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ABSTRACT

Seven papers from the 1987 CAUSE conference's Track I, Policy and Planning, are presented. They include: "Is Higher Education Too Old for Technology" (Linda H. Fleit, Edwin J. Merck); "Approaches to the Replacement of Major Applications Systems," a panel summary (Richard Howard, A.L. LeDuc, E. Michael Staman, and Charles R. Thomas); "Keeping Users Friendly," a panel summary (Richard D. Howard, Mary M. Sapp, Deborah J. Teeter, and Gerald W. McLaughlin); "Integrated Telecommunications Planning--Distributed Management" (Phyllis A. Sholtys); "Hidden Impacts of On-Line Systems" (Jeffrey W. Noyes); "Developing an Institutional Plan for Computing" (Gary E. Wenger); and "Long-Range Strategic Planning in a Decentralized Administrative Information Services Environment, Phase II: Structure, Content and Implementation of the Plan" (John C. Moldovan, William M. Gleason). (LB)

Leveraging Information Technology

Proceedings of the 1987 CAUSE National Conference

TRACK I: Policy and Planning

December 1-4, 1987
Innisbrook Resort
Tarpon Springs, Florida

CAUSE, the Professional Association for Computing and 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 almost 2,000 individuals from 730 campuses representing nearly 500 colleges and universities, and 31 sustaining member companies.

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 a bi-monthly newsletter, *CAUSE Information*, the professional magazine, *CAUSE/EFFECT*, and monographs and professional papers; 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.

INTRODUCTION

As professionals in an always-exciting field, we are constantly facing challenges to blend new information technologies into our institutions. It is important for higher education to develop environments that promote the use of information technology for strategic advantages, that allow faculty, staff, and students to benefit from existing technology, and that stimulate the discovery of new opportunities.

The 1987 CAUSE National Conference, with its theme "Leveraging Information Technology," offered the opportunity for us to share, exchange, and learn of new developments in information technology to improve and enhance our environments. The CAUSE87 program was designed to allow the fullest possible discussion of issues related to these new developments. Seven concurrent tracks with 49 selected presentations covered important issues in general areas of policy and planning, management, organization, and support services, as well as in the specialized areas of communications, hardware/software strategies, and outstanding applications.

To expand opportunities for informal interaction, some changes were made in the program schedule. CAUSE Constituent Groups met the day before the conference, as they did in 1986, but were given opportunities to meet again during the conference. Current Issues Sessions were moved to Thursday afternoon to provide some flexibility with time, encourage interactive participation, and extend opportunities to continue discussions with colleagues. Vendor workshops were offered for the first time this year, the day before the conference. The Wednesday afternoon schedule accommodated continued vendor workshops, vendor suite exhibits, and concurrent vendor sessions.

David P. Roselle, President of the University of Kentucky, set the tone for CAUSE87 with a Wednesday morning opening presentation expressing his commitment to the value of information technology in higher education. John G. Kemeny, past president of Dartmouth College and currently Chairman of the Board of True BASIC, Inc., spoke during Thursday's luncheon of new developments in computing for classroom learning. The concluding general session, Friday's Current Issues Forum, offered an exchange of philosophies about making optimal use of technologies on our campuses.

We were extremely fortunate to be at Innisbrook, a resort with outstanding conference facilities and great natural beauty (and weather)—a real distillation of the best of Florida.

Almost 800 people attended CAUSE87. Many of them described the conference, in their evaluation forms, as stimulating, informative, and memorable. We hope this publication of the substance of CAUSE87 will be a continuing resource, both for conference-goers and for those who will be reading about the conference offerings for the first time.

Wayne Donald
CAUSE87 Chair

Leveraging Information Technology

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Track I
Policy and Planning

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Because of the magnitude of potential commitments for new technology, planning for growth must be long term, with flexibility to take advantage of innovations. The concomitant policy issues, which tend to focus on internal concerns of who, for what purpose, and how, must also be recognized if the institution is to leverage information technology to its greatest benefit.

Papers in this track address the policy and organizational issues implicit in these conditions.

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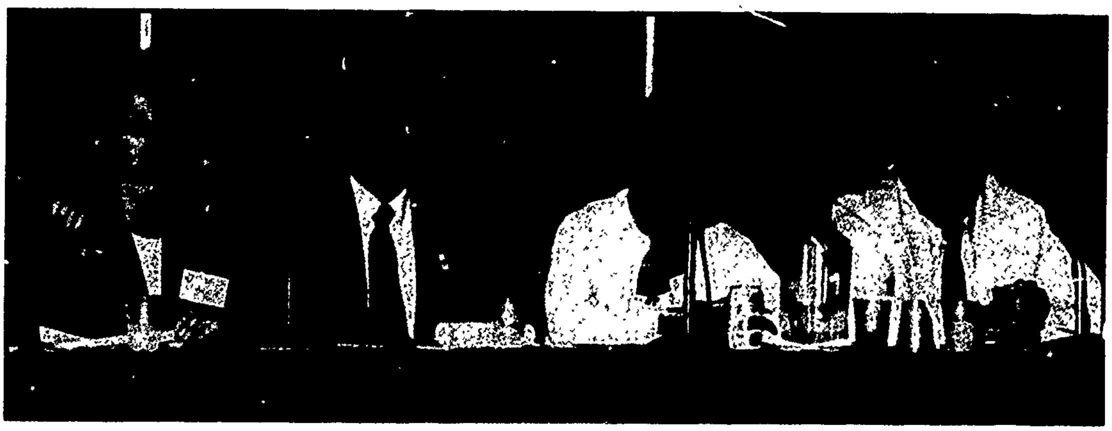

Is Higher Education Too Old For Technology?

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In far too many institutions, there is a lack of integration between institutional and computing goals, with neither of them designed to work together as a unified global strategy. On one hand, institutional goals rarely recognize the advantages and the limitations of technology; on the other hand, computing goals themselves become ends, rather than means to furthering the institution. This is one of the symptoms of several that this paper will cover in discussing difficulties in our institutions' ability to leverage information technology in the most effective ways. We propose that the reason for these difficulties is a fundamental mismatch in life cycles between higher education and technology. Using this premise, we offer suggestions to bring the two closer together, leading to better vehicles for communication, more educational opportunities for both university management and computer people, and overall continuity in the formation and implementation of goals.

The theme of this conference is "Leveraging Information Technology." Implicit in that title is the recognition of an undefined problem, one of the symptoms of which is the general level of dissatisfaction with the impact technology has had on education. Also implicit in the theme is the hope that this conference will identify the "problem" and offer up suggestions so that, in the future, education will see greater rewards from technology. In this paper we take that challenge seriously and attempt to detail the symptoms, identify the problem (or at least a structure for understanding the problem) and offer up suggestions for addressing the problem.

SYMPTOM: Relatively small impact of technology

We have been saying for years that technology has the potential to change our institutions dramatically; if leveraged properly, technology could substantially increase not only the efficiency and effectiveness of the institution, but also the very nature of its approach. And yet, the impact so far has been relatively small except on the budget and the physical presence of hardware around campus. This combination has served only to increase the suspicion by University executives that return on investment in computing is very low. And, the patience of these "resource allocators" is wearing very thin.

SYMPTOM: Lack of integration between institutional goals and technological goals

Despite the recent emphasis in education on long-range planning, there seems to be very little global thinking going on -- at least not of a unified nature. Institutional goals and technological goals are developed and implemented with little sensitivity to, or awareness of, each other. Technology fails to support the efforts of the policy makers and the policy makers fail to understand or to take advantage of technology. The result is a fractured strategy which leads to a lack of unified institutional movement.

SYMPTOM: Defensive behavior on the part of executives and computer people

Executives and computer people are often in the wrong business -- preserving the power and influence they have gained over the years rather than applying their combined efforts to create stronger institutional unity. On the one hand, executives maintain power by further tightening an already rigid organizational structure. Unfortunately, rigid, hierarchical structures, while preserving power, also impede the flow of information and deter managers from being open to new ideas and/or change. Computer people, on the other hand, hold on to power by continuing the myth of their uniqueness - "Here is a discipline that only we can understand." This behavior fosters an attitude in which computing goals become understood as being ends in themselves rather than a means of furthering institutional growth. The combined defensive postures of these two groups provides for an information jam, negating the very essence of what technology is designed to enhance. Further, this attitude of defensiveness is antithetical to the behavioral core necessary for institutional movement - creativity, experimentation, openness to opportunity, and their byproduct - innovation. Ironically, the potential for technology to make information available to greater numbers is defeated. The resistance is great, and it is also clear that any attempt to "flatten" the organizational structure could intensify the defensiveness by threatening the sanctity of executive power and blurring the uniqueness of the computer lords.

SYMPTOM: Lack of executive involvement with technology

If you don't ask, you won't get. Or -- if executives are not involved in defining what information is necessary for decision making, they will not receive the requisite information from the computer people. Computer people are trained in how to get information, not what to get. Only management has the vantage point and the responsibility to specify the information that is needed to support progress on institutional goals.

Currently, many executives put more energy into avoiding involvement with technology than actually engaging in an exchange between manager and technologist. For example, few people at the top have "hands on" knowledge of computers or computing and thus display an approach that is detached and seemingly ill-informed. They create powerless committees to "study the issues," and to "make recommendations" which only serve as a barrier from the issues surrounding technology. Creating "computing czar" positions is another favorite way to isolate the decision-makers from technology.

Besides avoiding involvement, many current executives have difficulty in determining and articulating institutional goals. "You can't support something if you don't know what it is," say the computer people. "It's not our job to decide what direction this institution is going in. Tell us what you want and what format it should be in and we'll get it for you." This combination of ill-defined goals and lack of executive involvement serves to diminish meaningful communication. The result is a fragmented institutional vision and varying, often competing, perspectives.

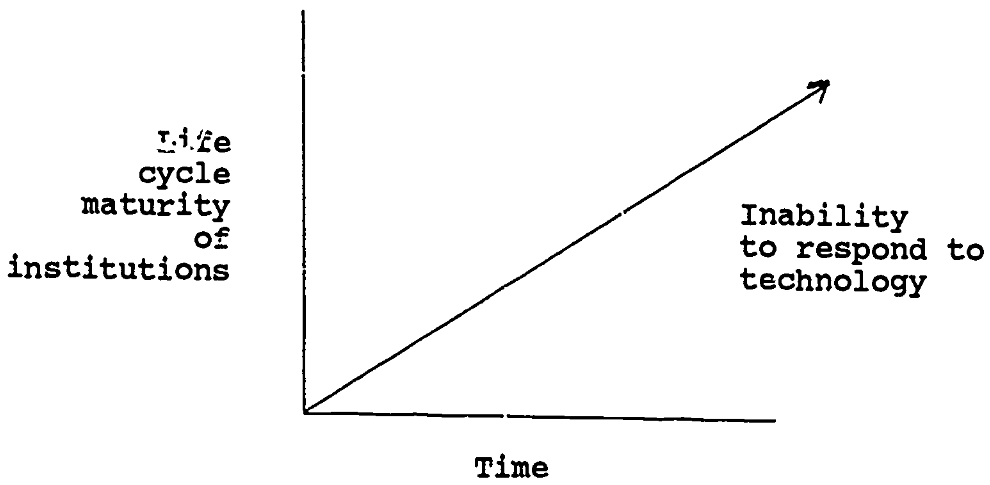
So far we have identified four symptoms: relatively small impact of technology on education; lack of integration between institutional goals and technology goals; defensive behavior on the part of executives and computer people; and lack of executive involvement with technology. Modern techniques of analysis dictate that before seeking a solution(s), the cause or underlying problem reflected in these symptoms must be understood. In order to understand the problem, it is imperative that a framework be developed in order to reduce the open-ended ambiguity to a tangible working structure. In other words, a synthesis of broadly defined symptoms into a concrete cause or problem can more easily be accomplished with the help of a cognitive framework. We call our framework "the life cycle mismatch."

All institutions, people, and living things in general go through life cycles. These life cycles can be divided into various stages, each of which is accompanied by predictable characteristics. Probably the most simplified understanding of life cycle theory would include the stages labeled early, growth, and mature. The early stage is generally characterized as flexible, open-ended, new, changeable, innocent, malleable, fluid, creative, and other like adjectives. The growth stage takes the animate object over time to the mature stage, usually characterized as well developed, systematic, rigid, cautious, protective, predictable, etc.

What part of the life cycle are our educational institutions in today? Or, more appropriately, what kind of environment do they present in which technology can develop? Any answer to that question is certainly an overgeneralization and a bit of a risk, but there are some subjective observations which do indicate a response. In general, we feel that many, if not the majority, of educational institutions are in the mature phase of their life cycles. Our educational institutions seem to reflect many of the adjectives used previously to describe that stage: systematic, rigid, protective, cautious and predictable. Further, there are many manifestations of this behavior, such as a well defined hierarchical decision-making structure; a highly structured communications network which supports the status quo and discourages new or certainly radical ideas; a rigid promotion and compensation system based on tenure and unionization; and a power structure that is defensive in posture and lacking in fluidity.

The next logical question is: What type of environment does technology need in order to flourish? Or, more appropriately, what phase in the life cycle of educational institutions would support the greatest leveraging of technology? If technology -- at least our modern computer-oriented version -- is anything, it is new and undeveloped. Change is ever present, calling for an open-ended, unstructured approach. Technology needs a flexible, fluid environment which encourages experimentation and risk-taking -- in short, all of the characteristics found in the early stages of typical life cycles.

By now the conclusion and thus our definition of the problem is obvious. We observe a mismatch between the environmental characteristics offered by educational institutions in the mature part of the life cycle and what is needed by technology -- characteristics more typical of the early stage of a life cycle. In other words, technology and the educational institutions which provide its environment are out of phase with each other causing a negation of many of the potential advantages technology has to offer. Technological innovation is only as good as the ability and willingness of its environment to support and integrate its features. A simple graph plotting the life cycle maturity of educational institutions over time shows an ever increasing area that can be defined as the inability of these institutions to respond to technology.



In summary, all of the symptoms observed earlier in this paper can be understood as the result of the life cycle mismatch between our educational institutions and technology. If pressed to invent an alluring title for a paper that would describe these relationships, one could envision -- "Is Higher Education Too Old For Technology?"

The final part of this paper offers up a number of suggestions to help address the problem. We have taken our cue in crafting the suggestions from our definition of the problem. Accordingly, the suggestions all cluster around ways to encourage educational institutions and the people who manage them to behave in ways more characteristic of early life cycles. And, in general, the suggestions indicate motivators that reward creativity and risk-taking while discouraging rigidity and defensiveness.

Suggestions

Obviously, there isn't much we can do to change the fact that higher education has been around much longer than computer technology, and is, therefore, more prone to take on the characteristics of the later stages of the life cycle. But what we can do is to encourage our institutions to take on more of the trappings of earlier stages, in order to bring these two better into harmony. Without greater harmony, our institutions will continue to be unable to respond to the changes that are happening around them, and even more important, will continue to be largely unable to take full advantage of technology.

The suggestions we offer are ones that tend to focus on the most positive characteristics of the earlier stages in an organization's life cycle. These include a generally freer information flow, a somewhat looser organizational structure with less hierarchy and segmentation, more of a positive attitude toward risk-taking, more in the way of sideways communications, and more of a results (rather than a process) orientation. In younger organizations one tends to find less bureaucracy, fewer rules, less attention to process than to achievement, and in general, more of a willingness to change, grow and adapt.

Conversely, probably many of us would describe the colleges and universities in which we work in quite different ways: a fairly rigid hierarchy, a thick Personnel Manual full of do's and don'ts, a firmly entrenched salary and title structure which tends to reward longevity as much as anything else, a well-defined chain of command, and so on. Insofar as an institution that fits this description cannot take advantage of innovation, we maintain that it's also going to have some considerable trouble in making good, effective use of technology.

One other thing we should make clear. It is unrealistic to think that higher education, having been around since about the fourteenth century, is somehow going to become something that looks like a Silicon Valley start-up, and everyone's going to walk around in sandals and tee-shirts and work strange hours and give up their titles in favor of participating in quality circles, and so on. But some changes can be made, and especially if there are one or two key people on each campus who will act as change agents.

The suggestions that we are going to propose assume that someone on campus is going to be the change agent. It would be nice to think that someone is the campus's ranking computer perso[illegible]ther that be the computer center director, or the Vice [illegible]. for Integrated Information Systems Resource Deli[illegible]ces and Everything Wonderful. Of course, i[illegible] all else fails, the President will do in a pinch. Even though we all know that it won't always be the computer person who initiates change, the computer people do have a special responsibility to their institutions in this regard, mainly because of their involvement with, and their knowledge of, the most dynamic subject matter that has ever been. Computer people have had the opportunities to learn by now how to handle and how to take advantage of change, and they can serve in this regard as the leaders and models for the rest of the campus.

Suggestion #1: Decentralize

Of course, the moves toward decentralizing computing have been underway for some time. But we're talking here about more than just allowing some end users to have microcomputers. We're talking really about decentralizing the capacity for responsible computing. This means access to the mainframe data bases; it means education and training in all of the things computer people have learned over the years about protecting the investment in their work (structure, documentation, backups, etc.); it means responsibility for making some big decisions about computing on campus as a whole. Most important, it means that computer people have to trust that the end users know what they're doing, despite some apparent evidence to the contrary.

By decentralizing, some of the rigidity inherent in the typical hierarchical, segmented organization will begin to dissipate, as information, knowledge and resources are shared across organizational boundaries.

Suggestion #2: Ten Important People

Pick a number of influential people on campus that seem to be fairly accessible, reasonable, friendly, intelligent, and willing to try new things. Befriend them. Make them allies for your point of view about where computing on campus ought to be heading. Convince them of how they can use technology to further their own ends, whether those ends be educational, political or simply recreational. Have lunch with them often. Make sure they hear about every good thing that happens in the computer center, and when there are problems, make sure they hear your version of what happened. Once you have won their trust as a fellow human being, begin to suggest that they try some of your ideas. Make sure they get tons and tons of support for anything they want to do even remotely connected with computing. If they want to buy their eleven-year-old daughter a computer for Christmas, make sure they go to the right store, get the best advice, obtain any available discount, and receive a personalized Christmas card from the dealer. After a while, these people will begin to influence others, and a chain of information will begin to be constructed throughout the campus which will thread through and around the formal organizational lines.

Suggestion #3: The Right Committee Structure

There are committees and there are committees. One of the characteristics of a very rigid institution is a whole bunch of standing committees, most with no real power or authority, but serving simply a means for the committee members to garner status and prestige, along with presenting an illusion of collegiality.

There are ways, however, to make committees into something really useful and innovative, and some institutions have already done this. The right committee structure might look something like this: At the top is a high-level group made up of representatives from a cross-section of campus groups, which advises the President on strategic campus technology matters and has the authority to make decisions. This may be called a steering committee, an advisory committee, or it may be a subcommittee of the President's Cabinet or some similar group. However, this is not a committee that one gets put on by virtue of one's position, or length of service, or as a reward for good behavior on some other committee. It is made up of people, including the computer people, who are smart and have vision and have the institution's best interests at heart. The key lies in its authority to act without permission from any single vice president. This is the group who will decide how computing will further the goals of the institution, how computing priorities will be set, how resources will be obtained, and other strategic issues.

The next level down will be one or more advisory/user groups for the computer center itself. This is a fine opportunity to co-opt some of the computer center's loudest critics, by making them committee members and actually giving them some responsibility for deciding how things should be done. Having to negotiate with one's colleagues is not the same thing as commanding the computer center to shape up.

Both of these types of committees, if done well, will serve a very important communications purpose in having different kinds of people, invested with some real authority and responsibility, making real decisions across traditional organizational boundaries.

Suggestion #4: Planning a Direction

One of the traps many of us have fallen into in the past several years is in the area of planning. It's a trap because planning is so often done for the wrong reasons, in the wrong environment, and for the wrong people.

What too often happens with the results of all of those long and difficult hours spent in constructing and writing the plans is either one of two alternatives. The first occurs after all of the hearty applause at the initial presentation; everyone's copy of the plan gets put up on a very high shelf somewhere, never to be looked at again until the next consultant or a brand new vice president comes along and says that there ought to be some strategic planning going on around here. The other alternative is at the other end: blind obedience to the plan regardless of changes in circumstances, key players, technology or resources. In both of these cases, the planning effort has become a defensive posture, and can do a great deal to stifle creative changes that might really be beneficial to the institution.

Planning done in the right environment and in the right way, however, can be a key factor in helping the institution position itself with regard to taking advantage of technology. The most important part of the planning effort is the formulation of some kind of statement of direction, rather than specifying endless details about the next x number of years. An articulation of direction, rather than details, allows for some organizational flexibility and keeps the institution much more able to respond in a positive way toward changes.

Suggestion #5: The Chief Integrator

Many of you are familiar with the growing tendency for our institutions to create and staff a "computer czar" position, and it's a topic we can continue to discuss in other forums. But regardless of your feelings about this trend, there is one aspect of it which is critically important, and that is in the person's role as an integrator between the computer people and the rest of the institution. It can't be emphasized enough that the person in charge of computing must know as much about the institution and about higher education in general as he or she knows about technology. That person should know about the promotion and tenure process, about the Board of Trustees, about the current controversy surrounding whether colleges and universities have to account in their financial records for depreciation of assets, about what the accreditation process looks like, about what the educational goals of the institution are, and so on. In other words, the chief computer person has to be as much an institutional person as a computer person, and must make sure that communications from and to the computer people, and communications from and to the rest of the institution are clear and free-flowing. That person's reading list should be as likely to include The Chronicle of Higher Education and Change Magazine as it does Computerworld and PC Week.

In being the Chief Integrator, this person serves as perhaps the most important catalyst in helping the institution get away from rigid compartmentalization, and the limitations inherent in having the people in each department know only about what goes on in their own territories.

Suggestion #6: Hands-on

One of the most important factors in helping the people at the top to relate to technology is proximity. Talking about something terrific is not the same as giving someone the opportunity, in private, to see how good it really is. It is unrealistic to expect that all of the people who can benefit from technology will ask for it; they may not know enough to ask, they may think they don't have enough time, or they may not want to put themselves into a new learning situation. There are a whole host of reasons that many of our presidents and vice presidents resist actually being in the same office with a computer. But we have good reason to suspect that once over the initial hurdles, it is very likely that these people will become, if not fans exactly, at least more tolerant of technology, be more understanding and realistic in their approach to computers, and be better able to serve as leaders for the rest of the institution.

There are some ways to promote hands-on, although they do mostly involve at least a bit of subterfuge, and are often met with limited success. Fortunately. however, this may be one of the problems that eventually takes care of itself, as the people entering the top levels of our institutions increasingly bring with them either the experience or the desire for hands-on. In the meantime, even the slightest hint from the top of wanting hands-on should be enthusiastically encouraged.

Suggestion #7: Budget

Most colleges and universities follow a highly structured two-year budget process. The first year is spent reviewing program needs - both continuing and new - and working through a cumbersome approval process starting with the faculty member or administrative head and culminating with the trustees. Year two is the spending year - a time to maintain successful old programs and finally to act on new ideas generated as much as two years prior. We believe this budgeting system encourages the status quo while demotivating creative faculty and administrators. Good ideas need immediate attention. Resources should be readily available to help administrators capture the energy and vitality so often stimulated with creative thinking. Thus, the question is how to run an orderly budget process while making resources available to facilitate institutional responsiveness to new ideas of merit.

Rather than allocate a university's entire budget for specific programs - even specific line items - we suggest holding out a pool of funds that are undefined or unassigned. The definition for these funds should be allowed to take shape as the year progresses and, more importantly, as ideas and opportunities emerge. The responsibility for allocating these funds could be that of academic deans or a committee with the composition and power akin to our suggestion in #3, above. In this case, process is not as important as responsiveness; making funds immediately available to support innovative thinking is the key.

For the real risk takers, we suggest making limited funds available before a well-formed idea even emerges. For example, academic deans could award funds to individual faculty with only one stipulation: use it for a totally new project. There is also the possibility here to encourage broader, more synergistic thinking. The dean, for example, might require that this new project be cross-disciplinary. Reversing the traditional sequence of idea, review and funding, to funding first, idea next (skipping the review), should increase the pool of innovative thinking institution-wide. Necessity may be the mother of invention, but a little cash up front never hurt either.

Suggestion #8: Space

We thought ending our list of suggestions with one that is highly speculative, if not amorphous in nature, would promote a little creative thinking here today. That is another way of saying we have a suggestion, but we aren't exactly sure how it works. The subject is space, and how it influences behavior - in itself a topic for another full paper if not a dissertation.

While everyone in this room would agree that quality and kind of space is a major determinant of behavior, we probably would have a difficult time agreeing on exactly how. Some research has been done on the subject; however, the field is far from being classified as a quantifiable science. We mention it today because of our strong belief that the structuring of space is a very powerful tool in stimulating innovative thinking. And by stimulating innovative thinking, we hope to bring our institutions into greater harmony with technology.

Remaining safely general, we suggest spaces with generous amounts of natural light, accented with soft, warm, artificial light of the incandescent type. Rooms should have an open feeling with little segmentation - fewer walls with greater visual access to other members of the community. Ceilings should be high but in proportion and fresh air should be in ample supply and circulated continually. If that sounds like an environment your machines live in, but not you, don't feel alone. We believe that the emphasis on providing the "proper machine environment" has drained attention away from creating positive human environments -- ones that stimulate rather than rigidify. Computer professionals are often placed in the basement without even minimal amenities such as refreshed, circulating air. Ask yourselves one simple question: Does my machine live better than me?

Recapitulation

Implied in the theme of this year's conference is the question, how can we improve on our performance to date? How can we increase the impact of technology on education, bringing it more in line with what we should expect from a massive allocation of resources like we have seen over the last several years? As subsets of that inquiry, we have also asked the following questions: Why is there a lack of integration between institutional goals and technological goals? Why is there abundant defensive behavior on the part of executives and computer people in dealing with technology? And why, in general, is there a lack of executive involvement with technology? Understanding these questions as symptomatic of a common problem, we have sought to create a cognitive framework to aid with our analysis. We call our framework "the life cycle mismatch" - higher education and technology out of phase on critical life cycle issues. In an attempt to promote greater harmony between education and technology we have offered eight suggestions which can encourage our institutions, or more appropriately, the people in them, to behave in ways more consistent with early life cycles. Creating the proper institutional environment for technology to grow will promote, we believe, the best leveraging, if not the flourishing, of technology.

PANEL DISCUSSION SUMMARY

APPROACHES TO THE REPLACEMENT OF MAJOR APPLICATIONS SYSTEMS

Moderator: Richard Howard
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E. Michael Staman
Vice President, Sales and Marketing
New Jersey Educational Computer Network, Inc.

Charles R. Thomas
Vice President
Information Associates

Deciding to phase out a major applications system is the first of a series of decisions which can result in either significantly improved functioning and service (best case) or the classical "unmitigated disaster" (worst case). The actual result is a function of many decisions along the way.

One of the earliest decisions in the process, possibly the most important, and surely among the most controversial, is whether to develop the new application in-house or to seek outside help through either a software house or an independent third party. Each option has advantages and disadvantages; improperly managed, all will become a labyrinthine and uncertain adventure. Nowhere are failures more painful and visible in computing activities than at the end of a costly, highly- publicized, multiple-year development project which fails to meet user expectations, design specifications, or some combination of the two.

In this session, the panel discussed the relative merits of in-house development (Al LaDuc) versus purchasing and adapting a system to meet the needs of the campus (Chuck Thomas). In each case the advantages and disadvantages were presented with an analysis of the critical decisions which must be made for each course of action. Mike Staman then discussed the merits of working with an independent third party in deciding whether and how to replace major applications systems, and the processes of designing, developing or acquiring, and implementing such systems.

The bottom line after all discussion, was that the decision to purchase an outside system or to develop one in-house should be made in light of the institution's existing systems and the implications for the new system's integration with them. In either case an objective third party can often provide an unbiased analysis of needs and the expertise, both in the "build vs. buy" decision and in the management of implementing a new application.

PANEL DISCUSSION SUMMARY

KEEPING USERS FRIENDLY

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North Carolina State University

Mary M. Sapp
Director, Planning and Institutional Research
University of Miami

Deborah J. Teeter
Director, Institutional Research and Planning
University of Kansas

Gerald W. McLaughlin
Associate Director
Institutional Research and Planning Analysis
Virginia Tech

One of the traditional wisdoms of the information age is that end-user support should be user friendly. While this belief has been applied traditionally to hardware and software, it is also appropriate for administrative policies, procedures, and organizational structures. In this panel, the data management philosophies at three large research universities were presented. Issues of data access, people, and user training were discussed in light of each philosophy. Reguardless of data management environment, the user needs are similar; they want timely information to support decision making.

The participants in the panel all have responsibility for the institutional research function on their campus. Traditionally, this function has been the interface between those responsible for data processing and those who were in decision making and policy development roles. It is from this perspective that the panel addressed the above issues within the data management structure and philosophy at their institution.

Deb Teeter discussed the mature centralized structure in which administrative data control is implemented in one central office which establishes policies and procedures for the campus.

Gerry McLaughlin explained the issues raised in a decentralized information structure where no central agency performs the traditional data administration functions.

Mary Sapp provided insight into the situation where an institution is in a dynamic transition with many new systems in the formative stages. In this fluid phase, many responsibilities are being reassigned as the process moves from batch to on-line.

Regardless of the institution's data management philosophy, these issues must be addressed within the context of the present environment and a strong sense of what you want it to be in the next five to ten years. It was apparent that all institutions represented on the panel are dealing with the effects of increased computer literacy across their campuses and the demands for direct access to administrative data that has resulted.

INTEGRATED TELECOMMUNICATIONS PLANNING - DISTRIBUTED MANAGEMENT

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Planning and management responsibilities for data, voice, and video communications have traditionally fallen under more than one administrator and often cross organizational lines as well. The underlying technologies, however, have become so interwoven that effective planning for one area now requires consideration of all. Universities need a mechanism to coordinate and consolidate planning for campus data, voice and video communication systems.

This paper identifies one means of developing an integrated planning process without disrupting established management and reporting channels. Development of a consolidated telecommunications plan for data, voice, and video is discussed, starting with development of a planning structure that successfully crosses organizational boundaries, to identification of campus needs and development of strategic and operational plans to meet these needs. The paper focuses on what was learned through one institution's experience in developing the plan and how they can help others.

The Setting

Founded in 1968, Northern Kentucky University is the youngest member of Kentucky's public university system. Located on a dual campus of 289 acres and 19 buildings, the University serves a population of over 9,000 students, most of whom commute from within the Northern Kentucky region and the greater Cincinnati (Ohio) metropolitan area. NKU is a multi-purpose institution, offering degrees in arts and sciences, business, professional studies and law, combined with a large continuing education-outreach program.

In 1981 the University replaced an 800 line Centrex system with a campus-owned 1200 line analog telephone switch. One-way closed circuit television (CCTV) was available in 4 of the 19 campus buildings. Instructional and research computing relied on a DEC PDP 11/60 minicomputer (since replaced by a VAX 11/785), while administrative users were supported by an IBM 4331 (upgraded to an IBM 4381). Approximately 50 microcomputers were in use, primarily in instructional departments. Access to the PDP was limited to 22 dial up ports. IBM connectivity was available only to office users within ready coax distance of the mainframe.

By 1984, the university's voice, data and video delivery services were suffering from campus growing pains, technological change and rising expectations. With the addition of two new buildings and general campus expansion, the telephone switch was saturated and plans were underway for its expansion or replacement. During the same period, a rapid increase in the number of stand-alone microcomputers put substantial computing capability into the hands of end users who were beginning to demand access to the University's central computers. Campus video services also needed expansion to other buildings, an upgrade to two way video was under consideration, and there was growing recognition that a satellite receiving station could significantly boost educational programming options.

In addition to the growing pains described above, there was pressure on the voice, data and video departments to expand services at the branch campus some eight miles from the main Highland Heights facility. Originally used as the first site for the university, the branch campus later housed the law school, and most recently become the focus for continuing education and other non-traditional activities. The only communication links with the main campus were 30 leased, voice-grade telephone lines. Additional voice lines were urgently needed to support the 40 people and eight offices housed there. Moreover, the branch campus was devoid of CCTV capabilities and also lacked direct access to the mainframe computer and its administrative support services.

Planning Environment

Each university division maintained separate planning and advisory groups and coordination of division plans occurred during the budget process. Within divisions, most planning took place at the department level. An exception to the segregated planning process occurred in the area of computing and information services. An Information Management Policy Committee, made up of the major division heads and executive staff officers, addressed policy issues and established priorities for computing-related activities. However, the service units responsible for voice, data and video communications reported to different areas of the university and the unit managers were attempting to address planning and expansion issues from within these separate organizational structures. (See figure

1.) Video services is the bailiwick of the media services director who reports to the associate provost. Telephone services reported through facilities management to the vice president for administrative affairs. The director of computer services (supporting both academic and administrative computing and data communications) reports through an assistant vice president for information management within the administrative affairs division.

Moreover, activities of other planners directly impact the service load of the three units above. For example, a newly created position of director of academic computing (reporting to the associate provost) is responsible for establishing priorities for instructional and research computing. The campus library (also reporting to the associate provost) added still another dimension to the planning environment with goals for full scale automation of library functions, including access to an on-line card catalog from campus offices and dorm rooms.

Despite the structured bureaucracy, informal contacts were maintained among the individuals with functional responsibility for voice, data and video services. Also, the library director discussed library automation plans with Information Management personnel. Casual meetings revealed that all of these offices shared concerns about the need for expanded services for the two campuses and about the rapid technological convergence that was occurring among delivery systems for voice, data and video.

Informal Team Approach

During the 1984-85 academic year, the Assistant Vice President held several informal meetings with the directors of computer services, voice communications, and facilities planning to discuss the growing voice and data communication needs of the campus and implications for an anticipated telephone expansion during the next biennium. Decisions would be needed concerning the appropriate role for the telephone switch in supporting data communication for the campus. However, it was evident to the participants that a longer term direction should be established for both voice and data communications. The meetings continued and the core group asked the director of academic computing to join in an effort to define and address the planning issues.

The participants shared a growing conviction that the campus required a robust communication system to enable maximum utilization of the university's expanding storehouse of computer equipment, databases and library resources; provide the capability for rapid information transfer; and enhance NKU's ability to deliver instruction to an increasingly diverse and dispersed student population. The group recognized the problem and was eager to address the planning issues, but it lacked recognition as a formal campus committee and had no official charge.

Seeking official status for the group, the Assistant Vice President submitted a proposal to the Vice President for Administration to establish a formal planning committee. The proposal emphasized the need to ignore organizational boundaries and integrate planning for communication systems at the University. Committee membership would consist of officers with functional responsibility for implementing and delivering voice, data and video services, and the directors of academic computing and the library. Since most of the recommended members had also participated in the informal group, the history of these earlier meetings provided evidence that a cross-organizational committee could work together.

During the summer (1985), the proposal was approved by the vice president and endorsed by the Provost and the chief student affairs officer. The Assistant Vice President was named chairperson and the Telecommunications Planning Committee's report would be submitted to the Information Management Policy Committee. The informal team approach had successfully bridged organizational boundaries and won support as the official planning group for campus networks!

Planning process

The major goals for the planning effort were to identify the telecommunications environment needed for the 1990's and beyond, and to define a stable network infrastructure into which modular components can be connected.

The first official task was determining a planning strategy to meet the committee charge. We approached the planning effort in five phases or steps:

1. Define the problem, establish boundaries and identify constraints.
2. Assess the current environment.
3. Define current and future telecommunications needs.
4. Specify requirements and standards.
5. Develop a network implementation plan.

One of the first challenges was the need for committee members to develop a broader understanding of voice, data and video delivery systems. Each officer with functional responsibility for communications had solid technical strength in one technology but only cursory knowledge of the other two. Other members lacked technical background, but brought an essential user perspective to the committee. For the committee to effectively accomplish its task, we all had to know enough about the three technologies so we could ask the right questions. Accordingly, committee members reviewed a substantial body of literature, attended general information presentations by major vendors, participated in regional communications and computing conferences, attended communication workshops, and monitored network plans and implementation progress at two regional universities. By the time the planning committee survived the intense orientation process, a true working team had emerged.

Two planning issues quickly surfaced. The first was related to the basic charge, which was to define a stable network infrastructure that would allow incremental expansion of campus networks. To achieve the necessary compatibility, transportability and connectivity goals the campus would need to adopt and maintain clearly defined standards. Although this presented few problems for voice and video, since these technologies adhere to established standards, data communication is chaotic. With NKU's multi-vendor computing environment, we faced the challenge of linking incompatible architectures and conflicting operating systems and communication protocols. Moreover, in the face of rapid changes occurring in the connectivity arena, the committee was concerned about the feasibility of locking the campus into a rigid data network scheme.

The second issue related to the need for a communications consultant. The committee was convinced that an outside consultant would be an essential resource for the Committee, but was uncertain about the timing for the consultant's participation, and how to locate someone with sufficient expertise in the three technologies. Ultimately, we decided that it was essential for the University to define where it wanted to go before calling on a consultant to help develop a plan to get there. Accordingly, the committee opted to conduct a needs analysis prior to seeking a consultant.

The Committee prepared an inventory of communication and computing facilities and conducted an extensive review of campus needs. A draft needs analysis report was prepared and disseminated for campus review. When the draft "hit the streets," several open meetings were held to discuss the document and respond to any questions. As an additional step in the assessment process, a campus survey was conducted to obtain detailed information on perceived communications needs and their relative importance. Based upon survey responses and interaction with the campus community, a final needs assessment report was prepared.

The study quickly verified that the University had exhausted the resources of its current communications systems. NKU's most urgent need is for expanded telephone service as well as communication networks to provide access to already existing computer and video resources. Plans to automate library records and expand administrative systems will compound the access demands. At the same time that voice and data communication needs are multiplying, we need to extend instructional video capabilities throughout the two campuses and to other sites.

While the campus was reviewing and responding to the preliminary needs analysis, the Committee focused its energies on defining needs in functional terms of telecast, voice and data loads; acceptable transmission speeds; wiring topologies; and wiring media. Preliminary standards were under discussion. Because the cost of expanding the analog voice switch (an obsolete model) was nearly as costly as replacing it with a larger digital switch, it was clear that the university should move to digital technology. However, a digital switch was not viewed as the appropriate vehicle to support the bulk of the data communication traffic. Future usage patterns would include heavy data transfer and concurrent use of computer resources, thus pointing to the need for a high speed communication backbone for the campus.

Opportunities and Constraints

The Telecommunications Planning Committee soon faced an additional challenge. During the state's biennial budget process, NKU received authorization and funding to construct an applied science and technology center (AS & T), and for a telephone upgrade. Because the AS & T center would house student computing labs and a number of technology-intensive academic departments, the construction budget included an extra allowance for installation of communication networks for the building.

From the perspective of the Telecommunications Committee, the construction project provided both opportunities and constraints. The networks slated for the new building focused attention on the Committee's work and provided an immediate application, albeit a rather large "pilot" project. Also, the first link of a campus backbone network would be installed to connect existing services to the new building. However, the advent of the building also vastly accelerated the planning schedule! After the architectural and engineering firms were selected by the state, it was essential that the University define specific requirements -- including those for communication networks -- in a timely fashion. We had less than three months to complete our initial specifications, as far as AS & T center was concerned.

Under these circumstances, extensive deliberations were a luxury we could no longer afford. We embarked on a crash project to define appropriate standards and identify viable options available in the marketplace. Fortunately, the Committee had already articulated draft communication standards, made preliminary determinations about the feasibility of integrating voice data and video delivery systems, and developed a "concept" schematic showing typical building wiring and future campus interfaces (figure 2).

When the AS & T project got under way, the committee was fast approaching the stage where a consultant was needed. To our initial delight and later frustration, we found that the engineering firm would obtain consultant services as part of the building and telephone contracts.

The engineering group handled the building's video design with their own personnel, but subcontracted with separate telephone and data communication consultants the design of the other two systems. The consultants' roles bore little resemblance to initial committee expectations. We had envisioned the active participation of a technological gadfly who would test the committee's assumptions, suggest viable alternatives and refine the committee's ideas. Instead, each consultant worked independently of the other to turn University specifications into a structured bid document for his respective area of responsibility. What was missing from the deliberations was a broad perspective of video, voice and data.

Although there was initial disappointment that neither consultant provided any new conceptual insights, the Committee was reassured to find that our preliminary plans appeared credible to the outside experts. Neither consultant indicated any problem in designing installations to meet our specifications.

In retrospect, the greatest constraints associated with the construction projects were related to time and funding issues. In regard to time, it was more than a little disconcerting to the Committee to realize that the University was implementing specifications developed as part of a plan that had yet to be submitted for approval! The funding constraints were frustrating for, under Kentucky regulations, authorized projects had to stay within the state-approved budget and the campus could not supplement the project budgets from other fund sources. Accordingly, many compromises were required to keep costs in line. For example, the budget for the telephone project was too small to fund a switch sufficient to meet long-term campus needs. Rather than lock the campus in with an undersized switch, the university compromised by specifying installation of a large switch that would be delivered with only 1400 installed ports. Thus, we could keep the project within guidelines and later purchase the additional ports from other funds.

Despite their misgivings about making decisions without the lengthy deliberations typical to an academic institution, Committee members were delighted that the first modules in the development of a networked campus would soon be put in place. Although some of the components and standards advocated by the Telecommunications Planning Committee had received defacto campus approval within the context of the building and telephone projects, the Committee wondered what reception awaited the full report. We soon found out.

The Plan

The telecommunication plan advocated development of comprehensive systems of voice, data and video networks to be accessible throughout the campus. The development plan was based upon four fundamental strategies:

- o Because of the university-wide scope and high costs, an incremental implementation of modular projects will be needed.
- o To achieve compatibility, transportability and connectivity goals for campus networks, standards must be defined, adopted by the institution, and maintained for all projects.
- o Centralized university funding should be provided for backbone networks between buildings and for building distribution systems.
- o To promote user commitment and wise stewardship of University funds, departmental networks and connection to intra-building systems should be the responsibility of the offices and units wishing to use the communication system.

In all, ten modular projects were defined for implementation over a five-year period. These included a new digital telephone switch, a high speed backbone network, video satellite uplink and downlink, and several modules to provide building distribution systems. Completion of the projects will not completely wire the campus, but the major delivery systems will be in place. Departmental connection to intra and inter-building systems will be financially attainable for those who seek access.

The Committee report received wide review and discussion on campus. There was general agreement with the need for and scope of the projects recommended, although some areas of the university believe the proposed implementation schedule is too slow and others feel it is too aggressive. The relative priority assigned to individual modules may well change as various groups lobby to have favored projects move up in the ranking. The plan is officially still under final review by the Information Management Policy Committee and modifications in project sequence and timeframe are likely. However, there has been consensus on the design strategies advocated by the committee, (i.e., implement a series of modular projects, and adopt and enforce the use of standards).

Even while the plan is being refined, there are mounting pressures to get on with implementation. Departments want to begin installing departmental LANs with the assurance that they can eventually be connected to a high speed backbone network as it becomes available. In this context, the Policy committee has charged the planning group with identifying specific LANs that meet defined standards. Funding approaches for the major modules are under discussion, and the campus atmosphere is one of "lets get on with it!"

Implications

At Northern Kentucky University the operating units that support voice, data and video communication were distributed throughout the organization. The planning approach provided a way of integrating the planning process without disrupting established management and reporting channels. By forming a partnership of multiple service units and major users, we had a planning team that also had campus-wide credibility. The experience has led to some conclusions and recommendations for others who wish to embark on a similar planning process.

1. Focus on a shared interest. The centrality of the communication planning issue served to unite planners from throughout the organization. Because the

committee members were directly responsible for delivery of services, or were major users of the services, group motivation was high.

2. You need a facilitator. This requires an individual who is willing to go beyond stated organizational jurisdiction, to solve problems.

3. Try the informal team approach. Low key, unofficial meetings and an area of mutual interest can overcome organizational and political barriers. Once the group demonstrates its commitment to coordinated planning, convincing the rest of the organization is comparatively easy.

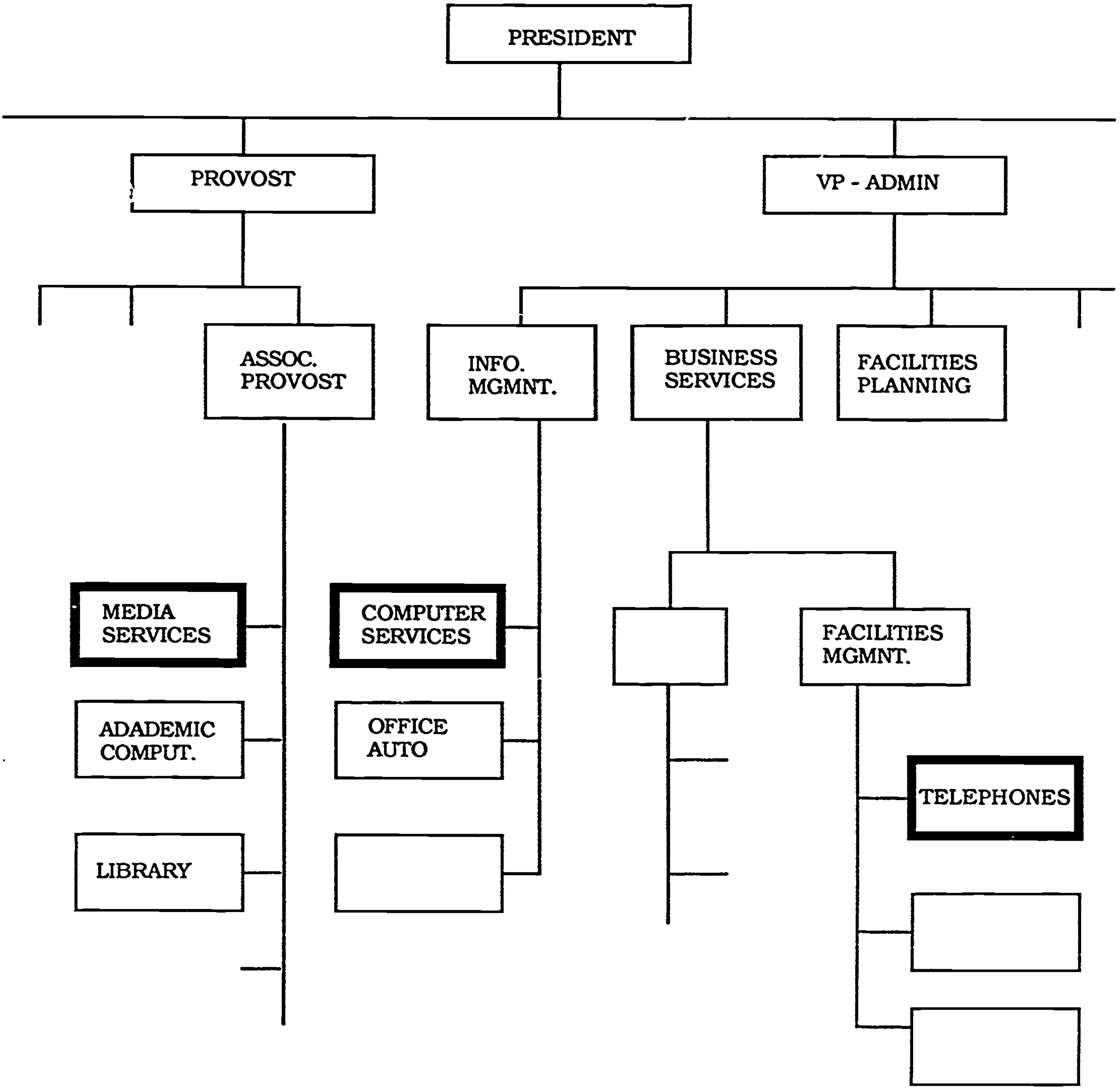
4. Bridge the technical specialties. It is essential to spend some time in developing a broad understanding and appreciation for each of the technologies involved. The initial learning activities undertaken by the committee members provided helpful information for all, and the shared learning experience helped develop a cohesive team atmosphere.

5. Set some ground rules. Members of the planning group must understand that the committee role is not to pass judgement on established goals of individual units or areas of the university, but it is to focus on developing a combined plan to achieve defined goals.

Conclusions

Information technologies have become a basic campus resource and their development impacts the total institution. Moreover, the underlying technologies have become so interwoven that to plan for one requires consideration of all and it is increasingly important that coordinated planning mechanisms be employed.

For many institutions, organizational restructuring has created a framework to facilitate coordinated planning for technology. Even within these organizations, effort is still needed to bridge technical specialties and develop cohesive planning groups. In institutions with distributed management structures, the challenge is even greater for you also need to bridge organizational and political barriers. Whatever organizational model is in place, it is essential to bring institutional vision to the planning task. Although there is no perfect solution that will work for all institutions, building a planning team unified by mutual responsibilities and interests is a strategy to consider.

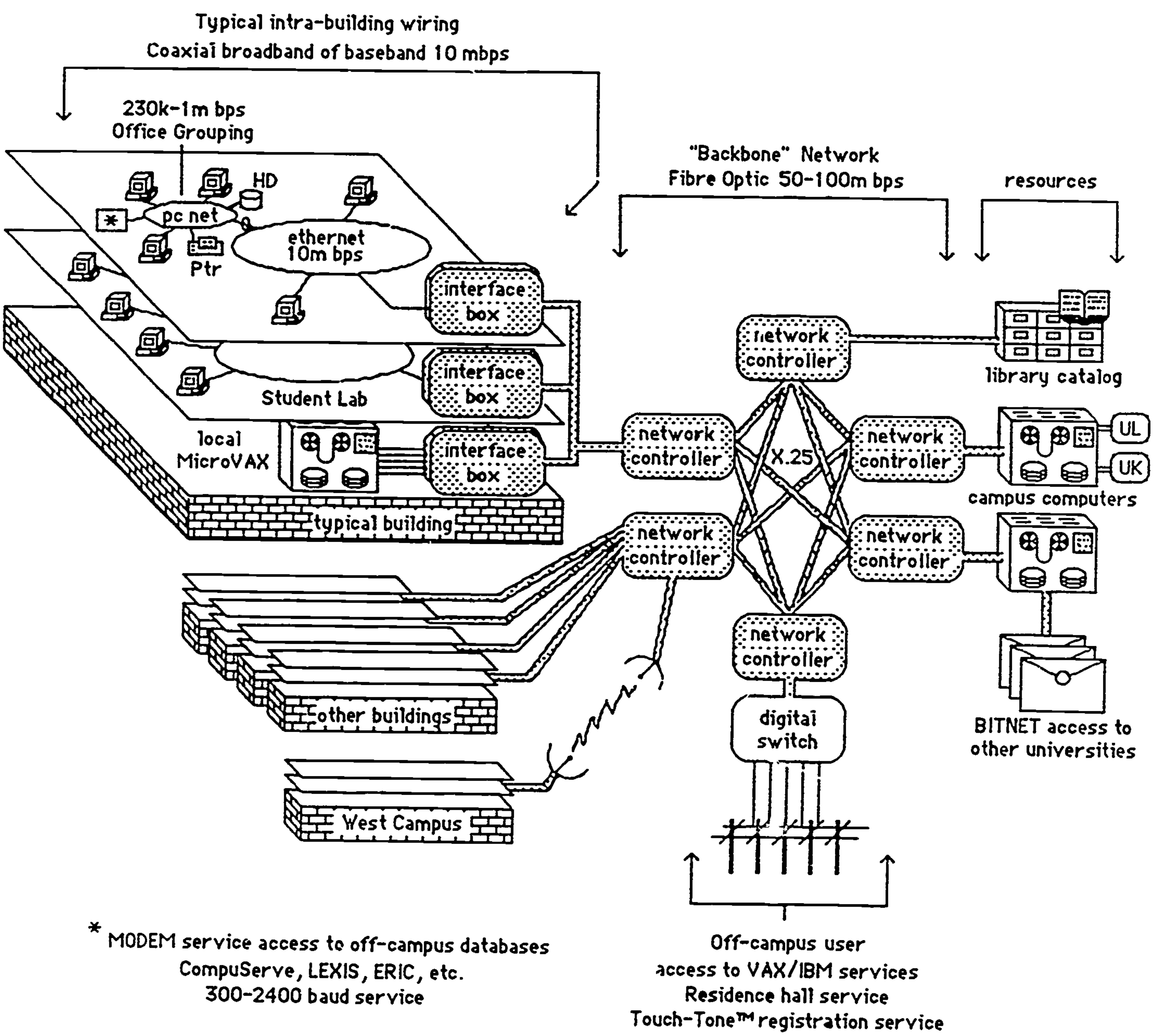


COMMUNICATIONS MANAGEMENT AT NKU

Figure 2.

NKU Data Network

Concept Diagram



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HIDDEN IMPACTS OF ON-LINE SYSTEMS

A presentation to

CAUSE '87

Tarpon Springs, Florida
December 2, 1987

by

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ABSTRACT

Many colleges and universities are discovering that new on-line administrative computer systems, while initially very attractive, require a great deal more time and money than originally expected. This paper examines on-line systems, their advantages and disadvantages, and what surprises, or "hidden impacts" might be in store for the unsuspecting institution. Finally, advice is given on how to avoid the hidden impacts through additional considerations in the project management.

"Hidden Impacts of On-Line Systems"
CAUSE '87, Jeffrey W. Noyes

Introduction

The current trend in the use of computer technology to support the administration of colleges and universities in the United States is moving toward the use of distributed or "on-line" computer systems, that is a computer system in which a central, composite data base is accessed and controlled from a far reaching network of workstations located in a variety of departmental, or user, offices. This trend is supported by several factors, both from the computer industry and from within the higher education community itself.

Continuing advances in electronic technology drive the costs of computer equipment ever downward, while at the same time increasing the power and capabilities of that equipment at a fantastic rate. In addition, major functional innovations, such as word processing, networking, spreadsheets, and electronic mail, have come about during the past five or ten years that allow a complete new approach to using computer technology for administrative or business functions. The marketing forces of the computer industry, ever trying to increase - or maintain - sales, bombard us with ads claiming that we cannot live without the latest PC, network, mainframe computer, or other new piece of technology.

The past decade has seen things change within the higher education community as well. The numbers of traditional age students are decreasing dramatically, the tightening national economy is making funding more difficult by restricting government funding and changing tax incentives for private fund raising, and the average age of our faculty is becoming a burden. Serious competition has arrived at the hallowed halls. In response to these factors, colleges and universities have begun to adopt management techniques more commonly used by business. These techniques of budgeting, accounting, management reporting and performing self-analysis require data processing capabilities beyond that possessed by many colleges and universities in the recent past.

All of these factors are bringing a large number of colleges and universities, including a growing number of smaller colleges, to make the commitment to "on-line" systems. These systems, as claimed by their vendors, provide for instant access to all information from every desk, guarantee that all information is up-to-date minute by minute, and that any type or style of report imaginable may be created by any member of the office staff. As we shall see, there is truth in all these claims, but a great amount of false expectation may be built if the proper planning is not done.

The most common error, an error of omission, made in the installation of on-line systems is failing to include all aspects of the institution in the planning process. While the system changes dramatically, usually the planning process does not. That is, planning takes place in the same fashion that it always has, mainly involving the DP staff and some representation from major user offices such as accounting, payroll, and registrar. What is generally not realized is that major changes will take place in all user offices, and that those aspects of change must also be taken into consideration. These are the "hidden impacts" to watch out for.

In the end, we learn that on-line systems do indeed provide most of the benefits claimed, and that they are certainly worth the investments required in money and time to purchase and install. We also learn, however, that they do cost more than might initially be imagined and that they significantly change the use and management of information in offices throughout the institution.

Background

To facilitate a common understanding for discussion, it will be useful to make the following definition of the term "on-line systems". As mentioned in the introduction, "on-line systems" are generally computer hardware and software systems used to support the administration of the organization. "On-line" refers to the utilization of a great many work-stations or terminals located throughout the organization all connected to a common, usually central, computer complex. In addition, "on-line" usually refers to the fact that all of the data is stored on active, immediately accessible disk drives rather than on secondary data storage devices such as magnetic tape or removable disk packs. "Data base" software is used to provide for centralized data files that are accessible from the work-stations, and data files that are coordinated or "integrated" with each other. For example, an address change must be made only once in the system, but will be recognized by the accounting, payroll and personnel systems. Finally, these systems are usually supplied with a modern, or "fourth generation", retrieval language that allows end-users to directly produce special reports at will. There is obviously a great deal more to such systems, such as networks, application and operating system software, and so on, but these items describe their main features.

It will also serve as interesting background to note the major factors that have placed the higher education community in the position of dealing with the issues surrounding the installation of "on-line" systems. Why are we here?

A great deal of the change in computer systems is brought about by the underlying changes in the technology or hardware that make up those systems. The electronics and computer industries have brought us cheaper and faster hardware in the form of the computers and related peripheral equipment consistently over the past several decades, and there is certainly no reason to expect that trend to change in the near future.

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In addition, communications networks have become so widespread and so fast that it is now possible to transfer great amounts of information over distances both great and small, very quickly, accurately and at little cost. Finally, the improvements in hardware speed and size have brought about a revolutionary new product: the personal computer, or PC. Substantial computing power is now available on the desk of the individual user at affordable prices.

Substantial advances have been made in software as well. The programs that allow us to harness and utilize the power of the computer have become more capable and sophisticated, and at the same time, easier to learn and use. New concepts in software over the last few decades that have led to "on-line systems" include time sharing (interaction with the computer through a terminal or work-station), data bases (structured organization of data files), fourth-generation languages (4 GL's) for easier program development and data retrieval, and perhaps most importantly, microcomputer concepts such as spreadsheets and word processing.

These factors give us the tools.

The next set of major factors involve the market place. Computer manufacturers need to sell their newly developed (or soon to be developed) products to stay in business, so they develop a variety of marketing strategies. In addition to advertising, they create new application products, form user groups, conduct joint development projects with users, and continually stress the improvements of new products and the benefits to those of us fortunate enough to purchase them. As a result, we've heard a great deal about "instant access", "end-user computing", and the advantages of "user control" and "4 GL's."

These factors give us the awareness.

Finally, for any change to be widespread, there must be a need. Today there is certainly a need for improved management techniques in higher education. The intense competition brought about by fewer students and limited funds is forcing colleges and universities to be more aware than ever before of the real costs of providing education, of a wider range of revenue sources, and of the need to manage and operate the institution in a more business oriented fashion. Presidents are demanding faster access and more timely reporting of information. The data must be more accurate and complete than ever before. More ad-hoc and exception reports are demanded, and much more institutional analysis is being done, such as enrollment trend analysis, financial forecasting, and retention analysis.

These factors, then, give us the need.

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Advantages - Real or Hype?

Let us now list, for discussion, the proposed advantages of "on-line systems", and then examine each to see how true the claims are, and how each contributes to the "hidden impacts".

All data on-line.

Direct and immediate access by the user.

User control.

"Easy" ad-hoc reports.

End-user computing.

Fully integrated.

More accurate.

More timely.

"Hidden Impacts" - What are they?

The hidden impacts of on-line systems are briefly listed below. In the next section we will examine each in detail in relation to the system "advantages" and why each could well be a "hidden impact".

Money. The entire system will cost a great deal more than originally planned, perhaps two to five times as much.

Time. Implementation and operation of the system will require much more time than anticipated, especially for user offices.

Technical training and capabilities for users. User office staff will be required to become familiar with a great deal of computer related technical detail. Probably none was planned.

Institutional policy review and changes. The majority of the institution's policies related to the area in which systems are being installed (eg finance, student records, etc) will be called up for review and probable change.

Organizational interaction and cooperation. The interactions between user offices will change dramatically, forcing a great deal of policy and procedure change as well as improved cooperation.

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Hidden Impacts - Class I: Money

Expenditures for the system significantly beyond those originally planned may be brought about through one or more (probably all) of the following "advantages" of on-line systems.

All data on-line. One of the great mysteries in the data processing industry is the apparent inability of project managers to accurately estimate the necessary disk storage for a particular system, even with liberal "safety factors". It's really not much of a mystery, however: the project usually grows in size and scope as it is being developed, but the developer is held to the original estimates. "On-line" systems are particularly prone to this type of hidden impact, since the whole focus of the system is to provide on-line system storage for all necessary data. It is amazing to witness the data storage requirements grow as the user community becomes aware of the potential uses of on-line data. New data elements, or classes of information, are constantly added, and retention periods extend from the original one or two years to four or five years or more. The end result can be to increase disk storage from two to as much as ten times the original estimate.

Additional disk storage will have financial impact in several ways. First, obviously more disk drives will have to be purchased and the maintenance budget increased. If enough disk drives are added, it may also be necessary to increase other hardware components of the computer system such as adding disk channels, controllers, memory, and even central processor capacity. In extreme cases it may be necessary to purchase additional system software to operate and manage the more complex system.

Direct and immediate access by the user. Remembering that the main focus of the system is "on-line" access, it should not be surprising that the number of access points, or terminals, will also grow during the development and implementation of the system. As the user offices begin to understand the full scope of operating the system, the number of necessary access points will increase dramatically. In addition, once implementation has begun, possession of a terminal becomes a very important status symbol: one's job is not important unless one has a terminal. It becomes quickly "necessary" for every clerk in every office to have access to the new on-line system. Again, the number of terminals on the system can grow by as much as an order of magnitude from the original estimate.

The financial impact of additional terminals will be felt not only in the purchase and maintenance of the terminals, but also in associated equipment such as modems, data lines, communications ports and so on. The addition of a great number of active terminals will have the same secondary impact as additional disk drives, it will increase the size of the central computer system. Additional communication hardware, central memory and even central processor capacity will have to be provided to adequately support the additional access points.

Finally, there is a secondary financial impact of adding a major amount of hardware and software to the computer system. Additional staff in the computer service department will be required to operate and support it. Generally, it is not reasonable to expect the same size staff to support a system that has grown twice as large and complex.

Hidden Impacts - Class II: Demands on User Offices

The second area, or "hidden impact", often omitted in planning is that of the creation of a whole set of new demands on the staff in the user offices when an on-line system is implemented. With "end-user computing", the user office not only gets the benefits of the new type of system, but also gets a great many added responsibilities. These new responsibilities fall into several categories, again grouped by the "advantages" of on-line systems.

All data on-line. Having large amounts of data is wonderful, but it is soon discovered that the computer center no longer does the data entry. Since the user office is the focal point of flow and control of the system, data entry is now done directly through the many work-stations in the user offices. Therefore, additional user office staff is frequently required for data entry (although positions may be transferred from the computer center since their data entry group should cease to exist, or at least be dramatically reduced), and training must be provided for these new data entry clerks.

In addition to the personnel required to enter the data, the user office manager is now responsible for making sure that data entry schedules are met, that is, critical data has been entered prior to running a report, and that the data is accurate and complete. These last two items, accuracy and completeness, become critically important in this new age of tougher management. It is just not acceptable to report that there are 250 students whose gender is unknown, or to have missing grades, or, a most critical but frequent problem with these new systems, to have 50 students in the system each with two or even three different ID numbers. The user office manager(s) must work with the computer center in establishing procedures to detect and correct such error conditions.

User control. Having control of your own piece of the computer system is great, too. No longer must you wait for the computer center to run your reports, now you can run them whenever you want to. But wait, has all the data been entered and checked? What about data from other offices? The business office cannot generate tuition statements until all financial aid has been applied, the registrar cannot process applicants until all the admissions data has been entered, and so on. The user office manager now must be aware of the total production schedule for the entire system, coordinate the operation of other offices as well as his or her own, and compromise where necessary to resolve schedule conflicts. Again, staff assignment and training become issues for this important part of running the system.

End-user computing. In a sense, this item is the combination of the first two, but it is worth mentioning in its own right. End-user computing means that the user office has full control and full responsibility for the operation of their piece of the overall system. This means that to realize the full potential of the system, someone in the user office must understand the full capabilities of the system in detail, including (but not limited to) knowing the data base dictionary (DBD), and system interactions and limitations - not only for this office, but other functional areas as well.

Easy ad-hoc reporting. Many software vendors are marketing new retrieval packages, some included with application software, that are called "4 GL's", or fourth generation languages. These 4 GL's are advertised to be so easy to use that user offices can now easily generate their own one-time, or ad-hoc, reports from the on-line system. However, while these languages are indeed easier to use than Cobol or other complex programming languages, they are far from being easy enough for anyone to use. They still require logical thinking and an algorithmic approach to producing a report. They still require systematic problem analysis and solution, and they still require a great amount of attention to detail and much patience and time. In short, not everyone can write a report in a 4 GL, just as not everyone can program a VCR, memorize 10 digit long distance telephone numbers, or calculate their own income tax.

A great "hidden impact" of on-line systems, therefore, can be the realization that someone in the user office must learn, through formal training, how to write reports in this new 4 GL, and be given the time to do it. Once again, staff assignment and training become issues for the office manager. In this case, the assignment can be a real thorny issue depending upon the technical capabilities of the present staff.

At this point let me summarize the hidden impacts on the user office. What has really happened is that to gain the benefit of user control, the user office manager has assumed responsibility for many of the functions that formerly were performed by the computer center. These functions include data entry, production scheduling and coordination, quality control, some system analysis, and some application programming. If totally hidden or omitted prior to system implementation, these "hidden impacts" can be devastating to the unsuspecting office manager. In a sense, each user office becomes its own mini data processing shop. In other words, to avoid the inconveniences and delays of the commercial airlines so that you can come and go as you please, you've had to become a pilot!

The computer center still has work to do, however, in fact a lot more than ever before. The mainframe computer still resides in the central computer center, which is responsible for hardware maintenance, operating system and application software maintenance, and actual operation of the overall computer system. The computer center installs and maintains the hardware and software associated with the data network, and still has production responsibility for large jobs such as payroll, registration, and so on. The computer center is still responsible for the majority of system analysis and application programming, and will spend a great deal of time and effort "customizing" the new on-line system for your particular institution. Finally, the computer center has taken on a new responsibility with this type of system, and that is assistance and training for the user office staff now involved in the operation of the system. This can be a major task for a large, completely distributed system, and will certainly involve additional staff in the computer center as well as in the user offices.

Is it really true? Yes, Virginia, but . . .

Now that the various possible hidden impacts of on-line systems have been exposed, let us examine wether or not the new systems can meet the expectations that their makers create.

Are on-line systems more accurate? Generally, yes. They allow for inclusion of coordinated data, for improved edit checking during data entry, and for checking systematically for missing data. However, for all these features to be of full use, all necessary data elements must be included in the data base, and the data must be continually checked and corrected or "cleaned up". The old data processing phrase "Garbage In, Garbage Out" is still very appropriate.

Are on-line systems more timely? Emphatically yes. By distributing the data entry and production scheduling to the user offices, the classic bottlenecks and delays associated with batch processing in the central computer center are eliminated. Now data can be entered as it is created and one great paper trail, source documents, can be drastically reduced or even eliminated. Also, now that user offices can generate reports at will, there are few reasonable excuses for late reports.

Are on-line systems fully integrated? Maybe. This really depends on your definition (and the vendor's definition) of the term "fully integrated". In general, redundant data (storing the same persons name, address and other biographical information in more than one file, for example) is reduced but not totally eliminated. Also, the various systems are coordinated with each other (eg financial, human resources and student systems), but usually through batch programs or similar linkages. Probably a single system for university administration that meets the pure definition of "fully integrated" would be too expensive to develop and implement to be marketable. In general, however, the systems that are marketed as fully integrated are reasonably compact in their use of data storage, and coordinate data between the various modules well enough to be highly useful.

Conclusion

Now that we've uncovered the hidden impacts and determined that, in spite of them, the system is worthwhile to purchase and implement, how do we avoid the hidden impacts? The two major things to keep in mind are awareness and planning. Hopefully you are now aware of the hidden impacts, and the next step is to include them in the planning process for the installation of your system. This can be accomplished by adding the following ideas to any good data processing project management technique.

Probably the single most important planning function in the entire process, and the one that should be the first major step taken in deciding to make the commitment to an "on-line" system, is to set the overall expectation as to the general size, cost and scope of the new system. How many workstations will be needed, approximately what will the entire system cost (within 10 percent or so), and what will be the impacts on the user offices. This step can best be done by a small, senior management group that has informal discussions with at least two vendors, and visits to at least two other institutions successfully operating a system similar to the one anticipated. By managing general expectations in this manner, hidden impacts, or surprises, should be held to a minimum.

Next, the entire planning and implementation process should be viewed as an iterative process, that is, one that will be revised continually from the beginning. As implementation and training proceed, refinements in requirements will occur, some of them very highly beneficial to the institution, and the process needs to be flexible enough to accommodate this.

Full consideration, discussion and planning should be done for the data that is to be captured and stored, including retention periods. Some allowances should be made for adding data elements, but this portion of the planning should be as complete as possible early in the planning process.

Project teams should be established that include responsible members from the staffs of all user offices that will be impacted by the new system, not just the "primary" users.

"Hidden Impacts of On-Line Systems"
CAUSE '87, Jeffrey W. Noyes

To avoid being cumbersome, project teams should be broken down into functional, or module groups, for example a student system team could be made up of subcommittees for admissions, registrar, financial aid, and business office.

User office managers must know what their new functions and responsibilities will be, plan for them, and make sure that their staff is trained. The overall operation of each user office should be analyzed, both in its current form and how it will operate after the new system is in place. The number and placement of all workstations must be carefully considered, as well as the actual duties of each staff member using the new system.

Extensive training in the capabilities and operation of the new system should be conducted for all project team members as early as possible to familiarize them with the system. If possible, visits should be made to another institution that is using the system, so it can be observed in actual operation and the team members can have a full discussion with their peers about the new system.

If properly designed and planned for, on-line systems won't have any "hidden impacts" and will provide all of the advantages that are expected.

Developing an Institutional Plan for Computing

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The College of DuPage is a community college with a student enrollment of 28,890 students and about 2,400 faculty, staff and part-time students employees. There are many issues today and in the future that will affect higher education. New technologies will have a tremendous impact on how we teach, manage and administer an educational institution. We feel planning for computing provided the institution an organized approach to meeting the challenges of today and the future. This paper is divided into the following sections.

- **Why Plan for Computing**

  This section discusses the major reasons why the College of DuPage decided to plan for computing.

- **How to Plan for Computing**

  This section discusses the steps that were important in planning at the college.

- **A Model of an Institutional Plan for Computing**

  This section reviews the organizational structure of the College of DuPage 'Institutional Plan for Computing'.

Why Plan for Computing

The first step of a planning process is to determine the need to plan for computing. Planning requires a significant resource commitment from an institution. There were ten key reasons why the College of DuPage decided to plan for computing.

- **Provides an understanding of computing on campus**

  We used the planning effort to define the computing resources; hardware, software and support. This provided a basic inventory of all computing resources. In order to share resources, we needed to know what was available on campus.

- **Provides justification for resources**

  In reviewing the existing resources for hardware, software and support and projecting future needs based on new requirements provided additional justification for resources based on current capacity and limitations.

- **Identifies opportunities for effective resource management**

  By evaluating existing equipment on campus provided possible resource sharing, centralized support and reduced maintenance on current equipment and replacement equipment.

- **Identifies threats in the current environment**

  By evaluating existing hardware and software, possible problems were averted.

- **Provides unified approach for goal setting**

  The institution sets individual goals that are supported by all departments.

- **Provides institutional commitment to shared objectives**

  When everyone is involved in the planning process, they tend to work together to meet objectives.

- **Set priorities and timeframes for computing in the relationship to other institutional goals**

  Computing is not the only goal for the institution. By planning for computing you set the appropriate priorities in relationship to other goals.

- **Allows more effective responses to technological changes with the institution**

  Once the strategic direction is determined decisions affecting technology can be made effectively.

- **Provides cost analysis and control of spending levels**

  By effective planning for computing for three years identifies costs and upper limits. In the past it seemed we were providing funds without knowing what next month or next year would bring.

- **Provide a strategic direction to meet the current and future needs of the institution**

  If you have directions your decision making is easier. By planning properly each year you stay on course to hopefully make the right decisions or more so than not planning.

How to Plan for Computing

Planning of computing is not a simple undertaking. It requires a significant commitment in resources from the president to the end users. We feel there are 18 key steps to developing a successful institutional plan for computing.

- **Obtain executive management support and commitment**

The most important issue is commitment and support from executive management of the institution.

- **Setup a team to be responsible for the planning effort**

  Must have a group of responsible people to provide the majority of the work effort.

- **Involve all levels of management**

  Managers, Directors, Vice Presidents and the President were involved in the process. This provided open lines of communication throughout the institution.

- **Identify a planning process**

  You must identify the steps in the planning process to know what has been done and what needs to be done throughout the project.

- **Setup surveys to gather input**

  Surveying is a good method of collecting input on many issues. We found that the best survey was a personal interview with each of the departments.

- **Use reference material to formulate comparative data**

  It is important to compare where you are as compared to other institutions of similar size. Whether you are spending at similar levels or the PC to student ratio can provide some justification. Do not use comparative data as your only justification.

- **Review historical information on current computer usage**

  In order to know where you are going you need to know where you have been. We needed to gather enough historical data to project usage or capacities on the existing equipment

- **Setup institutional committees**

  You need to setup representation from the academic and administrative areas of the institution. The plan must come from the users department not just Computing.

- **Define goals and objectives for each committee**

  The committees should define a set of goals and objectives in order to identify responsibility.

- **Provide constant feedback to all committees**

  It is important to keep all committee members informed on the progress. Minutes should be taken and reviewed for each meeting.

- **Committees must meet on a regular basis**

  Setup a regular schedule of meetings. The frequency will very depending on where you are in the planning cycle. You should meet at least once per month.

- **Committees must have 'active' members**

  Appoint committee members that will participate in the process. The committee members must be willing to work outside the meeting and attend all meetings.

- **Provide adequate time for planning**

  Depending on the complexity of your environment and the scope of the plan, you must provide adequate time for planning. This can take 12-24 months.

- **Limit plan to three years**

  We limited our plan to three years with revisions each year. We felt that planning for any additional years would be a waste of time.

- **Develop an outline for the plan**

Work with the committees to determine what should be included in the plan. Setup a preliminary outline in the beginning. Change the outline as needed throughout the planning process.

- **Review current and future technology**

  You must review the current and future technology in order to compare with what you have and recommend improvements.

- **Define recommendation & action plans**

  Define a set of recommendations for each major area of computing and define the dates for implementation for each recommendation showing the acquisition, installation and production for hardware, software, and support.

- **Define financial considerations**

  The plan should include the cost for each recommendation and if possible, identify funding options and provide a financial plan. We included a unit cost analysis showing the effect of the plan each year on the student cost.

Model of an Institutional Plan for Planning

This section provides an overview of the organizational structure of the College of DuPage's 'Institutional Plan for Computing'. The report was setup to provide an organized and easy to read document for the board of trustees, management and users. The document was prepared using type set quality printing incorporating the use of graphics and tables to improve the presentation.

The plan was divided into seven major chapters; Introduction, The Planning Process, The Current Environment, Academic Computing, Administrative Computing, Central Computing, and Summary Recommendations and Financial Considerations.

Each chapter of the plan contained a section called 'action plans and financial considerations'. This section provided the estimated budgets for capital and operating costs for each item recommended in that chapter. Also included was a timeframe for purchasing the items. The timeframe was divided into acquisition, installation and production. Acquisition was the month for purchase, installation was the estimated installation of the equipment and production was when the user could use the equipment.

Introduction

'Introduction' chapter described the major issues and trends that will impact computing in higher education in the future and provided the justification for planning. A few of the major issues included declining cost of computer hardware, increased demand for computer-related education, software development, staffing and communications.

The Planning Process

'The Planning Process' chapter described the planning process in detail including surveys and committee structures and the flow of planning information and decision making. This chapter of the plan was divided into 'surveys' and 'committees' sections..

Surveys

After designing literally hundreds of questions to solicit the most complete and meaningful data possible, we generated five surveys: the Academic Computing Survey, the Administrative Users Survey, the Administrative Computing Departmental Survey, the Academic Computing Departmental Survey, and the Community College Survey. Each survey was designed to gather the appropriate information from a group of users. We found the departmental survey provided the best information for planning. In the departmental survey we interviewed each dean and director.

Committees

We setup five committees on campus to be responsible for the different levels of planning.

Academic Divisional Computer Committee - ADCC

Each academic division identified three to five faculty members involved in computing. These members served on the Academic Divisional Computer Committee to address computing needs. Their responsibility was to:

- Define long range computing objectives
- Define the importance of the computing objectives to the instructional process
- Collect information from the division and incorporate the information into a computing plan for the division
- Provide a divisional plan to the ACPC committee which identified anticipated and projected new computer use and direction for computing at the divisional level

Academic Computer Planning Committee - ACPC

The Academic Computing Planning Committee consisted of faculty representatives of each academic division, two academic deans and the Manager of Academic Computing. The charge of the committee was to gather and evaluate information as provided by the Divisional Committee and Computing and Information and use this information to:

- Define the current computing environment
- Evaluate computer resources and support
- Make suggestions on how to improve computing
- Define academic computing needs and objectives for the college
- Review of ongoing divisional computing needs

Administrative Review Committee - ARC

The Administrative Review Committee consisted of Deans and the Executive Director Computing and Information. This committee reviewed the information provided by the ACPC and provided a higher level review of the proposal. The committee was responsible for:

- Reviewing the divisional needs
- Providing additional input on divisional needs
- Recommending a priority of the needs
- Reviewing goals and objectives

Administrative Systems Users Advisory Committee - ASUAC

The Administrative Systems Users Advisory Committee consisted of major computer users and director/dean level representatives from the five administrative units (Main Campus, Open Campus, Administrative Affairs, External Affairs, and Planning and Information) as well as the Executive Director, Manager Administrative Systems, and Manager Information Support Services from Computing and Information. The committee was responsible for:

- Reviewing and prioritizing all administrative programming requests
- Providing input from their units on computing needs for hardware, software and support
- Providing input on future computing needs
- Formulating the Administrative Computing Plan
- Evaluating the Administrative Computing Plan
- Reviewing ongoing unit needs

Computer Services Management Committee - CSMC

The Computer Services Management Committee consisted of the President, Vice President Planning and Information, Vice President Administrative Affairs, Vice President External Affairs, Provost Main Campus, Provost Open Campus, and the Executive Director Computing and Information. The committee was responsible for:

- Reviewing the academic planning recommendations
- Reviewing the administrative planning recommendations
- Reviewing the future direction recommendation
- Recommending priorities
- Recommending funding levels to the Board of Trustees

Final funding decisions for the Institutional Plan for Computing was made by the Board of Trustees during its review.

Current Environment

'Current Environment' chapter described the current computer facilities in terms of computing support, hardware and software. The chapter was divided into two sections, Computer Support and Computer Systems and Facilities.

The computer support section identified all the departments providing computing support with respect to personnel. The amount of support was defined in FTE's, full-time equivalents and the type of support i.e., programming, consulting and training.

The computer systems and facilities was divided into five areas: mainframe system resources, minicomputer system resources, office automation resources, microcomputing resources, and academic computing lab facilities. Mainframe, mini and office automation resources were subdivided into descriptions for the major workload, system hardware, system software and application software. 'Microcomputing resources' was subdivided into administrative and faculty resources. The 'academic computing labs' was subdivided into hardware in the lab, description/purpose of lab, management and staffing.

Academic Computing

Academic Computing included all of those activities which were integral to or related to student instruction in computer-related disciplines, or other instruction which relied on computers. This included all computing functions which either assisted instructors in the development or maintenance of course materials or facilitated students in the learning process. Academic Computing involved all of those activities which support the use of computers such as the maintenance of hardware, the integration of software into instructions, the preparation of support materials, personal consulting or problem solving and the management of lab facilities. Academic Computing also involved those activities which promoted the growth in the use of computers such as the consideration, selection, and review of hardware and software; training for computer literacy; computer planning and the development of new academic applications.

The Academic Computing chapter was divided into 'Student Usage', 'Hardware Needs', 'Software Needs', 'Support Needs' and 'Action Plans and Financial Considerations' sections.

An Academic Computing Departmental Survey provided information which allowed for projections of computing needs over the next three years and also how hardware and software resources should grow to support those needs. We provided a brief description of the major instructional divisions for Main and Open Campus, and the level of computer usage for these areas.

Growth projections were presented in terms of the number of additional students and contact hours, as well as a written description of those areas where growth is expected to occur. This included a description of new applications or systems that may be used over the next three years.

Projections in the number of additional computer stations were determined for the college as a whole for each type of computer resource.

Faculty access to computer resources was evaluated and compared to the number of computers which are needed over the next three years. The Academic Computing Departmental Survey provided information on the current amount of money budgeted for software by each area of the college and the projected percentage increase which is needed over the next three years. The Academic Computing Survey provided a description of the applications which are needed.

Student computer support was also evaluated by determining the current level of support in terms of FTE support staff per number of computer users and then projecting how support should increase over the next three years to maintain the current level of support. The current level of faculty computer support was also determined and the importance of various types of support was evaluated. A comparison will also be made between the number of support staff available to students and faculty at the College of DuPage and the other community colleges which were surveyed.

Administrative Computing

Administrative computing included all the information processing services which provide the college management with the data necessary to make decisions, record data, and carry out the day-to-day operations. The major administrative functions/applications included payroll, personnel, general ledger, accounts payable, accounts receivable, purchasing, student registration and records, financial aid, inventory, word processing, and management information system.

Several issues pertaining to administrative computing was addressed to provide an acceptable level of service and support:

- Provide users adequate online response time, i.e. quick access to data
- Provide users with adequate disk space to store their data now and for the future
- Provide users with a security system to maintain the integrity of the data
- Provide users applications that are flexible and easy to maintain and modify
- Provide users applications that are accurate
- Provide users the tools to access their data and generate their own reports and analysis
- Provide users consulting support for their applications
- Provide users with training on how to use an application
- Provide users with user documentation for ease of use
- Provide users with flexible operational hours
- Provide technical expertise to evaluate current and future applications

Administrative computing was divided into 'software', 'hardware' and 'support' needs. Software included major administrative applications and end user applications. All major administrative applications were supported by Computer and Information and were usually run on a mainframe or minicomputer. The end user applications dealt with "tools" that were used by end users to perform their jobs. This would include microcomputer-based applications and decision support systems.

Software Needs

Administrative Software Needs

The major administrative software applications at the college included: General Ledger System, Human Resources System, Financial Aid System, Student Billing and Receivables System, Student Records System, Capital Assets System, Management Information System, CLSI Library System, Response System Variable Prescription, Office Automation

For each major application we provided a 'description' of the application, who were the 'users', 'current problems and concerns', 'growth estimates' and made 'general recommendations' for the system.

End User Software

End user software consisted of any application that existed on user personnel computers or on fourth generation applications on the mainframe. We surveyed the user departments to identify the computing functions that were needed. The functions were divided into nine categories: graphics, electronic mail, text management, high quality printing, statistical analysis, data management, report writing, project management and download PC.

Below shows a graph of the computing function needs of users. This is an example of how we used graphics in the plan.

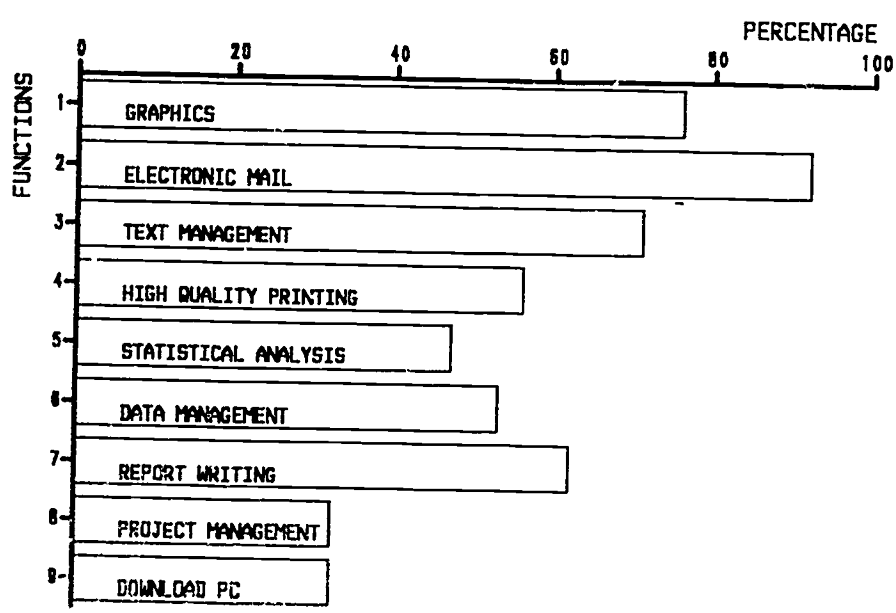

Figure 49. Computing Function Needs of Users

Support Needs

Computing support was divided into four areas: training, programming, documentation a[illegible] consulting. We surveyed the user departments to determine the major support area.

Computer support is provided by several areas of the college. In the departmental survey we requested users identify areas of support that needed improvement. The following figure shows the individual departmental support needs. This is another example of the tables we included in the plan

DEPARTMENTAL SUPPORT AREA NEEDS

DEPARTMENTS	*SUPPORT AREAS** 1	2	3	4
PRESIDENTS				
Office of President	X			
Auditor	X			
MAIN CAMPUS				
Office of Provost	X			
Automated Office	X			
Instruction			X	X
Humanities & Liberal Arts		X		X
Social & Behavioral Sciences				
Natural Sciences				
Occupational & Vocational Education	X			
Business & Services	X			
Student Affairs	X	X	X	X
Learning Resource Center				
OPEN CAMPUS				
Office of Provost	X			
Academic Alternatives	X			
Business & Professional Institute				
Regional Center - Southwest				
Regional Center - East	X			
Regional Center - North	X			
Community Education	X			
ADMINISTRATIVE AFFAIRS				
Office of Vice President	X			
Campus Services	X	X		X
Auxiliary Enterprises	X	X		X
Financial Affairs	X	X	X	X
Human Resources	X	X		X
Purchasing	X		X	
Public Safety				
PLANNING & INFORMATION				
Office of Vice President	X			
Computing and Information				
Admissions, Registration & Records	X		X	X
Research & Planning	X	X	X	X
EXTERNAL AFFAIRS				
Office of Vice President	X			
Public Information/Media Production	X	X	X	X
Development	X			
Campus & Community Events	X			

*1-Training 2-Programming 3-Documentation 4-Consulting

Figure 1. Departmental Support Area Needs

Hardware Needs

In the hardware needs section within Administrative Computing we included all departmental personal computers, terminals and printers. This need was defined by each department requiring access to the mainframe and departmental applications. Although the equipment was included in the plan, each department had to budget/fund the equipment from their own budgets. This provided flexibility within each department to set their own priority.

Central Computing

Central Computing was all the support in system hardware, software and personnel that was shared with academic and administrative computing. This included governance issues, computer operations, system hardware, software and support and campus-wide communications. This section evaluated the central computing concerns and recommended a direction in each area that would meet our current and future needs.

Governance

We reviewed the governing authority of the organization in dealing with computing on campus and recommended changes that would improve planning and the operation.

System Software Needs

Systems software are the program/applications that support the operation of the central computing facility. This included a review and appropriate recommendations for operating system software, security, performance monitoring, system accounting and charge back, and data center management software.

Support Needs

We reviewed the support needs for systems and operations. Recommedations were based on current and future acquisition of application and system software. Data base and security were key areas for support.

System Hardware Needs

Computer equipment needs were based on the growth of existing applications and new applications that are to be purchased or developed. In situations where the growth exceeds the capacity and the capacity cannot be expanded, the equipment must be replaced. If the equipment cannot perform a certain necessary function, even with upgrading, then the equipment must be replaced. In the following sections we identified the hardware component needs for the next three years.

Computer equipment needs on the IBM system were defined by four major areas: 'disk space', 'ports', 'CPU memory', and 'CPU power in MIPS'.

Disk Space

The disk space was defined by the current application usage including administrative, academic, and systems; the estimated growth from 1988 to 1990; and the new applications that are planned over the next three years.

We provided tables with current and new application disk space requirements. The disk space requirements were projected for the next three years. A graph in the plan showed the disk space used vs. available and projected the growth through 1990.

The disk space was defined by administrative software applications and system software applications. The administrative software application disk space included storage for all the data files, work areas, and programs that support the application. The system software applications included disk space that was required for operation of the computer systems software.

The same approach was used for 'ports', 'CPU memory' and MIP capacity. Graphs were included in the plan showing trends. Recommendations were made based on the current and future application needs.

Communications and Networking

We reviewed the communications and networking needs on campus. We discussed the problems with incompatibility of computer systems. The users were surveyed on connectivity needs and a table was included on which systems needed to talk to other systems. Several strategic directions were defined for communications and networking along with a recommendation to develop a plan for telecommunication on campus addressing voice, video and data.

Summary Recommendations

This chapter provided summary recommendations and financial considerations for academic, administrative, and central computing for fiscal years 1988-1990. Included are sections summarizing the staffing needs, the total institutional financial considerations with various funding alternatives.

Academic Computing

This section summarized all the recommendations for Academic Computing. The recommendations were divided into hardware, software, support for faculty and students. A financial table was included showing the cost by fiscal year for operating and capital costs.

Administrative Computing and Central Computing

Administrative Computing and Central Computing sections were defined using the same approach as the academic computing section on recommendations and financial considerations.

Support

We summarized in one table all the staffing needs for the next three years. Each new position requested was identified including a summary justification for each.

Institutional Financial Considerations

This section was divided into a summary of cost for administrative, academic and central computing by fiscal year. We included sections on funding alternatives and a financial plan. The financial plan showed tables on actual vs. estimated budget for FY84-FY88. We provided several funding options including financing and setting up a general computing lab fee. The last part of this section included a unit cost analysis of actual vs. projected assuming the plan was funded.

LONG-RANGE STRATEGIC PLANNING IN A DECENTRALIZED ADMINISTRATIVE INFORMATION SYSTEMS ENVIRONMENT–PHASE II STRUCTURE, CONTENT AND IMPLEMENTATION OF THE PLAN

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Abstract:

This is a continuation of the paper presented at the 1986 CAUSE meeting. In that presentation we described the events that led to the decentralization of administrative information services, the creation of the position director of administrative information services, the process for making the new organization work, and the approach to developing the strategic plan for AIS. This paper will focus on the actual planning process and the content of the Plan. The Plan starts with a statement of planning assumptions and a discussion of critical issues. Goals are developed based on the issues and assumptions. Finally, implementation strategies are discussed specifying appropriate information technologies that address the goals, assumptions, and issues.

LONG-RANGE STRATEGIC PLANNING IN A DECENTRALIZED ADMINISTRATIVE INFORMATION SYSTEMS ENVIRONMENT–PHASE II STRUCTURE, CONTENT AND IMPLEMENTATION OF THE PLAN

I. Overview

In the last paper we described how the authority, responsibility and accountability for administrative services and related information systems was distributed to the chief administrative officers. Responsibilities were divided between the administrative departments and the central computer center. The director of administrative information services position was created to provide overall coordination of the planning and delivery of university-wide administrative information systems, services and management reporting. A committee structure was established to provide leadership and direction in the continuing development and coordination of the university's administrative information resources.

A five year plan had been developed in 1981. The priorities established in that plan were essentially implemented. However, priorities and the environment had changed dramatically demanding an update to that plan. Since that plan focused entirely on application systems it was necessary to broaden the scope of the new plan to consider all strategic issues. After considerable research a planning methodology was chosen and the planning process begun. Good progress was made in the first few months but then delays occurred that were precipitated by a variety of factors such as, conflicting priorities, scheduling problems, and lack of expertise. Use of an outside facilitator expedited the planning process and resulted in open discussions that succeeded in identifying issues and developing recommendations for strategic solutions.

This paper describes the results of the planning process by reviewing the planning document in terms of its organization and specific content. Finally, progress to-date in implementing the strategies developed in the plan is reviewed.

II. Structure of the Plan

After trying a number of different ways to organize the information in the Plan, the following structure was selected because it is consistent with other university planning processes. This structure also provides the desired transition from the conceptual framework of the Plan and specific work that has to be accomplished to execute the Plan:

A. Executive Summary

Highlights and summarizations are taken from the chapters of the Plan and presented in this section. Included are the two top priority courses of action and additional priorities as outlined in the Plan. This is followed by a short synopsis of the nature of the Plan and the issues upon which the goals and strategies of the Plan are based.

B. Introduction

This section describes our past planning activities and the sponsorship and objectives of the current plan. It provides continuity with past planning efforts and points out the status of implementing the plans.

C. Planning Assumptions

Broad statements that create the basic foundation of the Plan are presented in this section.

D. Issues

This is probably the most important part of the Plan because it is in this section that the planning group identifies the most important administrative systems topics that need to be addressed.

E. Goals

The stage is now set for closing the gap between the conceptual background and the actual work that needs to be done. This is accomplished by developing specific information systems goals based on the planning assumptions and issues. For this purpose the area of information systems was divided into information management, departmental computing, central computing, organization, communications, security, and applications systems.

F. Strategies

With this background, current technologies are examined to determine alternative solutions that address the issues and help achieve the goals identified previously. As in the previous section the strategies are organized according to information management, departmental computing, central computing, organization, communications, security, and application systems. Each set of strategies is preceded by a description of the current environment to insure a common understanding of our starting point.

III. Content of the Plan

A. Executive Summary

Recommendations

This section outlines the major recommendations that are developed in detail in the Plan. Since the Plan is strategic in nature, and the intention is to provide a long-range blueprint, a detailed cost analysis and implementation schedule are not included. These items were considered implementation issues that will be addressed as subsequent tasks. However, in order to provide some sense of priority, the two most important strategies were identified.

The first strategy is to implement a modern data base management system for the purposes of promoting access to data, organizing data to support decision making processes, and improving the quality of data, while at the same time protecting the current investment in applications systems.

The second priority is to provide for connecting administrative departments for the purpose of electronically transmitting transactions, documents, and messages.

Other recommendations consist of continuing with the operation of the central computing utility, improving communications between planning committees, considering establishing user support functions to support newly implemented technologies, developing an administrative network strategy, developing and implementing departmental and central data security policies and procedures, and improving departmental applications systems.

Issues

Three main issues have been identified in the Plan as user computing, connectivity, and decentralization vs. centralization.

User computing is a concept that conveys the importance of focusing on the needs of the users and their direct access to computing resources for the purpose of accomplishing their job responsibilities.

Connectivity refers to the need to access and use administrative data, the ability to electronically create and revise documents, create messages and distribute them throughout the university.

Decentralization vs. centralization speaks to the concept that the two organizational models are not mutually exclusive but are in fact complementary. Responsibility for applications development has been decentralized but data management and certain support functions are best managed centrally.

B. Introduction

This section of the Plan starts with a general introduction, discusses some of the related planning activities and why this plan is necessary, gives the background for decentralizing the administrative applications systems, and reviews the current status of the planning committees. The Plan should have certain characteristics in order to make it effective. The following characteristics are discussed in this section: The Plan needs to contribute to the university's long term goals, it needs to maintain a broad scope, it needs to have wide participation, it must be needs driven, and must have the full commitment by senior management.

C. Planning Assumptions

Through the use of assumptions the planning group is able to address a variety of perceptions, ideas, trends, needs, etc. and, thereby, set the stage for assessing the current environment and determining future needs. Much discussion and careful editing have gone into preparing thirteen assumptions, the most important of which are presented here:

- The responsibility for administrative application systems is delegated to the respective administrative department managers while the administration of overall data structures is centralized.
- Access to information, including the converting of data into information, is the central focus in administrative information systems planning.
- Users will play an increasingly active role in designing, developing or acquiring, implementing and managing administrative information systems.

D. Issues

User Computing

User computing is a relatively new phenomenon that has evolved primarily as the result of gaining direct access to computing resources by users throughout the institution.

The classic aspect of user computing is the applications systems that support user functions. This has been the focus of systems plans and actions over the last several years. Decentralization of application development has helped accelerate progress in improving current applications systems.

Besides the work necessary in the applications areas, there is a need to address the information gathering, processing, storing and reporting requirements of the university. The major shortcoming of the current data access methods is the inability to easily combine data extracted from two or more files.

Other aspects of user computing are how to determine the need to access data, what criteria to use to limit access to data, the concept of data ownership vs. data custodianship, and responsibilities on the part of users.

Finally, as a result of making data more accessible, a rising concern will be the support users may require in deciding how to properly use data.

Connectivity

Connectivity refers to sending and receiving information electronically among and between offices inside and outside the university. Functions associated with connectivity can be classified as reading, updating, and printing administrative data, electronic mail, calendaring, and document storage and retrieval.

Based on a survey the following recommendations were made:

- Provide administrative and academic units the ability to electronically read, update, and transmit administrative data.
- Provide administrative and academic units the ability to electronically create and revise documents, create messages, and distribute both throughout the university.
- Encourage access to office automation for administrative and academic units where no access now exists.

Decentralization vs. Centralization

The central administrative data processing staff was distributed to major administrative areas as part of implementing the plan to decentralize administrative information systems management. Departments have reallocated positions and looked to contractors to supplement permanent staff in order to help address their needs. Several offices, such as the deans' offices, have not been provided with technical staffs and do not have central support staff available to them. There is a need to provide these offices with adequate technical support.

The installation of on-line administrative systems has caused increased competition for central computing resources. As a result, the current capacity of the mainframe could be exceeded in the very near future.

The structure and relationships of the computing policy and advisory committees are not clear. The purposes of the committees, their memberships, and their interrelationships need to be reviewed and defined.

E. Goals

Goals are defined as statements that describe what needs to be accomplished over the foreseeable future without specifying how to accomplish it. Following are some of the major goals as they are categorized in the Plan:

Information Management

- Create an environment that promotes access to and availability of data within prescribed limits of management control.
- Provide for the migration of current administrative systems files to a data base environment while protecting the investment in current systems and expertise.

Departmental Computing

- Ensure compatibility among departmental and central computers for the purpose of communicating between them as the need arises.
- Provide administrative and academic units the ability to electronically create and revise documents, create messages, and distribute both throughout the university.

Central Computing

- Continue using the central host computer for shared applications and to achieve economies of scale.
- Provide for compatibility with departmental computers for the purpose of interconnecting and sharing data and programs as necessary.

Organization

- Enhance the management of administrative information systems.
- Integrate information services into each administrative function in the university.

Communications

- Provide for greater communications integration between administrative and academic systems.
- Provide for the merging of data, voice, graphics, and image processing.

Security

- Make all information available except where sufficient cause to limit access can be demonstrated.
- Security requirements should not unduly impede access.

Application Systems

- Continue the process of converting to on-line transaction systems where appropriate.
- Improve the productivity of system designers and programmers by utilizing modern system development technology.

F. Implementation Strategies

Information Management

The strategy for achieving the institution's information management goals is to acquire and implement a state-of-the-art data base management system. A primary consideration is to protect the current investment in applications software. In implementing the data base management system, the university should have the flexibility to utilize a combination of transparency, extract, and native data access approaches.

This strategy was developed by identifying various criteria to evaluate a number of viable options to migrate to a modern data base environment. The criteria consisted of ease of access, controlling access to data elements, ease of manipulating data, costs, implementation effort, host impact, application impact, need for support staff, product support, and need to maintain independent departmental data bases. Two implementation strategies were considered: (1) implementing a data base management system that is integrated with the application systems; (2) implementing a data base management system without changing the existing application systems.

The first option was ruled out on the basis of cost, since it required the replacement or reprogramming of all applications systems. The second option involved really three different access modes: a transparency mode, an extract mode, and a native mode. Since each mode offers advantages and disadvantages, the ideal solution is to have the flexibility to employ all three modes depending on the files or systems being accessed.

Departmental Computing

One strategy relative to departmental computing involves administrative applications. With the advent of decentralization and the development of departmental and personal computers, local solutions are favored whenever it is economically and managerially feasible to do so. Current technology supports a four-tier architecture consisting of the mainframe, departmental processors, personal computers, and supercomputers. Administrative systems support this architecture by encouraging users to select solutions that best meet their needs.

Another strategy with respect to departmental computing deals with the common departmental need to electronically create and revise documents, create messages, and distribute them throughout the university.

Current departmental computers consist of IBM, Wang, Digital Equipment Corporation, and NBI systems. Considering the mixture of departmental computers, two alternative solutions were considered. One solution involves the installation of an electronic mail system on the central host computer. The second solution is to install a software product that translates the various existing document formats in a way that is transparent to departmental office systems users.

The first solution was eliminated on the basis that it creates a dual system environment in each office. This is both costly and confusing and would probably result in user dissatisfaction and consequently lack of use.

The second solution is clearly the more desirable approach provided that viable products are available that address the required functions.

Central Computing

An extensive analysis of CPU usage revealed an annual increase of CPU usage of 25%. Based on this analysis and forecasted usage the conclusion was that a CPU upgrade is urgently needed and a change in operating systems is required.

Although the implementation of a data base system and a connectivity solu• ɔn have both an immediate and long term effect on the host computer, the conclusion by the Computer Center is that this effect will not seriously alter the projected demand trend on the central Computer Center.

Organization

For a variety of reasons, computing planning committees and the functional units have tended to work independently. There is a need to develop means whereby there is periodic communication between these groups for the purpose of keeping each other informed of general plans and ideas and identifying any issues that might require close coordination.

University decision support systems, data administration, and the evaluation of the quality, integrity, and use of data elements in the university's administrative systems data bases need to be implemented.

Membership of the Administrative Information Systems Advisory Committee needs to be broadened to include Library Services, the Provost's Office and technical representatives from the academic areas.

As a result of involving a broad set of users more directly in the use of new technology such as, data base systems and office connectivity tools, assistance to users in the form of training, demonstrations, consulting, counseling, and trouble shooting is necessary. For that purpose separate support functions will be established and responsibilities, staffing requirements, and organizational affiliations will be determined.

Communications

Data access and transmission requirements are expected to grow significantly over the next several years and will probably become more complex as the need for automated support increases. The proliferation of hardware throughout the university requires a highly flexible and responsive communications network.

The university's Communications Steering Committee and its Subcommittee are charged with the development of the university-wide communication strategy for voice, data, and video capabilities. Plans are already underway to develop a communications architecture for the university, to implement an academic data network, and to take advantage of the Integrated Digital Services Network that is being implemented by the local telephone company.

Security

A university-wide security coordinator has been designated with responsibility to work with security officers and internal audit to develop a university security program.

Special attention will be directed towards how the information management strategy could impact security. The newly created data administration function will coordinate the development and implementation of a variety of data security policies and procedures.

Application Systems

This section provides a detailed description of the current systems of each administrative department and the application systems development plans over the next two to three years. Each department has prioritized their projects and stated estimated completion dates. Lack of space prohibits the discussion of the various projects but the following is a summary of some of the major scheduled projects:

Facilities Work Control System
Architectural Computer Assisted Drafting System
Building Attribute Data Base
On-line Cashiering System
New Purchasing System
Improve access to administrative data
Public Safety System
Telephone Billing System
Office Automation System
Voice Response Systems

III. Implementation of the Plan

In summary, the Administrative Information Systems Strategic Long Range Plan is the product of eighteen months of effort by the Administrative Information Systems Advisory Committee and its Operations Subcommittee. The focus of the Plan is to identify critical issues, goals, and strategies. It does not attempt to comingle strategies and priorities across major categories. The document was developed as a blueprint for future implementation and, therefore, does not include a specific timetable or resource needs. As the Plan is implemented, the resource needs and implementation timetables will be clarified.

Solutions

The first step toward implementing the Plan was to identify the top priorities. The consensus is that information management and departmental connectivity represent the top two priorities and efforts should be made to find viable solutions for these strategies.

Information Management

Extensive discussions have been held with a number of leading Data Base Management System vendors. The discussions have focused on the benefits of implementing a data base management system and how to migrate to a data base environment. After several months of analysis, two points became clear. First, in order to obtain the major benefits of a relational data base, our current file structures would have to be changed to relational files. Second, since our major systems consist of vendor supplied packages, we couldn't reprogram the systems without losing vendor support. This implied that we needed new applications system packages that are integrated with a relational data base.

After a few inquiries it became apparent that these types of packages were not available from our software vendors. Therefore, we have elected to implement an intermediate solution. This solution consists of software that enables end users to access data in the existing files without the need to know where the data is located and without the need to alter the existing file structures. This type of product typically contains a data dictionary, a query language, and an interface to existing file access methods.

Departmental Connectivity

The challenge in this area has been to find viable products that could manage the variety of office systems that have been installed by administrative departments. IBM's Distributed Office Support System (DISOSS) had been assumed to be the only product that adequately addresses the university's needs. In response to concerns expressed about the viability of that product, a task force was appointed to research DISOSS. The report by the task force indicated that DISOSS would meet our needs and suggested that there might be other products on the market that compete with DISOSS. Upon further inquiry it was determined that products from Softswitch could also address departmental connectivity functions. We will soon be entering into a competitive procurement for this type of software product.

Organization and Funding

In order to address a number of lingering issues that have been created as a result of decentralization, a team of three outside consultants were engaged to make recommendations regarding how the computing function should be organized and to review the existing computing and communications plans for the hospital, academic computing, and administrative computing.

The following are some of the primary recommendations by the consultants:

- Computing controversies should be resolved by using three vice presidential deputies to develop consensus recommendations to the three vice presidents. Issue-specific task forces should be utilized in this process.
- All present advisory and policy committees should be dissolved and a new committee structure be constituted.
- University objectives relating to computing and communications should be clarified.

By combining the academic and administrative top priorities, based on independent planning efforts, the following computing priorities will be implemented:

- Central computer upgrade
- Academic networking
- Administrative data access
- Administrative connectivity