing Activities Council. Once again, we developed a partnership where he contributed the ideas, and we did the leg work. Although it took 18 months, we now have a campus-wide plan for computing resources.

Computing Activities Council

The Computing Activities Council could be considered the University's answer to the concept of a steering committee. It is appointed by the Chancellor and "reviews, monitors, and recommends policies related to the needs, uses, budget allotments, and information control measures for the computing facilities and functions as a hearing body for proposed modifications to those policies" (*Faculty Handbook*, 1986, p. 32). Its membership consists of faculty representatives from each of the University's colleges and a couple of administrators. Prior to 1987, even though the Council met monthly during the academic year, it did little more than rubber-stamp policies such as how long reader files could be stored on the system before they were purged. The academic-types accused the Council of being an administrative committee and the administrative-types said the Council was dominated by academicians.

When the new faculty chair took over in 1987 things started to change. First, Computing Services assumed the clerical functions associated with calling meetings, etc. This relieved the chair of having to spend significant time with details, and he could devote more of his time to really important matters. Next, the chair developed a number of subcommittees to deal with different issues: administrative information systems, library automation, microcomputer management, networking, planning, and supercomputing. The same kind of partnership that Computing Services had formed with the chair soon became associated with each of the subcommittees as well as the Council as a whole. Council presentations to the Chancellor were much more effective than requests from Computing Services to the Vice Chancellor for Finance and Administration that were then forwarded to the Chancellor. At the end of one such presentation, the Chancellor queried two faculty members representing two different colleges as to their positions on the issue. When both responded positively, the Chancellor responded that if those two colleges agreed on something, it must be inevitable.

Ad Hoc Committees

"Ad hoc committee" is just another way of describing a participative management team. It can be a very powerful device when used wisely. One of the ingredients we found essential to the successful functioning of an ad hoc committee is knowledgeable leadership. Over the past two years, the Chancellor has appointed three ad hoc committees related to computing. The Computer Network Planning Committee was assigned the task of implementing phase one of our campus-wide network backbone. Once this task was complete, the ad hoc committee was excused and a new subcommittee of the Computing Activities Council was formed to work with the University's networking specialists. The Student Information System Committee was formed to develop specifications for a new, integrated student information system. After the specifications were complete, this committee too was excused and a new committee is being formed to oversee the acquisition and implementation of a new system. The third ad hoc committee formed was the Library Automation Committee. Its purpose is to develop specifications. Although committees can sometimes be heavy to carry around, we have found that the benefits of involving all players is worth the weight. This is particularly true when you consider that Computing Services may have been the representative left out as has happened in the past.

Computing and Information Technology Management Principles

Several months ago, our attention turned from dealing with specifics such as implementing the network backbone, upgrading the mainframes, or acquiring a student system to thinking in more general terms. Although we have made much progress in the past couple of years by using a participative approach, it seems reasonable that someday we may want to function a little more efficiently, particularly on routine matters. The literature tends to toot the horn of a full-functioning steering committee/user board (Bouldin, 1989, p. 26; Drury, 1984, p. 256; Glover, 1988, p. 19; Marks, 1989, p. 14; Nolan, 1982, p. 72; Reck and Reck, 1989, p. 89). Although the Computing Activities Council could serve such a role, we were not fully comfortable with it as a long term solution as it stands today. For this reason, we were quite excited this spring when we ran across an article in *Harvard Business Review* by T. H. Davenport, M. Hammer, and T. J. Metsisto entitled "How Executives Can Shape Their Company's Information Systems" (1989, p. 130). This article discussed the development of principles to guide computing and information technology management. We started the first step this past summer. Computing Services' managers held several meetings to develop a "strawman" set of principles. These principles are now being reviewed by the Vice Chancellor for Finance and Administration with the idea that they will eventually be presented to the Chancellor and other vice chancellors for acceptance. Along the way, the Computing Activities Council will also be provided the opportunity to have input. Once the principles are accepted, they could be used by Computing Services to make routine decisions and would define those occasions when decisions needed to be taken directly to the Council.

RESULTS

Today, Computing Services is generally considered to have a vital role in the day-to-day functions of the University. This is a quantum leap from the time when the typical computer user would rather do almost anything than to have to deal with us. The change did not occur overnight, and we still have a long way to go. The essential thing is that today we are perceived as being headed in the same general direction as the rest of the campus. We believe that the activities described above account, at least in part, for this change in perception. The key, however, has been our genuine openness. We have both listened to and acted upon the concerns of our campus community.

Setbacks

Although we feel that our partnerships have produced positive outcomes, the process is not as easy as it may sound. One of the major difficulties is time. Sometimes, things seem to take forever. It is often tempting to think that you could have already implemented something in the time it took just to educate the players. Expectations of progress must constantly be down-graded to match actual progress. In order to minimize disappointment, each individual meeting must be viewed as only a small part of the whole. When discussions start going in circles, or get way out on a tangent, even though it seems like it would save time to cut the conversation off, it is better to let it run its course or to subtly redirect it. Occasionally, such a conversation might be just what is needed to convince the last dissenter. Finally, sometimes you have to step back and take a long-range perspective just to see how far you have come. All in all, I imagine that the process is like plastic surgery. It is no fun while you are going through it, and the process seems to take forever, but the results are generally worth the trouble.

Successes

There is no doubt in my mind that if Computing Services had set out alone to implement the network backbone, we could not have achieved the quality of results we have today, even though it would have been available much earlier. It took a faculty member at a committee meeting asking if the goal was to implement the cheapest alternative or to implement what was best for the University to get everyone behind the concept of a network that the University could look upon with pride. Somehow, it would not have been the same if a systems analyst had asked this question. I believe that a significant indicator of our success is that people refer to UARKnet as the "University's network," not "Computing Services' network." This is a far cry from the old days when they had to use "Computing Services' [mainframe] computer."

The Future

We plan to continue to use the participative partnership approach for major University projects, particularly those that have far reaching implications such as the network backbone and the student information system. Now that we have some experience, we have learned first-hand those things which can either make or break the experience. Not surprisingly, we were not the first to uncover these. Kanter (1985, p. 224) actually concludes her discussion of participative management by offering the following ten suggestions for organizations that would like to implement a participative approach:

- Start small and with local issues.
- Neither promise nor expect too much.
- Allow people to define for themselves the issues they want to discuss and to opt out of those they wish to avoid.
- Involve parties whose power might be at stake and give them important, rewarded roles in the new system.
- Provide education on both the skills of participation/decision making and the issues to be discussed.
- Maintain leadership.
- Make sure minority views are heard; be wary of group pressure.
- Keep time bounded and manageable.
- Provide rewards and feedback—that is, tangible signs that the participation mattered.
- Expect participative teams to wax and wane; they supplement, rather than replace, the hierarchy or routine structure.

Of the above, our experience indicates that "maintain leadership" is probably the most critical. We might even suggest that you change it to "maintain knowledgeable leadership." A vision of the future is needed. This is a piece of cake if the leader represents the information support organization; however, this has not usually been the case with us. It then becomes a challenge for your organization to turn the appointed leader into a real leader.

REFERENCES

Alter, Allan E. "Comrades in Arms." *CIO*, November 1989, pp. 56-67.

Birnbaum, Robert. *How Colleges Work: The Cybernetics of Academic Organization and Leadership*. San Francisco: Jossey-Bass, 1988.

Bouldin, Barbara. "When Resistance Reigns." *MIS Week*, 28 August 1989, pp. 25-26.

Brancheau, James C., and James C. Wetherbe. "Key Issues in Information Systems Management." *MIS Quarterly*, March 1987, pp. 23-45.

Bruce, Thomas A. "Data Administration as a Business." *Database Programming & Design*, November 1989, pp. 44-56.

Currid, Cheryl. "End the Us-vs.-Them Bias With Sense of Partnership." *PC Week*, 25 September 1989, p. 81.

_____. "Smart IS Managers Know 'You Never Walk Alone.'" *PC Week*, 2 October 1989, p. 91.

Davenport, Thomas H., Michael Hammer, and Tauno J. Metsisto. "How Executives Can Shape Their Company's Information Systems." *Harvard Business Review*, March-April 1989, pp. 130-134.

Drury, D. H. "An Evaluation of Data Processing Steering Committees." *MIS Quarterly*, December 1984, pp. 257-265.

Faculty Handbook, University of Arkansas, Fayetteville, Arkansas, November 1986.

Freund, Eric, and Frank Schlier. "Changing the IS Mission." *Computerworld*, 3 July 1989, pp. 45-46.

Glover, Robert H. "Realizing the Benefits of Information Technology Investments on Campus." *CAUSE/EFFECT*, Winter 1988, pp. 17-56.

Harrison, Charles. "Humanist Restores Hope to Once-Troubled Drexel U. With a 'Magic Wand'—and Successful Fund Raising." *The Chronicle of Higher Education*, 18 October 1989, p. A3.

Inmon, William H. "The Team Development Approach." *Database Programming & Design*, November 1989, pp. 23-24.

Kanter, Rosabeth Moss. *The Change Masters: Innovation for Productivity in the American Corporation*. New York: Simon and Schuster, 1983.

_____. "Dilemmas of Managing Participation." In Michael Beer and Bert Spector (eds.), *Readings in Human Resource Management*. New York: The Free Press, 1985, pp. 196-226.

Marks, William W. "Managing MIS Project Mayhem." *System Builder*, April/May 1989, pp. 14-29.

May, James H. "Chaos and the Marketing of Computing Services on Campus." *CAUSE/EFFECT*, Spring 1989, pp. 4-6.

Moad, Jeff. "Asking Users To Judge IS." *Datamation*, 1 November 1989, pp. 93-100.

Nolan, Richard L. "Managing Information Systems by Committee." *Harvard Business Review*, July-August 1982, pp. 72-79.

Reck, Robert H. and Virginia P. Reck. "Steering IS Committees Straight." *Datamation*, 15 October 1989, pp. 89-92.

Ryland, Jane N. "An Interview with John F. Rockart." *CAUSE/EFFECT*, Fall 1989, pp. 9-14.

Scheier, Robert L. "A Little Politicking Makes Partnerships Work." *PC Week*, 2 October 1989, p. 91.

_____. "Partnership Is the New Name of the Game." *PC Week*, 2 October 1989, pp. 91-93.

Stone, Charles. "Warm-Blooded Technology." *CIO*, November 1989, pp. 74-78.

Wyatt, Joe B. "The Information System as Trusted Colleague." *CAUSE/EFFECT*, Fall 1989, pp. 46-48.

Zimmerman, Robert E. "Survival Skills for the Computer Center in the University of the Future." *Proceedings of the 1988 CAUSE National Conference*, November 29-December 2, 1988, Nashville, Tennessee, pp. 101-108.

Administrative Computing at Stanford: What Didn't Work and What Might

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Abstract

In 1987, Administrative Computing at Stanford underwent a major reorganization that included moving the organization under a new Vice President, creating new management structures, and decentralizing applications support programmers into the line organizations. This paper explains some of the causes leading up to those changes and attempts to assess what has worked and what hasn't in financing and managing administrative computing at Stanford. The first section of the paper discusses organizational and management issues, the second the financial strategies, and the paper concludes with some thoughts on charged-out services written 25 years ago by the 1972 Nobel Prize winner in economics, Kenneth Arrow.

Administrative Computing at Stanford: What Didn't Work and What Might

I. Introduction

In 1987, administrative computing at Stanford underwent a major, and for some, stressful, reorganization. The purpose of this paper is to describe some of the key factors that led up tho this reorganization and explain some of the management and financial strategies adopted in rebuilding a stable, responsive administrative computing environment.

The choices institutions make about to structure their budgets and their budget processes often determine how difficult or easy certain ventures are to start and how well others will succeed.

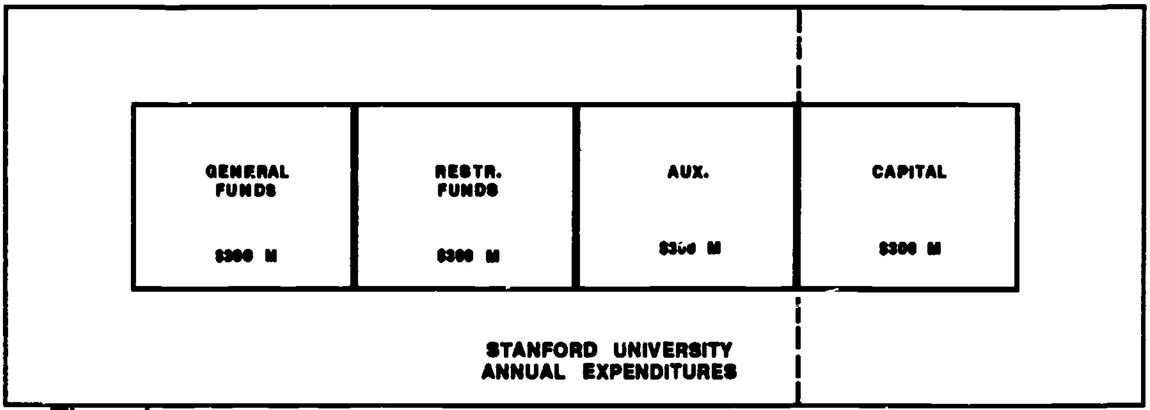

Figure 1

Total Expenditures at Stanford

As Figure 1 shows, to the nearest 100 million dollars, Stanford spends $300 million annually in general funds, $300 million in Restricted Funds (restricted to the use of specific schools, departments or activities), $300 million in Auxiliaries (such as the Linear Accelerator, the Faculty Practice Program, the University Press, Intercollegiate Athletics, etc.), and another $300 million in Capital expenditures such as new buildings.

The fact that such a large portion of the expenditures are made in the Restricted Funds Category means that the institution is very independent and entrepreneurial. And, this independence and the local control of such large resources means that the preferred mode for new adventures is charge out (i.e., service centers). For those unfamiliar with Service Centers, these are essentially what industry would refer to as profit centers, except that they are not allowed to run profits.

II. Management Structure in 1986

Figure 2 is one depiction of a Stanford Organization Chart for 1986. As most university employees know, organization charts for universities are completely dependent on who is writing the chart as, for the most part, organization charts are either never written down or not shared.

In 1986 there were six Vice Presidents. Excluding the Medical Center, which was and continues to be mostly independent, the largest Vice Presidential Areas were the Provost's (who is also the Chief University Budget Officer) and the Vice President for Business and Finance.

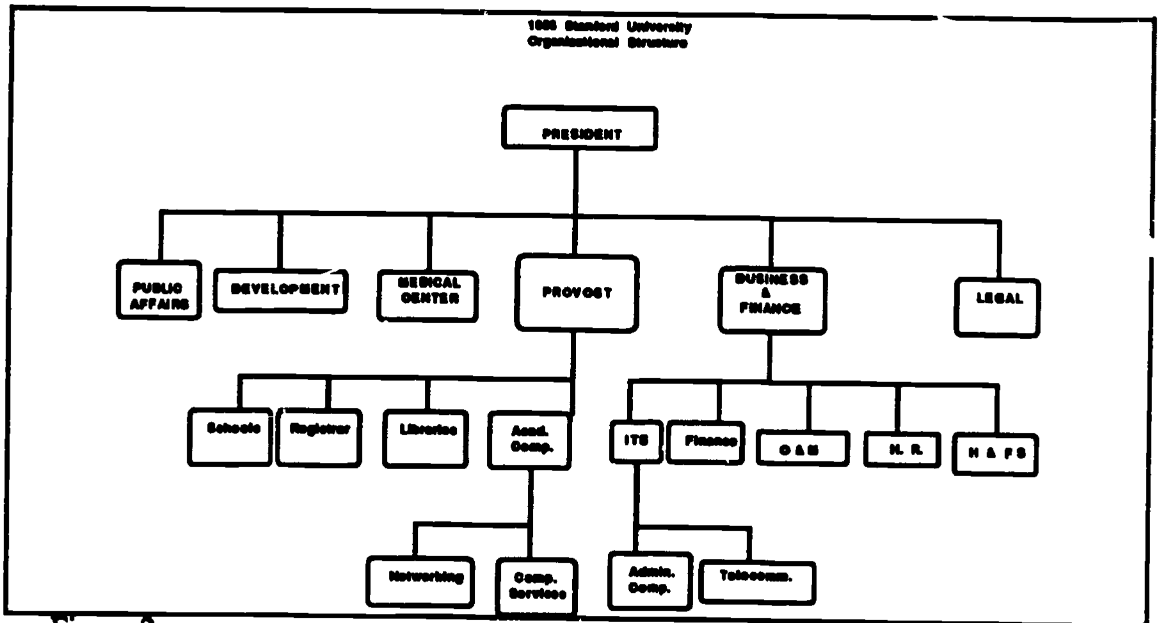

Figure 2

Major local systems applications had been built in the Development Office (reporting to the Vice President for Development), the Registrar's Office and Libraries (reporting to the Provost), Telecommunications (reporting to the Director of ITS), . he Controller's Office and Human Resources (reporting to the Vice President for ...ness and Finance). These local applications were written in SPIRES due to a University policy, adopted in 1982, that central data bases have similar structures.

Information Technology Services (ITS) and the Vice President for Business and Finance were responsible for the entire range of administrative computing services. Central computing capacities were provided on a fee for usage basis from ITS. Application support programmers for both maintenance and development of systems were available to local units for hire from ITS.

Funding for these resources resided in different locations. Funds to pay for computing capacities resided in the local units budgets along with funding for applications maintenance. Funding for development of new systems resided in the staff function of the Vice President for Business and Finance.

III. Management Problems with this Structure

The authors have heard said, both by Stanford folks and by non-Stanford folks, that the main problem ITS had was that its mission and goals were not in alignment with those of the University. In our opinion, this simply is not true. We believe that ITS and its previous leaders listened very closely to what the community wanted and did everything possible to provide that level of service. This included extensive computer related consulting services and everything else from providing copy centers to post office box services. Virtually everything that someone wanted was provided.

The problem was not the services, it was the cost of those services. And, the cost center model which had allowed tremendous growth based on local demand ultimately provided for the downfall of ITS.

What Went Wrong?

1. Lack of Capacity Forecasting

Both local units and central ITS did capacity forecasting to some degree but neither integrated their forecasts with each other. The local areas typically had someone who worked for central ITS responsible for making projections but this person was in an awkward situation. The local unit frequently did not want to be told that they would need 15-30% more capacities and furthermore did not have funding to pay for capacity increases of this magnitude. Thus, local units typically did not have official forecast estimates and if they did, they were simple statements that next years capacity needs would fit within the units budget (i.e., something like 5% growth).

Central ITS, on the other hand, knew that 5% growth was unrealistic and that based on historical data, 30% growth per year was a much better estimate to use in determining when machine upgrades were needed.

2. Flat or Declining Rates

The result of this capacity planning, or lack thereof, was that ITS assumed computing capacities would grow by 30% per annum and thus determined that they could decrease rates by 10% per year and still increase total expenditures by 20% per year.

3. Expenditure Control

Expenditure control was the principle area where the problem manifested itself. The key users of these services (the local applications) were not happy paying for the free consulting services that were being offered to support the rest of the administrative community.

4. Budgeting for New Systems

Budgeting for new systems didn't work because new systems were forced to pay average costs rather than incremental costs. And, more importantly, the central budget officer was either unable or unwilling to pull back funds from areas that received windfalls.

5. <u>1986 deficit</u>

The result of all this was that, in 1986, ITS ended with a $2 million deficit and a whole lot of finger pointing.

The local application areas blamed ITS because, "how could we project how much our systems were going to cost when ITS keeps changing its rates."

ITS blamed the local application areas because. "If ITS controlled application development, then the applications wouldn't use so much computing capacities."

Staff for the budget process blamed the Vice President and his staff for not controlling expenditure growth and the Vice President blamed the budget staff for not anticipating that the local areas would not have enough funds to pay for their computing needs.

After many months of this and a review committee established by the Provost to reduce ITS expenditures, the Provost finally declared a stop to the finger pointing and created the following new computing structure at Stanford.

IV. 1988 Organization Chart

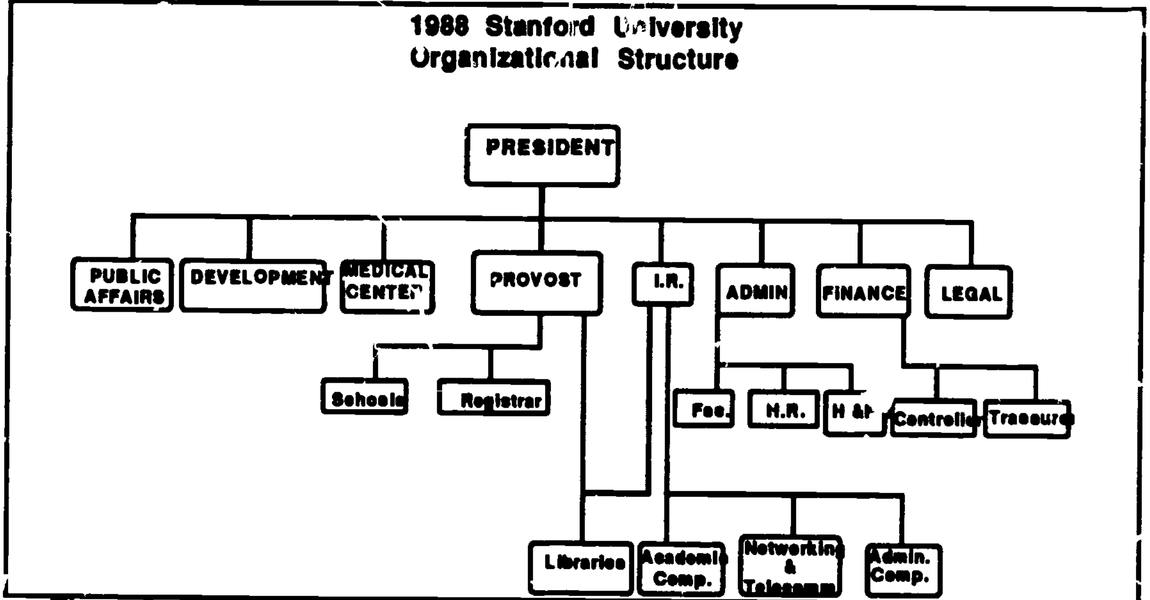

Figure 3

Figure 3 depicts the changes that took place from 1986 to 1988. Not one but two new Vice Presidential areas have been formed. Information Resources (IR) is now responsible for Academic Computing, Administrative Computing, Networking and Telecommunications Services and Library Technologies. In addition, the Vice President for Business and Finance's desire to move into new ventures resulted in the creation of an eighth Vice President for Administrative Resources. This VP took over Human Resources, Facilities Planning, Operations and Maintenance and Student Housing and Food Services.

The structure of Administrative Computing Services also changed. Whereas in the past ITS provided the computing capacities on a charge out basis and hired the applications programmers, under the new structure the applications programmers were decentralized to the local areas and computing capacities are now purchased on a pricing agreement basis.

The management structure of administrative computing also changed with the creation of the Core Resources Allocation and Management Group or CRAM for short. (There were some unhappy people at this name but after discussing some worse names, CRAM stuck.) CRAM's charge, as its name indicates, is to allocate core capacities to the central, core applications and to manage the use of those resources.

Here too was something that didn't work. The first pass at creating CRAM was to have the Assistant Vice President for Information Resources (Chair), the Controller, the University Budget Officer, the person in charge of the applications development fund, and the Director of Administrative Computing as the members. Needless to say, this structure did not go over very well with the University Officers in the Libraries, Registrars Office, or the Development Office. After all, these offices were still the core clients.

So, after a little more thought, it was decided that CRAM should in fact include its primary clients (i.e., the senior officer responsible for each of those applications areas) in addition to those mentioned before.

V. The Need for a Creative Financial Strategy

The organizational solution that proposed decentralization of the applications programmers, recentralization of funds for mainframe services, and an oversight management group called CRAM created a unique set of challenges for a financial strategy to support this new entity. Essentially, the financial strategy had to achieve the following goals:

1. Create a funding/charging mechanism that would assure the authority of the new CRAM management structure.

Without some control over resources, the new management group would have little clout and insufficient accountability to make the new reporting relationships work.

2. Support control of Applications Programming in the line organizations

A major complaint about the old organization was one of the lack of understanding of the essential University processes that systems had been designed to support. They were not adequately designed with client needs in mind.

3. Protect the University Operating Budget from uncontrolled growth in computing costs.

As mentioned earlier, unconstrained growth in computing costs hitting the Operating Budget had to be brought into control. It was the key factor in triggering the reorganization of administrative computing.

4. Maintain an equitable charge-out strategy for cost recovery to meet Federal A-21 regulations governing service centers.

Because Stanford is a major research University with administrative computing costs ultimately allocated to federally sponsored research projects, our Service Center charge out policies must meet the criteria of federal regulations. Principal of these regulations is the requirement that users be charged equitably to assure fair costing to Government sponsored projects.

5. Provide long-term stability for the Data Center that would assure timely hardware and software upgrades as necessary.

While controlling costs to the University remains a primary concern it is equally important to maintain the Data Center's technology at a level that optimizes Stanford's needs against the opportunities created by technological advances. Upgrades on our IBM mainframe units are needed on 2-3 year intervals to meet our client needs and to keep up with the technology so we don't find ourselves in a technological cul de sac.

VI. The CORE Concept for Funding Primary Administrative Systems

In order to meet all of the objectives outlined above, the concept of CORE was developed. Essentially, the idea was to have the Provost enter into a partnership with the Stanford Data Center to purchase a piece of the IBM mainframe for the use of the primary administrative systems. On an annual basis, the central Operating Budget would buy a share of the mainframe's overall CPU capacity, disk and tape storage, and printing capacity. Instead of billing each client account for actual CPU seconds used, pages of print and megabytes of storage, the Provost, with Operating Budget funds, owns a percentage of these capacities and allocates them to the CORE clients (including the Registrar, Controller, Office of Development, Administrative Resources and the Libraries). The amount purchased would be based on historical usage and estimates of growth for existing function, plus some head space.

This concept met objectives #3 and #5 outlined above in that it is a reasonable cost recovery method under A-21 principles and it established the full cost to the Operating Budget well in advance providing the needed cost control. The only problem was that the funding to purchase a piece of the mainframe was in the individual CORE clients' budgets! In order to make the CORE concept possible it was necessary to pull these dollars out of the line organization budgets. This was also the key to making the CRAM management group work (objective # 1). Making them collectively responsible for the CORE budget would support their authority.

At Stanford very little is done by mandate. Thus, it was necessary to persuade the line managers that this plan was in their best interests as well as those of the Provost. This was accomplished by emphasizing the advantages of budget stabilization that would come from knowing in advance exactly what their computing costs would be for three years in advance. Plus, the line managers bought into the overall concept of optimizing local control for applications programming and central control of the Data Center budgets. Of course, the principal line managers, such as the Controller and the Registrar, who are owners of the large administrative systems are members of the CORE Resource Allocation

Management (CRAM) group. This gives them dual responsibility for both their own applications and for sharing in the management of the overall CORE capacity allocations and growth. Once these funds were centralized in the control of the CRAM group, objectives #1 and #4 outlined above were realized. Moving the applications programmers into the line organizations, ***where the funding was,*** and co-locating them with the line staff met objective #2. Figure 4 shows this realignment of the applications programmers to the line and the recentralization of the production computing budgets.

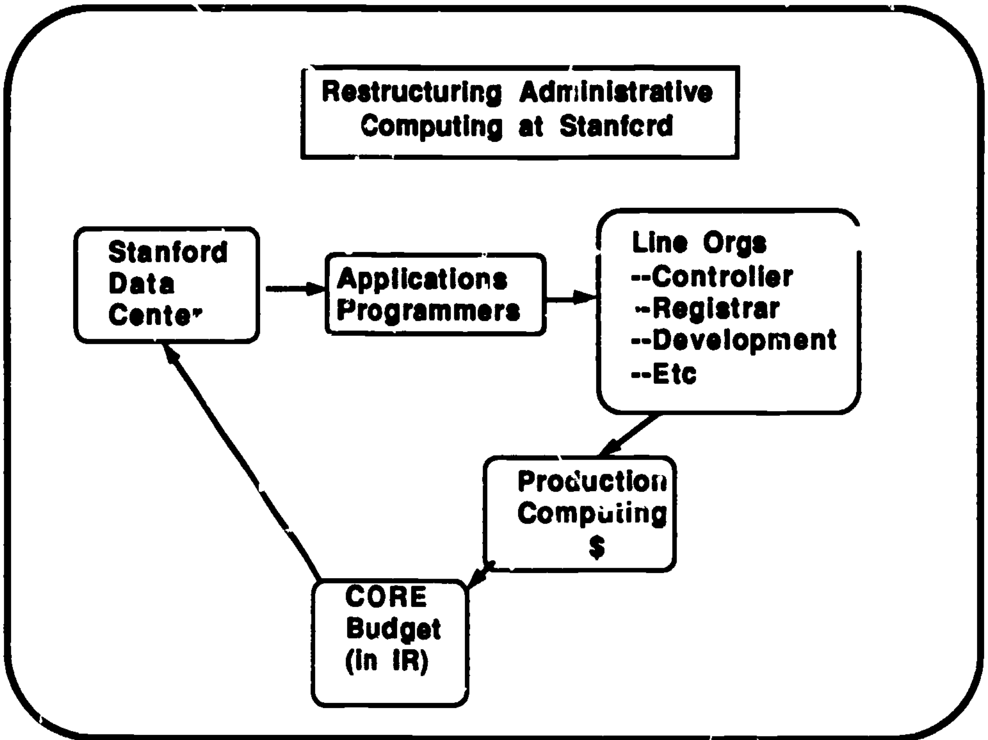

Figure 4

VII. How Well Does the CORE Concept Work?

Administrative computing is now in a "controlled" growth pattern. Computing costs charged to the University Operating budget are expected to grow at about 12% per year (down considerably from years of more that 20%). However, because the Provost purchased a share of the mainframe, including some critical "headspace", actual growth in CPU usage for the CORE systems is expected to grow at an average 21% over the next three years. In addition, capacity forecasting has improved and Data Center equipment planning is better integrated with budget realities, supporting more realistic planning for mainframe upgrades. A consolidated three year plan has been prepared for all of the CORE applications, and, this year, the Data Center and CORE clients are making important advances in integrating user needs with technology planning through the applications plans.

VIII. Conclusions

There are many conclusions that could be drawn from the Stanford experience. As always, the financial strategies and organization structures need to fit the culture of the institution. However, given the context of this conference, we will try to summarize the important things we felt we learned. To some, these will seem extremely obvious. But, unfortunately, when you are surrounded by day-to-day problems and no one has or is willing to accept clear responsibility, very obvious things tend to be missed.

Following are the lessons we found most important:

1. Control both rate increases and total expenditures growth for service centers.

2. Include major clients as a part of the management structure for administrative computing.

3. Develop a financing strategy that allows this to happen.

In our case there were many parts to that financing strategy but perhaps the most important one was the partitioning of the machine and the upgrade strategy we chose to adopt.

Epilogue

As an epilogue to this paper, we would like to share some thoughts from a young economist who later went on to win the Nobel Prize for Economics. In a 1964 paper, "Research in Management Controls: A Critical Synthesis", Management Control: New Directions in Basic Research, Ken Arrow wrote down five circumstances under which charge-out structures (or transfer pricing as it was called in those days) do not work. We leave it to the reader to determine how many, if any, of the following apply to the Stanford situation.

Circumstances under which Charge-Out Structures do not Work

1. When consequences of the decision extend far into the future.
2. When the external world is changing, particularly when it is changing uncertainly.
3. Externalities (when the profitability of one part of the organization depends on the profitability of another).
4. When there exists large uncertainties in prices.
5. When managers are not performing well. (i.e., When they are not paying attention to revenue and expenditures.)

An Intensive Approach to Application Enhancement

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November 1989

Many institutions face an aging applications portfolio that demands much attention and many resources from information systems management and clients. These older applications are often caught in cycles where maintenance and operation become increasingly expensive, yet replacement costs are prohibitive. Efforts to meet constantly changing business needs are also straining many applications. In order to help support a major capital campaign, MIT chose a highly targeted and intensive approach to enhance an existing alumni/fund-raising/gifts system rather than replacing it. This paper discusses this project and projects of this type in general.

Introduction

As they head into the 1990s, many universities find themselves facing a common problem: a portfolio of business and administrative applications that are aging, difficult and expensive to maintain, and no longer meet the needs of the functions they support. This problem is not unique to universities, as corporations with custom applications (as opposed to relying predominantly on vendor packages) face the same issue. We presently find ourselves in an era when new tools and techniques to support the design and construction of applications are commonly available, yet most organizations still spend the vast majority of their programming resources on maintaining existing systems.

As an application ages, the real dollar cost to operate and maintain it usually increases each year. There are a number of reasons for this:

- As the application is changed by adding screens, modules, data elements, and the like, it becomes unwieldy, and its original architecture weakens to the point similar to a house of cards ready to collapse at the failure of one key component.
- As changes are made, technical documentation often is not updated, making maintenance more difficult by causing a divergence between the application and the documentation.
- As the underlying business processes of the organization evolve and change from those in place when the application was originally designed, the ability of the application to support changing functions decreases. Each succeeding functional change becomes more and more difficult to implement.

Most application support organizations face intense pressure from clients to keep up with their requests for changes. Many groups carefully monitor their backlog of requests but are seemingly unable to "keep their heads above water". This pressure forces many application changes to be done on a "quick fix" basis, without sufficient thought given to implications on the overall application architecture. These quick fixes often exacerbate the problem with older applications and make continued maintenance and operation more costly and difficult. This paper will describe a successful project to improve a major business application and extend its life by a targeted approach to breaking out of the typical costly maintenance cycle.

Background

The Massachusetts Institute of Technology (MIT), like most institutions, has an aging applications portfolio and spends most of its application support resources on maintaining these applications. With the exception of three relatively small systems which use vendor packages or service bureaus, all of MIT's administrative applications have been custom developed. During the last fiscal year (ending June 30, 1989), MIT spent more than $7 million to develop and maintain administrative applications, with 50% of this total spent on low-level maintenance. Many of these applications operate in the IBM mainframe environment and are more than ten years old, with an original architecture dating to the 1960s. While some of these applications have been converted to different operating systems over the years (DOS to VS1 to VM/CMS), their underlying designs have not been improved.

Most maintenance on these applications is done on a task-by-task basis, in which individual changes are implemented one at a time. The priority for maintenance tasks is established by the client, who responds to changes in business processes and functions. Changes to application databases are occasionally made, usually done on a task-by-task basis also. In some instances, this process results in the technological equivalent of a ramshackle shack which is now ugly (from a technical, functional, and user interface perspective), difficult to maintain, and in danger of collapse.

Over the last few years, MIT has decen... ...d the responsibility for support of approximately 50% of its administrative applications[1]. Applications can be developed or maintained in several ways: by programmers from Administrative Systems Development (ASD), the central applications development group; by programmers in client offices; by consultants from outside of the Institute; or by any combination of these.

One of the risks of decentralization, observed at MIT as well as at many other universities, is difficulty in creating and enforcing standards. With the responsibility for applications support reporting up through different line organizations, there is a good chance that common techniques, tools, and architectures will not be used. Unless some type of centralized review and authority over application support is established (by the central information technology organization, for example), the risk of standards being ignored is much greater. The lack of adherence to standards can exacerbate the maintenance problem described on page 1.

The Alumni, Donor, Development, and Schools System

In 1979, MIT developed an application to track all alumni and their gifts. The central application development group, working with the Alumni Association and the Treasurer's Office, developed the new system. The system uses the ADABAS database management system to maintain its data and the PL/I programming language for on-line and some batch functions.

Over the years, the system was maintained and enhanced to provide additional functionality as client needs changed. The central application group performed most of this maintenance on a task-by-task basis as described above, with little overall strategic direction. During this same period, the Alumni Association also established its own small group of programmers; the group focused primarily on writing management reports to track the various data about alumni and their gifts. In addition, this group developed a number of small subsystems that used some of the data in the main system.

In the mid-1980s, MIT began to formulate plans for a major capital campaign. These plans evolved into the Campaign for the Future, a $550 million, five-year campaign. As part of the plans, the Resource Development department more than doubled in size in order to manage campaign prospecting and solicitation. Part of this increase resulted from creating a small programming group to write management reports for the campaign. The staff of the Alumni Association also increased (though by a smaller magnitude) in order to enhance its efforts on annual giving.

By the campaign kickoff in 1987, the original alumni/gifts system had grown to become the Alumni, Donor, Development, and Schools (ADDS) system. Its purpose was to support the following groups:

- Alumni Association, responsible for alumni relations and annual giving
- Resource Development, responsible for researching, prospecting, and soliciting major gifts
- Treasurer's Office, responsible for recording the gifts
- development officers of the five schools at MIT, responsible for school-related solicitations

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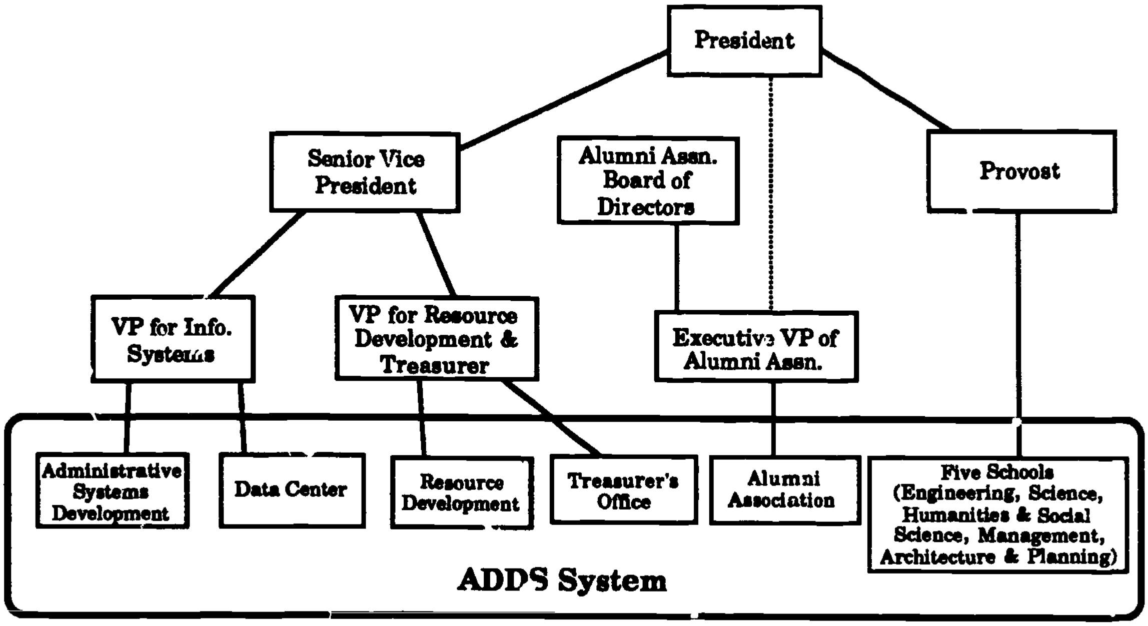
1 For more on how MIT has decentralized application support, see Mary Ellen Bushnell and Do...ld E. Heller, "Application Development Services in a Competitive Environment", *CAUSE/EFFECT*, Fall 19.., p. 33.

The illustration below shows the relationship of the ADDS system to the various departments involved.



The architecture, many of the programs, and much of the database structure of the ADDS system remained similar to the original system developed almost ten years earlier. A number of enhancements and modifications were made to support the campaign, but these primarily were added on top of the existing system, rather than being fully integrated into it. Some of these enhancements were actually new subsystems to track such entities as prospect information and campaign volunteers. Other enhancements involved writing reports (at this stage primarily using NATURAL, a 4th generation language) to support campaign researchers and solicitors. At the time, ASD and the client offices believed the system should last through the life of the campaign, even though it would be close to 15-years-old by the end of the campaign. ASD had two programmers supporting the ADDS system, with 60% of their time spent on maintaining the on-line system, and 40% on programming management reports.

With the campaign ready to begin, the ADDS system was being used by almost 200 different people in three administrative departments and five schools, with an average of 60 simultaneous users. During the most recent fiscal year, the system was used to record over 40,000 gifts and pledges with a total value exceeding $131 million. In addition, an average of 170 batch report jobs are run against the database each week. Many of us felt an omen was sent when the stock market dropped precipitously on Black Monday only three days before the official campaign kickoff in 1987.

The Problems Begin

With increased usage of the ADDS system following the campaign kickoff, both the clients and ASD staff began to notice some problems. Their observations included the following:

1. Response time for both the on-line portion of the system (used for entering and querying alumni biographical and gift information) and batch jobs (primarily management reports) was deteriorating. While this was partly due to the overall load on the IBM 3083 mainframe on which ADDS ran, some questions were raised about the performance of the ADDS system itself.

2. The mainframe costs associated with running the ADDS system were increasing rapidly and approached $1 million. Since the data center at MIT operates on a chargeback basis, the increased costs impacted the client operating budgets.

3. The user interface and functioning of the on-line portion of the system were awkward and inconsistent. Menu hierarchies and screen navigation rules forced users through many different screens in order to enter or query information.

4. Many of the programs were awkward and difficult to understand for the programmers maintaining the system. Over the years, some inefficient and unstructured programs had been written that tended to be "cloned" by subsequent programmers who needed to develop a similar function or report. In this way, inefficiencies and structural problems were perpetuated throughout the system.

5. The data structures were inefficient and in many cases did not support client business needs. Data elements and descriptors (keys) had been added to the database as needs arose, with no overall plan for or redesign of the database.

These observations raised concern over whether the ADDS system would in fact be able to support the Campaign for the Future during its remaining four years. We knew we could not implement a vendor package or develop a completely new system in the middle of the campaign without major disruptions. Even if the system did in fact last through the end of the campaign, people thought it could not be used much beyond that, if the campaign was extended beyond its original five-year duration (a common event in capital campaigns).

Because of these growing concerns, clients and Information Systems (the central information technology organization) decided in 1988 to conduct a study of the ADDS system, examining problems and possible solutions to ensure system usefulness throughout the life of the campaign. A decision was made to hire an independent consultant in order to bring the necessary expertise to the review process.

Review of the ADDS System

In September, 1988, MIT hired a consultant[2] to review the ADDS system and make recommendations for improving it. The consultant had a number of years of experience in applications development and had been a principal in a consulting firm specializing in ADABAS and NATURAL applications. He spent approximately six weeks meeting with clients and ASD staff as well as reviewing PL/I and NATURAL programs, the logical and physical design of the database, and system performance reports. The results of the study were presented to a group that included the vice president and department head of each of the areas involved with the ADDS system.

The key findings of the study, as summarized in the final report, were:

1. Programs and batch jobs are inefficient ... programs and jobs can be improved 10%–95% in execution speed by more structured design and programming techniques.

2. Programs, jobs and systems are difficult to understand and maintain .... almost all programs could benefit from improved structured design and programming techniques ... there is almost no technical documentation.

3. The database design is inefficient ... there are an excessive number of keys to the major files.... Compound keys to support the frequently used access paths do not exist ... there is no documentation about the design decisions made

2 The names of the consulting firms used in this project are not given in order to avoid any appearance of an endorsement by MIT; this should not be construed, however, as a comment on their performance. More information is available from the author.

4. The user-interface of the on-line systems is inefficient.... The user must traverse through multiple screens to satisfy their information request where one screen would suffice.... The user cannot go directly from their current screen to the one they need next.... On-line help is rarely available

5. Finding problems and determining their cause(s) is difficult and time-consuming ... determining how often programs are run is difficult or impossible ... determining which database files are accessed, how they are accessed and how often is difficult and expensive. There are over 40 NATURAL libraries containing over 4,500 programs ... only 1200–2000 are used in production.[3]

In order to eliminate or alleviate these problems, the report made the following recommendations:

1. Proceed with a project (the "ADDS Efficiency Project") to improve the systems, practices, and procedures related to the ADDS database.
2. Hire a full-time Data Administrator to manage the ADDS systems and the improvement project.
3. Provide training to all ADDS development personnel in structured design and programming.[4]

The major benefits of undertaking this project would be to improve the performance efficiency of the ADDS system, reduce or control the growth of application maintenance and support costs, and most importantly, ensure that the system would last for the duration of the Campaign for the Future. The major incremental costs (beyond resources already dedicated to the ADDS system) would be the cost of the data administrator and the additional resources for accomplishing the report recommendations.

The Search for a Data Administrator

Among the complexities of the ADDS system are that it directly supports three major departments and that the technical support is provided by three different departments (see diagram page 3). Because of this, governance of the system is relegated to a series of committees, summarized in the table below.

Committees with members	Responsibility
ADDS Management Group Director, ASD Director, Alumni Information Management Director, Campaign Systems Recording Secretary Data Coordinator, Sloan School	• Set policy • Long-range planning • Resolve differences between the Technical Group and the Operations Group
ADDS Technical Group Director, Alumni Information Management (chair) Technical staff from ASD, Alumni, and Resource Development Area Manager, ASD	• Establish programming standards • Review file structures • Determine ways to implement changes requested by the Operations Group
ADDS Operations Group Director, Campaign Systems (chair) Users from Alumni, Resource Development, Treasurer's Office, and Schools Area Manager, ASD	• Discuss requested changes, performance problems, and other factors affecting users

3 "Management Report: MIT ADDS Database Systems Efficiency Evaluation", internal MIT report, October 1988, pp. 6–8.

4 Ibid. p. 12.

During discussions about hiring a data administrator to assume overall responsibility for the ADDS system and the ADDS Efficiency Project (AEP), it became clear that a consensus did not exist regarding which organization should supervise the data administrator in a reporting relationship. In addition, the question was raised whether a qualified data administrator could be retained once the AEP was complete and a more stable operating environment was achieved.

Because of these concerns, the decision was made to hire a consultant to act as the data administrator and to lead the AEP for its estimated duration of twelve months. The consultant would be funded by and would report directly to the Director of ASD, with a responsibility for coordinating his or her work with the three groups that govern the ADDS system.

In December 1988, a Request for Proposal was written and distributed to twelve organizations around the country. The request contained excerpts from the ADDS study and asked for proposals for providing data administration services. The organizations solicited ranged from Big 8 accounting firms to small, specialized information technology consultants. Proposals were received from seven companies, and after an initial review by the Director of ASD, two were eliminated because they did not meet the minimum requirements stated in the request. The remaining five proposals (which ranged in cost from approximately $94,000 to $219,000) were distributed to the members of the ADDS Management Group. Another proposal was eliminated in this process and the remaining four firms were invited to MIT to present their proposals.

The presentations were conducted in January 1989, and the winning proposal was selected unanimously. The contract award was based on three factors:

- qualifications and reputation of the contracting firm and of the individual proposed as data administrator
- description of the services to be provided
- proposed cost

The winning proposal was the second lowest in cost of the four finalists. A one-year contract with the firm was negotiated and signed, and the data administrator began working in February 1989.

The ADDS Efficiency Project

A project team was formed for the AEP. Under the direction of the data administrator, members included two senior level and one mid-level analyst programmers and one technical writer, all from ASD. In addition, a manager from ASD also was involved on a day-to-day basis with the project. The AEP team would work closely with programming staffs from the Alumni Association and Resource Development, though the AEP team would not have direct authority over their work. All parties acknowledged that, while programmers from the client departments would be involved in the AEP, the majority of their work would have to continue to support the on-going operations of the campaign.

The first task of the AEP team was to review the ADDS study report and to develop a project plan outlining the work to be conducted over the following twelve months. The project plan was completed and reviewed with the ADDS clients within about three weeks. The major activities of the project fell into the following three categories:

- Analysis and redesign of the production database files
- Analysis and reprogramming of the large, frequently-run batch reports
- Analysis, redesign, and reprogramming of the on-line portions of the system

In addition to these activities, education and training of the technical staffs supporting the system were to be addressed by the project. This was done through a variety of mechanisms: informal training sessions about the ADDS system and its data targeted at users; sessions about specific programming topics led by the data administrator and targeted at client programmers; and formal workshops on various aspects of ADABAS and NATURAL programming led by an outside training firm.

The AEP was scheduled to last for twelve months, through February 1990. To allow for any changes that may occur during the life of the project, the schedule set the completion date for the final task approximately ten months into the project, thus allowing for contingency time of 15%.

As noted on page 4, one of the critical problems with the existing system was the lack of standards supporting the maintenance of the ADDS system. Consequently, one of the project's first activities was to establish standards for the maintenance and documentation of the ADDS system. The consulting firm selected to provide the data administrator was well-respected for its work with ADABAS and NATURAL environments, including establishing specific programming standards. The AEP team wisely decided early on to adopt these standards as the basis for much of the work to be done.

Analysis and Redesign of the Database

As described on page 4, an overall plan for implementing changes to the database files in the ADDS system did not exist prior to the initiation of the AEP. In the past, when an office needed a field added to one of the files, it was usually added to the end of the file because this was the easiest and fastest way to make the change. This solution was used because of the quick turnaround time required by the clients and the workload of the database analysts. Often there was insufficient time to conduct an analysis of the change and its impact, in order to develop the most efficient and effective solution. Requests for new keys for the file usually occurred in a similar manner, without reviewing whether existing keys could be combined or otherwise changed to meet client needs. In addition, database problems were made worse because virtually no reviews were conducted to determine whether unused or underused fields and keys could be eliminated. At no point were real attempts made to truly normalize the data.

Compounding problems with the database itself were the numbers of new programmers and users added in the client departments over the previous few years. For the most part, both users and programmers were not provided with enough training to give them sufficient knowledge of the data and their uses in order to do their jobs effectively. Without a thorough understanding of the logical and physical database design, as well as adequate technical training, programmers could not structure programs to make the most effective use of the data and of machine resources. Similarly, users who did not understand the data often did not know how to accurately formulate requests for information.

In order to evaluate current database use, the AEP team worked with the database analysts in ASD to collect information about patterns and frequency of use of the files, fields, and keys. The team analyzed the usage patterns through an iterative process; they reviewed this information with the clients to determine possible changes. Early in the project, it was decided to combine all of the recommendations into a major restructuring of the database in order to minimize the impact on the clients.

After a thorough review and analysis of the database, the AEP team developed a list of changes. The list included the removal of 100 fields (16% of the total fields in the 14 affected files) and 101 keys (41% of the total keys in those files). These changes were scheduled for implementation in the summer, after clients had concluded processing to close the fiscal year.

Analysis and Reprogramming of Batch Report Jobs

The ADDS system was used most frequently to produce various types of reports for the management, researchers, and fund raisers in Resource Development and the Alumni Association. The most pressing problem was that jobs were taking too long to run, even during overnight batch processing. In February 1989, the IBM 3083 mainframe on which the ADDS system ran was upgraded to an IBM 3090, providing roughly twice the computing power. While this provided short-term improvement, database users were concerned that problems might resurface later when the 3090 became busier. Thus, the AEP team was charged with examining the report programs to see if they could be made more efficient.

This task was a difficult one, because there were literally thousands of programs in scores of libraries. The AEP team embarked on a process of identifying key tactical improvements that could be made to selected programs. They accomplished this by analyzing the performance of jobs run against the ADDS database and their resource utilization as measured by physical input/output calls and database transactions. A weekly list of the most resource-intensive jobs (fondly referred to as the "chugger" list) was created in order to track which jobs were using the most resources and were run most frequently.

Once these key jobs were identified, the data administrator met with the programmer responsible for each job. They examined the programs, and suggested and tested methods of improving the performance efficiency of the programs. The revised programs were tested to measure their resource usage. The results showed that some of the most resource-intensive jobs could be reduced by more than 75% in both run time and resource utilization. Since many of these report programs had been cloned, fixing one program often led to changes that could be made quickly to others.

Analysis and Redesign of the On-Line System

The largest and most complex activity in the project was the analysis, redesign, and reprogramming of the on-line portions of the system. The major portions of the on-line system consisted of approximately 230 PL/I programs that were ten years old. These programs were divided into two main subsystems: BioEntry, used for the entry and display of biographical information about alumni, and GiftEntry, used for recording gifts and pledges made by alumni and others. Both subsystems were largely undocumented and often did not follow good software engineering techniques, resulting in difficult and expensive maintenance. A relatively simple request to change the layout of a screen became a major endeavor. In addition, because user interface standards were not used, inconsistencies in screen navigation rules and function key definitions existed.

Since the scope of the project was primarily to improve the performance and efficiency of the ADDS system, the project team did not set out initially to make major enhancements to system functionality. One of the first decisions made by the team, with the concurrence of the ADDS Technical Group, was to discard the PL/I programs in their entirety and reprogram the screens in NATURAL. Prototyping and testing demonstrated that existing programs could be replaced with NATURAL programs without any response time slowdown (and in fact some improvement). Previous experiences had shown that the time required to write programs in NATURAL was much less than for equivalent PL/I programs.

The AEP team began with the premise that it would simply copy the existing data entry and query screens and reprogram them in NATURAL. During prototyping, they received many requests for improvements to existing functionality. Most of the suggestions revolved around the screen navigation and function key definitions. During the iterative prototyping, the team determined that it could accommodate the requests of the users without delaying the project schedule. Thus, they decided to meet requests for new functionality from the users as long as the original schedule for reprogramming of the on-line systems could be maintained.

As described above, the existing ADDS system contained two main on-line subsystems. The original plan was to maintain the structure of two separate subsystems, with the reprogrammed GiftEntry subsystem put into production in August and the new BioEntry implemented in September. Prototyping allowed us to discover that the two could be combined into one subsystem to support both biographical and gift data entry and query functions. The combined subsystem would minimize the effort spent on reprogramming the screens and also would simplify future maintenance. The project team continued the iterative prototyping of the screens, taking into account the functionality improvements requested by users. A major revision to the technical and user documentation of the BioEntry and GiftEntry systems was done concurrently with the reprogramming effort.

Once design specifics were well-established, programming of the screens began. The existing 230 PL/I programs were to be replaced with 90 NATURAL programs. When the target dates for implementing the new subsystems were delayed until October, it became apparent that these changes and the scheduled implementation of database changes (described on page 7) were likely to occur approximately one month apart. Because the system would be closed down for a period of time for the production conversion with a resulting impact on clients, the AEP team and clients opted to implement both the database and on-line subsystem changes in one conversion. While a combined conversion would be more complex, a shorter period of impact for the clients was a more important consideration.

The work on both the database changes and replacement of the on-line subsystems continued, the implementation date for both activities was November 4, 1989

Evaluation of the Project

The conversion of the database files and on-line subsystems was completed on schedule. The conversion required an intensive effort by a variety of parties:

- database analysts, who converted the actual database
- the AEP team, who installed the new version of the on-line screens
- the client programmers, who installed the subsystems they were responsible for converting to the new database formats
- the users, who conducted all of the testing after the conversion

The system was shut down for two business days to accomplish the conversion. With very few minor exceptions, all converted programs were implemented successfully without any bugs.

As the deadline for this paper approached, we are still evaluating the performance improvements of the new database structure and on-line programs. Some of the improvements already noted include:

- a 25% reduction in disk storage for the fourteen files affected by the database changes
- an improvement in response time for both on-line functions and batch report jobs
- a large degree of user satisfaction in response to the simpler screen navigation and function keys in the new on-line subsystem, leading to increases in user productivity

Data on the total resource usage and response times for both on-line subsystems and batch jobs will be collected over the next few months and compared to preconversion data. So far it appears that both resource usage and response times have decreased, but we will make a formal conclusion when more concrete data are available.

One of the difficulties in evaluating this project is the number of factors affecting resource utilization, production costs, and response time. For example, one of the concerns described on page 4 was production costs of $1 million annually for running the ADDS system. Since a major goal of the project was to improve performance efficiency, a performance measure could be the production cost of the system before and after the conversion. A simple comparison of this type, however, assumes that the volume of activity in the ADDS system remains constant. If the volume increases (because of running more reports, making more queries, or recording more gifts, for example), you need to control for this in cost comparisons. While possible, this is a tedious and time-consuming task, given the size of the ADDS system, the large number of users, and the variety of jobs run. Thus, comparisons of resource utilization over time are difficult to make.

Summary

The current schedule of the project calls for the final report and recommendations to be completed on January 5, 1990. This is approximately two months earlier than the original twelve-month schedule, due primarily to not using the contingency time. Explicit project costs can be summarized as follows:

Contract with consulting firm for data administrator	$148,000
Addition of one full-time programmer and one half-time technical writer from ASD (above existing level of ADDS support) for ten months	96,000
Total	$244,000

The total does not include costs associated with time spent by the programmers in client offices for work done on enhancing client subsystems and batch jobs. While these costs were not tracked separately, they are believed not to be large since none of the clients added additional staff exclusively for this effort. The programming staffs of both the Alumni Association and Resource Development were able to continue to meet the operating needs of the campaign during the entire project.

As mentioned above, the quantitative benefits of this project still need to be calculated. We do know, however, that the following results have been achieved:

- The useful life of the ADDS system has been extended to ensure that it can continue to meet the needs of the campaign workers.
- Current estimates are that the programming resources necessary for maintaining the on-line portion of the ADDS system in NATURAL will be half of what was necessary for PL/I program maintenance. Taken another way, twice as many tasks can be accomplished with the same resources. In addition, programmers joining the project will be productive more quickly because of the 4th generation language and structured techniques now used in the system.
- The functionality and user interface of the system have been vastly improved; users already have acknowledged this change.
- The improvements in batch report jobs have been noted earlier, and initial indications after the conversion are that on-line response time has improved also.

The decision to apply an inten ve approach to enhancing the ADDS system appears to have been a wise one for MIT. By extending the life of the system and postponing the capital expense of replacing it, we have made resources available to address priorities in other areas. Other older applications at MIT are currently being examined to determine whether the same approach will yield similar benefits.

ALIGNING UNIVERSITY GOALS WITH INFORMATION SYSTEM STRATEGIES--
SMOKE AND MIRRORS?

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Ball State University's president, vice presidents, provost, and leadership of information systems jointly completed an intensive study of information systems investments and the degree of alignment with the goals of the University. Objectives of the study were to improve the executive leadership's understanding of information system (IS) investments, determine the level of alignment of these investments with strategic University goals, and identify opportunities for shifting investment priorities to better support these goals. A 1988 study of critical MIS issues ranks aligning ` and corporate goals second in a list of twenty (behind using IS for competitive advantage). This paper describes the methodology, findings, and impact of the study at Ball State University.

ALIGNING UNIVERSITY GOALS WITH INFORMATION SYSTEM STRATEGIES--

SMOKE AND MIRRORS?

A recent study of critical management information systems issues ranks aligning information systems (IS) goals with corporate goals second in a list of twenty---first was the use of IS for competitive advantage. (CIO, January, 1989, p. 10) It has also been reported that average spending on information systems for 1989 would increase at a rate twice that of inflation, but that less than 10% of senior IS executives have found ways to measure the value of their information systems to the corporation. (CW, December 5, 1988, p. 20)

Ball State University's president, all vice presidents and the senior leaders in campus computing jointly completed an intensive study of computing investments and the degree of alignment with the goals of the institution. The study took approximately one month to complete, including data gathering, the analysis of university and computing goals and computing investments, and completing the final report.

Ball State University is a state-supported institution with over 19,000 students, 1200 faculty, and a computing services budget of $6,500,000. University Computing Services reports to the Office of the President and has responsibility for academic and administrative computing and data communications. Overall policy and planning is supported by four committees: President's Advisory Committee on University Computing (PAC), Academic Computing Committee, Administrative Computing Committee, and the Computing Resources Subcommittee of the University Senate. The University leadership has focused strategically on the application of computer, data communications and video technologies to enhance it's image, quality and competitive advantage.

A structured approach employed in this study was SIM (Strategic Investment Methodology), offered by IBM's Advanced Business Institute. SIM has been used in private enterprises in the United States and Europe, but Ball State University is the first institution of higher education to employ the methodology. President John E. Worthen was the executive sponsor of the study, appointing the participants, providing resources needed, and becoming an active participant. IBM provided senior consultants from the Advanced Business Institute and the technical resources that were required. Other participants are listed in Figure 1.

Objectives of the study included:
*Improve understanding by senior University officials of total computing investments throughout the campus.
*Relate computing investments to University goals, and identify over or under invested priorities.

WHO

EXECUTIVE TEAM

VP BUSINESS AFFAIRS
VP STUDENT AFFAIRS
ASSISTANT TO PRESIDENT
VP UNIVERSITY ADVANCEMENT
PROVOST
PRESIDENT, EXECUTIVE SPONSOR

FACILITATORS

IBM CONSULTANTS,
WHITE PLAINS, NY

PROJECT TEAM

DIRECTOR OF FINANCE
COORD. INFORMATION SYSTEMS
DIRECTOR COMPUTING SERVICES
ASSOC. DIR., COMPUTING SVCS.
COLLEGE DEAN
DIR. ANALYTICAL STUDIES/PLAN
ASST. DIR. OF FINANCE
IBM REPRESENTATIVE
IBM SPECIAL INTERN

Figure 1--Participants

*Provide a system to determine the impact of changing University goals on computing resource allocations.
*Clarify and enhance communications between senior administrators and computing leadership.
*Develop action plans to improve alignment of computing investment with key University goals.

Computing investments must be measured not only in the computer center or traditional organization normally thought to contain this budget, but also in user areas throughout campus. User areas have workstations, personnel dedicated to computing, minicomputers, outside services, software, networking and maintenance that may be budgeted for separately from centralized services. Of course computer center budgets include investments (expenditures) for mainframes, minicomputers, personnel, networking, maintenance, outside services and software.

These investments are analyzed and categorized in a four quadrant grid according to the type of resource (i.e., personnel, network, computer, outside services, terminals, other), functions or uses (i.e., teaching, research, public services, marketing, administration, support), technology portfolios (learning support, decision support, office support, physical, infrastructure, institutional), and management approach (utility, venture, retail). Consensus techniques are used to weight University goals, rank functions, and determine which technology portfolios have the most potential to contribute to meeting the University's goals.

All this analysis is combined in Figure 2 that illustrates the percentage of computing investments made in the various user functions and technology portfolios, as well as the strategic values of each of the cells (as determined by the consensus ranking and weighting). It may be seen that the high strategic and very high strategic value cells are typically receiving the most investment; examples of exceptions are learning support/resource development, and external support/administration. User functions which could qualify for additional investment include research, evaluation/accountability, and support services. Technology portfolios to be targeted include office support and decision support. Close study of the chart indicates that the University is, by most indices, investing in high impact areas. Few cells were identified in which there was a low strategic weight and a high level of investment. While this indicates strength, it also is a limitation in that there are fewer "fat" (i.e., overinvested) cell from which resources can be reallocated.

Action plans were developed during the study and reviewed by the University Officials. President Worthen has referred future study activities to the President's Advisory Committee.

FUNCTIONS	INST.	OFF. SUP.	DEC. SUP.	LEARN. SUP.	PHYS	EXT.	INFRA STRAC.	USER TOTAL
TEACHING	6.1				0.0	0.0		36.7
RESEARCH	0.6				0.0	0.0		5.9
MARKETING/PUB REL	3.6	0.4	0.1	0.0	0.0	0.0	0.0	4.9
RES. DEVELOPMENT	1.8				0.0	0.0		2.8
HUMAN DEVELOPMENT	0.6				0.0	0.0	0.2	1.1
ADMINISTRATION				0.5				37.4
EVAL/ACCT.					2.0	0.0		1.0
SUPPORT SERVICES								0.0
PUBLIC SERVICE	0.0	0.1	0.4	0.1	0.0	0.0	0.0	2.2
TOTALS	42.7	5.7	7.7	16.3	0.9	0.0	26.7	100%

VERY HIGH STRATEGIC VALUE > 2.5%

HIGH STRATEGIC VALUE >1.6%

Figure 2--Analysis

MANAGING COMPUTER SUPPORT COSTS THROUGH EFFECTIVE USER TRAINING:

Lessons Learned at the University of New Hampshire

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Given the rising costs of technology, directors of computing must look for cost-effective and efficient means of providing support to users. Yet, how can the computer services department provide cost-effective support to an increasing number of users with an ever-broadening spectrum of needs? One answer has been to create hardware and software standards. Yet, even with standardization, changes in personnel, upgrades to hardware and software, and the availability of new technology necessitate a long-term approach to providing computer support. At the University of New Hampshire, we believe that the one of the most cost-effective means of providing support to users is through effective user training. This paper presents the University of New Hampshire's approach to user training and argues that, among the investments a computer services department can make, training can actually have one of the biggest payoffs.

Introduction

As the discrepancy grows between computing budgets and other ways to spend limited campus dollars, computer center directors are having an increasingly difficult time justifying the high costs of computing. At a recent conference of high-level University administrators, a number of University financial officers indicated that 5% of their annual budgets was being spent on computing. This number went as high as 10% for those Universities that had undertaken a significant campuswide networking effort.

Along with the rising costs of computing, the number of computer users on campus continues to increase, and the profile of the computer user is changing. Many users have a growing comfort level with technology, a greater awareness of the possibilities offered by computers, and a growing demand for increased computerization. Still others feel pressured to begin using computers in spite of their continued fear of technology. The computer services department must be responsive to these changes. Yet, the computer services staff is not growing. How does the computer services department support an increasing number of users and changing institutional needs in a rapidly changing computer environment?

One answer which is often overlooked is to provide effective training. Many computer center directors consider training as an investment with less payoff than adding additional hardware, software, or support staff. At the University of New Hampshire, however, we believe that among the investments a computer services department can make, effective training can actually have one of the biggest payoffs.

The Importance of Training to the Institution

New technology continues to alter not only the teaching and learning aspects of an institution, but also its administrative capabilities. Adequate training is absolutely necessary if institutions are to take advantage of this rapidly changing technology. People must have the skills necessary to work with new technology and its associated software systems. Training is therefore beginning to emerge as one of the most important functions of campus computing. However, training individuals to use computers is difficult because of rapid changes in the field and because of the variety of uses to which computers are put in a large post-secondary institution. The institution must therefore be committed to significant training for all users,--faculty, staff, and students. At the University of New Hampshire, it is our view that training for computing is a key factor in providing the support needed to keep users ahead of technology.

If we were to look at a cross section of post-secondary institutions today, we would find they tend to approach training differently based on how important they view the training function. They may simply "muddle through" with little or no training, they may do "reactive" training in response to problems or as specific needs arise, or they may actually have a planning process for training just as they plan for the acquisition and use of technology.

Much of the training for computing in higher education has not been particularly effective, partly because technology has developed so fast. Existing training models have not coped well with the changing technology. Moreover, as the computer experience of faculty, staff, and students increases, so do their training needs. Training must shift from basic literacy to more selective training for particular skills. What then are the elements necessary to provide effective training?

Factors Affecting the Success of Training

Some of the elements of good training are fairly obvious. Others are not so obvious. One of the first things to assess in an effort to design a training program that will provide adequate support to users is the goals of that training program. In order for training to be a part of the overall support infrastructure of the computing department it must go beyond merely teaching skills for using a particular software package or solving operational problems. Although these are important and necessary goals, training must also include the goals of increasing the productivity and quality of work and of creating an environment of teamwork where users work together more effectively.

If the goals of training are viewed in this larger perspective, a number of cost-saving benefits can result including:

- Making it easier to introduce changes and use new technology;
- Reducing costs associated with errors, rework, or down time;
- Reducing learning time for new employees;
- Doing more with the same number of people.

On the other hand, inadequate training can lead to costly delays, problems, and dissatisfaction on the part of users. One way to cost-justify training might be to consider the cost of not training. According to one recent article, corporations can waste as much as $740,000 per 1000 installed PCs if they don't teach people how to use them. (Information Center, November 1989, p. 28.)

Timing is crucial for training to be effective. Don't wait for problems to arise. Schedule adequate training before implementing changes. At the same time, training must satisfy a need or it will not be retained. For example, administrative users trained in how to use a new on-line administrative system months before the system will actually be in full operation will have forgotten most, if not all, of what they have learned by the time the system is fully functioning.

You must also ask yourself what delivery method will work the best. Not all users learn in the same way For some, one-on-one training is most effective. For others, self-study packages will work best. Generally, less experienced users learn best with one-on-one training sessions or small hands-on workshops. More experienced users can learn effectively with self-study packages which might include documentation, video tapes, or computer-based-training (CBT) exercises. These forms of training allow the more advanced learner to skip areas they are already familiar with or go faster than a classroom presentation might allow them to. In general, training should include a balance between skills-based training and knowledge-based training. However, the emphasis on skills, or the "how to" aspects of training, should probably be emphasized early on so that the user may see results before becoming discouraged. Understanding the concepts will be easier after at least a short period of doing.

Training should also be geared to specific work groups, that is, to groups where people share similar job functions and, therefore, similar problems. An example of a training model that did not work well at the University of New Hampshire was an attempt to teach a word-processing course to a class open to both faculty and staff. These two groups, in fact, use word processors in very different ways. The faculty were more interested in learning how to do such things as footnotes and bibliography entries, while the administrative users wanted to learn how to produce mailing labels or use the word processor's mail-merge function.

It is also important, although not always possible, to try not to mix skill levels. If class sizes do not permit having a beginning, intermediate, and advanced section of a particular course, be sure to have have plenty of examples and exercises for more advanced users to work on while you are helping less-experienced users.

Encouraging Users to Take Advantage of Training

In order for training to serve as effective support, thus reducing support needs in other areas, users must take advantage of the training available to them. One method of making sure users take advantage of training courses is to make them required. This is not necessarily the most effective way to assure that users will benefit from training, however, since training will not be effective if it does not satisfy an immediate need. Training courses must often be scheduled far in advance due to limited classroom facilities and the availability of instructors. For this reason, courses may not be offered at the most appropriate time for users. Requiring someone to take a training course for a product they will not be using immediately will not eliminate their need for support later on.

Another, better way to encourage users to attend training sessions is to make them as easily-accessible as possible. One way to accomplish this is to provide in-class, or in-office, training for users at the request of faculty members or administrators. Another is to provide regularly scheduled "walk-in" training sessions so that when users develop a particular need, they can get immediate, and therefore, more effective training support. Video tapes of training sessions, whether "home-grown" or commercial, are another way to make training more immediate since users may view them when, and as often as, they like.

In all cases, training must be marketed to the user if the user is to take advantage of it. Marketing efforts for training can take the form of published schedules announcing monthly course offerings, newsletters or flyers announcing special training sessions of particular interest, or announcements in the institution's newspaper under a "notices" or "calendar of events" column.

Another way to make training attractive to users is to make the registration process as easy as possible. At the University of New Hampshire, users can call one central phone number to register or, if they prefer, can register for courses on-line. If on-line registration is used it must be well thought out so that it is both easy to use and up-to-date. Nothing will discourage a user from future training more than showing up for a class which was canceled but for which no information to that effect appeared in the on-line registration schedule. Thus, if on-line registration is used, it must be easy for the user to register, cancel, or reschedule and equally easy for those maintaining the on-line registration program to notify those registered of changes or cancellations.

Evaluating Training

An important, and often overlooked, factor affecting the success of training in providing effective support to users is that of assessment. For training to be effective, it must be seen as an on-going process which begins with a determination of institutional and individual needs, involves both users and trainers in the planning process, and includes procedures for evaluating the effectiveness of the training and making changes and adjustments as needed.

One way of evaluating the success of a particular training effort is to have users fill out a course evaluation form following the training session. This is an effective means of fine-tuning individual training programs. It is also a means of determining specific areas for which adequate training is not being provided. It will not provide much information, however, on some of the questions which those responsible for training need to consider if training is truly to be a part of the computer services department's support function. Some of these questions might be: Does the training make the user more self-sufficient? Does it make the user more efficient at his or her job? Does it provide a more cost-effective means of support to users than other types of support?

In order to address some of these larger training issues, the University of New Hampshire conducted a survey of both academic and administrative users of personal computers in the Spring of 1989. The goal of this surveying effort, called *Project PC Literacy*, was to determine what hardware and software were being used by users, how much users knew about support available to them on campus for hardware and software products, what hardware and software purchases were planned by users for the upcoming year, how important computing was to the user in performing his or her job, and what support, in what form, users felt they would like to have.

A total of 104 departments were surveyed as well as full and part-time faculty. The department survey took the form of a half-hour meeting to discuss computer services the department had used, an evaluation of those services, and discussion of services the department had not used c was not aware of. Departments were also asked about their future computing needs. After the meeting, an inventory of the department's microcomputing hardware and software was taken. At the same time, a two-page survey was sent to all full and part-time faculty. The survey asked faculty what microcomputer hardware and software they used, what computing services they used, didn't use, or didn't know about, and how they evaluated training and support services available to them. To encourage faculty to return surveys, all those who completed and returned their surveys were entered in a drawing for a gift certificate to the campus computer store.

The results of this survey were very revealing and resulted in a number of changes in microcomputer training and support offered at the University. Some examples include: the offering of evening courses for faculty; the publicizing of our on-line "questions" mailbox, which many users asked for but were unaware of the existence of; and the expanded use of regularly scheduled "walk-in" training sessions for users. In addition, we learned that some of the most successful forms of training we provided, might not be considered "training" in the traditional sense of the word. These were things such as our one-page, "how to" documents and our Faculty Resource Library, both of which allow users to "help themselves" to training as they see fit.

Training for Academic Computing

The training function for academic computing at the University is part of the department of *Computing and Information Services* and falls specifically under the responsibility of the Manager of User Support. Four areas in the User Support group which provide different forms of training are: the User Support Center, the Faculty Resource Library, the Desktop Publishing Center, and the Training Center.

The User Support Center was set up two years ago in response to user complaints that they were unsure where to go to get answers to computing questions. The Center is the first place for faculty and students to go for help with any computing question. If a user needs help with software, hardware, or any other computing information, a member of the User Support Center will either answer the question directly or refer the user to a consultant responsible for small or large systems support. These consultants are located either in the Center itself, or in offices adjacent to it. At the User Support Center there are a number of "self-help" training and support facilities such as a library of trade journals and a selection of one-page, "how to" documents on such topics as: *Getting started with BITNET*, *How to protect your work*, and *Installing WordPerfect 5.0*. There is also a Media Conversion Center with self-help guides to help users convert data files between MS-DOS, Macintosh, NorthStar, CP/M, or VAX computers. Users can also transfer information between 5 1/4" and 3 1/2" MS-DOS disks there.

The Faculty Resource Library and Desktop Publishing Center are two other learning environments which are particularly attractive to the more sophisticated academic user. In both centers, faculty may sit down by themselves, try new software, and ask for help from consultants when they have a problem. One-on-one training is available by appointment on the use of all software and hardware available in the centers.

The Training Center is located near the User Support Center and is used for training of both academic and administrative users. There are three classrooms at the Training Center tailored to the training needs of faculty, staff, and students. They provide projection equipment, microcomputers, and terminals which allow trainers to include either classroom demonstrations, hands-on training, or a combination of both, as appropriate. As part of the overall training effort, the Training Center offers regularly scheduled short courses on such popular topics as WordPerfect and dBASE III. Many of these courses are also available on videotape for viewing at the user's convenience. These tapes may be checked out for viewing on- or off-campus. There are also a number of commercial tapes, many of which incorporate software for hands-on exercises and self-paced learning.

The Training Center also provides projection equipment and computers for use in classrooms. Training Center personnel will deliver equipment to the classroom and set it up. Arrangements can also be made for extended-use setups. Each piece of loaned equipment is labeled with a hotline phone number to call if there is an equipment problem.

The Cost-Saving Benefits of Effective Training

As the above examples show, effective training can take on a number of different forms, not all of which take place in the traditional classroom environment with an instructor. Documentation, software packages, and video tapes can provide adequate and cost-effective training for certain user needs. In order for training to be successful and, at the same time, provide a cost-effective means of support for users, it must be evaluated carefully and tailored to both institutional and individual needs. The goals of the overall support function of the computer services department must be taken into account, as well as the resources available for the training function.

With careful planning, implementation, and evaluation, a number of cost-saving benefits to the overall support effort will result. These include:

- Teaching users how to do things for themselves rather than having the computer services staff do things for them;
- Enhancing the personal productivity of faculty and staff;
- Reducing the time spent on problems and crises;
- Reducing the time needed to install and maintain user systems;
- Decreasing departmental "downtime" resulting from turnover;
- Reducing lost productivity due to the learning curve associated with the implementation of new systems;
- Reducing risk of loss by educating end users on data integrity and security.

Recognizing that one of the best ways to manage support costs is by developing effective training, we will now turn to a case study of one training model developed at the University of New Hampshire. The following example of a training effort for administrative computing at the University of New Hampshire presents a model that has not only proved to be more successful in providing support to users than previous efforts but, at the same time, is among the most cost-effective training models used to date at the University.

A Case Study in Training For Administrative Computing

The University System of New Hampshire (USNH) is comprised of four campuses: Keene State, Plymouth State, University of New Hampshire Durham, and University of New Hampshire Manchester, and a state-wide adult education school called the School for Lifelong Learning. USNH Computer Services (USNHCS) is the organization that provides the administrative computing support for financial accounting, human resources, and student administration. Computer Services is located on the Durham campus and is connected to the other locations via a combination of leased and dial-up telephone services. Each campus has its own computing organization that operates independently from Computer Services, but these computing organizations support primarily instructional and research computing.

The Opportunity

The University System implemented a financial accounting system in Fiscal Year 1987. The new system was a well-known and successful software package, but this was the first implementation in a VAX VMS environment for a large University System. The implementation was a disaster due to many factors, and the University System was in serious trouble. The financial system allowed for a distributed entry of many documents,--purchase requisitions, budget transfers, payment vouchers, internal purchase orders. This distributed processing concept was a step forward in the effective use of automated systems, but it required a corresponding leap forward in the amount and quality of training.

The entry of the financial documents was a very intimidating responsibility for many of the staff of the University System. The staff required to do the work was primarily department secretaries, most of whom, had never before interacted with a computer. A few attempts were made to provide training, but no trainers were available to provide assistance for spur-of-the-moment questions, nor were there continuing classes presented to train new staff. The task of training the end users was given to the Controller's Office staff who had all that they could do to address a multitude of implementation problems and no time to assist the end user with training. The detrimental effect was dramatic; the situation caused a tremendous amount of frustration and many of the clerical staff resigned as a result. To describe the situation as chaotic would be only a slight exaggeration.

The Challenge

It was crucial to initiate a quality, timely, and comprehensive training capability. The training model would need to account for a widely dispersed audience. As earlier stated, USNH Computer Services served users in several locations in New Hampshire. To add to the problem, the training model could not include an increase in staff. Further, the University System was in crisis and something had to be done immediately; speed was essential and a lengthy preparation process was not acceptable.

The Model

The central theme of this case study deals with cost-effective means to provide training support to end users. The previous discussion on administrative computing presents the situation that occurred to precipitate action by the Computer Services organization to provide training to its end users within the constraints of existing resources and staff. The model that developed was based upon the following fundamentals:

1. In order to increase the number of trainers in the Computer Services organization, group all the functions that provide direct services to end users into one User Services department and designate all staff as trainers.

2. The number of professional trainers will be limited, therefore, leverage the skills of these few through support of a large group of non-professional trainers.

3. Quality documentation is an effective form of training.

User Services

The definition of User Services should be viewed as a broad concept. The functions of Production Services, Quality Assurance, Data Security, User Accounts, Technical Writing, Information Center, Consulting, and Training are consolidated into the User Services department. Each staff member, regardless of their speciality, is designated as a trainer and expected to provide end-user training.

The experience at the University indicates that the staff is not only willing to perform the added task of trainer, but that it is a welcome relief from their normal responsibilities. Over time, each staff member will develop a particular area of expertise and, in some cases, surpass the knowledge of the primary trainer

At UNH, this practice of designating all User Services personnel as trainers, is also extended to phone support. The objective is to ensure that the telephone will always be answered quickly during the business hours of 8:00 a.m. to 5:00 p.m. Everyone is expected to provide phone support and the phones must be covered. The delivery of service is paramount and it is unacceptable for any staff member, including the department manager, to consider themselves exempt from the function of training and phone support. This approach to user service allows for the development of a critical mass of personnel that is able to provide consistent and effective delivery of training and telephone support.

Non-professional Trainers

The user community serviced by USNH Computer Services has embraced the concept of end-user trainers. The professional trainers in Computer Services promote the idea that their primary function is to train the end-user trainers who, in turn, provide front line training to a particular department or division. The ideal would be that the USNHCS trainer support only the end-user trainers, but, in practice, this is not possible. Many departments have trainers who are not effective and some have none at all. The USNHCS trainer must prepare training exercises for both the end users and the end-user trainer. The fact that this "train the trainer" model is not 100% effective does not invalidate the concept. The goal is to provide cost-effective training, and, if the number of end users to be trained is halved because of effective end-user trainers, fewer professional trainers are necessary.

It takes a significant effort to recruit end-user trainers and, once recruited, to keep them involved. It is important to establish an end-user trainer committee that meets periodically to share information and receive updated training assistance from USNHCS. This committee is particularly important to those end users that are representing remote campuses. (Keene State and Plymouth State are each 90 miles from the Durham campus of UNH.) Poor training practices and inconsistent or incorrect information will result unless the end-user trainers are frequently updated with current data. The onus is on the computer services staff to encourage an active and interested user trainer committee. The user trainers all have a primary function to perform. Training is a secondary responsibility and interest will decline unless they are provided with regular stimulation from computer services. To kindle this interest takes a significant amount of time and effort but the results are worthwhile.

Quality Documentation

An excellent method for reducing reliance upon direct end-user training is useful documentation. Effective documentation is elusive; the initial effort to prepare quality materials is very time-consuming. Obviously, the content of training manuals is important; not so obvious is the need for an effective format for the documentation. Regardless of how well the narrative is written, if it is delivered to the end users in a form that is not conducive to easy use, it will not be utilized and the efforts will be wasted. Our experience has shown that an effective format for training manuals requires the services of a professional technical writer/editor. The form is as important as the content and a quality form requires the services of a professional.

The approach that has proven to be effective for Computer Services requires that the end-user office develop the documentation narrative and User Services provides the editing and formatting. User Services employs a technical writer/editor to edit and format text developed by end users, to prepare documents for printing, to coordinate the printing with the printing services department, and to distribute the documentation to the appropriate end users. The technical writer/editor uses desktop publishing software (specifically, Aldus Pagemaker running on an Apple Macintosh computer) to prepare the documents for printing services. Fortunately, the Printing Services department at the University of New Hampshire acquired a photo composition/typesetting system that is compatible with documents prepared by Aldus Pagemaker, eliminating duplication of efforts.

Once the initial preparation is completed, the task of keeping the documentation current is also assumed by User Services. Effective updating of documentation can occur only when the initial effort has produced a manual that is designed for ease of maintenance. This is another argument in favor of having a professional involved from the start. If the initial effort produces a document that must be reprinted in its entirety each time an update occurs, the cost of printing and distributing the manual will be astronomical. Doing the job right at the start of the effort saves a significant amount over the useful life of the manual.

Part of every training exercise is the presentation of a User Guide to the staff being trained. The training will not only show how the automated system works but will also include instruction in the design and use of the User Guide. The objective is to have the end user become reliant upon the User Guide rather than the User Services Trainer. Nothing is ever completely successful, but if a large percentage of end users use the documentation, then the User Services Trainer can spend time on other responsibilities. Again, the objective is to leverage the skills of the professional trained with good documentation manuals.

The Impact

The USNH Computer Services organization has in excess of 1,000 end users located on four dispersed campuses, the University System offices at a fifth location, and eight locations for the School for Lifelong Learning. The User Services organization has two professional trainers and one technical writer/editor to serve this large and diverse user community. One of the trainers specializes in application systems,--financial accounting, student records, and human resources; the other trainer concentrates on technical products such as Fourth Generation Languages (Oracle and System 1022), Text Editors, Job Control utilities, and operating system commands. Each is capable of substituting for the other if needed.

A single technical writer/editor has excellent written communications skills and is thoroughly conversant in the use of Aldus Pagemaker for the Apple Macintosh computer. The content of all of the user documentation has been written by either the end user or one of our professional trainers. The technical writer has taken the narratives and transformed the prose into attractive, readable, well-organized, and easy-to-maintain documentation manuals.

The manuals have been updated frequently and remain as current today as when first created. The net impact of quality documentation on the ability of User Services to offer training will never be able to be measured accurately, but the fact that this large group of end users are well trained and very knowledgeable is testament to the success of the overall training model. The assumption is that the documentation is a major contributing factor to that success.

Case Study Summary

A monthly calendar of events is published to announce all courses for the next two months. User Services has developed an on-line course registration system that is easy to use and available to any Computer Services customer. Phone reservations are also received. In addition to the formal courses, User Services has periods set aside each week for introductory training for the major administrative systems. All new staff for the University System can be trained in the basics of any system the same week that they are employed. The "Drop-in Center" makes available a comfortable atmosphere for end users to stop into User Services for answers to questions or a quick training exercise. The emphasis is on friendly service to end users and "one-stop shopping" to meet all their needs. The techniques outlined in this paper have allowed USNH Computer Services to provide a quality and comprehensive training service with a very small staff. The primary elements of this training model are:

1. End user trainers to leverage the skill of the professional trainer.

2. Supplement training with quality end user documentation.

3. Combine all end user services into a single organization to provide a "critical mass" of staff, all of whom are expected to be trainers.

Lessons Learned at UNH

Training must not be considered a quick-fix, an add-on, or a "cookbook" approach to educating users. To be successful, training must be seen as a process to strengthen long-term institutional goals and performance, and as a cost-effective means of providing user support. Often, not enough time is spent up front assessing needs and planning the training effort, nor is enough time spent evaluating the results and making necessary changes.

Changes in personnel, upgrades to hardware and software, and the availability of new technology necessitate a long-term approach to providing computer support. Given the distributed nature of the equipment, the need for a strong centralized support organization, one that can coordinate training and other support functions, is essential. While knowledgeable end users will become an extension of centralized support, their jobs do not depend upon providing computer services. There must be an organization whose responsibility it is to coordinate training for all users. With proper planning and evaluating, however, training can be one of the most cost-effective and efficient means of providing computing support to users.

METHOD FOR PLANNING

ADMINISTRATIVE INFORMATION SYSTEMS DEVELOPMENT

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ABSTRACT

This paper describes the situation faced by universities in general, and Western in particular, in planning the development of administrative information systems. A methodology to assist decision-making with respect to the relative priorities of alternative (competing) projects has been developed and was applied for the first time in the 1989-90 fiscal year and is being continued for the 1990-91 fiscal year. The methodology is designed to identify the principal options for information systems development, and to permit the application of executive judgement as to the strategic importance of competing projects. The methodology itself and the rationale for its adoption are described. Our experience to date, and issues encountered and their resolution is also summarized.

ADMINISTRATIVE SYSTEMS PLANNING AT UNIVERSITIES

Planning the development of information systems is a challenging matter in most large organizations, and universities are no exception. Commonly experienced difficulties include the following:

- rapidly *evolving technology* changes both the nature of the work to performed and the tools available to do the work;
- the growth of *decentralized computing* using microcomputers and local-area networks creates rising expectations by the clientele to be served as well as multiplying the technical considerations;
- the *proliferation of client demands*. as computer applications increase both in number and importance points to the need for a general strategy and a need to involve more persons in the decision-making process;
- *a backlog of unfinished work*. It is common to have a large unfinished backlog of systems development work. Western is perhaps typical: the backlog of identified work amounts to approximately 3 years for a systems development staff complement of 20 positions. This situation creates frustration in client departments.

In addition to the commonly experienced difficulties, the organization of administrative processes in universities presents some special obstacles and considerations. These are:

- Administrative processes, and the information systems to support them, are regarded as *overhead activities of secondary importance* at universities, where the primary activities are teaching, research, and direct public service;
- *Funding is tightly constrained* in higher eduction and therefore new funds for administrative information systems are hard to obtain;
- *Increasing demands for administrative productivity* have been experienced with record enrolments, demands for new services, and requirements for information for government-mandated programs;
- *The need for participative decision-making*, due to tradition and the accountability of the university administration to a legislative-style decision-making system, and particularly in view of the fact that the end-users to be served by information systems are academic departments and students.

An important and simplifying factor in administrative information systems development at universities is that many (not all) of the important information systems are fairly stable in purpose and have, in one way or another, been in operation for many years.

The major administrative information systems include:

- student admisssions, registration and record-keeping; financial accounting and budgeting; purchasing and physical asset management; personnel administration; fund raising and alumni records; and physical plant systems.

APPROACH TO ADMINISTRATIVE INFORMATION SYSTEMS AT WESTERN

The technical means for development of computerized administrative information systems at Western is modern and typical of the mainstream. Information systems projects are initiated with a request to the Department of Administrative Systems (DAS) which uses the PRIDE methodology for capturing the information necessary to plan a project. Project committees are formed for major projects to manage the phases of development. In most cases, information systems are developed in-house; although Western attempts to evaluate software available from external sources, it has usually been found that already-developed and available software is either unsuitable or deficient, or that in-house development is cheaper or more practical.

Western uses IBM computers, the MVS/XA operating system, and the Cullinet IDMS-R database management software for major information systems. A variety of fairly standard means of connecting administrative workstations to the mainframe administrative computer is used; most administrative offices now employ microcomputers using the MS-DOS operating system. Up-loading and down-loading of administrative data to microcomputers is facilitated with Cullinet's Infogate/Goldengate software. A catalog of administrative databases is maintained and aided by use of the dictionary capabilities of IDMS. This data is regarded as a corporate asset; procedures have been put into place to facilitate and control the use of "corporate" data throughout the university.

ADMINISTRATIVE INFORMATION SYSTEMS STRATEGY

Despite the use of the foregoing resources and methods, Western -- like many universities -- found itself in increasing difficulties in carrying out its information systems development in the mid-1980s. Many of its information systems were in need of re-development. Staff of the Department of Administrative Systems had to be reduced, in view of the "steady state" budget situation, to pay for adequate hardware and software to run the re-developed information systems and to handle the amounts of data and increasing degree of on-line access required for administrative operations. New administrative computer applications were being requested, in addition to a "backlog" of system development work stretching out for three or more years. In fact, many worthwhile projects had simply been put on the "back burner" awaiting sufficient resources.

The Vice-President for Administration foresaw that senior executive action was needed to break the logjam. Even if all worthwhile administrative computing could not be accommodated, there was a need to concentrate resources on the development and maintenance of those information systems which were critical and/or most strategically important. Because of the complexity and scope of the information systems work which could be undertaken, it was difficult to identify the major decisions which were needed, let alone foresee all of the implications for the departments affected. Simplification was needed as a basis for decision-making.

A major consideration was the need to involve senior levels of the administration in decisions regarding information systems development. The reasons were: first, the expense of development of information systems was forcing financial trade-offs which would affect all areas of the administration, and second, the information systems would have a major effect on most areas of administrative operations and therefore needed to be coordinated with general administrative planning.

It was recognized that decisions should not be made, or forced, by the Department of Administrative Systems. It was not considered fair, or appropriate, to expect this department to provide technological leadership, accept responsibility for development of information systems, *and* make decisions as to the priority and timing of new projects. Especially in the emerging technical environment of *distributed computers*, these decisions needed to be a result of collective planning *throughout* the administration.

A classical response in many universities to some of the above difficulties has been the introduction of "hard dollar" chargeback. The basic rationale for this has been to provide a simplified planning concept for the administrative information systems department: they provide whatever clients request and can pay for. It also has the effect of putting the onus on the client departments to obtain resources for information systems. However, this approach has been rejected at Western for the following reasons: first, it would not generate more money in total for administrative computing, and secondly, it would reduce the flexibility of the administration to move information systems resources to the most strategically important or critical projects -- which could very well change quickly according to circumstances.

ADMINISTRATIVE INFORMATION SYSTEMS GOVERNANCE

It was decided to put into place an administrative structure to meet the following objectives:

- Involve the senior levels of administration in decisions relating to administrative information systems. Accordingly, the Priorities and Planning Committee for Administrative Information Systems (FPCAIS) was set up, chaired by the VP, Administration, and consisting of all Assistant VPs as well as the Director of Administrative Systems. This committee became the vehicle whereby major decisions with respect to administrative information systems are taken.
- Involve appropriate staff throughout the administration in matters relating to information systems development. An advisory subcommittee, the Advisory Committee for Administrative Information Systems (ACAIS), was established, consisting of the Directors of most administrative departments, and representatives of all academic faculties -- the "end users" for many kinds of administrative information services. ACAIS is consulted with respect to all major policies and procedures regarding administrative information systems. In addition, a number of special study groups and task forces with technical expertise have been set up to consider certain matters, especially in connection with the initiative for office automation which was launched in the fall, 1988.

A METHODOLOGY

A search was conducted for methods which would facilitate planning and decision-making for major information systems development projects. Vendors and companies, as well as other universities, were consulted. It was concluded that many large organizations, despite investments of millions in "information systems development methodologies", generally "muddle through" where the big decisions were concerned. It was recognized that the tools and methodologies described above could not help in this regard, even though they are useful, if not essential, once a project has been decided upon.

Although "politics" can never be eliminated where major financial decisions were concerned, a method which would reduce the complexity of choosing among dozens of competing projects was desired, as well as a way of conceptualizing the decisions to be made. Many authors advocate the application of information systems resources to the most strategically important projects -- that is, the projects which most directly support the "strategic" goals of the institution. This is undoubtedly a good concept, but Western -- like most large universities -- did not have a clear or explicit plan, strategy, or set of goals which are of direct use in trying to decide which information systems projects should have priority.

It was decided to apply some methods described in the book "The Computer Solution: Strategies for Success in the Information Age", by Eugene F. Bedell, 1985. The methods advocated in this book appear to address the major concerns described above. Although these methods have been successfully applied in a few large corporations, they are not well-known, nor to our knowledge have they been applied in universities. Therefore we are breaking new ground in this endeavour.

The remainder of this paper is devoted to describing in detail the method which we have adopted. The method has some points in common with classical "cost-benefit analysis", but allows a considerable degree of collective executive judgement to be applied. Like any workable decision tool, it is used as a *guide* -- not the last word -- in the decisions we make regarding computerized administrative information systems development at Western.

PRELIMINARY STEPS

The first major task undertaken by PPCAIS was a review of the backlog of information systems development work. This was completed in 1987, and used to set the agenda for information systems development projects in 1988-89[1]. Previously, information systems development work was organized into *projects* and each project has in turn *phases* which are the necessary steps in the execution of a project of this nature: preliminary feasibility studies and definition, systems analysis and design, database design, programming, implementation, and maintenance.

In the summer of 1987, DAS undertook to review and cull the entire backlog of project work in order to provide PPCAIS with current information. About 100 sub-projects (phases) were identified. For each sub-project, a brief description was prepared, and manpower requirements in man-hours were estimated. Fortunately, Western has enough experience with project planning methodology that manpower estimates are now considered quite reliable. This information, however, proved to be too detailed for PPCAIS to identify the major decision points and tradeoffs, so DAS was requested to prepare consolidated "work chunks" -- the goal was to identify 20 to 30 major items of work which could be considered by the general administration. A "work chunk" proved to consist of about 2-3 man-years of development work -- systems analysis and programming. Based on this information, the work plan for 88-89 was approved. At the same time, it was decided to apply the methodology described below in the summer and fall of 1988 to produce the plan for 89-90.

IAU: Importance of an Activity to the University

A basic concept of this methodology is that of an activity. An activity is a major function of the university. In order to understand the importance of alternative information systems to the university, it is necessary to determine: first, which activity an information system supports, and second, *how important that activity is to the university.*

1Western uses an annual planning cycle. In the last quarter and early first quarter of each year, each department submits a plan for the following fiscal year (May through April). Every three years, each department submits a three year plan, which is thoroughly reviewed by the Senate Committee on University Planning. The annual plans provide an update to the three year plan and are accompanied by budget requests. Each year, planning instructions are issued. In the planning for 88-89, departments were asked to comment on their information systems development plans, and in the planning for 89-90, administrative departments and participating academic faculties were asked to include plans for office automation. These plans were collected and provided to PPCAIS for information. Of course, administrative information systems plans of departments are usually developed with the involvement of the Department of Administrative Systems. In this way, DAS has advance notice of client department requirements in order to prepare its own plans and recommendations, which are also reviewed by PPCAIS.

TABLE 1

IAU - IMPORTANCE OF AN ACTIVITY TO THE UNIVERSITY

10: ***Critical.*** An activity is *critical* if it must accomplish *outstanding* performance on *all* of its objectives for the university as a whole to achieve its long-term goals.

8: ***Important.*** An activity is *important* if it must accomplish *most* of its objectives for the university as a whole to achieve its long-term goals. The difference between *critical* and *important* is that outstanding performance is not required.

6: ***Contributory.*** An activity is *contributory* if it directly contributes to the achievement of the university's long-term goals, but the university may achieve its long-term goals even if the activity fails to accomplish a substantia portion of its objectives.

4: ***Support.*** An activity is *support* if it does not directly work to accomplish the university's goals, but supports critical, important, or contributory activities, and whose failure will not prevent the university from achieving its long-term goals.

2: ***Overhead.*** An activity is *overhead* if it must be done, but does not contribute to achieving the university's long-term goals.

0: ***Detrimental.*** An activity is *detrimental* if it works against achieving the university's long-term goals.

Examples of activities are: recruiting and registration of student; paying staff; financial accounting; budgeting.

It is not necessary to maintain an exhaustive list of all activities at the university. Only those activities for which information systems development is proposed need be identified in a given planning cycle.

In our first consideration of activities, a list of the principal functions of administrative departments was prepared. Generally speaking, single identifiable departments are the focus of a given activity -- that is, a single department usually has the prime responsibility for coordinating and/or carrying out the activity. For each activity so identified, each member of PPCAIS was asked to prepare a *subjective estimate of the importance of the activity to the university*, using a scale of 0 to 10, as shown in Table 1.

The administrative officers applying these ratings must form an idea in their minds of the university's long-term goals, understand the objectives to be accomplished by each activity, and know how accomplishing the objectives will contribute to the achievement of the university's long-term goals. For their judgements to be valid for the university as a whole, it is important that the administrative officers be positioned to make these judgements. PPCAIS seems appropriately constituted for this purpose.

The scores assigned by the members of PPCAIS were clustered and discussed by the group. The officers were asked to revise their estimates. Based upon the revised scores, a composite score representing the central tendency of all the scores was determined for each activity. It is noteworthy that the officers reached a fairly consistent set of scores for the various activities. The discussions of the officers in compiling this scale were interesting and yielded insights into the importance of the various activities at the university. This suggests that the process has team-building value, quite independent of the application of the IAU Scale to information systems decisions.

We should candidly recognize that it is difficult for any employee or officer to voice judgements about the importance of major university-wide activities (particularly outside one's domain of responsibility), and is fraught with political, organizational, and interpersonal overtones. This is especially true when carried through for the first time. It was possible at Western because the members of the PPCAIS are officers who routinely work closely together, and because the scores assigned by individuals have been keep confidential to the group.

It is planned that each year the list of activities IAU Scale will be revised, as necessary, as a first step in the annual planning cycle. It is expected that the IAU Scale will probably not change significantly from year to year, once established. It is probable that the IAU Scale can be applied in other decision-making situations at the University as the officers gain familiarity and comfort with its use.

DEFINITION OF PROJECTS AND SYSTEMS

The second important concept in this methodology is that of a computerized information system (or system for short). Each proposed project over the period for which decisions are made (fiscal years, at Western) leads to the establishment of a computerized information system. In other words, a project produces a system. The task of the decision makers is to choose between projects which compete for resources; or equivalently to set priorities for the acquisition of systems.

Each proposed project is given a descriptive title, a short description in non-technical language, and an estimate of manpower requirements and cost. We have calculated manpower requirements in man-hours, and costs are obtained by multiplying man-hours by $40 -- an estimate of the cost per hour of a programmer-analyst. The decision-makers will choose from the list of projects. An example of a project description is show in Table 2.

At Western departments are permitted to "buy" project manpower from DAS at the rate of $40 per hour. In the past, this has been done routinely for smaller projects and for "ancillary" (cost-recovery) departments. A decision available to PPCAIS is which departments will be required to "buy in" if they wish a project to be undertaken or to raise the priority of their requested work.

TABLE 2

A TYPICAL PROJECT DESCRIPTION

Title: Improve the Reporting of Ledger Account Data

Description: Improve the reporting of general ledger account data, both on line and in hard-copy. Provide for selective account ranges on reports; maintain and display up to five budgets (current and past four revisions); provide management report screens for any period in the current and prior fiscal year; provide tables where ledger account numbers can be linked to an entity code.

Manpower Estimate: 1850 hours

Cost Estimate: $74,000

ISA: The Importance of a Computerized System to an Activity it Supports

It is assumed that each system will support a unique activity. If a system supports more than one activity, this does not invalidate the methodology, but the estimate of how important a system is to an activity needs to be revised (see below). Alternatively, the definition of a system and/or the activity which it supports can be revised so that the system supports a unique activity.
In order to estimate the importance of system to the activity which it supports, the ISA index is prepared, as shown in Table 3. Originally, is was intended that the Department of Administrative Systems would prepare this index in consultation with the client department requesting the project; however, it was found that client department staff tend to overestimate the importance of system development proposals. To date, estimates prepared by PPCAIS are being used. In subsequent

decision cycles, a greater effort to involve client department staff in assigning ISA scores is desirable. In order for this exercise to be productive, however, more clarity regarding the definition of activities will be required from senior decision-makers.

TABLE 3

ISA: HOW IMPORTANT IS A SYSTEM TO THE ACTIVITY IT SUPPORTS

10:***Essential Factor.*** A system is an absolutely essential factor in achieving the major objectives of the activity it supports. Note that a system is not essential just because an activity uses it extensively.

5:***Major Support Factor***. A system is a major support factor to an activity if it is not essential to the activity, but can, or already does, play a vital role in supporting the activity.

1:***Minor Support Factor***. A system is a minor support factor for an activity if it helps the activity achieve its objectives but reasonable alternatives are available that are not significantly more costly, less convenient, or less effective, and that would not significantly disrupt operations.

0:***Not Useful***. A system is not useful if the activity it supports does not derive benefits from its use. It should be eliminated.

ISU: The Importance of a System to the University

In order to obtain an estimate the importance of a system to the university, we multiply the two indices, IAU - Importance of the Activity to the University, and ISA - Importance of the System to the Activity. The resulting index, which we may call ISU - Importance of a System to the University - is a value on a scale of 0 to 100.

Both the IAU and ISA Indices are ordinal scales - subjective estimates of the kind familiar to social researchers. We are aware that from a methodological point of view, the multiplication of ordinal indices is questionable. We have adopted this technique for the pragmatic reasons that the procedure is simple, that it separates the construction of the ISU index into two steps involving estimates of two quite different yet important factors, and that it appears to work well enough for our purposes

ESA: How Effectively does a System Support an Activity

The final index to be compiled is an estimate of how effectively a computerized information system supports an activity, both before and after its development. The ESA Index: How Effectively a System Supports an Activity, is compiled on a scale of 0 to 10 as shown in Table 4. The Administrative Systems in consultation with Client department representatives proposing the system.

TABLE 4

ESA: HOW EFFECTIVELY DOES A SYSTEM Support AN ACTIVITY

10:***Highly Effective.*** A system is functionally appropriate, technically adequate, and cost-effective. Little or no additional work or investment is required for the system, other than routine maintenance.

5:***Moderately Effective***. A system provides a moderate degree of support to the activity, but substantial improvements are needed to improve functional appropriateness, technical quality, or cost-effectiveness.

1:***Ineffective***. A system supports the activity it was designed to support, but ineffectively.

0:***No Support***. No system is currently installed, or the system that is installed is so ineffective as to be worthless.

The Change in Effectiveness Resulting from Installation of a System

In order to estimate the contribution to overall effectiveness resulting from installation of a given system (i.e., from completion of a project) we weight the change in the ESA Index with the ISU Index - Importance of the System to the University. The two values are multiplied together, that is:

The Change in Total Effectiveness Resulting From Installation of a System

= (ESA(New) - ESA(Old)) X ISU = (ESA(New) - ESA(Old)) X IAU X ISA

The resulting effectiveness index is on a scale from 0 to 1000. It can be divided by the largest value and multiplied by an arbitrary number (normalized) to facilitate comparison. We rank-order the resulting numbers to facilitate consideration by the decision-makers. An example of the calculations are shown in Table 5, using data for 1989-90.

Estimates of Cost-Effectiveness

A final step can be taken to introduce a measure of cost-effectiveness for each project. This is obtained by taking the index of increase in effectiveness and dividing by the estimated cost for the project to produce the system. Given the direct relationship between cost and man-hours at Western, we can equivalently divide by man-hours. For convenience, the resulting numbers can be normalized to obtain a Cost-Effectiveness Index. We rank-order the resulting numbers in order to facilitate consideration by decision-makers. See Table 5.

Use of the Indices by Decision Makers

The resulting indices are used as a guide to decision-making. The decision makers must consider how many projects can be undertaken in a given planning period, any logical inter dependencies among the projects, timing, and any other factors relating to planning outside the scope of this methodology. Using manpower estimates as a surrogate for costs, and assuming that the pool of manpower is known in a given planning period, the projects must be fitted into the agenda for the manpower available.

Once priorities have been assigned, the projects can be listed in priority order, and cumulative manpower calculated. In this way, the amount of work which can be accomplished in the following planning period can be readily identified. See Table 6 for an example, where the projects have been ranked in the order of estimated cost-effectiveness.

We consider that a programmer-analyst can produce approximately 1000 hours of project work in a year, taking into account training time, vacation, average sick time, and other activities which cannot be assigned to projects.

Each project can be viewed as a "rectangle" which can be stretched out or shortened according to the number of analysts assigned to the work. The height of the rectangle is proportional to the number of analysts assigned, and the area is proportional to the size of the project measured in man-hours. This, of course, is a standard way of planning manpower assignments. See Table 6 for a feasible schedule resulting from an selection of projects from the list in Table 5.

TABLE 5
PROPOSED VS DEVLOPMENT PROJECTS

PROJECT	(A) I.A.U.	(B) I.S.A.	(C) OLD E.S.A.	(D) NEW E.S.A.	(E) (ADD-ABC) CHANG EFFECT.	(F) EFFECT RANK	(G) MAN MTHS per project	(G) MAN MTHS cumm	(H) EFFECT/ MAN MTHS
FINANCE									
1. GENERAL LEDGER ON-LINE ENTRY	4	10	1	10	360	3	24	24	7
2. RESEARCH ACCT ON LINE ENTRY	6	5	1	10	270	8	71	95	17
3. LEDGER ACCT REPORTING	4	5	5	10	100	17	22	117	18
4. MISC PROJECTS-FINANCE	4	5	5	5	0	26	38	155	26
D.A.A.R.									
5. OFFERS OF ADMISSION	8	10	5	10	400	2	8	8	1
6. MISC PROJECTS - ADMISSIONS	8	5	5	5	0	25	24	32	22
7. MISC PROJECTS - STU RECORDS	4	5	5	5	0	24	37	69	24
PERSONNEL									
8. MANPOWER ON-LINE ENTRY	4	5	1	10	100	11	35	35	14
9. PENSION ADMIN/TAX REFORM	4	5	1	5	80	20	26	61	19
10. PAY EQUITY/SAL INCR	6	10	1	10	540	1	25	86	3
11. APPOINTMENT LINES	4	10	1	10	360	7	42	128	10
12. NEW DATA ELEMENTS	4	10	1	10	360	5	44	172	11
13. EMPLOY EQUITY	6	5	0	5	150	12	5	177	2
14. MISC PROJECTS-PERSONNEL	4	5	1	5	80	19	48	225	21
OTHER SYSTEMS									
15. CAD INTERFACE	4	5	0	5	100	15	5	5	4
16. SCHOLARSHIP DOWNLOADING	4	1	1	5	16	21	5	10	16
17. PURCHASING ONLINE ENTRY	4	10	1	10	360	6	54	64	13
18. IDMS/ONLINE - COST LEDGER	4	5	5	10	100	14	21	85	15
19. IDMS/ONLINE - B&G SYSTEM	4	5	1	10	180	10	24	109	12
20. BANK DEPOSIT - FND IN WESTERN	8	5	5	10	200	9	11	120	6
21. IDMS/ONLINE - FEES	4	5	5	10	100	18	43	163	20
22. MISC PROJECTS - ALUMNI	6	5	1	5	120	13	14	177	9
23. MISC PROJECTS - DEV OFFICE	0	5	5	5	0	22	4	181	23
24. POINT OF SALE - BOOKSTORE	4	5	0	5	100	16	5	186	5
25. IDMS/ONLINE - GRAD STUDIES	8	5	1	10	360	4	32	218	8
26. MISC PROJECTS - LIBRARY	0	1	5	5	0	23	8	226	25

TABLE 5
PROPOSED VS DEVELOPMENT PROJECTS
BASED ON COST EFFECTIVENESS

PROJECT		MAN MONTHS PROJECT	MAN MONTHS CUMMULATIVE	
05.	OFFERS OF ADMISSION	8	8	
13.	EMPLOYMENT EQUITY	5	13	
10.	PAY EQUITY/SALARY INCREASES	25	38	
15.	CAD INTERFACE - SPACE SYSTEM	5	43	
24.	POINT OF SALE SYSTEM - BOOKSTORE	5	48	(1989-90)
20.	BANK DEPOSIT - FOUNDATION WESTERN	11	59	
01.	GENERAL LEDGER ON-LINE ENTRY	24	83	
25.	IDMS/ONLINE - GRADUATE STUDIES	32	115	
22.	MISCELLANEOUS PROJECTS - ALUMNI	14	129	
11.	APPOINTMENT LINES	42	171	
12.	NEW DATA ELEMENTS - PERSONNEL	44	215	
19.	IDMS/ON-LINE PHYSICAL PLANT SYSTEMS	24	239	(1990-91)
17.	PURCHASING ON-LINE ENTRY	54	293	
08.	PERSONNEL - ON-LINE ENTRY	35	328	
18.	IDMS/ON-LINE - COST LEDGER	21	349	
03.	GENERAL LEDGER ACCOUNT REPORTING	22	371	
02.	RESEARCH ACCOUNTING ON-LINE ENTRY	71	442	
16.	SCHOLARSHIP DOWNLOADING	5	447	
09.	PENSION ADMINISTRATION/TAX REFORM	26	473	
21.	IDMS/ON-LINE FEES SYSTEM	43	516	
14.	MISCELLANEOUS PROJECTS -PERSONNEL	48	564	
06.	-ADMISSIONS	24	588	
23.	-DEV. OFFICE	4	592	
07.	-STUD. RECORDS	37	629	
26.	-LIBRARIES	8	637	
04.	-FINANCE	39	676	

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Track III
Organization and Personnel Issues

Coordinator:
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Converging technologies have dictated that institutions view their organization's structure and use their personnel in new and better ways in order to manage the changing information resource function. Not only is it important to determine where information will be created, preserved, and communicated; the choices of how and who will perform the functions and the skills required to perform and manage the functions are critical. Topics covered in this track included: organizational strategies for delivering information technology services; cultural differences among the units involved in the information infrastructure (computing, library, telecommunications); the need for different skills and capabilities in systems development staff in light of new development methods; the evolving role of the information center; and training and productivity issues.

Jim Scanlon, California State University

How to Successfully Mix Oil and Water: or How to Get Your Programmers to Work with Librarians

by
James J. Scanlon

Information professionals, as any diverse group of individuals, span the whole range of personality types, from the most gregarious to the very withdrawn. Different types of personalities are drawn to different professional types. We are all used to dealing with the typical police or bureaucratic mindset. One of the primary responsibilities of any manager is to ensure that individuals work well in harmony. Generally, computing and library professionals have very different personalities. This paper will examine the personality differences between librarians and computer professionals and further examine several strategies which will allow them to work together. The paper will also examine the present and future relationships of the computer center and the library.

The typical stereotype of the librarian is a little old lady with a bun on the back of her head who is constantly 'shushing' patrons. According to the Myers-Briggs Type Inventory (MBTI), librarians typically are literal, search for total solutions to problems, and place emphasis on authority. On the other hand, computer specialists think linearly, tend to search for the best possible fit to a problem, worrying about exceptions as they occur, and place emphasis on knowledge as opposed to authority when seeking answers.

These two differing personality types serve their professions well. Librarianship is a mature profession with a history going back to Greek and Roman times. Consistency of information presentation is essential for the librarian. One main function of the library is to provide quick and easy access to information for large numbers of patrons. In order to provide this level of access, there must be a high degree of standardization.

One must constantly rely on rules of authority to achieve standardization Over the years, these rules have served librarians and the general public well. The majority of adults were educated in a system which used library methods to access informations.

Because of the age of libraries, the decision-making processes have become very standardized. This is true of any mature institution. Mature institutions tend to have numerous review committees and very formalized decision-making processes which are indicative of bureaucratic organizations. Generally, since libraries are bureaucratic institutions, reliance is placed on authority as opposed to knowledge.

On the other hand, computer professionals come from a culture that is very young. As typical of young cultures; change is a constant. To deal with change, professionals must adopt coping strategies. Often these coping strategies solve only a certain percentage of problems in the general situation and then deal with the remainder, on a case-by-case basis.

Computer professionals, as indicative of professionals of any emerging field, tend to shoot from the hip and place their faith in the knowledge of individuals as opposed to their authority within the organization. Authority is a commodity that does not solve the problem at hand; therefore, is of little value.

Getting these two cultures to work productively, is at times, a difficult and frustrating process. Constant clashes occur between the personality types. Procedures which make absolute sense to a librarian make little sense to the computer professional, and vice versa. Conflict seems almost inevitable because of the differences in these interpretations. A case in point would be the library automation system at the University of Georgia. At the beginning of the author's tenure as manager of library automation, there was a great deal of dissention between the library staff and the computer staff. Shouting matches were not uncommon and little respect was shared between the two organizations. Over the course of three years, several strategies were developed to provide a better working relationship between these two groups. These strategies were based upon the following four pronged approach:

1. Develop mutual professional respect

2. Develop mutual understanding of operational needs of the other organization,

3. Develop an identification with the positive results of the other organization,

4. Good problem definition.

At the beginning of the project, the library staff perceived the computer staff as technicians, not as professionals. As technicians, the computer staff's opinions and needs carried a lower weight in the minds' of the professional staff. The genesis of this problem is quite understandable. Often, there is no formalized training for the computer staff, while a professional librarian is required to earn a Masters of Library Science. The difference in educational requirements alone was enough to make this perception widespread.

The key to overcoming this problem from the point of view of the computer staff was to act with a professional demeanor in all contacts with the library staff. When discussing problems, the computer staff was instructed to deal with the problems in a professional manner. In all situations, the computing staff attempted to portray the professional image and to refer to themselves as professionals.

From the point of view of the library staff, the professional image of the computer staff was built by the management of the library. When talking about the computing staff, they were referred to as professionals. When a decision needed to be made, the management staff would often refer to the expertise of the technical staff. This leading by example was very helpful in building the image of the computer professional as a true professional.

The second step was to develop a mutual understanding of operational needs of the other organization. Due to the diverse backgrounds and missions of computer professionals and librarians, there was difficulty understanding the professional concerns of the other group. As stated previously, the major interest of the library staff is to ensure constant and consistent access to information. It should be noted that the key words for library staff members are constant and consistent. These two words require a high degree of uniformity in operation. This overriding requirement for uniformity has lead to the requirement of librarians to require solutions which allow for all of the cases. When an unusual cataloging problem occurs, it must be dealt with immediately. It cannot be handled on an exception basis, but as a part of the routine function of the library.

The computer professional deals in a world where there is constant change. This is not only due to changes in the external environment and the work requirements of the supported systems, but those changes due to random occurrences. It is possible for a computer program to be changed due to the chance passing of a cosmic ray through the wrong part of a computer chip. Because of the extremely variable world of the computer professional, only the most common cases can be handled on a routine basis. All others must be handled on an exception basis.

Just as the library and computer professionals must recognize each other as different types of professionals, this recognition has its own set of professional concerns. Discussions of all problems and solutions should focus on the professional concerns of both communities. The computer professional is concerned with the stability of the system and integrity of the data. On the other hand, the librarian is concerned with the accuracy of the data contained in the system. These two sets of concerns are often at odds with one another. Decisions need to be made where there is a win-win solution regarding the professional concerns of both communities.

The bottom line of each of the two professionals is the same: "The provision of information in a timely and accurate manner." Because the end is the same, each group should identify with the positive results of the other. A system which handles the inter-accuracies of the relationships of serials designed by a librarian should be greeted with a high level of enthusiasm by the computer staff. On the other hand, an operational fix allowing for the recovery of data which is apparently lost should be appreciated by the library staff.

When developing a common language between the two staffs, it is incumbent on the computer staff to learn the language of the library staff. The jargon of the librarian may seem arcane, but it has a precise meaning for professionals in this area. The computer staff should learn the language of the user to allow the computer staff to do three different things. It helps the computer staff to associate more closely with the needs of the library staff to understand the logic behind the language. The second reason is that it allows for easier problem identification and solution. It is much easier for the user to explain the problem in a language in which he is accustomed, than to try to explain a problem in a language that he really doesn't understand. The third reason is that it helps build the professional image of the computer staff because the computer professional has learned language of the user, and in the process, gained new empathy with the user.

One method for developing this type of positive attitude toward the successes of other organizations is to hire staff from the organization or to allow that organization the opportunity to become involved in the solution of a problem they are facing. The former library staff member could often speak the language of the user much more easily than the general computer staff. An unanticipated benefit of using library staff as professions is to get at the other side of the questions. When one of the computer staff would complain about a perceived library problem, the former library employee would say, "But you just don't understand." From this rather startling statement, will come a new understanding of the operational requirements of the library.

Problem definition became a very big issue between the two groups. The library staff, being excellent problem solvers, would present problems in terms of solutions rather than as problems. This attempt to solve the problem before it was well understood generally yielded poor results. From the point of view of the computer professional, was that what often appeared to be a rational, intelligent solution to the real world would not work in the computer environment.

To assist in the problem definition, a great deal of time was spent in meetings where all aspects of the problem were well understood. When these problems were well understood, solutions would be discussed. This discussion process was often lengthy and stressful. As a result of this process, problems were solved which were agreeable to all parties concerned. By defining the problem in a manner understandable to all, a large step was taken in the solution of the problem.

To make these four coping strategies work required the full cooperation of all levels of management in both the library and the computer center. It was the expressed commitment of the directors of both departments that full cooperation between these two would exist. More than a commitment was made by these two individuals; they were occasionally called upon to intervene in situations out of control. From the commitment of the senior managers, the junior management followed with the active encouragement and cooperation.

In the final analysis, it was through the dedication of both organizations that a common professional ethic was achieved to deliver a service to their user community as it was needed. The professionalism of both organizations was the deciding point. The role of management was to demonstrate how this professional ethic could be achieved to improve communications between organizations.

These steps are applicable to all groups using the service of computer professionals. It should be remembered, the main goal of the computer professional is to achieve success through the success of the user community which he/she serves. A computer professional can design the most elegant system imaginable, provide instantaneous response time, and have 100% machine availability; but if the user cannot use the system, it is valueless. The key to a valuable system is to increase communication with the user.

Meeting the Challenges in Computer User Support

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The establishment of the microcomputer as a standard desktop tool, coupled with ever-increasing access to computer networks, has resulted in significant challenges in campus computer user support. Typically, the institutional response to these challenges has been shaped by the previous orientation of the responsible office: e.g., administrative vs. academic computing, or a history of mainframe vs. mini/micro support. This presentation describes a case study where a new "Computer User Services" department, completely separate from administrative computing, academic computing and the information center/MIS department, was created in an effort to provide a source of "application-neutral" user support. Problems and solutions are discussed, including the benefits of the approach and recommendations for those interested in pursuing a similar course.

In a short ten years, microcomputers have become the single most important tool -- aside from the telephone - in most administrative offices in higher education. At the same time, desktop computers have provided myriad opportunities for enhanced academic instruction, research and public service. One result of this literal revolution is the emergence of a new breed of computer consultants and a variety of new offices aimed at providing microcomputer support to campus computing users.

Most of these support organizations have evolved in obvious ways: for example, out of the traditional academic or administrative computing departments within the college or university. Others have become extensions or integral parts of Information Centers or MIS departments, where attempts have been made to adapt business concepts in the college setting. In every case, a series of new challenges must be addressed in some way:

- Guiding the transition from a "machine-centered" to a "user-centered" computing environment,
- Making all campus computer users citizens (or potential citizens) of an integrated data network,
- Dealing with the issues of hardware and software standards,
- Managing technological change with some semblance of rationality,
- Meeting user education and training needs, and
- Maintaining effective support sub-groups (for example, network user groups, computer stores, computer maintenance shops, special interest groups, etc.).

The Challenges:

The challenge of effectively guiding the transition from a machine-centered to a user-centered computing environment is dependent on the extent to which campus computing professionals acknowledge a fundamental change in computer user status.[1] In the old computer environment the mainframe (whether academic or administrative, or both) was at the center of activity, with computer experts working diligently to help users access "the machine." In the new computing environment, campus mainframes are simply one of many computing platforms -- including minis, high-powered workstations and microcomputers -- available to help users accomplish their tasks. While some have been slow to recognize it, the focus has clearly shifted away from the technological bulk

[1]The authors are indebted to Arthur S. Gloster, II, California Polytechnic -- San Luis Obispo, for his presentation, "Establishing an Information Resource Management Organization," in An IBM Seminar for College and University Executives, November 3, 1988, Oakland, California.

of major computing centers to the individual computing needs of the user, which typically can now be satisfied in a variety of ways.

This being the case, the real hub of activity from a hardware standpoint becomes the network, which leads to the second challenge outlined above: that of **making all campus computer users citizens (or potential citizens) of an integrated data network.** In this context it is not necessary to define an integrated network from a technological standpoint. Regardless of how it is achieved, providing general "any to any" device communication is, or will be, a requirement at most campuses.[2] The focus here is on the difficulties associated with providing flexible, easy-to-use network access to a group of users with such widely disparate needs, interests and levels of sophistication.

The challenges relating to **hardware and software standards** have been widely discussed in other settings. Suffice to say here that whatever size computer user support staff is available, it will only be able to effectively assist users with so many hardware configurations and software packages. Selecting good hardware and software standards and making them stick is both an art and a science.

Managing technological change with some semblance of rationality is perhaps the most frustrating challenge from a budgetary point of view. As each new generation of hardware and software bursts on the scene, top university administrators may have reason to believe that computers are a kind of "racket," with periodic payments required for "protection" from the dire consequences of being left out of the next level of technological advancement.

Unfortunately, the pace of technological change continues unabated, although the rush to adopt the latest new thing appears to have slowed temporarily while users either work to catch up learning to use what they have, or are content with tools that are generally adequate. The challenge, of course, is to help identify hardware and software migration paths that both protect current investments, while allowing users to advance at a rate that needs and desires demand.

A major part of the current investment in microcomputer technology is in training. **Focusing on user training needs and keeping pace with them as they evolve is a major challenge,** since it takes time and money to bring a large group of users to a significant level of expertise on any software package. Furthermore, each level of competence provides a window on further possibilities, which makes this a never ending process. At the same time, employee turnover insures that there will always be a need for introductory courses.

The final challenges we have identified are in the areas of microcomputer hardware support. In spite of challenges from small businesses and the questions relating to unrelated business income tax, manufacturer education discounts have put most support centers in the position of **running some kind of computer store and providing some level of microcomputer maintenance.** Store operations range in scope from offices

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[2] At Florida Atlantic University, the technical challenge has been to integrate three separate data networks with four different protocols into a single entity from a user standpoint. This is being done with gateways and protocol converters, using TCP/IP on the fiber optic-based Ethernet network.

which simply verify eligibility and hand out forms for users to return directly to the vendor, to full scale store front operations with large inventories of equipment. The ease with which most microcomputer hardware problems can be diagnosed and repaired makes maintaining some level of repair facility almost irresistible. Both kinds of operations have introduced a whole new set of management problems and challenges in campus computing.

The Case Study:

In 1987, a State University System of Florida review team conducted a comprehensive study of computing at Florida Atlantic University and published its report. In addition to recommending a new division of Information Resource Management bringing the various computing departments under one cabinet-level administrator, the team recommended creation of a new End User Support Center supporting both administrative and academic computing users.[3] After the new Associate Vice President for Information Resource Management was hired in 1988, he began immediately to implement many of the review team recommendations, including the creation of the new Computer User Services Department.

The Associate Vice President agreed with the review team's observations that a lack of coordination and direction had resulted in a wasteful and confusing use of resources. Individuals in both computing departments were providing the same kinds of services, but often with conflicting results. The person a user would call for help depended almost entirely on who they knew, rather than who might be best qualified to satisfy their needs. The two existing centers supported different networks with different communication protocols, in spite of the fact that many users had both academic and administrative functions to fulfill. Also, different software orientations resulted in serious incompatibilities in sharing electronically stored information.

While theoretically desireable, the review team's recommendations with regard to the functions of the new Center were impossibly comprehensive. Ultimately, within the broad mission of providing "responsive, high quality technical support to Florida Atlantic University computer users," the following five specific goals were adopted:

- Provide reliable, competent advice to faculty, staff, and students on hardware configurations, application software and network connectivity for microcomputers.

- Offer low-cost hardware maintenance services for microcomputers that will minimize user down time when repairs are necessary.

[3]Roberta Maddox, Information Technology Resources at Florida Atlantic University: Report and Recommendations (Tallahassee, Florida: State University System of Florida, September 18, 1987), p. 27.

- Provide effective low-cost training on microcomputer software products and use, as well as DEC VAX (mainframe) computer use.

- Coordinate campus hardware and software standards, and obtain the most advantageous pricing possible (through site license agreements, etc.) for products to assist individuals and departments minimize costs.

- Serve as a bridge between users and the technical systems people at the Computer Centers. Computer User Services personnel understand the technical foundations, capabilities and limitations of computers at Florida Atlantic University, and can help individuals apply computer technology to his/her day-to-day tasks.

The personnel and support dollars for the new department were literally carved out of the existing Administrative and Academic Computing departments. Identification of the personnel to be reassigned was relatively easy, given that both departments were already engaged in the kinds of support activities envisioned for the new unit; the individuals involved were simply given the opportunity to be part of a combined operation in which they would be doing essentially the same things. The timing was perfect for shifting the necessary budgets, since the directors of both of the existing departments had resigned just prior to the Associate Vice President's arrival. A former Assistant Director of Academic Computing was reassigned to head Computer User Services, and the department was on its way.

Staffing Problems:

Today, after one complete year of operation, the Computer User Services Department at Florida Atlantic University is firmly established and moving forward in the fulfillment of the goals identified above. The effort has not been without problems however, and some lessons have been painfully learned.

The first of these had to do with the consequences of putting together a user services staff from two very different computing environments and dealing with their resulting "identity crisis." The composition of the original Computer User Services staff members was two from Administrative Computing, five from Academic Computing, and one contract employee from a Regional Data Center.

The Administrative Computing personnel were accustomed to a one-vendor environment where technical problems were solved by calling in the vendor's marketing representative or engineer. These consultants were used to dealing with administrative personnel with tight deadlines -- most tasks were "emergencies," and priorities were established based on the user's rank in the University rather than on the relative severity of the problem. The administrative users had generally been given whatever they asked for, rather than following a strategic plan for campus computing.

Network connections for administrative users had been accomplished by running individual coaxial cable from a controller in the Administration Building to the user's office, wherever it was located. The cost of coaxial cable and distance limitations kept the number of administrative network users stable. In this environment administrators got immediate service, and since long-term goals were never addressed, they were the recipients of many one-of-a-kind, support-intensive microcomputer programs. For example, the consultants spent a great deal of time producing customized sets of mailing labels for various administrative offices.

On the Academic side, personnel were experienced in a multi-vendor environment. An Academic network was in place, based on Ethernet 802.3 technology. It was widely used and included both VAX/VMS and UNIX systems (including Hewlett-Packard, SUN and AT&T workstations) as well as a variety of microcomputers and terminals connected both directly to the network and through network servers.

Unlike the crisis environment of the administrative users, large projects with tight deadlines for academicians could usually be anticipated and planned for. While academic users often indicated emergency status for their requests, meeting deadlines was generally not as critical as on the administrative side. Consequently, some of the academic computing consultants had a very casual attitude toward consulting and user problems in general.

A major staff-related problem at the beginning had to do with salaries. There was a historical disparity in salaries between the two departments. Other staffing problems emerged during the process of assimilation. The Academic Computing Center had generally enjoyed a reputation as a successful, technically competent department. Personnel who moved from Academic Computing to Computer User Services had to give up some of the glory associated with their old reputation to build a new one. (The present location of the department is in the same building and in the same hallway as the Academic Computing Center so some of these identity problems still persist.) At the same time, the administrative computing personnel needed to be accepted into the group, and everyone had to participate in an exchange of system-specific knowledge.

Cross-training and sharing of clientele were other initial problems. The former administrative consultants generally viewed administrators as THEIR clientele and were not anxious to take on the diversity of academic-type problems. On the other side, the former academic consultants were not terribl anxious to take on problems viewed as "office-related," such as helping someone prin labels, fix envelope jams in laser printers, and so forth.

Policies and Procedures:

Computer User Services first had to establish an organizational structure. The next order of business was to establish working hours and expected work routines. As indicated above, personnel were used to very different management styles. After general departmental policies were in place, procedures for each of the three sub-areas in the organization structure were established: **Training, Maintenance, and Consulting.**

Training. One of the first things decided was that it was important to set up **internal training** criteria and procedures for staff development of the Computer User Services staff BEFORE attempting any expansion of training for campus computer users. For example, the chief maintenance person was sent to a one-week seminar to learn the finer points of repairing microcomputers. In turn, he was required to give a one-day seminar to the rest of the staff. Every staff member had to take a PS/2 and an AT style system apart, identify the boards and components, and put them back together. Following the same philosophy, other staff members attended local application seminars such as SAS and Desk Top Publishing, and vendor presentations on the Macintosh and IBM AS/400. Every other week, the department has an in-house technical seminar on pertinent topics such as LaserJet Printers (including Postscript printing), downloadable fonts, network connections, Campus Network Design, UNIX to VMS gateways, using the Kurzweil Programmable Text Scanner, and so forth.

With a program for internal staff development in place and functioning, Computer User Services proceeded to expand the training offered to university microcomputer users. Examples of the courses that were being offered include: Introduction to Microcomputers (including DOS), WordPerfect Beginning, WordPerfect Intermediate, WordPerfect Advanced, WordPerfect Special Topics, DBAse, Lotus 1-2-3 Beginning, Lotus 1-2-3 Advanced, Hard Disk Management, Backup and Restore Techniques, and Desk Top Publishing.

When one of the original staff left the University to relocate out of state, it was very difficult to replace his skill level. During the long recruitment process, a grant was negotiated to partially fund a certified trainer to teach faculty and staff. Because of the success of that program, the grant has been expanded to support 1.5 FTE positions. Computer User Services now has a part-time certified trainer with an office management background who concentrates on office-type seminars and courses including specialized topics such as WordPerfect mailmerge, printing three-up labels, among others.

Another method used to augment the number and frequency of training courses offered was a significant increase in the number of courses taught by persons of expertise from outside the department. For example, the Computer Science Department had requested that Computer User Services offer mini-courses in programming languages not taught by their department. Consequently, part-time specialists have been hired and courses have been successfully offered in such topics as "C" and FORTRAN. These classes typically have had full registrations the day they are announced and have required waiting lists.

Maintenance. An early and major undertaking of Computer User Services was to set up a new **Computer Maintenance Service Auxiliary** to repair and maintain campus microcomputers and peripherals. Starting the Auxiliary required first a list of standard supported hardware be produced, prices were established for agreements and repairs, a proposal written and presented to the President's cabinet, then the proposal went to the Board of Regents for approval. When the Board of Regents approved the new Auxiliary, a document explaining services and charges was prepared and distributed on campus. A new technician position was established, which involved generating a position description and bringing in enough capital to cover the technician's first year salary before recruitment could take place.

Although the initial charges were undoubtedly too high (based on the need to cover the technician's salary), the maintenance auxiliary has been successful. After the auxiliary was set up, a new microcomputer burn-in and installation service was instituted for campus users for a nominal fee. The fee also covered preliminary diagnosis and pick-up and delivery for warranty repairs. Whenever possible, loaner equipment has been provided to keep users up and running while their equipment is being repaired.

A second major undertaking has been the set-up of a **Computer Support Lab and Productivity Center**. This Center provides demonstration equipment and software for students, faculty, and staff to test and to learn about computer equipment before making purchasing decisions. The products represented in the Productivity Center to date are IBM, Apple, DEC, NeXT, and Hewlett-Packard. The hardware and software available for demonstration will be continually updated, depending on new announcements from computer vendors.

Part of the Productivity Center is the Florida **Atlantic University Computer Store** where vendors offer systems to students, faculty, and staff at educational discount prices. The Productivity Center also offers a method to obtain campus standard software at educational discount prices. In addition to providing Florida Atlantic University with a central place to discuss computer options, to exchange computer information, to demonstrate new technology, and to explore network connectivity issues, the Center offers other services. The Kurzweil scanner is a programmable text-only scanner which can be "taught" to read material printed in a foreign language, or text in different printer fonts. There is also a graphic scanner available for use.

Consulting. The consulting group has been the most problematic of the three areas within Computer User Services. The principal difficulty has been in clearly defining duties and then finding qualified personnel who are flexible enough to cover microcomputers through mainframes, and technical programming through office automation applications. From the beginning, the consultants were required to have experience with mainframe computing, with microcomputer computing as a secondary skill. The philosophy was that if a consultant is expected to be able to ascertain whether a user computing need might best be satisfied on a mainframe or a microcomputer, the consultant must understand the entire computing picture.

Other problems experienced in the consulting area include: (a) Software Standards. When it was announced that WordPerfect would be the campus word processing standard[4] the choice was backed up by surveys and microcomputer magazine ratings. However, there were still some very unhappy Wordstar and Displaywrite users. (b) Cross-Training. As indicated earlier, a consulting staff concept was followed instead of relying on individuals to be the sole expert in any one area. All members of the staff

[4]It was already the de facto standard, with approximately two-thirds of the university word processing market already cornered.

were given primary and secondary responsibilities for supported software. This has been difficult to accomplish because of the demands on staff time, and the natural tendency for people to specialize in their favorite area. The new Productivity Center is expected to assist since new software and hardware will not be installed or remain on just one person's desktop system. (c) Help Desk. The intent has been to establish a user hot-line, i.e., an easy to remember number for all campus users to call with computer questions and problems. While the number exists and functions to a certain extent, employee turnover and other problems have made success in this area difficult to obtain. (d) Computer User Database. At the outset, the Associate Vice President directed that a computer user database be established to keep track of individual user hardware configurations and software revision levels. A software package was purchased for this purpose, but again, employee turnover has prevented it from being fully implemented. (e) Network Connectivity Issues. The campus IBM S/38 has been successfully connected to the campus network by a gateway system. However, until very recently, we haven't had the necessary staff to solve the problems associated with keyboard mapping.

Successes in the consulting area have included: (1) establishment of a User Bulletin series for important announcements and distribution of university-wide documentation, (2) expansion of university site-licensing for microcomputer software (for example, in a six-month period, 570 packages of WordPerfect were distributed at a savings to the University of over $30,000), (3) creation of independent user groups (because it is not possible to support all applications, independent user groups are sponsored to augment the consulting staff), and (4) opening a Computer Support Lab and Productivity Center where faculty, staff, and students can try out a wide range of software and hardware before purchasing.

Criteria for Success:

The following criteria were identified to measure overall success or failure: Are the functional goals being met? Are users receiving reasonable levels of service? Are the anticipated efficiencies of operation being achieved? What end user problems have been effectively solved or addressed?

The scorecard so far has shown significant evidence of success: the Help Desk hot line logs an average 120 calls per week, the equivalent of two maintenance personnel are consistently busy, Computer User Services training classes are in constant demand, users (who are not shy about expressing dissatisfaction) appear reasonably happy, real dollars have been saved through more effective software site licensing, and the Productivity Center is open and operating.

Lessons and Recommendations:

Some of the obvious lessons learned were: the cliche that computing is a constantly changing environment is more true than ever; it is necessary to constantly train personnel; computer software consultants must continually be reminded it is as important to SHOW the user the solution as it is to fix the problem (better yet if the user can be taught to fix the problem the next time it occurs); that there is no such thing as "settled" or "all fixed"; and there still is not enough time in the day to accomplish everything -- which means setting priorities and sticking to them is essential.

Some of the most conspicuous mistakes included not remembering that higher salaries do not necessarily make employees happy, starting out with maintenance contract prices too high, and relying too extensively on part-time help.

Most notable successes included: starting with a clear mission statement and goals, hiring professional teachers with specialized computer training and sending the consultants to special training seminars and classes before allowing them to teach (it is a mistake to expect someone might be a good teacher just because they are expert programmers), separating the training group from the consulting group, and setting up the Help Desk hot line.

In terms of recommendations to others, overall the Computer User Services Department at Florida Atlantic University has been a success. It might be argued that there are still significant differences between pure administrative users and pure academicians. However, an extensive data communications network which offers the same menu of services to all, effectively blurs the distinction between types of users -- and some clearly wear both hats. The experience at Florida Atlantic has confirmed that there are economies to be realized, and that progress toward a university-wide community of computer users is an achievable goal.

Bridging the Gap:

Designing an Effective User Interface

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As information systems professionals we are totally immersed in systems technology, at work and probably also at home. We are comfortable with computers and excited about pushing them to the limits in order to solve our institution's problems. Typically, we design and build large centralized administrative systems. On the other side of the gap are users who differ widely in their impressions of the systems we deliver. On the one hand, there are those who are not at all comfortable with computers and find our systems intimidating, frustrating and difficult to use. On the other hand, there are those who have had a variety of microcomputer experiences and find our systems lacking in sophistication and "personal" flexibility.

This presentation will describe our experience at the University of British Columbia in developing a consistent, flexible but realistic user interface for a student information system. We will discuss such issues as screen design standards, on-line help, on-line procedure manuals, programmer creativity vs standards and managing user expectations.

1. What is the User Interface?

In a very simple sense, the user interface is everything with which the user has to interact in order to use a computer system. However, in this presentation we wish to concentrate on the kind of user interface you should consider for large, custom-developed systems in a mainframe environment, where you seldom find a good user interface. Therefore, our definition of an effective user interface has three components: the integration of systems and procedures, on-line documentation and the application of consistent design principles.

The Integration of Systems and Procedures

To integrate systems and procedures we must begin by deliberately designing the system and the office procedures at the same time. In fact, in a student system we also have to consider the student procedures, since students are users of a system just as much as the staff in the Registrar's Office or the faculty in the Biology department. Therefore, forms, paper flow, instructions and screen design should be seen as one "system" and designed as an integrated whole. Our users, students included, are becoming more educated in the use of systems and are demanding this degree of sophistication. We, as system planners, system designers and system managers, must respond to this challenge and broaden our definition of the system.

However, we must also be cautious and not attempt to automate everything in sight. Designers should be taught that the initials IBM could also stand for "it's better manually"! In other words, expanding the definition of the system does not imply that the computer must do all of the work. Analysts must apply their talents to the human side of the interface as well as the computer side. This begins the bridging of the gap.

Another way to bridge the gap is to realize that tables and codes belong to the users, not to the system. In the early days of systems everything was encoded in pursuit of the elusive goal of system performance. Today, we encode values to improve the human performance, by saving keystrokes and time. We can only achieve this goal if the users can easily remember the codes or easily find the correct codes. As information system professionals we seem to have a talent for developing cryptic codes for nearly everything in our environment (DBMS, CASE, 4GL, JCL, DFD, DED, TP, PSD, PDS, VRU...). Somehow most of us even manage to remember what these codes stand for. Yet when we apply this talent to encoding values in our systems we manage to develop codes like "7-01-90-290" to mean Master of Arts in English! We still believe that numbers take less DASD and less CPU (there's those codes again) than ordinary English language words. In the broader definition of the system, this just isn't true. A consistent, meaningful, user-defined and user-maintained coding structure is a first step on the way to bridging the gap between the human being and that binary CPU deep inside the blue box.

On-line Documentation

The next step is to put as much of the information as people need to effectively use a system right at their finger tips, which are on the keyboard (or maybe a mouse, or even a touch screen). The way to do this is with on-line documentation. This does not mean that we should rush out and take the Microsoft Word or Word Perfect files from which we print our manuals and put them in a file on the mainframe for users to read. In mainframe systems you don't have the different font sizes, boldface type, graphics and other layout aids you find on a PC. On-line documentation has to be carefully designed, using very different concepts than printed manuals. At minimum, a good set of on-line documentation should encompass:

- screen help
- data element help
- error message help
- prompts
- integrated procedure manuals
- training tutorials

Many PC software packages now offer these aids; why shouldn't our large mainframe systems?

Consistent System Design Principles

The primary objective of applying consistent system design principles is to put the user in control at all times. Too often we develop systems which appear to users to have a mind of their own. For example, we realized that in the first set of screens we developed pressing the enter key would in some cases update the screen you were on and then take you to the next screen; in other cases it would update the screen you were on and then clear the screen for the next entry; and in yet another case it would update the screen you were on and re-display the updated record. It all seemed logical to us because we knew which screens were in "threads" and which handled multiple records, but the users pointed out that there was nothing on the screen to tell them what action pressing enter would cause. They felt the system was in control.

To address these concerns, our interface definition insists on standard screen design principles, such as letting the users know what function they are in, single function screens, adherence to screen standards, menu-driven applications, consistent terminology for captions, prompts, etc., consistent navigation rules and consistent use of navigation aids like PF keys. We will describe later how we defined these standards and rules.

2. Why Design an Effective User Interface?

We believe that there are two key reasons why it is necessary to design an effective user interface. These are to meet the constantly changing user expectations and to achieve a more efficient use of resources in developing and supporting information systems.

To Meet User Expectations

The expectations which users have for systems are often very different than those of the system designers. If we are to meet these expectations, then we must begin to understand our users better. This process begins with understanding our environment. For example, UBC is a large public university with approximately 30,000 students in 12 autonomous faculties, including arts, science, professional faculties and graduate studies. Each faculty has distinct requirements for student information and distinct approaches to what, in other universities, may be common procedures. Thus, a single approach to certain system functions would not meet the users' requirements.

In addition, we were involved in the custom development of a student information system in a large mainframe environment, which entailed a migration of the system from a 1970's batch approach to a fully interactive, on-line environment (IDMS/MVS). We used a structured approach to phase in the new system, first developing a Touch Tone Telephone registration system (an application with high visibility in the community), then reviewing all student systems to develop a plan for replacing the remaining old systems in several subsequent phases. The users who best understood the existing batch system therefore lacked the on-line experience to effectively contribute innovative ideas for a new system. Nevertheless, we had to consider the needs of these users as well as those who were ready to make a giant leap into the twenty-first century. Only by carefully designing the user interface can you meet the expectations of such divergent groups of users.

In any organization you will find that the users of a system have different and changing skill levels. For example, we had some experienced people, both faculty and staff, who used the registration system frequently, understood its functionality well and were eagerly awaiting more of the same. On the other hand, we had many infrequent users who lacked confidence in using computers and didn't know what the system could do for them. There was also a large group who had been using an on-line system on a different mainframe which suffered from slow response time and limited functionality. They were prepared to use the new system, but with a certain vocal skepticism about its ability to do the job.

However, their lack of enthusiasm was easily offset by a small but growing group of PC-literate users who saw the PC or MAC as a solution just waiting for every problem. Why couldn't the mainframe have pull-down menus, pop-up dialogue boxes, multiple windows, graphics or icons and still have sub-second response time, they asked.

Finally, there was the diehard group with only batch system experience. Their idea of the user interface was to "cram" everything on one screen, replicating their coding form which had ten or fifteen different transactions on the one form.

Recognizing these different skill levels still wasn't enough. We had to try to ensure user ownership of the system. The initial 6 months in the life of a system are critical for its long term success. A sense of pride and ownership must be developed during the design stage to ensure that user support will be there to iron out the initial growing pains that any new system experiences. In order to achieve this sense of pride and ownership, the users need to feel that they played a key role in the design of the system and that their ideas were listened to and addressed in the system which is finally delivered. Developing this ownership means that the project team must learn to approach tasks from a user point of view rather than an analytical point of view. For example, a system designed according to all the rules of accounting principles may keep the auditor happy but will fail miserably if it is too complex for a clerk, the primary user, to understand.

Efficient Use of Resources

Every project manager is interested in making the best use of resources in delivering a system. At first glance, designing a user interface as we have described may appear to increase costs, particularly in the design and development stages of the project. However, a closer examination of most projects will show that a large portion of the team's time and the project's budget is spent on creating user manuals, conducting training sessions, and distributing replacement sections of the manuals as the system is modified. Adhering to consistent design principles and including on-line documentation should reduce the number and the size of printed manuals, reduce the number of training sessions and reduce the cost of distributing, updating and replacing documentation. The results should be a more user-oriented system for the same resources.

In addition, maintaining an adequate level of funding for large central systems at universities is always difficult. The system is expected to support the unique requirements of the individual faculties and departments, as well as those of the "centralized" administrative departments. Yet as soon as faculties believe they are not being served adequately, they may "steal" the funding to develop their own unique PC-based solutions. Developing a quality system from the users' point of view can often prevent this duplication of effort and provide cost-effective solutions for all users.

Another hidden cost of training and documentation surfaces once the system has been in production for some time. The frequency of user training sessions and the new releases of documentation decrease and new users to the system are left to struggle with learning the system on their own, frequently using outdated paper documentation. For example, the department that attended the most training sessions and collected the most manuals during our initial project is still the least knowledgeable on campus. They frequently complain that the system won't do what they want, simply because they do not know that a feature exists. Is this their fault? Probably not. In hindsight, we recognized that those people were probably the least computer-literate group of users, had difficulty absorbing everything in the training sessions and thus had limited knowledge to pass on to new staff. With on-line assistance, new users will be more likely to be aware of the system features and continue to be satisfied with the system longer.

3. How to Design an Effective User Interface

As we have indicated, we are now developing the second phase of a student information system. We have learned from our mistakes on the first phase and have begun to apply some of the concepts we have discussed so far. As a result of these experiences, we believe that the key factors in designing an effective user interface are establishing interface standards, ensuring extensive user involvement and recognizing the cost of training and documentation.

Establish User Interface Standards

The first step is to develop a standards manual. This is not an easy task. We asked several senior analysts on the team to write position papers on each of the elements of the user interface as we defined it in section 1, such as help, table strategy, screen standards, etc. These papers took into consideration some of the standards we had already developed in Project 1, the ideas we had gathered from the users and the ideas we had discussed as a team. The position papers discussed different ways of implementing the concepts and their technical considerations and made recommendations regarding the best approach. We had numerous meetings with the team leaders and several all-day sessions with the whole project team and user representatives. The entire process spanned several months, during which time we were also completing the functional design of the system.

Just when we thought we had a standard pinned down the old question, "Is it a standard, a rule or a guideline?" would surface. (We found that a standard was something you had to do, a rule was something you could break, and a guideline was something you could ignore!) There were always reasons why the standard didn't apply to a certain situation or became technically difficult to implement. At some points we wished that we had had a standards appeal court with all the bureaucracy to discourage team members from wanting to re-open the standards discussion. What we learned, however, is that a certain degree of flexibility is necessary both in developing the standards and in enforcing them, although knowing when to stop the research and publish the standard is difficult in this environment.

In the end, we also found that time and resources did not permit us to implement every design concept we had considered. So we tried to set achievable goals and focus on those concepts which would best contribute to an effective user interface at a reasonable cost. We chose to implement a meaningful coding structure with easy table look-up, consistent screen design principles, screen help, data element help and a limited set of prompts. These provided the basis for the other aspects of the user interface which we hope to add in later projects.

Ensure Extensive User Involvement

Having developed the standards, we looked for ways in which to get the users heavily involved in the design of their system. In our first project we recognized the value of significant user involvement and therefore planned for user secondment, including 90% of a senior person in the Registrar's Office and some time from representatives of all key departments. We also established a user Advisory Committee with senior representatives from all faculties. However, we soon discovered that maintaining sustained user support was not an easy task, because day-to-day activities frequently took priority over systems development. Thus we looked to additional solutions for Project 3.

Buying User Involvement

First, we "stole" an administrative staff member in the faculty of Education who served as our user trainer on Project 1 and hired her as a systems analyst. This has worked very well. The team has the benefit of an in-house user, while she has gained technical expertise and is better able to recognize when a proposed functional solution is not technically feasible. Next, we sought to ensure stronger support from faculty members. When one of our best faculty representatives, a former Associate Dean of Graduate Studies and a member of the Commerce faculty retired, we hired him as a team consultant on a part-time basis. He has an excellent understanding of the administrative functions of the university as well as what will and will not be acceptable to faculty members in a student information system. His wealth of knowledge and sudden lack of day-to-day responsibilities allowed him to focus on the design of the system and therefore we improved the quality of the system significantly.

Another way in which we "bought" user expertise was by assembling a development team with strong application experience. In addition to the extensive student application knowledge for UBC team members, we hired consultants with student application experience, both at UBC and other educational institutions. In fact, when we take the two senior UBC people and the two senior consultants, we have a total of 47 years of diversified student application knowledge!

However, we learned that even with such knowledge it was not always best to assign analysts with strong functional experience in a particular area to that specific function. It was sometimes difficult for analysts to overcome their natural inclinations to improve efficiency by relying on their past experience rather than taking time to understand the needs of the current users. An alternative may be to assign another team member to do the initial research and design the system, then use the analyst's functional knowledge as a resource and for reviewing the design.

Structure for Participation

Strong, consistent user participation in the design of a system is difficult to achieve when using traditional approaches to systems development which rely on interview sessions with many individual users followed by extensive written specifications and user responses. We opted for a structure which required concentrated user participation for short periods of time. We did this by encouraging the use of prototypes and Joint Application Design (JAD) workshops.

We believe that using prototypes is the only way to design an effective system, since users typically don't know what they want in a system until they have seen a version of it. Further, in order to take full advantage of prototypes they must be presented and discussed with a group of users rather than with one person at a time. To be successful, such group sessions require a structure and a clear focus, which JAD delivers most effectively. Since it is a workshop with a team of users and only one analyst, a JAD generates excellent ideas and synergy while encouraging strong user participation. By incorporating the creative use of technology, such as projecting the prototype on a screen and modifying and expanding it during the session, users became even more actively involved in the system. However, this user involvement and improved quality of design did not come automatically. JADs and prototypes require careful management.

Prototypes, by their very nature, encourage change. Prior to the JAD we had to work with the team to encourage them to accept this change, since most analysts take great pride in their work and find it difficult to accept that their prototype wasn't perfect. However, after the initial JAD sessions, during which the users had changed the prototype many times, the team easily fell into the cycle of accepting and making changes readily. It was then difficult to bring the design to a close because there was always one more "better idea" to be incorporated.

Even the users got caught up in this "better idea" syndrome. For example, we established our general system design principles well before the JAD sessions, as we described earlier. We thought that we had considered all of the options and selected the ones which worked well in project 1 and were best suited to our users and our technical environment. Nevertheless, we still got surprised in some areas. Each of our screens had a unique mnemonic identifier. We thought these would be easy to remember and give some clue to where a screen fit in the overall system. During the JADs the users decided, however, that numbers with no specific meaning were a better way to identify screens. We were committed to designing for the users, so we agreed to use numbers on the new screens and to change the names to numbers on all of the screens already built in project 1!

In some cases the JADs encouraged creativity beyond reality. Based on previous experience with PC's, the users requested "friendly" menus. They had seen menus in alphabetical sequence, menus with highlighted key letters for selection, menus with selection by number, and menus with selection based on cursor positioning. Each of these approaches had its advantages for some group of users; therefore, they wanted some aspects from all four methods of selection incorporated into each menu! Needless to say, it fell to the project manager to explain why the technical limitations of MVS and the cost of programming would only permit one type of menu.

Offsetting our enthusiasm at the degree of attention the users were giving to design concepts in these JAD sessions was the disappointment at the consistency of the user participation. Even though we invited representatives from various departments to the JADs well in advance, we discovered that commitment to day-to-day activities appeared to take precedence over a system being developed for the future. Some people who had confirmed their attendance did not attend at all and others only attended for part of the session. Even more frustrating, we found that some users who were too busy to attend the initial three-day development session attended the one-day review session and then wanted to re-open previously resolved issues because they had missed the initial discussion. This presented a difficult dilemma for the JAD facilitator and the project manager who wanted the user involvement, but also had a tight project schedule to meet.

Finally, a few guidelines on selecting user representatives are in order. Because of the size of the University, we found that it was not feasible to involve representatives from every faculty and department in a JAD. Therefore, careful selection was required to get a representative cross-section of the campus. Sometimes, this involved including some users who had traditionally been opposed to the system. The natural inclination was to avoid these people, but we found that it was best to get their viewpoint up-front, when the issues could be addressed, rather than waiting for the sniping to occur after the system was installed. We also found that during the development process staffing changes occurred in key user positions. At UBC, Deans and Associate Deans are term positions. When the term for one of the Project's actively involved Associate Deans expired, his replacement had a totally different view of his role on the project and how the system should work. Managing such a change was a challenge for the project team.

Even more difficult, we discovered that our greatest asset could become a potential liability. Our Registrar has taken a keen interest in the project, has attended all of the JAD sessions, has displayed a great vision for the future and has shown that he has an extensive knowledge of the current rules and regulations. He has also been the champion of the novice and occasional user, suggesting various concepts which would make the system resemble a PC and be more accessible to these groups. His enthusiasm and vision had an infectious quality which the project team enjoyed. However, he sometimes forgot that the project budget was limited, the scope had to be controlled and that mainframe systems just couldn't deliver everything his PC could. We should all have such faith in systems development.

Recognize the Cost of Training & Documentation

Our past experience was probably not much different than most large projects in a decentralized setting. For Project 1 we organized and ran 35 user training sessions, which cost the project team more than 100 person days of effort. We trained over 300 staff and faculty and then handed out at least 400 user manuals. These manuals saw more than 200,000 pages of paper run through the Registrar's Office photocopier. The manual is already in its second edition and still needs revisions and improvements. Yet despite this massive effort, the team still spent more than 200 person days on post-implementation support, often "hand holding" the same users we had trained.

We concluded that by expending some resources early in the project to improve the user interface (as we have described) we hoped to reduce our training costs; but that was not enough. We also had to address the issue of voluminous specifications, which were read once or twice by the programmers and then left on the shelf, while someone else re-produced much of the same information later in the user manual. We decided to take an evolutionary approach, agreeing that in writing specifications we should have the ultimate goal of on-line help in mind. The concept was to get the team to write specifications which could become documentation, which then would become the on-line help text. In this way we expected to produce a minimal user manual, perhaps in the form of a quick reference guide.

The theory sounded good and was eagerly embraced by the team; however, we made one startling discovery: not all analysts write at the same level or with the same degree of proficiency. We had agreed that screen help would consist of two parts. First, a brief statement of the purpose of the screen (what it did), which would be the first "page" of help. Second, there would be three to four "pages" of a description section indicating how the screen was to be used. It was amazing to discover that four analysts could all have a different definition of what the word "purpose" meant. In the first draft of our screen specifications we found that one analyst could describe a fairly complex screen in one terse sentence, while a colleague would take four convoluted paragraphs. Neither of these accurately described the purpose of the screen.

We also found that keeping a consistent level of language and approach was a problem. The programmers and analysts knew what a screen was supposed to do from the system point of view and were naturally inclined to write help for themselves. It proved very difficult to train analysts to think like clerks.

The answer, we found, was to have the team write the first draft of help and then let an experienced writer polish the product. This added to the time it took to develop the specifications but certainly improved the quality.

Conclusions

We are just completing the design of the system and have not yet begun programming and installation. We have tried to adhere to our definition of an effective user interface and to involve the users extensively in the design of their system. By this time next year we should have implemented the first phase of the system and gathered some working experience with it. Perhaps we will have an opportunity to share the outcome of this experiment with you at Cause 90.

OFFICE OF SYSTEM AND COMPUTER SERVICES IN-HOUSE MICRO COMPUTER REPAIR IN THE COLLEGE COMPUTING ENVIRONMENT

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Other than third party vendor maintenance services, what alternatives can College management consider for reducing the increasing costs of repairing and maintaining micro computing devices? What primary considerations should be addressed, when an alternative internal repair support decision is made? How do we ensure users will be provided service equal to or better than the service they would receive from third party vendors?

The In-house Micro Repair Group at Cuyahoga Community College was initiated through a proposal developed by the College, the Office of Systems and Computer Services, and Systems & Computer Technology Corporation, the computing center facilities management organization.

INTRODUCTION

Cuyahoga Community College has implemented an in-house "Micro Computer Repair Center" which provides faster response to user problems, is more sensitive to user needs and priorities, and is more cost-effective than third party services.

This session will share the experience Cuyahoga Community College encountered before, during and after the implementation of it's own in-house Micro Repair Center ...what went right, what went wrong,.... and is intended to provide background or assistance to other Colleges in implementing similar in-house solutions.

BACKGROUND

In 1983/84 Cuyahoga Community College was faced with the dilemma of whether or not to continue paying a third party vendor approximately $95,000 annually for the maintenance of its terminals, printers, and micro related devices, (approximately 622 pieces of equipment), or find an alternative which would be less expensive, provide faster response and better service user support requirements.

During this period, whenever devices broke down or a user had a problem, a call was placed to the Office of System and Computer Services, (the data center), where it was logged by either a computer operator or a communications technician. The call was then forwarded to the third party maintenance vendor. They would respond by sending a repair technician to repair the device on site or return it to their service center. If a spare was required the college was still obligated to supply it.

Due to the critical nature of on-line administrative transactions being processed, it is imperative that terminal problems be addressed immediately. The vendor guaranteed four hour response time, which is not unreasonable without a dedicated repair person on site. Quite often, this response time is not sufficient. When lines form at the business office, during registration because of equipment downtime, students get angry, frustrated and leave. When you depend on enrollment for your livelihood, this type of situation can not be tolerated.

The College data processing environment at this time consisted of a Honeywell 6610 dual processor as the mainframe computer linked to three campuses through Honeywell DPS 6's serving as gateways. All Administrative Offices had Hazeltine or Courier terminals which were the smart devices and Lear Siegler ADM 3/5 dumb terminals. Remote printing was primarily done utilizing Decwriter LA 34/36 printers. The Micro computer environment consisted of a few IBM PC's in some offices, Apple II's in labs, and some donated Commodore 64's, none of which were network connected. Computer related hardware and software inventory management was in its infancy, unorganized and inefficient.

Gameplan

Planning was underway for upgrading the current network terminals to micro computer PC's which would provide faster response and greater functionality for the users. Implementing leading-edge technology, the college was creating more micro computer related courses of instruction, which meant more micro computers in the classrooms, which required more dollars for maintenance. All things considered, it became apparent that micro repair costs were going to significantly escalate.

After requirement bids, five vendors submitted proposals for the maintenance of the devices just described. Only two vendors quoted prices for the repair/maintenance of all terminal, micro and related devices, one being the then current college third party maintenance vendor.

TRANSITION

A proposal was prepared by OSCS and submitted for an in-house micro repair center utilizing existing communications support personnel.

The college decided to try experimenting with several options. The first option tried was an agreement with the third party vendor on a time and materials basis, with no overall maintenance contract, for basic equipment repair services.

The second option also included the third party vendor on time and material, but also included one of the college OSCS communications technicians as an in-house repair person. The vendor was primarily responsible for the repair of the administrative terminals and remote printers. The OSCS technician was responsible for repair calls associated with micro computers, ensuring that all calls were logged and forwarded to the vendor and tracked if local repair was not possible.

The vendor charged $60.00 per hour with a two hour minimum so all calls cost at least $120.00... more than the worth of some devices, after parts costs were added.

The technician was soon overwhelmed with repairs and faced a backlog of equipment, which had been picked-up for repair. The backlog continued to grow and consequently the single technician with his other communications responsibilities, couldn't service the devices disabled the longest. This arrangement was unsatisfactory because the technician could not perform his primary duties which took priority over repairing micro equipment or auxiliary devices.

OSCS Goes It Alone

Late in FY 87/88 the college decided to modify its contract with SCT and add an addendum for additional personnel to initiate its' own in-house micro repair center staffed by two repair technicians. The staff currently consists of a senior technician, repair technician, and part-time student assistants on a continengency basis supervised by an OSCS Manager.

The guidelines for the Micro Repair Center were that it would provide four hour response time, provide coverage from 7:30 A.M. to 9:00 P.M. (Monday through Friday) and service all three campuses, the District office, and other satellite sites which the college owned or occupied.

To begin operations, policies and procedures had to be written and implemented, the College community had to be informed of the existence of the Micro Repair Center and repairs had to begin.

The Micro Repair Center was budgeted with approximately $115,00.00 to buy replacement parts, loaner devices, tools, manuals, a software package for inventory and problem history management, and pay third party vendors for any work allocated to them. Initial staffing costs were budgeted at approximately $163,00.00.

The initial Micro Repair Center staff consisted of a senior technician who had an extensive background in micro computers, a trainee who was transferred from computer operations, a student assistant with a knowledge of micro software, all under an OSCS Manager with an operations background.

The first order of business was to prepare a suitable workplace. A phone number exclusively for micro repair had to be obtained and published. Space had to be allocated and work areas set-up. Space for parts, tools, manuals, in-coming/out-going devices, devices waiting for parts, others being worked on and office space was another concern which had to be addressed; there had to be space for not only the computers, but also for the micro repair staff.

A form had to be designed which would serve as hard copy documentation of problem calls. Information had to be comprehensive enough to include the requestor name, phone number, problem description, date/time reported, date/time responded, date/time device up, repair person, description of work performed, time spent, parts cost, warranty information, loaner information, and name/date/time of outside vendor. This all didn't happen on the first design...the form became more descriptive as more experience was gained in the shop. Also this hard copy form had to stay with a device until it was returned to the user. This repair form is also the vehicle used to log and monitor problem history which is maintained on the Micro Resource Manager software package.*

Resource Management

At this point it's appropriate to discuss the importance of having an automated software package for inventory management and problem history tracking.

The college had established a policy which required all hardware/software purchased by anyone in the college to be logged, tagged, and distributed by the data center. This provided a control point which allowed better tracking of the increasing amount of micro computer equipment. Prior to the establishment of the Micro Repair Center all of this information was entered on a data base maintained separately within the data center. The college also maintains its own data base which contains the same information, but not as organized or descriptive. Neither of these data bases contained files which could be used for problem reporting or maintenance information; especially labor and parts cost data.

Management reporting requirements at this point were vague and undefined. The initial focus was on inventory control management and problem history. The first tracking package purchased cost $600.00 and after installation and use for a short period of time was found to be deficient in tracking labor or parts costs and wasn't sophisticated enough for our expanding inventory management requirements. We reviewed the Micro Repair Manager (MRM) package from Atrium Information Group which appeared to fulfill our requirements and could be upgraded to accommodate 15 on-line users. We purchased the basic package in November,1988 but production installation wasn't implemented until March, 1989 after an initial testing phase. Computer Associates now markets the MRM system. Management now focused on inventory control, problem history, labor tracking and parts costs statistics because OSCS had until July, 1989 to present facts figures, and statistics which would justify the decision to continue the implementation of the in-house Micro Repair Center.

To install the MRM inventory data base we had to import all records first from the original package base and second from the college capital data base. The first import was not difficult because previously defined files and descriptions were similar. We completed importing records from the college capital data base, (the most difficult) in October of this year. It's important to note that on the data base a device is defined as anything which is attached to, can be attached to, or actually is a micro computer. For example, a keyboard is a device which we must fix or discard, but still have the responsibility for repairing it...even though keyboards aren't

entered on the data base because they cost less than $200.00. We still have to provide parts and labor costs for repairing them.
In-house repair becomes a necessary and viable alternative when the number of devices begins to exceed 600. This is an approximate break even point, depending on equipment repair supported, to cover salaries, parts and equipment. Currently CCC with 2,000 micros representing a composite total of 8,000 devices to support, requires a cost effective solution. Our present in-house repair cost to support all equipment, PC's and other devices, is $278,000 per fiscal year. A current third party vendor quote received, of $246.00 per PC, would equal $492,000 for just PC's alone. Consequently in-house repair saves the College a minimum of $200,000 per year. To realistically look at total savings, you must include the cost of third party repair for all other non-PC devices. The additional costs of these items, digitizers, plotters, file servers, printers, etc. dramatically escalates third party maintenance costs over just PC support.

Estimated savings since the original implementation of the in-house Micro Repair Center at Cuyahoga Community College approaches $392,300 for 22 months of service. This figure is based on prices third party vendors have quoted to maintain devices at one college location... then multiplied by the remaining devices throughout the rest of the college and compared to the documented costs we have incurred in the Micro Repair Center.

An alternative method of comparing internal versus third party is to take OSCS's labor charge of $35.00 per hour and compare that to the minimum hourly rate third party vendors would have charged for the same repairs on site; approximately $130.00 and then add the parts costs. Most third party vendors are quoting $55.00 per hour on-site but they also include travel time and expenses in addition to this cost which equals the $130.00 figure. We realize significant savings (wholesale) on Apple parts as an authorized Apple repair center. This is achieved by having a repair technician trained at their school.

FUTURE CONSIDERATIONS

Currently the Micro Repair staff is resident at the Metro Campus of the college. While this arrangement provides timely service to Metro, the District office, the Unified Technology Center, and a downtown satellite it doesn't provide the same to the two campuses located outside the Metro Cleveland area.

We have considered several alternatives to improve micro repair. One alternative is providing training, at a basic level, to Academic Campus Consultants located at our Western and Eastern Campuses and providing a small inventory of devices and parts frequently causing problems at these sites. At this point in time this alternative is still under consideration. Ideally, there should be a qualified repair technician at each campus who is linked online into the MRM system. This would allow us to generate an action report from the MRM system directly to the appropriate campus and that technician could then perform the required maintenance and update the MRM system. If the repair call required us to bring the device to our central shop at Metro it could be picked up and a loaner dropped off by a delivery person making the rounds to all locations once a day.

We also need to improve our service/response from those third party vendors which are repairing farmed out devices. Some of these repairs are taking in excess of two months which is unsatisfactory. Expanding our repair capabilities to reduce the necessity of sending equipment out appears to be the only realistic solution to this problem.

We have requested the programming staff to perform an analysis of the "MRM" and "Progress" software packages and to determine from management what reports or reporting statistics are required. The analysis will be the impetus to generate a project producing additional custom reports from these two packages.

The use of College student assistants could also be expanded into an academic training environment supported by and supporting the institution.

The management of the inventory database can be greatly enhanced by including the Purchasing and Receiving departments in the group of online users of the MRM system. This would allow any purchase order relative to micro hardware/software to be entered by the Purchasing department at it's inception, viewed for status by our office, updated by the Receiving department when the order came in, and updated again by our department when the order has been tagged, delivered and installed, and finally entered into the inventory database by our staff.

CONCLUSIONS and RECOMMENDATIONS

The in-house Micro Repair Center at Cuyahoga Community College is a new viable operational entity which has saved the college hundreds of thousands of dollars in its 22 months of operation. It provides faster response to user problems than a third party vendor can for the costs incurred, and it provides the college user community a central point within the college which they can call for hardware problems. An additional benefit of the in-house Micro Repair Center is the familiarity and in most cases a relationship the users have developed with the Micro Repair staff in addressing their questions and problems. Having a central focal point within the college which monitors the pulse of micro related problems and micro inventory management is essential for control purposes and for senior college management to be able to identify its' micro computer resources and micro computer needs.

Distributing Support - Departmental Computing Coordinators

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Abstract: End user computing appears to be successful as the talents of end users are increasing. This is the mission of our information centers. The mission is being fulfilled, and everyone is happy, right? Well, almost, but now we face a new set of concerns as decentralized processing seems to threaten the integrity of the institution's information resource.

Information Systems at Loyola is sponsoring a new program to create a partnership and better define the relationship between it and end users. The program will institute an accountability called Departmental Computing Coordinator (DCC). The objectives of the program are to promote and harness the talents of end users, while maintaining the integrity of centralized systems.

Distributing Support - Departmental Computing Coordinators

To say that a lot has changed in computing over the last few years is not an unusual statement: computing always changes a lot *any* and *every* few years. What distinguishes *these* last few years are the computing capabilities that have been placed on the user's desktop.

The new capabilities offer new opportunities, and computing support organizations have to reconsider their methods to take advantage of them. This paper describes how we at Loyola are doing that by means of a program called Departmental Computing Coordinators (DCC).

Background: Computing at Loyola University Chicago

Loyola is a private, Jesuit, coeducational university with an enrollment of about 16000 in its ten schools and colleges. There are three campuses in the Chicago area, and one in Rome.

Our computing environment is centrally administered, and standards for microcomputer hardware and software have been set by the Information Systems (IS) Division. Our mainframe computers are IBM. There are several DEC, HP and ATT minis, and about 2000 microcomputers - primarily IBM or compatible, with 100 or so Apples.

To date, the high level of centralization and standardization has produced a good track record: user satisfaction and IS credibility is relatively high.

IS has maintained communications with users through various committees as well as by establishing key contacts in each user department. In 1985, the key users representing the largest, or most computer intensive, departments were invited to join the IS sponsored "Superuser Group".

The Superuser Group is a voluntary collaboration between Information Center staff and Superusers. The group meets every two months. Coordination of the group was turned over to users after the first year, and IS continues to attend group meetings.

The Superuser Group is important because it sets the scene for the DCC program. We envision the evolution of our users as being key user to the more formalized role of Superuser, and then to the role of DCC.

Conditions leading to the creation of the DCC program

Before defining the DCC program, I would like to mention how we in IS saw things occurring at Loyola. I think that the following points also characterize most computing environments:

* There had been an increase in mission critical ("bet the business") systems operating on departmental microcomputers.

* There is an increasing demand by the institution to see return on computing investments i.e. how a department has improved their services or cut costs.

* There is an increasing requirement for specialized software. Loyola has met what the university had identified as a strategic level of workstation deployment, and the tools are in place that meet the need for basic automation - wordprocessing, spreadsheets, data management.

  Departments are now requesting software for specialized applications - unique to the function of the department - in order to maximize the use of their computing equipment. The evaluation, selection and use of this software requires knowledge of the business of the department.

* There is need for administration of new areas:

  Local Area Network administration - Loyola has 40 Local Area Networks installed, there are about 800 workstations connected via LANs. LANs need a certain level of administration performed locally.

  Data administration - IS has been engaged in a Data Administration planning over the last 2 years. Of course, an important objective of data administration is to manage data to avoid redundancy and improve the integrity of data. Presently, however, there are over 150 end user managed databases in departments. Most of these were developed with IS; however, it is very easy to loose management control over end user databases. Therefore, IS needs to ensure that end users follow fundamental procedures in managing data in their databases.

* There is a desire to optimize the use of our expensive computing resources by taking advantage of computer literate users, of which there are many these days.

* Desktop computing capabilities will continue to increase, become less expensive and be available to a larger user audience.

Expected Benefits of setting up a DCC program

It was apparent to IS that our end user support methods would need to be upgraded to respond to the conditions just mentioned. For the Information Center, the primary end user support group, change was a familiar process. Prior change had usually meant an increase in central support staff, but since it was clear that user departments possessed a wealth of computing talent and capability, we had the opportunity to create a program that would take advantage of that resource.

This is what we hoped to achieve with a program that would give users defined roles as computing resources:

* A best of both worlds scenario: Successful computing projects require an institution-wide (integrated databases, telecommunications, network compatibility, data administration) and local (the function of the department) analysis. IS is the most qualified to address the former matters, the DCC is the most qualified to address the latter. Projects will be partnerships.

* The optimization of IS support through key department contacts

* The immediate availability of first line computing support to a department

* The synchronization of local computing planning with institution-wide, long range computing plans

* The creation of departmental computing standards to be maintained locally

* The improvement of IS/User communications

* The computing abilities of present staff will be utilized and redundancy in support services coverage will be reduced. The result should be a reduction in the rate of growth of the cost of end user computing support.

Departmental Computing Coordinator definition

The description of Departmental Computing Coordinator is called an "accountability".

An "accountability" is an individual component of a job description. Usually, a particular job description will contain several accountabilities, each of which is assigned a percentage of time and a rating of the impact of the performance of that component on the institution.

DCC was set up as an accountability, rather than as a job description in itself, to accommodate different percentages of time required to fulfill the DCC responsibilities according to department size and level of automation. For example, in some small departments the DCC responsibilities can be fulfilled using a small percentage of one staff member's time, while a large department might require that a full time staff member be dedicated as a DCC.

The same flexibility is required in regard to rating the impact of the DCC responsibility. For example, a DCC who is responsible for workstations serving a patient monitoring function will receive a higher rating for impact than a DCC who is responsible for wordprocessing workstations.

Any DCC has the responsibility to be a liaison between IS and the DCC's department. This entails:

* Serving as the communication link between IS and the department.

  Communicates policies, standards and procedures to department staff
  Communicates user needs to IS

* Serving as the first contact for his/her department's computing questions.

In addition to the liaison role, a DCC might have either, or both, of these functions:

* **Administration of departmental LANs**

  At least one individual must be designated network administrator for a Local Area Network installed at Loyola. This person will be the department's liaison with Information Services and will be expected to fulfill the following roles and responsibilities:

  * Planning, with IS
  * Set-up and installation assistance
  * Support for day to day operations
  * Training requirements coordination

* **Departmental Data Administration**

  At least one individual must be designated data administrator if the department locally maintains electronic data owned by the institution (Data Administration will be the arbiter, if necessary). This person will be the department's liaison with the Data Administrator and will be expected to fulfill the following roles and responsibilities:

  * Planning, with IS
  * Programming (Fourth Generation Languages)
  * Documentation of data management systems
  * Data backup and recovery
  * Staff training requirements coordination

How does a department determine if it needs a DCC?

IS presently handles most of the computing functions that have been described as future responsibilities of DCCs. In many cases IS will continue to do so. The need for a DCC arises when departmentally directed computing becomes an operating requirement. The following are guidelines for when DCC functions should be instituted:

> **Liaison** - As mentioned previously, all DCCs will have, at least, liaison responsibilities. This role is **recommended** when a department's computing requirements would best be met by identifying a key, local user. This recommendation would typically be made by consensus of the department head and IS.
>
> **LAN Administrator** - This DCC function is **required** if the department has a LAN.
>
> **Data Administrator** - This DCC function is **required** if the department locally maintains electronic data which Data Administration classifies as mission-critical data. The role might be recommended if the volume of data maintained locally is large, even though the data are not considered to be mission-critical.

Once the need for a DCC is determined, how is it instituted?

After IS and a department head have concluded that a DCC is needed, the department head will have the DCC accountability included in a revision of the job description of the employee selected to serve as DCC.

The revised job description will be submitted to Compensation to review for possible regrading of the position.

Pitfalls to date

Overall, the DCC program proposal has been well received. Serious pitfalls have not been encountered. The following are questions and constructive criticisms directed toward the DCC proposal:

1. The *More Work* criticism is, "How come we have to make this a formal program, and go through the trouble of regrading jobs?"

   The response is that we have gone as far as we can go informally, and the need for DCCs is increasing greatly. The Superuser group has taken responsibilities on voluntarily; however there is no guarantee that this will be true for most users. These responsibilities are not an official part of the job, and are not included in compensation consideration. So far it has been a matter of great cooperation and luck.

2. The *Not Manageable* criticism is, "We have over 250 departments! Where are you going to hold meetings?"

   The response is that although it is possible for the number of DCC's to grow to where monthly meetil s become unwieldy, we'll manage communications with the DCCs through technology (electronic and voice mail), newsletters and small meetings which IS will repeat.

3. The *How to Evaluate Positions* question is, "What do we do when one Secretary Grade II has the DCC accountability and another Secretary Grade II does not?"

   The response is, from our Compensation Department, that this is not a problem. It is a matter similar to many others, such as when one secretary monitors a budget of one million dollars and the other secretary does not monitor budgets a. all, or perhaps monitors a very small budget. The difference in percentage of time spent and in impact will be graded accordingly.

4. The *Who will be the Gatekeeper* question is, "Who will decide who needs and who shall be a DCC? Won't this have implications like faculty asking for a reduced teaching load because they are the DCC?"

   This is pending reso. ion. The resolution will probably have the department head request of the head of his/her division that a stan memb become a DCC. This request would include a written recommendation by IS and a justification according to mula.

5. The *Costs* question is, "Will it cost a lot to upgrade present positions by including the DCC accountability in job descriptions?"

   The response is that overall costs for mputing support will be reduced institution-wide, although DCCs are likely to receive a small increase in pay. Cost savings will result from a reduction in the rate of growth of IS end user support staff.

Progress to date

We are optimistic abc it the development of and response to the program so far. Support for the DCC program has been received from these sources:

> Information Systems sees the program as a means to support the IS mission, which is:
>
> > "To provide the leadership and expertise to design, implement, support and manage information technologies to foster the teaching, research, and health care mission of Loyola University Chicago"

Personnel and Compensation like the program because it will establish job grading standards to use for the increasing number of positions which include computing responsibilities.

Superusers like the program because it will provide a means to have their responsibilities included in their job description, and therefore to be acknowledged and paid for performing those responsibilities.

Most Department Heads who are acquainted with the program support it, and a few have not formed an opinion. Those who like it feel that it gives them greater influence in their department's computing operations.

The program has received a qualified sanction by the Information Systems Steering Committee, pending resolution of the "Gatekeeper" question (#4 above). This committee consists of Division Heads.

Other signs of progress are that:

* many of the elements of the program are in practice, or are being put in practice. This can also be a pitfall (see #1 above) if it is perceived that there is no reason to pay someone who is presently doing the job voluntarily.
* the DCC manual has been written.
* important issues have been raised, some have been resolved, and the rapport between IS and departments is continually improving.

Summary

The Departmental Computing Coordinator program will:

* clarify the computing responsibilities of department staff.
* clarify the departmental computing support responsibilities of Information Systems.
* optimize computing talent within the institution.
* reduce the cost of end user support services.
* contribute to Data Administration objectives.
* establish a better rapport between Information Systems and our user community.

Conclusion

Loyola's centralized approach to information technology management has been successful. However, technology has changed. Implicit in the DCC proposal is the recognition that Loyola's mission, and therefore the IS mission, can be better served by reassigning responsibilities for *some* areas of end user computing that IS previously controlled. This will encourage creative application of computing technology to specific department business problems, and free IS resources to concentrate on the enhancement of the information technology infrastructure.

There is a certain amount of risk that is involved when reassigning responsibilities. The DCC program is a cooperative effort between IS and our users, based on mutual respect, and ultimately, mutual goals. The maturity of the Loyola IS organization and user community have created the confidence that any failures will be outweighed by the overall achievements of the program. With many elements of the program currently in effect, this has so far been the case. We are optimistic that the DCC program will be officially sanctioned in the near future, and that it will meet its intended goals.

EGADS, we DID it!

Employing Global Administrative Distribution Strategies Data Integrity Distributed

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The University's demand for access to data makes it necessary to distribute administrative systems. Global strategies fundamental to the implementation of distributed systems are: source point data capture, electronic signature approval process, data value authorization restriction and access to administrative systems by all departments. These strategies widely disperse the responsibility for data integrity to user offices. The recent design and implementation of the new Student Records System at Virginia Tech employ these strategies. This discussion will explain these strategies, their impact on the development and distribution of administrative systems, the advantages and disadvantages of distribution, as well as user interaction in development.

Introduction

A totally distributed system is one which provides all users access to data they need while prohibiting access to data they are not authorized to see. This access includes both inquiry and update capabilities. The demand for increased access to data at Virginia Tech necessitates the distribution of all new administrative computer systems. Adoption of distribution philosophies and implementation of the supporting strategies provides the methodology for accomplishing this. The rewrite of the Virginia Tech Student Records System combined these philosophies and strategies with extensive user interaction to produce a distributed system. Academic departments maintain data integrity which results in the role of data verification for the central student records office.

The Systems Development group at Virginia Tech is the primary developer of new administrative systems for the on-line IMS environment. This paper reviews the early development procedure at Virginia Tech, the philosophies and strategies that changed our methods, a system developed employing these strategies, and the conclusions resulting from an actual implementation.

Early Development

Development in the 1970's was initiated by a request from a user office, then fundamental manual procedures of the user office were observed and their basic needs were considered. The users were only involved in minor decisions during the design phase of a system. All other development phases of the project were strictly controlled by Systems Development, from planning functions and designing screens to testing the system. The user office was consulted on the contents of the screens but rarely saw them again until the system was demonstrated prior to implementation when they were trained and presented documentation defining the use of the system.

Systems Development maintained these early systems until growth in expertise and staff led to the formation of system support groups associated with large user areas, such as Personnel/Payroll, Student Records, and Student Accounts. These groups then became responsible for system maintenance, minor modifications and user reports as requested.

Access to transactions/functions was controlled with logical terminal security. Distribution was limited and generally confined to the related user area.

Over the years, the number of terminals on the main and satellite campuses expanded, until in the early 80's, all administrative departments had on-line access to the mainframe. The University community evolved into a sophisticated computer literate society with many of the departments active in mini and micro computing. This growth led to demands by deans and department heads for greater access and stricter control of information relating to their areas of responsibility. Answering this challenge required a change in philosophies and strategies for developing new systems.

Philosophies and Strategies

Introducing new philosophies into the university environment requires a fundamental set of plans. In the 1982 CAUSE Monograph Series, Vinod Chachra and Robert C. Heterick presented a global strategy for administrative systems in a document entitled ***Computing in Higher Education: A Planning Perspective for Administrators***. This publication contained the following concepts.

- ***Source Point Data Capture*** - Data is entered via workstations in the department of origin and transferred electronically to the destination office. Any requirements for approval at a higher level reroutes the document through the appropriate office for an "electronic signature".
- ***Value-added Data Handling*** - The data's electronic route depends upon a user's need to add information or approve a document. For those administrators not in the hierarchical flow from source to target office, on-line queries and management reports are available.
- ***Destination-Point Documentation Generation*** - Documents are printed in the destination office as needed for external communication and verification.
- ***Transaction Tracking System*** - Events are tracked in audit trail records with individuals restricted to activities and data corresponding to their area of responsibility.

The University adopted these global strategies for administrative systems and approved the "electronic signature" - the concept of a password entered on a terminal screen in lieu of a signature on a document. Implementation depended on an authorization system capable of identifying areas of responsibility for a user and the required routing flow for documents.

Virginia Tech Authorization System

The in-house developed Virginia Tech Authorization System controls the use of IMS transactions through a unique authorization identifier associated with a user. These are established by Data Administration on request from an administrative user. The authorized user then contacts the administrative office controlling the requested transaction for access. Transactions are grouped according to function with access based on the need for the function. The administrative office is responsible for distributing the functions and assigning the data value mask for the user.

The data value mask defines the type of authorization and how a function is distributed. For example, the data value for the grade change function is composed of college, division, department, and course level (undergraduate or graduate). Each person's mask for this function is based on their level within a college. The dean of the College of Education can process any student taking a course within the college. The associate dean of a division within the college can process any student taking a course within his division. This hierarchy continues down through the department head and his/her assistants responsible for undergraduate and graduate courses. -The mask for the Registrar's staff is set to allow access to all students.

The routing of data through the various offices is controlled with the data value mask and a process called "In-basket". Approval hierarchies are established for functions based on signature requirements. In the approval process of an electronic document, routing automatically progresses to the next level upon approval at a lower level. The user at each level reviews the documents to be approved in his/her electronic in-basket daily, much the same as processing paper documents. Alternate signatures are defined for each level to expedite the flow regardless of absenteeism in the signature hierarchy. An audit trail of the signatures, the original document, and any comments added during the approval process are stored as part of the authorization system. On final approval, the new information becomes effective with the update of the appropriate administrative data base.

To hold users accountable for changes in a system, the authorization identifier and password are required on all update transactions. These become part of the audit trail reflecting the change. Thus accountability of data is based on the authorization identifier and the access controlled with data valued functions.

Distributed Student Records System

In the summer of 1985, the University administration announced the decision to convert from a quarter calendar system to a semester calendar system beginning Fall 1988. The existing student records system was first developed in the early 1970's and was supplemented with additional data bases throughout the next 15 years. Structural changes were needed based on requests accumulated over the years in addition to those required for the semester conversion. Rather than make major modifications to an antiquated system, the University requested Systems Development rewrite the entire student records system employing the policies and strategies previously described.

Objectives

System objectives, based on the global development strategies, were:

- Build upon the computer literacy of the University allowing users to fully interact with the system
- Capture data at the source
- Provide accountability in conjunction with data access

- Reduce flow of paper to and from the Registrar's office
- Utilize electronic signature approval process for documents
- Involve user in every phase of development

Other objectives of the rewrite focused on paper storage reduction and system modularization for ease of maintenance.

User involvement

Due to the extensive scope of the rewrite, it was divided into multiple sub-systems based on publishing and processing deadlines. Meetings with the University Registrar and staff to define the basic functions began the development of each component sub-system. A set agenda defined topic guidelines for each discussion and members of the Registrar's staff attended those pertaining to their individual areas of responsibility.

General sessions were held with the undergraduate and graduate academic deans, department heads, administrative users of student information and the Office of Institutional Research to gather their requirements for the new system. These sessions were more comprehensive allowing for discussion of existing problem areas and requests for processing, access and data. Transfer of responsibilities for data entry and data integrity from the Registrar's office to the colleges and departments was explained and discussed. Current procedures and information flows in the various colleges were analyzed to arrive at consolidated solutions acceptable to all concerned. Meeting documentation, recorded by a secretary as well as the analysts in attendance, provided a valuable cross reference during the system design.

Planning meetings were held with Student Systems Computer Services, the computer support office for all student related functions. Issues discussed included maintenance requirements, reporting needs, good and bad features of the existing system, and areas needing expansion.

As design analysis was completed for each phase, a detailed scope of effort proposal was presented to student system administrators for approval. Once these proposals were approved, data bases were designed and, as part of Systems Development's methodology, reviewed by in-house data base committees composed of selected members of Systems Development, Data Administration, and Student Systems Computer Services. Screens and reports were designed with the Registrar retaining final approval of all layouts. Throughout the entire rewrite, an analyst from Student Systems Computer Services was assigned as a liaison for the communication of requests and responses between the Registrar's office, Student Systems, and the development team.

The Registrar's staff was involved in the system testing phase of each sub-system. Also, selected academic and administrative departments across the campus became test sites. Their expertise in daily processing identified exception conditions in several procedures and their perspective on the flow of screens and transfer of information from one sub-system to another resulted in modifications which improved overall system performance.

Before implementation, the Registrar's office was responsible for determining the distribution of transactions to academic and administrative departments and colleges. The needs and requirements for data accessibility for each office were reviewed to establish the proper data value mask for each function.

Training

Prior to this system, a minimal number of transactions were authorized for departmental users. Because of the wide distribution of update capability, greater emphasis was placed on training for this system. To enhance this training, detailed user's guides were produced and distributed at training sessions.

As previously mentioned, the University Registrar's staff was trained in conjunction with sub-system testing. A diverse cross section of the University community, ranging from clerical staff to college deans, participated in group training sessions corresponding to their access needs. These were conducted in the weeks prior to implementation and attendance was mandatory to receive authorization access to the new system. Slides were used to explain each transaction and familiarize the users with the type of information available. A question and answer period followed each presentation.

After the system was put into production, the Registrar's staff conducted "hands on" training in each user's office, giving detailed explanations for each transaction defined for the user. Future users of the Student Records System must be trained by the Registrar's staff before authorization is granted.

Implementation and Results

The catalog sub-system was implemented in September 1986 to meet the publishing deadline for the Fall 1988 University Catalog. This was followed by the timetable sub-system in November 1987. The registration modules were temporarily placed in production in April 1988 to conduct class registration for Fall. The remainder of the system conversion took place in July 1988. An unforeseen benefit of phased implementation was the gradual introduction to the users of new transactions, processes and responsibilities.

In determining the electronic routing of a process, unnecessary steps in existing administrative procedures were uncovered. The review of manual procedures proved advantageous to the user offices and resulted in streamlined automated processes.

The new system provides the University community with:

- ***Increased access to information for inquiry and update throughout the University, restricted by area of responsibility.*** Deans are now able to view all information relating to students in their college as well as all courses taught in their college. Update functions, such as registration hours override, blocks, grade changes, classroom scheduling, etc., which were previously controlled by the Registrar, are now processed in the various administrative offices.

- ***Distributed responsibility for data integrity and timeliness.*** Grade changes are entered into the electronic "in-basket" by clerical staff upon request of the faculty member teaching the course. The course offering department head is the first step in the approval process. Grade change "documents" are then forwarded to the student's major dean with final approval granted by the course offering dean. At this point, the student's grade is changed with no required interaction by the Registrar's office. Additional process responsibilities transferred from the Registrar's office include demographic updates, major changes, academic level changes, readmission, independent study approval, and academic drops.

- ***Reduced paper processing and storage.*** Departments enter their Timetable of Classes modifications on-line where previously paper reports were corrected and returned to the Registrar's office for data entry. Grade change cards are no longer sent to the Registrar's office. All transcript information is now stored electronically, eliminating the need to store permanent record cards. Classroom usage is maintained on the system, replacing a manually updated room assignment board.

- ***Enforced policy by programmatic date and function restrictions.*** One module of the system, a Dates data base, contains all processing and calendar dates for each academic term. Schedule completion programs check this information before allowing modifications to a student's class schedule. Blocks are not allowed prior to the current date. Grade changes cannot be made before the current term is complete.

  Function restrictions are in place to control student and course processing and are achieved with the data value mask. For example, Virginia Tech offers 4 types of degrees: associate, undergraduate, graduate, and professional. The Graduate School is only allowed to update student and course information pertaining to graduate students. Each college/department is restricted to their own data. This same concept controls access for on-campus versus off-campus processing.

Advantages

Accomplishing the major objectives for the Student Records System resulted in numerous advantages.

- ***Entry of data at its source with immediate error detection.*** This eliminates duplication of effort required when data is typed on a form prior to terminal entry. Errors in information are noted and the person responsible for the data can research and correct them.
- ***Reduced errors from misreading or misinterpreting written information.*** Interpretations of hand-written forms are no longer a problem for the Registrar's office reducing the time required to contact the user office for explanations.
- ***Improved timeliness of processes.*** The delay due to mail schedules and paper shuffling is eliminated. Changes can be processed in minutes rather than days.
- ***Modified workload for the University Registrar's staff.*** Other duties are accomplished because of reduced data entry, decreased form filing, and less time involved in researching errors.
- ***Diminished volume of permanent paper records required.*** All transcript information is stored in the system rather than on permanent record cards. Cards with the audit of grade changes and major/minor changes have been eliminated.
- ***Enhanced control of data accessibility.*** Distribution by function and access control by data value mask have resulted in more secure student records information.

Disadvantages

Post implementation studies and interviews revealed problems for consideration when changing to a distributed system.

- ***Deans and department heads perceive additional workload for their areas.*** These offices feel they are performing services previously provided by the Registrar's staff with no increase in resources. The system is viewed as function oriented rather than task oriented thus requiring multiple transactions to accomplish a single process.
- ***A higher skill level is required for administrative users.*** Correction of errors cannot be ignored and must be dealt with before proceeding with on-line transactions. Research into the cause of these errors requires knowledge in all areas of student records including the appropriate transactions for determining the cause of the error.

- ***Verification for completeness and correctness has become more difficult with the removal of data entry from the Registrar's office.*** Omissions and mistakes entered by the departments go undetected until they have an impact. For example, in the Timetable of Classes a subtitle for a course was published as "Ask John what to call this".

- ***Restricted access is viewed as a limitation.*** Deans cannot look at the records of a student in another college when considering a major change or readmission in a new major.

- ***Additional computer hardware and communications expenses were incurred by some users to increase the access points to the IMS system.*** Departments whose primary processing involved the use of personal computers required new and/or additional mainframe connections.

Conclusions

Final observations

With the support of the University, the Virginia Tech Student Records System was successfully implemented as a distributed system. Based upon a study by Virginia Tech's Administrative Systems Review Committee, the benefits of distribution to the user office and the University community are numerous and far outweigh disadvantages revealed since implementing the Student Records System project.

Establishing standards in processes across the various colleges will ease the impact of changes required by automation. The transfer of responsibilities from the central user office to academic administrators may require additional resources in those areas. Involvement of the user community in the development process needs to be encouraged to produce a workable system for all areas.

Distributing a data processing system requires the definition of policies and strategies to govern distribution of data, the full cooperation of the University administration, a means of controlling access, and the support of the user office.

Future considerations

All future development in the Student Records System will employ the philosophies and strategies discussed in this paper. Current discussions include the availability of data on PCs for spreadsheet processing and access to the system by students - not only for inquiries but to update items such as address and phone number. The capability of defining a user's access is crucial towards achieving the goal of total distribution.

Reference

Chachra, Vinod and Robert C. Heterick **Computing in Higher Education: A Planning Perspective for Administrators**, CAUSE Monograph Series, 1982

Administrative Systems Review Committee - Final Report, Virginia Polytechnic Institute and State University, June 21, 1989

The Center for Emerging Technologies in Computing, Communication, and Human Resources

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ABSTRACT

Converging technologies have dictated that institutions view their structure and use their personnel in new ways to manage the changing information and communication resource function. Today's information and communication problems demand answers which are integration oriented -- first for people, then for technologies.

A faculty/staff group developed a proposal for a needs-based, interest driven structure to achieve computing, communication, and human resources goals for the Institute of Agriculture and Natural Resources at the University of Nebraska-Lincoln. The Center for Emerging Technologies (CET), which could implement and integrate computing, communication, and human resources, is proposed to bring together people and technologies. CET offers a framework for solutions to these Institute-wide concerns:

(a) computing/communication services;
(b) staff updates, training and development;
(c) student education concerning effective utilization of new technologies;
(d) technology assessment, computing/communication research and development, and facility planning;
(e) "think tank" applications providing a visioning framework.

The proposal for CET is on-going; we are not reporting on a completed project. We will describe the proposal presentation process and the audiences and outcomes. We will report on early returns on investment as well as some of the ongoing, in process activities IANR is now undertaking.

* *All authors contributed equally.*

THE CENTER FOR EMERGING TECHNOLOGIES IN COMPUTING, COMMUNICATION, AND HUMAN RESOURCES

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Interactive, computer based communication technologies cannot solve all the problems of American higher education. Nevertheless, even in today's changing and seemingly chaotic educational environment, these tools advance both the practice and process of higher education (S[illegible]lley, 1989).

Many times, interactive, computer driven technology applications can be implemented within existing higher education structures. For structures to be successful, however, those responsible for administrative reorganization must be capable of change. They must see programs and themselves in new ways (Heterick, 1988; Hirschheim and Klein, 1989).

This paper focuses on one segment of a large, land-grant university, the Institute of Agriculture and Natural Resources (IANR) at University of Nebraska - Lincoln. We will discuss a planning effort to substantially expand the use of interactive technologies in our programs and attain more fully integrated applications across the campus. If implemented, this plan may require new computing and communication strategies, commitments to change, openness to risk, possibly new and untested management authority, and departmental reorganization within IANR.

We will describe the background of the institution, and some of the computing, communication, and human resource issues, the proposal outlining the Center for Emerging Technologies, and the outcomes of the entire process including the lessons learned.

THE BACKGROUND

The University of Nebraska has three campuses. The flag-ship campus, the University of Nebraska-Lincoln is a comprehensive, land-grant university with approximately 24,000 students. Redefined as a unit in 1973, the Institute of Agriculture and Natural Resources has as its mission teaching, research and extension in agriculture, natural resources and community and family living. It is administered by a vice chancellor. IANR provides state-wide support of agricultural needs through a network of research and extension centers and eighty county extension offices.

To handle IANR communication and computing needs, there is a Department of Agricultural Communications providing communication support, and the IANR Computing Services providing computing resources.

Historically, the Department of Agricultural Communications is responsible for developing brochures, editing manuscripts, producing slides and graphics, producing mediated programs, producing radio and television programming, and handling the IANR news and information functions. Computing services, including consulting, maintenance, and programming, are carried out through IANR Computing Services. Rigid boundaries exist. Once written, job descriptions are set in concrete. For each job and task, there are specific tools. Territory is defined.

A blurring of jobs and functions is now occurring. In Agricultural Communications, artists and editors are using computer graphics packages and desktop publishing systems. Reporters have developed a computer based electronic newsroom. In IANR Computing Resources and other departments, faculty and staff are developing brochures and newsletters using desktop publishing. Individuals are designing visual presentations with computer graphics systems. Across the campus, in every department and unit throughout IANR, faculty, staff, and students are using the same tool, the computer, for similar communication tasks.

Previously, each discipline had its own unique gadgets -- artists with rulers and colors, editors with blue pencils, reporters with paper and pencil, computer programmers with lines of code, statisticians with formulas. The tools were job specific. Today the same engine for the tools sits on the individual's desk, linked in varying configurations. The tools and the engines cross previously rigid boundaries. In fact, the tools and engines are converging. The technologies are evolving into dynamical systems.

Lines isolating "traditional" disciplines are becoming less and less distinct. We are all embracing similar, "front-end" technologies in our daily tasks. Yet faculty and staff are continuing to play old University roles. They perform traditional functions while assuming new, expanding roles with the tools of the computer/communication revolution.

We still have the needs for which the past tools worked well, and for which the new tools are continuing that work. We are doing timeworn activities differently, having computerized our former work tasks. By using computers, faculty are becoming more independent. Parallel to that developing autonomy, faculty are growing more dependent on the providers of new technologies, those individuals who know how to assess and maintain the new technologies, those individuals who can envision multiple and diverse uses of the new technologies, and those individuals who can work with the human component in the technological era.

These elements of computing, communication, and human resources are problematic. They do not fit into existing university patterns, with simple borders, within established and orthodox disciplines. Such novel constituents have blurred the traditional university structure. Naisbitt (1989) calls this the open square -- issues with no black and white, simple definition; rather they are issues full of grays, and reds, and blues, and perhaps many other of the 16.8 million colors.

THE PROPOSAL

As an outgrowth of an IANR faculty luncheon in September 1988, we came together as a group. That September meeting covered issues related to the decentralization and centralization of computing and communication services. From that discussion, we felt a need for the Institute to formally investigate new and emerging computing and communication technologies. We also wanted to include equipment and personnel recommendations to the Institute.

We firmly believed that decentralization of computing and communications technologies was resulting in the need for more powerful equipment and for connectivity between dispersed user groups. Decentralization was also creating an enormous demand for new University funds to explore and implement these technology explosions within IANR departmental units.

Based on our views of the future, we developed a short white paper. Our primary purpose was to suggest institutionalization of appropriate administrative guidelines to secure appropriations for items with price tags beyond the realm of individual departmental budgets. Such guidelines could include coordination of these activities by an Institute appointed Vice-Chancellor's committee. We sent our comments to the Vice Chancellor and selected department heads and were invited to meet with the Vice Chancellor's council, composed of all the Deans of the Colleges. Following that presentation we were asked and encouraged to further explore, expand, and report upon our ideas.

From this charge grew a second, more comprehensive proposal. This proposal encompassed the computing and communications, human resource, technology assessment, and futuring arenas at the Institute.

Our proposal rested on a simple belief derived from the literature, from our scanning of the environment, and our personal feelings -- that the information and communication challenges of today's campus demanded, and indeed, required, coordinated solutions -- first for people, then for technologies (Brand, 1987; Dede, 1989; Heterick, 1988; Hussey, 1985; LeDuc, 1989; Sculley, 1989, Seybold, 1989).

To fully implement computing, communication, and human resources, an organization must assume responsibility for identifying, developing, managing, and maintaining those resources. To define a framework for doing this, we proposed a **Center for Emerging Technologies in Computing, Communication, and Human Resources** (CET).

Such a Center would facilitate the use of these resources within IANR. We proposed the CET to support institution strengthening and human capacity-building. We also recommended that CET results be evaluated in both human and technical terms.

What is The Center for Emerging Technologies? We envisioned CET as a needs-based, interest driven structure to achieve computing, communication, and human resources goals within the Institute of Agriculture and Natural Resources. CET is a formal response and an institutional commitment to the integration of people and technologies.

Steele (1989) pointed out that opportunity will rarely reside in the traditional practices of simplifying, separating, and operating exclusive entities. Integration will be the key since problems cross lines of interest and authority.

The Center for Emerging Technologies was proposed to address several Institute-wide needs including:

(a) computing and communication services;

(b) professional and organizational development focusing IANR staff and organizational development activities;

(c) technology assessment, computing and communication research and development, and facility planning; and

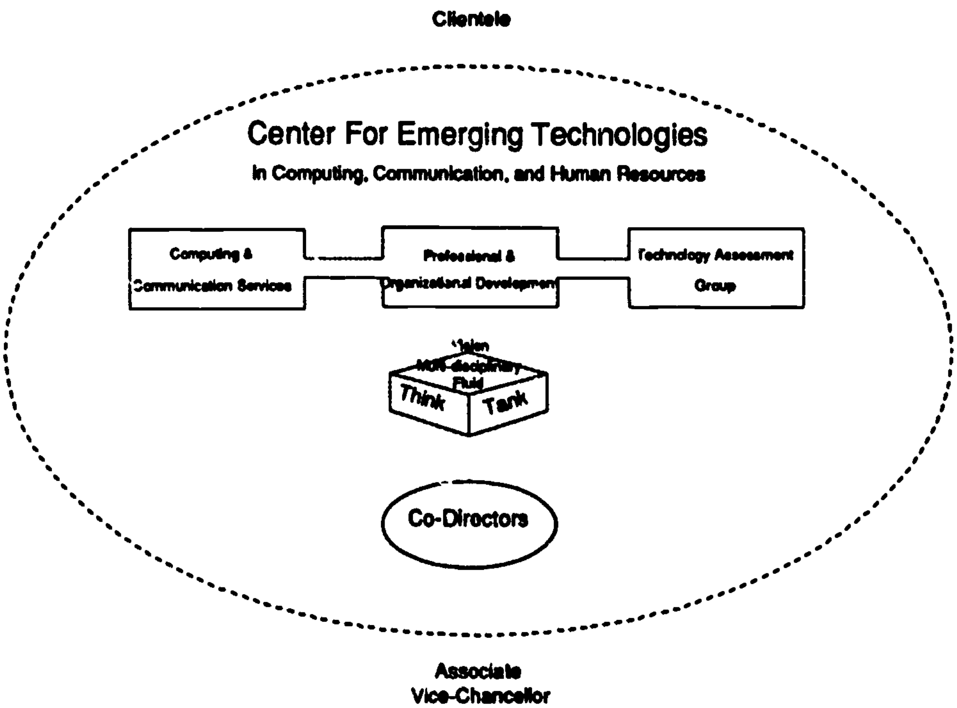
(d) "think tank" applications providing a framework for visioning.

The Center for Emerging Technologies in Computing, Communication, and Human Resources would create an environment that:

-- refocuses efforts toward priorities as outlined in IANR's Strategic Plan;
-- allows for doing new things, not just computerizing old processes;
-- analyzes positive and negative impacts of the integration of technology and people;
-- streamlines the support, consulting, and maintenance roles in IANR;
-- allows for "think tank" capabilities;
-- encourages curiosity and risk taking.

The CET would address perceived barriers and fortify multi-disciplinary ties between computing, communication, and human resources.

The CET structure flows from the functions of existing communication and computing programs and innovative *futuring* activities.



CET's four major areas or divisions are outlined and described below:

A. Computing and Communication Services--integration of computing, communication and information delivery services:

Computing consulting and support services would include administrative computing (budgeting, accounting, and requisitions, student records, drop and add, registration, research databases, and personnel), mainframe computer support, computer programming support, and computer labs (development, expansion, and monitoring).

CET communication services would comprise production of visuals. signs/displays, printing facilitation and distribution, photography. Consulting communicators would work on a inter- and multi-disciplinary basis within IANR to facilitate communication marketing, strategic planning, and production efforts.

Both communication and computing components would also involve maintenance capabilities, networking, equipment loan (computer and audio-visual equipment), large equipment facilitation (siting within units), communication and computer training and support on campus and at District Centers.

This component results from the integration of communication and information delivery services. A blurring of the barriers separating previous functions drives this natural marriage of services.

Computing, for example, was once separated between mainframe data processing (DP) shops and non-computer users. You either used computers through the DP shop, or you did not use them at all. This evolved into a mainframe environment which began supporting personal computer users only among the innovative. Today there are few if any non-computer users on staff, most have access to intertwined networks, and none who particularly care whether the computer service represents a mainframe or personal computer operation. A blurring of the previously well defined confines of computing types vs. non-computing types has occurred.

Another good example of blurring can be found in the academic computing arena and alternatively the arena for administrative computing. In the very recent past, these two entities were quite separate. Many institutions, including the University of Nebraska, have distinct computing organizations for these two segments of our school's support components.

Today, however, a blurring of the barriers separating these entities is rapidly occurring. Review any issue of Academic Computing or T.H.E. Journal to see programmic examples of vast blurring. Faculty are requiring access to their student advisees' records, electronic mail needs to travel over networks to administrators as well as educators, departmental accountants are accessing budgeting and requisitioning programs via campus networks, and yet they still expect electronic access to all the academic programs and academic computer networks. The list of mutual needs is growing daily. Now, instead of being able to conduct business within a DP shop, or across a proprietary network, the academic and administrative information organizations are utilizing similar network components, as they're now being required to serve identical user bases distributed across the campuses. This blurring of boundaries is requiring the movement to similar computing platforms or transparent information exchange between varieties of vendor platforms.

Distributed computing has fostered the growth of local desktop publishing, newsletter productions, graphic design operations, and the use of multi-media technologies throughout many campus departments. Where once the department of information or communication was relied upon for nearly all production and dissemination of materials, more and more production is being done "in-house". Questions to our communications specialists from faculty and staff are now highly technical, computer oriented and many times impatiently voiced. No longer are these professional communicators advising solely on content or appearance, but more on how to stretch the limits of the myriad of graphics and text hardware and software components springing up throughout the campus.

Secure, protective borders of responsibilities are disappearing. These two groups of service and educational professionals are finding themselves drawing from the same well and watering the same masses. The proposed component consisting of communications and computer services personnel, will enhance everyone's ability to serve more cooperatively and thus effectively.

B. Professional and Organizational Development - focus of IANR staff and organizational development activities:

The human component of CET includes activities revolving around faculty renewal, staff leaves, re-tread shop, staff training, student education and module development, grantsmanship, fundraising, needs assessments, interest inventories, development of recruitment and retention strategies, links to outstate educational facilities, research activity such as impacts of change, higher education, administration, etc.

Professional and Organization Development activities will cut across many of the Computing and Communication practices. Both groups will have to be closely coordinated to ensure targeted, specific programs for faculty, staff, and students.

C. Technology Assessment - facilitation of the research, development and evaluation of new computing and communications technologies:

This component would be responsible for the development of the Institute as a Beta and pilot test site for emerging computing and communication technologies. It would also work on planning functions for IANR computing and communication resources, such as consultation on new buildings, student computing labs, and networking.

Other activities would include outreach to Nebraska industries and business on computing and communication consultation, and research on communication activities and outcomes, including qualitative audience analysis.

D. Think Tank - framework for visioning and futuring:

This component is a future oriented, scanning group that encourages new ideas. Activities will focus on establishing environments for planning, modeling, and prototyping ideas, analyzing positive and negative impacts of suggesting ideas via cross impact matrix analysis, and creating a body of resource materials for sharing.

Interaction will take place in interdisciplinary and multidisciplinary ways and would allow individuals from differing views and/or areas to combine positive talents. Thus, we feel that human capacity for problem solving and futuring will be developed, refined, and enlarged through the think tank and the human resource component. The Think Tank is to provide the environment for *alignment* (Naisbitt and Aburdene, 1985).

On coming into the think tank, people's initial expectations will be "challenged/reset"; people will have or be exposed to some fundamental training in futuring before they come into the think tank. Follow-up activities will be developed as part of the experience. A process of constant futuring will be developed.

An attempt will be made to avoid elitism or the charge of snobbery. The think tank should not divide people into categories. Rather it should be used to bring people together. However, it is not a counseling center for opposing views. It is a process oriented, futuring activity. The think tank encourages responsibility for thinking. It invites moving information around and depends on open environments, minimum boundaries, and high levels of people interest.

A lot of think tank activities will take place away from normal duties and environments, i.e., retreat type of settings. Yet a lot of activities can be done in the current physical environment. The challenge will be to change the mental environment of faculty, staff, and students. Initial training and challenging of expectations will be used to change that mental environment. New norms will be established when people come into the think tank.

EXPECTED IMPACTS

What are the expected impacts of the CET? Based on our examination of the IANR needs and expectations, CET objectives and activities, the following impacts were projected:

1. Addresses the organizational challenges of IANR Computing Services and the Department of Agricultural Communications. It brings together the emerging technologies and the support staff of computing and communication.

2. Places responsibility for the management of support services with professional/managerial staff, and not faculty. This arrangement would free faculty for consulting and academic activities supporting CET.

3. Focuses on human resource needs in response to accelerating changes.

4. Provides a structure for "re-careering" and "opportunity offering" through the Professional and Organizational Development component.

5. Eliminates duplication of services.

6. Provides structure for multi-disciplinary interaction between CET and departments in content related development activities.

7. Eliminates the encounter between centralization and decentralization service concepts by advocating that a mix of both is a more realistic approach.

8. Recognizes the need for strong, distinct authority in content areas of computing, communication, and human resources for the purpose of institutional structure and functions of leadership, development, and futuring.

9. Creates temporary disequilibrium among those directly impacted by proposed changes, an addressable administrative impact.

10. Creates unit administrative issues including transfer of personnel and services, and tenure concerns.

OUTCOMES

The CET is an idea whose time has not yet come to IANR. Nevertheless, the changes envisioned in the CET and its proposed restructuring remain viable.

We know that order, rationality, predictability, and impersonal modes of operating are all barriers to innovation and creativity in institutions of higher education. Change, of the scale offered by the CET proposal, runs counter to institutional needs of orderliness and predictability. While it can be planned and controlled, change requires new behaviors, different interactions, altered assumptions, and revised attitudes.

Given that, several ideas from the CET proposal and the earlier White Paper have been explored and implemented. These include the following:

1. Administrative calls for new equipment requests and acquisitions have been prioritized based upon IANR-wide, interdisciplinary utilization.

2. The Office of Professional and Organizational Development (OPOD) was in the process of independent formulation during this proposal's development. OPOD is now undertaking human resource activities encompassing recareering, technical assistance, and retraining.

3. Several IANR task forces have been formed campus-wide to review and forecast policy on databases, graphics, and desktop publishing activities.

4. Think Tank applications have been reconceptualized to include futuring. One member of our group has been asked to work in multi-disciplinary, Institute futuring activities.

5. An informal IANR-wide futures group of faculty and staff is meeting on a regular basis, twice a month. In addition, the Department of Agricultural Communications has developed a futures committee.

Sikes, Schlesinger, and Seashore (1974) point out that all universities have obstacles to creativity and imagination. These involve order, rationality, predictability, and impersonal modes of operating. "Change to some degree runs counter to orderliness and predictability; it can be planned and controlled but inherently it calls for new behaviors, different interactions, altered assumptions, and revised attitudes. One cannot always be sure where it will lead" (p. 39).

We faced many of these obstacles to implementation and change. From our experiences, we learned several things, some of which we would like to share. For example:

1. *Don't take a hardball to a softball game.* We lacked experience in working with the system. We assumed that good ideas sold themselves. We did not include department heads or higher level administrators early enough in the design and development process. Basically, we handed them a "finished" product in the CET. We did not get an advocate to champion our cause. We mistakenly believed that administrative interest (which we had) was tantamount to strong support and quick implementation.

2. *Show me yours.* We had difficulty in assessing the reactions that others would have with the CET. The very nature of the CET makes it awkward to pilot or develop a prototype. Without a visible, working model, widespread faculty interest or serious administrative support has not been forthcoming.

3. *Wash your mouth.* We may have been too explicit when we wrote our second paper, the comprehensive opus detailing the CET. We played out our ideas and put our findings in writing, without options. We did not look for models or provide alternatives. We could have presented two or three scenarios representing different degrees of change.

4. *Don't expose your backside without suntan lotion.* While the administration was interested in our ideas, they did not officially sanction them. We should have asked for letters and verbal approval with copies to selected faculty, in particular the department heads.

5. *Share everything.* We did not involve key people on campus. Even though we used a multi-disciplinary team approach, we needed a broader base of support for systematic change, and for the development of the CET in particular.

We did not account for alignment. Once we had the vision, we needed to attract people who could help realize it (the vision) by adopting it as their own and sharing the responsibility for achieving it.

6. *Time is on my side.* We might have arranged time for people to spend studying the proposal. This might have helped broaden the process and understanding of the changes envisioned. Change could probably come about sooner and more radically if the administration had received the message from more people directly and indirectly affected by the

change. But we acted swiftly, turned data around quickly, and in the process, did not give many of the audience with whom we were communicating enough time to digest our ideas or offer suggestions.

CONCLUSION

We realize that success or failure of change ultimately rests with the people who are being asked to change - their attitudes, understandings and their support. This takes time. Although parts of the CET proposal have gained acceptance, and indeed have been implemented, others remain as *challenges*.

REFERENCES

Brand, Stewart. The Media Lab. New York: Viking, 1987.

Dede, Christopher. "Planning Guidelines for Emerging Instructional Technologies," Educational Technology, April 1989, pp. 7-12.

Heterick Jr., Robert C. A Single System Image: An Information Systems Strategy. Professional Paper Series, #1. Boulder: CAUSE, 1988.

Hirschheim, Rudy and Heinz K. Klein. "Four Paradigms of Information Systems Development," Communications of the ACM, October 1989, pp. 1199-1216.

Hussey, G. Art. Electronic Technology: Impact on Extension Delivery Systems. Washington, D.C: Extension Service, United States Department of Agriculture, Electronic Technology Task Force Report, May 1985.

LeDuc, Albert L. "Why Lightning Strikes systems Development-And How to Reduce the Probability, CAUSE/EFFECT, Summer, 1989, pp. 34-39, 53.

Naisbitt, John. "Toward an 'Open Square' Society: Life in the Grav Area." Trend Letter, March 30, 1989. pp. 1-3.

Naisbitt, John and Patricia Aburdene. Reinventing the Corporation. New York: Warner Books, 1985

Sculley, John. "The Relationship Between Business and Higher Education: a Perspective on the 21st Century," Communications of the ACM, September 1989, pp. 1056-1061.

Seybold, Jonathan. "Making Sense of the Computer Publishing Revolution," The Seybold Report on Desktop Publishing, September 20, 1989, pp. 3-7.

Sikes, W. W., L. E. Schlesinger and C. N. Seashore. Renewing Higher Education from Within. San Francisco: Jossey-Bass, 1974.

Steele, Ray. University of the Future. Satellite Video Conference. Muncie, IN. 1989.

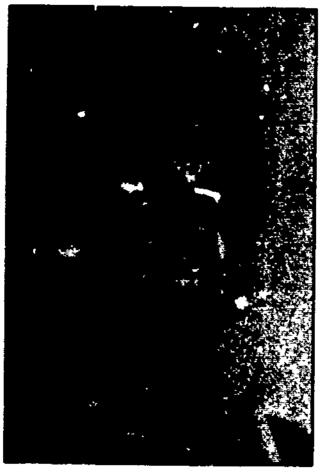
CAUSE89

Track IV
Policy and Standards Issues

Coordinator:
Jill Tuer
University of Michigan

The wide variety of functions included in managing information technology and the rapidly changing environment make the creation of policies and standards imperative. This track provided opportunity for sharing experiences in both the development of policies and standards and their subsequent implementation. Presentations covered such areas as: data administration (including security, integrity, access, dictionaries); disaster recovery; student, faculty, and staff computing access; microcomputing; standardization vs. autonomy; involvement of constituencies in policy making and planning; central vs. local models; institutional guidelines for information systems planning in distributed environments; and institutional standards for departmental systems.

Ronald Hoover, Penn State University



Anne Knight, Harvard University

Edgar Frackmann, HIS Higher Education Information System, Federal Republic of Germany

Developing Guidelines for Information Resource Management:

A Grass-Roots Process in a Decentralized Environment

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Abstract

The decentralization of administrative systems at Virginia Polytechnic Institute and State University has evolved both by design and by virtue of advances in technology and user expertise. Meanwhile, forces both external and internal to the University have focused attention on the need for minimum levels of standardization in order to utilize the various information resources to the institution's best advantage. In response to these pressures, the offices of Institutional Research and Data Administration (later renamed Information Resource Management) undertook a project that resulted in the development of a set of guidelines for information resource management.

This paper describes the historical evolution of the present situation, the forces that motivated the development of the guidelines, and the consensus-building activities that led to the acceptance of the guidelines as University policy. Noted in particular are: the key role played by an existing loosely-structured organization of systems coordinators; the bottom-up strategy for endorsement of the guidelines; and the management focus of the guidelines document. Insights gained along the way are presented to help those pursuing a similar endeavor.

Presented at

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San Diego, California

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Background Information

Virginia Polytechnic Institute and State University, also known as Virginia Tech, is the land-grant university of the Commonwealth of Virginia. With almost 25,000 students and over 1,500 full-time instructional faculty members, Virginia Tech is the largest university in the state. It ranks in the top fifty U.S. universities in total research expenditures, with an annual total approaching $100 million. Virginia Tech's computing capability includes an IBM 3090 Model 200 supercomputer, an IBM 3084, and several smaller mainframes. Access to the mainframes is provided by the 3,000 terminals across campus, as well as by many of the 12,000 personal computers on campus.

The Historical Evolution from a Centralized to a Decentralized Environment

During the late 1960's and much of the 1970's, administrative information systems at Virginia Tech operated in a highly centralized environment, based on common methods, repetitive procedures, and shared knowledge within a small group of experts. Essentially all major record-keeping systems were IMS systems developed in house by the central Systems Development office. This centralization offered the benefit of consistency across systems, along with the potential for large-scale integration. The level of expertise required to develop and maintain IMS applications also encouraged the maintenance of a central support system. Requirements for integration and security across systems and the sharing of limited mainframe computing resources led to a "build-on" approach to existing systems and furthered the need for coordinated and centralized data-base management.

Counterbalancing the forces promoting centralization were policies and decisions that led to the distribution of data management activities. Principal among these was the fact that central operational data systems were never operated as a "job-shop". Virginia Tech never intended to maintain a central pool of programmers providing support to administrative units who needed access to University data. Instead, the practice was for in-house-developed systems to be turned over to user offices (along with the addition of some support staff positions) for local management and maintenance of production systems. All major production applications were run by decentralized system-coordinating groups. On a somewhat informal basis, Systems Development staff provided continuing backup support for trouble shooting and minor modifications on the systems they developed. The central Data Administration office administered the IMS data base system and the UCC-10 data dictionary that supports IMS, coordinated and assisted with production implementation, managed security, controlled IMS space allocations, and maintained a system of shared tables.

During the 1980's, the move toward decentralization accelerated dramatically. Programming and systems-analysis staffs were growing in administrative offices across the campus, especially in support of the student, personnel/payroll, and accounting record systems, but also on a smaller scale in a number of other offices. While the budget of the computing center remained a central allocation of real dollars controlled by the use of allocations of computer dollars, the other costs associated with such staff growth — salaries, equipment, supplies, professional development, etc. — were direct costs in the budgets of the individual offices. This shift in dollars promoted a corresponding shift in the mindset of the managers of the administrative units, a shift toward a much more decentralized point of view. "If it's MY money being spent, then I'd like more control on how it's spent," summarizes this new perspective.

Software developments played a role in the move toward decentralization, as new less-complicated data-management systems and languages such as SPIRES®[1], FOCUS®[2], and SAS®[3] allowed operating

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[1] SPIRES is a registered trademark of Stanford University, Stanford, CA

[2] FOCUS is a registered trademark of Information Builders Inc., New York, NY 10001

[3] SAS is a registered trademark of SAS Institute Inc., Cary, NC 27511

offices increased independence from central support systems. Fourth-generation languages were eagerly examined by both the central computing-support offices and by the operating offices as potential new tools for maintaining systems and providing services. For the first time, the purchase of sophisticated off-the-shelf software packages began to be considered as a serious alternative to developing all major systems in house.

The Motivating Forces in the Development of Guidelines

The development of guidelines for information resource management at Virginia Tech should be viewed against the background of a number of campus events, trends, and initiatives of the latter half of the 1980's. A major force was the rapid expansion in the number of personal computers on campus, including many that were bought by administrative units that had never been heavy users of mainframe computing. Suddenly, offices that had no previous capability for using administrative data in unprocessed form were displaying appetites for data that were commensurate with their rapidly developing skills in word processing, graphics packages, spreadsheets, and data bases.

Another major contribution came from the University Self Study of 1986-88, which identified several concerns in the area of information resource management, including documentation, consistency of coding, and ease of access. Specifically, the self-study report contained the following points.

- A recommendation for an inventory of the data bases used for management information, and for the development of procedures for consistent coding, complete documentation, user training, and system integration.
- A suggestion that the office of Data Administration (which was later renamed Information Resource Management) take a lead role in the coordination, integration, and dissemination of the new wave of information technology.
- A recognition of Institutional Research as a major player in the process of gathering and analyzing data to support the planning and decision-making functions.

A concurrent campus initiative was the commitment to move toward a "Single System Image" (SSI), a vision being articulated by Dr. Robert Heterick, Vice President for Information Systems. (See "A Single System Image: An Information Systems Strategy", *CAUSE Professional Paper Series*, #1, May, 1988.) This vision accepts the increased pluralism of "native computing environments" — whether mainframe, minicomputer, or microcomputer, and whether spreadsheet, word processor, data base, or other — and develops a strategy for maintaining "coherency in computing and communications". In the context of administrative information systems, the SSI implies the capability of moving large amounts of diverse input and output to and from a variety of native environments. Essential to this transmission process is the establishment of standard interfaces, based upon intelligent data-management systems capable of doing the required translation.

Another motivating factor was the emergence of external standards, such as the International Standards Organization's Open Systems Interconnect (ISO/OSI) model for data communications and the American National Standards Institute's (ANSI) Information Resource Dictionary Systems (IRDS) standard, approved in 1988. Meanwhile the University began to witness growing acceptance of "standard electronic operating procedures" for particular business functions in the private sector where the University conducts business. As a prime example, vendors were positioning themselves to accept purchase orders using Electronic Data Interchange (EDI) standards. In order for Virginia Tech to anticipate, plan, and be responsive to these initiatives and reap the accompanying benefits, it was clear that some degree of conformance to standard practices for data management was imperative across the University's information resources.

The Self Study played another significant role in the move toward guidelines through its call — together with the University's positive response to the call — for the development of a strategic planning process. It was generally recognized that (a) such a process could place major new demands on administrative data systems to provide management information to support planning and (b) the ability of the University's decentralized data systems to provide the integrated data needed by such a process was suspect.

The problems inherent in one area of the administrative data systems — but symptomatic of problems in a number of other areas — were highlighted in the work of the Facilities Data Base Task Force, which completed its six-month study in September of 1988. The task force found a proliferation of special-purpose systems operating totally independently of one another, using imprecise or conflicting data definitions, and offering very few options for sharing of information. The task force's report identified several essential standards for data quality and usefulness including rigorous definitions, standardization of data items, uniform sets of codes, and documentation of data elements and structures.

Another motivating factor in the development of guidelines, itself a consequence of some of the forces described above, was the start of planning for a data dictionary. Data Administration was charged with looking at the products available commercially and the possibility of developing a data dictionary in house. The immediate goal was to provide a tool for the inventory and documentation of the entire administrative data resource. The ultimate goal was the development of a "university data base", a concept that had earlier been articulated in a position paper developed by Data Administration. In general terms, the university data base is a logical data base (not necessarily a physical data base) which provides a stable information architecture within which the authorized users of University information can obtain what they need to perform their duties.

A final event worth noting is the 1986 decision to purchase an accounting system to replace the IMS-based accounting system that was nearly twenty years old. This decision was made at a time when the resources of Systems Development were heavily committed to developing a new student system in IMS. The student-systems project had an immovable target date of Summer 1988, at which time the University would convert from a quarter to semester system. A decision to develop the accounting system in house would have meant several years delay in implementation.

Nonetheless, the decision to purchase the accounting system sent shock waves throughout the University administration, both for being the first commercial software package to be used for a major operational system, and for not being an IMS system. Unforeseen problems, delays, and expense also created a few aftershocks. The magnitude of the effort required to configure the new system to the University's computing environment raised the consciousness of the University's executive leadership about the need for communication between and consistency across data systems and about the associated costs when consistency is lacking.

The Development Process

The process of developing guidelines for information resource management began in Spring 1988 with meetings of a core group consisting of two representatives from Data Administration and two representatives from Institutional Research. These meetings had multiple agenda items. Both units wanted to define and develop their positions relative to the Self-Study mandates. Institutional Research representatives were anxious to talk about issues of consistency and communication among administrative data bases, as a consequence of both their traditional responsibility for data-gathering and reporting projects that involve multiple data bases and their prospective new role in support of the planning process. Data Administration representatives wanted to begin their feasibility study on data dictionaries and to define their long-term role in the development of a "university data base". In this connection, they wanted to discuss the possibility of using Institutional Research's Student Census File as a starting point.

Early in the discussions, a common thread among all of the agenda items became clearly evident: the need for guidelines and standards in the management of all of the University's administrative data systems. It also became clear that a fairly distinct division could be made between guidelines and standards, in the sense that guidelines indicate what should be done and standards indicate how it should be done. It was quickly recognized that the issue of standards, with its attendant enforcement questions and other political problems, had the potential for derailing the entire process. Everyone in the core group agreed to put aside standards for the moment and to focus first on guidelines.

An initial set of guidelines was drafted in August 1988. However, the group recognized that, without the perspective and the support of the individuals who operate and maintain the individual administrative data systems, these or any other set of guidelines had no future.

The next step involved the Administrative Systems Users' Group (ASUG), a loosely-structured organization open to all interested parties. The intent of ASUG is to provide an open forum for communication between central computing-support offices (Systems Programming, Systems Development, Data Administration, User Services, etc.), system coordinating offices (Accounting, Student Systems, etc.), and other users (Institutional Research, Budget and Financial Planning, Extension Information Systems, Library, etc.). ASUG's monthly meetings include time for announcements of general interest and questions on topics of common concern. Despite its informal basis and its lack of any official status in the University administrative structure, ASUG has made productive contributions to the University beyond just serving its communication function. Since its inception in 1986, one ASUG subgroup has developed COBOL programming standards and another provided significant input on requirements for an access-control software package that was purchased in 1988. In both cases, the proposals from these ASUG committees were presented to ASUG as a whole where they were reviewed, modified, and endorsed.

In July 1988, five individuals were asked to represent ASUG on a committee to assist in the development of guidelines. Four of the individuals were from the staff — generally senior programmer-analysts — of the offices of Student Systems, Accounting, Facilities, and Budget. The fifth member was the EDP Auditing Manager from Internal Auditing. Two from the core group were also committee members and coordinated the group meetings.

The committee members were encouraged to reach their own conclusions, with little pressure to retain the features of the draft document prepared by the core group. After a series of meetings over a period of three months, characterized by a lot of thought-provoking discussion and a considerable sense of give and take, a guidelines document was finished. The document was basically a revision of the original draft of the core group, refined by the management perspective of the ASUG representatives. In the true spirit of compromise, no individual on the committee thought that the guidelines were exactly what he or she wanted, but they all agreed that they had a chance to be heard in the deliberations and were willing to support the document, both in ASUG and within their own offices. Perhaps the greatest concern expressed by the committee members was that they might be perceived as telling their own managers how information systems should be managed.

The revised set of the guidelines was distributed at the November meeting of ASUG, along with a request for comments and suggestions. It was announced that the guidelines would be on the agenda of the January meeting.

During December, a meeting was held for the managers of the various administrative data systems, including the immediate supervisors of several of the committee members. These individuals, basically the most senior among the ASUG members, were considered essential to building the consensus needed at the operational level. The group suggested some improvements in wording and other clarifying statements, and without a formal vote, generally endorsed the document.

At the January ASUG meeting, a representative of the core group led discussion on the guidelines, including the proposed changes incorporated into the document as a result of the December meeting. Among the points that came out in the discussion were these:

- The guidelines must be viewed as a living document; revisions will continue to be made as consensus dictates.
- Many of the "data custodians" (generally the individuals to whom the systems managers report) are not currently aware of their responsibilities as set forth in the guidelines. An important function that should not be overlooked is that of educating and assisting the data custodians.
- Data Administration must move toward standardized interfaces and security strategies for decentralized systems and provide tools such as a comprehensive data dictionary for information-resource documentation and reference.

- Some of the tasks implied by the guidelines are not currently being done. To accomplish them, additional resources (for example, documentation specialists) and/or new strategies will likely be required.
- Clarifications of responsibility and authority may be needed to ensure that the guidelines are followed. In particular, the need for clear responsibilities for data-exchange interfaces in the evolving distributed environment was noted.

The discussion concluded with an endorsement of the guidelines.

Also in January of 1989, the core group initiated discussions with the Assistant Vice President for Administrative Affairs, whose responsibilities include two that are directly relevant to the guidelines project. One is the ADMINSYS system, an on-line repository and reference system for University policies and procedures. The second is the office of Records Management, which was in the process of developing local records-management policies and procedures to conform with Virginia's state policy. Initial discussions focused on how electronic records fit into a policy which — although it refers to "information in any recording medium ..., including data processing devices and computers" — is definitely oriented to hard-copy records. While the endorsed guidelines do not specifically address procedural issues for electronic records management, they do provide a framework for determining such procedural issues. Since standards and procedures would be developed based on the guidelines, it was agreed that the guidelines belonged in the ADMINSYS system, with cross references to other sections of records management policy.

In March 1989, the guidelines document was presented to all those administrators who have responsibility for the major operational data systems. These are the individuals called the "data custodians" in the guidelines. They have titles like Controller, Associate Provost for Student Systems, and Associate Vice President for Facilities. Generally speaking, they hold positions just under the vice-presidential level and just above the level of the ASUG members. All of these individuals were provided with copies of the guidelines and invited to attend a meeting to discuss them. Again after only minor modification, the "data custodian" group endorsed the guidelines.

It is worth noting that in each meeting with the various constituency groups questions were raised regarding how the guidelines would be implemented or enforced. Although such lines of questioning are clearly relevant and important, the group was encouraged to focus only on the principles (the what) now. It was made clear that the standards and procedures that would later be developed to conform with the guidelines would again progress through consensus-building forums. It was encouraging that the concepts embodied in the guidelines were viewed as both reasonable and needed at all levels of the organization. In fact, in response to a question about auditing and compliance, a representative of Internal Auditing suggested that he would routinely use this policy in his review process.

In the final step of this informal "approval" process, the Director of Institutional Research and the Vice President for Information Systems (the executive-level supervisors of the members of the core group and the two top-level individuals most directly responsible for carrying out the Self-Study mandates on data management) met and discussed the guidelines. These two agreed that the guidelines were appropriate and authorized their inclusion in the ADMINSYS system.

Of course, this is not the end of the story. Much work lies ahead, most notably the development of standards. On the software side, the guidelines clearly identify the need for data-management tools to help with issues of accessibility and compatibility, and they specifically mention the essential role of a central data dictionary. Development work is currently underway on a dictionary product which will run in a relational environment and which is based on the ANSI IRDS standard. Acceptance of these guidelines is an important first step for successful implementation of this data dictionary.

Strengths of the guidelines

Perhaps the most notable strength of the guidelines, and also a key to the broad base of endorsement, is their management focus, as opposed to a technical or operational focus. Nontechnical, nonthreatening terminology was used intentionally to promote shared understanding.

A second important strength of the guidelines is that the criteria for inclusion of a data base or data element under the guidelines is based on the University's usage of information and not on existing system structures. The guidelines introduce a concept called the Administrative University Data Base (AUDB), which is defined as a logical aggregate of data critical to the administration of the University. The criteria for inclusion in the AUDB cover all of the following classes of data.

- Data relevant to planning, managing, operating, or auditing major administrative functions.
- Data referenced or required for use by more than one organizational unit.
- Data included in an official University administrative report.
- Data used to derive an element that meets the above criteria.

Finally, the guidelines are strengthened by their definition of information management roles based on function, without regard to current or future organizational structure This gives them general applicability which will not become obsolete in an environment of ever-widening distribution and ever-increasing use of administrative information. *Data custodians* are ultimately responsible for the data created and referenced within their particular area of responsibility and in turn, for conformance to the guidelines. *Data stewards* are those delegated the responsibility for data maintenance and dissemination as directed by data custodians. Individuals who have need for University data are considered the *data users*. Virginia Tech is considered the *data owner* of all University administrative data. The function of applying formal guidelines and tools to manage the University's information resource is termed *data administration* and is a role overseen by data custodians, but played by all participants. The recent reorganization and rename of Information Resource Management (formerly Data Administration) underscores the leadership and support role this office provides for the distributed data administration activities.

Also a credit to the guidelines is their breadth. Following the introduction of the AUDB concept and explanation of the information management roles, they deal independently with each of the following topics: data capture; data storage; data validation and correction; data manipulation, modification, and reporting; data security, data documentation, and data availability. Next, they address the need and procedure for annual review with possible update reference related policies, and end with a section defining terms used throughout.

Lessons Learned

This final section presents some of the lessons learned by the core group as they progressed through the various steps in the development of the guidelines. Perhaps some of the insights gained along the way can be beneficial to others and — if incorporated into an initial strategy — serve to speed up this kind of process. The intent on this campus is to use a similar strategy in the process of establishing standards and procedures for conformance to the guidelines.

Perhaps the most important lesson learned and a primary point of success so far was the use of informal groups in the absence of formal organizational structures in the University community. Such groups generally brought to the process a set of diverse backgrounds and experiences, but were always able to identify common purposes and needs. Three of the key groups in this process — the core group, the system managers, and the data custodians — had never previously met together on a formal basis.

Even ASUG, the most structured of the participating groups, has no officially recognized role in the administration of the University. However, its choice as the first constituency group to work on the guidelines was particularly successful. It had a history of working on common problems in an atmosphere of mutual trust. Moreover, its members were the people who would be affected by the guidelines on a daily basis, as well as the individuals whom the data custodians would consult about whether the guidelines were relevant and worthwhile. Getting this group's participation and endorsement as a first step turned out to be an excellent strategy.

Also contributing to the success of the process was the riding of the tides that were surging in the University community. The case for guidelines was built on a broad base of forces and events: the Self-Study, the purchase of an accounting package, the need for policy on records management, and several others. By capitalizing on the diverse array of motivating factors, the core group was able to convince a number of groups and University officials at various levels in the organization of the value of these guidelines.

Another lesson to be extracted from this process is the importance of creating focus as a means of avoiding unnecessary controversy and distraction. This was the reason why standards were put aside initially in order to build consensus on guidelines. Debate and discussion could be focused on this limited topic in order to build a foundation upon which to base further work and more attention to detail.

As in so many projects, one of the keys was to maintain reasonable expectations. This was important in at least two areas. First, it was recognized by the core group and articulated to the constituency groups that neither total agreement nor the perfect document were likely outcomes. Consensus, however, was attainable, even though no one who contributed to this process was likely to agree with every point in the final document. Second, it was evident at every step of the way that the process was and will continue to be an evolutionary one. The document is not "cast in stone", but is expected to continue to evolve in response to technological and environmental change.

The virtue of patience was yet another basic principle that was reinforced by the process of developing the guidelines. At each stage of the process, the guidelines changed slightly, as each new constituency group brought its new perspective into the discussion. From looking at the end result, it is evident that what seemed like minor modifications in fact served to build depth into the final set of guidelines. In retrospect, it seems unlikely that a top-down approach (which was the core group's first impulse) or any other less patient course of action would have worked as well.

The final point to be made here is perhaps a capsule summary of the entire process. By acknowledging and illustrating data management problems without laying blame, by describing desired outcomes and suggesting a path for achieving those outcomes, the core group helped to expand thinking beyond the limits of individual turf boundaries or existing organizational structures. As a result, the *Guidelines for University Administrative Information Resource Management* are not the "rules according to XYZ Department", but rather a platform that will support a variety of idiosyncratic architectures and individual missions and, at the same time, support the global information needs of the University.

APPENDIX

Virginia Polytechnic Institute and State University Policy and Procedures Section 2005

Guidelines for University Administrative Information Resource Management

1.0 Purpose

While all administrative data captured using University assets are resources of the University, they vary in their relevance to the administrative processes of the University. This policy is intended to apply to those data which are critical to the administration of the University. While these data may reside in different data base management systems and on different machines, these data in aggregate may be thought of as forming a logical data base, which will herein be called the **Administrative University Data Base (AUDB)**. This terminology is not intended to imply that these data now or in the future should reside in a single physical data base. Rather, it is a recognition that regardless of where these data reside, there are some general principles of data management that should be applied in order to maintain the value and guarantee effective use of the information resource.

2.0 Policy

2.1 Information Management Roles

- The University is considered the **data owner** of all University administrative data.
- University officials, such as the Controller, the Associate Vice President for Personnel Resources, and the Registrar, are responsible for data in their functional areas and are considered **data custodians.**
- Staff delegated the responsibility for information management activities related to maintenance and dissemination of data are considered **data stewards.**
- Individuals who have need for University data in order to perform their assigned duties and are therefore authorized access are considered **data users.**
- The function of applying formal guidelines and tools to manage the University's information resource is termed **data administration.** Those data administration activities that do not fall within the realm of responsibility of designated data custodians are the responsibility of the Information Resource Management (IRM) department.

2.2 Data Included in the AUDB

- A data element is considered part of the AUDB and should conform to AUDB standards if it satisfies one or more of the following criteria:
  - It is relevant to planning, managing, operating, or auditing major administrative functions.
  - It is referenced or required for use by more than one organizational unit. Data elements used internally by a single department or office are not typically part of the AUDB.
  - It is included in an official University administrative report.
  - It is used to derive an element that meets the criteria above.
- Data elements which meet the criteria for inclusion may be identified as such by a data custodian, a data steward, IRM, or a user group.
- A data custodian should be identified for each data element to be included in the AUDB.
- IRM should assist in the negotiations for inclusion and for identification of data custodians.

2.3 Data Capture

- The data custodian is responsible for complete, accurate, valid, and timely data capture. These responsibilities may be delegated to data stewards
- Electronic data should be captured at or near its creation point as identified by the data custodian.

2.4 Data Storage

- An official data storage location for each data element should be identified by the data custodian.
- A official data storage location of valid codes and values for each data element should be identified by the data custodian.
- Data element names, formats, and codes should be consistent with University standards.
- Archiving requirements and strategies for storing historical data should be determined for each data element by the data custodian.
- IRM should assist in determining data storage location and archiving requirements for AUDB data.

2.5 Data Validation and Correction

- Applications that capture and update AUDB data should incorporate edit and validation checks to assure the accuracy of the data.
- The accuracy of any element can be questioned by any authorized data user. The data user has the responsibility to help correct the problem by supplying as much detailed information as available.
- The data custodian or delegated data steward is responsible for responding to questions and correcting inconsistencies if necessary.
- Upon written identification and notification of erroneous data, corrective measures should be taken as soon as possible or in accordance with the consensus of the users to:
  - Correct the cause of the erroneous data.
  - Correct the data in the official data storage location.
  - Notify users who have received or accessed erroneous data.

2.6 Data Manipulation, Modification, and Reporting

- The data custodian is responsible for authorizing manipulation, modification, or reporting of AUDB data elements and for creating derived elements, which are also members of the AUDB.
- The data custodian is responsible for ensuring that data maintained are consistent with official University reporting requirements.
- The data custodian has ultimate responsibility for proper use of AUDB data; individual data users will be held accountable for their specific uses of the data.
- All extracted or reported AUDB records should include the time and date of data capture.

2.7 Data Security

- All AUDB data should be secured and access granted to a data user only for University business on a "need-to-know" basis and within predefined access rules and security requirements.
- The data custodian has ultimate responsibility for determining security requirements and authorizing access.
- The individuals or office responsible for implementing access control will be identified and charged with this responsibility in writing by the data custodian.
- The data custodian is responsible for documenting authorization procedures.
- The data custodian is responsible for monitoring and reviewing security implementation and authorized access.
- All data users of AUDB data should sign a statement indicating their understanding of the level of access provided and their responsibility to likewise maintain the inherent privacy, accessibility, and integrity of the data they are provided.
- The data custodian is responsible for assuring that data are backed up and recoverable in response to events that compromise data integrity such as system failure, inadvertent faulty manipulation, unauthorized user penetration, or other unforeseen disasters.

2.8 Data Documentation

- Documentation of data elements should be provided to IRM in machine-readable format and will reside in a **University Data Resource Dictionary.**
- IRM is responsible for the data administration function of maintaining the University Data Resource Dictionary and for making it readily accessible to data custodians, data stewards, and data users. In essence, IRM is data custodian for the the University Data Resource Dictionary.
- Documentation of data elements is the ultimate responsibility of the data custodian.
- Documentation/definition for each data element should at least include:
  - Name and Alias Names
  - Description
  - Data Custodian
  - Usage and Relationships
  - Frequency of Update
  - Source for Data Capture
  - Official Data Storage Location and Format
  - Description of Validation Criteria and/or Edit Checks
  - Description, Meaning, and Location of Allowable Codes
  - Access Rules and Security Requirements
  - Archiving Requirements
  - Data Storage Location of Extracts
- Documentation for derived AUDB data elements should include the algorithms or decision rules for the derivation.

- Change in any of these characteristics should be noted to IRM and/or recorded in the University Data Resource Dictionary in advance of the change.

2.9 Data Availability

- Data Custodians are responsible for providing accessible, meaningful, and timely machine-readable AUDB data for University use. This activity may be assigned to data stewards or to other University officials within the predefined access rules and authorization procedures.
- Data custodians and IRM share responsibility for AUDB data compatibility, accessibility, and interfaces.

3.0 Procedures

These *Guidelines for University Administrative Information Resource Management* have been prepared by the Information Resource Management (IRM) department and the Office of Institutional Research and Planning Analysis in association with the Administrative Systems Users Group (ASUG). They serve as a statement of objectives to manage the administrative information resource. These *Guidelines* apply to all AUDB data. In addition, these *Guidelines* should be considered and followed where possible by all those who capture data and manage administrative information systems using assets of the University. ***Standards and procedures should be developed to conform to the objectives embodied in these Guidelines.***

Copies of these *Guidelines* or related standards documents are available from the Information Resource Management Department and from the Administrative Information System.

3.1 Updates

As an ongoing document, these *Guidelines for University Administrative Information Resource Management* will be maintained and revised as needed by the Information Resource Management department (IRM) in cooperation with data custodians and administrative systems users groups. All administrative system users are encouraged to correspond with IRM describing any suggestions for improving these *Guidelines*. When corresponding please refer to the document title and provide an appropriate section and page number reference.

Changes or updates to these *Guidelines* will be reviewed by the Agency Records Administrator to ensure compliance with *Management of University Records* (University Policy 2000) and related State regulations. Revisions to these *Guidelines* will be sent to the manager of the Administrative Information System (before the effective date of the change, if possible). The update will be made, the date and revision number changed and the revision noted in Section 6.0, and returned to be approved and released.

4.0 Definitions

1. **AUDB (Administrative University Data Base)** is a conceptual term used to identify that body of data critical to University planning, management and business operations.
2. **Data administration** is the function of applying formal guidelines and tools to manage the University's information resource.
3. **Data custodians** are the University officials responsible for managing a segment of the University's information resource.
4. **Data stewards** are staff members delegated the responsibility for data maintenance and data dissemination.
5. **Data users** are individuals who are authorized access to University data required by them to perform their assigned duties.
6. **University Data Resource Dictionary** is a database system that functions as a repository that contains comprehensive information about University data and documentation of University administrative systems.

5.0 References

1. *Policy 2000*, "Management of University Records," effective February 1989.

6.0 Approvals and Revisions

Approved January 5, 1989 by the Administrative Systems Users Group (ASUG).

Establishing and Implementing Policies and Procedures for End User Training in Higher Education

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ABSTRACT

At some institutions the central administration mandates or facilitates the use of technology for administrative, instructional, and research needs. At other institutions it is the office staff and faculty who, by using it, have discovered the value of technology: in these institutions, support is informal. Those who facilitate access to technology usually acknowledge and generally support training for staff and faculty with funds and personnel. When access to technology is not actively supported, training is often ad hoc or obtained from sources both outside and inside the institution, usually for a fee.

Harvard University and the University of Michigan represent two contrasting institutional models in the way they support technology. One applies a decentralized approach to user support, while the other is centrally supported

Training is an aspect of user support that often receives short shrift: it is under valued and under funded by administration at many institutions. At Harvard, training, like all user services, is provided both centrally and de-centrally, and is not consistently supported within the various Schools. Harvard's Office for Information Technology provides training open to all University employees, yet it is based on a fee-for-service. In contrast, at the University of Michigan, the Computer Center User Services provides free training to all employees.

This paper will compare and contrast these two universities in their approach to technology and user support and the policies and procedures they use for end user training. The similarities and differences between free training and fee-based courses — similarities based on the nature of high-quality training programs and differences brought about by the structure of the institutions — may help other institutions plan for training programs of their own.

Both authors are managers of training programs for central computing organizations at their respective institutions.

Introduction

A group of college and university technology educators in southern New England began meeting regularly in 1988 to discuss issues and share ideas about training at their respective institutions. The early meetings, supported by Apple Computer, focused on Macintosh training. Preliminary discussions revealed the need to obtain a training profile of each of the nine institutions. The institutions include Boston College, Brandeis University, Brown University, Harvard University, MIT, Trinity College, Tufts University, Wesleyan College, and the U.S. Coast Guard Academy. The survey, completed by training managers or coordinators, gathered data about the training programs, classroom facilities, training policies and procedures, evaluation methods and marketing strategies. The section identifying successes and challenges raised the issue of how policies and procedures for training were established — through central mandate or by default — and what made particular training models work in each institution.

Description of the Institutions

Harvard University. Harvard University is decentralized: it consists of 11 graduate and professional schools and an undergraduate Faculty. Central administration consists of the President's and Vice Presidents' Offices, Budget Office, General Counsel, News and Public Affairs, Alumni Association, Development Office, Office for Information Technology, and more. Founded in 1636, Harvard is the oldest university in the United States. It awards at least 17,400 undergraduate and graduate degrees each year. Supporting the student population, there are 2400 full-time and 600 part-time faculty members as well as a staff of 15,000.

The University of Michigan. The University of Michigan is also decentralized with 16 graduate and professional schools and an undergraduate Faculty. The University community in Ann Arbor is comprised of over 36,000 students, 3,000 faculty, and 15,000 staff. The University organization is comprised of the Offices of Business and Finance, Government Relations, Academic Affairs, Research, Development, and Student Services. The Information Technology Division is headed by a Vice-Provost who reports to the Vice-President for Academic Affairs. In addition to the main campus in Ann Arbor, The University of Michigan also includes a campus in Flint and one in Dearborn, with a Chancellor at the head of each.

Recognizing the importance of Information Technology to the research, instructional, and administrative activity on campus as well as to the quality of life, the University has made a major commitment toward support of Information Technology on campus. The Information Technology Division consists of approximately 700 employees engaged in the provision of computing, communication, and network services. A campus-wide network environment has been created that connects the entire campus in a network of interlinked, local- and wide-area networks connecting mainframe, microcomputer, and minicomputer users . The network uses a variety of media including fiber and twisted pair wire. There are currently 9300 asynchronous ports connecting faculty and staff offices and student workstations in public clusters and residence halls.

Planning and Budgeting

Harvard. Planning and budgeting occurs in each School and Faculty at Harvard before the central budget is compiled. As with all other aspects of University life, the way budgets are done also affects information technology planning and implementation. Individual Faculties and administrative Departments have developed systems to meet internal needs and provided users with tools for data management. Concurrent with the increasing use of distributed computing is a plan to connect the entire campus by fiber, enabling a computing network of pcs, minicomputers and mainframes within five years.

According to the 1987 Long-Range Plan of the Office for Information Technology (OIT), "no University-wide framework for technology use exists at Harvard, and there are no University-wide standards and controls for implementation." The plan's objectives were, "in addition to identifying OIT's long-range goals and strategies, to begin a process for gaining consensus on these goals and to build awareness throughout Harvard of the University's future information technology needs."

The plan emphasized that information sharing tools are needed and that extensive training is equally important in order to upgrade individual technology skills. OIT's publications and its computer training program were established in their present form along with this plan. The information dissemination and training services are designed to raise consciousness about information technology in higher education, and are intended to stimulate discussion and increase customer self-sufficiency in using information technology.

Although there is no central mandate about technology at Harvard, expenditures in this area grow at the rate of 8 percent per year. With no central standards, OIT can only set some de facto standards through sales of a limited range of hardware and software at the Technology Product Center and by providing training for selected software packages. Individual schools set their own standards and provide their own computer support structure, which may or may not offer training.

Michigan. Budgets at Michigan are also prepared by each individual school, college, or administrative unit. Since 1984, the Information Technology Division budget has grown from 4 million dollars to its current level of 17 million. The majority of this funding is comprised of direct funding from the University's general fund, but it also includes revenue from mainframe charges to external clients and modest user fees. Having recently realized many of its important strategic goals (including the installation of a campus-wide network and the deployment of 1600+ workstations in campus computing sites), it is expected that the ITD budget will remain relatively stable in the near future. Increases to the budget are more likely to come as a result of additional user fees than from additional central funding.

Computer support in a decentralized university such as The University of Michigan is not surprisingly also decentralized. While at one time it was thought that a "centralized, controlled, rational approach to a microcomputer environment at the University of Michigan would be nearly impossible to achieve[1]," computer support is now best characterized as the result of individual units working together for mutual benefit. While it is true that there is not a "centralized and controlled" environment, there is a great deal of "rational thought " being expressed. Individual units can make whatever decisions they wish for the acquisition and support of information technology, but it is not unusual to find decisions being made in favor of ITD-supported solutions. We find that support responsibilities are typically shared -- with general support usually provided by the central service and discipline-specific support provided by individual units, schools, and colleges.

Several mechanisms exist for sharing information and shaping support policies. Of key importance is the concept of ITD supported products. Individual units know what products are supported and what services they can rely on from the Information Technology Division. Evaluation teams made up of both ITD and non-ITD personnel make recommendations for supported products. An ITD Selection Committee makes final support decisions based on the availability of support resources and the perceived demand for a particular product. Information about needs and directions for information technology are shared at regular meetings of several campus groups of computing support professionals and key policy makers from within and beyond ITD.

[1]The University of Michigan UCCPU SubCommittee Report "University Microcomputer Policy" January 4th, 1984

Computer Education and Training

Harvard. OIT's training classes are open to the entire University as well as to non-profit institutions in the area. These classes are hands-on, skill-building sessions offered in two dedicated classrooms in Cambridge and one shared facility in the medical area in Boston. During the 1988-89 academic year, more than 900 people were trained on the Macintosh and the IBM PC/PS2 in 121 classes of 21 different courses. People taking these classes were representative of eligible organizations: 60 percent were staff members from all Harvard schools, 19.5 percent were from OIT, 2.7 percent were faculty, 3.8 percent were graduate students, .8 percent were undergraduates, and 13.2 percent were from non-profit institutions.

In addition to classes, the technology education group of three professional people, under the management of Anne Knight, organizes a colloquium series, hosts user groups, and holds product demonstrations throughout the year. The educational program has grown steadily since 1986.

Most of OIT's services are supported by user fees. Very little central funding is provided. The classroom must be full cost recovery. Thus, the importance of high quality programs and services is obvious. The biggest challenge is to determine client demand from the widely scattered audience and to set fees appropriate to the market. Harvard's training program must be as good if not better than its competitors and must be offered at a lower price. The setting of goals and standards for OIT's training program became vital to its success.

Michigan. Computer education programs at Michigan are designed for faculty, staff, and students of the University. Non-University participants are eligible only for the University's mainframe (MTS) classes. Michigan's end-user computer education program began with mainframe training in the 1970's. In 1984, with the influx of microcomputers and Michigan's participation in the Apple University Consortium program, workshops became an effective and efficient way to communicate with the rapidly growing numbers of novice computer users who needed to learn more about what computers could do for them and who needed to develop their computer use skills. Since 1984, the workshop program has grown enormously. Current education programs include:

- regularly-scheduled workshops
- self-guided instructional materials (print and computer-based)
- training the trainer activities
- special workshops

Regularly-scheduled workshops are offered in systems use (Macintosh, DOS, and Michigan Terminal System), application areas including electronic messaging and conferencing, database management, spreadsheeting, word processing, data communication, local area networks, authoring systems for creating multi-media courseware, and workshops to facilitate access to UM data. There are over 14,000 registrations for workshops each year and over 1,800 hours of instruction in more than 100 different workshop titles each semester.

Workshops are offered in a variety of formats including lecture/demonstrations and hands-on classes. A Macintosh classroom and an IBM PS/2 classroom are regularly used for hands-on classes. Each of these rooms contains 16 workstations and overhead projection capabilities. The computers in the IBM Lab are connected to one another on a local area network with a network file server containing all programs and practice exercise files. The Macintosh lab will be added to the same network as soon as commercial releare connected to one another on a local area network with a network file server containing all programs and practice exercise files. The Macintosh lab will be added to the same network as soon as possible. A 3rd classroom equipped with a Macintosh and a PS/2 is used for lecture/demonstration workshops. This room is also equipped with projection equipment for each computer.

The workshop population at Michigan is composed of approximately 55% staff, 39% students, 5% faculty, and 1% MTS clients. This is not an exact mirror of the University statistics for these groups. Faculty are representative, but staff clearly outnumber students in workshops.

The University of Michigan's Computing Center education program is managed by Elaine Cousins, assisted by a staff of 5 full-time instructor/consultants, a full-time registration clerk, and a part-time secretary. Staff from other areas of User Services also regularly teach workshops. Their time commitment may vary from 6 hours of classroom instruction per term to over 40 hours. In addition to the Computing Center education program, other ITD education programs include the Office of Administrative Systems program (with 3 teaching staff) and the Residence Halls program which makes use of student trainers to teach students in the residence halls.

Because workshops are not the only way to teach about computers, self-guided print tutorials and computer-based tutorials have been created. These include introductory training on mainframe use and the widely-used computer conferencing facility at Michigan. A series of tutorials on basic concepts of computer applications is currently in progress.

In keeping with the desire to help users help themselves, the University of Michigan Computing Center assists departmental trainers, faculty, and teaching assistants to teach computer topics using Computing-Center developed materials. Approximately 20 groups took advantage of this service last year and it is anticipated that more will do so in the coming year.

The end-user education budget at Michigan is approximately 300,000. This represents salaries, material preparation and production, advertising, and software for teaching. Not included are teaching lab hardware costs, staff expenses for supplies and equipment, and non-education group salaries (approximately 1.5.FTE).

IV. Goals and Standards for Training at Each Institution

Harvard: The goals of Harvard's training program are to:

- impart skills to its customers
- maintain high-quality course content and delivery
- have satisfied, repeat customers
- build and maintain a good reputation for OIT

The classroom standards that were established include:

- an instructional methodology with lecture, demonstration, and hands-on exercises and group problem-solving in the advanced courses
- in-class opportunity to practice
- one person to each machine to provide a hands-on experience
- a comfortable learning environment — a bright, clean classroom and an assistant for large classes;
- using current, appropriate, reliable technology
- regular support by a technical person.

Michigan. The goals of The University of Michigan's computer education program are to contribute to the quality of instruction, research, and the administrative work environment by facilitating better use of Information Technology. We do this by:

- Providing information about Information Technology resources on campus
- Enhancing the computing skills of the U-M and MTS community
- Assisting faculty and computer support staff with their education/training responsibilities
- Encouraging self-help and strategies for continued learning

The program standards we have adopted to help us realize these goals include:

- talented and knowledgeable instructors who are an integral member of our support team
- up-to-date training equipment in comfortable classrooms with overhead projection equipment
- varied formats that encourage active learning and problem-solving
- supportive, group-oriented environment with 2 students per workstation in workshops

V. Policies and Procedures

Harvard. The mission of the training program at Harvard is to increase the customers' skill level and self-sufficiency in using information technology. The overriding management objective is to make the classroom function full cost recovery. High standards were established to attract clients. Timeliness and clarity is important for marketing the courses. A training catalog published each semester is distributed in September and January as an insert in the Technology Window publication to all 1,400 Harvard employees. Certain courses, such as SAS, require targeted mailings, and publicity in the medical area has received special attention. General publicity is handled through calendars in other Harvard publications and via announcements on Harvard's information telephone number called FACTLINE. We maintain a training information telephone mailbox and "hotline" to respond to customer questions. Decisions about each semester's offerings are based on software sold at the Technology Product Center, software used by OIT staff and discussed in the User Groups, and on information gleaned from other information technology forums at Harvard.

Introductory courses for the PC and the Macintosh are offered more frequently than intermediate and advanced courses, and they are offered in two half-day segments. The intermediate and advanced courses are one and two days long (7 hours each, including mid-morning and mid-afternoon breaks and an hour for lunch), depending on the amount of material to be covered. In addition to the operating system courses, word processing, desktop publishing, spreadsheets, databases, and statistics courses are offered. File transfer and local area network training is also offered. Adjustments to the schedule are made each semester, based on past experience. When use of software packages represents a critical mass, training programs are offered, and support is provided.

Pre-registration for all courses is required via mail or in person, with payment and confirmation letters sent acknowledging enrollment. Fees range from $125/day for introductory courses to $395 for three- day courses. Student rates are $15 to $70 lower, depending on course length. When a class is filled, the registrant is contacted about enrolling in the next class offered. Waiting lists are maintained, if necessary. Cancellation within five working days is accepted with full refund. OIT reserves the right to cancel classes with insufficient enrollment (less than five people) or because of inclement weather. Failure to show up for a class does not entitle the student to a refund.

The student/teacher ratio is 8 or 9 people. If there are more students in IBM PC classes, up to a maximum of 12, a classroom assistant is hired. No assistant is provided in the Macintosh classroom where 9 students is the maximum.

Although prerequisite skills are defined for all classes, frequently students come to classes they are not prepared to take. This year we have instituted a self-assessment skill test, which is sent to all registrants with their confirmation letters. This enables students to determine whether or not their skills are sufficient to proceed to a higher level course.

The problem of varying levels of expertise among the student population is handled by the instructors. They adjust their rate of instruction to the majority of the students and try to provide extra help for slower students during the exercises.

Technical support is provided for all classrooms. OIT's technical support person prepares the systems before class and is available to troubleshoot any problems that may arise during class with the network, the individual systems, the projection unit, or the printers.

Harvard contracts with independent trainers as instructors. Each instructor is selected on the basis of an interview and recommendations from other employers. They are evaluated during their first course by the manager. Their fees are negotiated and depend on level of experience, amount of course development necessary, and on years taught for OIT.

Fortunately we have never had to cancel a class because of instructor illness or failure to show up. We do not have backup provisions for instructors, so "the show must go on."

Course outlines are prepared by all instructors, and either third-party courseware or instructor developed courseware is used for instruction. Bibliographies and "cheat sheets" are prepared by the instructors. OIT provides each instructor with a policy manual and technical notes. Twice a year the instructors meet with the OIT staff to review, discuss, and evaluate the past semester. Often, suggestions are adopted by all the instructors.

At the end of all classes, the students complete a course evaluation form. These evaluations are reviewed by the instructor and the training coordinator. Problem areas are discussed immediately with the instructor, and appropriate adjustments are made to course content, length, or presentation.

A Paradox database is maintained of all registrants on a PS/2 Model 70. This database is updated regularly with data from the central Human Resources database. Reports can be generated upon request on enrollment (numbers, distribution according to department or staff type), courses (name, type, number, hours, fee, etc.), and income and expenses. These reports are used for planning purposes and preparing the Department's annual report.

Some Departments or offices at Harvard request special training sessions, especially if they have more than five people to be trained. These sessions are scheduled according to classroom and instructor availability. Occasionally on-site training is provided, especially for the President's and Vice-President's offices. When OIT cannot meet a training request, we refer people to outside vendors or try to accommodate the request next semester.

As yet, OIT has not developed follow-up surveys of our customers. In order to reach the faculty, a needs analysis may be conducted in the spring of 1990 to determine their desire and availability for training sessions.

Michigan. Policies at Michigan have grown out of our experience and our desire to offer high-quality, effective programs that meet the needs of our participants.

Dependability and Consistency:
Because it is important for the campus community to be able to plan ahead, an entire semester's schedule is published one month in advance of the coming semester. Information about the workshop schedule is available in a Computing Center publication, *Non-Credit Computing Courses on Campus* , as well as in other campus publications published each term by the Human Resource Development office and the Hospital Training Department. Our ITD newsletters and general University publications publish weekly workshop schedules as well. An online file that is widely accessible on campus also carries information about workshops and any last-minute schedule changes.

In order to narrow the gap between participant expectations and reality, our publications try to clearly convey exactly what will be covered in a workshop and what prerequisite skills are necessary. Information is also provided about the length and format of the workshop.

So that it is not necessary to cancel workshops in the event of an instructor illness, substitute instructors are available and specially-prepared "Instructor Notes" are assembled in notebooks for reference. Workshops are cancelled only in the case of insufficient enrollments (fewer than 5 registrations for advanced, limited-audience classes and fewer than 10 for traditionally more popular classes).

Printed materials have become an important part of Michigan's workshop program. Some are designed as reference materials while others are step-by-step tutorials. In either case, our participants have come to expect high-quality support materials for post-workshop use. Many people also find that our handouts substitute for attending a workshop when their schedules are particularly busy.

Excellent workshop instructors are particularly important to our program's success. Our instructors are very knowledgeable and enthusiastic teachers who enjoy training. Instructors work in teams to design new workshops and are available as consultants to users both before and after workshops. The workshops they design grow out of their experience on the U-M campus and reflect campus needs. Wherever possible, we try to assign more than one person to teach a particular workshop title. This helps when we need substitute instructors and it also makes consistency in workshops essential. Instructors of advanced courses need to know that the same material is covered in introductory courses regardless of which instructor may have taught it.

Appropriate Scheduling:
Schedules are planned taking into account University class schedules and the curriculum is modularized so that individuals can sign up to learn the skills they need. Although we have very few evening workshops, we have scheduled some to accommodate students, faculty or staff who find evening workshops more convenient. Registration and enrollment statistics are monitored carefully so that we can offer the right number of workshops each term and at the right time of the semester. In general, introductory courses are offered more often than advanced classes.

Classroom Policies:
A myriad of policies and procedures seem to govern attendance and registration. All of our policies, however, are designed to improve the classroom experience of those attending or eliminate a "no show" problem.

Some of our classroom policies are:

- Late-comers forfeit their seats to "walk-ins"
- Registration is required, but walk-ins are encouraged
- Registrations are accepted no earlier than one month in advance
- Class limit of 30 participants for hands-on classes
- 2 participants per workstation is the norm
- No eating or drinking in the classrooms
- No mail registrations to enable immediate confirmation of registration
- Modest fees are charged for all but introductory workshops and hands-on systems use workshops. (typically $5.00 per hour; no charge for students)

Other Policies:
Computing Center developed tutorials are distributed for a nominal fee ($10.00) and may be duplicated freely. Commercial tutorials will be available for checkout beginning in the winter term. Print tutorials and workshop handouts available for $2.00 or at no charge (for workshops that have no fee.)

Special workshops may be requested by faculty or departments. Departments are charged roughly $150/hr for special workshops and development time for special workshops that are not regularly taught is charged at 40.00 per hour. An estimate is given to each department requesting special workshops in advance.

Program Analysis and Ongoing Improvement:
At Michigan, we monitor our program and its effectiveness regularly. Workshop evaluations are completed by participants after each session and these are compiled for each workshop each semester. Instructors are the first to receive the evaluation data and often respond to feedback in the evaluations immediately. Participant evaluations are also very useful for identifying problem areas that can be addressed in a special meeting. Some recent such topics have included enhancing presentation skills, teaching to a mixed level participant group, handling questions, and teaching newly arrived foreign students. Longer-term follow up evaluations have not been carried out with the exception of special workshops where the Education Manager always talks with the organizer of the training several weeks after the training has been completed.

Consultants provide input into the curriculum planning and registration and attendance data are analyzed for trends and indicated changes to workshop schedules. Beginning next term, we will be instituting a plan for peer evaluations. The Education group meets biweekly to address any problems that arise and once or twice each semester, the entire teaching staff assemble for topics of mutual interest and the sharing of teaching tips and skills.

I. Challenges for Training Programs at Each Institution

Harvard. The ongoing challenges for Harvard's training program are:

- requiring full cost recovery for the classroom, which includes all overhead expenses (space rental, instructors, staff support, course materials, printing, telephone, hardware, and software, etc.)
- setting and maintaining standards for course materials (course descriptions and outlines, pre-tests, student materials in proper sequence with page numbers, quick reference sheets, integrated exercises, bibliography, and student data disks)
- keeping our excellent instructors happy (pay commensurate with skill and experience, providing staff assistance, dinner meetings semiannually)
- getting students to self-assess their skills and enroll in appropriate classes only.

The challenges for the future of Harvard's training program include:

- preparing and training faculty to evaluate and use technology for personal and professional tasks by cooperating with computer services groups within the various Schools
- keeping up with the rapidly changing technology (when to upgrade and what expenditures for hardware and software to capitalize)
- developing effective training coordination mechanisms within Harvard (regular meetings of user support managers from the various Schools, quarterly meetings of training coordinators and trainers, etc.).

Michigan. Challenges for Michigan in the coming year are numerous and revolve around budget, changing technologies, and changing user needs. Among the more interesting are:

- Reaching increasing numbers of users with static resources
- Keeping up with rapidly changing technology and changing user needs
- Narrowing the gap between experienced and novice learners in the same class
- Continued exploration of alternative training media and strategies
- Becoming an effective lobbying voice for user needs and improved software
- Helping users work "smarter" with new technology

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A METHODOLOGY FOR STANDARDIZATION: FROM EIGHTEEN WORD PROCESSORS TO ONE

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ABSTRACT

The ever-increasing computer usage at Allegheny College demanded an increase in computer support. By 1987 the 450 employees and 1900 students of Allegheny used eighteen different word processors.

The Computer Center found that standardizing on one word processor was one way to increase productivity without increasing computing staff size. The complex change process required the support of top management as well as user involvement in the decision. Workshop training with hands-on experience was found to be the best strategy when teaching novice users. A users' group allowed for continuing user involvement. Project evaluation using a questionnaire provided necessary feedback.

A METHODOLOGY FOR STANDARDIZATION: FROM EIGHTEEN WORD PROCESSORS TO ONE

This paper reviews the procedure used at Allegheny College to standardize the use of word processing. Founded in 1815, Allegheny is a small, private liberal arts college. The 254-acre campus located in northwestern Pennsylvania in Meadville is 90 miles north of Pittsburgh. Meadville is a small city of 15,000 people, surrounded by farm country and rolling wooded hills.

The methodology for standardization included the following steps that proved successful:

1. Needs assessment
2. Top management support
3. User involvement in the decision process
4. Questions and answers
5. Workshops and training
6. Distribution of the software
7. Formation of a Users' group
8. Project evaluation

The Need to Standardize

Before standardization, the 450 employees of Allegheny College used eighteen different word processors, many at different version levels. The most popular were PC-Write, Multimate, Volkswriter, WordPerfect, WordStar, and MS Word. The 1900 students primarily used PC-Write. Support and training for all these packages was a very time consuming no-win situation for the Computer Center staff.

The quality of support offered by a computer center depends upon three factors: the staff, the number of products supported, and the level of support offered.[1] If the majority of the college community were to use one versatile, powerful, user-friendly word processing package, we would be able to concentrate our support on one good package.

By January 1988, it was apparent to the Computer Center staff that an attempt must be made to standardize on one word processing package at Allegheny. In addition to improving user support, standardization makes the exchange of information much easier and increases efficiency. The Computer Center performed an evaluation of major word processing packages to select the most appropriate program as a standard for Allegheny. Product reviews and professional literature suggested that WordPerfect was the most widely used and highly rated word processor on the market.[2] A recent survey of CUMREC members also found WordPerfect to be "the easiest and most helpful software."[3] The package met our criteria of being both easy to use and learn, with powerful and versatile features for both general and academic use. The Computer Center suggested that Allegheny College adopt WordPerfect as its standard.

Administrative Executive Committee Support

Research indicates strongly that in any complex change process, there is a critical group of people whose commitment is necessary to provide the energy for a change to occur.[4] Support of top administration is essential when attempting to effect most organizational changes. All department heads had to be willing to supply the time required for training.

The first step in this process was to approach Allegheny's Administrative Executive Committee (AEC), comprised of senior officials reporting directly to the president. The cooperation, support, and guidance of this committee was sought from the outset of the standardization effort.

By the end of February 1988, the AEC agreed in principle to support the concept of limiting support to one or two standard word processors on campus. They requested the development of a formal mechanism for selecting the appropriate word processor. They believed it was important for the users to play an active role in arriving at the decision. They shared a common belief that resistance can limit the successful implementation of computer applications.[5] User involvement tends to reduce resistance. The users needed to have a strong input.

The AEC wanted a vehicle for all constituencies of the college - student, faculty, and staff - to provide input to the final proposal. As this retraining effort was to affect all members of the college community, the AEC saw it as an opportunity to improve communication on campus. If workshop participants could discuss the type of work each did, people would to get to know each other better. As participants discovered that they shared many similar concerns and problems, an increased sense of community might develop. Forming a users' group would provide an opportunity for people to come together on a regular basis. Thus a secondary goal of standardization was to provide opportunity for communication across boundaries.

The AEC gave its support for funding on two conditions: first, that workshops would include a mix of people from different offices and different levels of authority; and second, that a users' group would be formed.

Word Processing Standardization Committee

The Computer Center began to discuss ways to involve the entire college community in the decision. We rejected the idea of sending out a questionnaire and explored the idea of an ad hoc committee. By May 1988, we had focused on the formation and purpose of the Word Processing Standardization Committee. This committee was to make explicit the reasons for adopting a standard word processing package at Allegheny. Using the existing evaluation materials provided by the Computer Center, we wanted the committee to take into consideration cost, power, flexibility, and ease of use and learning. We anticipated this committee would reach the same conclusion we reached, choosing the same word processing package that we had in mind. The decision had to be made as soon as possible so training could take place during the summer months when the computer labs were available for employee use.

In June 1988, the committee was fo med. The Word Processing Standardization Committee included five staff, three administrators, three faculty, and three students. We chose members not only from various areas, but also with various computer backgrounds. The chairperson of the committee was a member of the Computer Center staff. The Computer Center prepared a working document to simplify the task facing this committee, emphasizing that it was only a recommendation. The committee would analyze the material within this document, and discuss the issues and strategies with colleagues. As representatives of the college community, they would build a consensus around a final strategy for standardization. The document included the following reasons and objectives for standardization:

1. **Communication** Communication cannot happen when everyone is speaking a different language. Standardization provides the ability to exchange information effortlessly with any office, administrative or academic. A free flow of information eliminates both communication barriers and problems of misinformation and speculation.

2. **Community** Better communication makes for better working relationships and increases understanding among groups. Standardization would require cooperation among the many offices on campus who have similar needs but rarely find occasion to discover the similarities. The entire campus working as a team toward a single goal could bring the college community together.

3. **Integration** To have everyone using the same tools encourages a sense of creativity, harmony, and organizational solidarity.

4. **Efficiency** When multiple word processing packages are used, employees must use a conversion program or retype to share documents among offices. Secretaries in academic departments find themselves working with documents from faculty who use different word processors. All of these tasks waste time and energy at a time when emphasis on improving productivity continues to increase at Allegheny.

5. **User Satisfaction and Productivity** Research shows that two important factors that impact end user computing are the efficient and productive use of available software and the quality of interaction with computer specialists.[4] The level of training and support the Computer Center could provide by concentrating on one package should improve both factors. This would lead to increased productivity, expertise, and user satisfaction.

6. **Quality** One of our goals was to equip faculty, students, and staff with the best possible tools. We evaluated several word processing packages and found what we judged to be the most likely software to meet the needs of almost all groups on campus. The package we recommended has powerful, easy-to-use features for general and academic word processing needs.

Questions for the Computer Center

The prospect of standardizing raised several questions, issues, and problems that needed to be addressed:

1. Transition We expected a period of transition during which the new standard word processor and the old word processors would all be in use. The transition period would take approximately one school year for administrative users. Converting faculty and students would take longer because of the number of upperclassmen using PC-Write and the time constraints faculty face in attending training workshops. During the transition we would continue to support the most widely used word processors. Any new employees and students would learn the standard package.

2. Time We saw the commitment of time to be the most universal problem. This commitment must have priority and come from the top down. Department heads must give staff the time to learn the new package. We anticipated each person learning the package would spend ten hours in workshop training over a period of 2-3 months. The time to achieve competency in the new software would vary considerably from person to person. For optimal results, we suggested that people begin using the new program immediately after training. For about one month, we estimated this could add one hour per day to the time it would take them to accomplish their normal work. We also recommended that for about one month trainees spend 1-2 hours per week away from their offices to work on the program, preferably in the microcomputer labs where people who knew the package would be available to answer questions and provide help.

3. Training Individualized instruction is most effective when teaching word processing. A small group accommodates differences in learner abilities, attitudes, and backgrounds.[7] We planned to conduct workshops attended by no more than 18 participants with two instructors for each group.

We planned to provide training in steps - an introductory session, an intermediate session, and then workshops on advanced topics. This would give users the opportunity to work with the program, absorb what they learned, and formulate questions before the next session. Individuals did not need to attend the introductory session if they felt comfortable with basic features of the program. They could attend the intermediate or advanced levels as they saw fit. The sessions emphasized the type of work participants were most likely to do with their word processor in their own working environment.

4. Support We had in mind a number of support mechanisms. The formation of a users' group would provide excellent and timely help for people having problems and an opportunity to share helpful hints discovered while using the package. Each office would identify a word processing expert. These liaisons would answer most questions and act as the word processing contact with the Computer Center. Telephone support from the Computer Center would also be available. We would distribute tip sheets and handouts.

5. Access/Distribution The standard package would be available on all college-owned computers and networks. Anyone who had his or her own equipment could purchase the software for a highly discounted rate. WordPerfect is not a public domain program. Unlike PC-Write, we could not duplicate and distribute it free of charge.

Word Processing Standardization Committee Decision

The Word Processing Standardization Committee met twice. During the first meeting the members discussed the problems and concerns. The committee made the decision to support standardization on WordPerfect during its second meeting. If this project were to be a success, it was important that the users understand the reasons for standardization, the commitment to it, and the long-run benefits.[8] To meet this requirement, on July 18, 1988, the committee sent a memo to the Allegheny community. Many areas in this memo reflected the recommendations of the Computer Center to the Committee. This memo presented the rationale for standardization and the reasons for choosing WordPerfect as a standard.

Workshops and Training

By mid July 1988, the Computer Center had negotiated a license agreement with the WordPerfect Corporation and ordered the software. It was time to formalize the training process. Many trainers say problems arise when users with different levels of PC experience and different job requirements are together in the same workshop.[9] However, one of our aims was to improve communication across the campus by getting people together. We chose to include employees from various departments in each workshop. In order to stimulate conversations, each workshop included a 15 minute coffee and cookie break. Users are more likely to seek help after their initial training if they are personally acquainted with the support staff.[10] The coffee breaks allowed the Computer Center to become acquainted with the users in a personal, friendly setting.

Now the problem we faced was who would teach the workshops. Up until this time, two people from Academic Computing taught nearly all computing workshops. Both had extensive experience teaching workshops, and one was the WordPerfect expert on campus. However, these two computer professionals could not possibly teach all workshops. Although the rest of the Computer Center staff had no knowledge of WordPerfect, everyone would join in and help with the training.

Here is where the plan met some resistance. "Any programmer, any DP type, any computer scientist, wants to program, not train."[11] Some of the staff were very reluctant to teach workshops since they had neither teaching experience nor training. One person refused to teach a workshop; the rest said they would, but they were hesitant because of their lack of experience with WordPerfect. A key ingredient in workshops is the instructor. The instructor must have a deep understanding of the program. It is important that he or she understands the fears and apprehensions of new users. In addition to prior teaching experience, instructors should have extensive experience with both the personal computer and the software that they are teaching.[12] Many of us were mainframe programmer/analysts who had never used WordPerfect. Most of us had no teacher training. So what were the chances for a successful training program? The workshops had to be a success. We could not risk failing in even one workshop group.

Our solution was to have the inexperienced teachers assist the experienced trainers in the early workshops to get a feel for what to expect. This worked out quite well. Even the one programmer/analyst who had refused to teach a workshop agreed to give it a try. After assisting in several workshops, we felt comfortable enough to teach, and in fact, we enjoyed it and did a good job.

Along with the July 18, 1988 committee memo, we sent a memo to all administrative offices announcing the WordPerfect workshops. We asked each office to identify the employee who would serve as the word processing liaison for the department. Liaisons were considered the key word processing experts in each office and would be the first to receive training in the package. They acted as the contacts with the Computer Center, received the software for distribution, and converted files from other word processors when necessary. When users had problems, liaisons would be the first people to consult.

Focusing on Allegheny's 125 administrative users, we conducted ten Introductory workshops and five Intermediate workshops during July and August. Each workshop met for two two-hour sessions. The Introductory workshops required no experience with WordPerfect. These workshops covered basic features of the package. The Intermediate workshops were for those who had taken the Introductory workshop or had a working knowledge of WordPerfect. They covered such features as working with blocks of text, advanced printing features, and search/replace.

Advanced workshops met for one two-hour session. Conversion workshop #1 showed how to use the conversion utility provided in WordPerfect. Conversion workshop #2 showed how to use Mastersoft's Word for Word to convert files created in Microsoft Word or Volkswriter. The Mail Merge workshop covered the techniques of merging a list of names and addresses with form letters. A Document Processing workshop dealt with the use of WordPerfect with the HP Laserjet.

The mix of staff, administrators, and faculty in the workshops was roughly 4:2:1. Each workshop had participants from an average of eight different offices. The workshops were definitely accomplishing the goal of bringing together the different groups on campus. People were mingling and introducing themselves to others, mostly because of the coffee and cookie breaks we included. We gave people time to talk and get to know each other. Everyone we talked to, including those of us teaching, enjoyed the workshops.

Distribution

On July 25, 1988, we distributed one copy of the WordPerfect software (six disks) to each computer on campus, accompanied by a quick reference card and a keyboard template. Each copy included instructions for using WordPerfect from floppy diskettes, installing and using

WordPerfect from a hard disk, and selecting a printer. Manuals were distributed at a ratio of one manual for every three machines.

Users could check out workbooks with self-paced lessons from Academic Computing Services. We DID NOT recommend using the on-line tutorial that comes with the WordPerfect program as we were experiencing some problems with it. This worked to our advantage since research shows that an on-line training package is a less effective teaching method than workshop training.[13]

WordPerfect Users' Group

End-user attitudes toward word processors affect efficiency and productivity. Assuming that more positive attitudes produce greater job satisfaction and productivity, we attempted to improve user attitudes.[14] In August 1988, we formed the WordPerfect Users' Group as the medium for exchanging solutions to problems, macros, and other helpful information. We encouraged anyone interested to attend the meetings. Two college employees with PC experience, who were not members of the Computer Center staff, coordinated the users' group. This was a further attempt to involve the users. The Users' Group planned to hold informal monthly meetings in a computer classroom where demonstrations could be given.

Problems

Many of the problems we experienced with the project were anticipated and measures were in place to deal with them. Other problems were unexpected. One major problem we encountered was that as we were about to standardize on WordPerfect 4.2, WordPerfect Corporation came out with a major upgrade--WordPerfect 5.0. "There are substantial differences between the two versions."[15] Not only did we have the task of teaching WordPerfect to the college community and ourselves, there was no one on campus who was an expert at WordPerfect 5.0. In addition, WordPerfect 5.0 requires 384K memory while version 4.2 required only 205K. Many of our PCs had only 256K memory. Version 5.0 runs best on a hard drive or a network with lots of free space.[16]

Another problem was that during this same time frame, many offices were converting to laser printers and hard disks. Besides learning a new software package, users were dealing with new hardware. Often calls concerning WordPerfect were actually questions having to do with the new hardware.

We logged all calls and reports of problems, sending students or personnel out to help users when necessary. Most problems seemed to be with printers. An IBM Wheelprinter driver was not available at the time we received the WordPerfect software. Eighteen offices on campus used the Wheelprinter. Furthermore, we had to experiment with suitable drivers for older dot matrix printers not supported by WordPerfect 5.0. As problems arose, we prepared handouts outlining solutions or ways to avoid the problems. These handouts as well as several useful macros were distributed through the users' group.

Project Evaluation

Although the standardization process was far from being complete, in November 1988 we performed an evaluation using a questionnaire sent to all employees of the college. This feedback would allow us to make modifications to the plan if necessary. Of the 450 employees receiving the questionnaire, 36% responded.

The questionnaires were analyzed using SPSS-X. Of those responding, 30% were administrators, 36% were faculty, and 34% were staff. Of the 59% using WordPerfect 5.0, 33% were administrators, nearly 27% were faculty, and 40% were staff. Of those responding to the survey, 61% attended a workshop: 87 attended the Introduction, 63 attended the Intermediate, 19 attended the Mail Merge, 9 attended the Document Processing, and 12 attended the Conversion workshops. The workshops were rated excellent by 61% of the respondents, good by 34%, and fair by 4%. None of the employees rated the workshops poor.

Despite the positive ratings, comments on the questionnaires pointed to three areas in need of improvement. First, the constructive criticism illustrated the importance of workshop evaluations. Before the next round of workshops in December, we would design an evaluation form to be completed by participants at the conclusion of each workshop. This immediate feedback would allow us to monitor the quality of instruction and make timely adjustments.

A second difficulty involved our practice of integrating users with various levels of computer expertise into a single workshop. To meet our goal of providing cross boundary communication, we combined users with different levels of PC experience. We overlooked the option to include users from various areas without including users of various levels of PC expertise. To eliminate this problem in future workshops, we would either match participants by ability, or require users with little PC experience to attend the Introduction to the PC workshop. Employee comments also led us to question the timing of the workshops. Participants in the summer WordPerfect workshops often attended an Intermediate or Advanced workshop without enough practice at the introductory level. Enforcing prerequisites would alleviate this problem.

Closing Thoughts

Throughout this project we have stressed user involvement. Research shows that the training strategy not only affects learning efficiency, but also affects attitudes end users develop toward the system.[17] We expect the favorable ratings of the workshops to carry over into the work area.

The first wave of training, with over 300 participants, was a success. We will continue to offer WordPerfect workshops, asking participants to perform an evaluation at the conclusion of each workshop. We have learned that feedback is a necessary part of the change process. Thus far, feedback shows that our expectations are being met.

Endnotes

1. Tumolo, P., and Saltzberg, S. (1987). How do you support a campus-wide office automation system and end user services? Proceedings of the 1987 CAUSE National Conference, Tarpon Springs, Florida.

2. Mendelson, E. (February 29, 1988). WordPerfect. PC Magazine, pp.322-326.

3. Hebblethwaite, J. (1985). PC's - promised land or paradise lost? CUMREC 1988, Los Angeles, California.

4. Beckhard, R., and Harris, R. T. (1977). Organizational transitions: managing complex change (p. 53). Reading, Ma: Addison-Wesley Publishing Company.

5. Arndt S., Feltes J., and Hanak, J. (1983). Secretarial attitudes toward word processors as a function of familiarity and locus of control. Behavior and Information Technology, 2, 17-22.

6. Danziger, J. N., and Kraemer, K. L. (1986). People and Computers, New York: Columbia University Press.

7. Czaja, S. J., Hammond, K., Blascovich, J. J., and Swede, H., (1986). Learning to use a word-processing system as a function of training strategy, Behavior and Information Technology, 5, 203-216.

8. Lechner,H.D. (1984). The Computer Chronicles. Belmont, CA: Wadsworth Publishing Co.

9. O'Leary, M. (August 25, 1987). A juggling act: training a spectrum of users. PC Week, pp.54-60.

10. Karon, P. (March 1987). Coping with reluctant users: managers need strategies to keep users computing. PC Week, pp. 41-56.

11. Krasnoff, B. (August 25, 1987). Information centers: coping in the midst of change. PC Week, pp.54-63.

12. Olson, D. O. (1985). Getting the most from personal computers. In Umbaugh, R. E. (Ed.), The Handbook of MIS Management (pp. 295-302). Pennsauken, NJ:Auerbach Publishers Inc.

13. Czaja, S. J., Hammond K., Blascovich, J. J., and Swede, H., 203-216.

14. Arndt, S., Feltes, J., and Hanak, J., 17-22.

15. Alfieri, V., (1988). The Best Book of WordPerfect Version 5.0. Indianapolis, Indiana: Hayden Books.

16. (April 1988). Preparing your computers. In Wilkes, A. B. (Ed.), The WordPerfectionist (pp. 3-6). Baltimore, MD: Support Group, Inc.

17. Czaja, S. J., Hammond K., Blascovich, J. J., and Swede, H., 203-216.

DATA ADMINISTRATION: Problems and Solutions

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Pennsylvania

ABSTRACT

This paper describes some of the problems encountered in the administration of data at The Pennsylvania State University and the solutions that have been implemented to solve these problems. It is recognized that the technical aspects of these solutions may not be applicable everywhere, however, the techniques presented will hopefully stimulate ideas for solutions to similar problems at other institutions.

INTRODUCTION

The implementation of data administration can vary widely from one university to another. However, some of the problems encountered in administering data are common to organizations that have active data administration functions. It is the purpose of this presentation to describe the structure of data administration at The Pennsylvania State University, and to detail some of the solutions to problems we have encountered.

Hopefully this discussion will provide useful information to those who are contemplating data administration, and alternate solutions to problems experienced by organizations that have already established data administration functions.

DATA ADMINISTRATION HISTORY AT PENN STATE

Data administration has existed at Penn State for many years. Initially it was in the form of policies, procedures and security measures that were necessary for the normal day to day operation of the computer department. As systems grew larger and more numerous, a more formal method of keeping track of university data was needed. This need was met through the acquisition of a system called Pride from M. Bryce & Associates Inc. Pride used paper forms to collect and relate information about files, records and data elements. The system was good for the collection of information but proved inadequate for reporting purposes. To correct this situation, a in-house system was developed to place the data from the forms onto magnetic tape. Updating and reporting facilities were also developed. This became the first machine readable dictionary used at Penn State. The administration of this system was the responsibility of the systems development group.

In 1974 the University acquired IMS as its first database management system. At that time a database administration group was created and assumed many of the responsibilities associated with data administration. In 1982 work began on a major effort to develop new student systems using the ADABAS database management software and its fourth generation programming language NATURAL. The new systems are on-line oriented and have created an environment where more data is available to more users than ever before. This environment emphasized the need for a more formal data administration function which was established in 1986. The goals of this function are as follows:

1. Institutional data are to be:

    a. Accurate
    b. Complete
    c. Accessible
    d. Secure

2. Information systems are to be:

   a. Coordinated
   b. Consistent
   c. Efficient
   d. Protected
   e. Flexible
   f. Accommodating

DATA ADMINISTRATION ORGANIZATION AT PENN STATE

With the establishment of the above goals came one of the first problems encountered by most organizations contemplating data administration. Where in the organization's structure should data administration reside? At Penn State it was decided that data administration would not be empowered in a single person or organization; rather, all units interacting with the system would share the responsibilities of data administration. Identified below are the key participants and their responsibilities:

1. Executive Director of Computer and Information Systems

   The primary responsibility of the Executive Director is for initiatives for system planning, policy development and research activities that affect data administration. The initiatives are undertaken with the direct involvement of the Committee for Administrative Systems Planning in which key offices are represented.

2. Manager of Data Administration

   The Manager of Data Administration is responsible for facilitating and coordinating overall data system planning, policy development, research activities, communication, system efficiency, data security and data accessing. The installation, maintenance and efficiency of the database and data dictionary systems are also the responsibility of the Manager of Data Administration.

3. Data Stewards

   Each data element in the administrative systems is assigned a steward. The stewards are responsible for developing coding structures for data, ensuring data accuracy, determining updating frequency, establishing requirements for data protection and authorizing access to data within the stewards area.

4. Access and Security Representatives (ASRs)

   ASRs are established in the major offices of the university and are responsible for requesting access to data for their organization and for ensuring appropriate access, use and protection of the data within their purview.

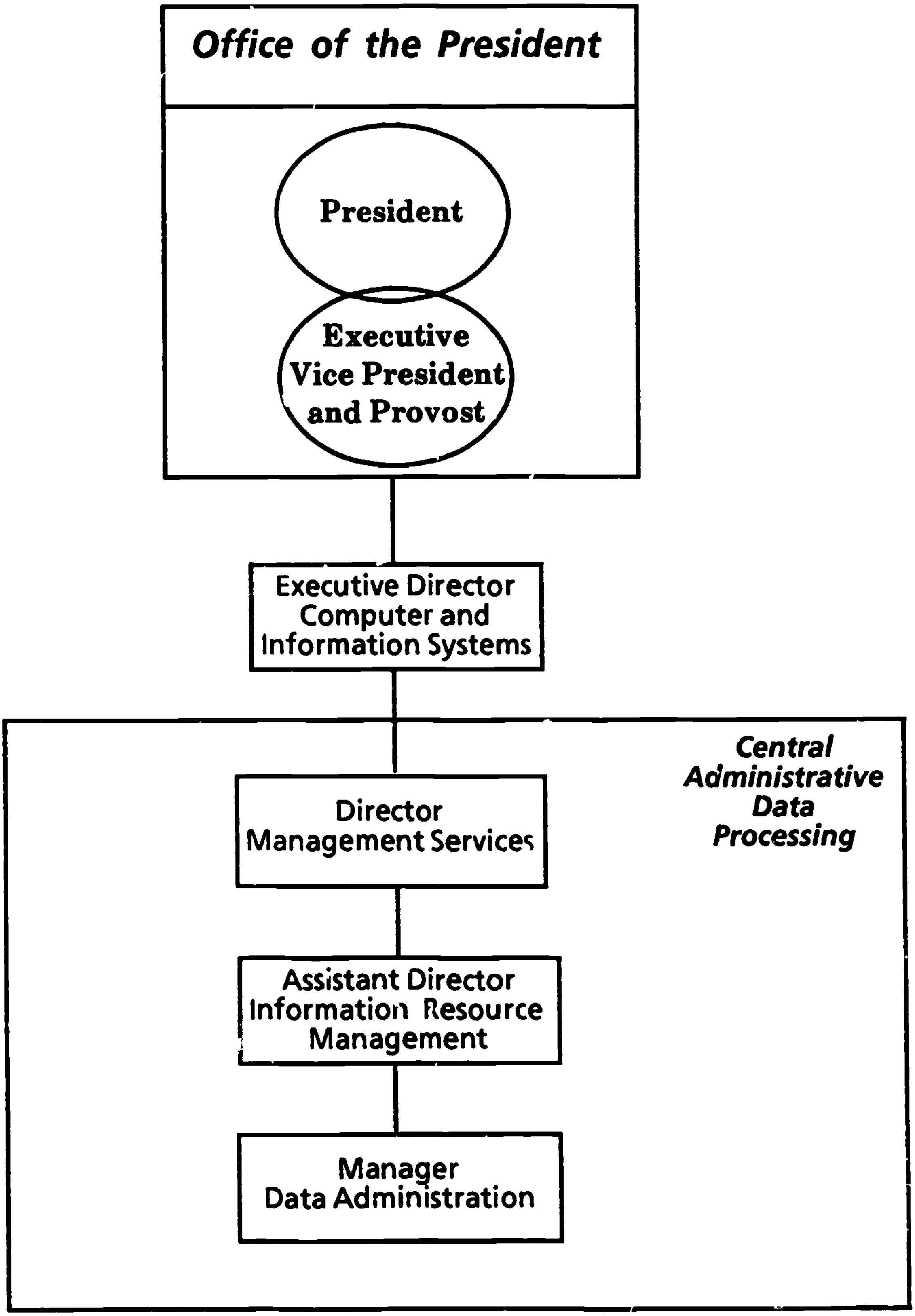
Office of the President
President
Executive Vice President and Provost
Executive Director Computer and Information Systems
Central Administrative Data Processing
Director Management Services
Assistant Director Information Resource Management
Manager Data Administration

Figure 1

Of the above participants, the Manger of Data Administration is the most active. This office handles the typical data administration functions of the University. The placement of this function is usually critical to the success of an organizations data administration efforts. Figure 1 shows Penn State's placement of this function within the central administrative data processing department which reports to the Executive Director of Computer and Information Systems and the Provost. This structure has advantages in permitting data administration to work directly with the operations, process control and security staffs to enforce standards and take immediate action in controlling data access. In addition, the database and data management staffs report directly to the Manager of Data Administration and provide technical expertise for software and systems solutions to many problems

A Potential disadvantage of placing the data administration function in the data processing center could arise when a problem occurs that affects organizations over which the Manager of Data Administration has no authority. Generally these problems take longer to resolve but have been successfully addressed through the coordination of data administration and the data stewards. In the event a problem cannot be resolved, the data administration reporting structure permits the escalation of the problem to the Executive Director of Computer and Information Systems and potentially to the Provost.

USER ACCESS TO DATA

The first challenge that faced data administration at Penn State was to provide a way of requesting access to computerized institutional data that would meet the needs of the users and all parties involved in the authorization process. From the users standpoint, a vehicle was needed that would allow them to identify the particular data they wanted to access. The data stewards wanted information describing why the data was needed and how it would be used. They also desired the capability of specifying any restrictions that were to be imposed on the use of the data. The security office required an identification of the individuals who would access the data and a signed statement that the users understood their responsibilities for using data as outlined in university policies and as agreed to by the stewards. Data administration needed a way of recording the request and subsequent approvals or disapprovals of everyone involved. In addition, it was highly desirable that the process be kept as simple as possible.

The initial solution to this problem was the design of a general form for requesting access to computerized institutional data. It was decided that a single one page form would reduce confusion on the part of the requestor and aid in the standardization of the request process. The front of the form, as illustrated in Figure 2, is completed by the access and security representative from the requesting office. This portion of the form is used to identify the data needed, the reasons for the need, and the individuals who will access the data. Each individual is uniquely identified by a "userid" assigned by the security office. The back of the form, as shown in figure 3, is used to record the signatures of those involved in the request, approval and implementation processes. In the event additional space is required, additional pages are attached to the form. When a request is completed, a copy of the form is returned to the requestor and the original form is filed in the data administration area.

PENNSTATE

Management Services

3 Shields Building
The Pennsylvania State University
University Park, PA 16802

Request to Data Administration for Access to Computerized Institutional Data

MGMT SVC USE ONLY	
Log Number	______
Date Rec'd	__-__-__
Date Stewd	__-__-__
Date Ret'd	__-__-__
Access Est	__-__-__

1. **PURPOSE of REQUEST:**
(Specify why data is needed)

2. **SCOPE of DATA REQUIRED:**
(Specify desired population, selection criteria, and specific data values – if appropriate)

3. **INSTITUTIONAL DATA REQUIRED:**
(List specific file names, or list of data elements. Attach additional pages – if necessary)

4. **TIME PERIOD:**

The data is requested for the period from ____________ to ____________ or

☐ Semester ________, ☐ Quarter ________, ☐ Current,

OTHER ______________________________

5. **INDIVIDUAL ACCESS INFORMATION:**
(Enter userIDs of individuals from your area who will access the data)

Figure 2

6. ACCESS and SECURITY REPRESENTATIVE SIGNATURE:

'firm the data I accept will be used in accordance with the agreement specified by the Steward(s) of this data and I have read and understand University Policies AD-20, "Data Security and Privacy" and AD-23 "Use of Computerized Institutional Data".

Name: ______________________ Administrative Area: ______________
(Please print)

Signature ______________________ Date: ______________

Forward the completed form to the Manager of Data Administration, 3 Shields Building, University Park.

---

7. DATA ADMINISTRATION ACTION:

Request ________ Approved ________ Disapproved ________

Comments: ____

Signature: ______________________ Date: ______________
(Manager of Data Administration)

---

8. DATA STEWARD(S) APPROVAL:

I agree to release the requested data which is under my stewardship, under the conditions and time periods noted on the reverse side of this form.

Steward's office ______________ Signature ______________ Date ________

Restrictions (Attach additional sheet, if necessary)

Steward's office ______________ Signature ______________ Date ________

Restrictions (Attach additional sheet, if necessary)

---

9. MANAGEMENT SERVICES APPROVAL:

Signature: ______________________ Date: ______________
Director, Management Services

---

10. INFORMATION CENTER ACTION:

The following data sets were created to satisfy this request.

______________________ ______________________

______________________ ______________________

Signature: ______________________ Date: ______________

---

11. INSTALLATION SECURITY OFFICE ACTION:

Appropriate access was established for this request.

Signature: ______________________ Date: ______________

10/26/89

Figure 3

-6-

The above process has worked well over the past three years with only minor changes to the request form as dictated by experience. The next step in the process will be to include the request form in an electronic approval system that will eliminate the paper form and speed up the approval process. This system will also provide requestors the capability of monitoring the progress of their requests.

ELEMENT CLASSIFICATION SYSTEM

The request form was not in use very long when another problem presented itself. Requests began to appear asking for access to entire data base files rather than individual fields. In these cases the stewards were provided with listings of their data elements from the requested files. For some stewards this meant reviewing listings of up to a thousand data elements. At times the steward would just finish one review when a request from another user would start the process all over again. Needless to say, the stewards soon asked for a better way to handle access requests.

What appeared to be needed was a system that would allow the stewards to grant access to classes of data elements rather than individual data elements. This meant the stewards required a methodology to group their data elements for access authorization purposes. The first proposal for providing this methodology used government classifications such as top secret, secret and confidential. This proposal was not well received for two reasons: The stewards felt that terms such as top secret and secret did not fit into the university environment, and no one could decide on a set of criteria for classifying data into these categories. A second proposal was then made that was more structured in its approach. It called for only two categories: classified and unclassified. A work sheet was also provided to aid in the classification process. The work sheet listed six factors to be considered for each data element. These factors were:

1. Competitive value
2. Fraud potential
3. Legal liability
4. News-worthiness
5. Financial exposure
6. Impact on management decisions

This proposal was also rejected. The stewards felt that two classifications levels were not enough and the factors on the work sheet were difficult to apply across the board. The third time is a charm and the third proposal was accepted by the stewards. It involved classification levels of 0 through 3 and two simple rules. Rule 1: Data elements classified at level 0 are available for anyone to access. Rule 2: Classification levels are inclusive of the levels represented by lower level numbers. For example, a user who is give access to level 2 data will also have access to level 1 and 0 data.

Other than level 0, no attempt was made to define the meaning of levels 1 through 3. The stewards were free to create their own criteria for assigning elements to each level. The classification levels are maintained in the data dictionary for each data element. Now, when a user requests access to a file, the stewards simply specify access to a classification level. As is sometimes the case, the solution of one problem often highlights another problem. The stewards were now able to authorize access in record time but the creation of tailored user views to match those authorizations was a painfully slow manual process. This was made worse by the fact that a given file usually contains elements for many stewards and therefore many access levels had to be considered in the creation of a user view for the file.

AUTOMATED USER VIEW SYSTEM

Eliminating the manual process for creating tailored user views was the next challenge to be addressed. The data dictionary system provided an on-line capability for creating user views from file descriptions. However, it was not able to use the steward's element classifications in the process. Half of the solution to this problem was in place with the documentation of data element classifications in the dictionary. What was needed was a system to link the element classifications with levels of user access authorizations for each steward and each file, and then to automatically create tailored user views based on these links. An existing code table file was used to contain the link information. A new code set was defined that contains an entry for each unique file, user and steward combination. The entry also contains the level of data access approved by the steward for the user. The final piece of the solution was the creation of an on-line program to read the code set and dictionary and create a user view that is tailored to the approved access for a particular user.

As with any system, exceptions do arise. Occasionally a user will request access to elements at a level higher than they have been authorized. When this occurs the stewards have four choices:

1. Authorize the user for the higher level.

2. Change the classification level of the elements in question.

3. Disapprove the request.

4. Grant access to the elements on an exception basis.

Choices 1 through 3 are handled by the automated user view system in normal fashion. Choice 4 requires some additional processing. In these cases, the code entry containing the user's access authorization is flagged to indicate an exception exists. The user view generation program then accesses another code set that identifies the data elements to be added as exceptions. The stewards have done a good job classifying their elements and the use of the exception process has been rare.

During the design of the automated user view system, provisions were made to select an alternate element classification level for sensitive data elements when used in conjunction with entity identifying elements. For example, a data element containing grade information may have a classification level of 1 if used alone or with other elements that do not identify a particular entity. This permits studies to be done on grades with no links to entities such as students or colleges. However, if the grade data element was requested along with entity identifying elements such as student id or college name, the access level of the grade element can be raised to 2 or 3. The stewards have the ability to designate entity identification elements and to specify alternate access levels for any data element. It is interesting to note that this feature has not been utilized. The stewards have opted to maintain a simpler system based on a single element classification.

DATA DICTIONARY USER ENHANCEMENTS

As institutional researchers and other users began accessing university data, they uncovered problems in the documentation of data elements in the dictionary. Typically, the element descriptions in the dictionary were created by individuals who worked closely with the data and had an in depth knowledge of it. As is often the case, these individuals assumed a similar understanding on the part of others and their documentation was difficult for the uninitiated user to understand. This problem was further compounded by the fact that the dictionary did not provide good facilities for the storage and retrieval of the kind of textual information required by the user.

The first step in the solution of this problem was for the users to get together and develop a list of the kinds of information they felt should be part of the data element documentation. The list they created is as follows:

1. USAGE INFORMATION - This category of information describes how an element is used and interpreted. Some examples are:

    a. Descriptions of algorithms used to calculate element values.
    b. Unexpected features of the format of an element.
    c. Cautions about the use of elements that have known limitations.
    d. Time dependencies and order of entry for array elements.
    e. Any special requirements for interpreting the values of an element.

2. VALUE INFORMATION - This information describes:

    a. Legitimate values for an element.
    b. Default values
    c. Indications of what values mean as well as what they do not mean.
    d. The effective dates for specific values.

3. UPDATE INFORMATION - The data to be collected in this category is to reflect:

a. How an element is updated.
b. When it is updated.
c. Who is responsible for the update.

4. RELATIONSHIP DATE - The information in this category describes relationships to other data elements and processes.

5. HISTORY INFORMATION - This documentation lists the date a change was made to an element and describes how the element was affected by the change.

A form was designed for the collection of the above information. A separate form for each data element was printed and distributed to the appropriate stewards for use in providing the requested data. A policy was also established requiring the completion of the form for new data elements and for changes to existing elements. This policy is enforced by the data administration staff which is the focal point for data element maintenance.

The second part of the solution was to design a data base to contain the new information and to develop an on-line system to access and maintain the data. The scope of the on-line system was expanded to include access to the regular data dictionary as well as a keyword data base. The keyword database is created by selecting words from data element names and descriptions and sorting these words to form a cross reference to the data elements. When used through the on-line system, this cross reference permits the user to select a keyword of interest, such as "degree", and view all data elements that contain this subject in their element name or description. A generic keyword can also be entered to allow access to all elements with keywords beginning with the selected characters. All on-line users have read access to this system and stewards have read and update access. Whenever an update is made by the stewards, the system enforces the creation of a history record to document the reason for the change and the date it was made. Future enhancements to the system will provide the stewards with an on-line capability to view the accesses they have approved through the previously described element classification system. They will be able to view approvals by user or by file.

The solutions presented in this paper to the problems encountered at Penn State have taken advantage of the vendor software in use for database and data administration. While the technical aspects of these solutions may not be totally applicable to similar problems at other institutions, the ideas and techniques presented should be adaptable to most environments.

PREPARING FOR CASE: IMPLEMENTATION OF A STRUCTURED PROJECT LIFE CYCLE

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AKRON

OHIO

Most academic institutions' long-range plans call for the implementation of automated aids to system development, including a full complement of CASE tools. In order to fully utilize the benefits of these tools, a computing organization must have a well-defined structured development methodology and must follow it religiously.

The University of Akron, like many other institutions, has been using a well-ingrained classical methodology for many years. This presentation discusses the development and implementation of the University's Structured Project Life Cycle. It covers the investigation of the various structured techniques to be adopted for analysis, design, development, maintenance, and project management; the development of procedures for building the data models, process diagrams, and structure charts, and the training methods used to ensure implementation of the new methodology. Future plans for modification of the project life cycle to accommodate future tools are discussed and several recommendations are made.

INTRODUCTION

> "By the 1990s, CASE tools and software development workstations will be as common to software development as programming languages and compilers have been for the last three decades. Computer-aided software engineering will take a central position among software technologies." - CARMA MCCLURE

As recently as a year ago, I was one of those who felt they had heard all of this before and that the whole idea of CASE and structured systems development was going to be just another "flash-in-the-pan". A couple of very important things have happened to change my mind.

The first was the realization that our traditional techniques were no longer having the desired results. Although systems were being developed at a fairly decent rate, the designs were not standard, even among the project leaders that had been in the department for many years. Additionally, files and databases were being designed and built that were totally unacceptable. Access to these files, even when they were very acceptable to the user, were difficult to maintain and ignored institutional data needs that should have been considered.

The second thing that happened was the "legitimization" of CASE and structured techniques. I'm referring to the announcement of AD/CYCLE by IBM and the adding of three of the top CASE product companies (Bachman, Index Technology, and KnowledgeWare) to the IBM "partnerships".

Although I'm referring to this as a "case study", it is actually an unfinished case study. We have gone only part of the way toward implementing the structured techniques and the CASE tool . In my contacts with other universities and corporations, I have found that most of us are at approximately the same point. We have either made the commitment to utilize structured techniques or have decided to stick with the traditional techniques until the dust settles.

This is the story of how we made our decisions and how we plan to go about implementing the tools.

ENVIRONMENT

The main campus of the University of Akron has a student enrollment of just under 29,000, making it the third largest of Ohio's state universities. The academic and administrative computing on campus share the facilities and resources of the University's Computing Center.

The University of Akron's administrative systems utilize an IBM 3090/200 running MVS/XA. Most of our programs were written in-house using COBOL and CICS. We use Easytrieve Plus for batch report generation for both users and programming staff, IMAGINE for batch query for our users, SAS-Graph for our batch graphic needs, and over the last two months, have developed our first set of online screens using IBM's Cross System Product (CSP).

The Model 204 relational database from Computer Corporation of America (CCA) was installed late in 1986 and several systems have been constructed utilizing Model 204's utilities, including a complete rewrite of the Accounting System. During the last few months, a commitment has been made to install IBM's DB2 as a second database.

Over the last twenty years, administrative applications have been implemented in all of the major areas: student systems, financial systems, human resource systems, alumni/development systems, and physical facility systems. There are currently 64 different systems that include a total of 3,200 programs. The number of programs in a system range from a bookstore report system consisting of one program to the personnel system with 374 programs. We spend about sixty percent of our productive time maintaining and modifying these systems.

REQUIREMENTS FOR CHANGE

In the spring of 1986, the University completed a five-year plan for computing. The seven committees that developed the campus plan over a period of about six months covered the major automation topics of: large mainframes, micros and minis, graphics, office automation, computer based education, administrative systems and programming, and networking and telecommunications.

A great deal of the good planning of these committees has already resulted in the implementation of some fine automated systems. What was missing was any commitment toward the development of new systems development techniques or the need for them. The closest anyone got toward suggesting such a step was the recommendation that

> "--a primary effort be exerted by the Computer Center's Administrative Systems and Programming department on providing the support necessary to enable the University's administrators to better utilize the available data and that these needs be given major emphasis."

The actual requirement for making some changes came from several other sources.

First, we had been trying to update our development life cycle for several years. The current development techniques have been in use since 1974, are totally traditional, and are based on manual operations to be automated and the subsequent delivery of specific documentation.

Second, there have been many requests for Executive Information Systems (EIS) and Decision Support Systems (DSS) from the highest levels of the University. These requests may not be a direct request for EIS or DSS, but will show up as a request for a quickly-needed inquiry covering several years of comparative data, some type of forecast, or a graphics output. Although we have set up a "Quick Response" group within the department, this is not the long-term answer.

Third, with the commitment to DB2, it has been emphasized that a good solid set of development techniques based on structured methods was a necessity if we were to be successful.

Fourth, it became apparent during the analysis and design of the last couple of database systems that our systems developers could not rely on traditional design methods and develop an acceptable system.

LIFE CYCLE METHODOLOGIES

Over the years, the primary objectives of the project life cycle have remain unchanged. According to Ed Yourdon, they are:

1. To define the activities to be carried out in a systems development project.

2. To introduce consistency among many systems development projects in the same organization.

3. To provide checkpoints for management control for go/no-go decisions.

Whether you were using a version of the classical project life cycle or of the waterfall model of systems development or a combination of both, the objectives stated above still remained valid. The problem stems from the fact that all of these methodologies required a sequential progression and bottom-up implementation.

According to Ed Yourdon again, the difficulties with requiring a sequential progression are as follows:

1. It doesn't allow for real-world phenomena such as politics or project leaders who make mistakes.

2. It allows for user indecision; indeed it is very common for users to change their minds several times during the development of a system.

3. It relies on outdated techniques; in fact, it totally ignores structured techniques.

There are several other difficulties listed by Ed Yourdon when bottom-up implementation is demanded:

1. Nothing is done until it's all done; there is nothing to show the user during development other than an enormous pile of listings.

2. Trivial bugs are found at the beginning of testing, serious bugs are found at the end.

3. Debugging is extremely difficult during final stages of system testing.

4. Requirements for computer test time rise exponentially during final stages of testing.

STRUCTURED METHODOLOGIES

For several years now, there has been a growing recognition that structured techniques were available to help us solve our problems. The big question was: how do we go about implementing them? Some organizations went to a semistructured project life cycle. Although it utilized top-down implementation and the coding and testing of high-level modules first, it was still a largely manual effort the depended on narrative specifications.

Another version of the top-down approach that has become popular lately is the prototyping life cycle. Although I do consider prototyping to be a useful part of good development life cycle, I don't see this type of life cycle as a complete answer to the development problem.

The structured project life cycle as proposed by Ed Yourdon contains nine activities: survey, analysis, design implementation, acceptance test generation, quality assurance, procedure description, database conversion, and installation. There is a lot to say for the planning, analysis, and design procedures in this life cycle, but the process is hard to learn and the various documents to be delivered by each of the activities are difficult to produce without heavy manual effort.

Unlike the traditional approach, any or all of the activities can be taking place simultaneously. In fact, the "radical" approach calls for all activities to take place in parallel.

STRUCTURED TOOLS - CASE

There are now more than a hundred companies selling "CASE" tools. Even 4GLs are now being called CASE tools if they generate some type of code.

My definition of a CASE tool is a tool that automates the structured techniques. By this I mean a series of programs that automates the development of the various components of each of the structured activities, maintains the information in a master dictionary, justifies the various relationships between the components, and generates the code. Any changes to the system should require changes to the components, not to the code.

Carma McClure lists 40 software packages as representative CASE full life cycle tools. I'm not sure I agree with her. Most of the tools listed depend on another tool for completion of the full life cycle. For example, Index Technology's Excelerator has excellent planning, analysis, and design tools but, at the current time, depends on another product such as Telon or Micro Focus to generate code.

We have only found two tools that we feel are full life cycle tools - KnowledgeWare's Information Engineering Workbench (IEW) and Texas Instrument's Information Engineering Facility (IEF). More about them later.

SYSTEMS DEVELOPMENT AT THE UNIVERSITY OF AKRON

The project development life cycle in use at the University of Akron since 1975 contains four activities: systems survey, systems design, systems definition, and programming. The deliverables are in narrative form except for a couple of manually produced flow charts. In fact, nowhere in the Computer Center's standards manual is this called a "life cycle". It is merely a list of items to be delivered after the system is developed.

As I mentioned earlier, we have been trying to develop a new development methodology for many years. Our latest attempt (about a year ago) had five activities: project initiation, requirements definition, system design, programming and testing, and implementation. Although data flow diagrams, prototyping, and structured walkthroughs were listed as parts of the activities, the basic idea was still a sequential, bottom-up, traditional life cycle. Because of disagreement among management as to the actual structure needed, it was never implemented.

The University of Akron made its first jump into the database arena in late 1986 with the purchase of Model 204. Prior to that time, lack of hardware resources made that move impossible. Several medium sized systems were developed and the rewrite of the Accounting System was our first major effort in Model 204.

Although the development with Model 204 was successful, the interfacing with other systems was difficult. If we could have stopped all development and taken the time to rewrite all of our systems in Model 204, it would have been very acceptable. However, this was never considered an alternative.

As we added new application tools and longingly looked at others, it became evident that Model 204 was not in the "mainstream" and was most likely not going to be. Most tools, including CASE tools, had not been developed with Model 204 in mind.

The commitment to implement IBM's DB2 was made about six months ago.

CASE PROGRESS

The whole area of CASE tools and where they fit within the applications development picture has become much clearer within the last couple of years and the tools available have had a tremendous increase in capabilities. I have attended some good sessions at CAUSE over the last couple of years presented by happy users of Excelerator and IEF.

We looked closely at Excelerator from Index Technology. The flexibility and usability of the system are apparent and they have a great track record. I'm sure there are several Excelerator user's at this presentation today. The only shortcoming we saw was the need for a separate product for code generation.

We also looked closely at IEW from KnowledgeWare. Like Index Technology, KnowledgeWare became an IBM partner a couple of months ago. Unlike Excelerator, IEW now has its own code generator.

The four activities in IEW (planning, analysis, design, and construction) and the components of each are well integrated. Since James Martin is the head of this company, it necessarily follows his Information Engineering methodology very closely. Because of the automated integration of the various components, the flow of the resultant life cycle is also much easier to understand than the nine step approach proposed by Yourdon.

Carma McClure lists the following benefits to be gained from the implementation of a CASE supported methodology:

1. Makes structured techniques practical
2. Enforces software/information engineering
3. Improves software quality through automated checking
4. Makes prototyping practical
5. Simplifies program maintenance
6. Speeds up the development process
7. Frees the developer to focus on the creative part of software development
8. Encourages evolutional and incremental development
9. Enables reuse of software components

She lists the following causes of CASE failures:

1. Confusion about what individual CASE products actually do
2. Using CASE tools to address problems for which they were not intended
3. Placing too much emphasis on CASE tools as a whole solution
4. Ignoring the importance of good management
5. No development methodology or standards in place
6. Poorly integrated CASE tools
7. Poor tool documentation and training
8. Not enough functionality present in CASE tools
9. Unclear about which software problem needs to be solved
10. No methods for measuring impact of CASE on software development and maintenance
11. No software development methodology training
12. Indecisive - unwilling to make a decision about how to use CASE technology
13. Unwilling to change current way of developing and maintaining software
14. View CASE as a high-risk technology
15. No plan detailing how to implement CASE technology

What, then, is the most frequently used development methodology in the United States? Nearly 30% of the structured technique users use Yourdon's structured design. Gane-Sarson and DeMarco users together make up about 25% of the total with Orr and Jackson users making up another 10%.

THE STRUCTURED PROJECT LIFE CYCLE

The development life cycle we will be implementing has seven steps: project initiation, requirements definition, system design, programming, system testing, implementation and production, and post implementation review. This is fairly close to the Yourdon structure that I mentioned earlier. In addition, data flow diagrams, entity-relationship diagrams, and structure charts, the basic-three of structured techniques will be interjected as part of the life cycle.

The structured project life cycle we envision consists of seven steps: project initiation, requirements definition (to include the activities of planning and analysis), design, construction, system testing, implementation, and post implementation review. We plan on incorporating the IEW activities and components into this life cycle.

IMPLEMENTATION

In addition to the standards currently being developed for the structured project life cycle, there are other standards we are working on that will be implemented during the next six to nine months. These include CSP, DB2, and the CASE tool usage.

One of the most important components of the implementation is the training of the project leaders and programmer/analysts. We started the training in May using two hour sessions every two weeks and planned to complete the initial training in nine sessions. So far, we have had about eight sessions and have made it through the requirements definition activity. The introduction to systems development alone took three sessions.

We will restart the training sessions again after the holidays. We plan to cover the structured techniques first though before continuing with the life cycle.

Another big question to be answered was whether or not to implement the structured techniques and the structured development life cycle fully before implementing a CASE tool (install them sequentially) or to go with the structured techniques and the CASE tool at approximately the same time. We decided on the latter approach because we feel that the CASE tools structure should help provide some badly needed consistency in our analysis and design.

RESULTS

We have already taken several steps on our long range SAA plan. We installed a local area network connecting all of the administrative project leaders and managers. We implemented CSP, completed the pilot project, and will be training additional users within the next few weeks. In addition, in preparation for DB2, we installed several upgrades to our operating software.

The next phase will begin about the first of January, 1990, and should be complete about September. This includes the implementation of DB2, IEW, and several other application tools, as well as training our personnel.

Future phases include expansion of the encyclopedia to the mainframe and additional IEW workstations in 1991, and the implementation of TIF and AS in 1992.

RECOMMENDATIONS

Structured techniques and CASE is the future. The two are singular: structured techniques will never succeed without CASE and CASE is useless unless structured techniques are implemented.

Nothing good is cheap. Providing a full tool capability for all of your developers will be expensive from both a software and hardware standpoint, but the techniques and tools can both be phased in rather easily.

Prepare to spend large amounts of time and money on training. There is some excellent training being provided by consulting organizations at the present time.

Sell, sell, and sell. Everyone I talked to, even the most excited users, stressed the need to continue selling management on the fact that CASE tools and structured techniques are the systems tools of the 90s.

REFERENCES

Brathwaite, Kenneth S. Systems Design in a Database Environment. New York: McGraw-Hill, 1989.

McClure, Carma. CASE is Software Automation. Englewood Cliffs, NJ: Prentice Hall, 1989.

Yourdon, Edward. Managing the Structured Techniques. New York: Yourdon Press, 1979.

Yourdon, Edward. Modern Structured Analysis. Englewood Cliffs, NJ: Prentice Hall, 1989.

STRATEGIES FOR DELIVERING ON-LINE APPLICATION SYSTEMS TO A LARGE CAMPUS

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ABSTRACT

This paper presents a look at the approaches, problems and successes of delivering Administrative Management Systems which affect both Central Processing Areas and Departmental processing of information. These systems affect policy, procedures and training required to operate the administrative functions involved.

As system implementors, our management of the application development projects must be sensitive to the user's perceptions which inevitably surround all development projects. Our experiences in on-line systems at the University of Florida have guided us to develop strategies which have been successfully used on several development projects.

Introduction

Building information systems solutions that work effectively for a business is a tough job for all those involved. Top management must find ways to ensure success and economy. Users must learn to use equipment and processes which often seem foreign to them. Middle managers must rethink the procedures and structure of their office and staff. They must learn to manage, train, and motivate a group of people experiencing drastic changes in their daily routines. The Information Systems Department must become knowledgeable in many areas of the business. They must also maintain a high level of skill in rapidly changing areas of technology. The above forces have been common knowledge to most Data Processing Managers for years.

Within the workings and agendas of a large public university such as the University of Florida (UF), these forces are diversified and multiplied. Projects undertaken in this environment must be closely managed and guided from inception through completion if you intend to implement successful Information Systems (I.S.) projects. Furthermore, you must continue to manage the project throughout the system's operational life time. Lack of coordination between top management, operational managers, system users and information systems personnel will provide for a difficult (perhaps impossible path) for developing quality information systems that work and continue to work as the demands on the university change.

To provide insight into the magnitude and scope of these issues at the University of Florida, the following profile should be considered. UF is a top 20 school in size of student population. As a member of the American Association of Universities (AAU), UF is among the nation's leading research universities. As a Land Grant educational facility, UF is responsible for Florida's Institute of Food and Agricultural Sciences (IFAS) and the related extension centers throughout the entire state of Florida. Also part of the university is a large Medical Center with related professional schools. It performs extensive research and operates many patient clinics.

UF has 20 colleges and schools. All programs are coordinated and offered on a single campus of more than 800 buildings spanning 2000 acres. Program offerings include:

- 137 Academic Departments
- 114 Majors in 52 undergraduate degrees
- 123 Masters degree programs
- 76 Doctoral programs
- 100 Interdisciplinary Institutes and Centers

  Post Baccalaureate Studies are also offered in law, dentistry, medicine and veterinary medicine.

All these statistics indicate UF is a large campus with a wide diversity in procedures, needs and management styles. A staff of over 13,000 faculty, administrators and university support personnel and 35,000 students must be coordinated through the never ending list of administrative procedures, regulations and mandated requirements placed upon a university with a budget of over 900 million dollars.

Administrative System Directions

The University of Florida has installed many successful applications during the last 5 to 6 years. Some of these are listed in Table 1.

Table 1: Recent Systems Developed or Installed at UF

Project	Installed	Description
P/P/B	7/84	Comprehensive On-line Integrated Payroll/ Personnel/Budget
SAMAS	7/86	Statewide Accounting System with state provided software.
Central Leave	6/87	On-line Personnel Leave Management
Performance Appraisal	9/85	Support Staff Performance
ACCESS	6/89	Central Employment
FTE/Effort	5/89	Faculty Staff FTE/Effort Tracking
Student Cashiering	8/87	Cooperative On-line Cashiering System
Automated Cashier Balancing	8/88	End of day Cashier Balancing System
Salary Commitment Tracking	1/89	On-line Salary Projecting
Purchasing	5/88	On-line Purchase Request Management
Purchasing Departmental	2/90	On-line Purchasing Departmental Entry
Employee History	11/89	Personnel Historical Retrieval
Traffic & Parking	3/90	Management of Parking Decals and Traffic Tickets

The systems have been installed with a relatively small staff by industry standards, and we have had a high level of acceptance by our campus community. More importantly, our Information Systems Staff has gained credibility and is in demand for a number of additional development projects.

Several common directions persist throughout all of these projects. These concepts are described below:

Systems are being provided ON-LINE via an IBM CICS Administrative Application Region to staff stationed primarily on our campus but with access from facilities in most of Florida's 67 counties. These systems provide management areas a mechanism for collecting accurate information and for reducing paper flow and usage.

Policy and audit enforcement can be built into the system. Massive time consuming reviews can be accomplished much easier via adhoc or routine reports.

Centralized control of functions and information formerly recorded and kept in manual files are now accessible. Administration is able to track and evaluate information housed in the databases. For example, prior to the Central Leave System, employee leave records were kept in manual files at the employee's department. Once a year, or based on sampling visits, audits were done to assist in policy enforcement. Leave liability was known only for the annual financial status and only then through a lengthy data collection activity. We are now able to record leave faster and more accurately than before. The department clerks need to work only with leave usage. The system determines leave earned automatically and accurately.

Technology within the systems is continually being upgraded as new tools become available for our use. Our approach to technology encourages our technical staff and management to use technology to assist the smooth working of UF. The choice of the most current technology for a project is not always necessary. As managers, you should evaluate all the issues and factors regarding an application and select the appropriate technology. There are places for Batch, On-line, Cooperative Processing Techniques and for VSAM, DB2, Sequential, and tape in all of our day to day operations. Generally, however, you want to choose the most current tools.

Staff training for the efficient use and management of the systems has been encouraged at all levels of UF's organization. Training and skills are to be enhanced at our user departments, management areas and within information systems. This is a continuing and ongoing activity which should begin early in every project and never stop even after the system is fully operational. Ongoing training is an important success factor for systems on our campus. Turnover and changes in responsibilities is a constant problem to overcome. We have over 1000 terminals accessing our business applications and the staff using the network must be comfortable using the applications.

UF Administration has identified several areas of concerns which we closely monitor during each project. These concerns are managed jointly during and after the project by the "owner" and Information Systems Department. Although varied in nature, each of the items below plays a key role in the production of a successful project.

1. Technology and Methodology
2. Security Management
3. Communication (of the human kind)
4. Departmental Training
5. Staffing
6. Management of Expectations

The strategies implemented for our projects are sensitive to the six items above. Attention is provided to all of these throughout a UF project.

How Projects Begin

The "TONE" and "STYLE" of interactions between participants of a project is often influenced by the initial formation or conception of a project. The term "How Projects Begin" refers to the origination of the concept or need for a new or enhanced information system. An awareness of the project origin will allow the I.S. department to present the solutions to users involved in more effective formats. If the I.S. department can keep the best possible working relationships with the system owners and related departments, the projects success will be more easily secured.

UF has identified three basic points of origin. Upper management promotes the project to be implemented. This scenario ensures the high level VP support needed for a project. The operational owners and end users may need to be convinced in some cases that the system will be worth all of the implementation effort. They will be required to participate and are an important success factor during the system startup. The line management will often conceive of ideas which deserve attention by I.S. and upper management. They must sell there idea to the VP in charge of their area so it can be studied for development. This situation provides a devoted and ready to work owner to implement and operate the system. The third type of project orgin often encountered is the external mandate. We have all grown to expect and react as necessary to these often short deadlined requests.

Implementation of information systems follow a three level thinking process for the project manager. First, "AWARENESS" of the problems that might occur. The second stage is understanding why these problems happen, "DIAGNOSIS". The third stage involves the "TREATMENT" of the specific problems you have diagnosed.[1] The issue of who or where a project is started can affect the factors commonly associated with implementation success. Refer to Table 2 to review the factors.

1Dickson and Wetherbe, <u>The Management of Information Systems</u>, McGraw-Hill. 1985. pp380-409

Table 2: Factors Associated With Implementation Problems

	Factor	Description
1.	Ease of Use	The intended users perception of the degree of difficulty to use the system must be weighed against the perceived benefits to the user.
2.	Previous Systems Experience	A previous bad or good experience can carry over to a new system activity.
3.	Data Problems	If the data is not or felt not to be accurate or complete, the users will lose confidence and tend not to use the system.
4.	Perceived Need	The users must perceive a need for the system for it to be used successfully.
5.	Control over Change	People do not resist change, rather they resist not having control over it.
6.	Mutual Understanding	Technical Designers and Managers must communicate a workable solution. Often there is failure to communicate and understand each other.
7.	Expectancies	The way users expect a system to contribute to their performance and their belief that performance is related to rewards they receive are important to how these users employ a system.
8.	Power and Social Change	The roles of power and political issues involved include: - rivalries - territorial threats - fear of obsolescence - resistance to outsiders - cultural factors - worries of job security - information possessiveness - changes in job pattern
9.	MIS Staff Turnover	Losing staff members during the project can cause a great deal of information loss to the technical staff.

Analysis Techniques

Developing an information system requires a great deal of analytical and technical expertise. However, the expertise must be governed by a method which provides tools to clearly communicate the analysis results to the programmers, owner and upper management when necessary. Characteristics required of the method used include:

1. Graphical	A picture paints a thousand words.
2. Stepwise Refinement	Various levels of detail are required.
3. Support English	Simple English explanatory text regarding application semantic content is easily attached.
4. Automated	It must have a computer based interface which ideally includes color graphic, intelligent diagramming and data dictionary abilities as a minimum.

These tools resemble the approach used by an architect designing a building. The architect must concisely and precisely define the specification of the building for a variety of technical experts (contractors) and the client. The drawings will be at various levels of detail with each level providing an accurate analysis of how and what the end product will be like when completed.

Analysis techniques for an automated system should try to provide three goals. First, the analyst should decompose and clearly understand the business functions to be automated. Define what the system must do or accomplish for the enterprise. Don't define how it will be done procedurally until later steps. Second, use the tools to decompose the information required to support the business functions. Once you have identified the information define the relationships between the information elements to provide a relational information structure of at least 1NF and preferably 3NF. The third step is to combine the function and information into a sound procedural flow of data.

At UF we have chosen to use a CASE tool and other support packages to provide intelligent graphic diagrams with attached data dictionary support. The tools provide the analyst with hierarchical function decomposition diagrams, entity relationship data modeling, and Gane-Sarson Style DFD diagramming. The supporting tools provide a means to produce a prototype of the on-line system for early review of system feasibility. A walk-thru should be conducted that challenges the designers decisions. The analyst should be called upon to defend the design choices he has made. A good design will be made better and a good design will withstand the process. When a poor solution is encountered, the walk-thru team must provide the impetus and direction to correct problems. Under no circumstances should a poor solution be accepted into a new on-line system. The system will only get worse if you allow the process to produce components with questionable quality.

In summary, analysis techniques are really quite simple. Understand the function, information and flow of data through the system. Build a prototype which allows your management, owner, and even departmental users to react and provide suggestions and/or confirmation to your vision of their system. It may be useful to think of this as the architect's sketches depicting the floor plan and external appearance of a building. His client will be able to look at his design concept, understand it, and then decide to accept, reject or suggest modifications to make it acceptable. A well conceived prototype provides a system analyst with a similar capability for an information system project. Lastly, the project manager must be committed to a quality solution and demand that his staff provide accurate and complete technical implementations of the prototype. You must demand quality in your system solutions.

Communication, Training and Expectations

Even with the best technicians available you are ensured a failed development project if you do not communicate and train the required audience of your application system. With training the users and management will be more comfortable and know what to expect. To be successful, you will need to provide the system you have conditioned the users to expect. Therefore, it seems to be extremely prudent to manage the communication and training processes carefully.

The communication and training process at the University of Florida is a three dimensional process.

- I.S. ensures that the owner understands how the application works. The owner/user assists actively in system testing. Classroom sessions are held to train the staff of the owner area.

- Owner manager ensures that his staff understands the new system. Procedures must be documented to accompany the new system at startup. I.S. personnel will assist the owner as needed.

- End users at the department are trained by the owner. A set of pilot departments should be considered for initial startup.

Communication and training should start early in the project's life. You should be persistent and deliberate, and be sure to avoid rushing through a training program. Finally, don't stop training after the system is operational. UF has systems with over 1000 departmental users. Turnover, promotions and changes in our staff require that we maintain an ongoing training program. Encourage departments to participate in the training programs and announce to users how they may attend a training session. Provide an easy to read and understand users' guide which is kept updated as system changes occur.

Summary

Reviewing the strategies discussed in this document will reveal three themes. Awareness of the environment and feelings that are held by the key participants of the project will allow the I.S. department to approach the problems without alienating required participants. A sound analysis methodology should be followed. The keys to the method are graphics, English semantic definition, and a prototype of the proposed system. Lastly, you must communicate and train all levels of the University community on the use of the application. Top management, the owner department, academic management and clerical staff must all understand their role with the system and be convinced to expect life to be better if the system is correctly utilized. Ignoring either the political, technical or communication and training aspects of the system development project will make it more difficult to achieve a successful system. Attention given to communication, training and the project's nature of origin will make a good technical solution successful.

References:

Blanchard, Kenneth The One Minute Manager. New York: Berkely, 1983

Brooks, Frederick P. The Mythical Man Month. Philippines: Addison-Wesley, 1985

Cash, James I., Jr. Corporate Information Systems Management Text and Cases. Homewood, Illinois: Irwin, 1988

Dickson, Gary W. The Management Of Information Systems. New York: McGraw-Hill, 1985

Shneiderman, Ben Software Psychology, Human Factors In Computer and Information Systems. Cambridge, Ma.: Withrop Publishers, 1980

ADMINISTRATIVE AND MANAGEMENT COMPUTING

- THE NEXT STEPS -

by

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Abstract

During the present period of decentralization of administrative computing in German universities which is marked by separate departmental computers and data-processing systems for each administrative department, some universities have started planning for the phase of "re-integration". Tasks to be fulfilled by more than one administrative department, cross-departmental data access necessities, office automation and communication, and management computing are the main impetus that force the universities to put the so-called re-integration on their agenda. The paper describes the state of the art of administrative and management computing in German universities, the planning pocess for re-integration, and the expected future development regarding the opportunities and limitations of re-integration.3

CONTENTS

1. Introduction

This paper deals with the state of the art and future perspectives in administrative and management computing in German higher education institutions. To fully understand the organizational and implementation problems dealt with here, it should be explained that most of the 244 higher education institutions in the Federal Republic of Germany are state funded. Although each institution is provided with a certain autonomy it belongs to one of the eleven states of the Federal Republic, it is governed and administrated according to the respective state laws and regulations, and the role, power and functioning of the state ministry of higher education may be compared with a combination of governing and coordinating boards of higher education systems in the United States.

The paper will address three main topics. A first section is dedicated to the distinction of three consecutive stages of administrative and management computing at German higher education institutions, a second part will focus on goals and concepts of a new era of administrative and management computing, and the final section describes planning and implementation problems, including suggestions how to resolve them. The paper attempts to address the problems in a generalizing way such as to provide valuable information beyond the borders of German higher education systems.

2. The Main Stages of Administrative and Management Computing

2.1 The "Big System" Era

It is interesting to remember that administrative computing in German universities started with an integrated management computing approach. The idea in the early seventies was rather to build the integrated Managment Information System (MIS) to improve planning of higher education than to support the institutional administration. Although the real outcome of the software production efforts was not the one big integrated Managment Information System for state higher education policy but merely institutional administrative support systems with almost no integration between adminstrative systems exept that they were run on the same mainframe, I would like to keep the term "big system era". This term might be justified by the fact, that these "big" administrative systems

- were run on mainframes ("big" computers)
- claimed to support the main (big) administrative domains
- emphasized (nothing but) the (data) administration of the huge amounts of data that happened to occur in the higher education administration.

These administrative domains and the supporting data administration systems of this first phase were: The student record systems including examination administration, the personnel and position record system, the equipment and other investment administration system, the buildings and space administration system and the stock administration system. The accounting system remained in that first phase of administrative computing in a "semi-automated" stage, i.e. implemented on magnetic card computers.

In this whole period from the late sixties to the early eighties higher education administrations witnessed certain developments in administrative computing with regards to several dimensions: the first systems started to be implemented and run on the (multi-purpose) academic computing mainframes and the later systems ended up on central administrative mainframes intended for all administrative computing systems to be implemented and run in one institution. The first systems of this phase of course were batch systems, and at the end of this period only dialog systems existed for administrative support. And if we regard the three groups of university staff involved in administrative computing, a shift of responsibility and closeness to computing facilities occurred within that period: At the beginning of administrative computing on the academic mainframes, the central academic computing staff was held fully responsible for everything, the hardware, the processing of the software systems and even the data stored on the mainframe devices by the batch programmes. The administrative computing staff, continiously emerging out of the planning and institutional research offices, during this period had to care increasingly about the hardware and software facilities, but diminishingly about the data. Whereas the users started in the case of batch systems with being totally seperated from the computing facilities and ended up with keyboards and screens on their desks linked to the central administrative computer and being fully responsible for their data and data administration.

The software was written in COBOL. ISAM or in some cases hierarchical data base systems used to be the data management systems. Regarding the whole Federal Republic a wide range of mainframes and operating systems were in use in the institutions. Although the systems were implemented on the same one mainframe (academic mainframe in the earlier part of this phase and administrative mainframe later) almost no interfaces between the systems, in the sense of whatever integration efforts, used to be implemented.

One could consider this type of computer use as a really partial support of the clerk's work mainly and merely focusing on supporting the administration of the huge amounts of data in the university's administration. A certain amount of management information or rather statistical information was extracted from the files, but rather on the basis of preformatted fixed reports, by intermediates such as institutional researchers, and rather for the middle management levels or the reporting duties to be fulfilled by state mandate than for the chief executives.

2.2 The Decentralization Era

This era starting about the middle of the eighties and still ongoing at most of the institutions is the era of the departmental computers, i.e. almost each of the university's administrative systems or a set of very closely related systems is implemented on a seperat computer. As a consequence each administrative department has its own computer or computers. Whereas this era started with a certain variety of operating systems of the so-called mini-computers in use at the institutions, we now witness a situation in which new purchases of departmental computers have almost exclusively the operating system MS-DOS for the single user PC's and the multi-user PC-networks (based on Novell), and Unix for the multi-user computers.

Computers and application systems for administrative support are spreading in both directions, in breadth and in depth. On the one hand new areas of the central administration are about to involve computer systems and computer support. The "big system approach" for only large data set administration is no longer valuable.

Many small systems on the margin of the big systems with even less or few data to be handled were developed and implemented, such as travel-expense-refunding, social administration, key-administration, room-cleaning service administration, budget planning, fund allocation models, purchase order system, billing support system, electricity and power supply costing system, administration of research projects, planning of the use of teaching room facilities. On the other hand it was a new experience for the central organizers and administrative computing personnel to realize that there was an administration on decentralized levels such as the academic departments, academic institutes, projects and other organizational subunits on the academic side, sometimes doubling the central administrative efforts on a disaggregated level, sometimes substituting central administration. These decentrally located administrations demanded their computer support as did the central administrations previously.

It is also a phase of the considerable spread of word processing, now almost exclusively on PCs with one of the three most common word processing software (Wordperfect, Word, or Wordstar). Such organizational units with their word processing machines installed earlier are now in a process of implementing the second generation of automated word processing solely on PCs.

It is also the phase of a tremendous increase in a specific "fast" (compared with the traditional "snail mail") external communication means: telefax.

As to the degree to which the clerk's work is supported by computers and computer systems, one could speak of a more comprehensive support compared with the previous phase of administrative computer support. The work on keyboard and screen is less interrupted by paperwork, as more data are available electronically and more process elements are supported by the software of the system applied.

This more comprehensive support approach is due to and coupled at the same time with a high quality and highly user-friendly and supportive user-interface on the screens, comprising the following main characteristics:

- selection in menues by positioning of the cursor instead of data input
- use of function keys for every other control function
- totally self-explaining screens/formats
- immediate check of field input
- widely use of windows for secondary file access
- browsing in secondary files based on random access according to numerical identification or in alphabetic order
- reports optionally on screen or on paper.

This user-interface is however still "specific", i.e. a part of the respective administrative system, in contrast to standard user interfaces such as MS-Windows or GEM.

The improved retrieval functions and userfriendliness are due to the fact that development tools, programming language and software environment of relational databases are used (such as Informix with 4GL for the UNIX environment and Clipper/dBase for MS-DOS PCs). The ameliorated retrieval options also allow direct computer output for management support. While middle managers such as administrative department heads indeed use the computer directly for their information requests, chief executives still rely on intermediates to get their information.

As in this phase of decentralization the hardware moves closely to the administrative departments, i.e. to the end users themselves, the responsibility for everything, the hardware, the purchasing and processing of the software and the responsibility for the data tends to follow this decentralization direction as well. Although central administrative computing staff should maintain a certain responsibility in decisions concerning the purchasing process of hardware and software, coordination, user training, and maintenance, one witnesses with the rapid growth of computer use in this decentralization phase not always such an ideal sharing of responsibilities between end-users and computing staff.

2.3 The Re-integration Era

After this excessive spread of stand-alone computers all over the central and decentral administration it is nothing but a logical step that a re-integration should take place. Although this phase is nowhere fully implemented but rather in its conceptional and planning phase, one can conceive the main traits and rationales of this phase:

- There are certain administrative tasks that are fulfilled not only by one clerk at one desk, but are to be handed over from one desk to another until completed. A purchase order from the central purchasing department, e.g., is followed by an input into the central accounting system. An input in decentral accounts, e.g., should be followed by an entry into the central accounting system (on an aggregated level). An integration with respect to the different computer systems according to the need of the administrative processes could be reached by two alternatives: by direct update or by file transfer.
- The passing over of data out of the administrative files to text files for word processing purposes is another issue of re-integration.
- University internal communication such as Message Handling Systems (MHS) require integration in the form of networks.
- There is a need for at least read-only access to central files inside the university, from various decentral places and positions.
- Statistics, reports and management information often have to rely on more than one administrative system and file in order to integrate this information into one report.
- The use of central resources such as high speed laser printers, central back-up storage, access to external tele-communication services (X25) and external information services from more than only one terminal in the institution demand integration of single or multi-user places.
- Telefax and analog telefon is a non-integrative form of external communication. One could easily predict that telefax in the future will be succeeded by teletex as the most used form of telecommunication, apart from telefon.
- The multi-functional terminal and a common user-interface controlling whatever application from word processing to administrative systems at the individual working place from the clerk to the chief executive is another facette of integration.

In contrast to the decentralization era, where we were talking of a rather comprehensive support of the clerk's work by computer systems, this era might be characterized by a quasi total and integrated support with almost no "paper-based" interrupts in the clerks' administrative processes at the keyboards and screens. It will also be the phase of executive support systems with executives' direct access to and "hands-on" desk-top keyboards, mice, screens etc.

If the central administrative computing staff does not take over the full responsibility for administrative computing in the central and decentral offices yet in the stage of concepts and planning, re-integration with all the benefits expected will never become reality.

3. Goals and Concepts for the Next Step of Administrative and Management Computing

3.1 Strategic Relevance of Administrative and Management Computing

The next steps are, of course, depending on the actual stage in the respective institution, both the decentralized spread of single purpose computers and the re-integration of these seperated facilities. But it is rather the integration phase, needing planning, conceptualization, in contrast to the incremental growth of the decentralization phase. And it is also the re-integration phase, giving rise to more general thoughts on goals, objectives and general benefits and the strategic meaning of administrative and management computing. The question might also be posed as to whether and how university administrative and management computing differ significantly from the corporate world and its computing services. There are four aspects to be considered:

(1) The "service" aspect: Whereas administrative computing in the corporate world, ecpecially in industry might be fully integrated into concepts of CIM or PPS, and thus serving the clients of the organization as well as internally, in the university administrative computing is almost totally seperated from the primary production processes and customer services. Thus the university administration and administrative computing is not directly linked to the aim of serving the university clients, but rather the members of the university production processes inside the institution, of whom, of course, the students are both customers and producers. But the better, the faster, and the less bureaucratic the central or decentral administration might function, due to the computer system support (but also due to the behaviour, efficiency and effectiveness of the administration employees), the more the overall atmosphere, functioning, effectiveness, productivity and creativity of the university's primary producers and production processes might be enhanced. Administrative computing - on whatever developmental stage - should primarily help the administrative employees do their jobs better, and in the integration phase to get the decision makers more involved into the benefits of administrative computing by improved and direct information retrieval options.

(2) The "Leading Edge of Technology" aspect: Taking into account the research and development functions of the universities, it would fit very well into the "image" of the individual institution to provide its own administration with the leading edge of the technology equipment and systems, even compared with the corporate world. But one has to be careful not to get confused about the size of the "enterprise" university. The higher education institution has to be compared with small to middle sized corporate enterprises. It was e.g. a mistake, as far as we can judge, to base administrative computing in the phase of the mainframe computers on data base software such as IMS, UDS and ADABAS. It would have been better to stick to the ISAM data management, in order to "consume" less computer resources compared with the data to be administred and compared with the retrieval needed at that time. But nevertheless it would suit the higher education institutions very well to have the leading edge of the technology implemented in their administrations, compared with the "right size" corporate enterprises.

(3) The "information" aspect: European higher education institutions have recently tended to be more exposed to a competitive "market" of higher education and research.

The more autonomy they are granted in that sense and the more they have to care about their strategic uniqueness and their market niche, the more their challenges are converging to those of the corporate enterprises. Executive managegement information, especially for the managers on the academic side of the enterprise university (President, Vice-Presidents, Deans) gains increasingly in having a strategic relevance. The information domains focus not only on the resources, processes and performances of the institution, but on various aspects of the institution's environment.

(4) The "implementation" aspect. University administration in Europe has more in common with public administration than with business administration. Although public administrations often show in their organizational structures quite a lot of hierarchical levels, the daily work and administrative processes of the subordinates seem rather to be shaped by laws and fixed regulations than by the guidance of the respective leadership-level persons. As a consequence often subordinate clerks have more influence on the implementation of computer support than the respective leaders of the administrative department or than the chief administrator. Although this might be beneficial for the motivation of the clerks it bears the danger of perpetuating organizational structures and impeding strategic decisions as regards the university administration, strategic decisions that could be made in the course of computer support implementation.

3.2 Premises, Goals, Objectives, and Concepts for the Next Steps of Administrative and Management Computing

It should be stressed once more that the next step of administrative and management computing in higher education is both a continuation of the decentralization together with the spread of departmental computers and systems, and the re-integration based on computer networks.

The premises, goals, and objectives of the next step are stated rather similarily by all institutions that are going to work out concepts, as follows:

- The concept of the central administrative computer should be abolished as far as possible. Departmental computers should be the prevailing concept of administrative computing.

- All levels of the university's administration should be supported by computers and systems. The amount of data to be stored and handled is no longer a criteria for automation.

- Access to data and the general user-interface should be highly comfortable.

- Access to "central" files (i.e. to departmental computer systems in the central university administration) should be provided for those who need this information for administrative or decision making purposes.

- Whatever transfer of data and documents is necessary inside the institution, it should be handled electronically and not by paper-documents. Data-input should not be necessary more than once in the flow of the administrative process.

- The primary goal of the so-called office automation is to implement word processing everywhere from the scientist to the secretary.

- Message handling (MHS) seems not to have the highest priority inside and between German higher education institutions
- There is an increasing demand for better, faster and desk-top information for all levels of university management, now for the chief executives as well.
- Data security and privacy as regards personnel data (student record files and personnel records) seem to have a very high priority with severe consequences for all concepts of networks and access to data. Administrative and statistic data have to be seperated from each other. Academic and administrative computing stringently seperated.

These premises, goals and objectives lead to some common traits of the concepts that have recently been developed at various institutions:

- Administrative departments are to be supplied with their own computer to run only the one system or the set of very closely related applications for this department. There are indeed four models for the departmental computer configuration, usually mentioned in the plans and concepts: (1) The MS-DOS PC with Clipper/dBase or Informix as relational database systems for those applications with only one user and rather limited data sets to be adminstred. It is also the typical configuration for the rather small decentralized administration in the academic departments, in academic institutes or in the research projects with their own administrations. (2) The second model is the Unix-computer for those applications and administrative departments with more than one user at a time. The relational database and the programming language used are Informix and 4GL. (3) The third model, being just an alternative for the same multi-user constellation consists of a PC-network, using Novell as network software and having a central file- and network-server (386-PC). (4) The fourth model consists of a combination of both, the Unix computer with PCs instead of non-intelligent terminals, and the underlying reason for this model is a combination of central and decentral computing at the individual working place.
- Data and document transfer between administrative departments and systems in the course of administrative task fulfilment should no longer be handled on paper basis but rather electronically. Although direct update from one system to another department's system would be imaginable, file transfer with subsequent update by the clerk responsible for the receiving system, is the favoured model according to the present concepts.
- To handle the data communication and transfer of data and documents between the seperated administrative computers and applications online, an adminstrative network is being planned. This network usually has two components or units: the central university administration and the decentral administration in the academic departments.
- Because of the extraordinary high security, privacy and confidentiallity requirements the academic and the administrative network are thought to be seperated physically almost totally. In fact there are four quasi seperated "planning units" as regards computer support and networking in German higher education institutions with only few overlap: the central administration, the decentral academic administration, the academic computing, and the library including access to external data bases. The main interface necessary for all four units is the access to external communication facilities: the German Academic Network (DFN) including all X25 facilities.

The fact that there is only little overlap is due rather to the security and privacy requirements (especially with regards to student and personnel data) than to other reasons based on the working processes. In case the academics need access to administrative or statistical data they have to use the academic administration terminals with their access to central information files instead of academic computing facilities.

- Even the link between the decentral academic and the central university administration is thought to be somewhat "buffered" for the same security and privacy reasons: three alternatives are to be found in the university concepts: (1) If direct access to the administrative computer and files is planned to be allowed at all, it is a read-only access, using the retrieval programmes provided on the administrative computer, and documenting every successful and unsuccessful attempt at access to data. Whenever update in central administrative files is necessary it will be handled through file transfer, the transferred files being used for update by the central administration clerks themselves. (2) Information retrieval according to the second even more "secure" alternative takes place on seperate information files to be maintained on seperate computers in the network and to be fed periodically from the administrative systems. (3) The most consistent "buffering" alternative is a requester/server or mailbox-concept, where the decentral requesters formulate their information retrieval requirements through a message handling system into a central mailbox, and central administration clerks answer the request by means of e-mail after having looked into their mailbox.

- Both for security reasons and for the reason of user-friendly and easy-to-handle user interfaces, the concepts provide for or even mandate the "hiding" and "locking" of the operating system and its operations against direct user interference. In the case of single user PCs often security software such as Safeguard are declared mandatory. The most advanced concepts even think about common user interfaces to take over the control for all applications or even sub-functions of applications on one terminal at one working place. On Unix computers Uniplex and Q-Office are examples to be investigated in further detail.

- The re-integration phase seems to provide the maturity of computer-technology for direct executive support. The more advanced concepts contain special sub-networks linking at least the President, the Vice-Presidents, the Chief Administrative Officer, and the institutional research and planning office together, with nodes consisting of MS-DOS PCs or MacIntoshs, the latter using new user interface concepts such as Hypercard. The primary goal of executive support seems however not to be communication on the base of a message handling system, but rather direct executive access to information. The following information elements are planned to be implemented and maintained (the maintenance being the most crucial and sensitive parameter in this kind of executive support systems):

  - "self-discriptive" data with respect to the individual institution
  - non-numeric, verbal information on the individual institution (role and mission statements, central and important decisions etc.)
  - inter-institutional comparative data on critical success factor areas
  - general higher education related data, describing the relevant environment of the institution (highly aggregated statistical data, economic data, demographic data etc.)

- non-numeric, verbal information of importance for the institutional policy and decision making (such as statements of legislators and politicians, information on federal and state financial programmes and initiatives, definitions of data elements etc.).

4. Problems of Planning and Implementation of Administrative and Management Computing

The following section is based on the experiences in the "big system" and the "decentralization" phase and is extrapolated into the phase of "re-integration" with its specific characteristics. It is also an attempt to find answers and solutions to problems that emerged during planning and implementation processes.

4.1 Comprehensive Planning or Incrementalism

Comprehensive planning in the past turned out to impede rather than to facilitate quick responses to computer service need in the university administration and to technological opportunities. The technological development and prices of computer hardware are changing so rapidly that plans tend to become obsolete at best soon after their completion. A thoroughly and comprehensivley conducted analysis of word processing need of a whole university in 1984, e.g., ended up with the recommendation to install at most of the word processing places electronic typewriting machines (with one line displays and small memories), whereas today 286-PCs and laser printers at places with intensive word processing activities seem to be the common standard. The coordination function of central university wide plans with regards to the variety of computer hardware and software (including administrative applications as well as word processing) on the campus can be achieved more "silently" and indirectly by offering central services for only selected hardware and software on the campus, such as training for users, maintenance, consulting and "trouble shooting" hot lines. Today one should really count on the normative and standardizing forces of the so-called "industry standards" and standard software available in the MS-DOS and Unix environment. Networking, of course, needs somewhat more planning, but one should not hesitate to plan for and implement sub-networks, which even take better account of security and privacy aspects than comprehensive administrative or campus-wide networks.

4.2 State-wide (System-wide) Co-ordination

There are some states in the Federal Republic of Germany with rather extensive state-wide coordination mechanisms concerning almost all university administrative computing items, with the aim of unification and for economic reasons. One stringent means of state coordination is a central state budget for all administrative computing purchases and decisions to be made centrally in coordinating committees on the state level. There is one major advantage to be emphasized with regards to this central coordinating model: It assists the university administrations to survive the competition with the academic computing investments, which often would leave only very small "budget bits" for administrative computing facilities. State central recommendations, decisions and budgets may back the technological advancement of administrative computing. But the disadvantages seem to overshadow the advantages of state central decision making committees: Those university administrations or administrative departments which do not really want administrative computing facilities may easily hide their reluctance behind the long lasting coordinating processes, while these processes at the same time tend to impede a quick decision for those administrations which urgently need and would like to implement computing support.

Coordinating and decsion making committees tend to require each PC to be decided upon in the central committee meetings!

4.3 Academic and Administrative Computing Relationships

Most institutions have their academic senate committee to decide upon the big investments, regardless whether academic or administrative support is under review. Especially in the "big system" phase of administrative computing this decision making structure as a result treated the university's administration as as "stepchild" with regards to computer facility investment. One solution would be to decentralize decision making on computer facilities by decentralizing budgets. But again the budgets for administrative computing might be limited too much in favour of academic computing budgets. The best solution is, of course, an enhanced visibility of administrative computing services for the academics, i.e. quick and direct online access to data they might need for their administrative, teaching and research activities. This kind of "involvement" of academics in administrative computing outcomes indeed showed less reluctance towards administrative computing investments in recent decison making processes. Compromises have to be found between high standards of security and privacy protection on the one hand and quick and easy-to-handle retrieval facilities for the academic side.

4.4 The Role of the End-User

As stated earlier the final end-user of public administrations including the university administration is rather powerful as to the organization of his/her work and administrative processes. This power extends to the formulation of requirements towards the data processing systems' developers and the implementation and processing of these systems. It does often, especially in the case of big administrative departments, not suffice, to have only one person responsible for the definition of user requirements towards the system developers, one person who rather tends to become a data processing expert than to remain the advocat of the user-requirements. Rather especially in the implementation phase, one should build on "concentric circles" around those users who show special identification with the new technology, who received special training, and who could help guarantee the motivation and immediate problem solving more than any other more centralized organization of user support.

There is however the danger that the relative power of the administrative end-user leads to a perpetuation the way in which administrative tasks are fulfilled. End users might tend to formulate requirements for automation such as not to change the flow of processes at all. Unless one does not succeed in involving the leaders in this process and build on their responsibility for the overall efficiency of university administration, the benefits of computer technology for the administration will not be fully appreciated and used. The involvement of the Chief Administrator of the institution and of the President in the hard- and software implementation decisions and processes seem to be crucial, especially in the phase of re-integration, where things can really be changed.

4.5 Responsibility of the Central Administrative Computing Staff

As ever in organizations the motivation of the individual is more crucial for the fulfilment of the organization's functions than formal structures and responsibilities.

In the phase of decentralization it was indeed an undoubtable experience, that those implementations of administrative systems worked best, where the end users felt responsible for everything, from requirements analysis to the daily running of the departmental computer and the daily back-up of the modified departmental data files. This "informal" or non-formalized responsibility cannot however serve as the model for administrative computing organization, especially in the case of network facilities existing in the university administration. There should be a stable and secure responsibility at a university central administrative staff level for the maintenance of hardware and software of the decentralized computers as well as for the network, training, immediate trouble shooting, further developments of software especially to serve additional retrieval requirements. There is however a shift in the activities of these staff members to be perceived from daily running of the administrative systems to more long term activities and ad hoc involvement in exceptional situations in the course of the daily running of the computer systems.

4.6 Self-made or Purchased Standard Software

Several reasons in German higher education administrations suggest the preference for standard software for administrative support. Institutions usually have not enough administrative computing staff in order to do both maintaining existing software and developing new software systems for the administration. To have students of computer science or business administration programmes develope systems in the context of courses or examinations, did not proove a valuable approach. The use of methods, tools and principles is more important for the students' learning process than the immediate result for the university administration, and there is a lack of continuity in the maintenance of these "academicly" self-made systems.

Due to common laws and regulations, some of them even on the federal level, others at least on the state level, and being applied mandatorily by all institutions in one state, the implementation of "standard systems" seems to be possible. These "standard systems" provide at least support for the so-called core functions of the administrative processes in the institutions. With the central administrative computing staff remains however the task to do the adjustments (especially additional and special retrieval functions) at the margin of the core systems.

4.7 Laws and Regulations

The often most influencial laws as regards the planning and implementation process of computer support in university administrations seem to be the law to garantee formal participation (co-determination act) and the law garanteeing privacy and protection of personnel data. There is no other solution for the success of the system implementation as to involve those being the formal representatives of participation and data protection as early as possible in the process of planning and implementation. If the final end-users are really convinced about the benefits of the new systems then there is no reason for those formal representatives, who rather tend to defer or even to impede computer support implementation, to oppose heavily. Severe data protection and privacy laws impact the decoupling principles and mechanisms between administrative support and retrieval functions for others than central administrators, that have been described earlier in this paper in the context of university wide networks.

4.8 University Management and Administrative Computing

University Management, be it the middle management level of administrative department heads, the Chief Administrative Officer or the President have not been involved enough in administrative computing decisions in the past. Administrative computing can however benefit greatly and even receive its major incentives from management requirements. Its early attempts owes administrative computing to the management information requirements (compare the MIS approach in the late sixties and early seventies which marks the birth of administrative computing in German higher education institutions, which was however more directed towards state and federal state level management information than towards the support of institutional management).

University Management involvement in administrative computing planning and implementation seems to be crucial, in order:

- to overcome the perpetuation of once existing administrative structures and to fully use the efficiency potentials of computer technology
- to fully set to work the strategic importance of administrative computing
- to fully use the potential of present computer technology with regards to executive support.

The development and use of executive support systems by the executives themselves may not only impact their involvement in administrative computing issues but may also shape decisively the administrative support systems which then will have an additional function to supply executive support systems with aggregated data automaticallly and periodically.

5. Conclusions

German higher education administrative computing has undergone and is still in the process of a "dramatic" decentralization of computer hardware and software implementation and use, with the prevailing concept of seperate departmental computers. The main emphasis of this phase of administrative computing support was laid on very high standards of the individual clerk's work support and on very user-friendly and easy-to-handle user-interfaces. The next step, a re-integration of the seperated computer and system facilities, will help reduce the paper-based interrupts and data input with regards to the clerk's work.

But perhaps the even more important benefits of this next step of administrative and management computing will be the direct access to data and information by those in some distance from the daily administrative processes, i.e by the institutional managers. The executive support system perspective seems to be the most interesting perspective of this future era.

CAUSE89

Track V
Telecommunications and Networking Issues

Coordinator:
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The user community on campuses today is demanding information resources to be delivered to the desktop. Data will be stored on mainframes, and MIPS will be on the micro. Electronic connectivity is through the network. Presentations in this track focused on such subjects as network management and control; integration of voice, data, video, and image communications; dealing with a multi-vendor environment; making the "right" choice when faced with multimillion-dollar costs, budget limitations, and rapidly changing technology; strategic planning and appropriate organization for telecommunications; the TCP/IP debate and development of OSI standards; micro-mainframe connectivity; accessing external resources (e.g., commercial data bases and supercomputing); distributed data bases; and models combining academic and administrative data networks.

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NETWORKING OHIO COLLEGES IN SUPPORT OF STATEWIDE ECONOMIC AND HUMAN RESOURCE DEVELOPMENT STRATEGIES

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In response to the Governor of Ohio's economic and human resource development strategies, The Ohio Board of Regents created EnterpriseOhio, a statewide network of public two-year colleges (community colleges, technical colleges and university regional campuses), to provide training services to local business and industry.

A rapid, comprehensive and flexible communication system was needed to link the colleges. The Ohio Network for Information Exchange (ONet) was developed by Cuyahoga Community College in cooperation with Systems & Computer Technology Corporation. Based at Cuyahoga Community College, ONet is a specially designed educational computer network whose electronic warehouse of information and educational services assists Ohio colleges in providing customized training to meet high technology needs of business and industry.

INTRODUCTION

The Ohio Network for Information Exchange (ONet) is a state-of-the-art communications network for higher education institutions in the state of Ohio. ONet currently provides a variety of communications network services including electronic mail, bulletin boards and databases to more than sixty colleges and universities. ONet was initially proposed, funded and implemented to meet a state-wide need for electronic information sharing.

In response to a changing state, national and international economy, and the Governor of Ohio's request for support of statewide economic and human resource development strategies, the Ohio Board of Regents challenged Ohio's two-year colleges and universities to take a proactive role in their communities' economic development efforts.

EnterpriseOhio, a statewide network of public two-year colleges (community colleges, technical colleges, and university regional campuses), was created by the Ohio Board of Regents to assist in sharing the best resources available for providing job training and retraining services to business and industry. A rapid, comprehensive and flexible communication system was needed to make this sharing possible. The Ohio Network for Information Exchange was developed to provide that electronic network.

BACKGROUND

Electronic communications for Ohio's two-year college presidents dates back to 1984, when Cuyahoga Community College, in cooperation with the Ohio Technical and Community College Association (OTCCA) established the OTCCA E-Mail Network. This early network was limited to sending and receiving short messages and served only the 23 presidents and the Executive Director of OTCCA.

In 1986, The Ohio Manufacturing Training Group (OMTG), a consortium of six Ohio colleges, recognized the need for the acquisition, development, dissemination and utilization of information to support the state's business and industry training needs.

The OMTG submitted a proposal to the Ohio Board of Regents to develop an enhanced comprehensive state-wide electronic information exchange network to: (1) facilitate sharing of information from projects developed among other groups of colleges within the two-year college system, (2) support information exchange requirements among the consortia group and all two-year campuses, and (3) create more effective information networking between the two-year college system and other organizational and institutional offices and databases in the State.

IMPLEMENTATION

Following the approval of funding by the Ohio Board of Regents on September 12, 1986, the ONet Steering and Planning Committees were appointed and held their first meetings in October of that year. At these meetings, an organizational structure was confirmed, a project coordinator/manager was appointed and project goals and objectives were approved.

ONet was tested on a pilot basis beginning in November 1986, at which time the Planning Committee and other "pioneers" assisted in testing the communications software and provided direction in the design of the network and its components. The electronic mail component and a demonstration bulletin board were available for pilot testing at that time while a prototype database facility was being developed.

By March, 1987, training sessions were scheduled throughout the state with over 100 persons attending. ONet became operational March 30, 1987 when the 24 users of the OTCCA E-Mail Network were transferred to the Ohio Network for Information Exchange. From that initial small group of users, ONet has grown to over 550 registered users in over 60 colleges, universities and agencies.

ONet is not just another electronic mail system, but a specially designed educational network whose electronic warehouse of information and educational services greatly assists Ohio's two-year and four-year colleges in providing credit and non-credit, customized training to meet local and state high technology needs of business and industry.

ONet was developed as a statewide initiative to serve primarily the two year colleges in Ohio. Today, it has been expanded to serve all public institutions of higher education and is being offered to private two and four-year non-profit educational institutions with plans to make it available to secondary schools in the future.

Partnerships

ONet was supported by, not only Cuyahoga Community College (CCC) as the lead institution and home for the mainframe computer, but also by three private companies; Ohio Bell Communications, IBM and Systems & Computer Technology Corporation (SCT). Ohio Bell and IBM provided support in the first year of development. As a result of a partnership already in place between CCC and SCT to manage CCC's computing facilities, this public/private partnership was extended through the creation of the National Center for Advancement in Education through Technology (NCAET). The purpose of NCAET is to advance excellence in education through the use of technology and to assist in the development and application of technology at CCC and other educational institutions. One of NCAET's major goals is the development and operation of electronic information exchange networks.

As CCC entered into the consortium to propose ONet, SCT, as part of its contractual responsibility with CCC, contributed extensive efforts in support of the initial development of ONet. Through the NCAET partnership, CCC assumed responsibility for all network communications, logistics and management as well as agreed to provide the necessary mainframe equipment and support. SCT agreed to provide the operational, maintenance and development staff and to assist in marketing ONet outside the state of Ohio.

Governance

Governance of the Ohio Network for Information Exchange was defined in the original proposal to the Ohio Board of Regents. Policy and planning directions are still provided by two committees originally proposed - the ONet Steering and ONet Planning Committees respectively.

The ONet Steering Committee serves as the policy body for the project: establishing priorities, assuring short and long term goals and objectives of the project are accomplished and reviewing and approving proposed project budgets.

In August 1987, the Steering Committee changed the name and focus of the group to more accurately reflect the interests of the members and to expand the membership to include three additional institutions who were involved in manufacturing training activities. The new committee combined the Ohio Manufacturing Training Group with the ONet Steering Committee; thus broadening the scope of the committee to permit involvement in other statewide initiatives, with ONet serving as the communications link for these projects.

The ONet Planning Committee is responsible for network development and implementation planning and schedules and makes recommendations to the ONet Steering Committee for final consideration.

The Chancellor of the Ohio Board of Regents appointed the EnterpriseOhio Executive Committee to serve as an advisory group to the Chancellor. This committee reviews all requests for funding from the Productivity Improvement Challenge Program grants which funds special statewide projects such as ONet, Train-the-Trainer and the Ohio Resource Exchange. The EnterpriseOhio Executive Committee provides overall coordination of these statewide projects and combined efforts of the colleges to meet business and industry training needs.

ON-LINE SERVICES

ONet users access the network with a personal computer, a modem and specially developed communications software which supports auto-dialing the network toll free telephone number and automatically logging on to the network. Once on-line, the user may access all available services from menus. The user can also transfer ASCII or binary files, making it possible to send virtually any type of file, (including spreadsheets and executable files) to other users throughout the network.

The services provided by ONet reinforce the colleges' partnerships with the state and the private sector in supporting and advancing the economic and human resource goals of the State of Ohio.

The most important function of ONet is to provide access to a "storehouse of information" through the database and bulletin board components.

Database Component

The database component permits the storage of, and access to, databases developed and maintained by ONet user groups. The database component permits users to search the data in an easy and efficient manner by searching any identified field for a particular word, partial word, or group of words to retrieve desired information. Developed specifically for ONet, and employing a similar search process for all database access, the database facility is a generic system which can be customized for any database to be stored on the network computers.

ONet not only provides access to databases stored on the computers at Cuyahoga Community College, but will eventually permit linking with databases stored on other computer systems via gateways. The following is a list of databases currently available on ONet.

Institution/Agency Directory lists key staff from over 60 different institutions and agencies.

Training and Services Inventory provides a comprehensive listing of credit and non-credit training courses and services, designed and developed to meet the needs of business and industry.

User ID Directory lists the names, titles, addresses and phone numbers of over 550 users who have access to ONet.

Development of additional databases under consideration includes:

- Access/Retention database
- OBOR Taxonomy of colleges, programs and courses

- o Grants database
- o Calendar of Events database
- o Others as defined.

In addition to the database services on ONet, another major source of information is provided by the bulletin board component.

Bulletin Board Component

ONet supports bulletin boards to deliver general bulletins or messages to all network users, or selected information to "special interest groups" (SIG) by offering each SIG its own dedicated bulletin board which can be accessed only by its members.

The bulletin board component currently consists of seven (7) public bulletin boards and several private bulletin boards for SIGs. The ONet bulletin boards are designed as electronic 3 x 5 card postings, limited to ten lines of copy but with the ability to attach a text file of any length for more detailed information on the specific topic. The text files can be read and printed on-line or download to the user's microcomputer. At the time an item is posted on a bulletin board, the user is prompted for an expiration date which will automatically delete the message and accompanying text file on the specific date.

The existing public bulletin boards include:

Ohio Network News Bulletin Board - Announces new ONet services, databases, and facilities, as well as helpful hints on how to use the network's many features.

EnterpriseOhio Bulletin Board - Provides messages about the activities of EnterpriseOhio, OBOR and associated projects.

Calendar of Events Bulletin Board - Lists meetings, seminars, and conferences throughout the state.

General Information Bulletin Board - Contains general items of interest, requests for information, want ads, etc., which do not apply to any of the other bulletin boards.

Awards/Grants Bulletin Board - Lists announcements and sources for available funding for educational projects.

Access/Retention Bulletin Board - Offers current information regarding successful access/retention programs already in place at other institutions as well as information on establishing new programs.

Help Wanted - Includes information on positions available, positions sought and requests for adjunct faculty and staff for special projects.

Electronic Mail Component

ONet offers the standard electronic mail functions of sending and receiving messages. It also offers many expanded mail related services such as; permitting the user to file messages received, generating and automatically storing copies of all messages sent, forwarding messages to other users, replying immediately to messages, editing messages and returning them to the sender, printing messages at the local office printer, sending carbon copies to other users and requesting an automatic acknowledgement when the message is read. There is even an on-line spell checker and thesaurus available.

Users can send messages, documents, and files which vary in length from a few words to a multi-page document. These documents can be composed while on-line with ONet, or can be prepared on a microcomputer using stand-alone word-processing, database or spreadsheet software packages. The documents can then be transferred to the host computer and sent directly to identified user(s) or included in an electronic message.

The user has the ability to send messages or prepared documents to one or more ONet users simultaneously, as well the ability to create and maintain distribution lists to send messages, documents and files to groups of users, such as committee members or project team members. Distribution lists can be created and maintained by one user and easily shared with other members of the distribution list for their use.

OPERATING ENVIRONMENT

The host hardware environment consists of an IBM 4381, Model Group 2 computer system, associated disk and tape drives, an IBM 7171 protocol converter and several other types of communications controllers.

The host software environment consists of the VP/SP5 operating system, under which PROFS 2.2.3 and SQL operate. The PROFS menus and screens were customized to provide consistent response from all function keys and more readable screen displays. All menus rely on PROFS kernels which are called by the menu system. All databases and bulletin boards rely on SQL as the information storage and retrieval system and were designed to compliment the customized PROFS displays.

ONet is accessed through the use of a specially developed communications software package developed by ONet with full on-site support from Systems & Computer Technology Corporation staff. This special communications software permits the users to access ONet by pressing a single key which dials the telephone number and automatically logs the user onto the network. Users need only enter their private password to gain final access to ONet. Once logged-on to ONet, users have the use of full screen editing and menus for ease of operation and selection of the many functions available. ONet is accessible 24 hours a day, seven days a week.

The communications environment consists of phone service provided by two vendors. Four local dial-up lines are provided by Ohio Bell. Six toll free lines, for use within the state of Ohio, are provided by AT&T. A nationwide toll free number is also provided by AT&T. Error correcting modems capable of responding at 300, 1200 and 2400 baud are attached to each line, and are connected to the IBM 7171.

The end user hardware environment may consist of any IBM PC, IBM AT, IBM PS/2, any compatible MS DOS computer or any Apple Macintosh computer. A Hayes command set compatible modem is required. A compatible printer attached to the microcomputer is also supported.

SUPPORT SERVICES

To effectively and efficiently use a computer network requires a certain level of understanding and skill. Special training classes are offered periodically to help develop the needed understanding of the network and to assist users in developing the necessary skill level. This service is an important part of the overall ONet philosophy to enhance the users' ability to effectively employ the services of the network in the most efficient manner.

Assistance is also available on an ongoing basis. If users experience a problem, they may call HELPDESK at (216) 241-6567, Monday through Friday, from 8:30 am to 5:00 pm. If the issue is not urgent, users may send an ONet message to HELPDESK anytime, 24 hours a day, seven days a week. HEL SK will respond to the query, either via ONet or, if necessary, by telephone. In addition to HELPDESK, each institution has appointed an ONet Liaison to assist local users with problems, supervise the maintenance of institutional information in the databases and coordinate activities with the ONet staff.

ONet Connection is a monthly publication distributed to ONet users as a regular source of ideas on new and existing network capabilities and suggestions on how to better use the available services. In addition, EnterpriseOhio News, a quarterly publication, was created to inform potential users of the availability of the Ohio Network for Information Exchange and to share information from the Ohio Board of Regents, EnterpriseOhio Executive Committee and supported projects and activities.

A copy of the ONet communications software is given to each new user along with the comprehensive QuickStart instructions which explains the setup and use of the communications software.

A set of 16 Quick Reference Guides, outlining the major functions of ONet and how to perform them, is also provided to every user of the network.

FINANCIAL SUPPORT

ONet's initial development was started through a grant of $100,000 from the OBOR. This represented less than a third of the first nine months' development costs. The remainder of the costs were contributed by CCC and the three companies noted earlier. Since that initial grant, OBOR/EnterpriseOhio has provided additional funding in the amount of $285,000 to help launch ONet during the critical development years while the network builds a strong bases of active users. It is projected ONet will become self-supporting by 1992.

Institutions have made a commitment to use ONet and support the network through assessment of users fees based on connect time. Currently, Ohio users are charged at the rate of $20 per hour ($0.33 per minute). ONet, in cooperation with CCC's Accounts Receivable department developed a billing, invoicing and tracking system to provide accurate records on revenue generated. Institutions are invoiced monthly; each invoice details the active user IDs and connect time for the month.

Currently, there is no installation fee for new users, however, consideration is being given to implementing a new user fee and/or some form of a minimum monthly fee.

FUTURE DIRECTIONS

ONet is a dynamic system which will continue to grow, not only in the number of users, but also in the available services to meet the changing needs of the user groups.

In addition to the already available functions, ONet is planning for future services which will have an even greater impact on the operation of individual institutions. Some added services which are under consideration include:

- Gateways to other networks
- Electronic Computer Conferencing
- Electronic Survey Services
- Articulation Agreement Support
- Electronic Exchange of Student Information

Although ONet was developed to serve institutions in Ohio, through the NCAET partnership, similar network services are being offered to other states to develop independent state networks like ONet with the capability of linking the states into a regional and eventually national network.

BENEFITS

Some of the benefits gained from actively using ONet include:

- o Locating available training resources for business and industry to meet training and employment needs.
- o Assisting colleges in their efforts to improve the economic development climate of their region.
- o Improving communications and supporting information exchange among participating institutions.
- o Sharing of valuable resources among institutions and omitting duplication of effort.
- o Creating important linkages with colleagues throughout the state through continued use of ONet.
- o Sharing information and participating in the development of new applications to meet changing needs.
- o Providing a cost effective and time saving communications tool to:
  - Communicate with persons without participating in "phone tag".
  - Access information at the time it is needed.
  - Send and receive messages at any time. (The system is available 24 hours a day, seven days a week.)
  - Access electronic mail, bulletin boards and database information services at the approximate cost of a regular state-wide long distance phone call, but with the potential for more immediate response, timely information, and added services.
  - Electronically transfer a multi-page document to another user or a group of users, immediately, at a fraction of the cost of sending a similar document via Federal Express or U.S. Express Mail and with greater ease and speed and lower cost than sending the same multi-page document to several users through facsimile copy.

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Reaching the Promised LAN

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McGill University's Management Systems group recently installed PS/2s and a Novell/ArcNet Local Area Network. This paper describes the environment, reviews the installation history, and discusses the problems and successes of the installation, including the uses made of the LAN, and the features most liked and most disliked of the LAN and the PS2s.

Background to McGill

McGill is Canada's oldest chartered university, founded in 1821 by a bequest from James McGill, a wealthy Scottish Canadian fur trader. We have been living off bequests ever since.

McGill is an English language institution in the heart of what is now downtown Montreal. Montreal is primarily French speaking, and our province of Quebec even more so. This provides one of our greatest attractions to out of town students - the ability to "go foreign" and practice a "foreign" language whilst studying in English. It is also one of our greatest problems, since most of our funding comes from the same French speaking provincial government.

We are public in the sense that our funding is mainly provincial, private in that subject to some overall approvals from Quebec we make our own rules and spend our money the way we see fit. We are therefore something of a blend between your private and state universities.

We are medium to large, with a day student headcount of 22,000 (19,000 fte's), and an evening headcount of another 8,000. Despite giving almost all of our courses in English, 26% of our students are French mother tongue.

Academically our major strengths are our professional faculties, particularly Medicine, Law and Engineering, and our strong research track record in all areas. We receive more competitively awarded research grant dollars per full time academic than any other university in Canada.

Organisationally, our strength is in our decentralisation. We have a long tradition of faculty power and "bottom up" decision making. The more perceptive will immediately recognise that potentially this can also be a major weakness, and certainly makes providing campus-wide applications and campus wide standards an interesting challenge.

The other, overwhelming weakness, is our financial position. Our deficit for the current year was originally budgeted for $12 million (US) - it is now expected to be around $6 million due to an improved provincial grant. Our cumulative deficit will be of the order of $50 million (US) at the end of the current year.

This sorry financial picture comes after years of belt tightening, short time summer working, and staff cuts, and is attribrutable to significant, long term, and self admitted government underfunding of us relative to the other large Quebec universities, and to a provincial policy which has frozen tuition fees at their 1968 levels. A Canadian student at McGill pays $450 (US) for tuition per year, even in Medicine.

Background to Management Systems

Management Systems is a fairly typical administrative systems group, with 35 development staff and 20 operations people who do batch data entry, batch updating and reporting, and give first line support to our administrative network users. We share the university's 3090-180E (vector) with researchers (a growing load since it's largely free time), students (a declining load since free PCs are more fun than free mainframes), and commercial customers (also declining). Our load is naturally growing.

We run MVS/XA, IMS as our main database, TSO/ISPF for development, COBOL, Mark IV and V, and have just installed Adabas, Natural and other Software AG products.

Organisationally we report to the same vice principal as the Computing Centre/Telecommunications group.

But our paper today is to do with how and why we implemented a Local Area Network for all of our development and most of our operations staff.

Objectives of the LAN

All of our developers and most of our operations people have had terminals for several years. Since 1982 we had gradually added a kludge of various PCs, XTs, ATs and clones, as we shall discuss later. When the story opens then we had a mix of ancient terminals and disparate PCs.

One of my goals in proposing the LAN was therefore to simplify this mixed environment. Another, and perhaps the most important, was to turn my development staff on to PC possibilities. Some were already PC enthusiasts - most were not. Most had little concept of what PCs could do - and were doing in the right hands - for administrative computing. I wanted to position my staff so that they both understood desktop computing, and could service the growing demands for PC applications support.

Similarly I wanted to build our experience with LANs, so that we could better support the needs of administrators.

And naturally I wanted to do all this and at the same time im- prove our productivity in the development amd operational areas.

And finally I wanted to regain the initiative we used to have, i.e. to catch up with or (gulp) surpass our power users in the field who were doing great things with PC/LAN technology.

Configuration

The configuration that we selected for our MIS department LAN consisted of industry standard software and hardware, which our Computing Centre had on its approved list of Campus products. For our Network operating system we chose Novell Advanced NetWare 286. We are currently using version 2.12 revision B.

The workstations and servers were provided through our Computer Centre Store, and NetWare was "gen'ed" (installed) on our servers by the technical staff of the Computing Centre.

Our choice of workstation was the IBM PS/2 Model 30 286 with 1 Megabyte of RAM and 1, 1.44 Megabyte diskette drive. We decided against hard disk drives, as we wanted everyone to store files on the network disk. The reason for this was to reduce costs and service problems, and to ensure that files were regularly backed up. Every station was equipped with a model 8513 VGA colour display and a mouse. Altogether there are about 50 workstations.

Each workstation is connected to the LAN using ARCnet interface adapters supplied by Pure Data Inc. in Canada. The cable plant consists of RG62U coaxial cable. ARCnet uses a tree topology, with workstations attaching to branches of the tree using "passive hubs" and the branches connecting to the trunk using "active hubs". Our own operations group did all of the cable and hub installation.

We decided to have 2 network file servers. One is the production machine and the other acts as a print server and backup machine for the first. For these, we selected Everex 386 PC's running at 20 Megahertz and equipped with 4 megabytes of RAM. We used 300 Megabyte CDC fixed disk drives for storage. Each file server is protected against power failures and surges by uninterruptible power supplies (UPS) manufactured by American Power Conversion Inc. For backup we are using a Legacy 150 megabyte tape drive.

Our backup cycle consists of daily copies of all files, a tape made weekly and kept for a month, and two monthly tapes which alternate. We also keep a tape off-site.

Since each of our workstations requires access to our host mainframe systems, our plan was to use the LAN as a path to the mainframe with the addition of a gateway server running a program developed in-house by our Computing Centre staff called Net3270. This would eliminate our need for two cable connections to each PC, and extra communications hardware/software such as IRMA.

We also added a remote dial-in gateway server to our LAN using the Remote2 communication software from Crosstalk communications.

Timetable

The UMS LAN grew out of experience with a smaller LAN set up in 1986 within the department's Information Centre. This LAN was based on ARCnet and NetWare, and connected 4 IBM PC's to an IBM AT file server. The Info Centre staff gained experience with the LAN, and I as manager of the Info Centre felt that this would be a good facility for the entire MIS department. Being a keen PC advocate, my boss the director of UMS, became wired to our tiny network soon after we had it fully "shaken down".

In November 88, I prepared a paper for our annual Managers Retreat proposing a LAN for all of Management Systems (excluding Data Entry which had their own minicomputer based system). A decision was taken to go ahead with the proposal if funding could be secured. A month later we had the final specifications and cost estimate for the network. Luckily, the funds were allocated and work began.

The first step was to expand the existing Info Centre LAN to a subset of the department and gauge how well things went. This would help us gain experience on a smaller scale with the vagaries of equipment acquisition, cable installations, software setup, training, and user reactions. We selected staff ranked as project managers and above as our pilot group. They were all equipped with PC's (many of our other staff were not), and they were the easiest to work with because their computing needs were more PC oriented, and they had more PC experience than our analysts and programmers who worked more with the mainframe.

We held our first training course in December 88, and by January 89 had about a dozen new stations on the LAN. Everything was working pretty well, so in February we began to spread the LAN to all remaining systems and operations staff. We decided to acquire and install PC's in groups of 10, to make it easier to setup the hardware and train staff.

Around this time we upgraded our IBM AT server to an Everex PC. Since more than half of the remaining staff not yet networked had PC's already, these were replaced with substantially better PS/2 models. Others who had terminals, were working with PC's for the very first time. Those staff that had PC's were using their PC's as terminals with IRMA cards. We replaced the IRMA cards into the new PC's. This meant that we had to run two cables to each PC temporarily until our gateway connection (Net3270) was fully operational. ARCnet uses the same type of cable as a 3270, so this made the job easier as we were well experienced with installing this kind of coax.

By April 89 we received our last lot of 10 PC's, and everything was running! We pulled several of our staff off of the IRMA link to the mainframe and tested Net3270. We gradually increased the load to test the performance and reliability of the gateway. We instituted weekly meetings between myself, my backup from the systems staff and our operations people to discuss the ongoing management and operation of the LAN.

There were still a few odds and ends missing or backordered (spare NIU cards, extra RAM, multi-user copies of software), but by May these had come in. By June, the implementation was for all intents and purposes, complete.

Over the summer we installed new modular workstation furniture in the department, and the LAN was a Godsend in allowing us to easily relocate staff both during and after the move. At this time we cut over to Net3270 fully, and ceased using IRMA.

Problems

Although everything is now running very smoothly (I'm amazed at how smoothly actually!), we did have our share of problems getting everything right.

Several items shipped to us were defective or failed soon after installation. Among these were 2 network interface units (adapter cards), 1 colour display, 1 PS/2 system unit, and 1 of the UPS's.

We also encountered another "gotcha" when we discovered that about 50 megabytes of our 300 megabyte drives were unusable after being formatted for NetWare.

Since we had two servers, we wanted both to be "online" so we bridged them to each other. This allows a workstation to access either file server. This proved to be problematic, as we somehow got the addresses of the servers mixed up, and couldn't activate one of them. Not having gen'ed the operating system puts you at a disadvantage at times like this!

Another problem which still haunts us today is RAMCRAM, or the inability to fit everything you want into memory at once. We are shoehorning DOS, NetWare, the mouse driver, NetWare menus, Net3270, and Framework III into 640K. This leaves very little working storage, and sometimes programs interfere with one another. We have reclaimed some extra space by using the LANspace program, and by eliminating Netbios from Net3270.

Cables always seem to present headaches in any network installation. We had are share of difficulties as well with cables being unplugged indiscriminately. Once we finally got everyone trained in terminating unused cables, the problem went away. It's a good idea to physically attach a cable terminator to each cable, with a note explaining its use at the end of every user accessible cable!

Our servers are attached to a multi-building fibre optic local area network running ProNet ("backbone") via a gateway. We had several problems with this connection, but with the ProNet driver software and with noise. Our Computing Centre solved the noise problems, but it took a lot of work. The drivers still do not always initialize correctly. The long term solution to this problem is to replace the ProNet with another network, as our Computing Centre expands this backbone to cover most of the campus.

Another source of problems is attempting to change anything about the LAN during the day. Don't do it! Like the mainframe, it's best to make changes outside of normal working hours.

We encountered several difficulties getting our backup tapes to work reliably. Our first unit, a Genoa tape system, never worked 100% of the time. Fortunately it was planned to replace it from the beginning, and its replacement a Legacy drive soon took over. It also did not always work! Eventually the problem was determined to be owing to the fact that the PC that it was attached to had 512K of memory. Attached to a 640K machine, it has worked fine ever since.

Trying to find a secure spot to ho. . r rervers to protect them from the environment, and curious fingers, has also been difficult for a department always short on space. Right now they are kept in telephone wiring closets, where telephone technicians often have to work - and unplug things! We are planning to move them into 'ockable cabinets soon.

Some of the software we have is only needed by a single user, but since we don't have hard disks on our PC's (and software often requires a hard disk) we have installed the software on the server. With some packages (e.g Harvard Graphics) the software does not work properly on a network disk.

In the area of human psychology, we hit some difficulty when we switched to the Novell Menus. This is a very nice menu facility, much better than the batch file menus we had used at first, but our users had grown accustomed to the old menus, and took awhile to adjust to the new "user interface".

Recently we discovered that even though we have plenty of free disk space, we have run out of "directory entries" on the file server. This means that we have used up all of the space to enter file and directory names on the NetWare volume. Apparently this can only be changed (increased) by regenerating the operating system, a formidable task I am given to understand. We are living with the problem for now by reallocating files onto another spare volume (lucky we have that) and by careful policing and file maintenance of the bloated volume. The lesson here is to allocate plenty of directory entries when you "gen" the disk volumes. 9,000 entries may sound like a big number, but you'd be amazed at how quickly network disks attract files!

Another fiasco we lived through related to printed output from the laser printers attached to both file servers. NetWare has an option that allows you to print "banner" pages (proclaiming the name of the person to whom the printout belongs) and separator sheets. These sheets have a useful purpose, but waste an incredible amount of paper and toner, especially for the majority of print jobs which are just one or two pages. We've compromised by omitting the banners, but leaving the separator pages. People have to sort through printed output and identify their own jobs.

One of our worst problems had to do with the Net3270 gateway. In the first couple of months the gateway hung, or went down occasionally, due to noise on the backbone network linking us to the mainframe computer located at our Computing Centre. This was pretty serious because most of our staff spend their time communicating with the mainframe, and Net3270 downtime resulted in much idle staff time. The major problem was finally rectified by removing the gateway from the backbone and placing it on a dedicated coax cable running to the Computing Centre from our office. Since then we have had other troubles caused by Netbios, but these have been cleared up as our Computing Centre re-wrote Net3270 to bypass Netbios altogether. In the last three weeks we have had no downtime at all.

Results

When the dust had settled, I surveyed all of the LAN users to see how they were using it, and how they felt about it.

Uses - On a weighted average basis, 59% of the time the PCs are being used in 3270 emulation mode using Net 3270. This is not too surprising as about half of the users are programmers or data controllers/schedulers.

30% of the time the PCs are being used with PC level packages, principally Framework III for word processing, but also including FoxBase/FoxPro, RBase, EasyFlow, 1-2-3, Harvard Graphics and a host of others.

E Mail to other people within the department takes up 6% of the time, and E Mail outside a further 2%.

Features - I asked what people liked most about the PS/2s. Bearing in mind that we had all come from either a monochrome 3270 or a monochrome PC1, the most liked feature was perhaps not surprisingly the colour screen, mentioned by 48%, followed by the keyboard (29%), overall speed (26%), and flexibility (19%). Amongst the other beloved features, the overall size, shape, colour and general aesthetics received several mentions.

Top of the least-liked features were the inability to hot-key between sessions as easily as with Irma (23%), the overall speed (16%), and nothing at all (23%).

I asked the same questions for the LAN as opposed to the PCs. Top of the pops were E Mail at 42%, so much easier on the LAN than with the previous mainframe version, and disk handling. Staff find using the disk server vastly better than fighting dozens of floppies. Access to a wide range of shared software was very close, at 39%, then trailing behind came laser printing and using shared files, both with 19%.

Remarkably the highest most-disliked feature for the LAN was "Nothing", with 16%.

Conclusions

The LAN and PS2s have been very well received. Naturally what people like best is what's new - colour, better keyboard, speed and the LAN. From the management perspective I am very pleased with the relative ease with which the LAN went in. We profited by walking, then jogging, then running. I am also pleased with the attitude change on the part of the staff towards PCs, and their acquisition of PC expertise. Finally, the improvement in internal communications through E Mail alone justifies a large part of the expense.

I look forward to building on our experiences so far by expanding the support we provide for end-user computing, and by upgrading some of our PS2s to take advantage of CASE and cooperative development of mainframe applications on the desktop.

I am also gratified that our traditional users such as the Registrar are now knocking on our door to join our LAN, and at least one existing small LAN wants to come on board ours to eliminate their support overhead.

POTENTIAL IMPACTS OF THE NATIONAL RESEARCH AND EDUCATION NETWORK ON RESEARCH LIBRARIES AND THE SCHOLARLY COMMUNITY

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ABSTRACT

Legislation for a National Research and Education Network (NREN) may soon be introduced in Congress. The NREN could create opportunities for major changes in the kind and content of information services delivered by academic libraries to the scholarly community. Examples are on-demand full text delivery, self-generated interlibrary loan, access to electronic library catalogs which include article-level access points, access to non-bibliographic data files and new means of electronic scholarly communications. Libraries and library organizations have important roles to play in the NREN, enhancing access to these and other information resources.

"We expect the revolution in communications to extend the power of our brains. Its ultimate effect will be the transformation and unification of all techniques for the exchange of ideas and information, of culture and learning. It will not only generate new knowledge, but will supply the means for its world-wide dissemination and absorption."

David Sarnoff, 1891-1971
Founder and President, RCA
Wisdom of Sarnoff and the World of RCA.

Library Automation and Networking

Academic libraries must still purchase, process, store and lend books and journals, but they must also acquire and access information in electronic form. They must do all of these things efficiently in addition to providing access to the universe of information not within their walls. To quote Richard de Gennaro, "Technology is making the resources within the library available beyond its walls, and the resources beyond its walls available within the library". (1) The way libraries manage these accomplishments is in great part related to an increasing use of telecommunication networks. We will illustrate and explain some of the current library uses of telecommunication networks and look at ways an expanded high-speed network which connects private and public sector, business and educational research endeavors will impact libraries.

Processing

Libraries use machine readable bibliographic descriptions to create online public access catalogs in addition to typed, handwritten, or manually produced catalog cards created prior to the mid 70s. Twenty years ago, a library catalog department may have housed 20 or 30 catalogers describing all the new books and journals acquired for the library. We still have all those personally produced records, but today the catalog department has far fewer staff, and those remaining search national bibliographic databases for records which match the new books and journals in hand. They may make minor changes in the records, but they acquire the text of the record over telecommunications lines, depositing them one by one into the local online catalog.

Similarly, libraries use telecommunication links to order new materials through library vendors or publishers. Electronic mail systems are widely used to speed orders to vendors. Sometimes the vendors are able to supply the matching cataloging records along with the books.

When journal issues do not arrive on time, or if missing issues need to be ordered, electronic mail systems are used to claim them. Libraries also dial into large serial vendor databases of journal holding information to determine issue availability.

[illegible]ese and many other ways, libraries make extensive use of bibliographic or commercial database searching [illegible] phone lines, and sometimes, dedicated high speed lines. The size and scope of research library collections and the need to process them efficiently mandate the use of information technologies.

National Bibliographies

The large national bibliographic databases used for processing collections also serve other purposes. The two largest databases are OCLC and RLIN. Current developments in the ways libraries and scholars are using these national bibliographic "utilities" have major impacts on telecommunication networks.

The utilities were developed for library use, not individual use. They continue to be chiefly used for cataloging functions and for resource sharing. However, both organizations have been moving toward providing individual access to their databases. OCLC is about to launch new search software called EPIC, which will allow much more flexible subject searching of the 20 million records contributed by the staffs of the 10,000 member libraries. Direct (not mediated by a librarian) patron use of the OCLC database will then be facilitated. Plans are not yet made, however, for internet access to OCLC, since OCLC is just now installing a new telecommunication network. However, it is common for libraries using OCLC to offer public access terminals in their library buildings, and with EPIC, individual use of the massive database will be easier and more effective. The Research Library Group (RLG) has already announced its plan to allow individual scholars affiliated with member universities to search its database, RLIN; and RLG has recently completed a pilot project called the Research Access Project which was designed in part to identify needs for direct searcher access not mediated by librarians. Further, RLG has announced internet access to the many research and bibliographic files in RLIN. RLG is installing its own dedicated high speed pathway, linking all the member campuses for materials processing and information transactions. Two RLG libraries, University of Pennsylvania and New York University, are developing gateways to move easily from the online catalog to RLIN.

Interlibrary Lending and Document Delivery

The largest research library cannot afford to own even a small percentage of all published works, so it must be highly selective about building collections to be housed locally. By joining organizations such as OCLC and RLG, libraries have for many years used their bibliographic databases to locate copies of research materials which have not been purchased locally. This is possible because the utilities store information not only describing the item itself, but listing all libraries owning the item. A library using either system can electronically transmit a borrowing request to the holding library, or a queue of holding libraries. Very recently, interlibrary lending meant that once the location of a needed item was found, and the electronic mail request was sent, the person needing the item waited for the U.S. mail to deliver the book or article. With recent advances in telefacsimile technology, high quality, high resolution copies can be made available by scanning and sending via phone lines. OCLC is even planning extraterrestrial library service with the Technical Library at NASA to beam information to astronauts. (2) Very recently, some libraries and library organizations are experimenting with digital scanning and digital sending, using fiber technology and the internet or components of the internet. The RLG anticipates using its dedicated network at night for large volumes of fax transmissions so that rush interlibrary loan requests need not depend on the mail. RLG is also developing a document transmission workstation to speed both the document request and the document itself on their way between libraries and other libraries, and between libraries and scholars. (3)

Although the RLG document transmission workstation is intended to be a critical part of the library document delivery service rather than a multipurpose workstation for scholarly use, the vision of a workstation enabling information to be received directly by the scholar is not a new one. "In 1945, Vannevar Bush urged scientists no longer dedicated to the war effort to turn their creativity to making knowledge more accessible. The device he pictured, which he called a "memex," was a desk which incorporated a numerically controlled microfilm store, reader, and camera. The stored information would include both published works and personal records; several items could be viewed simultaneously at high resolution....The computer had not yet emerged from the closed doors of the wartime cryptography department, but Bush's vision of the scholar's workstation is still a goal for the library of the future." (4)

Electronic Storage of Full Text

Vannevar Bush looked toward microtext for solutions rather than storage of text in digital form, but it is possible that the next step toward Bush's ideal scholar's workstation is about to be taken. Once the library scans or receives the document, and before it relays the document to the requestor's fax machine or computer, the library will store the document in analog or digital form, complete with illustrations, and link it to a bibliographic record for retrieval upon the next request. There is present experimentation with digitization of photographic and other graphic data for storage on compact disk or videodisc. Is this a form of publishing? What are the copyright ramifications? How much storage will libraries use? What involvement will libraries need with optical technology on site? How long should such documents be kept? Will publishers become the archive for their publications, instead of libraries? These and other public policy issues have been cited by Clifford Lynch as areas of great interest to libraries. (5) As scanning technology improves and standards evolve for document compression, the solutions to these questions will be addressed in the near term.

Library organizations such as OCLC and RLG are key to policy development on these and other related issues. At this time, both RLG and the American Library Association, as well as many states which are establishing statewide fax networks, are developing interlending policies and protocols for new delivery methods. Clearly, these policies will affect telecommunication traffic loads, and will lead to the resolution of many copyright, fair use, telecommunication access and scholarly communication issues.

Commercial Document Sources

There is a link with the commercial document delivery sector. Competing with libraries as sources of documents are many nonprofit and for-profit electronic delivery systems. Among these are:

1. ADONIS (Article Delivery Over Network Information Service)
2. ARTEMIS (Automated Retrieval of Text from Europe's Multinational Information Service)
3. Scientific Delivery System
4. EIDOS (Electronic Information Delivery Online System)
5. APOLLO (Article Procurement with On-Line Local Ordering)
6. Transdoc
7. Knowledge Warehouse
8. Project Mercury
9. ISI's Genuine Article Service
10. The ERIC Document Reproduction Service
11. Chemical Abstracts Service
12. University Microfilms International Document Service

It is worth noting that these organizations and the fees they charge affect the library's choices for the most effective way of obtaining needed information. This in turn will affect interlending operations and their cost effectiveness. If commercial document sources were on high speed networks alongside major research libraries or even publishers (a great many academic publications are now owned by a handful of large corporations) some interesting developments might occur. At this time, it is generally less expensive for the end-borrower to use libraries, but only because academic libraries are willing to absorb costs of delivering documents not owned locally to their primary clientele. RLG is considering a pilot project with UMI to include this company's serials holdings in the RLIN database so scholars will have easy access to the choice of using either UMI or interlibrary loan.

Take a moment to think about what part of the scholarly communication marketplace w elong to academic libraries and what part will remain in the private sector, as well as new ways they may be intertwined. The datafile produced by the scholar is the basis for research findings. The database itself will be 'published' by listing and describing it in library resource files in association with ICPSR - like consortia which archive and send copies. The published findings, possibly in electronic form, are indexed by the private sector, as always, burt the indexes are available on library catalogs. Procedings indexes and journal indexes are produced commercially. Libraries are likely to continue to enhance access to listings and delivery of documents, and may move toward distribution systems for not-very-profitable areas such as small scholarly markets, while the private sector will profit through activity in larger academic markets.

Special Collections an Scanned Images

The nature of available documents is changing, too, and in a way which might greatly affect telecommunication traffic. Digitized text, especially text with graphics or other images, consumes a considerable amount of storage space and telecommunication time. There are several pilot projects experimenting with scanning images with the intent of making them available to remote researchers The Library of Congress' American Memory Project is one example, and the National Agricultural Library's NAIN project is another. In the NAIN project, the National Agricultural Library (NAL) and the North Carolina State University (NCSU) Libraries will establish a telecommunications link through the Internet which will enable NAL to transmit digitized page images of requested material to NCSU. This demonstration project will test the technical feasibility and administrative structures necessary to capture, transmit, and receive machine-readable page images at remote sites. (6) A benefit to the scholar is clear: special or rare collections unavailable until now for examination without a site visit may be scanned, stored and retrieved from storage for transmission to local campus networks.

Preservation

Those who are concerned with the role of the library as the archive for preservation of information regardless of format are considering questions about the role of the library in preserving electronic images, including questions about the potential of scanning and storage of information as a preservation method. The Commission on Preservation and Access has recently appointed a Technology Assessment Advisory Committee to address these very issues. "Obviously, the goal is not only to produce a copy of a deteriorating item with relatively permanent life and of comparable or even enhanced quality and definition, but to provide copies that can be electronically stored, searched, disseminated, and reproduced in suitable print form from remote locations in a manner that is both convenient and cost-effective for the library and its users. ...Over the next few years, the Committee expects to concentrate on such areas as electronic image capture or scanning, compression and enhancement, optical character recognition, storage devices, transmission networks, workstations, user interfaces, searching algorithms and printing devices." (7)

Union Catalogs

In the past, the library card catalog was usually intended to provide an index to the material owned by that one library. Some groups of libraries had card catalogs called union catalogs because the catalog listed and described material owned by more than one library. It is now common for libraries to join together in international, national, regional and local networks to share the expenses of automating. The online catalogs of these groups of libraries contain information about the collections of all libraries in the shared automation project. This means the concept of a single catalog for a single library is no longer assumed to be the case. At the national level, one of the newest networks for such resource sharing is called LEGEND - Legal Electronic Network and Database. LEGEND provides law libraries with an authoritative database for legal materials and an effective way for some 500 law libraries to create, send and fill interlibrary loan requests using the OCLC Interlibrary Loan Subsystem. (8) It is also very common for regional resource sharing to be promoted through the development and use of regional online catalogs. The MELVYL system in California is a well-known example. The three major research libraries in the Research Triangle of North Carolina is another example, since the three libraries share the use of TRLN, a public access catalog. Some state legislatures have been funding efforts to link research libraries in the state to enhance availability of research resources to the taxpaying public. In Indiana, where the major research libraries all use the same catalog software (NOTIS), a Notis-to-Notis link has been funded for development. In Michigan, all the major research libraries use NOTIS and will be searchable on MERIT. In some cases where the major state resource libraries are not on the same automation system, the linkage is more difficult, but is still being developed. In Colorado, a system called IRVING provides baseline search capability for dissimilar online catalogs. Even the utilities are beginning to look at technical issues of interconnectivity; a RLG/OCLC technical paper is underway.

External Library Resources

Recently, some research libraries have been adding more than local or regional library information to the catalog. For instance, many of the bibliographic records of the Center for Research Libraries collections (located in Chicago) can be added to the catalog of any member. The Center for Research Libraries acquires expensive and often little used research material which then becomes available to all members. The local online catalog containing CRL catalog records will retrieve entries for material located in Chicago and available for loan even if the searcher and the member library is in California.

Journal Article Access in the Catalog

A growing number of libraries are taking this concept further by adding databases to the online catalog for nonbook material such as indexes to journal articles. The index to journal articles may be accessible to the user using the same search engine as the online catalog if it is loaded as part of the online catalog. Even if it is not part of the catalog, the journal article file is usually listed on a menu along with the book catalog. The library has the choice of adding article level indexing for journals not in its own collections by leasing access to commercial indexes, or it may index only journals in its own collections or the collections of its cooperative automation consortium. In this way, indexes to journal literature are available to any campus network user, or through dial access to the library computer. In the past ten or fifteen years, this could only be accomplished through the use of dial access programs where the trained searcher dials into a remote mainframe mounted journal index made available by database vendors. This is a case where telecommunication based use of data files by libraries is already decreasing. However, the potential for another substantial change in data access exists: the ideal access method for commercial journal indexes might involve internet access made available by the producers of databases rather than phone line access through vendors.

The definition of a library catalog has forever changed. (9) Catalogs no longer provide an index to owned materials, but to materials available globally for access via interlibrary lending or commercial document delivery services.

Direct Search Access to Catalogs

Moreover, individual online catalogs are increasingly available for searching on the internet. The current list on the Humanities Bulletin Board on the Internet contains over 25 major research library catalogs. This could change the process of access to the scholarly record, as research libraries continually increase the size of the databases of machine readable catalog entries through conversion efforts from card form. However, proprietary or commercial files included in individual online catalogs may be problematic for the internet user. CARL, the Colorado Alliance of Research Libraries has, for example, an electronic encyclopedia mounted and available to CARL members. It is not available without password authorization to those dialing in or coming in through the internet.

Information for Distance Learning

As remote access to library catalogs becomes even more universal, libraries become better equipped to support the information access needs of those involved in extension education programs. As the NREN is linked to state or regional telecommunication structures, we envision improvements in access to educational programs available through telecommunication, interactive learning, video and data communication. Even the most remote geographic region can be a local phone call away from continuing education, extension degree programs, teacher training programs, or partnership programs between secondary and higher education. Library, lending, and information service systems supporting such educational initiatives are vital.

Information for Economic Development

Just as information access plays a critical role in extension or distance learning initiatives, so does information access enhance and encourage economic development. Public libraries and state funded academic libraries are sources of business, market, and technical information key to economic growth. Remote access to business and technical information through regional library cooperatives and document delivery systems based on high speed networks are already present in some states and regions, and are under development in others. Expanded access to educational networks for these purposes is in direct support of state-based economies, or third world economies.

MRDF

So far, we have discussed the library's role in using telecommunication networks to access descriptions of printed material. Although the much proclaimed paperless society has not yet occurred, libraries are indeed acquiring information which is made available only in electronic form. Electronic bulletin boards, electronic journals, U.S. government literature indexes published on compact disk, data files and access software distributed on compact disk, and information sources such as the electronic encyclopedia just mentioned are all available in libraries.

Nonbibliographic data is often accessible in the library in machine readable form, and aggregate data sets are widely available through ICPSR (Interuniversity Consortium for Political and Social Research). Some universities involve the library as the source of access to and information about such aggregate data tapes.

The two utilities (OCLC and RLG) have recently announced a cooperative project to make available both cataloging describing the ICPSR tapes and the code books accompanying the tapes. In addition to files from ICPSR, RLG is now exploring arrangements with the Oxford Text Archive, ESRC Data Archive, and the Rutgers/Princeton Center for Machine Readable Texts. Machine readable data files on compact disk as well as in other formats are in libraries of all types, including small public libraries. Library involvement in management of machine readable data files (MRDF) is raising many questions. According to a recent RLG study:

> "MRDF itself is a generic term covering a wide variety of electronic information in terms of both physical format and data content. MRDFs can be a computer program, a collection of raw data, or a combination of both. Data itself may be numeric, textual, graphic, or a mix. MRDFs may exist on floppies, laser discs, magnetic tape, or hard discs. Data files may be static or dynamic. The data itself may be unique or exist in a variety of formats and combinations. The information may be public or private. MRDFs may be stored locally or accessed from a remote site. Some of these files are intended for public consumption, having excellent documentation, while others have been created by individuals for personal use without any initial intent to make the data widely available. Data files of the latter type often have little or no documentation and are not "robust" (thoroughly tested). Some MRDFs may be accessible as they are acquired; others may require extensive programming before they can be used by faculty and students. Individual MRDFs may require certain equipment and/or specific operating systems to be useable. Certain formats and/or publishers of MRDFs may require "stand-alone" workstations, while other sources of electronic information may provide formats and licensing options which allow data to be networked within the institution. This technology brings a dimension to information resources and their use and management that raises new issues for collection management and development, ranging from identification, selection, funding, and acquisition to cataloging, housing, disseminating, and sharing." (10)

Recently emerging as a major player in access to scholarly data files are the library consortia. RLG has assumed a critical development role through its PRIMA (Program for Research Information Management) project. As a result of PRIMA, several nonbibliographic data files will be available on RLIN. One of these is the MEMDB, the Medieval and Early Modern Data Bank. It was created by scholars at Rutgers University, and through a funded project, was made accessible by search software. The first phase of the project involved publishing the database on disk, but the next phase involves access via RLIN. Another RLIN file is Research In Progress, a file of entries and abstracts of journal articles accepted but not yet published in several journals indexed by the Modern Language Association as well as a number of women's studies journals. RIPD also contains information about funded research. Another 'early alert' file may be a table of contents service from Engineering Information, Inc. for very recent literature not yet indexed. With such a growing variety of nonbibliographic research data available through library organizations as well as in individual libraries, direct use by scholars of these resources is highly likely to increase.

New Forms of Scholarly Communication

A new wrinkle in the development or publishing of research findings and the publishing of research data is now being explored by Johns Hopkins University Medical Library. In this experiment with the publishing process, the text is mounted on a database, accessed by readers, students, and critics who respond directly via E-mail to the author. (11) This interactive process has also been proposed recently by Sharon Rodgers (12) as a way to revolutionize the scholarly publishing process. In her model, a working draft would be circulated to readers electronically before comments are cumulated into the finished version for review by referees.

Libraries and the NREN

Title II of Albert Gore's bill (National High-Performance Computer Technology Act of 1989) creates the National Research and Education Network. Title III addresses the National Information Infrastructure. This infrastructure includes 1) a directory of network users 2) access to unclassified federal scientific databases, 3) prototyping of computer chips and other devices using centralized facilities connected to the network, 4) databases and knowledge banks for use by artificial intelligence programs, and 5) provision for international collaboration among researchers.

If we examine each element of this "infrastructure" in relationship to academic libraries, we find that academic libraries have a long history of:

1. Using technology to build and maintain directories of network users;
2. Providing access to a variety of databases;
3. Working with applications and systems programmers to develop prototype front-ends, protocol converters, database loaders, search engine software, etc.;
4. Providing access to local and network-based non-bibliographic databases and knowledge banks; and
5. International collaborations related to information technology.

Academic libraries will continue to use information technology to process collections, lend materials, deliver documents, access bibliographic utilities and other database vendors, provide access to local and network-based non-bibliographic databases, and provide access to their own catalogs via the internet. The major difference for academic libraries between the present and the future is the increasing extent to which they must be at the forefront of plans to design the network management system which pulls these resources together and permits our primary clientele to access these resources in a standard, consistent, and intuitive manner.

What then will be the role of libraries as a part of this infrastructure? In a presentation given at the May 1989 meeting of the Association of Research Libraries, Kenneth M. King of EDUCOM cited the Library of Congress (LC) Network Advisory Committee charge to research libraries as related to the emerging national communication network. Libraries will be responsible for "collecting, preserving, organizing, presenting, and managing scholarly information regardless of format, for the design of the network knowledge management system which permits scholars to access information resources in a standard, consistent and intuitive manner, for connecting libraries to the network and managing interlibrary interaction and bibliographic resources on the network, and for supporting scholarly access to network information resources." (13) Taken further, we think the library community will develop directories of data points. Libraries will be responsible for archives of electronic information and for preservation and ensured access to public information. Libraries will be responsible for library-to-library communication protocols. They will be responsible for user education and training in the use of information resources. Libraries have already been critical in the development of standards for command language, and will continue to be critical in implementation of user interfaces with data files, whether they are bibliographic or non bibliographic in nature. The library community has long been active in the standards community (another example is the work of libraries with publishers to encourage the implementation of a standard markup language for electronic manuscript editing) and have gone on record supporting the ISO/OSI standard. Despite the fact that our campus networks and library automation systems are using TCP/IP, libraries have also been leading the way with OSI based pilot projects such as the Linked Systems Project now underway between several large academic libraries, the Library of Congress, OCLC, and RLG. (14)

NREN's Impact on Libraries

In order to accomplish any of the charges proposed by LC's Network Advisory Committee, academic libraries must first have an active role in planning information policy for the campus. Research libraries must ensure that they are connected to the campus networks, so as to provide state of the art telecommunication pathways to external and campus resources. Research library staffing and library organization charts must shift. One recent gaze at the future of academic libraries (15) predicts flatter organizational structures, greater numbers of non-library information professionals, (including computing professionals) and structures supporting the outreach of information services from the library to scholars according to discipline-based needs. These changes will be mandated by the fact that scholars will increasingly see their local library as one of many sources for the scholarly record. Their needs for assisted information access will occur wherever they work and access information networks -- in their homes, offices, labs and while visiting colleagues at other campuses.

Research Libraries must also form partnerships with other key players in the information infrastructure. A recent example of such a partnership is Informa, a forum for users of IBM technology in libraries. The goals of Informa include emphasis on better communication between IBM and the library community, encouraging innovation, articulation of the role of the library within the educational and scholarly communication process, and stronger partnerships for information access and delivery. In real terms, it is a lobbying effort to help inform and shape vendor-client-application relationships.

At the national level, research libraries must play an active role in influencing the development of national information policies. The NREN legislation is of interest to the Association of Research Libraries' Task Force on Telecommunication, which is working on developing statements defining the implications of migrating to a new national research and education network. As previously mentioned, the Library of Congress Network Advisory Committee has made strong statements on the library community's responsibilities in planning for the NREN. Libraries must therefore be part of the decision-making group which shapes the uses and resources of a new national network. Library voices must be included in the dialogue to answer important questions such as "Who will determine what commercial agencies have information, databases, or services available on the NREN?", and "what will the determining factors be in deciding what information or products will be accessible via the NREN by and for the public good." (16)

What element of the library community will emerge as the agency which represents our voice? One possibility is the Association of Research Libraries. It has in the past functioned as a lobbying group, as does the American Library Association, and as the professional organization closest to the scholarly community of higher education, could well begin to coordinate the policy articulation agenda for academic libraries. Its membership includes libraries affiliated with both OCLC and RLG. OCLC and RLG both have research and development offices staffed with information management professionals and librarians. We recommend that the ARL, perhaps using its Task Force on Telecommunications, should work with OCLC, RLG, and the Federal Coordinating Council for Science, Engineering, and Technology to establish the forum to address and ultimately create the "infrastructure" proposed by he NREN.

REFERENCES

1. De Gennaro, Richard, "Technology and Access in an Enterprise Society", Library Journal, October 1989, p. 42.

2. Online Computer Library Center, OCLC Annual Report 1988/1989. (Dublin, Ohio: OCLC, 1989) p. 16.

3. Lerche, Carol Farlow, Prototype Document Transmission Workstation (Draft for Review, 9/6/89. (Mountain Vi , California: Research Libraries Group, 1989).

4. Arms, Caroline, "Libraries and Electronic Informa n: the Technological Context, Part Two." EDUCOM Review, Fall 1989, p. 35.

5. Lynch, Clifford A. and Brownrigg, Edwin B., "The Telecommunicati s Landscape: 1986", Library Journal, October, 1986, p. 45.

6. "NCSU Libraries Awarded Joint Grant with National Agriculture Library," The NCSU Libraries Focus, 9 (3/4), 1989.

7. Brown, Roland C.W., "Development of a Technology Assessment Agenda," Commission on Preservation and Access Newsletter, September, 1989, p. 2.

8. "Legend is a New Network for Law Libraries," OCLC Newsletter, July/August 1989, p. 31.

9. "Locally Loaded Databases In Online Library Systems," Information Technology and Libraries, Special Issue, June 1989, pp. 99-185.

10. Managing a New Library Resource: Results of the RLG Machine-Readable Data File Project in Six Member Libraries. (Mountain View, California: Research Libraries Group, Inc., 1989).

11. "Information Tug of War: Consumers vs. Creators," The New York Times, 16 August, 1989, p. B10.

12. Rodgers, Sharon, "How Scholarly Communication Should Work in the 21st Century," Chronicle of Higher Education, October 18, 1989, p. A56.

13. King, Kenneth M., "The Role of Research Libraries in the Emerging National Communications Network", presentation at the 114th Annual Membership Meeting of ARL, Providence, Rhode Island, May, 1989.

14. McCoy, Richard W., "The Linked Systems Project: Progress, Promise, Realities," Library Journal, October 1986, pp. 33-39.

15. Woodsworth, Ann, et.al., "The Model Research Library: Planning for the Future", The Journal of Academic Librarianship, July 1989, pp. 132-138.

16. U.S. Congress, Office of Technology Assessment, High Performance Computing and Networking for Science - Background Paper, OTA-BP-CIT-59, Chapter 3, (Washington, D.C.: US Government Printing Office, September 1989), pp. 21-36.

Panel Discussion

National Networking Update: How It Affects Your Institution

Michael M. Roberts
Vice President, Networking
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Susan Calcari
Site Liaison, Information Services
MERIT/NSFNet

J. Gary Augustson
Executive Director
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Telecommunications are re-shaping the way that universities will teach, research, and collaborate. This panel presentation provided the latest information on national networking initiatives including CREN (the new corporation that will operate the merged BITNET and CSNET), NSFNet, and the coming National Education and Research Network. Panelists also described national legislative and funding issues that are shaping higher education networking for the future, and explained how campuses will be affected by these initiatives.

A brochure describing the NREN is available from the Coalition for the National Research and Education Network, 1112 16th St. NW, Suite 600, Washington, D.C. 20036; phone (202) 872-4215.

(Paper not available)

TOWARDS NEGATIVE ENTROPY: A STRATEGIC PLAN

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ABSTRACT

A fundamental concept of nature is that living systems without adequate "information flow" will utilize large amounts of energy (resources) while tending towards disorder. Our campus is such a living system and it has been the objective of a five-member campus team, with the support of administrative officials, to reverse this process.

After defining the "disorder", we have devised "A Strategic Plan for Communications at Winthrop College." This plan has two major goals: (1) to establish Information Technology standards on a campus-wide basis for information system network service centers and for end-users wishing access to and support from the network service centers, and (2) to install a campus-wide infrastructure network optimizing connectivity and interoperability between and among information processing systems while providing comprehensive end-user access. Our tactics and strategy will be provided together with accomplishments to date. This is a real-time activity with plans calling for budget and specifications by August of 1989.

Towards Negative Entropy: A Strategic Plan

INTRODUCTION

By way of introduction, we would like to provide a conceptual framework from which we can view the information resources and communications within our campus organization. We find it useful to think of our campus as a living system, analogous to single celled organisms, humans, or societies. We then may apply, by analogy, certain ideas from the fields of systems and information theory, and thermodynamics to such a system.

We use the term "system" as a set of units with common properties. The interactive relationships between the units are ones of constraint, control, and dependence. The "campus as a living system" is therefore all internal organizational units, from the academic departments to the office of the president, that function towards common goals in a predetermined structure or hierarchy. This living system is comprised of individuals and groups who process information for the system. In this article, information is considered a measure of the ***order*** or ***form*** of communicated or transmitted media and not the media itself. The "media" is considered to be that matter/energy which is able to be transmitted and assimilated and includes such forms as data, voice, video, graphics, and security signals.

The law of "Degradation of Energy" or "Second Law of Thermodynamics" suggests that disorder, disorganization, lack of patterning or randomness is the natural progress of a system from ordered to disordered states. Information is a negative index of uncertainty or disorder. For an organization to progress in an orderly fashion towards common goals; individuals, groups, and units within the organizational system must be able to acquire meaning or significance from processed information. It is through meaning and acquired knowledge that living systems change their processes to adjust to changes in their environment. Without information, media will be utilized, but no meaning or knowledge acquired. Information provides the power of organization, lack of information results in natural disorder, and the subsequent degradation of the organization.

Winthrop College has as its mission two fundamental aims: (1) the fullest possible development of each student as an educated person, and (2) the preparation of students for professional careers. Education is the effective transmission of knowledge and skills to students. If the college, a living, open system in competition with other similar systems, cannot process information effectively and efficiently within its internal units, it will not be able to reduce the internal strain that such systems experience. The system's organizational and operational integrity will diminish to the point of dysfunction. Biologists associate this progressive systems failure with aging and mortality.

We at Winthrop College are attempting to provide the means by which various media may be effectively ordered and communicated to maximize the transmission of information. We plan to do this by (1) establishing standards for the control and transmission of media as information and (2) creating a campus-wide communications infrastructure for its transmission.

The vehicle for effecting this change is Winthrop's "**Network Project Team.**"

Genesis of the Network Project Team

The committee that ultimately gave rise to the Network Project Team had its beginning in 1980 when Winthrop went in-house with administrative computing. Appointed by the president and named the "Computer Coordinating Committee," it had as its mandate "to ensure that all administrative units desiring computer assistance would be served."

By 1983, campus computing resources, especially microcomputers and microcomputer software, were expanding significantly. In an attempt to manage this rapid expansion of computing resources, the appointed committee was re-commissioned by the administration. The committee was to scrutinize the personal computer purchase requisitions and consult with those departments making requests that did not appear to be cost justified. Having no formal authority, the committee was not regulatory and had no effective role in controlling purchases.

In 1986, the President appointed a "Computer Utilization Committee," which was comprised primarily of the members of the previous committee. Moressi, Laster and Mitlin were asked to serve again, along with three other persons. No explicit directives were provided except by way of the name of the committee.

At our first meeting, in December 1986, there was a consensus from the group that we needed some definitive objectives the committee could attain. While exploring possibilities, we got into a rather animated discussion about the great difficulty the campus information resource centers experience in trying to provide services beyond their immediate physical domain. We also recognized that we were not even able to share resources because of the absence of standards between systems.

The committee decided it would define the problems and do a preliminary analysis of data communications, or lack thereof, on campus. The study would define the ***scope*** of the project, identify the ***information service centers***, and address the issues of ***standardization of services*** and ***campus communications***. With this information in hand, we would recommend to the President a course of action for the committee: plans for the establishment of a campus-wide network for Winthrop College.

The President and other senior officials became convinced of Winthrop's communications problem. We were directed to begin a feasibility study and to search for practicable options for networking the campus. At this juncture, there was no stopping us! Our next move was to identify ourselves as a group with a specific purpose. We adopted the name "Network Project Team."

Evaluation of Campus Disorder

In preparing the feasibility study, we found that information technology disorder fell into two categories: technical and non-technical. We further observed that the non-technical disorder, which can be defined as lack of coordinated control, resulted in the technical disorder.

- The three computer centers on campus use different computers and dissimilar communications protocols and transmission media. Sometimes there are three types of cable covering the same route.
- Communication line facilities evolved as opposed to being the product of design; there are no provisions for growth or change. There is no allowance for the integration of such communications media as voice, data, security systems, graphics and video.
- There is no single source to identify what communications lines and conduits exist and where they are located.
- Telephone lines have to be used for local connections because of the absence of conduit or other forms of direct connection.
- The telephone system and its administration operates independently of the computer centers. This arrangement precludes careful planning for multi-media transmission.
- Special lines outside of the telephone switch must be requested when attempting to communicate on or off campus with computers or terminals.
- An inordinate number of personal computer hardware/software systems have been purchased for use by Winthrop personnel. Service center resources cannot begin to support the great variety of hardware and software systems.
- No guidelines or standards exist for the acquisition of personal computer hardware and software. Thus, users are often left unsupported and unable to properly utilize their systems.
- Without controlled coordination of the information technology function, each of the existing service centers make independent attempts to communicate and share resources. The processes employed are usually complex and circuitous.
- The absence of standards impacts functionality, service and budgets.

DEFINING THE CAMPUS ENVIRONMENT

Another component of the feasibility study was a definition of the campus environment.

Two important factors that must influence the formulation of systems objectives are *organizational constraints* and the *people who use the system*. A term currently being used does a good job in describing these factors. It is called "organizational culture." Organizational culture addresses issues of money, people, time, and facilities and how each are allocated. In other words, the organization defines its priorities by the very nature of its existence. It follows that an understanding of this "nature of existence" is paramount to planning for change.

Because of this maxim, a determination of the culture of our campus was in order. Our starting point was the identification of campus-resident providers of computer services, and consideration of the niche or placement each occupied in the organization.

We defined three information system service centers: Academic Computing, Management Information Services and Library Information Systems. Each utilized a combination of mini-computers and micro-computers representing multiple vendors and had no protocol or media compatibility with each other. Each center was located in a different building.

The Academic Computing Center's primary role is to provide the tools needed by students and faculty for course-work requiring computers. We found that another important role has emerged and is growing in the area of faculty and student research. The Academic Computing Center also provides management of curricula and other functions directly associated with academics. Communications with other colleges and universities are made possible by communications links through the Academic Computing Center.

The role of Management Information Services is to provide computing resources for administrative functions common to all colleges and universities. The scope of services has been extended to include the administrative functions of the academic units.

The Library Information Systems center exists to provide a computerized public access catalog and internal library record keeping. Provision is made for access by author, title, subject and keyword.

As for the organizational placement, each of the service centers resides in the fourth layer. The Academic Computing Center and Library Information Services are aligned under the Academic Vice-President. Management Information Services is controlled by the Vice-President of Finance and Business.

Given this organizational structure the three centers have had no common ground for achieving unity of purpose.

The remaining component in defining the campus environment was to determine what other isolated computer uses existed, if any, and what functions were being performed by the computers.

To accomplish this a one page Information Technology Census form was prepared in summer of 1987 that asked each department to list the number of terminals and "intelligent" devices located and utilized in their area. We asked for manufacturer, model, and description.

Analysis of the data revealed that the campus used 6 types of display terminals and over twice as many types of printers. We had at that time 365 personal computers representing 13 different vendors in 24 buildings.

Since the display terminals were connected to the service centers, we knew what functions they were performing. We also knew that 170 of the personal computers were in PC laboratories. Exactly what was being done with the remaining 265 personal computers was unknown to us.

STRATEGIC PLANS

Our strategic plans are for the development of an Information Resource infrastructure at Winthrop College. The plans have two primary goals: (1) the establishment of campus-wide standards for information resources, and (2) the installation of a campus-wide communications network infrastructure.

GOAL 1: to establish Information Technology standards on a campus-wide basis for information system network service centers and for end-users wishing access to and support from the network service centers.

Objectives: Plan of action to:

O(1): *Provide network software standards.*
Timeline: July, 1990

O(2): *Provide network architecture and hardware standards.*
Timeline: July, 1990

O(3): *Provide specifications for a data exchange standard between computing systems.*
Timeline: July, 1990

O(4): *Develop standards that will define resource services the information service centers provide.*
Timeline: July, 1990

GOAL 2: to install a campus-wide network infrastructure optimizing connectivity and interoperability between and among information processing systems while providing comprehensive end-user access.

Objectives: Plan of action to:

O(1): *Define the campus's information resource service facilities.*
Timeline: December, 1988

O(2): *Define the campus's communications environment.*
Timeline: January, 1989

O(3): *Evaluate several networking technologies that could meet the needs of Winthrop College.*
Timeline: August, 1989

O(4): *Compare networking alternatives on a cost-benefit basis.*
Timeline: August, 1989

O(5): *Recommend establishment of organizational structure(s) for the support of the communications network.*
Timeline: July, 1990

O(6): *Develop proposed system specifications.*
Timeline: August, 1989

O(7): *Implement system in phased approach.*
Timeline: 5 year installation.

PLANS vs REALITY: Accomplishments & Adjustments

GOAL 1: Establishing IT standards

Standards are to be:

- developed with consideration of the finite resources of the service centers.
- developed with consideration of the average user.
- maintained and updated on a regular basis to reflect current and anticipated changes in technology and needs of users.
- flexible enough to allow for information systems development and expansion, and for changes in user's requirements.

O(1): Establish network software standards.

We are considering standards that are not only compatible with currently used technology, such as the International Standards Organization (ISO) Open Systems Interconnection (OSI) and Transmission Control Protocol/Internet Protocol (TCP/IP), but those that would ensure flexibility with future technological advances.

O(2): Provide network architecture and hardware standards.

Hardware interfaces must be selected based on the current equipment and near term hardware expansions of the service centers. We have yet to decide on an appropriate architecture and hardware interfaces.

O(3): Provide specifications for a data exchange standard between computing systems.

The three service center directors are coordinating th effort to establish standards for communications between our host computer systems. In addition, the committee is considering such systems as minicomputers, microcomputers, telephone circuits, video systems, security and emergency systems to determine their capability to adopt a data exchange standard.

O(4): Develop standards that will define resource services the information centers provide.

Standards will be developed for the three campus information systems and users of such services. These should clearly define the hardware, software and systems consulting and support source(s) and resources to be provided by the centers.

GOAL 2: Install campus-wide communications network infrastructure

O(1): Survey campus for Information Resource service facilities.

This has been accomplished. The three major information service centers on campus have been identified: The Academic Computing Center, Management Information Services, and Library Information Systems. Considerable detail has been accumulated on end user systems and data entered into database systems for analysis.

O(2): Survey campus for all existing communications lines and services, including telephone.

Most buildings on campus have been surveyed and data has been recorded as to the number of voice lines both in place and required and the number of data lines in place and required. Data has been entered in a database system for analysis.

O(3): Evaluate several operationally feasible networking technologies that may best meet the needs of Winthrop College.

Several vendors have been invited to informally review Winthrop's networking needs and provide some viable solutions. Members of the NPT have also visited several sites where networks of interest were installed.

A hybrid data switch/LAN is visualized. We have already had several companies demonstrate data switching capabilities on our campus.

O(4): Compare networking alternatives on cost-benefit basis.

We have not settled on any unique alternatives to provide definitive costs, although we have made some estimates based on a hybrid data switch/LAN.

The college's administration informed us of a possible "Step 12 Formula" funding for the network through the South Carolina Commission on Higher Education. We applied for this funding, estimating costs for using a data switch with existing telephone wires as opposed to rewiring the campus for a LAN configuration. On a projected basis, it appeared to be more cost-effective to eventually rewire the campus thus giving us the option of using a full LAN or a combination switch and LAN.

O(5): Organizational structure for support of network.

Two preliminary steps were taken in this direction:

1) in our proposal for network funding to the S.C. Commission on Higher Education (6/89), a budget allocation was made for campus network staff.

2) we reviewed campus Information Technology coordinating problems with the vice President of Academic Affairs and President (9/89).

O(6): Develop proposed systems specifications.

We have inventoried most all types of computing and communicating equipment on campus, identified most all buildings needing communications down to the room level in need of communications, located communications conduit in existence. For each of the service centers we have analyzed the current data traffic flow and expected traffic flow. With this data we have listed a number of specifications for service center and end user requirements.

O(7): Implement system in phased approach.

The *first phase* of the LAN implementation will be twofold: (1) to provide for all *existing* end-users, service to the host-systems through the network, and (2) to install a fiber optic backbone between existing host-processors with standard protocol software. The *second phase* will be to expand LAN facilities and install network software to provide for complete campus connectivity and interoperability.

SUMMARY

Conceptually, we relate our campus organization to a living system; a system that utilizes energy to do useful work. The better organized a system is, the greater is its so-called "information content" and its ability to use energy to do constructive work.

Our actions over the past two years have been to develop a plan and specifications for a more ordered structure for media such as data and voice; and for an appropriate means of transmitting these media both within and external to the organization.

We have set the plan into action and accomplished such tasks as defining major information resource centers, surveying the campus for central processors and their associated major software systems, and for communications equipment. We surveyed for voice and data lines on a room-by-room basis in most campus buildings. We surveyed for existing underground conduit and subsequently developed AutoCAD diagrams of the campus graphically depicting our results. We have invited interested vendors to present their networking strategies and made site visits to academic institutions and corporations. All this was done in an attempt to help us better define our information resource "problem" or disorder.

The data have been analyzed, problems identified, and the structure for solution(s) provided. We have submitted analytical reports and provided communications demonstrations to the upper administration. We developed a strategic plan for campus information resource standards and a communications infrastructure, and submitted a proposal for funding of the project to the State of South Carolina.

We plan, with the continued support of our administration, to be able to effect changes in our organizational environment that will allow us to progress to a state of "negative entropy." With these changes we may continue to grow in functionality, productivity and complexity with the ever increasing information demands made on our organizational units.

CHANGING WORLD BRINGS STRATEGIC CHANGES AT PENN STATE

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In 1983-84, The Pennsylvania State University developed its first Strategic Plan for Telecommunications that projected needs for 10 years. Now, five years later, changes in the world of telecommunications and computing have forced a new look at where the University should be heading. Completed in October of 1989, the new Strategic Plan recommends changes in some cases but reaffirms many of the initiatives contained in the earlier report. For example, the 1984 Task Force thought it was daring to call for 64 kilobits per second to every desktop. Yet today, Penn State provides networks performing at 10 and 80 megabits per second and expects even higher speeds in the future. On the other hand, the fiber optic network and the intra-building cabling standard have been re-validated. Besides providing a clearer focus on the future, an important objective of the strategic planning process is to foster increased confidence and renewed commitment to view telecommunications as a strategic resource at Penn State.

Introduction

Penn State's geographic dispersion creates unique communication problems. Until five years ago, many units of the University solved these in a mostly ad hoc and uncoordinated manner. However, in October of 1983, as the breakup of AT&T was imminent and telecommunications technology was advancing rapidly, the President's Office created a Telecommunications Task Force to study the problems and opportunities these changes presented in the context of Penn State's system-wide needs. The Task Force, representing the University's broad interest in voice, data, and video, presented its Strategic Plan for Telecommunications in October, 1984, after an intensive year of work. The Plan recommended how the University could best approach its changing telecommunications environment.

The focus on telecommunications allowed substantial progress in upgrading Penn State's telecommunications infrastructure, guided mainly by the objectives and strategies contained in the initial plan. With rare exception, the objectives are being implemented as planned.[1] After five years, it was time to assess changes in services, technology, and the institution and to do a mid-course correction. A planning group similar in composition to that of the original Task Force was established. Its members represented the major users of telecommunications and other support organizations upon which telecommunications has an impact. This Telecommunications Task Force II deliberated an average of two full days per month from January through September of 1989.

Mission Statement

Based on the charge to the Task Force by the Executive Vice President and Provost and on its own assessments, the Task Force took as its mission:

> To develop an overall telecommunications strategy for the University in support of all aspects of the University's mission;
>
> To define a telecommunications system to accommodate the voice, data, and video communications needs of the instructional, research, and public service programs engaged in by all academic units of the University, and to similarly accommodate the administrative and academic support needs of the University.

External and Internal Assessments

The Task Force recognized the emphasis being placed on economic development by Pennsylvania's Governor and by the Penn State administration. The members learned that the pool of high school graduates is declining, that research activities are increasing, and that education will have to expand beyond the classroom.

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[1] Arms, Caroline. Campus Networking Strategies. Digital Press, 1988.

They also found that federal regulations are changing, communications standards are being developed, and technology is advancing, opening new telecommunications opportunities-but also setting new challenges. Internally, it could be seen that competition for prospective students will intensify, Penn State will be embracing partners beyond traditional campus boundaries, and the University will be required to do more with less.

The Strategic Plan

To meet the needs it identified, the Telecommunications Task Force II has formulated a series of Goals and Strategic initiatives that will form the basis for future yearly Action Plans and which are the focus of this paper.

GOAL 1: Increase the ability of users within the Penn State telecommunications network to freely exchange information in support of teaching, research, and public service.

The focus of this goal is primarily on computers, because the Task Force believes that the next plateau in the development of the University's computing resource lies in greater interoperability between devices, ranging from desktop computers to large host centers. Effective research and education are dependent upon good communication, particularly in an environment as geographically dispersed as Penn State's. To achieve such communication, there must be a physical network that allows devices to be connected together, and a standard data communications protocol that will allow the computers to "talk" to each other.

1.1 Devise or adopt telecommunications standards as appropriate.

The first strategic initiative under Goal One recommends that the University continue devising and/or adopting telecommunications standards as appropriate for Penn State. The Office of Telecommunications (OTC) has already developed standards for backbone networking protocols, for cabling between buildings, and for wiring within buildings.

Standards will be particularly important as classrooms are modernized. The Task Force believes that classrooms equipped with contemporary technology to enhance teaching will become an important University resource of the future. Developing models for general-purpose classrooms that incorporate these resources should become a high-priority effort. Such classrooms should enable teachers to use computing devices and video units within the classroom and to connect to resources external to the classroom through data and video networks. Standards will enable this flexibility.

1.2 Enforce telecommunications standards

Clearly, however, standards do no good if they are not followed. The Task Force strongly believes that the flow of information in a major comprehensive university is as important as the flow of electricity and running water. Standardization of cabling and wiring is essential to the uninterrupted flow of information, and it is very important that local decision-makers not undermine the effectiveness of Penn State's communication system by electing not to follow the standards. Such actions have significant impact on the future productivity of users and ultimately will cost the University more money wh n enhancements to the wiring system have to be made on a piecemeal basis. Decision-makers must be encouraged to follow standards.

1.3 Define and implement s... ..rds for electronic security

As reliance on electronic information grows, so does the need for security standards. Developments in software and advances in hardware are creating new approaches to electronic data security that may be of value to Penn State, which now relies on a physically separate network for sensitive administrative data. If all users could be on a single public network, costs could be reduced and the network would be easier to use, more flexible, and more functional. A planning group should be formed to define a Penn State standard for data privacy and electronic data security that takes into account the various levels of security required for administrative and research data

1.4 Convert the Penn State network to the new OSI standards

The Penn State community's need for communication extends far beyond the boundaries of the University, and standards are as important to the flow of information externally as they are internally. OSI [Open Systems Interconnect] is a new international set of standards that will go a long way toward supporting the level of interoperability needed within the Penn State network. A planning group should be convened to develop a Penn State profile t at will identify the specific OSI protocols to be used at the Univer .cy and a small advisory group should be created to coordinate the impl..entation of these standards.

1.5 Increase connectivity by providing more LAN support

Local Area Networks (LANs) are physical networks that provide a depa.tment with opportunities for easy exchange of information among its members. Many departments lack the technical expertise necessary to design, install, and manage such a network. The Task Force .ecommends that telecommunications services be offered to support these departmental LANs.

1.6 Extend modern networking capabilities into each building on each campus through installation of standard wiring

As cable upgrade projects are completed to provide high-speed communication between buildings at each campus, the advantages of this cabling system must be extended into the buildings, most of which have not been wired for modern data or video communications. In. a-building wiring is critical in order to enable departments to easily install LANs and to have them connected to the high-speed data backbone.

GOAL 2: Provide equal service for similar applications at all Penn State locations

Goal two recognizes that Penn State's telecommunication needs range from simple telephone calls (perhaps to or from a County Extension Office), to high-speed access to supercomputers at other institutions, to delivery of instruction to on- and off-campus sites. The location of Penn State faculty, staff, and students should not disadvantage them in doing their jobs.

2.1 Provide systemwide high-speed access to the Penn State data backbone

Penn State's data backbone is especially critical for the faculty and students at the other campus locations, where information resources are not as varied or rich. By establishing high speed data links through regional communication hubs, the high-speed data backbone is being extended from University Park to all campuses, allowing faculty, staff and students access to national and international networks in addition to all university data services.

2.2 Provide all locations with dial-in access to Penn State data services

Another important means of accessing Penn State's computational resources is through dial-in connections. At University Park, faculty and students in their homes can access University computing services for the cost of a local phone call through a dial-in connection. Similar local access should be provided at other Penn State locations.

2.3 Work with Penn State information providers to attain equal access to voice-accessed information services

The voice information services that Penn State offers must also be equally available to all. Examples of such services include TIPS (Telephone Information Penn State) and the Registrar's voice response system that allows automated registration and drop/add transactions. Like computer-based information services, these information resource should be available on the same basis at all campus locations. The responsibility for providing these information services rests with the administrative offices in charge of the service--and thus the funding justifications should come from the information provider. The Task Force does, however, recommend that OTC continue to assist the information providers in developing these services.

2.4 Continue to install digital telephone switches (PBXs) and to upgrade telecommunications cable plants at all campus locations

The digital telephone switches that have been installed at several campuses make possible the larger menu of useful features (such as touch-tone dialing, 3-way conferencing, and call forwarding) that have been enjoyed for some time at University Park. As new switches are installed at the campuses, the telecommunications cable plant must also be upgraded.

2.5 Expand the Penn State satellite network

In order to derive still more benefit from the use of satellite technology for educational purposes, four enhancements to the Penn State satellite network are proposed. First, a second satellite downlink is required at all campuses (five have them now) to allow simultaneous reception of two events at each campus, thus expanding the opportunities for service (and for revenue).

Second, downlinks at County Extension Offices would take advantage of these convenient locations for groups to view instructional material. Because satellite receivers at the county offices would provide benefits for the Extension Service, for the University, and for each county, it is appropriate to divide the cost among those entities. A third enhancement proposes modifications to the satellite transmitting equipment to allow simultaneous transmission of two programs. This would alleviate scheduling conflicts, especially for programs run during early evening hours, or that coincide with short-term seminars. Finally, the Hershey Medical Center needs the capability to broadcast via the University Park transmitter for continuing Medical Education. This recommendation, which alters the original plan to install a transmitter at Hershey, eliminates the need to have specialized operational and maintenance personnel at Hershey.

2.6 Expand videoconferencing capabilities

The University has two videoconferencing systems in the early stages of development. The first has operated for four years and originates from specialized teaching studios at three campuses. A fourth will be added in spring of 1990. This system is particularly useful for credit course instruction. The second system, first demonstrated in 1988, is oriented toward administrative uses or small groups. It uses desktop workstations with built-in cameras and microphones. The Task Force recommends that both systems be expanded to include additional sites.

2.7 Help expand PENNARAMA cable service throughout the Commonwealth so as to serve all Penn State campus locations

Television is also a means of bridging the distance barriers between the University and the citizens of Pennsylvania. PENNARAMA is a 24-hour-a-day instructional service delivered to some 800,000 cable subscribers. It is provided through local cable companies via a network supplied by a non-profit consortium of cable operators known as PECS. There is no charge to the University for using this network, but so far it reaches only eight Penn State campuses. OTC should work to persuade the eligible cable operators serving other Penn State campus locations to carry PENNARAMA and to work with PECS to provide service to all campuses.

GOAL 3: Expand telecommunications support for all of Penn State's instructional research, and public service activities—wherever they are delivered

Because Penn State's clientele is becoming more widespread, telecommunications support must expand beyond the campuses and the county offices. Penn State faculty and students, for example, are increasingly involved in national and international projects and activities.

3.1 Extend network access to non-Penn State locations

There is a need for access to Penn State's information resources in non-traditional places like a farmer's field or a prospective student's home. Technologies like cellular telephones can potentially meet these needs--and

OTC should closely track the development of such technologies to ensure maximum benefits from them.

3.2 Provide access to data services not available through national research networks

Faculty and staff are beginning to need access to commercial or public service databases. These databases are not generally available through the networks used by researchers and to which we are already well-connected. Penn State today has no way of providing this new access. OTC should develop and implement a solution for providing this access to the Penn State community as soon as possible.

3.3 Provide greater support to Penn State's increasingly important international programs

The support required for international programs is worldwide in scope and encompasses a wide range of services. First, OTC should appoint a liaison to the Office of International Programs to advise and assist the Office as well as faculty and staff in international communications. Second, the Office of Computer and Information Systems should encourage extension of higher education networks to Penn State's international partner institutions in order to provide such services as electronic mail--and to enable these partner institutions to access Penn State's information resources, regardless of their distance from Pennsylvania. Third, Penn State should seek federal grants from agencies such as United States Information Agency to support educational programs and to improve communications to partnership institutions. Finally, Penn State should arrange a seminar with other institutions that have similar international programs to discuss how education can best be delivered to institutions in other countries.

3.4 Wire residence halls for computer and video services

Penn State's data network needs to be extended into the residence halls. It is the Task Force's view that students will require--and demand--network support for their own computing devices, especially as the number of courses requiring use of computers increases and as more information resources become readily available. The Task Force believes this need will become intense within the next five years and plans should be made to wire the residence halls for data services within that timeframe.

3.5 Examine solutions that would allow calls to be answered transparently from a multi-campus pool or at home.

During peak periods, many offices, particularly at University Park, experience overload of their telephone lines because of the large number of calls being attempted to a relatively small number of support personnel. With new telephone technology, it is possible to route calls transparently to support locations throughout the state and take better advantage of trained personnel at the campuses and talented individuals who may be home-bound such as the elderly or the handicapped.

GOAL 4: Through education, training, and other activities, assist faculty and staff in making full use of Penn State's telecommunications resources, thus helping to increase their productivity.

Goal Four is concerned with the educational activities that are needed if all of our faculty, staff and students are to make full use of telecommunication resources. This is very much like the technology transfer mission of the Cooperative Extension Service, whose techniques have been refined over the past 75 years. The following three recommendations define techniques to promote user adoption.

4.1 Create a group of "utilization specialists" for education and support.

The first step toward successful technology adoption is to create a group of "utilization specialists" to provide education and support for University users. These specialists would work with individuals and groups to make them aware of telecommunications resources, services and features that are available, offer activities to stimulate interest, help users with product evaluations, create opportunities for user trials and support the integration of technology into existing work processes.

4.2 Establish a volunteer facilitator program

A second technique for promoting adoption of services is to establish a group of volunteer facilitators from among the early users. These volunteers serve as local consultants and become advocates for change. Because their early adopter status makes them well respected by their peers, this group has great impact. This program would recognize the leadership role of these people, provide them with the latest software and information, and supply them with support materials to use with their peers.

4.3 Increase dissemination of information about telecommunications services

A third requirement is to better disseminate information on technology improvements and enhancements. Aggressively done, this can call attention to new applications and increase the level of interest. A variety of options can be implemented to accomplish this objective including printed newsletters and electronic bulletin boards.

GOAL 5: Identify new technologies that will enhance telecommunications at Penn State

Goal Number Five is closely related to resource implications, and calls upon OTC and others to identify new technologies that will enhance telecommunications at Penn State.

5.1 Continue an aggressive program of testing and prototyping new technology

A continuing, aggressive program of testing and prototyping is essential to remaining competitive in the field of telecommunications, where changes are occurring almost daily. Lack of funding in recent years has hampered development in some areas. Future developments are dependent on prototyping to avoid wasted money in full-scale implementation of projects and to move forward as new technology makes improvements possible.

5.2 Position the university to be able to take advantage of new technologies when they become available

Clearly, the University also needs to be able to take advantage of emerging technologies that show promise for the Penn State system, such as ISDN and HDTV. It is OTC's responsibility to stay abreast of developments, to evaluate those technologies through its prototyping activities, and then to appropriately integrate them into the Penn State network.

ACTION PLAN

After reviewing its goals and strategic initiatives-and the resource implications-the Telecommunications Task Force set about establishing priorities to be accomplished in the first three years of the Strategic Plan. The first year's budget request, for 1990-91, includes the following projects:

* First, the University is obligated by contract to continue T-1 service provided by an independent carrier to the Hershey Medical Center. This service will be extended to the Capital Campus in 1990.
* In addition, because only partial funding is available to upgrade Capital's local telephone switch and cable system this year, the remaining balance of funds are needed in 1990-91 to complete the project. To limit central funding requests for this type of work in any one year, two other campus upgrades have been pushed out to 1991-92 and a much-needed cable upgrade at Behrend has been stretched over a two year period.

In addition to these contractual obligations, there are several projects that need to be continued from previous years:

* The University Park cable upgrade, which will provide the necessary fiber optic, coaxial, and twisted pair cabling to all major buildings at University Park. Continuation of this multi-year project is a key factor in scheduling other major activities, including development of the high-speed data backbone, installation of intra-building cable, and expansion of video services.
* The regional hub project, which not only supports increased data transmission speeds, but also provides higher reliability through improved network control and monitoring capabilities, and enables the extension of the high-speed data network to the campuses.
* The University Park Data Backbone - Phase II, which will allow current data switch users to take advantage of the benefits offered by the University Park high-speed network at no additional cost.
* Extension of the data backbone to other campuses, which will allow higher speeds, better access, and more local control over campus networks. Such control will facilitate development and expansion of local networks by campuses.

* The campus PBX replacement and cable upgrade project, which in 1990-91 will provide for the first year of a two-year project to upgrade conduit and cable and to expand the local telephone switch at Behrend.
Of the new projects recommended by the Task Force, eight were selected for funding in 1990-91, but six of those are not entirely new.

* Two deal with increased staff and departmental allotment adjustment.
* A third is to make permanent a full (broadcast quality) video link that would give Hershey Medical Center access to the satellite uplink at University Park and circumvent the need to install a costly satellite uplink at Hershey. This is currently provided on an ad-hoc, trial basis.
* Fourth, satellite downlinks at the campuses and appropriate extension offices would add important flexibility and functionality to the network.
* Fifth, a request for prototype funds would make permanent an arrangement that has been temporary in the past, providing a continuing source of funds to assess the application of new technology into our environment, and limit the risk incurred when undertaking new projects.
* Sixth, we are also recommending an expansion of our current videoconferencing facilities, building on existing capabilities.

There are two completely new projects for which funds are requested.

* Dial-up data connections at the campuses to enable faculty, staff, and students to locally access Penn State's information resources from their homes; and
* Intra-building wiring at University Park to install standard wiring within buildings at University Park. It is now time to begin an overall infrastructure project to bring buildings at University Park to the same level as those at other campuses.

CONCLUSION

Five years ago a strategic plan was presented that, in hindsight, provided a strikingly accurate vision of the University's future--and the key role telecommunications would play in helping to realize that future. Today, there is no doubt that the plan has been instrumental in setting a strategic direction and that the University community is reaping the benefits of our work. However, there are even greater benefits to be gained by maintaining momentum. The continued investment in the use of telecommunication technology to support the mission of a University such as Penn State is critical, and underscores the need for a comprehensive, up-to-date plan.

Phase I of A Comprehensive Approach to the Planning and Design of a Multipurpose Fiber-Optic Cabling Plant

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Frostburg State University's rapid growth in data communication has saturated the current facilities and generated a need for a new infrastructure. During the same period, other communication and service needs have emerged or required enhancement. The planning process, which was driven by data communication, has been expanded to support and service data, voice, video, environmental control, campus identification card system, security video, FDDI, appropriate redundancy, and other future applications. The concept of a universal cabling plant was developed.

This paper will deal with Phase I - Planning and Design strategies used to synthesize the various technologies, capital and human resources into a comprehensive design.

Introduction

Frostburg State University (FSU) is one of the eleven constituent institutions of the newly created University of Maryland System. FSU's main campus is located in the town of Frostburg in Western Maryland. The University also offers courses in Frederick, Maryland and at a new Hagerstown Center in Hagerstown, Maryland. In the fall of 1989, FSU's enrollment was 4127 undergraduate and 659 graduate students for a total of 4786.

The Office of Computing Services supports all aspects of administrative and academic computing at the University. Over the last few years, FSU's growth has created a stronger need for computing services. In just the last year, FSU has increased the number of users and computing power by over fifty percent.

The growth and evolution of information systems at Frostburg State University within the next five years will be the most profound in the history of the University. The major reason will be the establishment of a network which will increase computer access by approximately 400 percent. In attempting to develop a strategy to deal with this evolution, the Office of Computing Services has recognized the need to incorporate new technologies and provide the flexibility to adapt to unforeseen developments. With FSU's next major technological innovation occurring in the communications, the connectivity of humans and machines is an extremely important issue.

Planning Strategies

With the current communication facilities saturated, the plan is to accouter a cabling plant design which could be easily managed, flexible enough to accommodate changes in technology, cost effective, quickly installed, immune from electromagnetic interference and service a variety of applications. Other administrative units were experiencing the same growing pains as the Office of Computing Services. The planning process, which was driven by data needs, was expanded to include these needs as well. These other functions and/or uses are considered to be of equal importance in the cabling plant design. Fiber-optics has been proposed as the media of choice.

Fiber-Optic Uses

In the fall of 1988, FSU contracted Digital Equipment Corporation (DEC) to conduct a feasibility design and estimate cost of the cable plant. DEC was provided with the goal to design a cable plant to support the following uses: data, voice, interactive video, future Fiber Digital Data Interface (FDDI), security video, environmental control, campus identification card system, and any other future applications. As a protection against downtime, redundant fibers have been added to take over upon failure of the primary systems.

Advantages of Fiber-Optics

Fiber-optics was chosen for the following reasons:

1. High speed and enormous bandwidth for data transmission - No argument here. The only problems is the ability of the hardware to deal with the speed of the fiber.

2. Immunity from interference and crosstalk - Living in the mountains of Western Maryland, immunity from electromagnetic interference was an extremely important feature. During the summer months, the current twisted-pair wiring is hit by lightning at least 8-10 times per season at a cost of repair between $30,000-60,000 per fiscal year.

3. Security - Any attempt to tap into fiber-optic will result in immediate detection. This may be an overstated feature for higher education.

4. Can be used for a wide variety of applications - There is a wide variety of fiber-optic in use today. Fiber is becoming increasingly used for data, voice, connections between microwave facilities, local-area networks, and etc.

5. Low transmission loss - The development of optical fibers over the last few years has resulted in a cable with very little transmission loss. Low transmission loss extricates the implementation of communication links.

6. Potential long range low cost - The cost of cabling and the labor to install additional applications is reduced and/or eliminated. The fiber-optic infrastructure provides the platform for these applications. Also, due to the fact that fiber is very small, the current communication-duct system will not need any changes. The current four (4) inch conduit will be more than enough room for all aspects of the cabling plant.

7. Reliability and life - Loose tube optical fiber is extremely durable and should last 20-30 years.

Basic Design and Topology

In designing a cabling plant to serve multipurposes with different technologies, you can not depend upon one topology to serve all your needs. In networking, the primary logical topologies utilized are bus, tree, ring, star, and point-to-point. If you are to serve multiple technologies in your design, multiple logical topologies must be available for all users. Therefore, any design must provide for all other logical topologies to exist in harmony and without placing unnecessary restrictions on each other.

FSU's design is based on a multiple star topology. The star topology serves the cabling system by providing maximum flexibility and at the same time minimizing costs. The system can accommodate other technologies with minimum disruption to other systems sharing the cabling plant. This is accomplished by equipping the cabling with a universal connection regardless of application.

Presently, FSU plans only to provide fiber-optics cabling between buildings. For data communications inside the building, thin-wire ethernet will provide the communication link to users. In other applications, the appropriate copper-wire technology will be implemented. There seems to be no need to bring fiber to the outlet at this point in time. By positioning the fiber distribution equipment in good size rooms with easy access to the conduit, fiber to the outlet can be added on a building by building basis in the future.

The main campus was divided into three major areas, thereby creating three major implementation phases totaling twenty-nine buildings. In Phase I, the main distribution frame and two other intermediate distribution frames (these are usually referred to as hubs) as well as other strategically located buildings were chosen because of their primary importance. The main distribution frame provides a single point of control for the star and allows for easy system administration. The two intermediate distribution frames create a second level of administration and control for the additional stars. In total, three (3) hubs and seven (7) buildings are included in this phase.

The hubs are extremely important in any design and should be selected with a great degree of care. The main hub needs to be centrally located on the campus, have excellent access to the communication duct system, and provide a reasonable amount of floor space to house the equipment room. This room will require enough space to store wall mountable interconnect centers for cable, fiber distribution equipment rack to handle all the fiber splices, and server rack for couplers, transceivers, terminal servers and etc. It is important to note that the main hub does not have to be your computer center building. If properly designed, any building can serve as the main distribution frame.

Phase II consists of the academic and administration buildings not considered to be primary in Phase I. These buildings serve as classrooms, faculty offices, research facilities, administrative and academic support areas. In total, eight (8) buildings are included in this phase.

Phase III consists of providing services to all resident halls. The resident halls are considered to be the least important for FSU's design. In total, eleven (11) buildings are included in this phase.

Functional Requirements of Fiber

Not all fiber is created equal. The selection of fiber used in the cabling plant design is one of your major decisions. This decision will require great debate and a sound rationale for justification.

There are two major types or classifications of fiber-- multi-mode and single mode. As a general rule, single mode fiber is used for long distance applications or those applications requiring an unusually high bandwidth. Multi-mode fibers are utilized for short distances covering a variety of applications. The longest distance traveled in FSU's cabling plant will be approximately 2000 feet. We are trying to build a multipurpose system over short distances, these facts lead us in the direction of multi-mode fiber.

There are three sizes of multi-mode fiber in use today-- 50/125 micrometer, 62.5/124 micrometer, and 85/125 micrometer. DEC recommended that FSU use 62.5/125 micrometer fiber because it is, 1) best suited for premise applications and LAN's, 2) has the best combination of attenuation and bandwidth, and, 3) is endorsed by major equipment manufacturers. Loose tube fiber-optic cable will be installed as a result of it's compacted size, isolation from outside interference, and reliability. This type of fiber is only for inter-building communications and can not be utilized inside the building because it does not meet fire codes.

The type of connectors to be installed is another important decision. There are no officially defined standards for fiber-optic cable connectors. The ST compatible connector is probably the most widely used today. FSU has chosen the ST compatible connector for implementation. When connectors are necessary for different applications, FSU will utilize a hybrid cable with the ST compatible connector at one end and SMA 905 or etc. at the other end. This increases the flexibility of the design and standardizes the demarcation lines.

Patch panels provide an excellent control point for each building. Patch panels create flexibility for multiple uses as well as simple cable plant management by furnishing a single connect point for all applications. At this point, the application leaves the fiber-optic cable plant and makes the transition to the intra-building copper-wire technology.

The last requirement, and probably the one that will be debated the most, is the number of optical fibers in the cables. How you allocate the number of fibers depends upon the various uses and the kind of technology used for each. FSU decided on 24 fibers for each building. There are two exceptions to this policy, Fuller House and Brady Health Center. Both of these buildings are extremely small and do not warrant all applications. Therefore, these buildings will only receive 12 fibers. The distribution of fibers per applications and topology is as follows:

APPLICATION	FIBERS	TOPOLOGY
Data/Ethernet	2	Star
Voice	2	Star
Interactive Video	2	Point-to-Point
Security Video	2	Point-to-Point
Energy Management	2	Point-to-Point
ID Card System	4	Point-to-Point
FDDI	4	Ring
Redundancy and Future	6	T.B.A.
TOTAL	24	

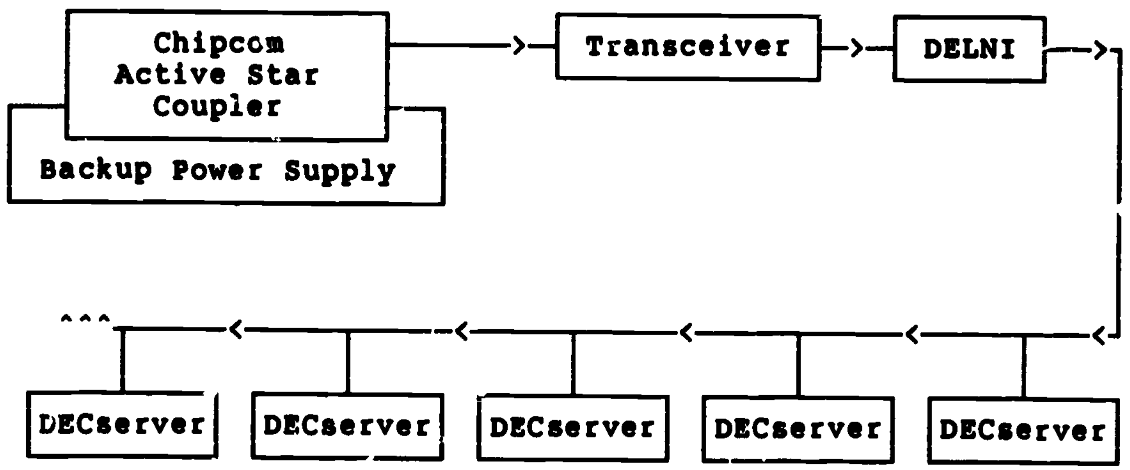
Ethernet Configuration

Digital Equipment Corporation is the main hardware vendor in the area of administrative and academic computing. DEC will play a major role in the implementation of the data aspects of this cabling plant design. FSU's decision to continue and expand this relationship is based on the fact that DEC has all the necessary products and features to fulfill the institution's goals and objectives.

Each hub will be equipped with a Chipcom 9314S-ST fiber-optic ethernet 14 port active star coupler with 9300BU backup power supply. The active star coupler was choosen over the passive coupler for one basic reason, the active star coupler has additional power to boost the optical signal. This will allow for greater expansion of the network. The active star coupler will then be configured to a Chipcom 9301T-ST fiber-optic transceiver which will be connected to a Digital DELNI-BA local area network interconnect. The DELNI will support either additional DELNI's or eight Digital DSRVB-BA DECservers.

In all other buildings, the fiber-optic cable will connect to the Chipcom transceiver then right to a DELNI or DECserver depending on the number of ports necessary. Due to the easy manner in which systems may be configured, adding to the network requires no significant re-designing or disruption to users.

ETHERNET CONFIGURATION FOR HUBS



Estimated Costs

The estimated costs are the result of several different analysis. The design and management figures are based on fees which would be paid to DEC, if they were to manage the project. The fiber-optics material and labor costs are the result of DEC's original study which solicited five major fiber-optic cable installation firms. These figures are the average costs of these five vendors. The ethernet components are prices from DECdirect with the appropriate discounts.

There are some interesting issues about costs. First, labor is not cheap. It is important to balance your time with the vendor's time. The installation, assembly, and splicing can cost more than the fiber itself if you are not careful. Splicing cost varied from $35.00 per hour to $95.00 per hour depending on the vendor in DEC's study. If you are developing your first fiber-optic cabling system, it is cheaper to pay the expert at the outset than to pay for your mistakes during installation.

Second, time is money. The management of a project like this will require at least one person full-time for one year or more depending on the size and complexity of your institution. We estimated that it would be cheaper to hire DEC engineers.

Third, FSU anticipates spending an additional half-million dollars in upgrading the current administrative and academic main central processing units. This additional equipment will be necessary to deal with the expanded user environment created by the cabling plant. Time-sharing ports will grow from the present 135 to 408. These figures below are only for the fiber and related work.

Estimated Costs for All Phases

Activities	Phase I	Phase II	Phase III
Design & Management	$ 40,000	$ 17,000	$ 26,000
Fiber-Optics Material	158,000	55,000	81,000
Ethernet Components	207,568	32,332	57,662
Labor	95,000	54,000	80,000
Phase Totals	$500,568	$158,332	$244,662
Grand Total			$903,562

Implementation Timetable for other Applications

Data communications is scheduled to be the first application to be implemented. Data is expected to be on-line sometime in the spring of 1991. Data communications will consist of administrative computing, academic computing, and a new library information management system. In academic computing, FSU supports computing for instruction, research, and faculty support services. All current and future planned microcomputer labs will be connected to the network with a file server and/or ethernet cards.

Environmental control (energy management) and campus identification card system will be implemented sometime in 1992. The energy management system will phase in approximately four to five buildings per year until completed. The campus identification card system is planning to be operational in six buildings. The system will support library access and use, a debit card system for the bookstore, dining room, snack bar purchases, and security access to computing facilities. We are exploring other aspects such as, security access to resident halls, parking, and ATM machines.

The last applications will be video and voice. The costs for a total fiber-optic PBX system and a video system for the main campus can not be justified at this time.

Some General Guidelines to Follow

- ☐ Decide early what applications need to be supported by the cabling plant.
- ☐ Choosing the appropriate design and topology is crucial. Remember any design must accommodate a variety of technologies and topologies.
- ☐ Provide enough capacity for growth. Some institutions double the capacity just for this purpose. Don't worry, you will find ways to use it.
- ☐ Time is money. Sometimes it is cheaper to pay the expert than to experiment.
- ☐ Watch your costs. Labor cost can be more than the fiber itself if you are not careful.
- ☐ Utilize mass production components and standards where ever possible. This will save money and create flexibility.
- ☐ Avoid any unnecessary hardware costs. Repeaters, for example, require maintenance and incur additional expenses.
- ☐ Use active couplers instead of passive couplers because they produce optical power and therefore allow for larger networks.

Conclusion

The development of a multipurpose fiber-optic cabling plant requires a sound planning process if all applications are to be synthesized into one coherent design. There is a consistent need to balance costs with benefit and service. Many aspects of this planning process are just plain common sense.

REFERENCES

Bigelow, Holly. "A Fiberoptics Primer," Fiberoptics Product News 1988/89 Buying Guide, 1988, pp. T55-T62.

Handcock, Bill. "Put More FIBER In Your Network," DEC Professional, October 1989, pp. 36-47.

Hecht, Jeff. Understanding Fiber Optics. Indianapolis: Howard W. Sams & Company, 1987.

Schmidt, George K. "Fiber-Optic Cable Plant for Frostburg State University," DEC Study, February 1989.

Senior, John M. Optical Fiber Communications: Principles and Practice. Englewood Cliffs: Prentice/Hall, 1985.

CAUSE89

Track VI
Academic Computing Issues

Coordinator:
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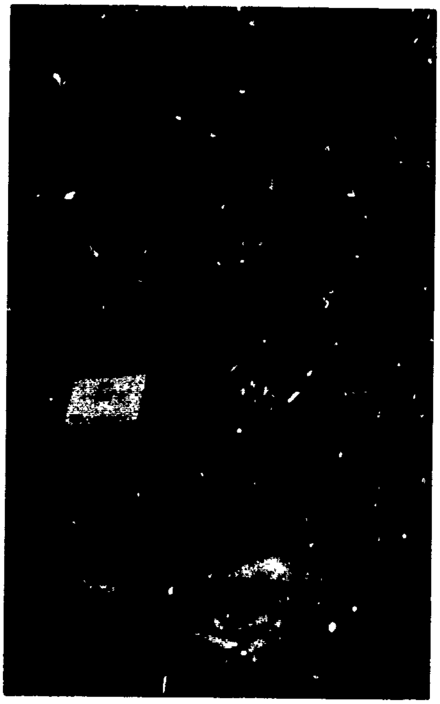
Many colleges and universities are increasing investments in computing for instruction and research, and the growth in departmental computing continues. Papers in this track focused on such areas as: coordinating with administrative computing (including planning, managing, evaluating, and networking, 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.

E. Michael Staman
West Chester University



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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

R. Ann Zinck
San Joaquin Delta College

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 le rship 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 important customers. In all cases, the goal of the department is to be outside the political arena. The 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 liability in case of theft of the equipment or damage while it was off-campus. There was also a question of what 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.

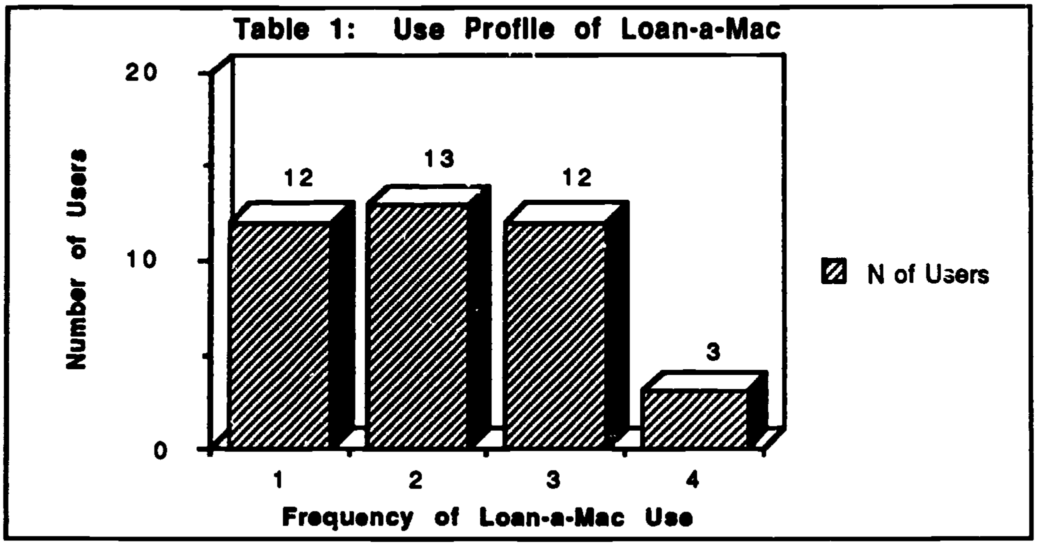
Table 1: Use Profile of Loan-a-Mac
20
10
0
Number of Users
12
13
12
3
N of Users
1
2
3
4
Frequency of Loan-a-Mac Use

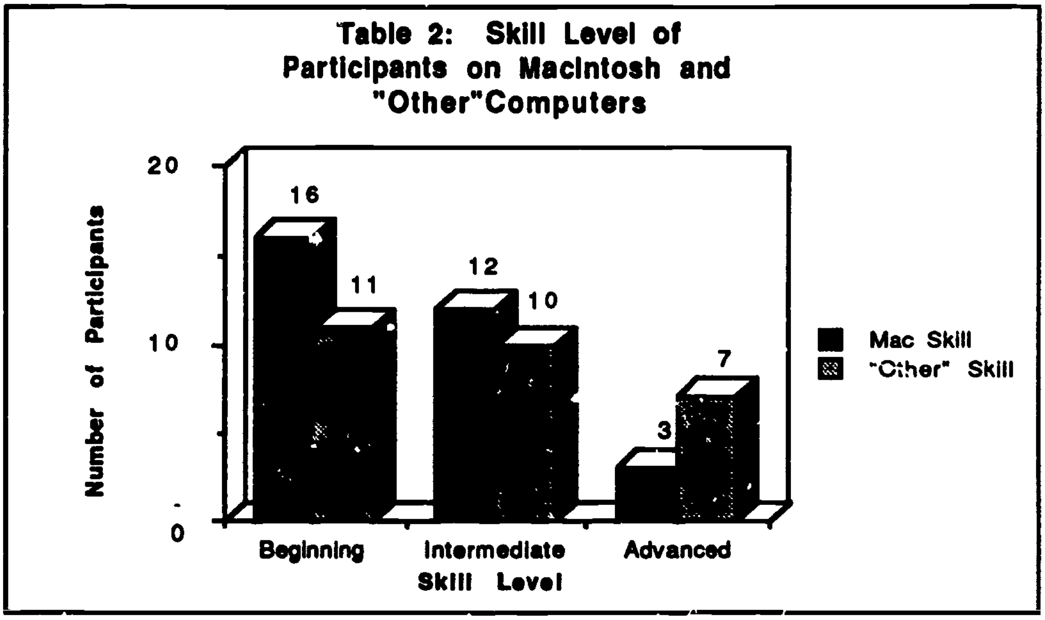
Table 2: Skill Level of Participants on Macintosh and "Other"Computers
20
10
0
Number of Participants
16
11
12
10
3
7
Mac Skill
"Other" Skill
Beginning
Intermediate
Advanced
Skill Level

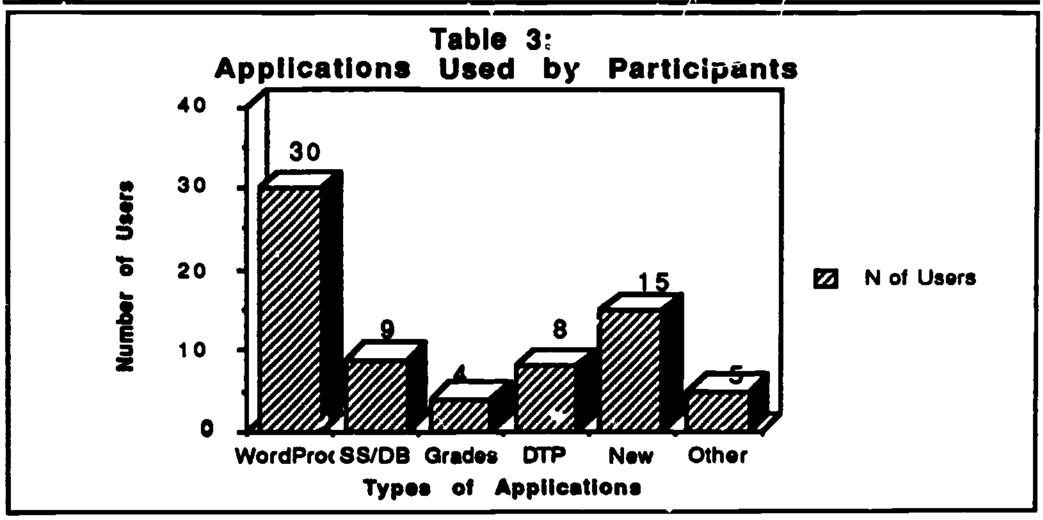
Table 3: Applications Used by Participants
40
30
20
10
0
Number of Users
30
9
4
8
15
5
N of Users
WordProc
SS/DB
Grades
DTP
New
Other
Types of Applications

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 d e 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 users 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 all 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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December, 1989

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 70' 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 Duration	Months/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 printe.. . owever, we are wiring the dorms for data and next year, the students will be able to send f les from their own room computer to the cluster printers or to special print statio 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
- Workstatio[illegible]ng
- 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 implementation 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 wish to 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

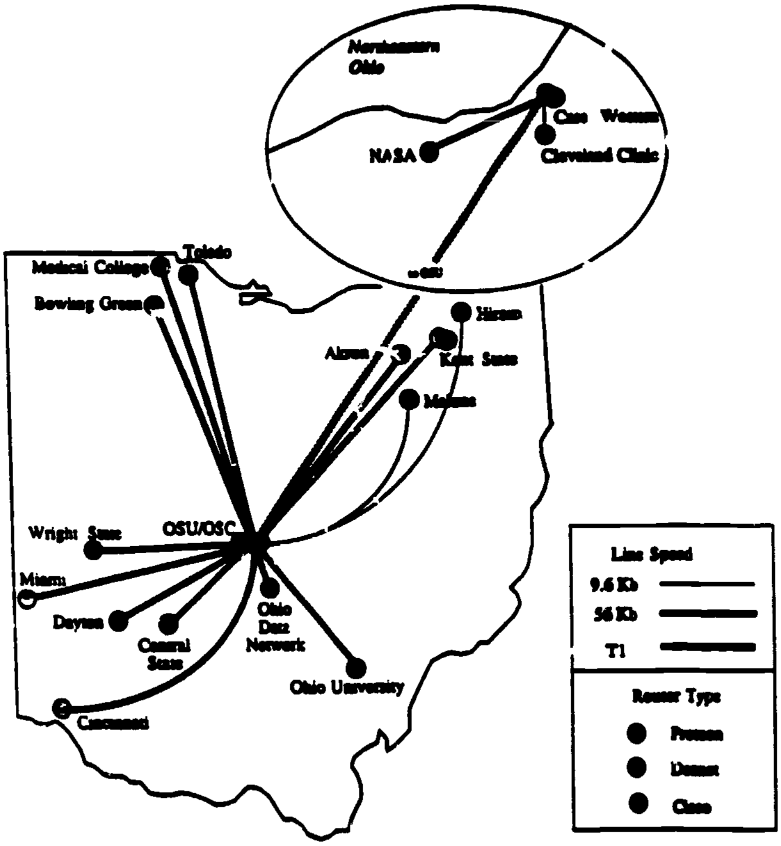


FIGURE B - Proposed OARnet Backbone Topology, Winter 1990

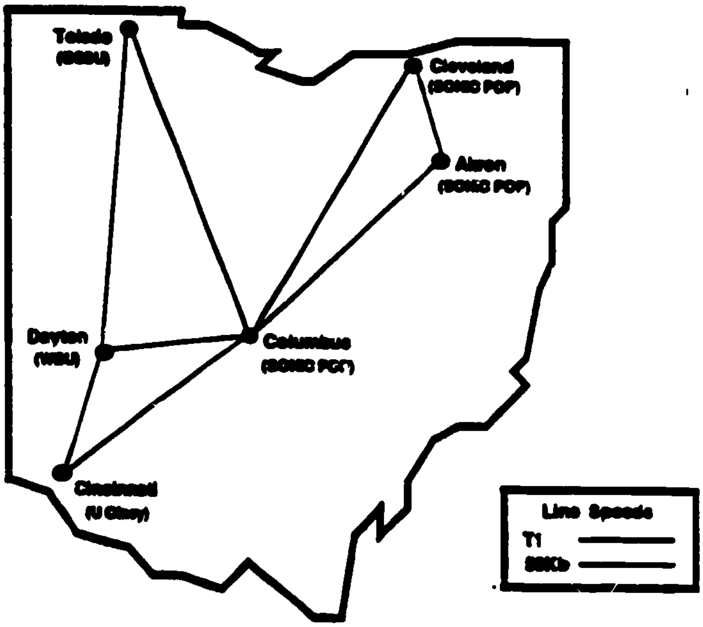
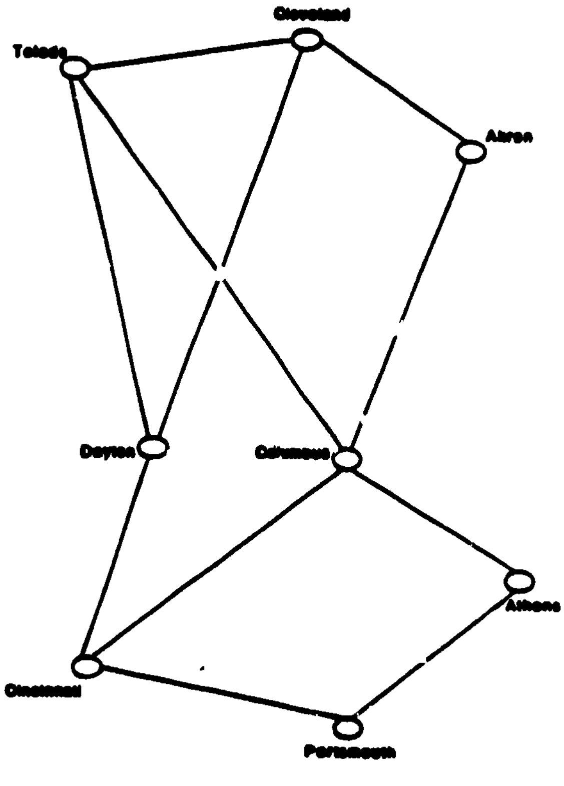


FIGURE C - Proposed OARnet Backbone Topology, 1991



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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and

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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 disc[illegible]'s 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 la' 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 imp ment 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.

Gainin mpus Commitment. While interest was very high on the campuses, there was some concern ove ng-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.

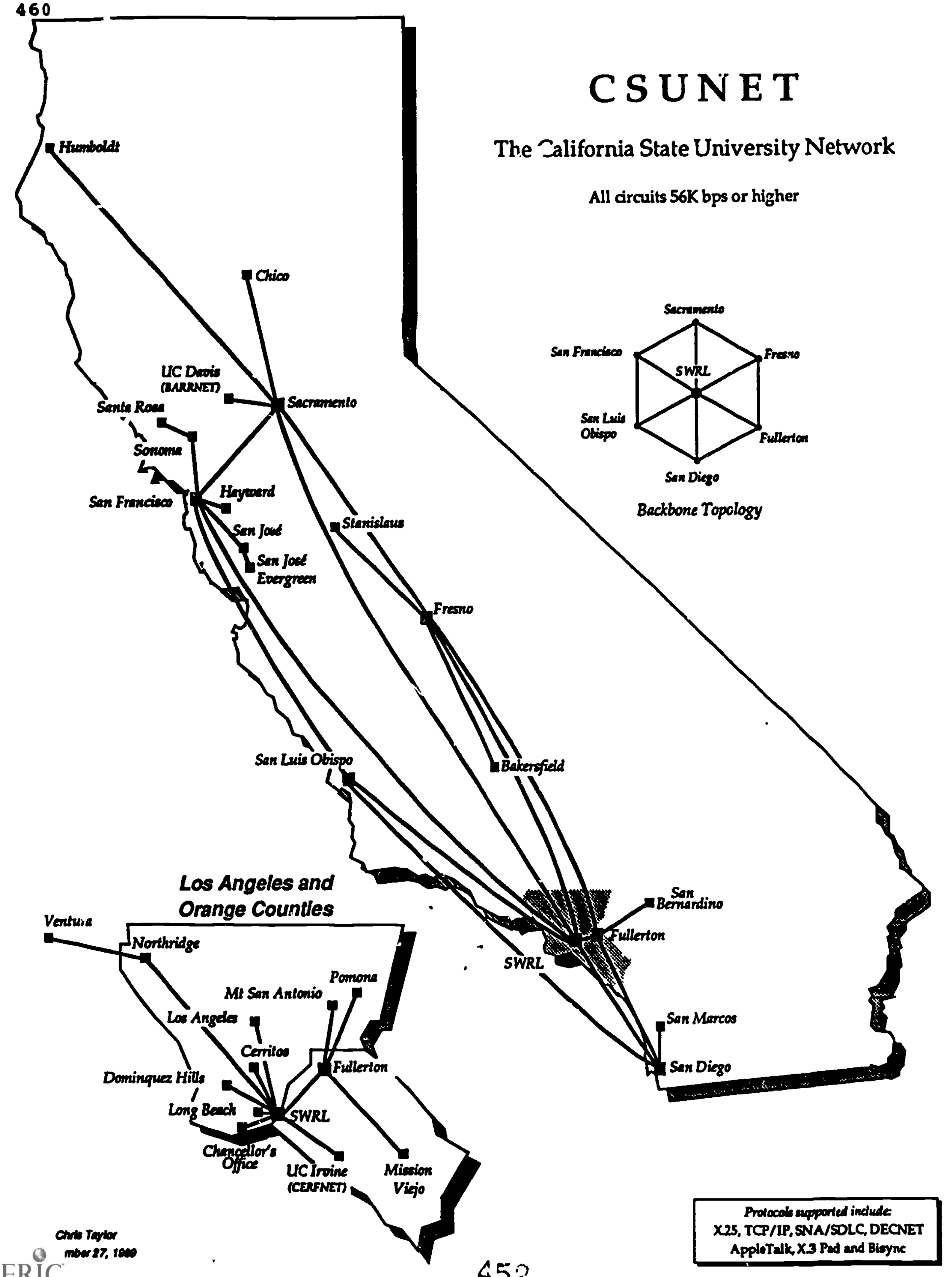

CSUNET
The California State University Network
All circuits 56K bps or higher
Humboldt
Chico
UC Davis (BARRNET)
Sacramento
Santa Rosa
Sonoma
San Francisco
Hayward
San José
San José Evergreen
Stanislaus
Fresno
San Luis Obispo
Bakersfield
San Bernardino
Fullerton
SWRL
San Marcos
San Diego
Sacramento
San 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

Figure 1

THE CALIFORNIA STATE UNIVERSITY

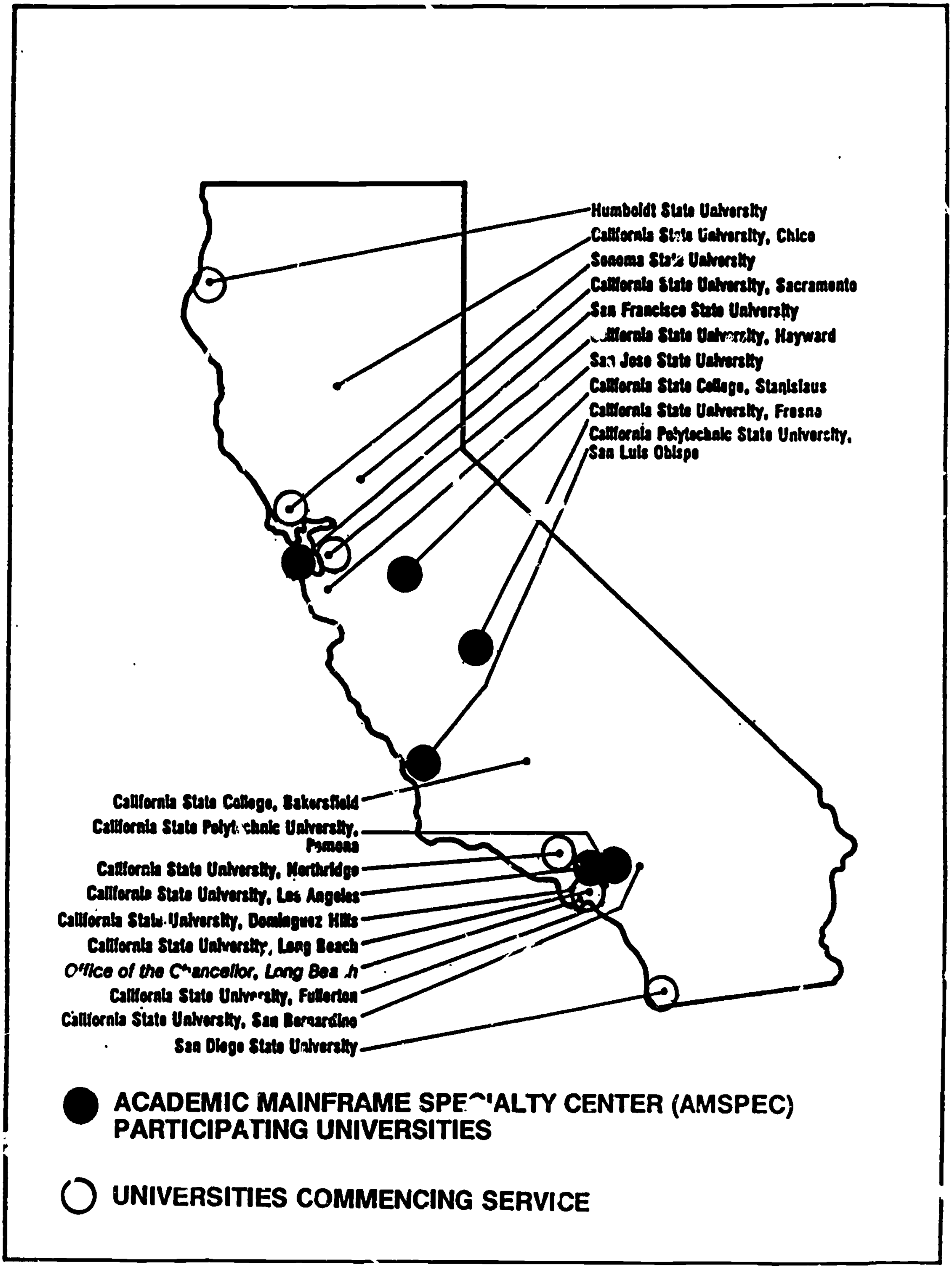
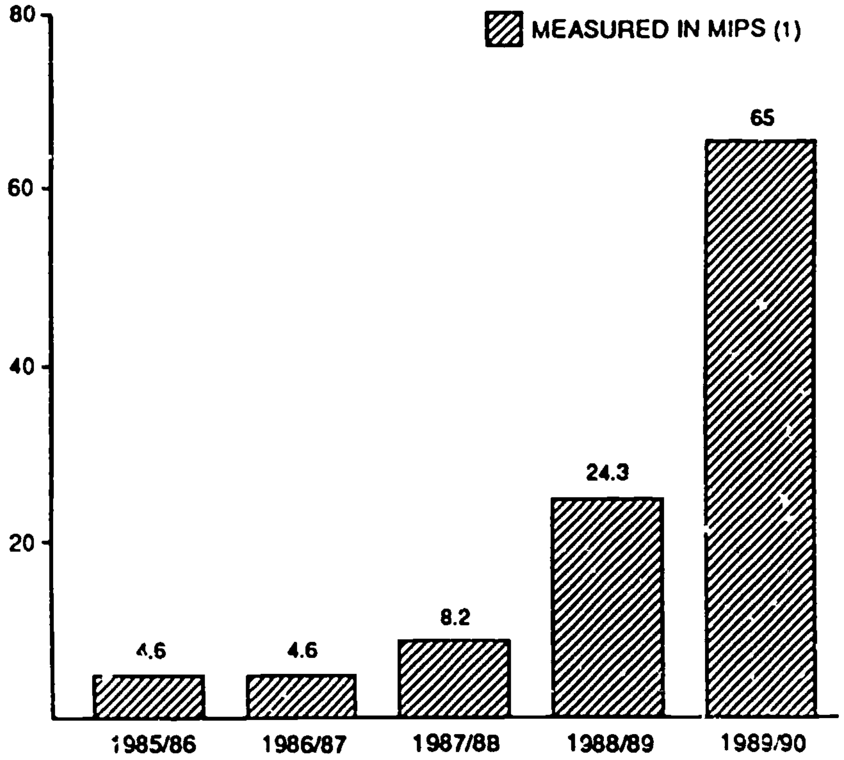


Figure 2

Figure 3 GROWTH IN MAINFRAME COMPUTING POWER AT CAL POLY

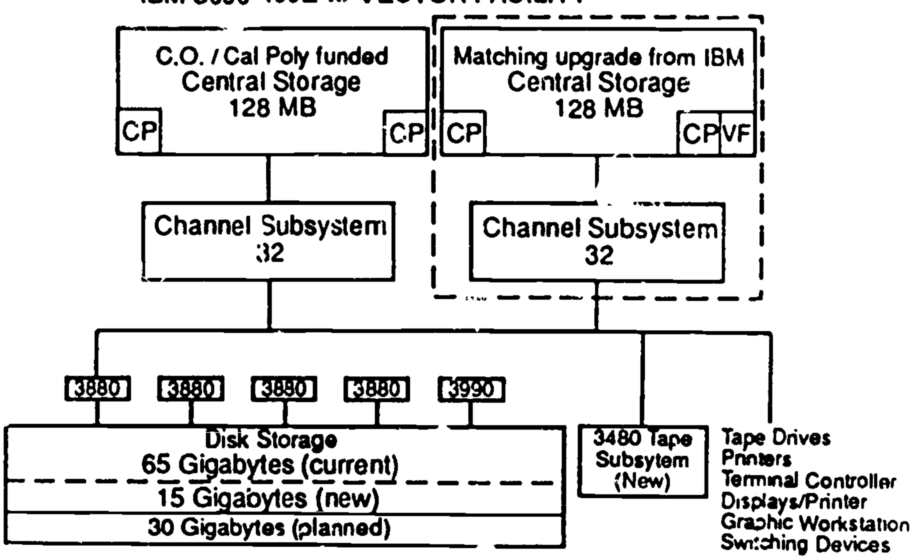


MEASURED IN MIPS[1]

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

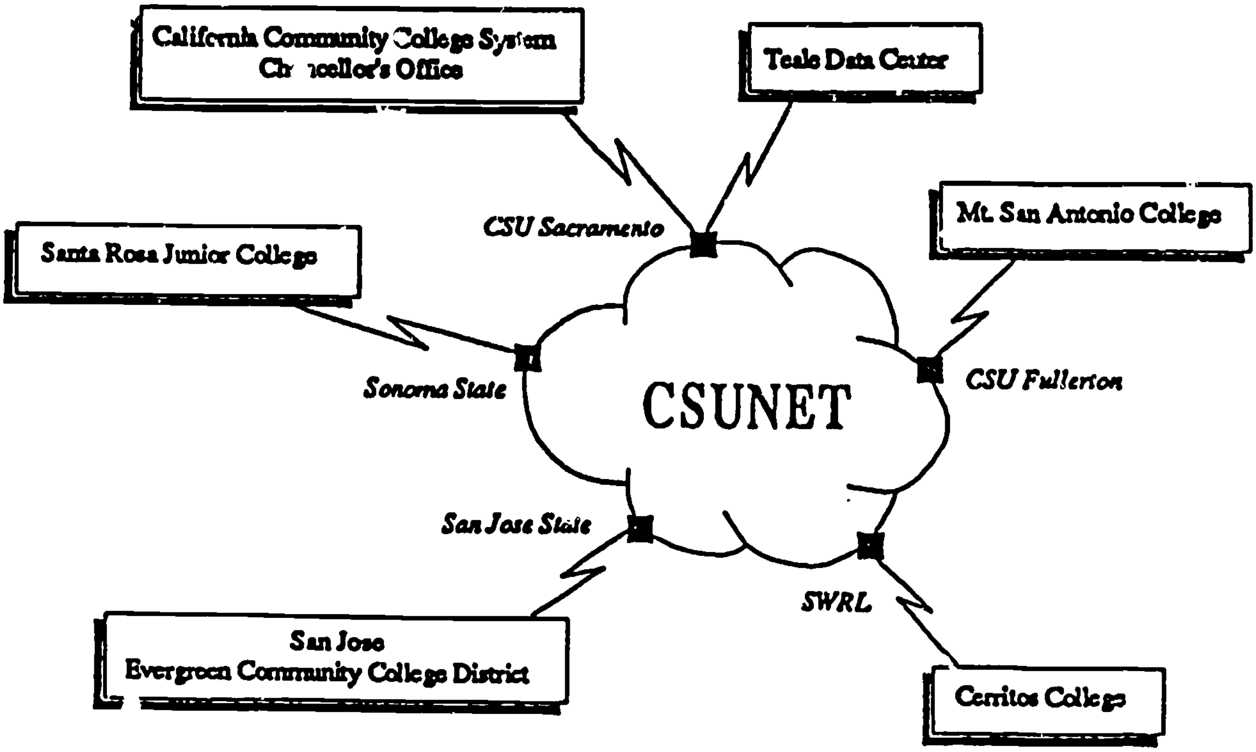


Figure 5

AMSPEC Services

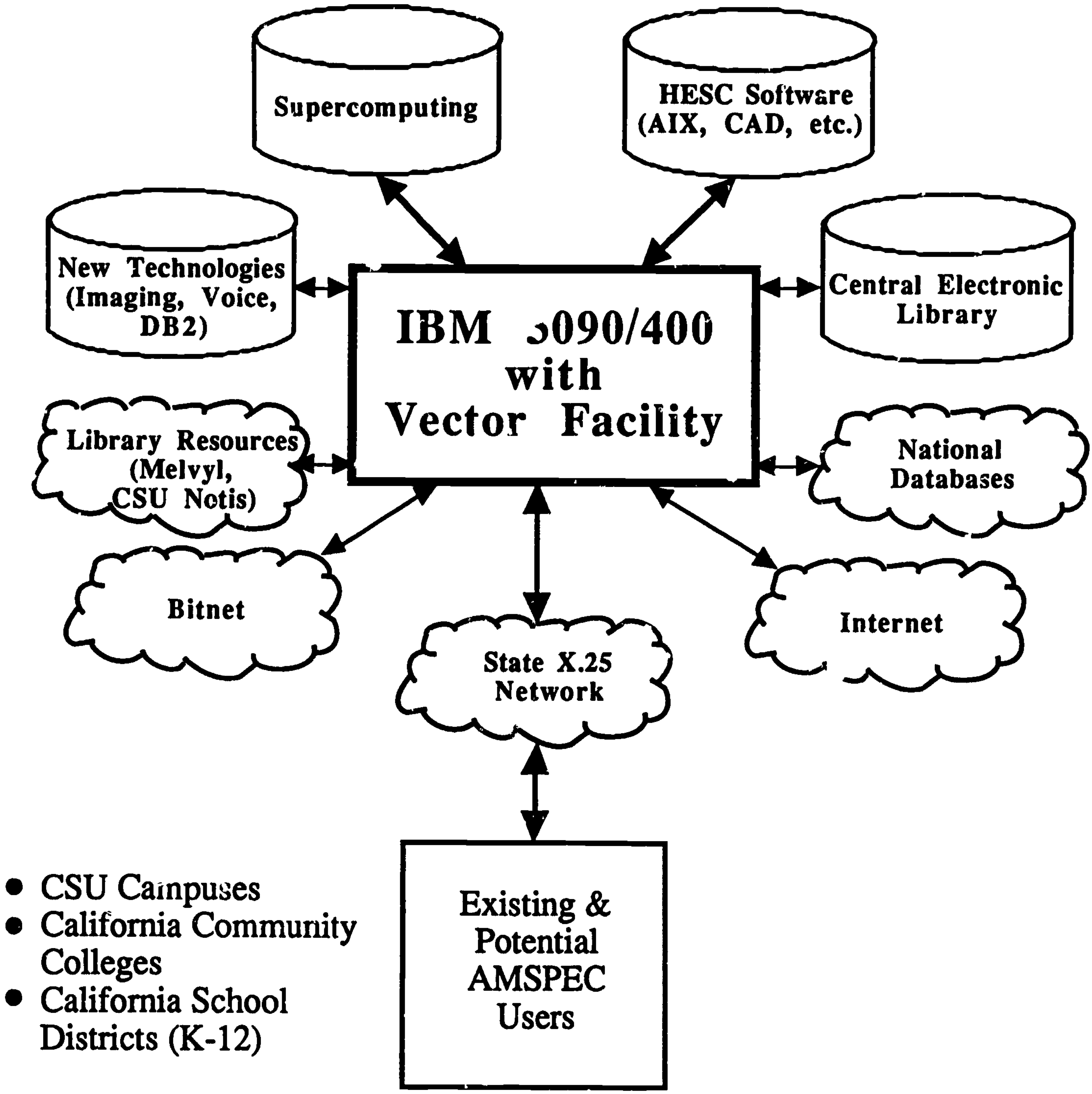


Figure 6

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

Dr. M.S. Vijay Kumar
University of Maine at Machias
Machias, Maine

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?) <u>and</u> 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 type 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 measure, 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 **S**imple, **P**roven, **C**ompatible, and **A**daptable.
2. the process of introducing technology should be through a process involving **S**uccess, **P**articipation, **C**onsensus and **A**dvancement.

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 types 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 (allen, 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 aspect 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 information 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 to 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.

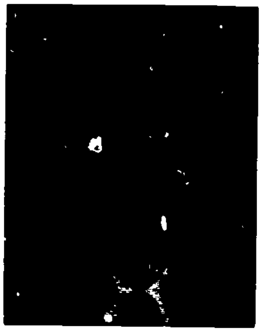
Reference:

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.

CAUSE89

Track VII
Applications and Technology Issues



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Many applications have resulted from technological advancements in the past few years, and emerging new technologies promise even more capabilities for enhancing campus information systems. Participants in this track shared information about specific innovative applications from their campuses and the use of newer technologies in higher education. The latter include CASE tools, artificial intelligence/expert systems, hypermedia, object-oriented design, CD-ROM and optical scanning, simulation, teleconferencing, parallel and vector processing, relational data base technology, and the "integrated workstation" concept.

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The Effect of Relational Database Technology on Administrative Computing

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ABSTRACT

Carnegie Mellon University has chosen to standardize its new administrative system development efforts on relational database and SQL. The INGRES relational database management software is currently in use on several development projects. One administrative computing application, the University Information System (UIS), uses relational database to distribute access to student and employee data. The UIS serves as a good test project for examining how relational database technology has affected administrative computing. The flexibility and the portability of the product were extremely beneficial in our environment. The easy to use 4GL tools allowed us to produce prototypes faster and to quickly make changes to applications. The benefits to the users have been most apparent in the improved access to data that currently exists with the UIS.

Special considerations are associated with moving to relational database technology. Users who want to obtain its maximum benefit need to spend time in learning the structure of their data within the database, the INGRES query tools, and SQL. Administrative Systems also must offer a higher level of support for the new group of people now using the database and develop expertise in the effective management of database applications.

INTRODUCTION

Carnegie Mellon University is an undergraduate and graduate institution located in Pittsburgh, Pennsylvania. Founded in 1905, the former Carnegie Institute of Technology now enrolls 6,900 students and employs approximately 700 faculty and ?,600 staff.

The computing environment at Carnegie Mellon can easily be described as diverse. Students use a variety of personal computers, workstations and some mainframes to do their coursework and research. In the administrative computing environment , word processing and office data processing functions take place primarily on personal computers, particularly Macintosh and IBM models, which are often linked together through local area networks to share resources like printers and file servers. A VAX cluster, (presently consisting of a 6330 , 6230 and three 11/780's), a Sequent Symmetry, a Sequent Balance, and several other workstation-class machines currently support the central administrative computing at Carnegie Mellon. The Administrative Systems (A.S.) department serves the central computing needs of the university.

The stated direction of administrative computing at Carnegie Mellon encompasses the relational database/SQL (Structured Query Language) standard combined with hardware and operating system independence. The INGRES database management software (a product of the INGRES Corporation, Alameda, CA) was selected for use as a basis for all development projects and runs in many operating system environments, including VMS, UNIX, VM and DOS. The operating system and hardware independence will allow us to take advantage of new opportunities presented by the ever-expanding technology base by giving us the freedom to be able to easily move applications from one environment to another.

It is both useful and interesting now to look at the impact of our decision to standardize our development efforts on relational database. Several relational applications have been in use at Carnegie Mellon since approximately 1984. These include systems like Inventory Control, Work Order Management and Telecommunications Management. Recently, a new INGRES-based Human Resource Management System saw its first major release. The Student Information System, which manages student records, admissions and student accounts receivable, was put into production a few short weeks ago. Many other development projects are in progress. We have chosen to examine one system in particular, the University Information System (UIS). This system, which was begun as a project in late 1985, is one of the larger more widely-used administrative relational database applications at Carnegie Mellon.

THE UNIVERSITY INFORMATION SYSTEM

The UIS is an INGRES application that provides the user with retrieve access to student and/or employee data. The need for such an inquiry system was evident at Carnegie Mellon several years ago, when it was apparent that the central systems, written in COBOL and housed on Digital Equipment Corporation's (DEC) DEC-20's, were not serving the needs of the user community. The central systems allowed access to data in a very limited fashion, and this access was slowed by problems with an over-loaded machine. While plans were being formed to replace these systems, particularly the Student Records and Payroll/Personnel systems, the new versions of the systems were too far away and would not solve immediate problems surrounding access to data. Though some data were available to users in the form of standard screens and printed reports, the need existed for access to data in a more ad-hoc fashion. That is, users wanted to be able to produce their own class rosters, teaching load reports and salary surveys as they were needed or to examine data in their files quickly and easily.

Because the technology to allow users this kind of access to data was available in the form of relational database software, and because the need for access to information on campus was so strong, the decision was made to provide the campus community with an interim solution to its problem. The University Information System was built to give users a way to get the data they needed to do their jobs while the new systems were being designed and developed. Formatted screens and standard reports, similar to those available in the old system, but more flexible and robust, were included in the UIS, along with the availability of SQL for users to write and run their own ad-hoc queries.

Previous versions of the UIS received their data on a nightly basis, via FTP from the source systems on the old TOPS systems. Now, since the new INGRES-based Student Information System and Human Resource Information System have been released, data contained in the UIS continue to be extracted from the new systems and shipped on a daily basis to a Sequent Symmetry running the Dynix operating system, where they are loaded into an INGRES database. The decision to continue to maintain an "inquiry-only" database after the release of the new systems was made for several reasons. First, having the second database would reduce the load on the primary database. This would be helpful during the first months of the release of the new systems, while bugs were being worked out and the system was monitored. Second, since the feed to the UIS was already in place and the applications were in use, it would not require much effort to simply continue the data transfer. This also allowed the development of the 'inquiry' portions of the new systems to be delayed until a later date.

The UIS data reflect what is contained in the central systems, and are available to users for query access only. Users are not permitted to change any data in the UIS. Any errors found must be corrected at the source, which is the central system.

As mentioned earlier, the UIS data are made up of student and employee information. Separate applications exist for access to these data. Each application consists of standardized screens, queries, reports. A main menu allows the user to choose which subset of the application he wishes to run. The menu, which is written in C, allows the user to choose to run the screens, queries or reports, print copies of the documentation, check when the data were last updated or enter the SQL query facility.

Screens. All the UIS screen applications consist of an entry screen and data screens. The entry screen gives the user the ability to search for a student or employee by name through the "name search" option. A list of all names that match the criteria typed by the user will be displayed in a special screen if the name search option is selected. The user can then select the student or employee he needs and call one of the data screens.

Each data screen in the UIS contains data about one entity: a student or a course or an employee. For example, in the student screens application, the 'roster' screen shows all students in a certain course and section for a given semester.

The user can move easily from screen to screen by typing the new screen code over the current screen code. In the case of a 'roster' screen, this action calls a different screen for the same course without returning to the main menu. The same method applies to changing the entity or the semester being retrieved -- if the user wants to see a new student on a student-based screen like the 'grade' screen, he simply types the id number of the new student over the id number of the current student. If a new semester is desired, the desired semester is typed over the old semester. Any combination of screen code, semester or entity can be changed in order to retrieve new data.

Queries. Commonly-used queries were written and installed in the UIS in a menu format. No special skills, such as knowledge of SQL, are required to run the query option of the application. Users simply select the desired query and enter a few simple parameters. When a query is run, the results are written to the screen as well as to a file, which can be manipulated further by the users.

Reports. The report generation option of the UIS applications gives users the opportunity to produce results for larger, complex queries that are needed on hard-copy, and that are not of a time-critical nature. Again, the desired report is selected from a menu of available reports and parameters are entered prior to execution. In order to control system load during the day and avoid large disk space allocations for each user that would be required by INGRES to run the reports, the report requests are submitted to a batch queue where they are executed when system utilization is low.

Ad-hoc Access. One of the driving forces behind the implementation of the UIS was the desire of the users to have better access to data. The UIS screens, queries and reports were duplications of and enhancements to the features available on the old central systems. The ad-hoc query facility available with INGRES was the key to providing the broader access that many users required in order to be able to retrieve data not available through standard reports or on the inquiry screens. The ad-hoc query option is available from the main menu and requires a knowledge of SQL, the data manipulation language used by INGRES. Users may form their own statements to select data from the database, perform aggregations or do simple file extracts.

The Data. The UIS database consists of approximately 350 megabytes of data representing information from 1975 through the present, contained in over 100 tables or relations. Several types of tables exist in the UIS. They are: main data tables, index tables, translation or utility tables and user-owned tables. The main data tables contain the data shipped to the UIS from the central systems. For example, the Student Schedule Table, which contains a record for every student for every course taken during a semester, consists of almost one million rows 30 bytes wide. Index tables are created when the database administrator defines primary and secondary keys for data access, and are important for efficient execution of queries. Translation tables hold codes and their meanings, and are used consistently by the screens, queries and reports to provide the English translation for a given code. Other utility tables include the tables used for tracking access authorization for users of the system.

Protection. All data in the UIS are considered to be sensitive data (grades, salaries), so tight protection is needed. INGRES provides a permit facility that allows data to be protected at the table level or to be based on values in fields. Also, the days of the week and time of day the database is available to users can also be specified. Once the population is defined for a user with specific permits on data tables, his world of view is limited to that population. Whether he is running the screens, a query, a report or executing his own SQL statement, the data available to him are always that same base population.

User Community. The user community of the UIS application spans a broad segment of the Carnegie Mellon community. Vice-presidents, department heads and administrative and clerical employees from both the academic and administrative sides of the university make up the approximately 200 people who have access to the database.

RELATIONAL TECHNOLOGY

As our current environment has grown from the previous generation of traditional, COBOL-based systems to applications using relational database management software and based on the relational model, we find it useful to look at what advancing to the next generation of computing has brought to the university. The effort involved in making this move is often very clear but sometimes it is difficult to see in advance what the benefits or problems will be.

The advantages of using relational databases for our administrative computing needs are many. We can examine what we see as advantages of relational database from the perspective of the users as well as from the perspective of Administrative Systems.

Advantages to User

Access to Data. For those users who have no need or desire to go beyond the use of simple inquiry screens, any differences between an application written using a relational database manager and an application written in COBOL may go unnoticed. However, those users who in the past were well aware of the structure and limitations of their COBOL application seem to appreciate the additional power they have with direct SQL-based access to the data.

The relational model is easy for novices to understand. The database is structured in the way that one would naturally describe data, grouping data into tables of logically related information about a single entity. As Chris Date, a well known authority on relational database management explains it [1], "a table consists of a row of column headings together with zero or more rows of data values. For a given table, (a) the column heading row specifies one or more columns; (b) each data row contains exactly one value for each of the columns specified in the column heading row." The relationship between tables in the database is expressed by common, key fields. The concept of "data independence" insulates the users, as well as the programmers, from having to understand complex data structures, pointers or underlying data access methods in order for a user to manipulate data. No knowledge of complex data structures, pointers or underlying data access methods is required.

Even the novice user can use the INGRES tools, such as QBF (Query by Forms) or RBF (Report by Forms) to do simple, forms-based inquiries of the data. With a basic understanding of the table structure and SQL, the novice user can perform simple select statements to retrieve data.

For the more sophisticated user, the relational database and its associated tools can be very powerful. With some training in order to become familiar with SQL and learn the database structure associated with an application, users find themselves with the ability to do complex manipulation of data in an ad-hoc manner. Many of our users have created their own tables to use in conjunction with the application tables. These "private" tables can be joined easily with the up-to-date data in the databases. Users have also found it unnecessary to store redundant data in their own personal computer applications, since the central data they need are now easily accessible. It is also much easier now to move any needed data to personal computer applications for use with other software packages, due to the easy-to-use command to extract data from the INGRES databases and the widely available access to data transfer programs like FTP or KERMIT.

Data can be viewed in ways previously impossible without complex programming, largely due to the data independence in relational databases, or the independence of users and user programs from the details of the way the data are stored and accessed. For example, using the old systems to produce a class roster required that a complex COBOL program be run that would produce a roster for every class offered that term. The output file was then divided and distributed to the appropriate departments. Changes to this procedure required the users to request programming and testing by Administrative Systems and often wait weeks for the results. Now, not only can a user do a simple "join" of a few tables, he can limit his request to rosters for a single department or even a single course, all in one SQL "select" statement. Views can also be defined to make life easier for an end-user. A "view" is a way to allow a user to look at one or more tables as one entity, providing logical data independence. When defining the view, the links between the tables are established, and the joins are executed every time the view is selected.

The users' ability to do ad-hoc selections of data on their own has in many cases reduced their dependency on central computing staff. Administrative users on campus need not wait the several weeks it could have taken in the past to have a report they requested written, tested, debugged and run by the central computing staff, who address requests in order of priority. They can write their own request, submit it and have their results almost immediately. The Office of University Planning in particular has made extensive use of the query and report generation facilities available in the University Information System to do the large amount of reporting functions for which they are responsible. Individual departments on campus are also producing their own class rosters, reports and academic audit records with the UIS database.

<u>Participation in Design Process</u>. Perhaps some of the most unique advantages of the relational database for the users concern user participation in the system design process. In more traditional system development environments, user requirements were translated into an information system by the programmers. Often, by the time the system was completed, user requirements would change. Now, because of the easy, rapid prototyping that can be done by the system developers (see next section), users get to see the system in earlier stages in the development life cycle and consequently offer suggestions or criticisms earlier. Users do not have to anticipate all their needed reports or

functions during the system design stage. It is relatively easy to write a new report or add a new screen once the initial system design is in place. Adding such objects does not require any changes to the underlying database and can be done easily using the INGRES tools (see next section.)

Advantages to Administrative Computing

Administrative Systems has indeed seen an increase in productivity and general system quality and flexibility since the relational database and its 4GL tools have been used in systems design and development. The relational model and its way of representing data in tables has been a useful model for developers. In the database design process, the relational model forces the developers and the users to view data in sets and examine the relationship between those sets. This helps to break down the process of designing large, integrated databases into smaller tasks and to facilitate the communication between user and developer.

Productivity. The INGRES software comes with its own tools to build applications, which have helped increase both the level of productivity and the overall effectiveness of the applications programmers in Administrative Systems. The logic portion of the application is specified in ABF (Application by Forms), the application builder. This is separate from screen construction, which is done through VIFRED, INGRES' forms builder, often referred to as a "screen painter". This separation allows for easier and faster changes to be made to an application, since the two functions can be done independently.

By using VIFRED it is simple to specify and later change field location, field validation, screen titles and field display attributes, such as on-screen highlighting, default values or color. Once a screen has been created, any feature can be easily adjusted. The INGRES software handles all the screen I/O, so no complex program is needed. In a matter of a few minutes, a simple screen can be constructed and a user can be entering or selecting data from the database.

Two simple interfaces to the database are available that allow very fast application construction. QBF or Query by Forms, is a screen interface to the database that allows the developer to add, change or delete data. Default QBF forms can be customized with VIFRED in order to add error checking or to customize the screen. No code is required to use QBF in an application. The same kind of function, if written in COBOL, would require hundreds or thousands lines of code. RBF, or Report by Forms, provides simple formatting and retrieval capabilities through a default report on a single table. The default report formats can be changed or enhanced easily. No coding is involved in creating a report with RBF.

A more complex reporting tool, called Report Writer, allows much more complicated reports to be written than d , RBF, still with no real code required. Report Writer allows the results of a query to be formatted and aggregated using embedded commands. The Report Writer commands are simple to learn and are combined with the SQL "select" statement to make up the script. A Report Writer script for a very complex report may be only one to one and one-half pages in length. Reports specified with RBF can be written out to a Report Writer script, where they can be changed if a more complicated report is required.

The key to the application building process is INGRES' ABF or Applications by Forms. This tool allows the developer to tie together the pieces of the application written using VIFRED, QBF, Report Writer and 4GL (Fourth Generation Language) code. The 4GL that ABF uses, called OSL, is the tool used to specify most of the application logic.

The ability to write most of the application control and logic in OSL code has in most cases reduced the necessity to write C or COBOL routines. Only in situations where the procedure required was too complex for OSL to efficiently handle or where high performance was so critical was the 4GL application converted to C and optimized for maximum performance.

A simple application can be produced using OSL and the other tools in less than a day. During the application development process, this ability to very quickly make a system prototype has been very valuable to developers. The developer can start with an application "shell" that contains the basic screens and functions, and work with the users to alter or enhance the application. Very little work is required up-front for this process to take place, and consequently little work is lost in designing something the user does not like or wants to change substantially. By using the 4GL application builder, the prototype of the system is the real basis for the final product, i.e., in most cases the prototype becomes the final product.

In general, we have experienced an increase in overall development productivity since the relational database and 4GL tools have been used. The decrease in development time has given us the opportunity to spend more time up-front on systems analysis issues, and has given us the ability to get system prototypes in the hands of the users faster than ever before.

Security. As mentioned earlier in this paper, the underlying permit facility handles access to data at all levels and is very flexible. Administrative Systems' programmers are not required to write data access routines for each application. Facilities for database auditing, checkpointing and journaling have also eliminated the need for any programs to be written to perform these functions important to database security.

Flexibility. We have been pleased with the overall flexibility of the relational databases. In a few cases where they were needed, changes to the system were easy to make, even after the final production release of the application was in place. Adding a field to a table does not affect the applications already in place. The application code will still run, without change or re-compilation. This is a true advantage over more traditional hierarchical or network databases, where application code is based upon the file structure. For example, a major change made to the UIS after its initial release was a re-structuring of the Student Biographical data table. Originally designed to be semester-based, the table contained many fields that were [illegible] from semester to semester. The decision was made to change the database to more accurately reflect university record keeping, which would reduce the table size from 800,000 rows to 40,000 rows. This change, which required changes to the data loading programs, some screens, queries and reports, and the database format took less than one week to implement. In a non-relational system, this would have involved a complete re-write and re-compilation of much of the application code.

Portability. In addition to flexibility, portability of applications across different hardware and operating system environments is important to us in order to take advantage of new advances in technology. With the INGRES software we have been able to demonstrate that this is a reasonably simple thing to do. As an example, the UIS was moved from its original home on an IBM 3083 to a VAX 8700 in less than one month, with most of the time being spent on making any operating-system specific changes, such as path names in references to files, in re-compiling COBOL code that had embedded calls to the database and in re-writing the application menu, which was converted from REXX to DCL. When a second port of the UIS was done, the UIS (database only) was moved from the VAX 6330 to a Sequent Balance 8 machine overnight. The pieces of the code written in COBOL and DCL were re-written in C on the Balance, in order to make the application as portable as possible. As a test, we were able to move the entire application from Dynix back to VMS in less than a day.

Maintenance. Development with 4GL's have greatly simplified aspects of system maintenance. Because ABF allows us to tie together many procedures and screens, if a change must be made to one part of the application, the entire application need not be re-compiled. Storing data in tables rather than having it hard-coded in programs also allows users to change applications with no programmer intervention.

Distributed Database Technology. Finally, we see distributed database, in the form of INGRES/STAR, being a true asset to our administrative computing efforts in the years to come. STAR now allows two or more databases to be opened simultaneously, whether they are on the same node or on different nodes. This feature is used frequently in administrative applications when connectivity to other databases is required, and allows us to eliminate duplication of data, keeping our databases current. A further benefit of distributed database technology is found in the ability to distribute data across nodes which are linked together via a communications network, like DECnet or TCP/IP. The data can be stored on any number of nodes and users at any node can see any of the data without having to know or to specify where it is. In this way, more data are available to more people, while at the same time it is possible to store each piece of data on the machine where it is most often used, in order to maintain efficiency.

OTHER CONSIDERATIONS

Although the benefits of relational database are many, it is also important to look at some of the side-effects associated with moving to this technology and to also look at what is required in order to use relational database effectively and efficiently. Many database vendors make great claims about the rate at which your productivity will increase, how simple the tools are to use and how much less work you will have to do. You are cautioned to not be fooled by such claims. Although productivity does tend to increase, nothing happens overnight!

For Users

Along with the improved access to their own data, users now have the responsibility of learning how to effectively use the tools that are available to them. If they choose not to take advantage of SQL or the other tools like QBF or RBF, most of the advantages of the move to relational database will be invisible to the user. We have found that support of the system by upper management is important to the learning process and the general use of the system. High-level support for the technology has had an effect on its use at Carnegie Mellon, particularly in the case of the UIS. When users at the vice-presidential level used the UIS and saw the advantages that this system afforded, the word spread to others on campus who were also able to take advantage of the newly available data.

It is important to users that they set aside time to attend classes to learn the structure of the database and to learn SQL. An in-depth understanding of what data are contained in which tables is extremely important to the user who will be writing SQL statements to retrieve this data. Some time should be reserved each day for the user to spend in practice sessions in order to become familiar with INGRES and SQL, the database and the operating system. We have seen many users attend an SQL class and then not practice what was covered in class. When they need to do an ad-hoc query, they have forgotten what they had learned, and are unable to make full use of the system.

Although users are required to know more than ever before about how their systems work and may find this learning to be a time-consuming process, it is important to stress to them how the time invested initially in learning the database layout, the application system and SQL will pay off in the future. They will have better access to their own data, will not have to go through a "middle man" (administrative computing) in all cases to get data they need and will be able to respond to their users in a more efficient fashion.

Remember that SQL is still a programming language, and sometimes SQL and database concepts will be difficult for an end-user to master. One should be realistic in these cases, and encourage a user who is having difficulty to master the formatted screen applications first, then attempt SQL use at a later date, once comfortable with the screens. In some cases, either due to lack of initiative, understanding or ability, some users never become comfortable enough with SQL to do their own ad-hoc queries. Many users will be content with the "fill-in-the-form" variety of applications interfaces. [2]

Although some claim that end users are never going to use SQL [3], our experience has shown that a few "key" users arise in each department or administrative area. These individuals tend to become the resident expert in SQL and are most often also the people in the department who have a good understanding of the data. These people have been able to serve as a consultant for others in their department who are experimenting with SQL.

For Administrative Computing

The addition of relational database applications to our computing environment brings with it a new set of responsibilities for Administrative Systems.

Training. Training new users was a significant part of the successful deployment of all our relational database applications. Staff who before were developers and users of the old applications needed to learn how to use the new tools available to them. As the user community grew, many people who previously did not have access to any electronic data also needed to be trained. Our experience with the University Information System showed us that Administrative Systems needed to plan for and present training on the database layout, SQL and other INGRES tools, as well as some operating system concepts. Several sessions, spanning days or weeks are usually required to give most users a basic, working knowledge of the application and the database manager. A few days between training sessions was also found to be helpful. This time lapse gave users some time to practice what was discussed in the formal class, and to return with questions in the following session.

We also had to train our own staff. A few people in the department were relational database "experts" when our major development began, but a good part of our staff were from traditional COBOL or 3rd generation programming language backgrounds. Some training was done internally by our own staff, but we did send large groups to one-week training sessions given by the vendor. In addition, certain staff were sent to specialized vendor training in advanced performance or coding. This all costs money, and you should plan for this in your project budgets. As we have added staff over the past few years, we continue to send them to the one week "INGRES for programmers" course, and will provide internal reviews of database concepts on a regular basis.

Support. In addition to the up-front training requirement, our department must plan for on-going support of these users. It is important to have a staff member available to take "emergency" calls from users who are having trouble with simple tasks like running the screen application, as well as to consult with more sophisticated users who are attempting to write complex queries or Report Writer scripts. Unless help is available, users will sometimes give up on the application.

Access Issues. We have talked some about the benefits of distributing the ad-hoc access to the data with SQL. This method has its drawbacks. In addition to users having problems formulating their queries, there is the danger that they may write and execute "bad" queries. Most often, these are "disjoint" queries that do not properly join tables. The usual consequence of this action is that the database manager executes a Cartesian product and the user's query runs out of disk space and fails. On a few occasions, however, the databases have become inconsistent and consequently inaccessible to all users until a "restore" command can be executed by the database administrator. (Automatic restoration of the database, as well as automatic detection of queries generating very large results are part of version 6 of the INGRES software, but for user of version 5 it is a manual process.)

In addition to the problem with disjoint queries, another unanticipated problem has arisen. Users on occasion are found to be running large, complex queries in interactive mode that are competing with regular production for machine cycles on the central time-sharing systems. No good solution as to how to handle this problem has yet been determined. Not all users can afford to own their own work station, where they could use their own machine resources. Access to the database can be limited to certain hours of the day, or users can be forced to execute all queries in batch mode at a lower priority. This second option would prohibit users from running simple queries during the day. Right now, we are attempting to educate the users who are writing the more sophisticated queries about how their work affects the rest of the users on the machines, and when and how they should do their work. A more permanent solution must be devised.

Many sites have chosen to avoid the problem of users causing inconsistencies in the production databases by providing them with an additional inquiry database. Having a duplicate database for inquiry purposes also provides an additional level of security (no changes can be made to the 'live' database) and helps improve performance for the users of the on-line inquiry screens, who are not competing against massive update, delete or add transactions. This solution requires that the additional disk space be available, that another database be maintained, and that the additional database be updated on a regular basis. Although this method introduces the possibility of the two databases being "out of sync," depending on the volatility of the data in the source system and the resources available, this may be a good method to use when production databases are involved.

Performance. Getting good performance from a database application is an important part of database management and should be given a high priority. First and foremost, good database design is critical to good performance. A large percentage of the development effort, probably somewhere around 35%, should be spent in the design phase. We have found that when enough time was spent on developing a good design, the system performance issues were easier to resolve.

Once the design is in place and the applications written, if a database is not properly "tuned" the result will be a slow system that will be the source of many complaints. Database programmers must be properly trained in how to take advantage of the database management system and to use it in conjunction with the operating system to its fullest potential. Sufficient time should be allotted during the system testing phase of any project to tune the database and application for maximum performance. The "tuning" process includes properly establishing file structures and secondary indices, distributing the data across disks and gathering statistics used by the internal query optimizer in query execution. Fine tuning should be an ongoing maintenance process. Careful management of all aspects of the database, including indexing, optimization, locking, database integrity and user permits is crucial to the efficient operation of the application.

SUMMARY AND FUTURES

Since the implementation of the first relational database application for administrative use at Carnegie Mellon, a trend has existed toward broader distribution of data and improved access to information. The standardization of all administrative computing on the relational model has brought with it many advantages, both to the user and to the data processing staff. Though some special training and expertise is required to properly maintain, administer and use these systems, the benefits they bring are of critical importance to the operation of this university.

Future directions for relational database in administrative computing see even more work being done in the area of the distributed database environment, through INGRES/STAR, to provide our users with access to many different databases appearing to be a single system. We also see the GATEWAY products, which provide links to other databases (like DEC's RDB) or files, (such as RMS files), to be useful to link existing non-relational systems with INGRES databases.

Finally,we hope to soon be taking greater advantage of the natural language interfaces to databases, which will allow our end users to have full access to their data by simply making their requests in simple English. We hope that this approach will provide users with greater flexibility in their work,and eliminate the requirement of learning SQL to make the greatest use of the data in their systems.

REFERENCES

[1] C. J. Date, *Database: A Primer*, (Addison-Wesley, 1983).

[2] L. Rowe, "Fill-in-the-form programming," in *Proc. 1985 Very Large Data Base Conf.*, Stockholm Sweden, August. 1985.

[3] M. Stonebraker, "Future Trends in Database Systems," in *IEEE Transaction sor Knowledge and Data Engineering*, Vol. 1, No. 1, March 1989.

ON-LINE CD-ROM access in a DIGITAL Environment

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ABSTRACT

Even small shops can provide remote access to CD-ROM databases such as MEDLINE, ERIC, AGRICOLA, and Books in Print. Despite having a limited technical support staff, we've done it in a DECNET environment.

Many extremely useful databases are available on CD-ROM. At our medical college, researchers, physicians, and students clamored for CD-ROM hardware and software. This confronted the administration with numerous departmental requests for identical CD-ROM players, microcomputers, and database subscriptions.

Rather than duplicating these systems, we connected a CD-ROM player to a device called a "V-Server" on our VAX system. It isn't magic, but if users' demands are great, funds are limited, and you use the DECNET communications protocol, it works.

This presentation also reviews alternative CD-ROM networking solutions using a Novell network, MACs under TCP/IP, and remote multi-access CD-ROM without networking.

I. Brief introduction to CD-ROM

A. Hardware - how it works.

CD-ROM (compact read-only disk) is a new technology that is breaking all previous barriers for storing computer data. A small 5-inch disk typically holds up to 600 megabytes of data. This is the equivalent of nearly 1,500 magnetic floppy disks of information! CD-ROM stores more because the "focal point" of a laser beam is much smaller than a typical "magnetic" disk head, thus more information can be stored on each disk. This has allowed many companies to "compact" thousands of pages of information on a single disk.

In addition to being efficient, mass-production of CD-ROM disks is very economical. CD-ROM disks are not susceptible to magnetic fields and cannot be accidentally erased.

B. Software - what databases are available?

New titles are being released every day. Typically, CD-ROM applications are based on LARGE database systems. To date, there are over 300 titles available. A sampling of databases (for education) include:

MEDLINE -index to medical journal articles
BOOKS IN PRINT
BOOKS OUT OF PRINT
ELECTRONIC ENCYCLOPEDIA
WORLD ATLAS
ERIC -index to educational research literature
PSYCLIT - index covering material of psychological relevance scanned from over 1300 journals from more than 50 countries
ABI-INFORM - a business database consisting of abstracts and indexing to business articles from over 800 business and management journals
TOMES PLUS - information on industrial chemicals, hazardous materials, toxicity, and emergency responses.
...and many, many more.

(At this CAUSE session we're distributing copies of the CD-ROM Sourcedisk, a CD which contains CD-ROM product titles and vendors and also copies of the magazine CD-ROM Enduser, which introduces this useful technology.)

C. **Cost - Hardware and databases**

CD-ROM drives (that attach to a PC) typically cost between $800 and $1400 depending on the type of drive and configuration. CD-ROM disks (databases if you like) can cost as little as $89 or up to $4000. Many CD-ROM databases are purchased as a "subscription" for a yearly fee which usually includes monthly updates. [These costs do not include the microcomputer system.]

D. **Why use CD-ROM?**

CD-ROM databases are popular because they provide a means to access almost limitless amounts of information in a small space. Depending on your facilities, you may already have most of the hardware needed to implement a CD-ROM database.

The most important factor in considering a CD-ROM purchase is cost. If you need the information, AND if you can implement a CD-ROM system effectively in your institution, then you have cause to consider purchasing a CD-ROM system.

Another factor when considering a CD-ROM purchase is ease of use. There is no standard in the ways software packages are written to access CD-ROM information. Some packages are menu-driven and easy to use; other packages may provide more information, but are more cumbersome. MEDLINE alone is currently sold by more than a half-dozen vendors. Each of these systems is very different from one another. If you get a chance to "demo" a system, do so.

Speed is also a factor. Although CD-ROM disks hold megabytes of information, CD-ROM drives are somewhat slow. Most users are not inhibited by this, as how much information is available usually outweighs how fast they get it.

Nonetheless, there are alternatives to CD-ROM systems, all of which should be considered first.

E. **Alternatives to CD-ROM systems**

The first alternative that should be considered is "outside access". Many vendors provide access to their databases for a license fee. In the past, we have used the "Grateful MED" dialup service that the National Library of Medicine (NLM) offers. All any user needs is a PC/terminal and a modem. The service is convenient and is offered 24 hours a day.

The cost for this particular service is approximately $23.00/hour for "prime-time" access (9am - 4pm) and $16.00/hour for "non-prime-time" access. Given the number of researchers at our college that utilize the system, this has proved to be too costly. However, given a different situation, this would be a cost effective way to access MEDLINE.

Another alternative is using "in-house" systems that are NOT CD-ROM based, but normal "load-your-own" systems onto computer disks. Typically, you purchase the software/data that runs on your existing computer system. This is an excellent solution if you can afford it.

II. The problem: A description of our previous non-network setup

A. Hardware configuration: the "standalone" model

Our initial configuration is a "standalone" model. It consists of a PC/AT workstation with two internal CD-ROM drives and a slave printer. This workstation is physically situated in our Medical Library and is exclusively dedicated to running MEDLINE (from Online Systems), which consists of a total of eight (8) CD-ROM disks.

Faculty and students use the MEDLINE system to search through literally millions of medical journals to find information relevant to their research. Because of its popularity and effectiveness as a research tool, this workstation is in use almost all day during library hours.

B. Problems and limitations

The primary problem with this setup is that of the location of the workstation. Faculty and students must reserve a time slot to use the system and must physically go to the library to perform their data searches. Our medical complex is physically large, so for many researchers, this proves to be extremely inconvenient and/or impractical.

Additionally, the workstation is only available when the library is open. Many of our faculty perform their research after midnight (or weekend evenings) when the library is closed, and thus they miss being able to use this powerful research tool at their convenience.

Finally, because there are only two disk drives, users occasionally must "swap" disks. This is an inconvenience and slows search time a bit.

C. **Cost of adding users - unacceptable!**

The cost for a CD-ROM workstation (including all software and licenses) can easily add up to between $5,000 and $8,000. We could attempt to solve the above problems/limitations by "duplicating" this setup across campus in various locations, but the costs would add up very quickly, and not enough staff is available to manage each separate workstation. Obviously, this was not the best way to expand our resources.

III. The solution: A description of our "multi-access" setup

A. The new hardware configuration - uses mostly existing hardware

To solve the problem of purchasing costly redundant systems, and to overcome the fact that PC CD-ROM applications are not usually "networkable", the MIS department used what is called a "V-Server", from Virtual Microsystems, Inc. The V-Server is a device that contains four (4) 286-based processing cells, and lets any VAX terminal (VT compatible) run PC-based applications. At the time, the V-Server was being used by staff who have terminals and who do occasional PC work, usually word processing or spreadsheets. When the need for additional MEDLINE access emerged, we realized that the V-server offered a way to implement remote MEDLINE access.

The V-Server connects to the VAX via a standard ETHERNET cable, and uses the DECNET protocol to communicate with the VAX. Each of the 4 V-Server cells comes with an expansion slot, so it was easy to hook up a CD-ROM disk controller. PC "disks" are actually virtual disks stored on the VAX. The V-Server cells handle the processing, while the VAX handles terminal communication.

[see figure 1 on page 10]

The nicest benefit of this setup for us is that it uses mostly existing hardware: By connecting the CD-ROM disks to the V-Server, MEDLINE instantly became available to all of our hardwired and dialup users.

The problems of physical location of the CD-ROM system have been eliminated, and the cost (approximately $10,000 for a 4-cell V-Server) were definitely reasonable. Note that we also use the V-Server for many other DOS applications in addition to the CD-ROM application, so the money invested was well used.

B. Problems and limitations

Although the V-Server is "PC compatible", there are obviously differences. It took a lot of parameter "tweaking" to install the CD-ROM software properly. We discovered that our MEDLINE uses quite a bit a memory, so we had to upgrade the CD-ROM V-Server cell with expanded memory ($1000) to work properly.

The second problem is that although the V-Server can be accessed by anyone [with a terminal/pc] on our campus, only one person can access the CD-ROM system at a time. This is because only one of the V-Server cells can access the CD-ROM disk. Until recently, this has been a minor inconvenience for our users. However, the CD-ROM system has become so popular that we are addressing the problem of simultaneous, multi-user access to CD-ROM now.

Another problem with the V-Server is, as mentioned above, that it expects a VT-compatible terminal on the user end. The keyboard mapping thus becomes somewhat awkward (i.e., "F6" on a VT220 terminal to enter an "F1" for the PC application). This problem is further compounded by users who use PC's to dial into the system, who end up with a PC emulating a VT terminal emulating a PC. Virtual Microsystems (the V-Server vendor) is currently developing a terminal emulation package for PC users that will map all keys on a 1-to-1 basis to make it much easier to use.

At this time, MACINTOSH users still have to put up with the odd keyboard mapping. Nonetheless, one physician MAC-enthusiast has contrived a way to use the V-Server MEDLINE from his MAC. Once we resolve IBM/PC problems, we will then work on the MAC next.

C. Reaction of staff and students- enthusiastic!

Most of our staff and students were familiar with the Library's CD-ROM MEDLINE system, but many did not use it for reasons described above. When they found out we were hooking up a similar system accessible from the VAX, the reaction was fantastic. We have now set up several users (over 50) who all remotely access the system. The amount of data on the CD-ROM disks, combined with an excellent software package, have helped researchers tremendously.

Our department has received many calls and a several letters commending the system, and they all want more!

D. The next step - Using a NOVELL network in our setup

As mentioned above, a major limitation of our current system is that it can be only accessed by one user at a time. The solution? We might set up the CD-ROM system on some sort of PC-BASED network, such as Novell. However, at first glance, this seems too expensive, and also takes the VAX out of the picture as the communications front-end.

Academic Computing Services at the University of North Carolina (Chapel Hill) has proposed an ingenious setup that uses both solutions, using a Novell network and the V-Server. This solution solves the above mentioned problems.

The setup involves attaching multiple CD-ROM disks to a Novell file server. Each of the V-Server cells is then configured with a network card (in the expansion slot) and thus each V-Server cell becomes part of the CD-ROM network.

[see figure 2 on page 10]

This approach solves our current problems, and is cost effective. A complete network (with workstations) need not be purchased; only one workstation (the server) and up to four (4) network cards. The CD-ROM disks which are now attached directly to the V-Server would instead be attached to the network server.

We have found four vendors of CD-ROM networking products - Artisoft, Inc., Meridian Data, Inc., Online, Inc., and CBIS, Inc. Base systems range from $2,000 for a 5-user system to $15,000 for a 20-user system.

IV. Other multi-user CD-ROM possibilities

A. MACINTOSH-based disk server

The solution(s) shown above all met our needs. We are running a DEC VAX with DECNET, and the V-Server happened to fit into this nicely.

What about non-DECNET sites? In our research of various solutions, we have uncovered some alternatives for sites that may not be configured as ours. One answer involves the use of a MACINTOSH computer as an APPLESHARE file server.

Stanford University recently evaluated a system called "Knowledge Finder" that uses a Macintosh SE computer working as an APPLESHARE file server over a PHONENET network. In turn, this APPLESHARE network is connected to the campus TCP/IP ethernet by using a Kinetics Fastpath gateway.

Thus, users of Macintosh computers across the local PHONENET or other similarly-connected PHONENET networks can all access the CD-ROM server. Their evaluation was successful, and they have implemented the product campus-wide.

Like us, they too implemented a solution that fit into their existing configuration, namely the TCP/IP network.

B. Modification of the Vserver

Another alternative that could be investigated is to have the technical staff at Virtual Microsystems modify the V-Server so that the CD-ROM drive is accessible from ALL of the V-Server "cells", and not just the one cell that the disk controller is attached to.

This gives us a "non-network" multi-user system, and is somewhat cheaper than the Novell system.

This would be a satisfactory solution, but it is slightly limiting. First, we would be required to "invest" a few thousand dollars of funding to have Virtual implement this solution, and it might be quite some time before the finished product is ready.

In addition, this limits our use of the CD-ROM system to the V-Server, and it gives us little flexibility to move to another configuration in the future.

C. Multi-user access WITHOUT the VAX

Obviously, not everyone reading this paper has a VAX. Fortunately, there are many solutions. The latest solution to this problem has only recently been addressed by network vendors. Both Novell and Gandalf Technologies have recently introduced network systems that do not use any front-end whatsoever, nor do they use workstations. Instead, these network systems work with many PC's or ASCII terminals, connected through a serial line. The result is much like a V-Server, in that you can easily provide remote access to networked systems, specifically CD-ROM.

The costs for these systems range from $10,000 to $20,000 (CD-ROM hardware/software not included). This type of system does NOT make use of your existing systems, except for your modems and/or communication lines. However, this type of system does free you from dependance on any particular mainframe system and/or network, and it can offer extremely flexible communications alternatives.

V. Conclusion

A. Evaluate your needs

Should you buy a CD-ROM system? Only your users can tell you. Find out the needs of your user community. Next, compare those needs with your knowledge of what's available in the marketplace. Subscribe to many of the free CD-ROM journals available to get the latest information.

The Medical College of Wisconsin found an increasing need for the MEDLINE database. Since the initial library workstation was installed, our need for access to this type of system has grown exponentially. For us, alternate methods of access (e.g., licensed external services or building in-house disk systems on the mainframe) were too costly to be acceptable.

B. Evaluate your systems

Take a look at your existing hardware. Does it lend itself to hooking up some type of PC-BASED system? There are many options.

DEC VAX systems (like ours) can hook up to many types of computers easily. We happened to have a third party product (V-Server) that made access to PC-BASED applications easy. There are many ways to enable multi-user access to CD-ROM systems. Use your own hardware if you can, as cost effectiveness is always important.

C. Choose the solution

Finally, make the choice appropriate for your institution. We were able to implement a solution that was extremely cost effective with a minimal initial investment. Because we were doing something "new" with our particular MEDLINE CD-ROM software system, the College received a 1-year license grant to make sure the system was functioning properly.

Check with your CD-ROM product vendor to see what type of evaluation periods are available. Although CD-ROM products provide a great way to distribute information, licensing can sometimes be costly, and the wrong choice can mean an unsatisfactory system.

Figure 1. Existing V-Server/CD ROM setup

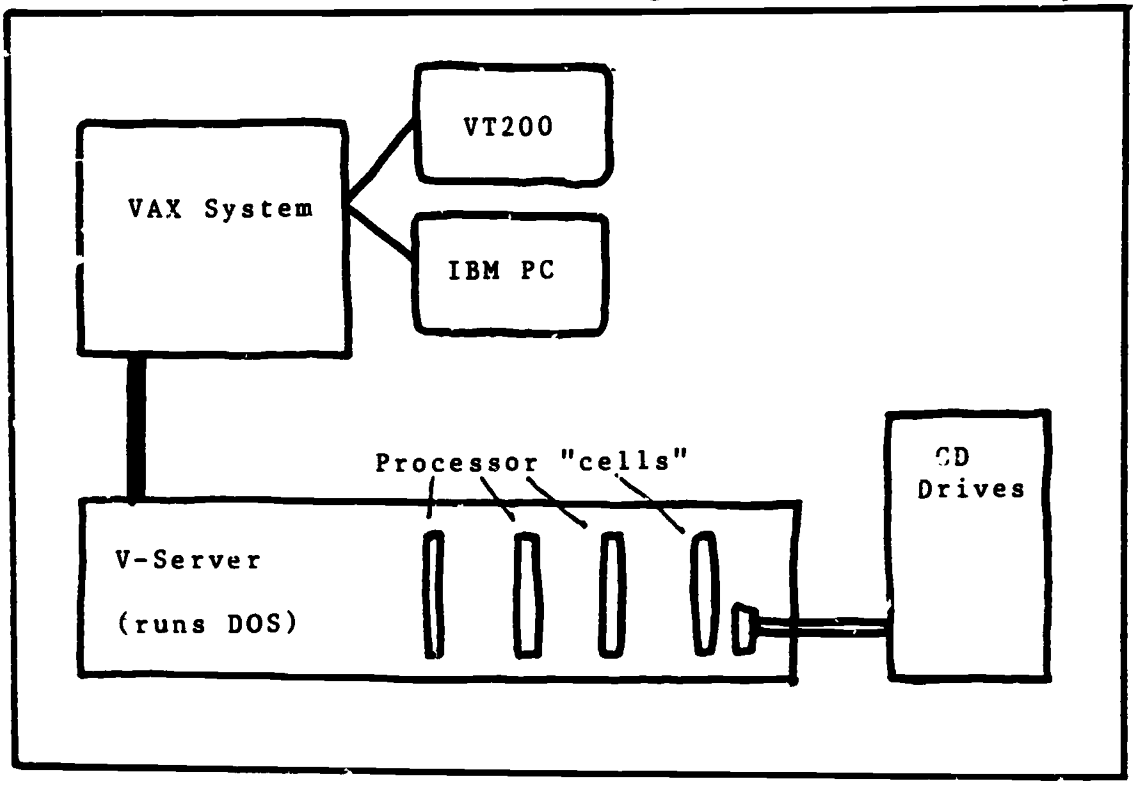
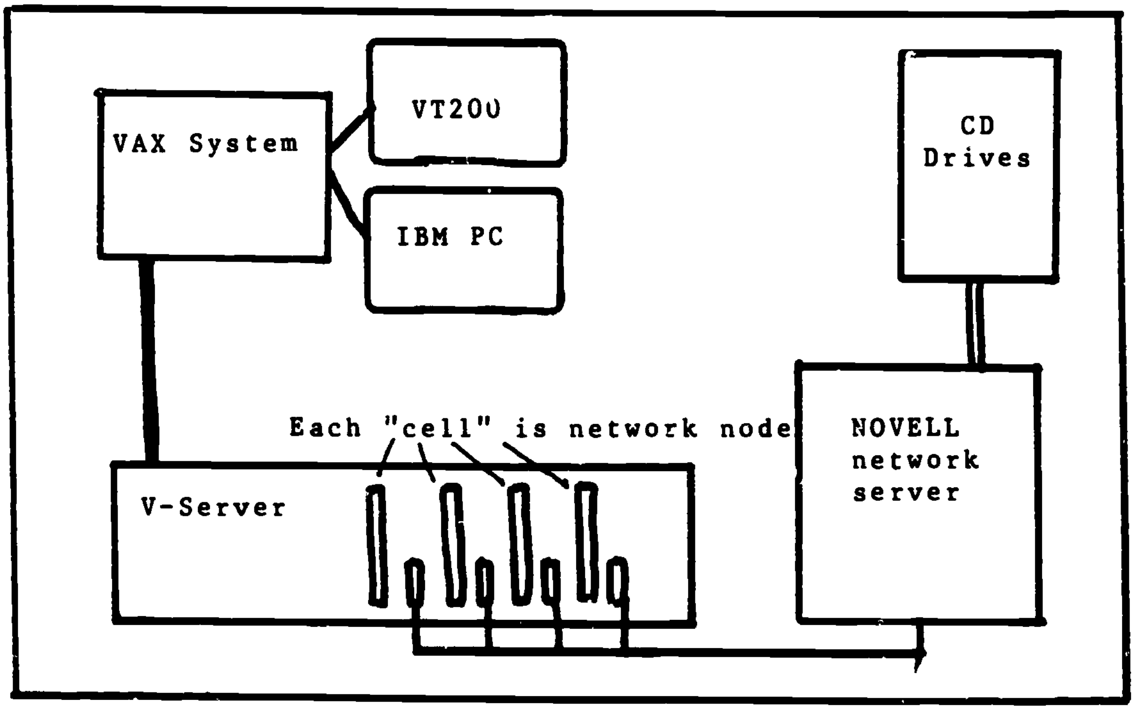


Figure 2. Possible future layout



U-VIEW: STUDENT ACCESS TO INFORMATION USING ATM'S

John J. Springfield
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U-VIEW allows students to display and print their Boston College records at automated teller machines (ATM's) located throughout the campus. By inserting a magnetic striped ID card and typing in a personal identification number (PIN), students are allowed access to their courses, grades, student loans, student accounts, financial aid, addresses, and other personal information.

ATM's are "natural" to the student because they can be located in convenient areas and are available after normal office hours. In addition, the U-VIEW ATM's have builtin 80-column printers. U-VIEW has improved life for administrators by eliminating many inquiries. Records are more accurate because students are reporting errors. The ATM security features include the ability to capture obsolete and stolen cards. ATM's are rugged enough to be located in unattended areas. Future uses include the ability to drop and add courses, view urgent messages, and update records.

An Old Idea, A New Idea

The idea of distributing computer access to user departments is not new. However, if we expand the term "user" to include the student (the true "end-user"), we are soon confronted with a whole set of issues that must be confronted. How do we guarantee security? What hours should access be allowed? What kind of devices should be used? Should the devices be located in hallways, dorms, or kiosks? Should full-page printouts be available? Should the new service complement or replace existing departmental access?

After pondering this idea you soon reach the conclusion that you need a device that can read encoded ID cards, is intuitive to use, has a built-in printer, and is rugged enough to resist abuse. In short, you need an ATM (Automated Teller Machine) that has an 80-column printer instead of a cash dispenser.

First Attempt - Terminals with Mag Stripe Readers

Borrowing an idea from David Ridenour of Indiana State University ("Allowing Students Read-Access To Their Own Computer Records", CAUSE/EFFECT ,March 1988), we decided to set up terminals with attached mag stripe readers in three high-traffic locations: outside the registar's office, inside the library, and next to the cashier windows. Since students already had encoded ID cards, we did not have to set up new administrative procedures. By late summer of 1988 students were using "U-VIEW" at these single purpose terminals to access their courses, grades, loans, accounts, financial aid, addresses, and other personal information. U-VIEW was easily used by swiping an ID card through the card reader and supplying a birth date. It was an instant hit with both students and administrators.

However, there were problems with this approach. Specifically:

- Some students inadvertently locked the keyboards by pressing cursor and other keys. A standard refrain from the registrar's office was "Hit the reset key!" Clearly, the standard keyboard was too complicated. All we needed was a simple numeric keypad and a few function keys.

- It became apparent that most students wanted and needed a printout. Long lines were being created because students were copying information from the screen to paper.

- Because the terminals and card readers sometimes confused students, there had to be a staff person in a nearby office to help them. It was obvious that these devices were not self-sufficient enough to be left totally unattended.

- Terminals had to be secured at night because they were not designed to resist abuse or theft.
- Although the system could detect anyone with an old or stolen ID card, we had no way to automatically retain the card.

Experimenting with an ATM

By the fall of 1988 it was clear that we needed a device that looked and acted like the standard ATM that was commonly used by banks. The main difference is that we needed a built-in printer instead of a cash dispenser. Students were used to using bank ATM's on and off campus. If we could find an ATM with a 80-column printer we were sure we could solve our problems. But did such a device exist?

After contacting NCR and Diebold, we discovered that Diebold had a model 1060 "Everywhere Teller Macnine". It was exactly what we needed! It had a 20 by 40 column display screen, a numeric keypad, four function keys, and an 80-column printer. But could we communicate with it via VTAM and CICS? It supported SNA/SDLC protocol, but the vendor had not heard of anyone rigging it up in the manner we proposed. After we secured a loaner ATM and manuals from Diebold, we were on our own.

When we received the ATM in December or 1988, our first and biggest task was to see if we could talk to it. Rod Feak, Computer Center Director and seasoned system programmer, dove into the manuals. Without Rod I would have hit a wall. Rod described the ATM to our system as a control unit with a logically attached terminal. To CICS it was set up as a 3600 device. Within a month Rod had CICS talking to the ATM. After that I retrofitted our existing U-VIEW application to work on the Diebold ATM. By February 1989 we went live and became the first college to use an ATM to dispense student information.

U-VIEW on an ATM

The ATM is left powered up at all times except for periodic maintenance. When it is first powered up, a CICS transaction sends a series of "states" and "screens" to the ATM. These states and screens allow the ATM to have limited functions even when CICS is subsequently brought down. Without accessing CICS the ATM can handle menu navigation, timeouts, and incorrectly inserted cards. But once a student requests data, the ATM sends a message to a CICS transaction and waits for a response. Response time is fast when displaying data. Printing data takes longer because of the relatively slow printer. All access is recorded on a log file on the mainframe.

The first screen appears as follows:

```
 ___________________________________________
|                                           |    -------------
|   BOSTON COLLEGE                          |   | 1 | 2 | 3 |
|      U-VIEW            |------------|     |   |---|---|---|
|                        |------------|     |   | 4 | 5 | 6 |
|                         .__________.      |   |---|---|---|
|                         |          |      |   | 7 | 8 | 9 |
|  PLEASE INSERT          |    /\    |      |   |---|-------|
|  YOU BC ID CARD         |    ||    |      |   | 0 | CANCEL|
|                         |          |      |    -------------
|                         |          |      |   O   (Four
|                         !__________!      |   O    Function
|                                           |   O    Keys)
|                                           |   O
|___________________________________________|
```

The card is read by the ATM and verified that it is an active BC student ID card. If it has been reported stolen, it is kept by the ATM and reported to the security administrator. It is important to note that all cards are kept by the machine until the student is finished. At the end of a session, the card is partially released to allow the student to retrieve it. If the student walks away, the card is retained by the ATM.

The next screen asks for the student's PIN number:

```
 ___________________________________________
|                                           |
|               PLEASE ENTER                |
|                                           |
|             YOUR PIN NUMBER               |
|                                           |
|                  XXXXX                    |
|                                           |
|            THEN PRESS ===============>    |   O
|                                           |   O
|                                           |   O
|                                           |   O
|___________________________________________|
```

The PIN is verified. If incorrect, the student is allowed two more tries. The card is rejected after the third incorrect attempt. If the student contnues to reinsert the card and enter an incorrect PIN, the card in retained after 9 tries security administrator is notified.

Once the student is allowed entry to U-VIEW, the main menu screen appears:

```
 ________________________________________________
|                                                |
|             PLEASE MAKE                        |
|                                                |
|             A SELECTION                        |
|                                                |
|                                                |
|             PERSONAL INFORMATION =====>        |  O
|             ACADEMIC INFORMATION =====>        |  O
|             FINANCIAL INFORMATION ====>        |  O
|             QUIT U-VIEW ==============>        |  O
|________________________________________________|
```

After this menu are various sub-menus and screens showing the desired information. All navigation is done by pressing one of four function keys. Each non-menu screen allows the student to press a function key to print the data on the built-in printer. Since the screen is only 40 characters wide, the printout usually has more detailed information that the screen.

Here is an example of a present semester course screen:

```
 ________________________________________________
| COURSE NAME            SCHEDULE   LOCATION     |
|                                                |
| GENERAL CHEMISTRY I     M W F 8   102 CUS      |
| GENERAL BIOLOGY I       T TH 10   104 DEV      |
| CALCULUS I              M W F 1   207 HIG      |
| INTRO TO LITERATURE     T TH 11   001 FUL      |
|                                                |  O
|                                                |  O
|           PRESS TO PRINT ===========>          |  O
|           PRESS TO CONTINUE ========>          |  O
|________________________________________________|
```

Note that the print and continue functions are always positioned on the last two lines on the non-menu screens. For security reasons screens and printouts never have student ID's or names on them.

By selecting various options at each menu, students are allowed to view and print the following information about themselves.

. Home, local, and parent addresses

. Vehicle parking permits

. Academic status and rank

. Last, present, and next semester courses

. Advisor and registration appointment time

. Student account

. Financial aid

. Student loans

Human Factors

Even though jumping the technological hurdles was personally exciting, it is the human factors that have and continue to be challenging. Students respond well to the simple keyboard and familiarity of an ATM. We tried to mimic the human/machine interaction of a bank ATM wherever possible. However, there are still some human factor problems that do not offer an easy solution.

Our first problem centered around the printing of information. Should we automatically dispense each printout after each selection, or should we wait until the student ends the session? Even though it wastes paper, we found that people want a printout immediately after they press the print function key. So we form feed the paper out of the machine as soon as possible.

Another consideration is the length of time that is allowed to view a screen or answer a question. If we do not allow sufficient time to read all the information (say 25 seconds), we frustrate the user. However if a long response time is allowed, users may walk off without taking their cards!

Our current dilemma involves the changing of the menu structure based upon the time of year. During drop/add period virtual all students want to see their courses. After the end of the semester they want to see their grades. Instead of going through two menus to reach the selection, we could automatically put the most frequent selection on top based upon the time of year. However this may confuse the "frequent user" student who is used to seeing things in the same order.

Shared Administration of U-VIEW

To make U-VIEW work successfully it was imperative that key departments be involved in overseeing it. We were fortunate to already have most of the pieces in place before the project began.

The ID card is issued by the campus police. If a card is stolen of lost the campus police investigate and reissue cards. Cards that are retained by the ATM's are turned over to the police on a daily basis.

MIS handles the programming, the computer center manages and maintains the ATM's, and network services maintains the connections and checks daily for worn-out ribbons and lack of paper.

The security administrator monitors an online log of U-VIEW access. Students are notified if there has been suspicious use of their cards. Statistics are kept on daily and monthly usage.

The registrar and other offices are very helpful in suggesting improvements to present features as well the need for new options.

Acceptance of the ATM

From the beginning the ATM was a success. Everybody seemed to say, "Gee, why didn't we do this years ago?". Students now have "one-stop shopping". Administrators can be freed from answering simple inquiries and use their time on the more involved student questions and problems.

The fall of 1989 showed the following usage of the ATM:

MONTH	NUMBER OF STUDENTS
September	5285
October	2304
November	3828

On slow weekdays about 100 students use the machines. Busy days will show over 500 students.

It should be noted that we expect this count to increase as we add more capabilities. We are purposely keeping the functions static until we have more ATM's. We do not want to simply move the lines from an office to the lines to the ATM's.

Future Enhancements

Currently we have restricted students to inquiry mode only. The next step is to allow updates, viewing and sending messages, and requesting printouts requiring batch processing. Some of this may require an ATM with an alpha keyboard, more function keys, or voice and video. ATM use could also be opened up to faculty, staff, and alumni.

Here are a few ideas for future use of the ATM:

- Drop/Add
  Allow students to drop/add courses that require no departmental permission.

- Student Elections
  Use the ATM like a voting machine. Insure that students only vote once. Voter turnout would increase. Results would be known instantly after polls are closed.

- Updating Local Addresses and Phones
  Students can update their own addresses by choosing from a list of dorms or neighboring streets. A free form address would require an alpha keypad.

- Messaging
  Urgent messages from home, campus police, faculty, adminstrators, or other students could be displayed automatically on the first menu screen. The sending of messages would require an alpha keypad.

- Faculty and Staff Usage
  Allow faculty and staff to view their address and phone, payroll deductions, etc. Currently anyone having access to a CICS terminal can view their records. However some staff may not have access to a terminal.

- Alumni Usage
  Alumni could view their records, request theatre or sports tickets, or request information on current donation projects.

Conclusion

The ATM has proven itself to be an effective way to distribute information to students, free administrators of tedious tasks, and generally improve the quality of life at the university. It's greatest strengths over standard terminals are the security features, convenience, ease of use, resistance to abuse, hours, and ability to print full-page information.

IMPLEMENTING A CENTRALIZED DIRECTORY AT LSU

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ABSTRACT

After twelve years of developing online data base systems, LSU achieved a major goal of integrating administrative data processing systems by creating a centralized repository called the Directory. The Directory stores name and address information about an individual, and serves not only as an entry point to such systems as Payroll, Personnel, Student Records, and Traffic, but also as an indicator of an individual's relationship with the University. Because the Directory collects information from administrative offices spanning different areas of responsibility, user coordination was a critical requirement during the development of the system. Both users and analysts were challenged during the design to evaluate the needs of the University as a whole, in addition to the needs of the individual offices. Topics of the presentation include design requirements, special features, and problems encountered during design and implementation.

INTRODUCTION

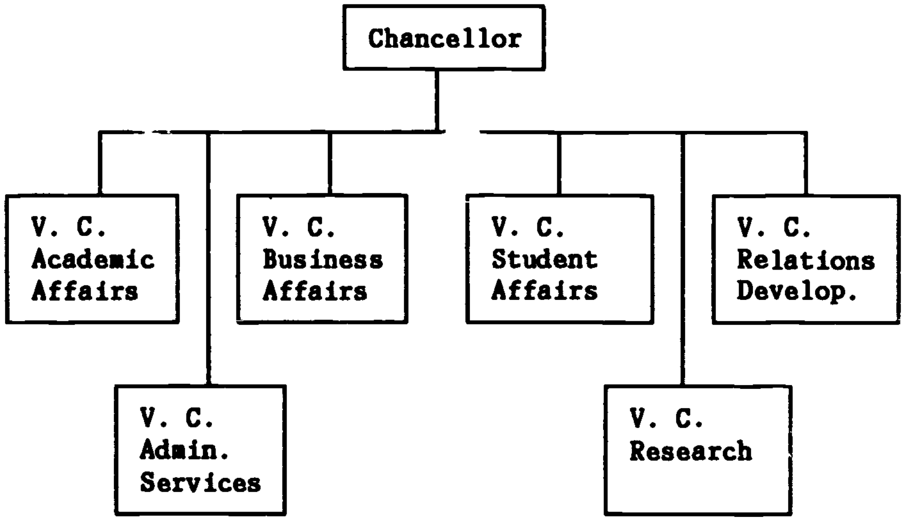
In the course of managing administrative computing development strategies, the direct involvement of users is indispensable. However, users sometimes seem to focus on their immediate needs as opposed to the needs of the University. As a leader of a technology group charged with the responsibility to deliver solutions to the community, what do you do if multi-departmental priorities conflict? How do you consolidate the requirements of many departments into a unified "institutional requirement" and work toward its implementation without direct departmental sponsorship?

In this presentation we will describe the steps that we at Louisiana State University took to design and implement a centralized, University-wide Directory system. We will describe the environment that lead to its development; we will explore the managerial as well as technical issues we faced; and we will give you enough insight into the rewards of doing this so that you will leave here ready to try it yourself.

THE LSU ENVIRONMENT

The University

At the time this project was conceived, Louisiana State University, had a management structure as follows:



Our department, Administrative Information Systems (AIS), reported to the Vice-Chancellor for Administrative Services. For many years, AIS had concentrated its efforts in developing applications that, while focused on the needs of the University as a whole, addressed mainly the needs of the individual sponsoring departments. Because of this departmental emphasis, a promise that we made in the late seventies, to develop data base systems that shared information, had not yet been fully realized.

For example, offices under all six of the Vice-Chancellors, were managing directory information (name, address, and phone numbers) through the many systems already developed, but they were not all coordinated. Let's visit with some of them to experience the problems they were having.

Public Relations

Meet Libby Paxton. Libby works for the LSU Office of Public Relations. Public Relations reports to the Vice-Chancellor for Alumni Relations and Development. Libby is in charge of Publications. She and her colleagues publish many of the University's publications like the catalogs, brochures, magazines, etc. One such publication is the LSU Phone Book. Like many other universities' directories, the LSU Phone Book includes information about students, employees, and the University organizational structure.

Prior to the Directory system implementation, Libby obtained student name, address, and curriculum information from the Student Records data base. During the fall registration process, students were given an opportunity to correct their name and/or address through scannable forms. After registration, these forms were used to update the data base. Later, the information was extracted, converted from upper case to upper and lower case, and formatted for the typesetting system. While this approach gave the students a chance to request corrections, it was too early in the semester to reflect the many housing changes the students made as they settled down for the school year at the University.

Employee information was kept in a file used exclusively for the Phone Book. Every year, Libby surveyed the LSU campus community to determine if there were changes in employee-department affiliation, name, address, and title. The file was then updated with the results of the survey, and after some validation, formatted for the publishing process.

The University organizational structure and key managerial contacts for each department were maintained in files containing the typesetting markup language codes. To keep these files up-to-date, Libby sent copies of pertinent pages to each department for their review. However, because of the lag between the annual review and the publishing of the book, she had to "monitor the grape vine." For example, organizational changes, and management personnel appointments and promotions approved by the Board of Supervisors, LSU's management board, were incorporated into the files before publication.

The Public Relations environment suffered from some obvious problems. First, the student address information was rarely accurate and in order to improve its quality, the Phone Book was often delayed to allow for updates to the Student Records data base. The name and address data in this data base were kept in all upper case, while the Phone Book was published in upper/lower case. This meant that a considerable programming effort was required in creating the publishing files from the data base, seldom with optimal results. Second, Libby's employee information did not carry the social security number, as a result, it could not be used to update the personnel data base. This deprived the rest of the community from the benefits of Libby's efforts to obtain current information.

Office of Telecommunications

Meet Chip Dodson. Chip is in charge of the Office of Telecommunications and reports to the Vice-Chancellor for Administrative Services. Chip has a group dedicated to provide directory assistance about LSU to the community. This group is supervised by Sandra Hodges. Sandra and her colleagues dispense phone and address information to callers.

Prior to the implementation of the Directory system, Directory Assistance relied on several sources for the information they were asked to provide. The primary source of information was the Phone Book. Sandra kept a "master" for the office with hand-written corrections and additions. She updated the master with changes she got though their daily contacts with the community. Hand-written cards provided by the Personnel Office informed them about new employees and changes in job classification.

In early 1987, Chip's predecessor came to us with the desire to do something about the Directory Assistance service. He wanted to explore new ways to obtain existing information on students and employees and improve the quality of the service. He was facing some turnover due to retirement and felt that the experience level of the operators would be difficult to replace.

Office of The Treasurer
Office of Parking Traffic and Transportation

Meet Judy Williams. Judy works in the Treasurer's office supervising billing and student fee collections. The Treasurer reports to the Vice-Chancellor for Business Affairs. Judy is talking to Gary Graham, who is the director of Parking, Traffic and Transportation. Gary reports to the Vice-Chancellor for Administrative Services, and is in charge of monitoring parking areas, traffic flow, and alternative means of transportation on campus.

Prior to the Directory system implementation, these two offices shared names and addresses which were separate from the student and employee records. Students gave changes to a Student Records clerk who updated the Student Records data base. Employees communicated changes to a personnel officer who updated the employee (Human Resource Management, HRM) data base. This information rarely got back to the Treasurer and Traffic name and address data base. Only through returned bills for traffic tickets, deferred notes, housing charges, etc. would these offices know that the address was incorrect.

Social security numbers, used as the key in most campus systems, were also maintained independently from the rest of the campus data bases. During the registration processing cycle, Judy needed to match fee collections to credit hours to verify student fees. The discrepancies in SSN that had developed during the previous year made this matching process more difficult and time consuming.

The Students

Ellen, Nancy, and George meet in the LSU Student Union between classes. Ellen just got married and claims that her married name is already in her transcript but not on her student paycheck. Nancy is disgusted that her student loan check was sent to her old apartment even though the Phone Book has her new address. George is puzzled that his phone number is wrong in the Phone Book, even though he requested a change at registration.

Before the centralized Directory, students were not aware that informing any University office of changes in name or address did not guarantee these changes would be effective across campus. Students might have had to report a change to five different offices in order to get all records changed. Their frustration, after repeated attempts to rectify the situation, may have caused them to abandon their effort to make the University aware of their location.

THE IMPLEMENTATION

Now that we have described the environment and the problems that were afflicting many of our users, we need to concentrate on the steps we took to implement a solution.

Armed with a request from the Office of Telecommunications to develop a system for their Directory Assistance operators, we embarked on a journey to produce a centralized solution for the University.

LSU's development methodology breaks down the applications development life cycle into Requirements Definition, External

Design, Internal Design, Program Development, and Installation. At this time we were at the end of the Requirements Definition which establishes what needs to be done. But before we could proceed with the definition of the how, the External Design, our Director requested an initial assessment to concentrate on the following questions:

- o Could a solution be found that would fit the current systems and those systems currently in development?

- o How much effort would be required?

- o Could the implementation be staged in such a way so as not to interfere with ongoing development efforts?

A detailed investigation was initiated to identify the primary systems using directory information. Eight out of 18 installed data base systems were managing this type of information: Admissions, Student Records, Independent Study, Human Resource Management, Traffic, Treasurer, Fee Bills, and Housing. Two of three systems in development would also be affected: Financial Aid and Telephone Registration. Fitting a solution that extracted information from that many systems would be a data management nightmare, so we concluded that the best solution was to develop a separate repository of directory information. This new data base should satisfy all requirements currently implemented in existing systems, and also serve as the source of information for the Phone Book and Directory Assistance.

The AIS organization was divided into four groups: Development, Maintenance, Technical Services, and Strategic Systems.
Following the installation of DB2 in 1986, and the success of our pilot project, the development group had a large inventory of systems in development. For this reason, this project was assigned to Strategic Systems.

It was estimated that by using DB2, the major components of the system could be completed in six to eight months. These estimates also told us that about 85 percent of the effort required to develop the system would be changing existing programs to access the new data base. For this reason, and to keep the impact to our current development commitments to a minimum, the participation of the AIS maintenance group was deemed indispensable.

The maintenance group responded with enthusiasm to our proposal. They were excited about doing work with DB2 and agreed with us about the many benefits that a project like this would have on the existing environment.

Now we needed the cooperation of our user community.

User Participation

A meeting was called with user representatives from all departments involved. The agenda for the meeting included:

- o A description of the current environment and the inherent problems we had identified.

- o A proposal for an institutional name and address data base that would serve as a central source of information for all systems.

- o A description of the requirements that had been identified.

Attending this meeting were six directors and ten Associate or Assistant directors reporting to five Vice-Chancellors from two campuses. The outcome of the meeting was positive.

Users were then contacted individually. We wanted to make sure that all of their concerns were addressed. The following issues were identified in the interviews:

- o The implementation of the Directory should not significantly alter the screen flow of the systems interfacing with it.

- o Social security maintenance procedures should be part of the Directory system implementation. It was suggested that since most systems use SSN as the key to records on individuals, discrepancies in them must be minimized for the Directory system to be successful. Some users felt that SSN changes should be restricted and demanded weekly notifications of SSN changes.

- o Availability of SSNs through Directory inquiry should be restricted to "those who need to know" to discourage unauthorized access to sensitive information in the target systems.

Since none of the issues discussed above would seriously impact the implementation of the system, a decision was made to proceed with the project.

The Design of the System

One of the first decisions that was made concerning the design of the system was the establishment of a model to interface with other systems. After some consideration, the Server/Requester model was chosen. With this model, the Directory system would act as a server and all the other systems would be requesters. The requester functions would be implemented in the form of subroutines that can be used by each system to satisfy their data needs. This model would give the system enough flexibility to be able to accommodate most requirements on a global basis instead of a system-by-system basis. However, we knew that we were also committing ourselves to a very demanding development and maintenance environment. All system needs would have to be satisfied by the Directory subroutines quickly to avoid delays in the implementation schedule.

Once the model was established, our standard Entity-Relationship modeling procedures were followed to establish the data model and to define the contents of the DB2 data base tables (Figure 1.)

The system was designed with the following features:

- o Access to information by SSN, spelling of the name, or sound of the name.
- o Quick display of name, title, organization, phone, and relationship with the University (i.e. faculty, staff, student, etc.)
- o Ability to handle requests for Directory hold so as to satisfy the Buckley Amendment and personal privacy issues.
- o Ability to keep a history of changes made to name and social security numbers to aid in the resolution of conflicts.
- o Ability to determine what systems carry information about an individual from a central location.
- o Ability to support multiple address types, but minimize storage redundancy when several address types share the same information.
- o Provide for decentralized maintenance of address data to maximize the chances of capturing correct information at any University office.

At the end of both the External Design and Internal Design, all user representatives were given an opportunity to review the definition of the system. Later in the development cycle, the users were again brought together to discuss pre- and post-implementation procedures. We took every step possible to keep the users aware of our progress with the implementation so as to minimize conflicts.

In the summer of 1988, the Centralized Directory became a reality. By far the most pervasive problems that we faced during the early stages of its implementation were data related.
In deciding what information to load into the new data bases, a priority scheme was worked out so that information was loaded from the employee and student data base before any of the other sources. This created some confusion among the users whose data was preempted by a previous load. However, after a few hectic days, the users either changed the data back, or accepted the change, and soon settled down to work.

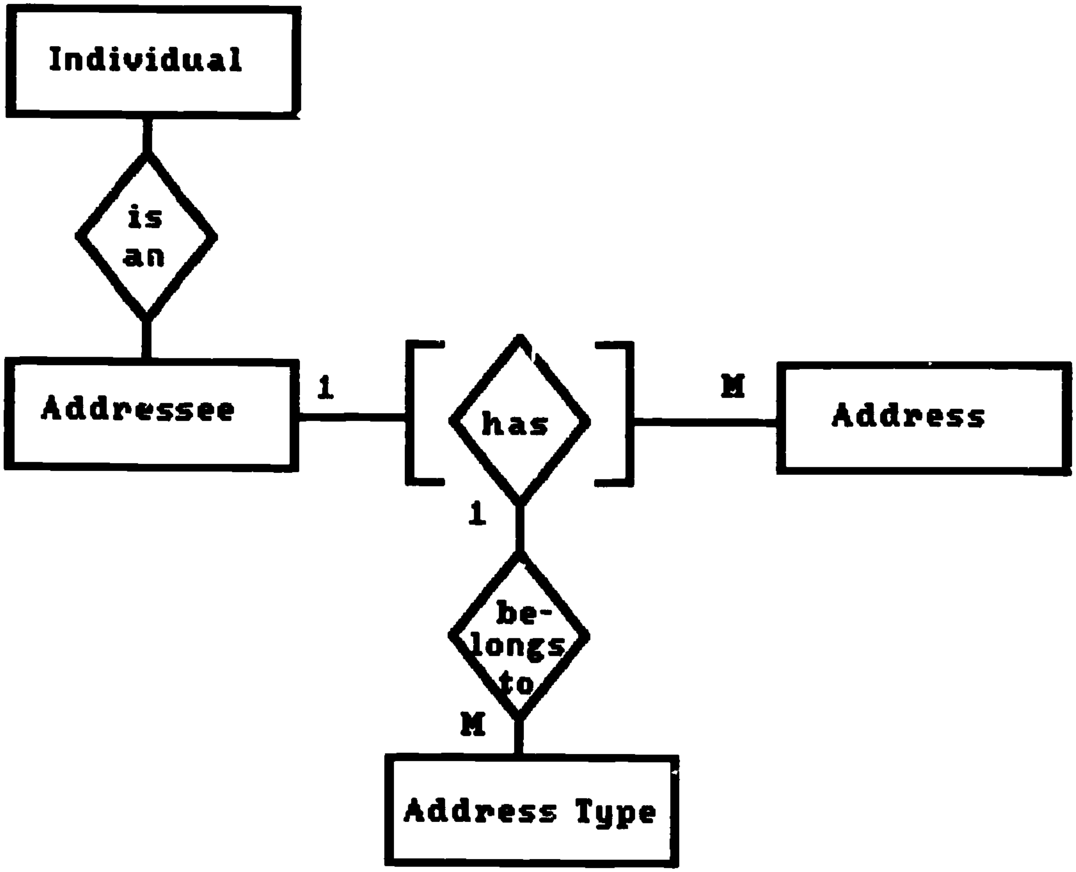
CONCLUSION

We started this presentation by describing the environment that started this development in motion. Then we described the steps we followed in implementing a solution; the importance of user participation, the issues that we faced during its design, and the richness of the features that resulted because of this effort. Let's visit with a few of the players to see how they are managing today.

Here is Libby looking at a copy of the 1989 Phone Book produced from the new Directory system. She says this is the earliest delivery of the Phone Book to the LSU community in years. Sandra is delighted with her responsive online Directory Assistance service. She is now able to make many of the phone and address changes directly and has retired her "master copy" of the Phone Book. And Ellen, now divorced, can finally rest assured that changing names is no longer as difficult as changing husbands.

Applications development starts with one user needing an automated solution for her/his business functions. Before you know it, you find yourself surrounded by lots of one-office solutions. What do you do? Face the issue. Integrate your systems, but in the process, don't forget to integrate your users too.

Figure 1. Directory Entity Relationship Model



Out of the Blue and into the Black: A Case Study of MIDAS

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Abstract

From time to time, promising applications of information technologies bubble up to the surface. Ideas for new systems can be the result of some new technology becoming commercially available, or they can be born of previous efforts which didn't quite work. Sometimes these systems have no specific (read: traditional) owner or sponsor, that is, they are generic, community-wide information systems. At MIT, we believe that the IS organization must seize opportunities as they arise. We must carefully weed through all of the various possibilities and move swiftly to develop the most promising. The history of MIDAS, MIT's Information Distribution and Access System, is the story of just such a system. This case study examines the origins of MIDAS in previous failed efforts, its development history from a concept ("the blue") and how it was ultimately transferred to a production service ("the black").

I. Introduction

MIDAS stands for MIT's Information Distribution and Access System. It is an electronic file service available on a public (i.e., ubiquitous access) timesharing machine operated by Information Systems. MIDAS can be used by any two people or organizations to securely exchange data. Access to the service software itself is *not* restricted, but access to the data placed there is restricted.

For the initial period, MIDAS has focused on solving the problem of moving data from central administrative departments (custodians or data suppliers) to Administrative Officers (AOs) in academic department and research laboratories and centers (data consumers).

For a central department, MIDAS provides a single interface for data distribution for anyone in the community, without needing to bother with individual idiosyncrasies of the receiving user. Examples of custodians are Comptroller's Accounting, Payroll or Purchasing.

For a departmental administrator, MIDAS provides a single interface for receiving data from any of the many sources of data that they would normally need to work with individually.

"Although the present implementation of MIDAS is not a long term solution, it is a pathway for the transfer of a fair amount of administrative information, quite adequate until:

1. network authentication is available on the administrative mainframes, and/or
2. central systems invest in overhauling their data models to facilitate direct-inquiry access.[1]"

MIDAS has the potential to, but has not yet, changed the way MIT conducts its business with respect to how data is moved between the central administration and academic or research units. In the non-coercive climate found at MIT, change often comes slowly. In the end, MIDAS can be judged to be successful if fewer custom systems are developed to distribute transaction data.

"Without a business plan that everyone owns, bottom up projects [MIDAS is largely a bottom up project] can only go so far toward changing how we do business. Working bottom up risks:

a. picking the wrong "bottom" items on which to work
b. going off on tangents on one bottom item that worsens another.[2]"

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1 email communication with M. McMillan, October 18, 1988

2 Ibid

II. Background

The Information Technology Organization

The responsibility for the computing infrastructure resides within the Information Systems organization. A concrete definition of what constitutes that infrastructure is underway, but includes at the very least, the telephone system, the campus data network, the supercomputer facility, a set of shared mainframes, both IBM and Digital Equipment Corporation machines which are used for a variety of administrative applications, and a set of general-purpose applications.

The Vice President for Information Systems is the Chief Information Officer (CIO) at MIT. The responsibilities of that role are defined in a document entitled *Administrative Computing Principles for MIT*[3]. This document also defines the basic criteria that the Senior Vice President (and a Steering Committee) can apply when evaluating proposals for systems development projects. These principles (and their implementation) are expected to evolve as they are applied to a variety of projects. Two of these principles are important to understand in the MIDAS context, the infrastructure responsibility and the call for innovation.

The *Principles* require that all organizations at MIT seek out and apply innovative information technology solutions whenever appropriate. Until October, 1989, one organization of the Information Systems group, Architecture & Strategic Technology (AST), was specifically charged to provide leadership in this regard. This group provided staff support to the CIO for innovative projects that did not have other sponsors, or were purely conceptual. This group was responsible for the definition and development of the MIDAS service during the period, April 1988 to January 1989. With the dissolution of AST, the responsibility for innovation has once again been distributed to each of the line organizations in IS.

Previous Efforts

In the years that preceded MIDAS, various efforts both at MIT and elsewhere provided experience from which to draw lessons about what to do, and not to do. Typically, these projects were tactical exercises, dreamed up by one or two people, often done with only minimal senior level support, usually done on a shoestring budget, and in technologies that were at the time not completely well-understood. These factors produced projects that didn't fare all that well in the end. These projects sooner or later encountered either technological difficulties, or political difficulties, or both. Here are a couple of the projects that the MIDAS project team learned from.

Technological difficulties

Several years before MIDAS appeared, there was a project called the Statement Display System (SDS), and a companion project, the MIT Accounting, Purchasing, Property System (MAPPS). The former was a mainframe based database system containing huge amounts of financial information, mirroring the existing batch financial systems. MAPPS was designed to deliver a read-only version of the information with conventional micro-mainframe file transfer technology (usually at very low speeds) to an IBM PC. At that time, that information was available only on printed accounting statements.

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[3]James D. Bruce, Administrative Computing Principles for MIT, August 1, 1989

At the time of this project, many of the larger departments and labs at MIT already had invested in microcomputers of one form or another, and had begun to develop effective, if crude, office automation systems for managing personnel, financial and other resources under their responsibility. SDS/MAPPS strode into this environment, and was one of the earliest attempts to marry mainframe and microcomputer technologies. Unfortunately, it did not meet all of the needs of its principal constituency, the administrative officers (AO) in academic departments and research laboratories and centers, lacking among other things, the ability for an AO to run adhoc queries against the downloaded data. But the thing that really killed the SDS/MAPPS project was its poor performance. The value of getting some information, even if slowly, was not great enough to enough people to get them to change to a new way of "keeping their books."

Lesson learned: System performance is a significant, necessary but not always sufficient condition for success. Build systems in well-understood technologies, sacrificing some function, to make sure that the resulting system can be tuned sufficiently to keep the consumers happy.

Political difficulties: getting them to say yes & really mean it

In the summer and fall of 1985, Information Systems conducted a study that ultimately led to the publication of *A Proposed Administrative Information Systems Strategic Plan*[4] in the spring of 1986. One of the themes of the *Plan* was the need for widespread distribution of data from the central data stewards to the academic units. In order to study that problem, a Pilot Program (the Accessible Employee Database (AED) project) was instituted to distribute Personnel data to the departments. Prior to this project, an administrator relied on two techniques to manage personnel data (or any other for that matter) in local offices, SneakerNet and rekeying of data from printed reports. Although the AED made some progress toward eliminating use of these techniques, some eighteen months later, the project finally ground to a halt, for several reasons, among them:

1. the project went on too long, and without a well understood project plan, expectations that had not been properly managed in the early stages gave rise to poor morale and suspicion. The AED project in fact exposed many problems, both technical and organizational, which threatened the project's original scope and focus.

2. the administrative officers who were participating in the pilot project had long been skeptical of the central administration's desire to "help them" by distributing data, and as time seemed to slip away, they felt vindicated and either dropped out or lost interest.

Lesson learned: Keep projects short, work to a very tight project plan, and above all DELIVER!

3. the project had produced too little, and too late, to maintain the interest and energy of the departmental representatives, and the IS representatives. Most of the people assigned to the project had volunteered 25% of their time, for six months, and were not generally being rewarded for their altruism in their home departments. The IS staff involved were still responsible for all of their normal work during the time that the pilot project was going on.

Lesson learned: To the maximum degree possible, don't use volunteer help to do something REALLY IMPORTANT! When push comes to shove, the operational stuff has to get done first.

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[4]J. Bruce, I. Colbert, C. d'Oliveira, A Proposed Administrative Information Systems Strategic Plan, January 21, 1986

4. the Personnel Office was unable to maintain the level of commitment to the project's vision during a critical personnel change. One of the *Plan's* principal authors was an officer in the Personnel office, and could make commitments to distribute the Personnel data. Within six months of the start of the project, that person had moved on, and with him, the Personnel Office's only understanding of the vision of the *Plan*. Although the pilot project continued for another year or so, there was never the same degree of commitment.

Lesson learned: Alliances with any one organization can be perilous if the champion in that organization has not transferred the "ownership" of the concept to the larger organization in which he/she sits.

As early as November 2, 1987, there was a MIDAS concept on the table. Given the demise of the Pilot Project effort, there were suggestions that any follow-on effort in the area of personnel information should be based on a generalized piece of software (as MIDAS ultimately proved to be) rather than be a custom office-specific data delivery system.

Fortunately, most of the lessons above were heeded during the MIDAS project. It helped that all of the developers of MIDAS had had direct experience with one or more of the above systems. So how did we proceed to a successful system?

III. "The Phoenix rises from the ashes"

The origins of the concept

After a second round of negotiations with the Personnel Office that tried to keep the Accessible Employee Database project afloat had failed, the project was abruptly suspended in March of 1988. As we were in the process of taking stock of what we had that could be salvaged from the Personnel project, and as we were looking around for new and interesting stuff to work on, fate intervened. There were a number of efforts going on around the now suspended project. At about the same time, the Financial Operations group had received a request for information from an influential member of the Strategic Plan's Advisory Council. Confluence also came in another form. Yet another group of AOs had been discussing ways that they could, working as a grassroots organization, build a personal computer application to manage the books of their (mostly research oriented) organizations. They petitioned for, and received, support for the idea from the office of the Vice President for Research. Thus there was a growing amount of pressure to begin to distribute important data. The Comptroller's effort had already done some preliminary studies and found that the SDS/MAPPS solution described above was not the answer, and they were getting ready to start to develop "son of SDS/MAPPS," another custom data distribution system.

The Vice President for Information Systems gave the go-ahead for a "proof of concept" project for an infrastructure service that would make the efforts of the groups mentioned above more efficient. This type of project solves most of the problems of the projects described above, as it limits the scope and duration of a given project, and use the "proof" as the mechanism for recommiting resources. With this charge, we approached the Comptroller with the idea of doing a joint development project. We proposed to develop and deploy a general-purpose data distributor system drawn from the technology developed in the AED. This system could then become part of the infrastructure. This would free the Comptroller's staff to develop any specific financial application software, on the mainframe or on microcomputers, that might be needed. As it has turned out, there are three application systems now in various stages of completion. The first is a fairly extensive mainframe-based system that permits AOs to examine, summarize and produce reports on their data in a variety of different ways. The data used is first retrieved from the MIDAS server, but left in a user's mainframe directory) rather than downloaded. The other two systems are personal computer based systems, one for the IBM PC family built using the Rbase product, the other for the Apple Macintosh family built using the 4th Dimension product.

Within three weeks of the initial idea, we had established the MIDAS Project organized upon the following principles:

- **Owner:** the Vice President for Information systems is the nominal "owner[5]" of MIDAS, in his role of CIO.
- **Custodians:** no single custodian manages the MIDAS facility. Any recognized data steward can make use of the system, for the price of the storage. To the maximum degree possible, a custodian should be self-sufficient. Although custodians alone can decide what they will distribute, clearly they aim to be responsive to the stated needs of the AOs.
- **Subscribers:** no single data subscriber's needs are more important than any other. The system aims to make data available to all platforms via use of commonly available protocols.

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[5]Our chosen development methodology, Productivity Plus, from DMR Group, Inc. includes a very precise meaning for "owner." A system owner is the person or persons who pays for the system, who therefore is entitled to making the go/no-go decisions.

- **Development:** the system would initially be built with existing tools and software products, and include an API toolkit for use by custodian-provided applications.
- **Operations:** the system should not require additional operations, production control or other administrative personnel. That is, it should not require intensive administrator.

What it is & what problem it is trying to solve

MIDAS is a "smart" file server that provides a single, consistent interface to data providers, and a single, consistent interface to data subscribers. Its "smarts" derive from the fact that unlike some other data sharing mechanisms and file transfer schemes, MIDAS "knows" what files it currently has stored, and the characteristics of each file, such as the name and type of each data field. Its most important features are:

- providers are insulated from the needs of any single subscribers' workstation type and software
- subscribers are insulated from the existing data formats of any single providers' mainframe database system or application
- subscribers can request only certain fields of a given file, and in a particular sequence to aid in loading into pre-existing applications (both on microcomputers and minicomputers)
- providers are responsible for maintaining the definitions of their files, and a list of the recipients of those files
- there are hooks for custodian developed application software
- access to the system for all of the above is ubiquitous.

The "little green light"

The development team was given a challenge--the entire development cycle, from concept exploration, through analysis and design, programming, testing and documenting, would consume no more than 2 months, approximately 11 weeks from start to finish. This is what we have since referred to as the "little green light." Needless to say, we were going to have to be very judicious in our use of time. Unlike previous efforts, this one would not start out with an unlimited time horizon. This ultimately had the beneficial effect of limiting the resources that were poured into this project, both in the beginning and over the long haul.

The guiding principle for the project was this: fulfill a simple need with a simple product. The first version could be very crude, but it must be respectable. On the pragmatic side, we needed to get financial data to users more easily than it was then possible. We decided that quick turnaround prototypes would be necessary. As a guiding principle, we believed that throwing away a couple of prototypes was not tragic. Throwing away the user interface would have been tragic. To do it a "piece at a time," doing whatever proved to be usable and possible, was the right next step.

Seeking "proof of concept"

The MIDAS Project Team was given the go-ahead with the proviso that we could proceed until "proof of concept" or until it was clear that this product wasn't going to work any better than previous ones. Throughout the development period, we tried to define carefully just what this "proof of concept" would mean, and how we would recognize it when we saw it. In the end, "proof of concept" is very much in the eye of the beholder, but the better the beholder, the better the proof.

We allocated the time we had in the following way:

- Week 1: Sell the idea to potential data stewards
  Explore the concept
- Week 2: Complete concept exploration
  Do analysis of system in its entirety!
  Start technical design of system
  Start prototyping in several key technologies
- Week 3: Complete technical design and hold design review
  while prototyping continues
- Week 4-7: Build, test, and deploy server code
- Week 6-8: Build, test, and deploy client code
- Week 7-10: Complete QA and documentation
- Week 11: Deploy system officially; receive initial data feed from pilot custodian

Definition of the system

One of the difficulties that immediately faced the development team was how to read consensus on the features of a system when there wasn't really a traditional owner. It was fortunate that the development team had participated in the previous attempts to distribute data at MIT, and understood some of the obstacles that had been encountered. For that reason, we decided to take two different tacks to the ultimate system. The first tack would be to use conventional systems analysis techniques, with the development team playing all of the roles of a typical systems project, both the customer and the analyst. At the end of a week of sometimes excruciatingly long interview/design sessions, we emerged with a system design that remarkably enough remains an effective design document even now, some 18 months later. This design was presented, reviewed and approved at a formal design review meeting at the end of Week 3. The second tack was rapid prototyping of the system's client and server functions. In order to do that effectively, we needed to choose a development environment that was familiar to the developers, rich enough in tools to permit such rapid prototyping, and that would ultimately be robust enough to act as a platform for the emerging service. We found that all three of these conditions were met by the only ubiquitously accessible mainframe on the campus for general purpose time-sharing access, an IBM 3083 running VM/CMS. The system was prototyped and ultimately deployed almost entirely in the VM/SP System Interpreter language REXX, with a few routines written in PL/I for the sake of efficiency.

Development of the system

The use of proven technologies from the outset probably did more than anything else to ensure completion within budget and on time. In this case, the innovation was largely in terms of the organizational impacts of the system.

But even in a project that is using off-the-shelf technology, you need to have some way to capture and manage the results of the many brainstorming sessions that are inevitable in a development group. A simple "Futures" list, maintained electronically and shared frequently with the development team, worked very nicely. The MIDAS administrator still uses this list for planning purposes.

Our original goal was to have a single group provide sole support for all MIDAS-related activities--design, development, maintenance, training, documentation, support, marketing, planning. This would mean that there were far fewer communications paths to handle on a day-to-day basis. In the course of the prototype phase, we found that we needed to bring in a few other groups to resolve problems or provide additional support where the expertise did not exist inside AST. The fact that we had already briefed the Vice President and his direct reports (directors of the various

Information Systems departments) meant that we weren't delivering any surprises to the other (eventual) support organizations.

Given the tight schedule, we decided to limit the group that could provide functional input to just a few users and one eager custodian for the pilot stages.

Providing support to users while still developing the system could have swamped the development team. We decided to groom the initial set of four users so that they could then provide some limited forms of support to a larger (15-20) group of users. We put in place a "buddy system" between the "expert" AOs and the large group. Administrators are already more likely to call another AO for help with some type of administrative procedure questions than they would call anyone in the central administration.

Deployment of the system

The responsibility for choosing test subscribers was assigned during the "proof of concept" phase to the initial custodian. One of the issues that was batted around quite a lot was whether this group should include experts, that is, experienced computer users, or a group that was more representative of the community at large. Support for the former was predicated on the idea that what was *not* needed during the pilot was a lot of problems of supporting novice users, that the proof of concept was not on how well the system could be deployed, but rather on whether data distribution could work at all. The "representative" argument was that proving the data distribution could work for savvy computer users was no proof at all, that the real pudding that needed testing was the relatively inexperienced personal computer user. There was passion on both sides, but in the end, we decided to go with mostly experienced users, and to use the buddy system for less savvy users, to keep the demand for support from the central organizations fairly low during the pilot stage.

Reaching "proof of concept," or declaring "success"

By the end of calendar 1988, we had generally proven that the concept was viable, and our project was judged a SUCCESS. In the course of the project, we discovered a number of things. In summary, we found that:

- it is technically feasible to construct in a *short* time a "*smart* data server to accept and redistribute MIT's administrative data using off-the-shelf components
- administrators will need to (and will if allowed to) connect to data distribution services in a variety of communication modes, and at speeds far exceeding 1200 baud, including high-speed access over the MITnet
- custodians do not have to be responsible for maintaining "user profiles" that tell them what kind of machine, software, etc. exists on each user's desk
- custodians do not need to generate "special purpose" files where those files are merely a subset of the data fields found in an existing "master" file
- custodian effort can be kept relatively low (for the reasons in the previous two findings)
- users found the initial threshold low enough to warrant their continuing in the project
- launching custodian applications from within the data distribution system has both rewards and hazards on a number of dimensions
- data distribution is a necessary, but not sufficient, condition for the integral and effective use of information in departmental offices. The lack of workstation-based applications to process these data was a major limiting factor to the overall data distribution service.

Developing a service plan

Information Systems has formalized the process of bringing a new (not anticipated by the 5 Year Plan) service to the campus. The primary instrument in this process is a Service Plan. Among other things, the Service Plan describes the benefits of the service, the service's objectives, provides an assessment of the demand and need for the service, risks, alternatives, estimates resource requirements, and suggests possible metrics and evaluation criteria. The Service Plan is typically presented by a Service Champion, and reviewed by the IS management team.

Finding the most appropriate "service champion," and working with them on the Service Plan were therefore our next major steps. The MIDAS team began by developing a number of scenarios for the transfer from "proof of concept" to production. This included placement of the marketing, custodian and consumer support, and system maintenance and enhancement functions. We reached agreement with the Production Services manager that his group should be the Service Champion. The scenarios also called for a variety of different levels in the expansion of the user and custodian base in conjunction with the other support areas. These scenarios were presented to the IS management team in December of 1988, at which time the decision was made to pursue a low-growth option for the initial 12 months (roughly calendar 1989), calling for 25 new users, and 5 more custodians.

A major prerequisite for the wider deployment of the system involved the establishment of "computing budgets" for the academic departments. Although this might not appear to be a major problem to some, there was little history of the use of central computing resources by these departments. The situation was further complicated by the overhead structures of these departments versus that of the central departments. In the end, it was decided that a portion of the central computer that hosts the MIDAS server, and in turn provides user access, would be allocated to academic departments and research labs & centers. This took the form of a MIDAS Grant Program, where each participating AO applied for a grant of monies to use the MIDAS (and related) systems. The MIDAS Grant Program is administered by the Production Services manager. The individual grants are monitored by the Administrative Officers in each participating unit.

Transferring technology

The Service Plan called for the MIDAS development team to train the new team that would be responsible for administering, and maintaining the system. This was done using a series of seminars and workshops during January and February 1989. During this same time, day to day responsibilities were being transferred to the new administrators in the Production Services group. During January, the original team constituted the first line of support with Production Services "watching" over our shoulders. During February, those roles were reversed. On March 1, 1989, the original development team was no longer involved in day to day support.

Finally, we transferred the responsibility for the documentation products to the Production Services group. These products were:

- User's Tutorial
- Technical Guide
- Custodian's Guide
- User's Quick Reference Guide
- Administrator's Guide
- General Information Guide

IV. Conclusions

From every failure, there are nuggets of gold that can be mined. There is no question but that the experiences in the several years prior to the MIDAS project provided the MIDAS development team with a number of insights and techniques that enhanced the project's chances for success.

Not everything that you touch will turn to gold. Changing the way large, bureaucratic organizations conduct business takes a long time. No single technology product is likely to instantaneously alter the business of MIT. MIDAS is just one component of many that together can make MIT a more effective and efficient enterprise, and a more enjoyable place to work. In particular, the lack of personal computer based applications, which would create a greater demand for downloaded data, has kept usage of MIDAS lower than anticipated levels.

Data definition is our Achilles heel. We needed to open the kimono about the problems that existed with inconsistent data definitions. Again and again, MIDAS (and previous efforts) risked running aground when the data was not of sufficient quality to be shared with departmental units. The fear of sharing substandard data was that it would put new and intolerable demands on the support resources of the central offices.

Marketing is key. You can't assume that in the hustle and bustle of everyday life, that new ways of doing business (regardless of how good they are) will be adopted instantly. You must continually market the usefulness of the system to both existing and potential, subscribers and custodians. In particular, it appears that it would have been a good idea to have provided for a consultant whose responsibility would have been to work closely with all of MIT's data custodians to make additional information available.

Source Data Capture. Electronic capture of administrative data at the desktop and delivery to the appropriate custodial organization may ultimately be what's required to change the way business is done.

Be lucky!

A Voice Bulletin Board System for Career Placement

by

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ABSTRACT

The Office of Career Planning and Placement at the University of Virginia has implemented a voice bulletin board system to electronically post verbal announcements for job openings. Registered users can access the computerized system by calling from any telephone equipped with touch-tone dialing - no other equipment is needed by the caller. The bulletin board system automatically answers calls, requests the caller to key in his identification number, and then recites job listings matching the career and geographical interests of the caller. The system runs unattended around the clock, except for an hour each weekday morning when database information is updated. Out-of-date jobs are automatically removed from the database, so all information relayed to the caller is current. The VBBS user benefits from remote access to valuable information, and the only cost accrued by the user is paying the phone company for any long-distance calls.

A Voice Bulletin Board System for Career Placement

Introduction

The Office of Career Planning and Placement (OCPP) at the University of Virginia in conjunction with the university's Administrative Computing Services have implemented a voice bulletin board system to electronically post announcements for job openings. Registered users can access the computerized system by calling from any telephone equipped with touch-tone dialing; no other equipment is needed by the caller. The bulletin board system automatically answers calls, requests the caller to key in his identification number, and then recites job listings contained in the database that match the interests and qualifications of the caller. The system runs unattended around the clock, except for about an hour each morning when the database files are updated.

Among the extensive computing facilities at UVa, is one very important one located in the OCPP office. Since 1986, OCPP has been using a 13-station PC network to support its efforts to assist students in planning and choosing career fields. Nonetheless, before the advent of the voice bulletin board system (VBBS), OCPP had to collect paper documents announcing job openings to make them available for review by interested job seekers who studied, lived, or worked in Charlottesville. The information, although potentially of interest to a large number of people, was not readily accessible to many who could have benefitted from it. To have access to this information, a prospective client of OCPP had to either visit the office in person or telephone a staff member to request information. In effect, the data was available only within the walls of Garrett Hall, the home of OCPP.

A manual filing system was used to organize and maintain the documents and to dispose of those that became out of date. This method was slow, cumbersome, and labor-intensive.

The new VBBS provides remedies for each of these two inefficiencies, offering significant advantages to both job hunters and to the OCPP office itself. The VBBS uses a conventional computerized database system to select and present jobs listings that are of specific interest to the caller. Out-of-town and even out-of-state alumni can access the database around-the-clock. Callers are able to "page" through the jobs by using any touch-tone as the signal to interrupt the computer's speech and to go on to the next option. All job positions that entered the system prior to the caller's last call are suppressed, unless the caller asks to hear all matches, regardless of when the job listings entered the system.

Benefits to the Caller

The VBBS clients are scattered about the country. When a job seeker calls, selections are made on the basis of the geographical preference indicated when he registered to use the VBBS. If the caller ever wishes to select on the basis of a different geographical region, he may utilize the on-line option to change his geographic preference, and then ask the computer to restart the matching process. At the opening voice menu, a caller can choose between hearing all matching jobs, or only those that have been added to the database since his last call. Out-of-date jobs are automatically removed from the database, so all information relayed to the caller is current. The VBBS user benefits from virtually instant access to information, and his only costs are a nominal registration fee and then paying the phone company for any long-distance calls.

Voice quality of pre-recorded speech played by the VBBS is indistinguishable from a live voice. The system is very simple for a caller to use: a voice menu is presented after each VBBS function completes. An introductory message is given to all first-time callers explaining the operation of the VBBS, an the system offers on-line help messages that can be requested.

When a job seeker calls the system, the VBBS software identifies the caller by his ID number (SSN), finds his data record, and makes note of the values for the three parameters on which it must find a match: major, geography, and career field. Then the job listings are searched, and when one is found that has attributes corresponding to those desired, the pre-recorded speech file representing name of the employer, the job title, and the short description is played to the caller. The caller can then have these items repeated, have a longer, detailed description played, go on to the next job match, or return to the previous menu of choices. And at any time during the playing of these speech files, the caller can interrupt by pressing a touch-tone, and the system will respond by playing the menu (which can also be cut short by the caller pressing a key) and asking for the caller's next menu choice

Benefits to OCPP

This system provides a vehicle for OCPP to distribute valuable information to its client base in a timely and efficient manner. Using the features of the DBMS, OCPP can easily monitor usage of the system, knowing exactly who calls and how often, and which jobs are most frequently matched. This unattended system is available to callers for 23 hours a day, and at an operating cost that involves only the manpower required for entering the new data each day. (Out-of-date data is purged automatically.) The reputation of OCPP is enhanced because both employers and prospective employees recognize the effectiveness of the system, and usage by one group encourages greater usage by the other.

Development of the System

The design, programming, and implementation of the software for this system was performed by Administrative Computing Services at the University. The telephone management functions needed to answer the phone, accept input, and play voice files were provided at the dBASE programming level by dbSpeaker(tm)[1]. Because the VBBS system is essentially a dBASE database system, development time is short and the effort is very much like conventional dBASE programming. In fact, much of this system's program code was developed before the arrival of the Watson system by using keyboard input and screen output to simulate telephone input/output (I/O). Then, when the Watson voice sub-system did arrive, it took only a short period to convert terminal I/O to telephone I/O. However, interacting with a telephone caller does present several complicating issues because of concerns with time-outs for input, having touch-tone input interrupt speech, and handling situations where callers hang up in the midst of a session. dbSpeaker, though, does provide useful tools to integrate the features to conveniently handle these situations. For instance, when waiting to read touch-tone input, the VBBS dBASE program passes to dbSpeaker a parameter defining the time period to wait before "timing-out". If the caller does not respond in the allotted time period and there is, in fact, a time-out, the program tries again by repeating the question two more times if necessary. If there still is no response from the caller in the way of touch-tone input, the VBBS will electronically hang up the phone on its end. This is necessary because there is no direct test available to see if the caller is still on the line. Consideration was also given to not allowing the total length of the call to exceed some value, say 10 minutes. But it was decided that because most callers would be paying for long distance calls, it was not necessary to limit call duration. If, in the future, this feature becomes necessary, it will be a simple matter to alter

[1] dbSpeaker is one component of the Watson(tm) voice sub-system that is a product of Natural MicroSystems Corp. of Natick, Massachusetts. Other required components for this application are a Watson interface board that resides in the PC, and two other software products from Natural Microsystems.

the program to note the time the call began, and to periodically check to see if the caller's daily limit of on-line time has been exceeded.

Although the Watson sub-system can output synthesized voice messages for variable data (e.g., values for a job title, name and address of an employer), it was decided to verbally record all data that is relayed to callers instead of keying it and letting the Watson voice system synthesize it. This approach yields a couple of significant benefits. First, there is far higher quality for the system's output as every message heard by the caller is a reproduction of a human voice. (The image of the voice is stored digitally, and it can be reproduced an indefinite number of times without any distracting background noise.) By using recorded speech for the job listing information, the voice output is much clearer and the task of data input is made easier. The data input module was written to accept the spoken word for job data fields such as job title, name and address of employer, short and long descriptions of the job, and name of person to contact. These data items are then entered into the system during its one hour of off-line time each day by speaking them into a telephone dialed into a data entry program running on the VBBS PC. Speaking these descriptive items into the system takes much less time and effort than keying them. Voice data is converted by the Watson system into digital data which is stored as disk files. Data for geographical location, career area, and required degree still must be keyed; these value are used for the dBASE matching algorithm and therefore must be present in the employers' database file in a standard dBASE format. These values are never directly relayed to the caller, but instead are implicit in any job match data spoken to the caller. (It was also decided to key the name of the employer in addition to entering it verbally. This allows historical reporting to include data on company names.)

A standard IBM-compatible PC is an adequate platform for implementing a VBBS application. However, it should be noted that if job data is stored as digitized speech, the disk space requirements become substantial. The dbSpeaker software uses a default speech compression rate of 3 Kbytes per second when recording voice data to disk, so a five-second message, for instance, will require 15 Kbytes of disk space. If each job has a job title, company name, short job description, long job description, and name and address/telephone number of a contact person, and then several hundred job descriptions stored on the system may require more than 50 Mbytes of disk storage. Considering this along with our expectation to upgrade the system in the future to accommodate multiple, concurrent incoming calls, an 80386-based PC equipped with a 60 Mbyte fixed disk was selected.

Registering the System Users

Students and alumni who wish to gain access to the VBBS are required to submit a completed application form to OCPP. On this form, the individual specifies his academic major, his career field interest, and geographical preference. To simplify the task of data entry at OCPP, each applicant writes on the form the actual code corresponding to his each of these three items (the entire set of codes is listed on the application form itself). Prospective employers, on the other hand, submit their hiring requirements on documents whose form and content vary widely. Therefore, keying this data often involves some decision making for the career field area or field of study. If the employer does not specify any majors that are required for the job, 'any' is entered and this will match with all student majors.

Management Reports

Because the system is essentially an automated dBASE database, it was a simple matter to program the usual report features that tell OCPP management about the usefulness of the system, and the characteristics of the clients who utilize it the most. Daily reports contain data for percent of time the system was in use, number of calls received, number of matching jobs found, number of students registered, number of students deleted (when the three-month registration period expires), and number of jobs currently listed. Other reports that are useful over longer intervals are number of calls received during the period; number of different callers using the system; and total number of positions that have been advertised. Reporting options can also list which career fields, majors, geographical areas have yielded the most job positions, and which employers have listed the most jobs. Another report will produce mailing labels for all employers who have used the system (provided employer address information has been keyed).

Future Plans

As demand for this system increases, a multi-tasking system will be installed along with a second phone line into the system. If the caller load begins to tie-up the two-line system, then a network will be installed and the current machine will be converted to the file server.

Another potential new feature will be the implementation of a voice mailbox so that callers can leave voice messages concerning problems or suggestions for OCPP to review the next business day.

A Counseling Reservation System in a Local Area Network Environment

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Abstract

This paper will discuss the development and implementation of the Counseling Reservation System developed at Cuyahoga Community College. In addition, the paper will discuss future plans for automation and Information Systems in the counseling and student services area - specifically, the expansion of the Metropolitan LAN and applications to CCC's Western and Eastern campuses. Finally, this paper will analyze some of the inherent problems found when introducing networked departmental computing into the College's offices as a case study which may benefit others following this same path.

I. Introduction

Cuyahoga Community College is a large two year institution which serves the greater Cleveland area in northeast Ohio. The College is composed of three distinct campuses and a district administrative office. The three campuses - Metropolitan, Eastern, and Western - vary in size, and composition of their student body but all three remain subordinate to the one "College" both organizationally and operationally.

CCC has aggressively pursued a leadership role in both administrative and academic information systems (IS) and computing, thus there are numerous IS initiatives which contribute to the College's strategic mission of academic quality, access, and success. One of these initiatives is the introduction of automation and networking to the counseling and advising areas of the College.

Beginning in 1986, a "pilot" local area network (LAN) and telecommunication capability was installed in the Metro campus counseling area in order to evaluate the effectiveness of providing both local resource sharing and host connectivity to the counseling staff (about 18 counselors.) The results were impressive in that most counselors used the electronic mail and word processing capabilities of the LAN in their daily work, and there was a general clamor for additional training, software, and resources.

In particular, the computing consultant (the author) and the director of the counseling area agreed that the key enhancement need for the LAN was some type of scheduling or appointment capability which would be accessible by all of the counseling and clerical LAN users.

A simple scheduling system was in use which provided batch reports of counselors' daily schedules as well as student record request lists. This Scheduling System originated from a timesharing application on the Honeywell/Bull mainframe computer, and was migrated down to the PC using dBase III's development language and database format. This simple Scheduling System would form the basis for the Counseling Reservation System which was jointly designed by the counseling director and the author.

The resulting application, the Counseling Reservation System, is operational at the Metro campus and will soon be migrated to the other two campuses. The system itself, has many merits and some weaknesses and is well liked and exploited by the users.

The development and implementation of this application will be explained in the following pages and represents the primary theme of this paper. A secondary theme of this paper is to discuss the Reservation System development and its importance to the overall IS strategy in the Student Services and support area of the College.

There are some interesting characteristics of this system's developm°t, which are also discussed. For example:

1] The scope of the system was technically and functionally conservative and was delivered rapidly to the user

2] The system was a literacy tool for both user and developer, and would be used to guide larger and more ambitious development efforts

3] The resource requirements were minimal and could be absorbed without committing or delaying other formal development projects

Section II is a discussion of the system development; section III discusses the implementation of the Reservation System, and finally section IV concludes by summarizing what was learned in this development and how others may benefit from this experience in small systems development.

II. Development of the Reservation System

The Counseling Reservation System grew from a simple scheduling system which was first developed on the Honeywell/Bull mainframe computer used at the College. This system was later migrated to an IBM PC application using dBase III's file format and application development language (ADL).

Th. scheduling system simply accepted appointment transactions keyed into a specific format, and later collated these into daily schedules and other reports which were used for requesting files from the records office.

The counseling director came to the computer center with the initial concept of a real time scheduling or appointment system which would eliminate the need for a manual schedule book. He had the following parameters to work with:

o About 18 full time and a few part time counselors; his staff generally worked from 8:30 to 5:00, but there were appointments taken in the evening from 5:00pm until 8:00pm and a small staff on Saturdays.

- o Each appointment was 30 minutes in duration and was handled one on one with a counselor and student.

- o There were numerous other "types" of time commitments for which the counselor would be assigned including walk-in counseling during registration periods and student orientations. In addition, the counselors enjoyed faculty status and might be teaching a class or have other academic commitments.

- o For scheduled appointments, the director closed out the scheduling about 3 or 4 working days ahead of time. That is, a student could not normally make a scheduled appointment with less than three days lead time. This allowed the office schedules to be collated and distributed, and allowed the records office to deliver the students file folders to the counseling office.

In terms of design, we agreed that the technical problem of automating a schedule matrix would be solved first. The author completed the file design and a simple scheduling program or algorithm which would accept a time range stated in normal clock hours (e.g. 8:30am or 10:00am) and "map" or translate this time range into the scheduling matrix.

The scheduling matrix or table looked something like this when completed:

Date	Counselor	Time Slot #1	Time Slot #2...Time Slot #<n>
04/11/89	JM	CC	CC
04/12/89	JM	XX	
04/14/89	AM		CC

The time slots represented 30 minute time commitments, while the two-position code (e.g. CC, XX) represented the "type" of commitment; a blank, of course, meant the time slot was open or available.

This worksheet style matrix had the advantage of being very straight forward and lent itself very well to display and visual inspection. The intent of usage was clear at this point, and would follow the following events:

- o The student would approach the front desk or call the counseling office to make an appointment to see a counselor.

- o The operator or clerk would glean the intent of the appointment (type), and if the student had preferences for the counselor (Who?), the time or date (When?).

- o Armed with these preferences the clerk would query the schedule matrix and visually determine the best fit for the student, and schedule the appointment.

The key to this "point-of-sale" process was providing the strongest possible visual representation of the schedule matrix on the limited size and resolution of the Personal Computer screen or monitor. We determined three separate queries or visual displays would be necessary:

- o A query by date. This displayed the schedule matrix and time slots for all counselors for a given date. The table could be "scrolled" or moved forward and backward in time using the PC's cursor control.

- o A query by counselor. For a student who wanted to see a particular counselor, this display would show all available dates for one counselor.

- o A query by BOTH date and counselor. For student who had both a date and counselor of preference, this query would zoom in on the specifics of an individual daily schedule. This, by the way, was the same query which produced the daily schedules for the counselors.

The terminology, Reservation System, is best represented in this part of the application. The director and author envisioned an airline reservation clerk interacting with a computer terminal display to accomplish reservations. Speed, accuracy, and customer satisfaction would all be dependent on how efficiently and effectively the computer would visually bring forth the needed schedule information, and how the clerk would navigate to the desired "best-fit" between customer need and availability.

This was the most difficult part of the design in that beating or equaling the manual process (i.e. visually inspecting and updating the manual schedule book) was a challenge. If we could satisfy ourselves that we had at least equaled the manual process, we knew that the other benefits of the system would warrant a full implementation.

The system, was developed along these lines. A computer center analyst implemented the author's time scheduling "engine" and completed the application in about 3 months of part time involvement. The system was tested stand alone at the counseling front desk, and the manual scheduling book continued in use as the authority information. The preliminary results concluded that:

- There was a rather high rate of data entry errors. In particular, an incorrectly coded student number (social security number) would introduce duplicate and erroneous records into the system.

- The visual representation of the schedule matrix was still inadequate for effective scheduling.

- The scheduling time engine worked as advertised, and the resulting time savings were very good.

The most critical enhancement of our second testing phase was to add a significant database overhead to the system, namely the student authority file.

We agreed that we would compose, extract, and maintain a file of all registered students at the local campus to be used in the Reservation System. The source of this file would be the mainframe based Integrated Student Information System (ISIS). This addition would add significant complexity and overhead to the system, but would solve our data integrity problems and would create an interesting tracking dataset which could be queried statistically in the future. The addition of this component of the system had the following characteristics:

- This would be an operational database. The information would be extracted and transferred to the PC or LAN, as opposed to a realtime interaction with ISIS.

- The authority student information would be linked to the local counseling information such as number of appointments, counselor last seen, and cancellation or no-shows.

- The file would be cycled on a quarterly basis. Students who had an appointment history would be retained, and the "age" of the student's experience with the counseling office would also be tracked or known.

The addition of this file, meant that the clerk could assume the properly registered student would be "known" to the system. This saved keystrokes and added greatly to the data integrity of the student appointment file. The student could be told of what the "system" recorded as their current demographic and address information; thus, changes or inaccuracies would be quickly reported back to the records office.

This authority file was implemented and to date we have one and one-half years of tracking information in the file. The preparation and transfer or "downloading" of the authority file is somewhat formidable (about 5-10 thousand records of 200 characters each), but once the file is operationalized the capacity of the local software and hardware is not really challenged.

III Implementation of the Reservation System

The formal implementation of the Reservation System followed the second testing period. This testing period continued to use the manual schedule book as a backup, but more and more reliance was placed on the automated Reservation System. The results were very good and the system was considered operational at the Metropolitan campus.

Chronologically, we set forth the following milestones:

A stand-alone Reservation System	Jan 88
Access by all counselors	Jan 89
Migration to other campuses	Jan 90
Multiple updaters on the system	March 90

In small systems development, it is typically a surprisingly large leap to move from a stand-alone or single user application to one which is networked or provides for multiple access The technical tools provided on the smaller systems are not geared for multi-user systems, and in general the data becomes much more vulnerable when "opening" up the system to multiple access.

As mentioned, the counseling area was equipped with an Ethernet local area network which originally ran 3Com's EtherSeries network software (this is now Novell Netware). The physical and logical network components were in place to allow access from the counseling offices, but there remained the technical problem of modifying the application to support multiple or concurrent usage.

We proceeded cautiously in this implementation. We clearly separated the functional milestone of adding additional "queriers" to the system and the milestone of adding "updaters" or the ability for two users to concurrently change the data. We understood that from a needs perspective, the counselors wanted the following from our system:

- o inspect their schedules from their own PC workstations
- o inspect a student's record or history with the office
- o inspect their peers' schedules and commitments

for which all three of these needs precluded any changes to the database; thus, they needed only to read or query the files as opposed to updating or changing the files.

The development environment, namely dBase ADL and a dBase compiler called Clipper (Nantucket Software), allows for multiple user capability. However, the lack of built-in or supplied data integrity and access control features places a considerable burden on the local programming and application design work.

We have, quite simply, moved slowly on this front because of a concern of losing reliability and simplicity in the system. It would be disastrous, at this point, to introduce multiuser database problems to a system which has such an excellent track record of reliability.

Instead, we have completed a query "module" or separate program which is a subset of the full Reservation System. This module insures no updating or changing of the system's datasets can be accomplished. This module is accessed by multiple counselors from their workstations and gives each counselor the ability to inspect or read all of the Reservation System's scheduling and student information.

We will migrate this current form of the application to the other campuses during this year. Our final milestone, is the completion of multiple user appointment updating of the system. This would be most helpful in times of high student activity and would allow the system administrator the ability to change or alter information while the Reservation System is in use. Additionally, it opens nhancement questions such as counselors scheduling their own app ents and adding comments or tracking information to the student records file.

IV. Summary and Recommendations

Readers knowledgable on technical matters regarding PC's, LANs, and networked applications might question the degree to which the developers urge caution and a conservative approach in developing these types of applications. There are certainly products and development tools which promise such things as true multiuser database management and integrity controls in this environment. However, it has been our experience that cost, and a lack of prevalent technical expertise can mitigate their usefulness.

As a case study, the development of this Reservation System is likely very representative of efforts taking place across the country. These development efforts are quite entrepreneurial in nature and typically involve a key "user" (i.e. our counseling director) and a sympathetic consultant in the computer or MIS center. We readily endorse this model, and observe the following advantages:

- o The vision and enthusiasm for the project is very focused which enhances the likelihood of success and decreases the likelihood the project will get sidetracked or continually redefined.

- o The project is narrowly defined, technically conservative, and can be delivered quickly. In this model human and technical resources are always at a premium; this necessitates the project "team" utilize and stretch their available resources, and implement before the resources "dry-up."

But, we have the following caveats as well:

- o Always search the market for an existing solution or one which can be customized to fit your needs. This can be a difficult "pill" for the designer and developer who are excited about applying their own solution.

- o The project must fit into some overall strategy or context. The end result should add value to larger or more conspicuous development or IS initiatives, and should fit into these efforts.

At CCC, this Reservation System development has been an entrepreneurial enterprise. The design, implementation, and expansion of the system has taken place with minimal resource impact and has been largely a product of one key user's innovation and hard work. However, the system does have an excellent fit with larger development strategies.

The counseling and advising areas, in addition to their networking and telecommunications capabilities, will shortly benefit from the delivery of a Degree Audit system which is built around their PC workstations and micro to mainframe communications and interfacing. This Advising and Graduation Information System (AGIS) fits very well with the Reservation System. Each serves a separate purpose, but the access, look and feel, and training and orientation of its users go hand in hand.

In all of this technical detail it is important to remember that the College's technology motivation is not about computers and hardware and wires. Its about quality and effectiveness. The opportunity to work smarter in the College offices, and to improve the quality of instructional programs, and most importantly to enrich the lives of each and every student who walks through our doors. In its own small way, we feel this system contributes admirably towards this goal.

CASE TOOLS for the 90's: DELIVERANCE OR EXTRA BURDEN

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This paper examines the viability of CASE (COMPUTER AIDED SOFTWARE ENGINEERING) as a replacement for the design and development strategies that have been employed in the past: namely, manual design and programming of application systems.

The primary focus will be on developing evaluation questions and assessing whether or not industry reports support the notion that CASE tools boost productivity and reliability of systems that are developed using these tools.

Consideration will be given to the questions of the necessity for the integration of CASE tools with other tools such as data base management systems, 4GL's, as well as, other CASE tools.

During the early 1970s, computer centers and systems development departments were abuzz with a new technology in the form of data base management systems (DBMS). Systems analysts and programmers were charged with determining the capabilities of the commercially available DBMS' and ascertaining what, if anything, such systems could do for their organizations.

The results of these investigations are history and many organizations adopted the use of these systems to provide more timely and integrated information for their users. However, the impact on the systems development organization was not as smooth as this scenario might imply. In the first place, there is a difference between acquiring a tool and altering the methods (techniques) used to develop systems. In the case of DBMS, acquiring a DBMS package did not insure that it would be utilized for something other than a replacement for the current disk accessing technique whether it be random or some form of indexed sequential. It was quite another matter to have analysts think in terms of an integrated data base for the organization and to develop systems with this concept in mind rather than focusing on the single system approach to development.

As we enter a new decade, we are faced with a new buzzword (CASE) which promises to revolutionize systems development and have an impact that could be more profound than that which we experienced with data base management systems. Even with this promise, the potential problems of integrating the use of CASE tools in an information systems organization are as foreboding, if not more so, than was the case with incorporating a data base management system (and the associated data base philosophy) into the tool-set used by systems developers.

The purpose of this paper is explore this new technology, indicate how it evolved, as well as, describe its current status, and identify some evaluation criteria and problems of integrating this new technology into an existing systems development organization.

It is difficult to cite an exact definition for CASE (Computer Assisted Software Engineering) but there is a common thread to many of the definitions that have been advanced. There seems to be a consensus that CASE deals with automating (applying the computer to) the systems development tasks and that the goal is to increase the quality of the software produced and improve control over the process of developing systems. From this definition, it is conceivable that a broad variety of existing tools could fall under the rubric of CASE tools including:

1) analysis and design tools (front-end or upper case tools including graphics, data repositories and process definition systems,

2) programming support tools (back-end or lower case tools) including code generators, screen painters, optimizers, editors, as well as, reverse engineering tools, and

3) project management tools.

A more specific definition of the components of CASE is offered in the many reports issued by James Martin on this subject and he suggests that there are five components of CASE:

"1. front-end design and specification graphics support, which at least relieves the analyst of the manual chores related to drawing and redrawing diagrams as the design evolves;

2. design analysis, which at least tracks and reports basic design flaws such as design pieces that are not related to any other piece of the graphic presentation. Some of the rule-driven tools now emerging can also detect other inconsistencies;

3. code generation, providing automatic translation of the specifications developed by the earlier components into source or machine code;

4. a "repository," "encyclopedia" or "metadictionary," which holds comprehensive entity models or views of the structure of the organization using the CASE facilities; and

5. "absolutely essential to the effective use of other elements" is a PC or similar commonly-used processor, which in addition to being a familiar, non-threatening and easily accessible piece of equipment, is (under CASE) provided with "very good interfaces including windows and menus and color." (Leavitt, pp.50-51)

With this admittedly sketchy understanding of what a CASE tool can accomplish, let us consider how we arrived at this juncture. In what must be considered a rapid succession of events, we have proceeded from developing computerized solutions to business problems by generating machine language code, to symbolic code, to compiler languages, to fourth generation languages and to the present state of CASE which is a specification-driven language that may or may not be tied to an automated code generation facility.

The infiltration of CASE into systems organizations is reasonably well documented but studies of their effectiveness in producing quality systems and/or reducing the backlog in systems are in the early stages of being undertaken and the results have just begun to appear in the last two years, Since few integrated CASE tools such as TI's Integrated Engineering Facility are on the market, statistics on utilization of CASE tools and their various derivations can be misleading. The norm for a company seems to be to utilize either an upper or lower case tool in a stand-alone fashion or they use an upper-case tool from one company coupled with a lower case tool from another company.

Based on the number of users of CASE tools on mainframes, one would not necessarily assume that there is and will continue to be a tremendous growth curve in this industry. As Myers noted (reporting on a study conducted by Computer Intelligence Corp.), "only 2% of U.S. mainframes have one (a code generator) installed" (Myers p.49). However, such figures are quite deceiving since much of the current development in the use of CASE tools is with front-end tools or is PC based. Index Technology's Excelerator, which had 23% of the CASE market share in 1987, as reported by the Computer Systems News, reported in late 1988 that it had shipped the 10,000th copy.

In a compilation of eighty-five (85) CASE software products included in a March 1989 Computerworld article by Santosus (pp.77-86), thirty-five (35) were PC based and another twenty-one (21) were workstation based (SUN, APPOLLO, VAXSTATION etc.). Only thirty-two (32) products worked solely with mainframes to the inclusion of PC's and workstations. The fact that many of the PC and workstation products also worked on the mainframe or had mainframe interfaces suggests that as one moves towards an integration of upper-case tools and lower-case tools the mainframe is more likely to be involved.

WHY CASE?

It is a well documented fact that in most information systems organizations have backlogs of requests to develop new systems or maintain existing systems. Added to this is the geometric rise in the number of computers and the declining number of graduates from computer science and computer information systems programs. The result of these factors as noted by McFadden and Discenza is that

> "A crisis in software development plagues American business today..In total, the number of new applications ... in the backlog undoubtedly exceeds the number of all existing applications...and the (IS) organization cannot respond to the need for new systems." (McFadden and Discenza p.68,

The net result of more computers, fewer trained IS people, and a huge backlog of requests for new systems and changes is that we cannot hope to satisfy our organization's systems needs with the use of traditional tools. Some observers suggest that increased user involvement with systems development is the solution while others such as McFadden and Discenza argue that the solution lies with use of fourth generation languages. An increasing chorus can be heard in favor of increasing productivity through the use of CASE tools as a complement to user development and using 4GL's and other user-oriented tools.

It is not surprising that accurately measuring productivity is and will continue to be a major focus in determining whether there is a payback in using CASE tools. Barry Boehm, who developed what some consider to be a landmark survey of productivity tools in the 1970's, has done some tests and reports on the perceived payback of CASE that

> "when developers were given their own workstations and a set of tools that covered the entire life-cycle, not just programming, a productivity gain of 50% was found."
> (Knight p.56)

Similarly, Necco, Tsai and Holgeson, in a study conducted in 1989 to determine if industry has aggressively tried to implement this new tool, found that

> "only twenty-four percent (24) of the responding companies indicated that they were utilizing a CASE tool... and a majority (60%) acknowledged that the CASE tool significantly improved the quality of the product, but only 47% indicated a significant improvement in productivity."p.8

Necco and his colleagues further report that

> "An analysis of the factors that influenced these improvements reveals that more than half of the respondents noted a significant improvement in the communication between the analyst and the systems users. Sixty percent, however, indicated that the tools did not improve project control, and would not make future maintenance changes easier." pp.9-10.

In a study of 3,000 active users of front-end CASE tools in the U.S., the Barton Group found that

> "Users report that exceptionally strong and widespread gains are made in documentation...
>
> A very large group reports respectable but not extreme improvements in... the quality of systems design..

Many users report strong improvements in ...the ability to meet business requirements...

Responses indicate a widespread, mid-level improvement in communication, as the tools force standardized outputs and documentation sets.

Most projects experience moderate improvement..in productivity..more time is needed to improve ..productivity

Most people experience minor improvements in..project schedules. The learning curve is greater than expected, but this is offset by improved documentation and communication."
(Merlyn and Boone p.66)

Regardless of the preliminary results on the success of CASE, supporters contend that benefits will be derived. Charles Martin in a vendor sponsored meeting of Excelerator users suggested that productivity improvements can come from four areas:

"Methodology training and enforcement--
The CASE tool helps train junior analysts in advanced techniques and enforces consistent usage throughout the organization.

Support for systems analysis diagrams--
Interactive graphic editors help analysts to develop the kinds of process, data base, and program structure diagrams which have proven to be the most effective way to communicate concepts behind the requirements and design.

Single entry specification bookkeeping--
Operating from an Information Resource Dictionary System, redundant specification documentation (viewing the specifications in different ways) can be prepared from non-redundant dictionary representations.

Reminds and consistency checks--
Complex inter-related bookkeeping chores are eased by CASE tool reminders of additional information needed to complete specifications and automated consistency checks." p.56.

CASE EVALUATION CRITERIA

Until we encountered the introduction of DBMS in the early 1970's, many of us were unfamiliar with software RFP's and such exercises were limited to the acquisition of hardware.

Since that time, software RFP's have become more common for all but the smallest computer installation. Many among us have drafted RFP's for application software, LAN software, screen painters, 4GL's and other software. Thus, it is not surprising that the first admonition is to study the company,its direction and the product direction. Just as there were many start-up companies in the DBMS field that didn't survive the maturing of the technology; such may be the case with vendors of CASE tools and some suggest that this phenomena is already repeating itself in the area of CASE tools. As Grochow of American Management Systems notes:

> "there were 50 code or application generator producers in 1982 when first became involved in the technology. Today,...of those 50, 10 are still around but there are 40 more. It's a volatile market." (Myers p.68)

A number of articles suggest evaluation criteria and checklists for identifying which CASE tool or set of CASE tools might best suit the needs of your organization. While most articles include a checklist of sorts, the articles by Aranow, Gibson, Santosus, Troy and Zucconi focus in particular on this issue.

Beyond vendor issues, some of the major questions are listed below with each of these questions having numerous sub-questions.

EVALUATION QUESTIONS

Does the product SUPPORT THE ENTIRE LIFE CYCLE and is this provided by a set of products as opposed to one product? If a number of products are used, how well are they integrated?

Is SUPPORT provided for the MAJOR DEVELOPMENT METHODOLOGIES such as Demarco, Gane and Sarson, Yourdon etc. ?

GRAPHICS CAPABILITY (DFD's, Flows, Action Diags, Models

Does it SUPPORT LOGICAL DATA BASE MODELLING?

Does it SUPPORT A CENTRAL REPOSITORY?

What PROTOTYPING CAPABILITY is provided? Is this an industry capability or is it product specific?

What PROJECT MANAGEMENT TOOLS are provided and supported? Are these industry compatible or unique?

Is this a MAINFRAME and/or PC BASED system? If both, what interfaces exist?

Is there provisio.. for MULTIPLE USER ACCESS?
Does this include support for major LANS?

Is it INTEGRATED WITH MAINFRAME DBMS & DATA COMMUNICATIONS with LANGUAGES, DSS, 4GL'S & other CASE TOOLS

Is there CHECKING OF SPECS FOR COMPLETENESS & CONSISTENCY

Does an EXPERT SYSTEM EXIST TO CHECK QUALITY & ACCURACY OF DESIGN?

Does the system SUPPORT AN OPEN ARCHITECTURE PHILOSOPHY?

What are the HUMAN INTERFACES and TRAINING TOOLS?

POSSIBILITIES FOR SUCCESS

Having evaluated and selected a CASE toolset, what are the possibilities of successful use, are there any strategies that will help and what problems are likely to be encountered and can they be avoided? Merlyn and Boone suggest that "success is not an automatic outcome of CASE" (p.68) and they cite a list of suggestions compiled as a result of the Barton study (noted above) about what organizations should do to derive the maximum benefit from the use of CASE products.

The suggestions from the Barton Group study are as follows:

"Establish a means for measuring results that addresses both short- and log-term costs and benefits.

Keep expectations realistic. Look for short-term improvements in communication and the quality of deliverables, but do not expect major improvements... for at least three years.

Move slowly and carefully....organizational changes are required therefore move incrementally

Scout the territory. Companies that understand the methods first have a better chance of success.

Test extensively...conduct at least four pilot projects

Forgive test errors. Expect to make mistakes..

Allow for postpurchase expenses.

Splurge on training...and.. supply coaching.

Focus on use and support ..and.. encourage full use.

Address organizational issues.

Make improvement a strategic goal.

Involve the project manager." (Merlyn & Boone pp.68-69)

Burkhard also suggests that certain guidelines be followed to insure success and that "like all correct development cycles, the implementation plan must be committed to a structured methodology." (p.21) Danziger and Haynes echo these findings. The adoption of a new technology is often accompanied with problems and CASE implementation is not an exception. There aren't any standards and there are scores of vendors marketing all sorts of products under the aegis of being a CASE tool. As was the case with local area networks the major hardware manufacturers have stayed out of the fray until recently when IBM acquired a percentage of Index Technology while at the same time pushing forth its own AD/Cycle Information Model (see Hazzah Dec.89 for a discussion of AD/Cycle).

A significant problem which again parallels the data base experience is that CASE technology is ahead of the CASE techniques that people employ. This is partly due to inexperience but it is also due to analysts not understanding the methodology or technique that the company may be implementing at the same time that the Case tool is being adopted. Thus, one could not overlook the learning overhead for both the CASE technology and the various methodologies such as Gane & Sarson that the installation might be installing.

The human factor plays an important role here as it did when structured walkthroughs were first introduced 15 years ago. People are fearful of their jobs but, even if they overlook this factor, they may not trust the tools. Beyond this the tool and the learning curve associated with its use, can be used to cover up unsound design(s).

The interface of the various CASE tools both with other CASE tools and with other software packages that a given organization might use or plan on using such as a DBMS or 4GL is of vital concern as one contemplates the role of CASE in an organization. The articles by Myers and Weitz and the articles referenced earlier that develop evaluation criteria address these issues.

The next steps for CASE technology seem to be well defined: there will undoubtedly be a vendor shakeout, the major players will be identified, de-facto standards will be set, an increasing number of interfaces will be built between upper, mid and lower case tools, as well as, with other software. From a capability perspective, a new generation of knowledge-based expert systems will vault CASE into the hoped for productivity gains.

BIBLIOGRAPHY

Aranow, Eric. "When is CASE the Right Choice." Business Software Review. April 1988, pp.14-17.

Burkhard, Donald L. "Implementing CASE Tools." Journal of Systems Managenment. no.5, 1989, pp.20-25.

Danziger, Michael R. and Haynes, Phillip S. "Managing the CASE Environment." Journal of Systems Management. no.5, 1989,pp.29-32.

Gibson, Michael L. "A Guide to Selecting CASE Tools." Datamation, July 1, 1988,pp.65-66.

Hazzah, Ali. "Improvements in Tools Leading to Second Look." Software Magazine, September 1989, pp.31-47.

Knight, Robert. "CASE Payback Perceived, If Not Exactly Measured." Software News. February 1987, pp.56-58.

Leavitt, Don. "Scratching the Surface CASE's Potential." Software News, February 1987, pp.50-51.

McFadden, Fred and Discenza, Richard. "Confronting the Software Crisis." Business Horizons. Nov./Dec., 1987, pp.68-73.

Martin, Charles. F. "Second Generation CASE Tools. A Challenge to Vendors." Paper #17 from the First International Workshop on CASE. Index Technology Corp. Cambridge,MA.

Merlyn, Vaughan and Boone, Greg. "CASE TOOLS: Sorting out the tangle and tool types." COMPUTERWORLD, March 27, 1989, pp.65-70.

Myers, Edith. "Back-End Tools Seek Front-End Companions." Software Magazine, September 1988, pp.49-68.

Necco, Charles R., Tsai, Nancy W., and Holgeson, Kreg W. "Current Usage of CASE Software." Journal of Systems Management, no.5. 1989, pp.6-11.

Santosus, Cathleen. "The Fine Art of Figuring CASE Payback." Computerworld, March 27,1989,pp.74-75.

Troy, Douglas A. "An evaluation of CASE Tools." IEEE Proceedings of the Computer Software & Applications Conference 1987,pp.124-125.

Weitz, Lori. "Not Cannibalism, But Coexistence with CASE." Software Magazine, October 1988, pp.43-59.

Zucconi, L. "Selecting a CASE Tool." ACM Software Engineering Notes, Vol.14, no. 2, April 1989, pp.42-44.

CAUSE89

Corporate Participation

Coordinator:
Gary D. Devine
University of Colorado

Participating in CAUSE89 were 39 corporations which offer solutions to the information technology-needs of higher education. A list of these corporations appears on the next page, followed by descriptions of some of their conference contributions—including corporate presentations and workshops, sponsorship of conference activities, suite hospitality, and exhibits.

PARTICIPATING VENDORS

CAUSE appreciates the participation of the following corporations in CAUSE89:

Advanced Micro-Electronics, Inc. (AME)
The AIMS Group
AMS (American Management Systems)
Apple Computer, Inc.
AT&T
Bell Atlantic
Business Systems Resources (BSR)
Campus America, Inc.
CMDS (Computer Management and Development Services)
Coopers & Lybrand
Data Research Associates
Datatel Minicomputer Company
Deloitte & Touche
Digital Equipment Corporation
Doelz, Inc.
EDS (Electronic Data Systems)
EDUTECH International
Ernst & Young
Gandalf
GKA (George Kaludis Associates)
Hewlett-Packard Company
IBM
Information and Communications, Inc. (IC)
Information Associates
Information Builders, Inc.
Ingres
INTEGRAL
InterVoice
LaserMax Corporation
NCR Corporation
Novell
Oracle Corporation
Perception Technology
Periphonics Corporation
Quodata
SCT (Systems & Computer Technology Corporation)
Sequent Computer Systems
StorageTek
Sun MicroSystems, Inc.

509 N. 7th
Vincennes, Indiana 47591
812-882-0870
Third Party Maintenance

Advanced Microelectronics

Advanced Micro-Electronics, Inc. is pleased to have participated in CAUSE 1989. This is the second consecutive year we have demonstrated our commitment to higher education and look forward to seeing old friends in Miami Beach in 1990.

Advanced Micro Electronics, Inc., with its headquarters in Vincennes, Indiana, was incorporated in 1985 as an Indiana company to perform PC and main frame terminal service.

The majority of our business consists of annual on-site service through contracts. The balance of our service is non-contract and is billed as time and material. We do not sell software, hardware or supplies; therefore, we do not have any restrictive relationship with any one vendor. We perform warranty and non-warranty work for most all brands and models found in business, education or government.

AME's personnel includes full-time employees in sales, administration and technical support. Each of our technicians has a degree in electronics, and extensive training in our shop before going out for on-site contracts.

We enjoy open account privileges with vendors nationwi for parts and services. This give us the ability to ship by r freight computer parts from our stock as well as from major distributors and manufacturers. We have established this relationship as an authorized third party maintenance company with several sources.

Internal controls assure that our commitments to our customers are maintained.

AME has a nationw de toll-free dispatching system logged into a "Service Manager" computer system. This system checks contract dates, customers, serial numbers, locations, billing rates or special instructions. It records initial call times, technician assigned, response time, reports open (not completed) orders, closed (completed) orders, time ompleted, parts used and also assigns a priority to each service call regarding our commitment to our customers. Our technicians also carry pagers for emergency calls after hours. Each technician has a key to his respective shop in order to have access to parts for after-hour calls.

All accounting is performed at the home office in Vincennes, Indiana by computer. We are able to modify our system to meet most any customer's paperwork requirements.

We enjoy a good reputation with customers coast to coast. Many send units to us by UPS for repair. The Midwest has an excellent work force at very competitive rates compared to many other parts of the country.

For more information, please contact Vance Olson at (317) 247-5353 or Jean B. Henderson at (812) 422-4455. We will be happy to come to your office for discussion on third-party maintenance.

THE AIMS GROUP

at CAUSE89 - SAN DIEGO

The AIMS Group, Inc. is pleased to have been a participant at CAUSE89. We enjoyed meeting with you and appreciated the opportunity to demonstrate the AIMS Software and discuss our solid committment to higher education.

The successful implementation of a UNIX port (Hewlett Packard) and the availability of an additional platform (DEC) during 1st Quarter '90 was announced.

New modules, including Degree Audit/Advising and microcomputer downloading were demonstrated at CAUSE89.

We look forward to the 90's with enthusiasm and we hope to see you at CAUSE90!

ams

American Management Systems, Inc.

American Management Systems (AMS) is delighted to have participated in CAUSE89. AMS is proud of the program that we put together for this conference and to have had the opportunity to make two major announcements at CAUSE. We hope that the CAUSE membership found their interactions with AMS as productive and enjoyable as we did.

LEGEND Series Announcement at CAUSE89

AMS announced a dramatic expansion of its application software products for higher education. Known primarily for its CUFS product for university accounting and financial management, AMS now offers systems to support the other major three area of college and university operations. The newly designated *LEGEND* series of administrative applications includes:

CUFS/*LEGEND*, the well established College and University Financial System, now in use by over 75 clients in the United States and Canada. CUFS/*LEGEND* includes fund accounting and budget control capabilities and a full range of advanced financial systems such as purchasing, inventory control and fixed asset management.

SIS/*LEGEND*, the new fully integrated Student Information System, which includes modules to support Admissions; Financial Aid, including needs analysis and automated packaging; Student Record, including Degree Audit, and; Student Accounts Receivable, including full cashiering support. SIS is currently being implemented by 12 institutions, including the University of Texas Health Sciences Center, the University of Nevada System, and Miami University of Ohio.

HRS/*LEGEND*, the new Human Resource System, which includes Payroll/Personnel, Applicant Tracking, Position Control and Benefits Management. The system is currently in use at the City of Milwaukee, the State of Alabama and the City of Monterey. The first college and university implementations at Oakland Community College and Bowling Green University will begin in 1990.

DIS/*LEGEND*, the AMS Development Information System, and includes alumni records, gift procession, prospect tracking and a powerful correspondence management system. DIS/*LEGEND* is currently under development and is scheduled for release in late 1990. Bowling Green State University is the first DIS/*LEGEND* client.

Strategic Alliance with EDS Announcement at CAUSE89

A new strategic alliance was announced by AMS and EDS (Electronic Data Systems Corporation). Together EDS and AMS will implement AMS's *LEGEND* series of administrative applications. As the world's leading systems integrators, EDS provides expertise in hardware acquisition and configuration, telecommunications and network management.

Other CAUSE89 Activities

AMS's strategic partnership with the University of Texas Health Sciences Center at Houston (UTHSC-H) was discussed by Bill Muse, Vice President, UTHSC-H and Fred Forman, Executive Vice President, AMS during the corporate presentations. The presentation focussed on the latest major initiative, the joint development of SIS/*LEGEND*.

AMS discussed and demonstrated the *LEGEND* products throughout the conference at the AMS exhibit booth and in its hospitality suite. In addition, AMS demonstrated prototypes of its SAA-compliant software in the IBM exhibit booth. This new strategic technology is fully integrated with IBM's Office Vision software and will be available in 1990.

Donna Morea, Vice President, AMS participated in a panel discussion entitled "Colleges and University as a Market Administrative Application Software." Fred Forman, Executive Vice President, was one of the two experts participating in an "Ask the Experts" session entitled "New Technologies, Artificial Intelligence and CASE."

AMS is one of the nations's leading independent firms in applying computer and systems engineering technology to solve complex management problems of large organizations. The company, entering its 20th year, is headquartered in Arlington, Virginia and has offices in over 20 cities throughout the United States, Canada and Europe. With its solutions-oriented strategy, AMS has distinguished itself within the industry for its excellent service to its clients. In 1989, AMS was proud to have been included in a new book, The Service Edge: 101 Companies That Profit From Customer Care, by Ron Zemke and Dick Schaaf.

For more information about AMS, its products and services, call or write:

John Reed
National Sales Manager
American Management Systems, Inc.
1777 North Kent Street
Arlington, VA 22209-2166
800-336-4786

Apple Computer, Inc.

Apple Computer would like to thank all CAUSE89 attendees for their continued interest and participation in activities sponsored by Apple and our Higher Education Information Technology partners. We are pleased to have once again participated in the CAUSE National Conference and to have shared with you the many powerful information access and management solutions for Macintosh that have been developed by your colleagues from across the country. As we advance into this new decade, we look forward to our continued partnership with CAUSE and its member campus information technology professionals as we work together towards defining future information systems.

It was our pleasure to host the following activities for this year's CAUSE89 attendees:

- Several university administrative professionals presented their information access and management systems at Apple's booth in the CAUSE89 Corporate Exhibit area. They demonstrated how Macintosh has "Extended their Reach" for distributed database access, electronic mail capabilities, library systems, and campuswide information systems. The following colleges and universities featured their solutions: Texas A&M University, Harvard University, Washington College, Baylor University, Sonoma State University, and University of Texas at Austin.

- CAUSE89 attendees could select from two Macintosh hands-on workshops to experience HyperCard and SoftPC, software that allows a user to run MS-DOS on the Macintosh.

- CAUSE*Net*, the CAUSE89 Conference Information and Messaging System, gave attendees easy access to sending and receiving messages from other attendees, conference schedules, location and times of sessions, maps, and restaurant listings. The fifteen Macintosh SE computers stationed throughout the conference area also contained digitized images of attendees that assisted colleagues to more easily contact each other during the conference for important meetings.

- During Apple's sponsored corporate presentation, David Koehler, Director of Information Resources, Cornell University, gave attendees a multimedia taste of computing in the 1990's. During this session, Mr. Koehler discussed Cornell's plans for building an administrative workstation-based information system with Macintosh technology.

- During one of the new "Ask the Experts" sessions; Doug Doyle, Apple's Manager of Multimedia Integration, joined Phil Farley, Marketing Manager at Hewlett Packard, and Joel Koebensvik, editor of *Academic Computing*, to discuss multimedia technologies and their potential for administrative computing environments.

- An Apple-hosted reception brought guests to the top of the Sheraton for a beautiful view of the San Diego skyline. The evening included the jazz melodies of George Shaw, Long Beach City College, featuring Macintosh-driven music. The reception closed with the raffle of a Macintosh IIci. Robert (Buck) Shaw, Manager of Database and Technology Services at MIT, was selected as the winner.

- Throughout the conference, attendees were kept informed of activities and conference highlights through the daily CHAT (CAUSE Has Apple Technology), a newsletter that was desktop published with a Macintosh computer and LaserWriter.

For additional information about Apple's products, programs, and solutions for higher education, contact your local Apple sales office, or write to:

Monica Sabo
Higher Education Marketing
Apple Computer, Inc.
19925 Stevens Creek Blvd., MS 43/P
Cupertino, CA 95014

AT&T
Your Computing Systems And Networking Solutions Company

AT&T is pleased to have participated in the 1989 CAUSE Conference in San Diego, California. The conference provided an excellent opportunity to demonstrate the latest in hardware and education solution software and to reconfirm our commitment to higher education.

The AT&T booth highlighted two education software solution developments, running on AT&T hardware, which drew the attention of many educators interested in campus networking and writing skills. The two software packages that were demonstrated were the Academic Network System and Writers Workbench. Both software packages were designed and developed for use within the academic community and serve to provide a solution to the campus networking and writing skills problems.

The development of ANS by the University of Wisconsin, Stevens Point, achieved its objective by approaching the problem in a threefold manner. By first recognizing what was the Challenge, second creating the Solution and third offering the Resulting Benefit to the education community, the answer to a concern by many academicians was provided.

THE CHALLENGE

Create a distributed computing revolution; link the campus into an integrated information resource open to every user.

THE SOLUTION

AT&T 3B2 computers support a multitude of UNIX System V-based applications. AT&T StarLAN connects AT&T WGS computers, a variety of micros, and hosts together. The AT&T Information Systems Network (ISN) is every campus user's gateway to all computer resources.

THE RESULTING BENEFIT

Stevens Point has been designated a Center of Excellence for Distributed Academic Computing by the Board of Regents for the entire University of Wisconsin system. The majority of the 9000 students on campus regularly use the network for coursework and homework. Faculty have integrated computing into 41% of their coursework.

In the information management revolution ANS serves to guide the development of new answers for old problems.

Further, in showing its commitment to education, a demonstration of the Writers Workbench software, Collegiate Edition, provided the CAUSE attendees with an insight into ways of improving not only student writing skills but the writing skills of all who are interested in improvement.

WWB runs on AT&T's 3B2 computer which is a workhorse in providing not only a hub for networking, as in ANS, but is the host for WWB. The WWB package focuses on employing the users own writing and developing the writing skill based on the user's entry. The interactive, user friendly nature of the program makes it both interesting and enjoyable to use.

The package consists of a set of comprehensive writing analysis programs which were created for use in schools to help students to improve their writing skills while making the art of learning fun. Administrators will find that the WWB can serve as a tool for better letter writing as well as many other uses.

These are but two of the education software solution developments showcased by AT&T at CAUSE '89. New developments are ongoing but must be nurtured by educators. Education is recognized as the key to opening new doors of development and AT&T plans to continue to partner with the institutions of higher learning and with organizations such as CAUSE to assure that those doors remain open. Through this partnering the benefits shared by each entity will serve to contribute to the benefit of Higher Education.

Campus America

"POISEd for the DECade"

Campus America continues to support CAUSE and its efforts to become one of the major influences in the profession of information technology management in higher education. As a Cause Corporate Member, Campus America participated in the CAUSE Corporate Exhibits and also made major press announcements about new product directions for the POISE administrative software system.

The Campus America theme at CAUSE89, "POISEd for the DECade", symbolizes plans for the next decade to provide administrative software products along with Digital's computers, that protect application software and hardware investments, are user driven, and are interoperable with other systems on campus.

This commitment was reflected in the major press announcement made by Campus America's National Sales Manager, Ben Bassett in the Digital Equipment Corporation Hospitality Suite. Campus America announced a new release of DMS-Plus, the company's relational database management system and 4GL designed specifically for education. This new release will include VAX Rdb/VMS and VAX SQL compatibility allowing Digital's VAX Rdb/VMS and VAX SQL database users to access DMS-Plus databases.

"Campus America's selection of Digital's VAX Rdb/VMS and VAX SQL as a database standard places them and Digital at the forefront of enterprise-wide solutions in education," said Roger Strickland, Education Industry Marketing Manager for Digital, who was on hand for the announcement.

As the leading supplier of administrative and instructional software to education, running on Digital systems, Campus America has always taken a leadership role with Digital in positioning products in the educational market. When Digital moved from the PDP-11 to the VAX architecture, Campus America was one of the first to convert software products to the VAX. Digital has made VAX SQL a standard feature of VAX Rdb/VMS. Each VMS operating system includes the VAX Rdb/VMS run-time license. For those colleges and universities taking advantage of The Education Initiative (TEI), VAX Rdb/VMS development licenses are now included in the Digital's Campuswide Software License Grant, which grants over 200 software licenses at no charge to the educational institutions. Campus America users now have an additional option which will allow interoperability among software systems along with DMS-Plus. And as part of Digital's

Campus America

-2-

Education Initiative, DMS-Plus with VAX SQL compliance permits this to happen.

DMS-Plus is the application development toolset used to produce POISE administrative software systems for education. These systems include Admissions, Financial Aid, Registration/Academic History, Degree Audit/Academic Advisement, Student Billing/ Receivables, Fiscal Management, Payroll and Development/Alumni. The software is priced according to the VAX model used.

In addition to the VAX/SQL compliance announcement, Campus America also announced its alliances with Computer Communications Specialists, Inc. and Edtech, Inc.

The Computer Communications Specialists' agreement will allow for the integration of CCS' FirstLine product, an interactive voice response system with Campus America's new POISE Tele-Registration System.

Edtech's S.N.A.P. II is a Type 8 Certified Program for calculating the Pell Grant Index and the Family Contribution using Congressional Methodology. POISE will develop an interface to allow for the transfer of data between S.N.A.P. II and the POISE VAX Financial Aid System.

Campus America's flagship instructional products have earned international recognition and acceptance from educators. These products include Computer Managed Learning (CML), Courseware and Testing software.

Campus America products are being used by more than 3,500 Campus offices in 500 educational institutions. Campus America, Inc., a leader in total administrative and instructional software for education headquartered in Knoxville, Tennessee, with product centers in Roswell, New Mexico, and Calgary, Alberta, is an elite participant in Digital's Cooperative Marketing Program (CMP). POISE software was specifically designed for Digital computers because of Digital's strong position as the leading supplier of computers to education. Campus America is the only software company offering both administrative and instructional software to education.

For more than twelve years, Campus America and Digital have worked together to provide cost-effective solutions for education in the administrative and instructional marketplace. For additional information, please contact Campus America, Inc., at (615) 523-9506, (Fax) (615) 525-5628 900 Hill Avenue, Suite 205, Knoxville, Tennessee 37915-2523.

"THE FUTURE'S SO BRIGHT YOU'LL HAVE TO WEAR SHADES"

So went the warning to CAUSE attendees. Since the March announcement that Datatel's two major computer systems, Colleague[R] and Benefactor[R], would be available on Unix-based computers, the future has never looked brighter. At the DEC beach party on Tuesday night, Datatel offered a solution for the glare: black "Blues Brothers" sunglasses. To complete the festivities, a photographer was close at hand to capture the mad antics. At the Datatel Clam Bake the following night, those who were captured on film were given photo key chains with their pictures in attached viewers.

////DATATEL

Colleague is Datatel's administrative computing solution for colleges and universities. Datatel used the CAUSE conference to demonstrate Colleague's complete suite of financial and student modules, but held special demonstrations of the **newly-released Budget Management and General Ledger** modules. These modules provide complete financial control with automatic "do-to, do-from" processing for inter-fund transfers, field level security for confidentiality, user-defined accounts for flexibility, and budget modeling for management analyses.

Benefactor demonstrations were held at the Datatel booth to show how this fund-raising package is setting the standard for large fund-raising organizations. Benefactor contains modules for individual donor information, organization information, gift and pledge processing, campaign management, major prospects, activities and events, membership, fund allocation, and correspondence control.

Benefactor's latest enhancements include a **Prospect Research Tracking** system for more effective target solicitations and comprehensive information for planning campaigns. A new **Non-cash Management Tracking** system to manage in-kind gifts and securities, appraisals and liquidation information was also a part of the new release.

Dr. Laird Sloan gave a presentation on Administrative Computing in the 1990s. Dr. Sloan, Datatel's Director of Product Planning, provided a glimpse of the company's vision of administrative data processing in the 1990s. His presentation touched on the role and impact of Unix, Computer Aided Software Engineering, X-Windows, and other advanced computer techniques in administrative processing for higher education.

Datatel has been offering quality software and services for over 20 years. We are grateful to CAUSE for the opportunity to reach such prestigious individuals as those who attend CAUSE and look forward to a bright future, helping colleges and universities meet their administrative computing and fund-raising needs. If you would like to know more about our company and its products, please call Laird Sloan at our Fairfax, VA headquarters at 703-968-9000.

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DELOITTE & TOUCHE

Deloitte and Touche, a recent merger of Deloitte, Haskins & Sells and Touche Ross, is pleased to have participated in the 1989 CAUSE Conference in San Diego. Our participation included a corporate presentation titled "CIO Survey of Major North American Companies - Trends and Issues" and a booth on the exhibit floor.

The presentation focused on the results of our annual CIO Survey of Major North American Corporations. This year's survey probed the areas of systems development, CASE tools, techniques, human resource initiatives and their impact on productivity and effectiveness. The Survey responses resulted in some very revealing and surprising findings. Copies of the survey results can be requested.

In addition, we sponsored a booth on the exhibit floor. The booth featured discussions between Deloitte & Touche consultants and information technology practicioners in many of the leading colleges and universities. The topics of interest included CASE technology, administrative system packages and systems integration.

Touche Ross is a leader in the field of higher education. In the past several years, Touche Ross has achieved excellence in the industry by developing in-depth knowledge in this specialization. The company's consulting function assists clients in higher education in dealing with financial, operational, and information technology issues daily. In the information technology area, it has a group of dedicated professionals who focus on issues to the successful use and application of information technology to solve critical systems problems.

continued . .

Touche Ross offers a vast range of services to higher education. Along with auditing, accounting, and tax consulting, its management consulting professionals offer:

- Administrative systems requirements development, package search, custom development and implementation
- Financial structures and systems
- Information systems operations review
- Strategic information systems planning
- Technology and capacity planning
- Telecommunications planning

Contact:

David M. Johnson
Senior Manager
Deloitte & Touche
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(216) 771-3525

digital™

Digital Equipment Corporation

"The Desktop of the 90s...Today"

True desktop integration

In a live, interactive presentation, Digital Equipment Corporation demonstrated its ability to integrate desktop computers from different vendors with different applications into a unified computing environment. Several hundred CAUSE members visited this popular demonstration at Digital's booth.

Digital showed how users working in a typical mixed vendor environment - using a UNIX workstation, VMS workstation, MS-DOS based personal computer, and Apple Macintosh - can exchange, revise and combine documents from different applications, and run programs across different platforms.

The demonstration, "Desktop of the 90s. . .Today," included examples of the client-server computing model. Integration of multi-vendor systems are achieved with Digital's recently announced Network Application Support services, a set of services allowing software applications to integrate across a distributed environment, and with third party software.

"The challenge is for educational institutions to evolve from a collection of connected computing devices to a truly integrated environment, while protecting their existing investment in equipment and maintaining individual choice on the desktop," said Roger Strickland, Digital's Education Industry Marketing Manager. "Digital provides that capability today."

The Education Initiative

Cost-saving partnership programs

Announced last fall at CAUSE '88, The Education Initiative (TEI) programs have set a new standard for vendor partnerships with the education community. Digital has introduced six innovative programs to help reduce technology costs and make technology more widely available to education users in both administrative and academic functions. These programs provide significant cost savings in all areas - acquisition of new systems, software acquisition, software maintenance and support, and hardware maintenance. More than 1000 educational institutions have signed up for TEI's most popular program, the Campuswide Software License Grant Program, which provides licenses to more than 200 Digital products at no charge.

Two Major Announcements

Digital is Committed to Standards

Grant to Support Linking Large University Library Databases

Digital Equipment Corporation announced grants to the University of California and to Pennsylvania State University to support the linking of major information retrieval systems at these institutions.

The project will enable users of the Penn State and University of California bibliographic library systems to search the holdings of either system while using the familiar commands of their own systems. To accomplish this, researchers will use a new application-layer protocol for computer-to-computer information retrieval, National Information Standards Organization Z39.50. The protocol permits the separation of the user interfaces from the information servers.

The vision behind this protocol is to enable users of any information system, regardless of the computer platform and software system, to search the full range of data available nationally, and then to consolidate the results of the search within their local system. Digital expects that the results of this project will help educational institutions meet a major challenge of the 90s: linking information resources, regrdless of their physical location and the computer system they reside on.

Digital and the University of California to Create OSI Network

Digital Equipment Corporation and the University of California announced a joint project to create an Open Systems Interconnection (OSI) network and test environment at the University of California and to form a link with the European Academic and Research Network (EARN).

The project will create an inter-campus OSI backbone in the University of California system, gateways between this network and the major national networks in the United States, and a transatlantic link. The project will make extensive use of OSI protocols that are being implemented for DECnet Phase V software, Digital's OSI implementation planned for release in 1990.

"Digital is committed to making it easy for computers to share information across organizations and networks worldwide, and we believe OSI will be essential to this effort," said William R. Johnson, Jr., Vice President, Distributed Sytems Engineering and Marketing for Digital. "This project will stimulate the early implementation of OSI protocols in the United States and promote standards-based global networking."

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CAUSE CONFERENCE 89
SAN DIEGO, CALIFORNIA

Doelz would like to thank all conference attendees and the CAUSE staff for making our first exposure to the CAUSE Conference a very pleasant experience. We would also like to thank our friends at S.U.N.Y. for their persistence in encouraging us to attend.

To our surprise we found not the traditionally rivalries amongst the schools, but a conscious effort to share knowledge of the latest technology in order to upgrade the entire community to the best communications environment. It is an ideal situation for Doelz since we provide advanced technology today geared to meet the requirements of the universities and colleges. During the conference, we were treated more like friends sharing information rather than just a vendor trying to sell product.

The university communications network is somewhat unique with problems stemming from managing multiple campuses, multiple applications, multiple mainframes, multiple speeds, and multiple protocols. The network manger is concerned with reducing network costs, better network management, avoiding obsolescence of existing equipment, flexibility, reliability, and disaster backup. Doelz provides a solution to these network problems through its third generation of Scalable Fast Packet technology via transparent wide area networks.

Doelz technology has been at work in the university environment for over twelve years. The **PLATO** System utilizes first generation Scalable Fast Packet for its network. Recently, we received a letter from Janus Technology Group in Minneapolis informing us that while visiting Jack Stifle of the Computer-based Education Research Lab at the University of Illinois, they had an opportunity to discuss the network. Robert Morris of

DOELZ

Janus reports "the first Doelz network prototype continues to operate as their only link...to other Plato centers around the country. That equipment has operated virtually non-stop, 24 hours a day, 7 days a week, since its installation over twelve years ago. There have been no failures, and on many occasions the system continued to operate when power failures and transients caused the rest of the lab to go down. This is over 105,000 hours of continuous uninterrupted and unattended operation in a less than ideal environment without failure, and without maintenance."

John Shinners of SUNY says of the Doelz network "It just runs and runs. The uptime reliability is incredible. We are running 13 protocols on the same network using IBM, TANDEM, DEC, UNISYS, etc.. We are extremely pleased with the performance of the network."

Doelz wants to assist other universities in solving their communications problems. We understand the special requirements of the campus environment and hear your requests for solutions. Your type of situation happens to be ideal for the Doelz Scalable Fast Packet Technology. Fourth generation superswitch is currently under development.

We have enjoyed being with you at Cause 89 and look forward to Cause 90 in Miami Beach. Thank You.

EDS and Higher Education

A partnership to support the instruction, research, and public service missions of our colleges and universities by effectively managing technology

Commitment to Education. Dedicated to building a successful partnership with higher education, EDS participated in the CAUSE89 Conference in San Diego. CAUSE89 provided the opportunity for EDS to:

- Present insights into how EDS helped General Motors, its parent company, in "Managing Technological Change" and why this experience is significant to higher education.

- Announce its new strategic alliance with American Management Systems (AMS) to implement AMS' LEGEND series of administrative software for colleges and universities.

Information Technology Leadership. As the world's leading systems integrator, EDS has spent nearly three decades evolving data processing service into the responsive art of *total information management*. Completely vendor independent, EDS has the flexibility to select the most effective hardware, software, and communications resources to create customized business solutions to diverse customer requirements.

Managing Technological Change. Managing a constantly changing technology environment to achieve and maintain a competitive edge has become a monumental task for information system managers, who face varying product life cycles and limited financial and personnel resources. The most cost-effective solution is to concentrate resources on primary business objectives, contracting with an information technology vendor for systems integration, communications services, and large systems development.

EDS' Role With GM. General Motors faced this issue in 1984, and rather than contracting for services, decided to acquire EDS. EDS found at GM a complex organization with many computing environments -- commercial, end-user, engineering, and plant. EDS' technical strategy was to develop and implement an expanded operational base, including:

- Information processing centers
- Digital voice and data network
- Enhanced training
- Centralized resource management
- Global management.

EDS integrated the operational base, leveraged existing products with strategic R&D, and delivered an infrastructure to support the business, which resulted in several benefits:

- Creating an operational platform for GM's tactical and strategic applications
- Changing the economics for future EDS business
- Saving money for GM -- $469 million by 1991 from data center consolidations and $326 million by 1992 from communications plan implementation.

Challenges for Higher Education. American colleges and universities are dedicated to providing quality education and research capabilities. Today, this is essential for the U.S. to increase its competitive edge and technological leadership in the global marketplace. The use of effective information technology resources will:

- Advance research quality and productivity through rapid data transmission and increased collaboration among academic colleagues
- Broaden instructional opportunities by linking students and faculty from various locations
- Cost-effectively integrate multiple computer systems across campuses, states, or regions.

Similar to GM, the higher education technology environment is complex, with different requirements between administrative and academic computing organizations, conflicting staff and faculty policies, and complex communications needs among departments, campuses, states, and countries.

Partnership for the Future. EDS is equipped to meet the higher education challenge with innovative technical solutions driven by proven experience and technology. Together, EDS and higher education can dramatically improve the instruction, research, and public service missions of our colleges and universities.

For more information about EDS, please call (703) 742-2382.

EDS

Ernst & Young

Rod True or Chuck Raz
Information Technology for Higher Education

One IBM Plaza
Chicago, Illinois 60611
(312) 645-3000

Ernst & Young (E&Y) participated in CAUSE89 in a number of different activities. First, E&Y sponsored a refreshment break to introduce the newly merged name and firm of Ernst & Young, previously known by CAUSE members as Ernst & Whinney. On October 1, 1989 Ernst & Whinney and Arthur Young officially merged to become Ernst & Young, one of the largest professional services consulting firms in the world providing information systems consulting services. The merger makes Ernst & Young the leading firm actively supporting Information Engineering concepts and the use of CASE tools.

Secondly, E&Y participated in the 1989 meeting of the CAUSE Strategic Advisory Council. This is the second year of E&Y's three-year term serving on this most important CAUSE committee. Lively discussion helped identify external factors and future directions that are likely to affect higher education computing and information technology.

Finally, E&Y proudly serves CAUSE as a Corporate member. As the computing needs of higher education become even more complex, E&Y continues to pursue and support strategic partnerships with leading organizations such as CAUSE to help information technology professionals plan for the future.

GKA

CAUSE89

GKA's participation in CAUSE89 included sponsorship of the Wednesday morning coffee break and a Track II: Funding and Accountability Issues presentation, **Managing Computer Support Costs Through Effective User Training: Lessons Learned at UNH**, on Friday morning by Principal John F. Leydon, who co-presented with Betty Le Compagnon, Executive Director of University Computing, University System of New Hampshire.

Company Profile

GKA is an executive consulting and management services firm specializing in support to higher education. Since its founding in 1977, GKA has assembled a cadre of senior professionals with first-hand experience as executives and technical specialists in universities and colleges. GKA has developed a reputation as a firm composed of strategic thinkers and creative problem solvers who go beyond a simple prescription to join with clients in preparing for and implementing change. GKA continues to enhance its telecommunications and information systems capabilities to keep pace with higher education's growing use of information technology.

Involvement in Higher Education

The core of GKA business has always been service to higher education institutions, executives and governing boards in a broad range of areas: transition support, strategic planning support, organizational evaluation, executive recruitment, software and hardware consulting, telecommunications consulting, project management, and interim management. A representative sample of GKA's higher education clients during the past five years is presented below:

Brandeis University
Columbia University
Drew University
Duke University
Fairleigh Dickinson University
Fayetteville State University
Indiana University
Keene State College
Marist College
Massachusetts Board of Regents
Meharry Medical College
Mount Holyoke College
New York University
Radford University
St. Lawrence University
St. Louis University
Union Theological Seminary
University of Delaware
University of Houston System
University of Maine System
University of New Hampshire
University of Pennsylvania
University of Pittsburgh
University of Texas M.D.Anderson Cancer Center
University System of Georgia
University System of New Hampshire
Washington University
Wayne State University
Western Carolina University
Westfield State College

Range of Services

Advancing technology is altering the way institutions collect, store, analyze, disseminate, and use information. University and college executives face an increasing array of technology-related challenges. GKA combines technical expertise and management know-how to support the design and implementation of effective information technology solutions. GKA's Information Technology service portfolio encompasses:

Evaluation and Planning
Operations Appraisal
User Requirements Analysis
Internal Plan Review
Strategic Plan Development

Procurement and Implementation
Computer/Telecommunications System Design
Systems Integration
RFP Preparation/Evaluation
Vendor Negotiations
Project Management

Network Planning/Long Distance Service Analysis
Performance Appraisal
Topology/Technology Design
Cost/Performance Optimization

Specialized Services
Office Automation/Cabling Analysis and Design
Facilities Programming
Interim Management/Recruitment
Business Opportunities Evaluation

For additional information, contact:

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IBM

IBM ANNOUNCES LIBRARY, ADMINISTRATIVE PROJECTS AT CAUSE 89

IBM's Academic Information System (ACIS) is proud to have been a CAUSE Corporate Sponsor for this year's conference.

More than 1,000 people attended the IBM sponsored Beach Ball on Thursday evening, which included music by a surf band, a comedy show and dinner.

Joining IBM at CAUSE this year were 10 IBM Business Partners, the largest number of Business Partners ever to participate at the IBM booth. They demonstrated a wide-range of administrative and library solutions.

During the conference ACIS was pleased to announce three joint projects to develop administrative and library computing solutions, as well as the addition of four specialists to the ACIS staff.

Executive Decision System

Addressing the area of administrative computing, IBM and California Polytechnic State University (Cal Poly) will develop a prototype Executive Decision Support System for higher education that would serve as a guideline for other colleges and universities.

Typically, an executive decision support system for higher education might include critical business information, such as a school's enrollment, level of state and federal funding, faculty and facilities. Executives gain access to the system through a personal computer and view data in easy-to-understand chart and graph form.

Administrative Computing Expertise

Joining ACIS to assist in providing solutions for administrative computing needs is Judy Di Mattia, a former vice president for administration and finance and university treasurer at Fairleigh Dickinson University. She will work with college and university administrators in such areas as finance, human resources, facilities management, fundraising, alumni affairs and student information systems.

Enhanced Library Application

To meet the computing needs of mid-size college and university libraries, IBM is joining with Carolina Coastal Community College and IBM Business Partner CMDS in a project to enhance an existing integrated library system application and increase its capabilities on the IBM Application System/400.

Specific enhancements planned for the application, TEAMS: Library System, include developing the program in code that is specific to the AS/400 system. This would make available the relational databases in the AS/400 system, which increase the speed and flexibility of information retrieval. Also, an acquisitions module, which will automate the ordering and purchasing of books, will be added to the existing catalog and circulation modules. The public access module will be rewritten to facilitate more intuitive interaction between the user and the computer.

Multimedia Interface

With Indiana University (IU), IBM is conducting a project to develop a multimedia interface for online library catalog systems. IU and IBM will develop the interface to the NOTIS library management system so users will be able to conduct catalog searches using a series of mouse-activated on-screen command "buttons." The interface also will add graphics to the on-screen instructions and will increase the application's visual appeal.

Three Library Specialists

ACIS also has appointed three librarians to help develop IBM programs for libraries.

Anita Breland, a strategic planning specialist, is IBM's liaison to INFORMA, a newly-organized forum for those interested in the use of IBM technology in libraries. She will work with members of the library community to evaluate long-term strategic issues.

Peggy Federhart, a specialist in library automation, will help librarians define their computing needs and identify and implement solutions.

Richard Hulser, a specialist in image processing, will assist in IBM's efforts to assess and answer the electronic-image-storage and retrieval-system needs of higher education libraries.

These announcements underscore IBM's commitment to providing a full breadth of innovative solutions for higher education. The partnerships that ACIS has developed with higher education, since it was formed in 1983, help IBM understand the needs of the academic community and respond with appropriate solutions. ACIS looks forward to expanding its higher education partnership even more during the coming year.

For more information, contact:

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INFORMATION & COMMUNICATIONS, INC.

Information and Communications, Inc.
&
SAFE

The Financial Aid Processing Solution

Information & Communications was pleased to attend CAUSE 1989, in nearby "Down Town San Diego". Through our participation and presence at the conference we came to better understand the needs of our clients, and the dynamics of the ever-changing market place.

ICI was happy to be able to provide attendees of CAUSE89 with the opportunity to enjoy themselves and to win prizes ranging from CD players to gift certificates. All the people you saw having fun with the orange stickers affixed to their name tags were playing the ICI-Dolphin Game.

In addition to generating lo. of fun at CAUSE89, ICI featured our line of Dolphin Software products. Headlining our product showcase was SAFE our comprehensive, on-line financial aid processing system. SAFE 6.0 is the culmination of 20 years of refinement, innovation, and enhancements made in response to the needs of the market place.

SAFE is design-engineered to be a stand alone financial aid processing system . Our single standard IBM VSAM type cluster data base configuration also makes SAFE ideal for integration into any Student Information System.

ICI's 20 year experience in higher education gives us a unique perspective on the market place. As specialists in financial aid processing, we are able to provide custom designed systems for a wide range of institutions in a wide range of operating environments.

This same experience puts on the leading edge for consultant support, administrative program reviews, and software search and evaluation services.

If your business is financial aid in higher education, then ICI is the best way to play it SAFE.

5601 LA JOLLA BOULEVARD • LA JOLLA, CALIFORNIA 92037-7524
(619) 454-9765 • (800) 424-7233

Information Associates Features Clients in Software Showcase

Customer Demos Focus on Leveraging IA Software and Services into Institutional Solutions

Of particular interest in Information Associates' exhibit at CAUSE89 were the live demonstrations conducted by clients running their own versions of IA software:

California Polytechnic State University
San Luis Obispo, California

Relational version (DB2) of the Student Information System in the OASIS Project (California Polytechnic State University at San Luis Obispo, and California State University at Los Angeles and Long Beach)
Macintosh workstation component for IA's Executive Support System
Sage Analysis in the OASIS Project

Salt Lake Community College
Salt Lake City, Utah

On-line, real-time procurement system integrated with IA's Financial Accounting and Accounts Payable applications to automate a range of functions
ON COURSE - Academic advising, graduation checkout, instant access to all degrees

University of Arizona
Tucson, Arizona

IDMS Financial Records System including multi-fiscal-year processing, better reporting and simpler transaction-history processing
Student Information System including voice response registration

St. Louis University
St. Louis, Missouri

Alumni/Development System used with innovation for pledge forecasting and personalized acknowledgment letters

Pepperdine University
Malibu, California

Human Resource System integrated with PC-based MultiFlex 2000 for administering flexible benefits plans

Colorado Community Colleges and Occupational Education System
Denver, Colorado

Student Information System at 12 sites including systemwide FTE reporting and CORE transfer program

Baylor University
Waco, Texas

Macintosh user interface to SIS that allows academic chairpersons to access information in four systems on networked Macintosh workstations

Ivy Tech - Indiana Vocational Technical Colleges
Indianapolis, Indiana

On-site IA services for project management to successfully implement the IA Financial Records System

INFORMATION ASSOCIATES INC.

Foothill College - Representing Foothill-DeAnza Community College District
Cupertino, California

Student Information System enhanced with touch-screen technology for registration and admissions

Williams College
Williamstown, Massachusetts

FOCUS and FOCUS Windows for decentralized reporting with integration in ALL-IN-1

California State University at Long Beach
Long Beach, California

On-site installation support from IA for SIS as part of OASIS project
Voice response registration

University of Colorado
Boulder, Colorado

An IDMS Client Support Unit institution which installed the IDMS Student Information System from IA

Maricopa County Community College District
Phoenix, Arizona

Academic Support -- Writers-NET application using INGRES tools and a relational database

Boston College
Chestnut Hill, Massachusetts

Student access to personal, financial, loans and academic information through terminals similar to ATMs

University of North Texas Computing Center
Denton, Texas

Optical scanners to record registration information and drop/add changes and an electronic network for transcript transfer and storage

IA Suite Spotlights Live Demos and Special Sessions

To complement the Software Showcase in its exhibit booth, Information Associates presented in the corporate suite live demos of its relational solutions (DB2, INGRES, VAX Rdb/VMS), showing the enhanced functionality of FRS and SIS; FOCUS; the SAA-compliant user interface BrightView; and IA's Executive Support System on a Macintosh workstation. "Meet the Pres." offered visitors to the suite the opportunity to talk with IA President John G. Robinson. Conferees wanting to discuss future technology at IA attended "Ask the Expert" sessions led by John Gwynn, IA's Vice President for Advanced Research and Technology.

For more information, call Gayle Steinberg at (716) 467-7740.

INFORMATION ASSOCIATES INC.

FOCUS

Information Builders, Inc.
1250 Broadway, New York, NY 10001 (212) 736-4433

Information Builder's FOCUS fourth generation language (4GL) and windowed application development facilities are unsurpassed for processing and controlling data. With FOCUS, users gain ease of use and higher productivity whether reporting and analyzing data, or building complete applications. FOCUS provides:

- Integrated decision-support and development tools
- A tenfold increase in productivity over developing applications in COBOL with embedded SQL
- Portable applications that run on any hardware and drive a variety of database engines

Users can write simple English phrases to query data sources and produce reports, including row-oriented financial statements. FOCUS generates business graphics, formal statistical analyses, and even spreadsheets, with one, integrated set of 4GL tools. For novices and casual users, there are automatic information and application generators with windowed, "point-and pick" displays for creating files, producing reports and developing database maintenance applications — all without coding.

FOCUS unifies data analysis and database maintenance functions in a single language available on mainframes, minicomputers and PCs. Applications and coding skills are portable across operating environments, and inter-platform connectivity facilities enable FOCUS users to access distributed data and execute remote procedures on nodes throughout a network.

Universal Access to Data

While most database engines provide access to only their native data structures, FOCUS delivers direct access to virtually every source in the data center—without conversion or reentry of data. All of the following relational and non-relational data sources are accessible with all of the FOCUS facilities while the physical details of the structures remain transparent to users:

Mainframe	Midrange	Microcomputer
Adabas	Adabas	ASCII
Datacom/DB	ASCII	dBASE III, IV
DB2 *	C-ISAM	LOTUS 1-2-3
IDMS, IDMS/R	DBMS	OS/2 Extended Edition
IMS	DMS,DMS/TX	Paradox
ISAM	Ingres *	Rbase
Model 204	ORACLE *	SQL Server *
QSAM	PACE	
SQL/DS *	Rdb *	
System 2000	RMS *	
Teradata	SP D2	
TOTAL (Cincom)	Teradata	
VSAM *	Sybase *	

*** Read and Write Access**

Powerful Relational Capabilities
FOCUS supports joins between the datasets it accesses. In a single operation, FOCUS users can consolidate data from multiple relational tables or join relational tables to non-relational sources, such as IMS, RMS or VSAM files.

FOCUS Updates External Databases
FOCUS generates and translates native SQL syntax. Users can issue interactive requests in either language to update relational sources on many platforms — mainframe users can update DB2, SQL/DS, Teradata and VSAM files, VAX users can update RMS and Rdb files, as well as Oracle, Ingres and Sybase databases, and PC users can use PC/FOCUS against the Ashton Tate/Microsoft SQL Server or IBM's OS/2 Extended Edition.

Comprehensive Tools
FOCUS combines integrated decision-support facilities with automated tools for building applications. Users have the choice of the 4GL or the windowed point-and-pick facilities for producing reports and graphs. For specialized needs, the FOCUS language is rich in custom-formatting syntax. CASE-based FOCUS Application Creation Tools (FACT), code generators and visually-oriented screen and window painters fully automate the development process, substantially reducing the time and effort required to prototype and implement new applications.

Expert System Tools
Information Builder's LEVEL5 expert system facilities allow organizations to capture specialists' knowledge in systems that end users can run to diagnose problems and perform analyses. Compatible versions are available for IBM mainframes and PCs, DEC VAX minicomputers, and Apple Macintoshes — LEVEL5 applications are portable between those environments.

Information Builders is implementing an "expert" mode in FOCUS to allow application builders to integrate LEVEL5 expert systems within FOCUS applications. These integrated applications will have access to every source of data that FOCUS can read.

Integration with Repositories
The FOCUS Application Control Environment (ACE), provides a centralized mechanism for managing FOCUS applications throughout their life cycles. ACE is a the repository for applications (and components — including data), and holds and applies access rules. Using ACE, MIS directors can track system usage, developers have a convenient application-deployment mechanism, and end users have centralized access to all of the site's FOCUS applications.

The ACE facilities will also interface seamlessly with IBM's SAA Repository when it is released. As an SAA Development Partner, Information Builders is thoroughly acquainted with the SAA structural boundaries and has re-engineered FOCUS to conform to IBM's new standards. FOCUS generates the SQL needed to create the DB2 tables that IBM's repository will employ, and IBI is extending DEC's CDD/Plus to include full support for FOCUS attributes (including field-validation criteria, etc.). Through the FOCUS CASE tool (FACT) it will be possible to both create and read entity descriptions for both hardware manufacturers' repositories.

Ingres

INGRES Announces First Intelligent Database

Why make a database "intelligent"? Simply to make it more useful.

With INGRES, the first intelligent RDBMS, programmers can put rules right into the data manager.

This gives higher education executives the power to incorporate complex business policies into the database manager for superior control and flexibility.

INGRES Customers Report Success at CAUSE

Carnegie Mellon University

Excerpts from Cynthia Golden's talk, *The Effect of Relational Database Technology on Administrative Computing:*

> **"In addition to flexibility, portability of applications across different hardware and operating system environments is important to us in order to take advantage of new advances in technology. With INGRES software we have been able to demonstrate that this is a reasonably simple thing to do."**

> **"A simple application can be produced using OSL and the other tools in less than a day. By using the 4GL application builder, the prototype of the system is the real basis for the final product, i.e., in most cases the prototype becomes the final product."**

CAUSE89 Report — January, 1990

New Jersey Institute of Technology

On Wednesday, Thomas J. Terry, Jr. presented *The Planning and Implementation of Relational Database Technology at NJIT*. Mr. Terry discussed the real-life benefits of using the relational database model in administrative and academic systems.

NJIT is an extremely computing intensive environment with over 1,500 nodes currently in their network and an additional 1,500 planned. Based on database experience gained in industry, Mr. Terry is improving the availability of data while maintaining tight control on expenditures. Many of these benefits will come from the use of relational databases.

Mr. Terry also shared specific experiences on how he is integrating INGRES with Series Z administrative software from Information Associates.

Maricopa Community Colleges

At Ingres' corporate booth Maricopa Community Colleges demonstrated its ACE System (Acquiring a College Education) for student tracking and a host of other exciting applications — including a student writing network, a course development system, and a system showing student progress toward any given major.

Maricopa uses the INGRES 4GL (Fourth Generation Language) to write their applications. According to Lance Miller, director of Information Services:

> **"The application development tools have increased our ability to produce applications by a factor of five to seven times. In concrete terms we saw applications that traditionally would take a year to 18 months being completed in two to three months."**

Ingres Corporation provides INGRES, the largest selling relational database management system in higher education.

Ingres Corporation
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Alameda, California 94501
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INTEGRAL™

INTEGRAL
Corporate Headquarters
2185 North California Boulevard
Walnut Creek, CA 94596

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FAX (415) 944-1416

COMPANY PROFILE

The 1989 merger of Integral Systems, Inc., a leader in human resource applications since 1972, and Data Design Associates, a financial management systems specialist for more than 16 years, created a new company, INTEGRAL — now one of the world's largest suppliers of application software for IBM mainframe, midrange, and PC hardware platforms. With 500 employees working out of offices in eight cities across the U.S. and Canada, the firm develops and markets a full range of financial and human resource management software supported by comprehensive product training and consulting.

INTEGRAL's human resource management systems were the first to comply with the standards established by IBM's System Application Architecture (SAA). INTEGRAL's HRMS products were written only with those tools specifically identified as SAA common programming interface products:

- VS COBOL II
- Cross System Product (CSP)
- Structure Query Language (SQL)
- Query Management Facility (QMF)

INVOLVEMENT IN HIGHER EDUCATION

Today, INTEGRAL's DB2 human resource systems are in use by over 70 clients. Originally founded in 1972, INTEGRAL rapidly attained an excellent reputation as a developer of human resource software specifically designed to meet the needs of institutions of higher education. Even in its expansion to other vertical markets, INTEGRAL continues to recognize the special needs of the academic community and to aggressively support those needs in both its financial and human resource products.

PRODUCT LINE

INTEGRAL offers an entire spectrum of financial and human resource management products for IBM and IBM-compatible mainframe, midrange, and personal computers:

FINANCIAL	HUMAN RESOURCE
MAINFRAME	
General Ledger	Human Resource Administration
Accounts Payable	Payroll Management
Purchasing	Applicant Management
Fixed Asset Accounting	Position Control
Project Accounting	Benefits Management
Accounts Receivable	Pension Benefits Administration
Materials Management	Flexible Compensation
MIDRANGE	
General Ledger	Human Resource and Benefits Manager
Accounts Payable	Payroll Manager
Purchase Order	Position Control
Accounts Receivable	
Fixed Assets	

FINANCIAL	HUMAN RESOURCE
PERSONAL COMPUTER	
General Ledger	Affirmative Action
Accounts Payable	Organizational Charting
Project Accounting	Distributed Human Resource Administration
Fixed Asset Accounting	Compensation Planning and Administration
	Succession Planning
	HR Vision

These products are available in multiple technical environments: mainframe systems use standard COBOL with VSAM or with an application generator (e.g., CSP, ADS-OL) and accompanying database technology (e.g., DB2, SQL/DS, IDMS). INTEGRAL products are designed to include a lengthy list of built-in features that are of significant value to the higher education community. Our products are in operation at numerous two- and four-year colleges and universities, local community colleges and land grant institutions throughout the United States and Canada. These colleges range in size from 1,000 to 80,000 employees and include the following:

- o Boston College
- o Harvard University
- o Rutgers University
- o Catonsville Community College
- o Indiana University
- o York University (Canada)
- o University of Minnesota
- o New York University
- o Colorado State University
- o University of Chicago
- o University of British Columbia

Unique higher education-related features in the INTEGRAL Applications include capabilities such as:

- o Multiple concurrent appointments (e.g., assistant professor and dean)
- o "Without salary" appointments
- o Management of curriculum vital information
- o Special forms of payment (e.g., stipends, honoraria)
- o Payment start and stop dates by appointment and account
- o Contract and grant certification
- o Position control
- o FTE tracking and control
- o Salary distribution to multiple accounts (e.g., general fund and grants)
- o Faculty and staff salary analysis
- o Tenure tracking

INTEGRAL, a CAUSE member since 1979, has participated annually at the CAUSE National Conference since 1974.

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For More Information, Contact:
Martha Harry, Marketing Manager
Extension 8771

InterVoice, Inc., developer, manufacturer and marketer of an interactive voice response system called The RobotOperator, was pleased to participate at CAUSE '89, in San Diego. Through our participation at this event, we trust we demonstrated our commitment to higher education and will continue to do so in the future.

Interactive voice response systems automate the function of a human operator, and provide online computer database information to incoming callers. Routine information can be obtained with voice response systems, some applications include: obtaining account balance information, check clearance, status of insurance claims, fund transfers, employee benefit information, and many other services.

Voice Response Applications in Education

Educational costs are escalating at a rapid rate. One way to cotain high tuition fees and high student expenses is with a voice response system.

There are numerous ways such a system can be utilized. Callers can access information from their touchtone telephone for:

- Campus registration -- Enter student identification number and then another security code. You then enter the catalog cousre number, the system will verify if course is available and asks for payment arrangements, (credit card, or check).

- Students no longer have to stand in long lines to register for courses. Fewer staff members are pulled from their day-to-day activities during registration with a voice response system.

- Request for transcripts, class cancellations, early grade reporting, setting up appointments with advisers/instructors, even ordering parking stickers for automobiles, can be done using a voice response system.

Voice response systems can be accessed seven days a week 24-hours a day, providing a service that was never before available under these circumstances.

603 Park Point Drive, Suite 220
Golden, Colorado 80401
(303) 526-1229

LASERMAX CORPORATION

LaserMax is pleased to have participated in the 1989 CAUSE Conference held in San Diego, California. The LaserMax exhibit booth featured demonstrations of the Company's CampusCard systems and an Academic Record Tracking System/Enrollment Assistance System (ARTS/EAS) developed at the University of Kansas. The Company's CampusCard system is available using either optical memory cards or integrated-circuit ("smart" cards). The CampusCard system consists of portable memory cards, read/write (R/W) devices that are attached to personal computers (or minis or mainframes), and system application software performing any of the following functions:

Identification and Security
- ID number, name, address, etc.
- Graphic ID (photo, signature, etc.)
- Facility access control
- Computer access security

Grade Transcript
- Historical data storage
- Use with curriculum data
- Current registration/ schedule information

Registration/Fee Status
- Current term registration status
- Fees paid (date, type, amount, expiration)
- Library authorization

Health Services Card
- Emergency medical data
- Optional medical records storage

Cash Card
- Campus purchases (cafeterias, bookstores, lab fees, etc.)
- License for off-campus purchases

Optical memory cards can hold up to 2.8 megabytes of digital information. This is equivalent to 1,000 typewritten pages and/or a number of full color graphic images (e.g. photograph, signature, medical X-rays). The smart card has memory capacities ranging from 500 bytes to 8,000 bytes. Its principal advantage is that it is a reprogrammable interactive device that offers unique performance in a number of applications such as security or debit card systems.

The Company also demonstrated the ARTS/EAS software system developed at the University of Kansas. The ARTS/EAS system is essentially electronic advising during the pre-enrollment process. This system has been used successfully during the last three registration periods at the University of Kansas.

Please contact Mr. Bill Eggert, Chairman, for additional information.

NCR CORPORATION

NCR Corporation a leader in information management processing systems for over 105 years develops, manufactures, markets and supports information processing systems for selected worldwide markets. Higher Education is a very important member of this group.

With the company's long-time commitment to Open Systems Architecture, and industry standards, NCR provides a full range of quality information processing for this marketplace. In addition, NCR understands the importance of providing superior sales and support expertise. To this end, NCR sales and support people are trained to address the needs of the Higher Education marketplace.

In line with this commitment, NCR was happy to participate in the 1989 CAUSE Conference held in San Diego on November 28 through December 1, 1989. We enjoyed the opportunity to exchange views with the decision makers in attendance.

The products NCR demonstrated at the conference included our powerful UNIX based TOWER family of processors and the TOWERVIEW, X-Windows based workstation and a selection of NCR's latest Intel 386 based personal computers. In addition we were delighted to display our Public Access terminal, the NCR 5682. This terminal provides the flexibility of pre-stored graphics and digitized sound to provide dynamic information displays to students, facility and administration. The 5682 presents many opportunities within Higher Education such as a self-service terminal to be used for student registration, dormitory access, food service payment, etc.

In addition to the above, NCR has signed a marketing agreement with SCT Corporation of Malvern, PA to co-market their "Banner Series" administrative software. This includes four integrated applications: student, finance, human resources, and alumni/donor development.

Overall, we believe that NCR's information management direction will serve well Higher Education's needs, as we both move into the 90's. NCR Corporation is an industry leader in providing open systems based on industry standards. Our commitment to open systems spans more than a decade, and it embraces a full range of broad product lines including processors, peripherals, subsystems, languages, data management systems, communications and networking. Using this technology, administrative departments can talk to one another through multi-vendor mainframes. Campus wide networks are no longer a thing of the future.

NCR looks forward to being with your again at your 1990 Miami Beach convention.

PROVIDING AN ENVIRONMENT FOR CAMPUS CONNECTIVITY

NOVELL'S PROGRAMS FOR HIGHER EDUCATION

Lee Caldwell
Director, Corporate Education Sales and Marketing
Janet Perry
Manager, Higher Education Programs

The college and university market for networking is large, and growing rapidly. In recent years, institutions have made huge investments in information technology, primarily in PCs and Macintosh computers. While most colleges and universities have some experience with LANs at the department level, only recently have they begun to consider how to network the entire campus into one unified scheme. Novell has several programs for colleges and universities which are designed to make this process easier to administrate, easier to install and less expensive to buy.

Getting Started with Netware

Nationally, only about ten percent of all microcomputers on campus have been networked. Creating Local Area Networks appears to be a good idea, but colleges and universities often lack experience with the technology. With a Novell starter grant, any campus, no matter what size, can obtain copies of NetWare at a significant discount from list price. These grants cover both SFT NetWare and NetWare 386. The number of grants available to a school is determined by the FTE enrollment. This program allows schools to learn about NetWare and networking without making a large monetary commitment. Application forms for grants are available from local Novell offices.

Standardizing on NetWare

Many campuses have chosen to standardize on one or two networking operating systems throughout the school. However, in the university environment that type of standardization requires a large number of servers. Often, it is difficult for small computing staffs to keep track of, and administrate, these networks. Novell has created a multiple-copy license of NetWare that provides schools with several benefits. This license creates a centralized administration for the network, provides ways for departments and labs to get on the network more efficiently, and has a cost advantage over the price of buying individual copies of NetWare. The Education Account Purchase Program for NetWare is available to any educational institution who needs a minimum of 24 copies of NetWare. It is available in three versions: Advanced NetWare only, SFT NetWare only, and mixed SFT/386 NetWare. Schools can buy additional rights in quantities of five. Schools which already have copies of NetWare can receive credit for them under the program. In addition, there are multiple-copy licenses of NetWare Assurance available under this program.

Expanding and Supporting Your NetWork

Novell has several other programs for higher education which are designed to help you expand and support your network. The **Campus Support Kit** is a bundled package providing Novell computer-based training, first-line technical support, access to technical databases, and discounts on training. Finally, the **C Interface for DOS and other Developer Tools** provides opportunities for schools to develop products based on the Novell platform.

Continuing Support for Education

Novell offers its full support to colleges and universities striving to create state-of-the art networks to better serve their students, faculty, and staff. From the Corporate Education Sales and Marketing Staff, to the local field specialists in education and many resellers, VARs, and OEMs, Novell is committed to helping your institution make the best use of your investment in technology.

Novell's corporate sales office is located at 5215 West Wiley Post Avenue, Salt Lake City, UT 84116 (801-530-8900). There are also local offices throughout the country. To find the name of the office or dealer near you, please call 1-800-LANKIND.

ORACLE

ORACLE FOCUSES ON HIGHER EDUCATION

Recognizing that the computing needs of colleges and universities differ considerably from those of our corporate customers, ORACLE Corporation formed a Higher Education Division. This group seeks to understand and satisfy the special administrative, academic and research needs of educational institutions around the country.

CAUSE89: A Great Success

ORACLE would like to thank the hundreds of convention attendees that visited our booth at CAUSE89. We enjoyed meeting with you and appreciated the opportunity to discuss our Higher Education Program, demonstrate ORACLE products, and illustrate some of the ways colleges and universities are using our Relational Database Management System. We were very pleased with the enthusiastic response to our Higher Education Division and to ORACLE products and services.

ORACLE at CAUSE89:

Presentations & Demonstrations

ORACLE's Higher Education Division demonstrated the following products at this year's CAUSE conference.

SQL*Forms: A forms-based development tool for building user-friendly applications quickly and efficiently, all without programming. SQL*Forms combines your instructions with information from ORACLE's data dictionary to generate your application.

SQL*Plus A 4th-generation tool that delivers a full implementation of SQL as well as powerful report-writing and data-transfer capabilities.

SQL*ReportWriter A comprehensive, non-procedural report generator.

ORACLE for the Macintosh

ORACLE for the Macintosh weds the power and productivity of ORACLE's Database Management System with the user-friendly interface of Hypercard. It allows users to access data on minis and mainframes through the easy Macintosh environment.

ORACLE's Higher Education Division also gave a special break-out presentation on the future of PC Databases.

ORACLE Information

For further information about ORACLE's Higher Education Division or ORACLE's products and services please call (415)506-5112.

See you next year!

Periphonics CORPORATION

BEYOND TOUCH-TONE REGISTRATION - A LOOK AT NEW, INNOVATIVE WAYS TO APPLY VOICE PROCESSING TECHNOLOGY IN HIGHER EDUCATION

In this paper, we explore the uses of voice processing technology for applications in higher education. Four classes of voice processing are described: automated attendants, voice mail systems, interactive voice response systems, and audiotex systems. The characteristics of each class are described.

Criteria for identifying suitable applications are discussed. Guidelines are suggested for excluding certain applications which may, at first, appear to be well-suited for voice processing.

The costs and benefits which are normally considered in assessing a voice processing project are described. While projects may vary widely, the payback analysis and cost justification are based on common principles which usually apply to any voice automation service.

Examples of existing voice applications, beyond student registration, are given. Voice applications which are not presently operational in higher education are suggested; some of these applications are in use in commercial enterprises, while others would be unique to higher education.

Criteria for selecting a vendor are suggested. The choice of a vendor depends not only on the nature of the current project, but also on the institution's plans for growth of the initial system and expansion into additional services. Examples are given to show how future plans may have serious influence on the present choice of a vendor.

Copies of the paper and slides are available from Periphonics Corporation; please contact Barbara Schechter.

4000 Veterans Memorial Highway • Bohemia, New York 11716 • (516) 467-0500 • TWX: 510 228 7310

Information Management For Higher Education

Quodata is pleased to have participated in the 1989 CAUSE Conference in sunny San Diego. Being a CAUSE corporate sponsor is just one more indication of Quodata's commitment to Information Management for Higher Education.

The new Degree Audit option to Quodata's Student system was introduced at CAUSE89. Demonstrations focused on both the Student and Admissions systems, as well as Quodata's new relational software architecture. A prototype Executive Information System (EIS) was shown as well.

Quodata software takes full advantage of Fourth Generation Language (4GL) tools, which gives new meaning to the word flexibility. Application systems were completely rewritten using these 4GL tools, so that virtually all reports, screens, tables, help messages, and many other functions can be tailored by users with no programming.

We are proud to have been named Digital's first Systems Cooperative Marketing Partner (SCMP) providing administrative software in higher education. Quodata is also pleased to be the first and only (to date) education vendor to endorse Digital's Unified Software Environment. Version 5 of Quodata's relational software architecture adheres to Digital's RMS standard. Our new Degree Audit option is the first announced administrative product to implement Digital's new DECforms screen management facilities. This Unified Software Environment will make managing multivendor networks much easier.

Quodata®

digital Cooperative Marketing Program

266 Pearl Street Hartford, Connecticut 06103 (203) 728-6777

SCT At CAUSE89: A BANNER Year

It was another BANNER year for Systems & Computer Technology Corp. (SCT) at the CAUSE89 conference in San Diego.

Corporate Demonstration Area

SCT's dynamic display in the Corporate Demonstration Area featured the company's advanced administrative software systems and professional services for higher education. One of the highlights at the booth was live demonstrations of the **BANNER™** Series -- the standard for administrative software. No other system matches BANNER's powerful combination of rule-based architecture, fourth-generation language, SQL and ORACLE®. And BANNER is available for a wide variety of hardware environments.

At CAUSE89, SCT announced the development of a BANNER Financial Aid System to complement the other systems in the BANNER Series -- Student, Finance, Alumni/Development, and Human Resources.

In addition, the booth featured the **SYMMETRY™** Series, SCT's powerful applications for larger IBM mainframe users, utilizing the SUPRA™ relational DBMS. The company's wide array of on-site professional services for higher education were also highlighted.

Two exciting new capabilities for accessing administrative information drew considerable interest at the SCT booth. **Banner*view** offers executives on-line access to strategic information through a Macintosh™-based interface. With its easy-to-use "click & find" technology and advanced query and graphing capabilities, Banner*view puts decision-support data at the fingertips of administrators and business officers.

Banner*touch allows an institution to set up an innovative campus information system. Using touch screen technology, the system provides on-line access to student and other information, 24 hours a day. With the proper security, students can access class schedules, financial aid status and other data.

Corporate Presentation

SCT's Corporate Presentation examined the many innovations that are providing greater access to information -- both globally and on today's campuses.

On a global scale, the evolution of Electronic Data Interchange (EDI) and the improved access to information are having a profound effect on economics and politics -- from the manufacturing innovations of the Japanese to the new era of *glasnost* in the Soviet Union. Information technology is a major component in these dramatic changes, which in turn create a demand for more information.

At the campus level, these developments are being translated into a wide variety of innovative tools that are becoming available to give executives, managers and end-users easier access to information. For example, SCT's Executive Tool Kit allows financial officers to easily access on-line information from their BANNER Student and Finance systems for analysis with PC-based applications such as Lotus 1-2-3®.

The Banner*view capability demonstrated by SCT at CAUSE provides another way of accessing and analyzing administrative information, with the "click & find" simplicity of a Macintosh.

Information access is also an issue from the student side of higher education. As competition to recruit and retain students increases, administrators are looking for ways to make it easier for students to attend their institutions, and to provide better services once they are on campus. And with the changing demographics of college students, continuing education programs are increasingly important to reach this new student population. Again, information technology is providing part of the solution.

For example,TouchTone voice response systems are improving the quality of service, while also reducing costs.

Banner*touch, a public access capability, allows students to access a wide range of campus and student information -- 24 hours a day. The use of ATM's offers numerous possibilities to reach off-campus students and provide a wide range of services. Further on the horizon, EDI could fuel education solutions on a national and global scale by making information -- and instruction -- available on a universal basis.

CAUSE/EFFECT "Contributor of the Year" Award

For the eighth consecutive year, SCT sponsored [illegible] CAUSE/EFFECT "Contributor of the Year" Award. The 1989 winners were. Richard D. Howard, Director of Institutional Research - North Carolina State University; Gerald W. McLaughlin, Assoc. Director of Institutional Research & Planning - Virginia Tech; and Josetta McLaughlin, Instructor in Business Policy - Virginia Tech, for their article "Bridging the Gap Between the Database and User in a Distributed Environment."

Hospitality Suite

To top off this BANNER year at CAUSE89, SCT, NCR Corp. and Sequent Computer Systems Inc. hosted a California wine tasting on Wednesday night in the Presidential Suite at the Sheraton.

For more information about SCT and its innovative products and services for higher education, contact:

Systems & Computer Technology Corp.
4 Country View Road
Malvern, PA 19355
Call toll-free: 800/223-7036
In Pa., call: 215/647-5930

SCT

SEQUENT
COMPUTER
SYSTEMS
INC

CAUSE 89 Highlights From Sequent

Sequent enjoyed attending the CAUSE 89 conference this year. We were honored to meet over 350 of the CAUSE membership in our Vendor Exhibit. Additionally, Sequent jointly sponsored the Presidential Hospitality Suite with Systems & Computer Technology (SCT) Corp, and had on-line demonstrations of SCT's Banner™ Student, Finance, and Alumni Systems based on the Oracle™ relational database management system.

We feel it worthwhile to direct readers to a paper in these proceedings titled *"The Effect of Relational Database Technology on Administrative Computing"* offered by Carnegie Mellon University. The paper describes CMU's experience with application development and deployment using the Ingres™ relational database management system on Sequent Symmetry™ computers as well as other systems.

Sequent- Leading the Revolution

As the leader of the Parallel Computing revolution, Sequent Computer Systems, Inc. is always proud to participate in CAUSE events! Over 160 Colleges & Universities around the world rely on Sequent to supply their computing solutions in administration, instruction, and computer science research. So, its always a pleasure to caucus with our clients at CAUSE.

There truly is a new form of computing on campus today- Parallel Computing. Its providing unprecedented speed and economy ideal for services in-

- Financial Administration
- Student Administration
- Alumni Development
- Instructional Computing
- Library Automation
- Computer Science Research
- Veterinary Medicine
- Telecommunications

Sequent, the leading supplier of cost-effective parallel processing systems, has already installed over 3000 Practical Parallel™ systems in locations that include top data centers, university campuses, and research institutes worldwide. These Systems are replacing traditional mainframe and superminicomputer resources, at a fraction of the price and delivering several times the performance.

15450 S W KOLL PARKWAY
BEAVERTON, OREGON 97006-6063
PHONE (503) 626-5700
FAX (503) 627-9880

SUN MICROSYSTEMS

Sun Microsystems was delighted to host the Wednesday afternoon refreshment break and to present our corporate education strategy.

SUN MICROSYSTEMS FOCUS IN HIGHER EDUCATION

Sun Microsystems made a commitment to education and research when the company was founded in 1982. Two of the founders, Andy Bechtolsheim and Bill Joy were graduate students at Stanford University and at the University of California at Berkeley respectively. They brought with them the technologies that have become the cornerstone of Sun Microsystems. Andy and Bill combined forces to start a new company. A computer business dedicated to a new concept. Network computing.

Today, Sun Microsystems is a 1.8 Billion dollar company and Sun workstations, networking tools, and software packages are at work in more than 1000 universities worldwide. Providing power for research and connectivity for campus-wide computing. Linking the lab with the classroom. The administration with the faculty. Teachers with students. Departments with other departments. And campuses with other campuses.

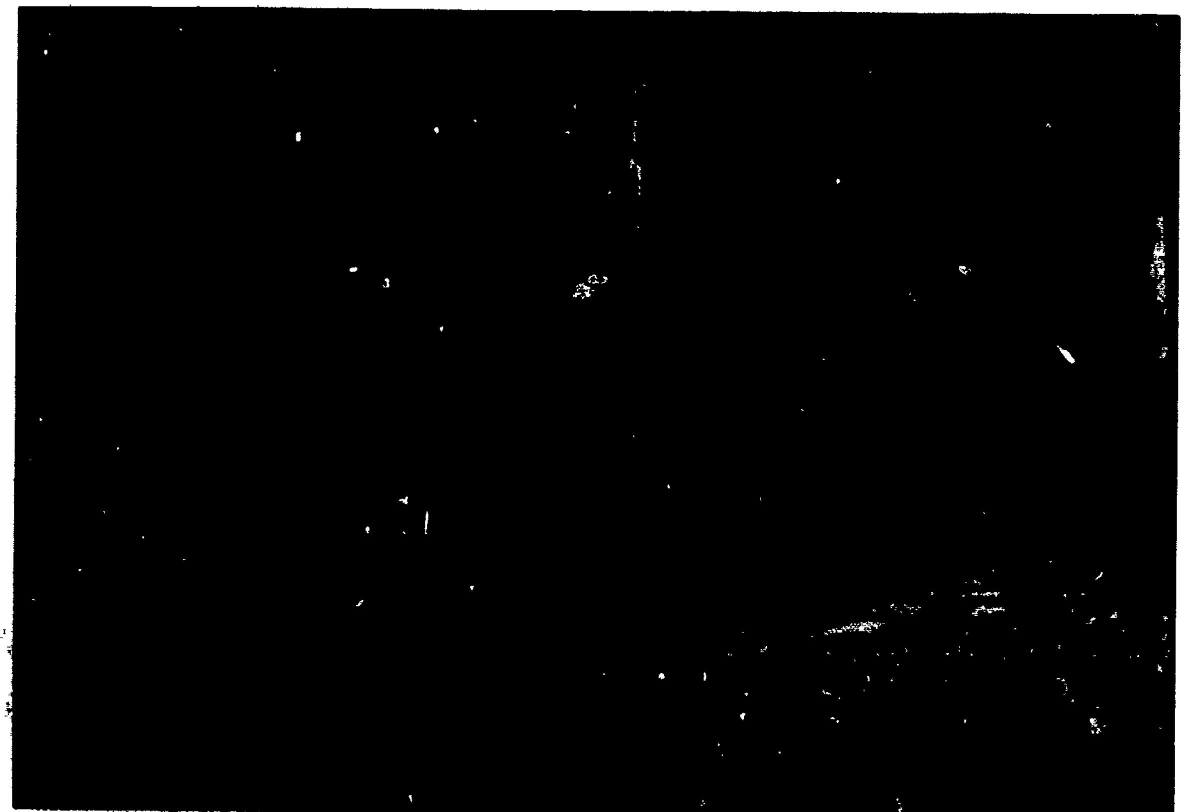
Sun Microsystems is proud to have such a strong presence in the academic environment. As we evolve in education applications, our new SPARC™ products will be used increasingly in distributed processing for administrative and library automation purposes.

SPARC is a registered Trade Mark of Sun Microsystems, Inc.

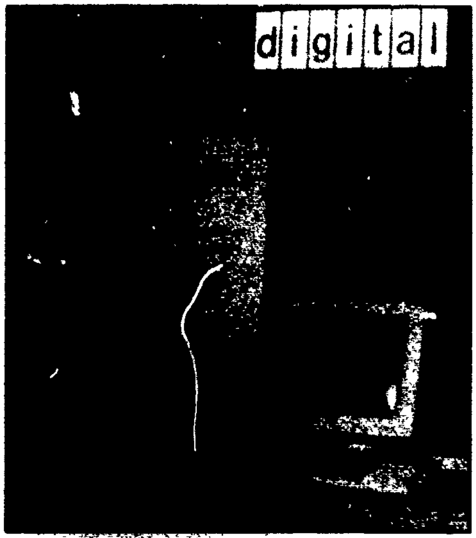
A Pictorial Review

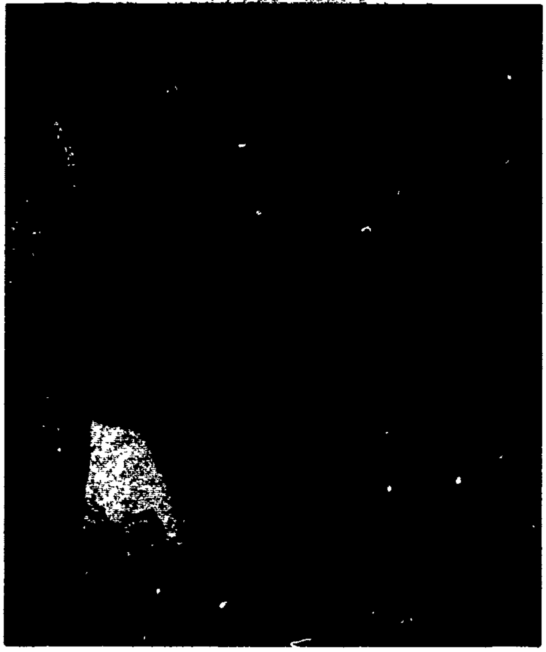
A record number (1,250) of congenial and knowledgeable professionals enjoyed outstanding San Diego weather, stimulating featured speakers, a well-planned menu of sessions, and imaginative social events at CAUSE89. Singled out for special praise in the more than 300 evaluations turned in were the useful opportunity to focus on the "bigger picture" and strategic solutions, the valuable professional contacts, the mix of professional and social activities, the level of vendor presence, and the excellent organization ("as usual") of this highly-respected conference for higher education administrators.

The pictures on the following pages are offered as a reminder to CAUSE89 attendees of the many opportunities for professional growth and camaraderie last November 28 through December 1 at the Sheraton on Harbor Island, San Diego....

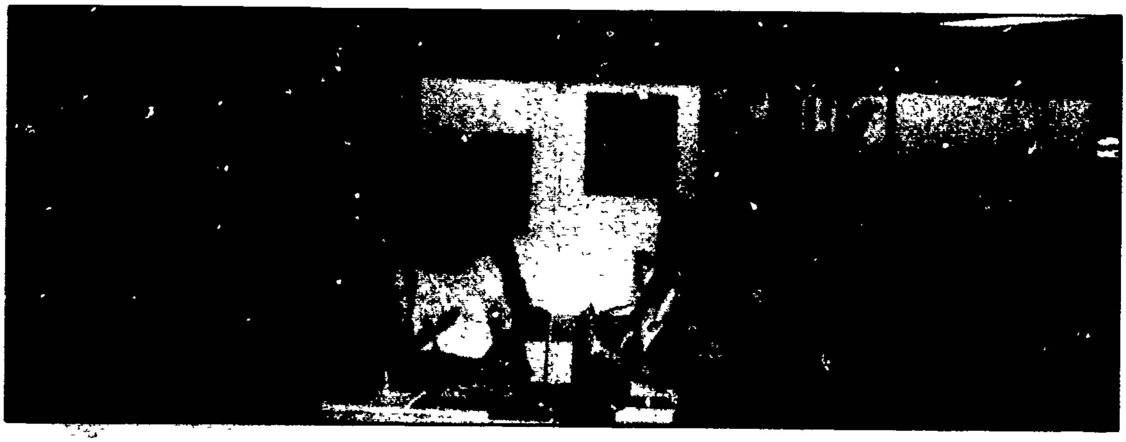


Corporate exhibits ...

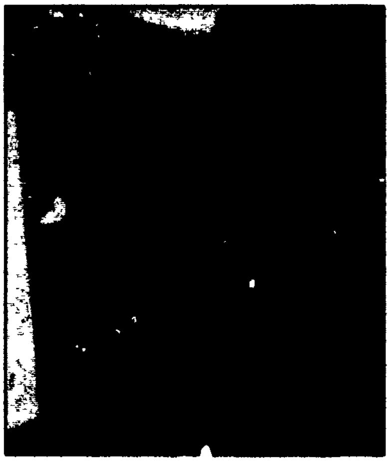




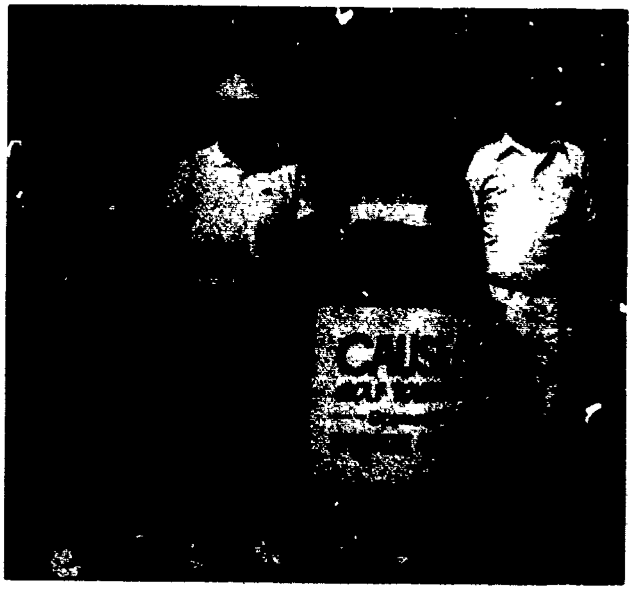
Corporate exhibits ...

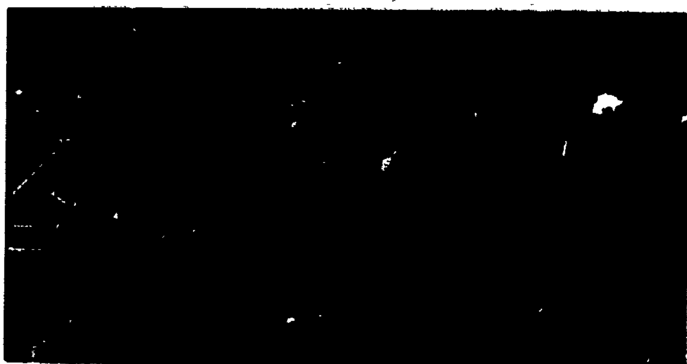


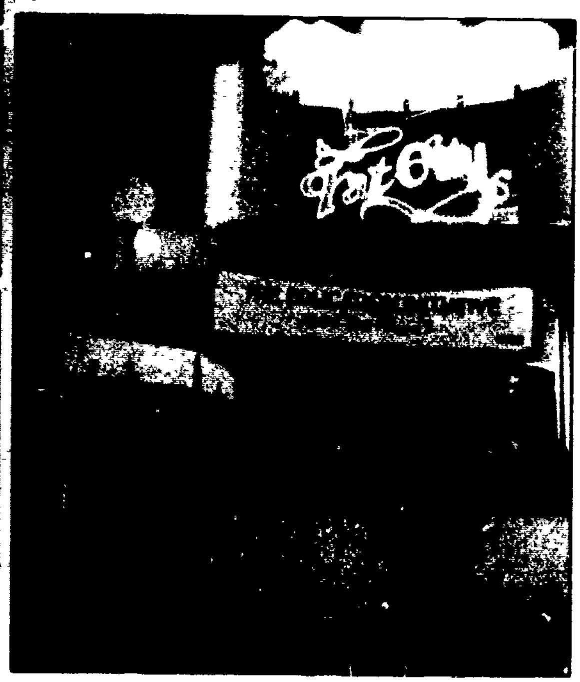
Registration and messaging system ...



Opening fun: golf and reception...

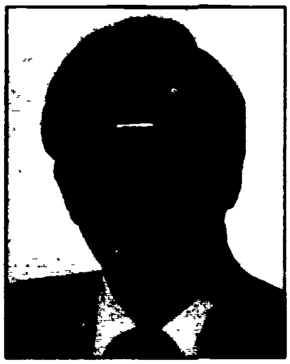




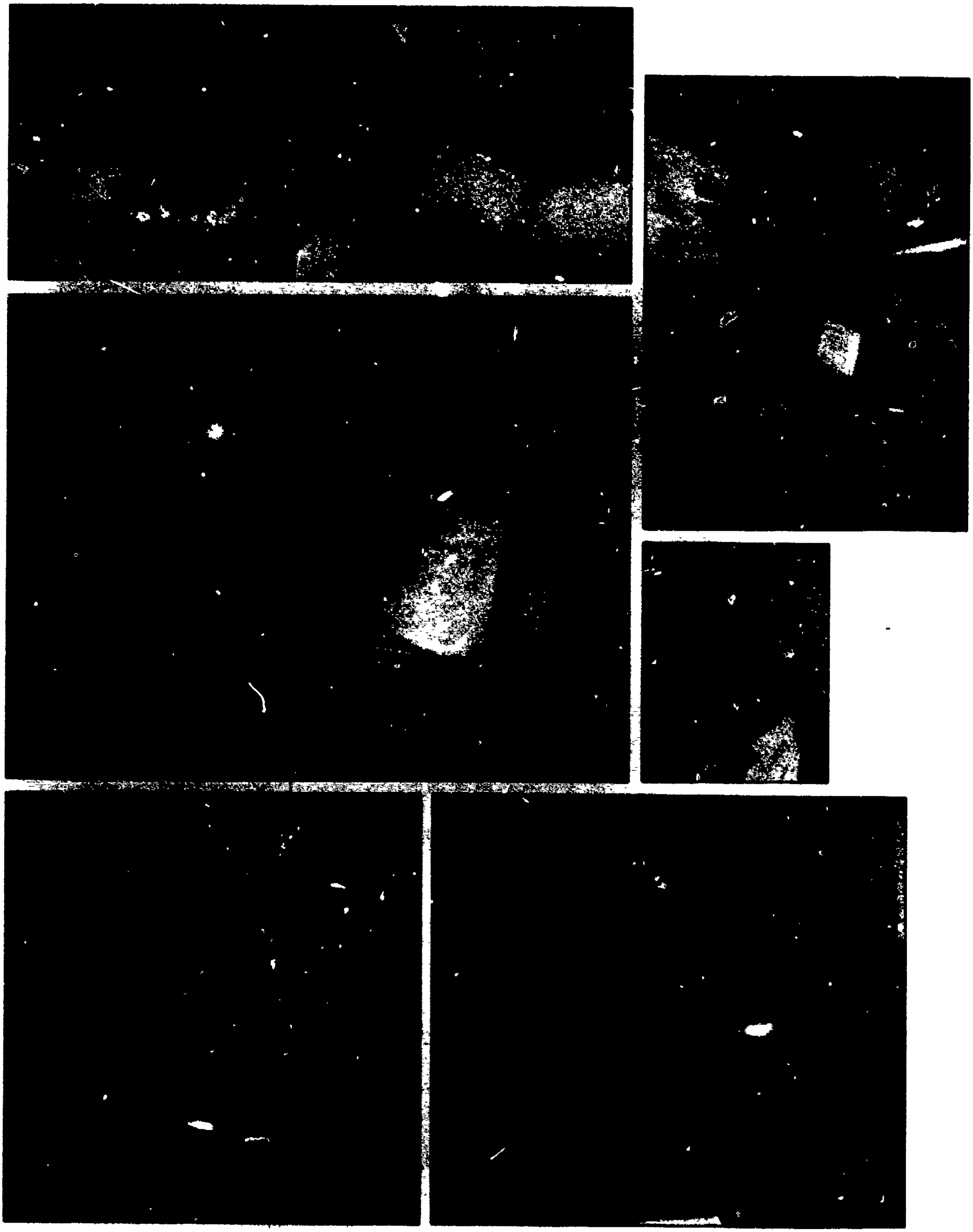


Talking, listening, learning ...

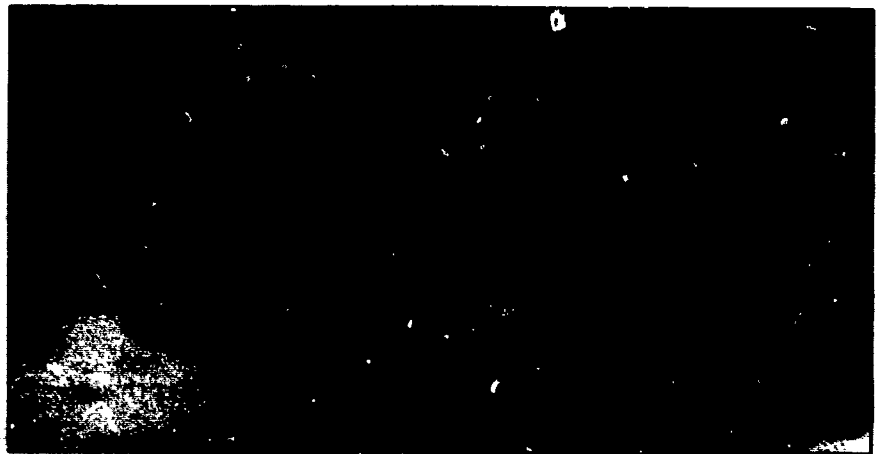


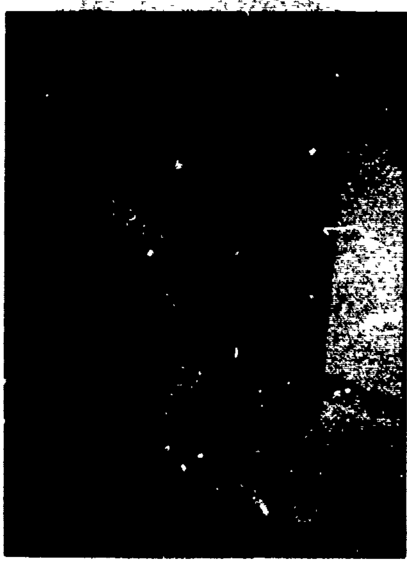



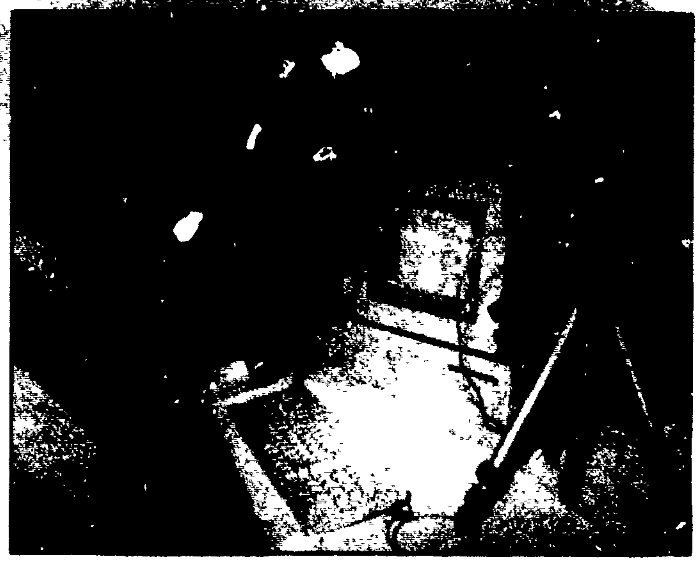
Talking, listening, learning ...

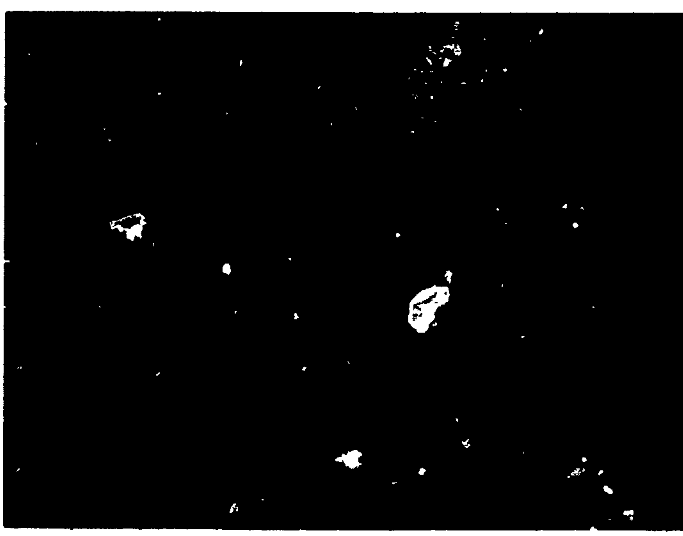


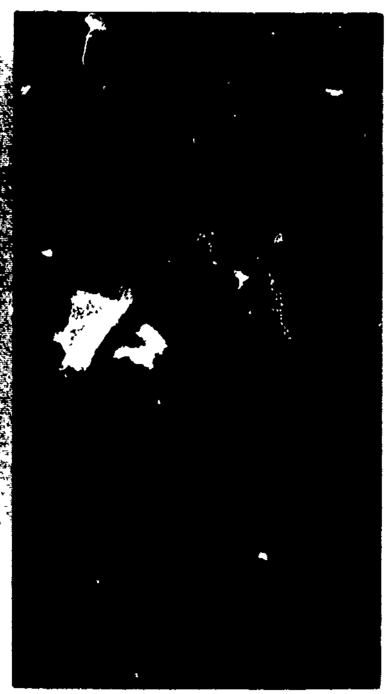
Talking, listening, learning ...



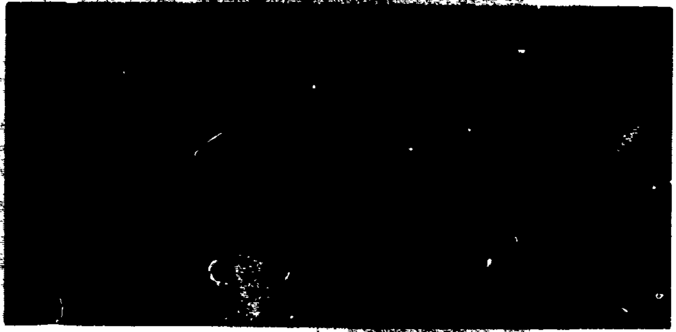








Informal networking...



Thursday evening Beach Ball...