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ABSTRACT

This track of the 1993 CAUSE Conference presents eight papers on how information technology can help people in institutions of higher education do their jobs more effectively. Papers include: (1) "Implementing a Culture of Change: The Five-Year Transformation of The George Washington University" (Walter M. Bortz); (2) "Empowering the User" (Terrence J. Glenn and Victor P. Mechley), which describes implementation of a new administrative information system at Cincinnati Technical College in Ohio; (3) "User-Driven Training--A Strategy for Support" (Ken Pecka), which discusses a training program at Whitworth College in Washington; (4) "The End-User's Desktop: New Center of the Computing Universe" (James H. Porter); (5) "Architecture and Re-engineering: A Partnership for Change at the University of Pennsylvania" (Linda May and others); (6) "Successful Planning from the Bottom-Up" (Eric Jacobson and Dolly Samson), which examines how strategic computer planning at Weber State University (Utah) begins with faculty identifying their needs; (7) "The Art and Politics of Re-engineering under Crisis Conditions" (Lynn A. DeNoia), which reviews a re-engineering project at Bryant College in Rhode Island; and (8) "Doing More with Less: A Pragmatic Approach to Getting the Work Done" (Laura M. Hofstetter and Maria E. Mullin), which demonstrates how the University of Delaware dealt with reduced staffing via information technology. (Some papers contain references.) (JDD)

Managing Information Technology as a Catalyst of Change

Proceedings of the 1993 CAUSE Annual Conference

TRACK II

LEVERAGING PEOPLE WITH TECHNOLOGY

December 7-10
Sheraton on Harbor Island
San Diego, California

TRACK II

LEVERAGING PEOPLE WITH TECHNOLOGY

Coordinator: James H. Porter

Making our people and organizations more effective has always been—and continues to be—the ultimate promise of information technology. Expectations for IT in colleges and universities, where the transfer of information is at the heart of the enterprise, are especially high. How can IT help people on campus do their jobs better?

Implementing a Culture of Change
The Five Year Transformation of The George Washington University

by Walter M. Bortz
Vice President, Administrative & Information Services
The George Washington University

Introduction/Lead-in:

For Centuries, people believed that Aristotle was right when he said that the heavier an object, the faster it would fall to earth. Since he was regarded as the greatest thinker of all times, he surely could not be wrong - and no one challenged his concept for almost 2000 years. In 1589 Galileo disproved that theory with his famous experiment at the leaning Tower of Pisa -- but the power of belief in conventional wisdom was so strong that professors denied what they had seen. They continued to say Aristotle was right, reinforcing the observation of Niccolo Machiavelli that, "There is nothing more difficult to take in hand, more perilous to conduct, or more uncertain in its success than to take the lead in the introduction of a new order of things."

The George Washington University:

In 1988, the then 163 year old George Washington University announced the appointment of its fourteenth president. With that appointment, the forty-three acre campus, but two blocks from the White House, began what can only be called a rebirth, as reassessment and reinvention began to occur in every corner of the institution. Nothing was sacred -and nothing too small or too large - to escape some focus. Long held at bay, the winds of change - driven by ubiquitous information technology - were blowing across all facets of our organizational life.

Leadership For Change

It should come as no surprise that one of the areas receiving unusual scrutiny would be the institution's business practices, especially the processes and procedures emanating from its policies. Consider a scenario where major segments of the institution are

attempting to make day to day decisions using different data from different sources -- the results are guaranteed to be less than satisfactory. To put it another way, if a university with a budget in excess of six hundred million dollars has units that cannot agree on enrollment figures, the number of funded positions, a given semester's financial aid commitments, or any other such fundamental information, then all the traditional collegial models of problem solving and participatory governance are but window dressing.

While I do not propose that college or university presidents need to understand the finer points of TQM or re-engineering methodologies ... I do know that they will not accept excuses why something cannot be done. Those of us whose responsibilities include information collection and dissemination must meet the challenge of large scale transformations which span entire organizations and tax the limits of both our technological and human resources. We must be prepared to integrate our information systems into those changing organizations, to reengineer processes, absorb new technologies, in other words to facilitate the formation of a cohesive institution capable of delivering quality, innovation and customer satisfaction. And all of this usually means a fundamental change in how we meld computing and communication resources to create an integrated enterprise. We must seek synergy of technology and organizational process. But merely pursuing technological change is not enough -- we must *implement a culture of change* if we are to be successful in that transformation.

Unfortunately, as we are all too painfully aware, change in general is not welcomed by most of our colleagues in the Academy. Those with long staff tenure embrace well entrenched, standing practices -- often with pride of ownership and authorship. It is that resistance to change, complicated by unaccommodating or unwieldy infrastructures, pressing financial necessity, and the ever present rhythm of the academic calendar that so challenge those who advocate and champion change.

Recognizing the Need for Change

I do not wish to suggest that prior to the current administration's arrival, former staff at The George Washington University had been sitting on their hands, ignoring the changing circumstance of technology and related data management. In fact, a student information system had been created in-house during the 80's, though by 1988 it had limited flexibility in addressing the growing needs of the community. The system was

not distributed to users, though reports were readily available. Originally, it had been anticipated that an entire information system would be constructed using the student system as the backbone. A quick review of a possible timetable for this task - using past experience as prologue -suggested a completion date somewhere just shy of the University's 200th anniversary in 2021! Had the institution pursued this option, it was suggested that we might want to create a profit center, in the form of a museum of 20th Century higher education administrative system software. A fitting tribute for so heroic an effort.

As you might imagine, proliferation of systems was rampant during the time the University was creating its student system. A mainframe based alumni and development software package had been purchased. The financial affairs folks were taking the better part of a decade to implement a finance software package. None of these systems addressed enrollment management needs, or financial aid packaging and modeling requirements, or procurement, or grants and contracts, or a host of other administrative systems ... all basic to the successful day-to-day operation of the University. Our systems - even payroll - were independent of one another and therefore filled with redundant data. They all required regular updates, as well as dumps from one to another. Furthermore, this potpourri of challenges was compounded by the verification that some costly upgrades to the systems mainframe hardware were but twelve months away. To add insult to injury, these upgrades were projected to be interim solutions at best -- they did not address the issues of integration nor improve access to information. It was clear, therefore, as the new administration took stock of its environment in 1988-89, that a decision was imminent to redirect the University's effort in information management. Our intention was to move as far ahead in the utilization of new technology as possible -- setting a pace commensurate with the rate at which we felt the institution could absorb the change --while implementing organizational diagnosis to assess the underlying processes, and the gaps between actual and desired work dynamics.

As with all such major decisions in large and complex organizations, there is some distance between the lip and the cup in declaring new policy and obtaining buy-in from the community. At the time of the decision, it was apparent that the institution could be faced with severe economic contractions as we addressed a host of issues concerning the quality of the student body and the faculty. More importantly, even though *everyone*

would have a vested interest in our direction, we could not -- would not -- accommodate to *everyone's* individual satisfaction.

Setting the Stage for Change

The keystone of our plan was the creation of an "infostructure" designed to support the mission and goals of The George Washington University. Our first step: the development of a Computing Technology Master Plan. Its purpose: to provide a foundation and set the direction for the future of administrative computing, as well as to address the issues surrounding academic computing support, especially mainframe support. The process that eventually produced the Master Plan was time consuming but as participatory as possible. No segment of the community was ignored. It was important to have as many "creators" as possible for the new directions that would come forth from this document. A quick review of the table of contents of this more than 200 page product will attest to its thoroughness. Both voice and data were explored in depth, and networking issues along with other telecommunication challenges addressed.

Because of this exercise, it became clear to the campus at large that it would not be enough to simply acquire new technology. Our university community was going to have to study and learn how the application of technology, in whatever form, could and would be used to transform, to reengineer if you will, the various administrative delivery systems of the institution. Success in such an undertaking can be benchmarked in a variety of ways: the ability to recruit and retain a desired quality of student, faculty and staff; a capability to provide the appropriate level of service to these constituents; the effectiveness of productivity improvements and their impact on the economic performance of the university; and finaily - in the grander scheme - whether we have furthered the stature of the institution in its accreditations, ratings and rankings.

In order to accomplish these objectives, a clear vision of computing at The George Washington University had to be presented, and a commitment to revisiting and updating that vision also had to be made. That represents a significant challenge when the pieces of administrative machinery - particularly those responsible for computing and telecommunications - reside in various vice president's portfolios. Therefore, following the recommendations of the Computing Technology Master Plan unveiled in

early 1990, Telecommunications, the Center for Computing and Information Management (including both administrative and academic support elements), and the Computer Information and Resource Center/User Services (the faculty and student support unit), were placed under the direction of one vice president. This consolidation, and the recommendations of the study in which the entire community had participated, created the foundations and set the stage for significant change.

Even as we set that stage, it was clear that the University should not exceed the current level of resources devoted to administrative computing. In fact, the University clearly wanted to rewrite the formulas to direct more of its resources away from administrative computing to academic computing. It was under such parameters that we began our search for a solution.

Implementing Change: Creation of an Information Infrastructure

One of the first orders of business was to make the long range, long term commitment to administrative software. In particular, the community needed to decide if the institution would "build or buy". Four primary issues drove the decision, all with financial import. First: the period of time we estimated it would take to achieve consensus on system functionality. Second: a consensus on the current level of IS staff proficiency and the training required to bring the resident analysts and programmers up to speed. Third: the need to rethink administrative processes and the challenging "pride-of-authorship" inherent to that exercise. And fourth: the reality that the last two systems the institution had implemented, finance and student, had taken a combined effort in excess of fifteen years -- and both were showing signs of instability.

It was this last issue which drove a strenuous review of our "buy" options, and the resultant investigation of available providers of full range administrative systems. We desired a "partner", one who would consider bundling a package of services, systems, and hardware enhancements in a long term relationship at an attractive and predictable cost. To this was added the bottom line requirement that since The George Washington University was already spending too much for administrative computing, the annual expenditure for this transformation to new technology had to be less than our then current budget.

A small GW group went to the market and reviewed the status and future directions of four higher education software vendors. The institution's ongoing experience and senior management's previous experience with Systems & Computer Technology Corporation (SCT) of Malvern, Pennsylvania, focused attention on them.

It was the institution's desire to have a real-time distributed system, coupled with our perception of both what SCT's BANNER software was and would become along with BANNER's hardware independence as well as SCT's willingness to contract it's installation, modification and implementation to GW's standards. After months of contract negotiations, and both rigorous and vigorous internal discussion, a seven year, multi-million dollar per year outsourcing contract was signed in May 1991. The 123 page contract committed the institution to purchase the current version of the administrative software, and laid out an aggressive modification and implementation schedule. A comprehensive relationship was formed that laid the foundation and made possible the institution's transformation to an integrated data, open systems architecture, distributed computing technology. In addition, the annual 7 year level payments of the contract resulted in an immediate and continuing savings to the University's bottom line. Thus we met the challenge of investing, while spending less.

The implementation of the financial aid module began immediately. On it's heels followed the Student Information System, Alumni/Development System and the Human Resource System. A decision on the Finance System was postponed for two reasons, number one: the newly arrived vice president for finance needed some time to become familiar with the landscape; and number two: the financial system software then in use had to be "stabilized". A delayed decision also allowed the financial affairs staff to carefully review their processes and procedures, and determine appropriate protocol in a distributed, rather than a highly centralized environment.

Redefining the Business Approach Through Technology

The results of that decision in 1990 and 1991 are obvious in 1993: The George Washington University is transforming itself. Perhaps the most significant outcome of the change to date is that decisions no longer equate to independent action. Student accounts, financial aid, registration, housing and a host of other operations having myriad processes are now inextricably linked in an integrated information system dependent upon and owned by all.

No doubt you will not be surprised to learn that the process of transformation has not been easy nor trouble free. Large scale organizational transformations of culture, resources, and strategy seldom are. Should you visit the campus or otherwise have contact with any of the hundreds of staff and faculty who have been involved with the activity, you will find various levels of enthusiasm for the software, the manner in which the "plan" has been implemented, and the speed with which the process has been accomplished.

What you *will* find is a community with more information available to them than ever before and still in the midst of struggling with the learning curve of new software. You will also discover an institution that is actively *redefining* the way it approaches its clients and how it chooses to do business with them. Unfortunately, the fundamental synergy of new technologies and processes are sometimes lost on a host of middle managers who would rather remind us of the list of yet-to-be-accomplished tasks!

But I can report to you that the majority of the campus now recognizes that the change accomplished, and that which is still underway, is worth the thousands of hours of staff time. More and more, users are willing to accede that they -- and our clients -- are enjoying vastly improved service levels and information access. Immediate access to information, on both individuals and transactions, has caused us to rethink *how* we collect the original information used to populate those data bases. An entire user subculture has arisen that spends time researching direct data entry. They search for methods that allow students, applicants, and prospective employees (as well as a host of others) to provide information directly to the system. Students now use touch-tone telephones to register. They obtain copies of their class schedule from information kiosks located around campus (called "GWiz") and they meet with faculty who can advise them on their academic histories with up to the nano-second accuracy.

At the end of the 1989 fiscal year, seven hundred users were connected to the data systems of the University. Last week, we connected our three thousandth user as we also announced a major effort to seek a partner for a significant telecommunications project, one that we anticipate will permit the institution to take a giant step in connectivity, and in the distribution of data, voice and video both on campus and throughout the world as we press the boundaries of the envelope outward to further explore interactive long distance learning and the administrative's challenges it presents.

Summary: A Culture of Change

I am satisfied that we have successfully influenced our culture within many areas of the University. We have done it through the establishment of strong links between the enabling technology, organizational processes, and our human resources. Today, every campus renovation carries a connectivity budget and includes input from a committee charged with technical enhancements. All new construction enjoys representation on planning committees from both telecommunications and academic computing support. E-mail abounds, software site-licenses are proliferating. The institution *is now* in the enviable position of trying to keep up with an accelerating campus learning curve and demand.

More and more, The George Washington University recognizes technology as an integral part of the infrastructure rather than an added benefit of "automation". We are beginning to see a return on investment. Fewer letters of complaint from students and parents on registration, financial aid processing, or student accounts is a welcome sign that the business operations are receding into the background -- where they belong! There is every reason to believe that future implementations (the Human Resource System later this academic year and the Finance System during the next two years), will be gentler transitions and provide even more significant benefits to a growing list. In the midst of the institution's "coming of age", in an era of enterprise integration, the general population is becoming more computer savvy. Anticipating future directions, The University is spending more of its resources to address the convergence of communications and computing technologies. High speed networking, off-campus network access, on-line library enhancements, networked software depositories and expansion of faculty access to additional learning based technologies and training are receiving more and more of our attention and resources. New faculty and staff arrive on campus each year with more computer sophistication. Computer literacy and training will begin to fade as a resource issue as new elements replace them. Bringing the entire community along in this enterprise is much like the task that the school teacher faces with a classroom of multiple intelligences and abilities. Holding everyone's attention and maintaining support campus-wide will continue to challenge us into the foreseeable future.

I look forward to reporting to you again in two years when, if our calendar has not failed us, we will be able to share with you additional good news of how we have further learned to leverage people with technology.

EMPOWERING THE USER

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ABSTRACT

This presentation describes how Cincinnati Technical College organized its efforts to meet the following challenges:

1. The use of PCs and automated systems was expanding rapidly with little or no thought given to integrating the systems.

2. Users of MIS were demanding more access to the computer-based data and faster response on system problems and on development of new systems.

3. The MIS department was being seen more and more as a barrier to progress rather than as a facilitator and servicer for progress.

The GOALS of this presentation are to describe:

1. The PLAN which was prepared to meet the challenges.

2. The STRATEGIES which were designed to implement the PLAN.

3. The INNOVATION which was necessary to break away from old habits and ways of thinking.

4. The EVANGELISM which was invoked to give leadership to the PLAN.

EMPOWERING THE USER

INTRODUCTION

Cincinnati Technical College (CTC) is a two-year, publicly-assisted technical college which offers fifty different certificates and associate degrees through four separate academic divisions--Business Technologies, Health Technologies, Engineering Technologies, and Humanities and Sciences. Approximately 5,500 students are in attendance at any time during the five academic terms, with about 3,100 FTEs. The special emphasis of the College is cooperative education for which it has been recognized nationally. Most recently, such recognition occurred on the front page of the Wall Street Journal[1] and on the ABC World News Tonight With Peter Jennings.[2]

Like many other two-year colleges, Cincinnati Technical College experienced significant but rather steady enrollment increases in the 1980s despite the decreasing number of high school graduates. In 1990 a new president was installed, James P. Long. Subsequently, enrollment jumped 10 percent and 11 percent in the first two years of his administration. His goal was to lead the College to become a community college. He recognized that additional growth was being jeopardized by outdated and outmoded administrative computing systems. He directed that a complete review of those systems be accomplished. To assist with the review, the College hired a consulting firm. The results of the study and the process which was used to plan and implement the new administrative information system is described below.

REVIEW OF FORCES AT WORK

There were three major forces at work at Cincinnati Technical College in the world of information systems in 1991.

1. Expanding Use of PCs and Non-Integrated Systems

   PCs were becoming ubiquitous. Some were connected to the larger computers in use (IBM 4361 mainframe for student systems, IBM System/36 for Financial Systems), but more and more were in use for stand-alone systems which made little, if any, use of data already in computer systems at CTC. Often, in fact, the data being processed were data which already existed in the large computers but which had been separately entered into the PC. Separate PC-based systems were used to re-enter data from computer reports in order to prepare reports required for the Ohio Board of Regents. Many analytical reports were also prepared using LOTUS 123 for different financial purposes using data which already existed in the System/36 financial systems.

2. Users Demanding More Access to Data and More Integration of the Systems

   The use of second-generation software had provided some basic integration of some parts of the student services systems, but there was only very incomplete integration

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1 Ralph T. King, Jr. "Real Help: Job Retraining Linked Closely to Employers Works in Cincinnati," Wall Street Journal, 19 March 1993, pp. 1, A9.

2 "American Agenda," ABC World News Tonight With Peter Jennings, 15 April 1993.

with the financial systems. Also, the Financial Aid process was manual and completely separate from the automated systems. The maintenance of the automated systems was extremely difficult because of poor documentation and because of relatively high turnover in the MIS department.

The MIS department was in a Catch-22 situation. When it attempted to respond to the user-demanded changes to the current systems, it often introduced additional reporting problems which exacerbated the difficulties and resulted in increased user dissatisfaction. The users had seen enough of the level of integration and data access which were available with fully-integrated systems to become much more demanding in calling for those capabilities at CTC.

The mainframe in use was being used to full capacity and response time was not acceptable at registration for a new term. Since CTC has five terms each year and five registration periods each year, the complaints about poor response time had become almost a drumbeat. The poor response time from the mainframe systems and the poor response from the MIS Department when system changes were required built a user perception of an MIS Department which provided poor service overall.

3. MIS Being Seen More and More as a Bottleneck

Because of the central role that the MIS department played in the operation and maintenance of the automated systems, MIS was blamed more and more for problems which affected student service, preparation of accurate reports, and the ability to respond to regulatory changes. This third challenge was particularly worrisome because the solution to the first two challenges clearly depended on effective leadership and teamwork from the MIS department. The longer MIS was seen as "part of the problem" the more difficult it would be for MIS to be seen as "part of the solution."

Over time, the user community came to accept the MIS department's poor performance as a fact. There was at least one benefit to the users from this fact. Whether it was true or not, it was relatively simple to blame the MIS system for any and all problems which occurred. This finger-pointing was a convenient cover for other problems and became a part of the culture. Everyone knew that the MIS systems were unreliable and set their expectations and attitudes to reflect that knowledge. The MIS personnel realized that they were being blamed for problems which pre-dated their employment at CTC and that their role was not regarded as valuable and supportive. This realization contributed to the morale problems within the department and an adversarial relationship with the users. Both of these factors contributed to a high rate of turnover in the MIS department.

PLAN TO ADDRESS THE THREE CHALLENGES

CTC decided to attack all three challenges at once with a team approach. The design of this team approach was based on the work done at Sinclair Community College[3] and at

[3] Stephen Jonas and others, "Selecting an Information System for The '90s--Can a User Driven Process Work?" Presentation at the 1990 Annual Conference of the League for Innovation in the Community College, October 21-24, 1990, p. 3.

Georgia Tech[4]. The team would include both the users and the MIS personnel with the users providing the overall leadership to the effort and having the final responsibility for the major decisions. It would include both management and workers, from the user departments and from MIS, with input regularly gathered from all. It would include both the academic and the administrative areas because it was clearly seen that a key part of integrating the automated systems was integrating the ability to access the functions and data those integrated systems would provide. This integration had to cross all lines of the organization through the use of systems for which all parts of the organization felt responsibility.

A task force was formed which included representatives from all departments, all areas, and all levels of the organization. This Task Force was asked to be a sounding board and a generator of ideas for the overall project. It continued to meet periodically throughout the planning and the implementation stages of the project.

An approach to project management was designed which would use the organizational structure which was already in existence to populate three levels of project effort.

Top Level - Executive Systems Review Board (ESRB)

The Executive Systems Review Board (ESRB) included the academic deans; the vice presidents for student services, finance, and administrative services; the dean of admissions and counseling; and the director of human resources; with the director of MIS as an ex-officio member. An organizational chart appears below in Figure 1.

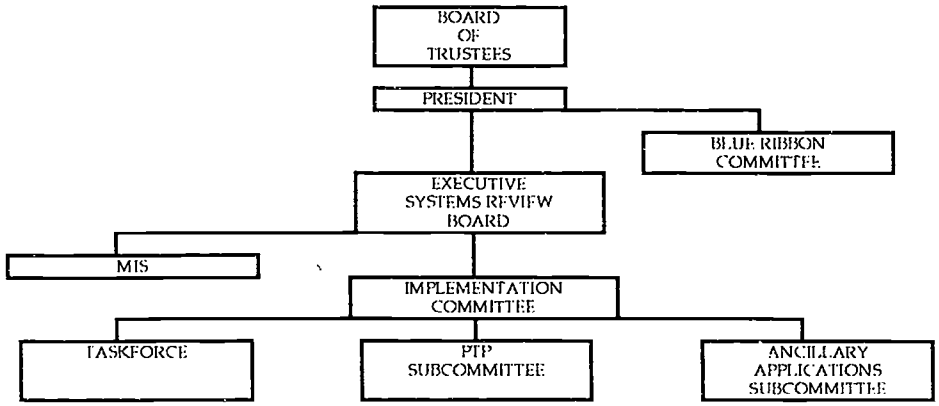

Figure 1: Organizational Chart for the Update '93 Project

The ESRB was charged with the responsibility for setting overall policy for the project and for making the major decisions concerning computer software, hardware, and personnel assignments. It guided the development of a Request For Proposal (RFP) and led the selection process to evaluate and choose software and hardware vendors. The process included in-depth interviews with all members of the Task Force concerning their areas' current systems, system problems, and needs for the future. These interviews resulted in written statements of needs which were consolidated into the RFP.

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4 Linda Martinson, "Scrapping Patched Computing Systems: Integrated Data Processing for Information Management," NACUBO Business Officer, June 1991, p. 35.

The project to upgrade the Administrative MIS to meet the requirements stated in the RFP was named UPDATE '93. The acronym stands for User Planned Data Access Toward Empowerment. The name intended to identify not only the process of upgrading the systems but also the teamwork approach being used.

The specific goals which were set for the UPDATE '93 project were the following.

1. Use of a relational database management system to support data integration, easy access, and powerful reporting tools.

2. The ability to communicate from any PC or terminal in the College to any other PC or terminal in the College.

3. The ability to download selected data from the central database to department PCs for further analysis.

4. Fast access to the data to improve service to the students in all interactions with the College.

5. The ability to add new features and functions (E-Mail, telephone registration, INTERNET access, etc.) without major changes to the basic system.

6. The ability to greatly expand the number of students served without a major expense to upgrade the hardware or software.

To advise him on the contents of the RFP and the criteria for the selection of the new system software and hardware, the president recruited a Blue Ribbon Committee of data processing executives from the business community. These vice presidents of major insurance, banking, and information systems firms met with the president and representatives of the ESRB to provide feedback, direction, and confirmation of the approach used. When the president took the recommendation for the purchase of a major new system to the Board of Trustees, he had not only the selection of the internal committee but also the concurrence of an independent outside panel with many years of experience in purchasing and designing software solutions.

Second Level - Implementation Committee

Once the selection of software and hardware had been made, an operating committee was established. It was called the Implementation Committee. It had the responsibility for making the decisions necessary to make the project happen. Those key executives in whose areas the new system would be installed were included, namely the registrar, controller, and the dean of admissions and counseling. In order to maintain a balance of academic and administrative viewpoints, the dean of health technologies, the senior academic dean at CTC, was also included. The director of MIS was made an ex-officio member. The selection of these members was made purposely to include two members of the ESRB in order to provide clear communication paths horizontally as well as vertically within the organization.

The Implementation Committee decided to set up sub-committees which would be populated with members of the Task Force and MIS department people.

Third Level - Sub-Committees

Four sub-committees were formed initially. The subcommittees were composed of midlevel managers and staff who would be ultimately responsible for working with the new system on a day-to-day basis. The subcommittees provided leadership opportunities and decision-making authority to persons who were not used to having these roles within the organization.

1. DATA MANAGEMENT AND SECURITY - to plan what data needed to be converted and what security needed to be applied to the system.

2. TRAINING - to plan and guide the training required.

3. CONVERSION - to develop and recommend the conversion sequence to be followed.

4. ANCILLARY APPLICATIONS - to make sure that any current needs for automated systems which were not included in the packaged software were addressed during the life of the project.

The four subcommittees met regularly for several months. Through their input, they laid the foundation for the implementation of the new system. The subcommittees crossed departmental lines and initiated the team building efforts. Subsequently, when the conversion became the primary focus, the Data Management and Security, the Training, and the Conversion subcommittees were combined into a single group called the Planning-Training-Problem Identification (PTP) subcommittee. PTP included all of the key supervisors from the user departments and all of their MIS teammates.

NEW STRATEGIES DEVELOPED

From the experiences gained by site visits during the selection process, the project leadership realized that the implementation phase would provide the greatest test of the teamwork approach. In order to help assure success, several strategies were developed.

1. Users who have PCs but do not understand them well must be made more computer-literate. Training classes on PC Fundamentals and DOS were developed and implemented using a "train the trainer" approach in order to institutionalize the knowledge. The training was conducted by a team made up of user personnel and MIS personnel. It included representatives from the academic areas as well as the administrative areas. A new E-Mail system was selected and installed on the new administrative network to help solidify the knowledge which was gained in the PC training.

2 Users must be provided better access to data through an integrated software system. This system is built on a Relational Database Management System (RDBMS) in order to provide the tools needed to effectively manage the database and to support ad hoc access (QUERY) to the database. To build on the training done earlier, the software vendor was brought in to CTC to conduct focused on-site training on the software modules. This system software module training involved both user and MIS personnel and was accomplished again using the "train the trainer" approach. Doing the training on-site allowed a much more focused effort. All questions and concerns were CTC's questions and concerns. All examples and solutions were

CTC examples and solutions. Training on the QUERY capability was provided to key personnel in all departments, not just to MIS personnel. User personnel were involved in helping to deliver the QUERY training to other units.

CTC recognized that empowerment of the users depended on three separate ingredients, computer literacy, integrated systems, and the Query capability. (See Figure 2.) Each of these ingredients needed to be acquired over a period of time, in an integrated manner.

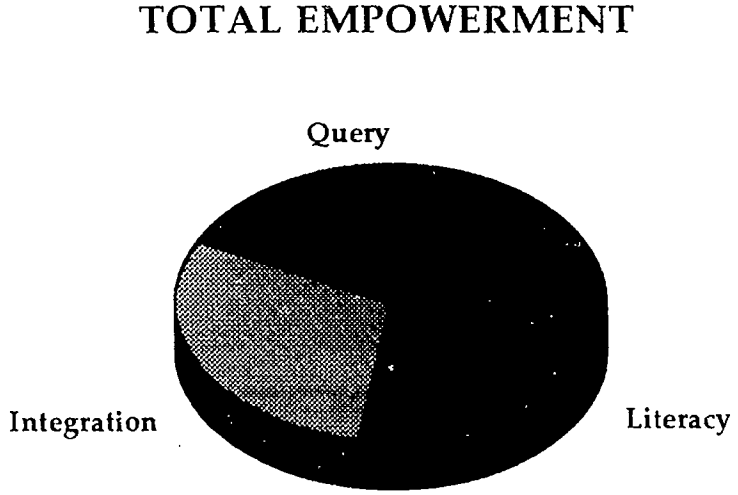

Figure 2: Computer Literacy + Integrated Systems + Query = Total Empowerment

3. MIS personnel must be reoriented to a user-service point of view. This change of attitude was accomplished through the identification and development of leadership within the MIS personnel, through the team-building previously described, and through assigning MIS personnel to specific teams with user personnel. User managers were regularly asked for input concerning how well the MIS personnel were supporting the efforts of the team. Problems which were identified were addressed immediately. In addition, MIS personnel were regularly asked for input concerning the cooperation being shown by the user personnel. Problems identified with those relationships were also immediately addressed.

   The modus operandi for addressing teamwork problems, from whatever source, was to meet with the personnel involved to review the problem and to develop a solution to which all parties agreed. If necessary, the next higher level of management was involved in the discussion in order to reach a consensus on the problem definition and on a solution. Since all of the departments involved in the project already had key executives on the different teams, it was relatively simple to gather the necessary personnel together and focus their attention on a common definition of the problem. In a few cases, it was necessary to raise the problem to the level of the ESRB in order to achieve the necessary level of cooperation. With all parties generally knowledgeable concerning the overall project, it was not necessary to prove problems existed so much as it was necessary simply to identify the problem and to show how it was interfering with effective progress. In addition, it was stated as policy that UPDATE '93 was to be user-driven with all major decisions made by the users.

INNOVATIONS IMPLEMENTED IN IDEAS AND IN ACTIONS

The project leadership introduced a number of innovative ideas within the implementation phase. First, teamwork was stressed as essential, not just a good idea. Good teamwork was recognized and rewarded with special recognition during meetings. Poor teamwork was also recognized, and appropriate corrective actions were taken. The previous adversarial relationships and attitudes were weeded out through joint successes and through recognition of the essential need for the full participation of all those involved. Second, decisions were not allowed to be made by single individuals, whether the individuals were department managers or vice presidents. All decisions had to be joint (integrated) decisions in order to successfully implement the new integrated system. Third, MIS personnel were not separate from the team effort. They were expected to be team contributors, not remote gurus or gofers to be ordered about. Fourth, the new system was not an end in itself, but the first stage of a process which would be continuously reviewed and improved. The Total Quality Management[5] approach, with the general recognition for effectiveness it has received in industry, was most helpful in this effort to convince the staff that change is part of the new way of operating.

In addition to the innovative ideas, a number of new actions were introduced. First, team assignments were announced publicly, and team performance was recognized publicly. Second, inter-department training was made standard. The Admissions personnel, once they had learned their module, were expected to train other departments on how that module worked. This approach solidified their understanding of their module's functions and contributed to teamwork and improved communications. Third, quick identification of problems became the order of the day. Anyone who did not identify problems of which they were aware became "part of the problem." Fourth, recognition and celebration of good performance and of successes became a regular part of the weekly meetings of the different working groups.

EVANGELISM

To break through the barriers which the culture at CTC presented, the project leadership continually stressed the inadequacies of the current situation, the benefits of the new system, and the essential need to implement the new system in order to prepare CTC for the future.

This evangelism took several forms. First, the Board of Trustees and the president confirmed the goals to be achieved with the new system. This confirmation was invoked to help add force and credibility to the need to assign all necessary resources to complete the tasks. Second, management stressed the total inadequacy of the current system and the essential need for change. Third, MIS personnel continually sold the excellent benefits to be achieved through the empowerment of the users. Fourth, several boosters of the new system were identified and encouraged to speak out positively among their peers and their staff about the benefits of the system, the importance of moving forward, and the need to meet project deadlines.

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[5] W. Edwards Demming, Out of the Crisis, Massachusetts Institute of Technology, Center for Advanced Engineering Study, Cambridge, Massachusets 1986, p. 4.

RESULTS ACHIEVED

As a result of the successful implementation of these plans and strategies, these positive results have been achieved.

1. The computer-literacy of the organization has been upgraded.

2. The users and the MIS personnel have a deeper understanding of the essential value which each group brings to the work.

3. The automated systems are fully integrated and provide a solid basis on which to improve service to the students and to upgrade overall efficiency.

4. The installed network enables all employees to access the data they need to fulfill their assigned responsibilities.

5. Communication between and among all employees is faster, more actionable, more accurate and less-paper dependent than before as a result of the use of E-Mail.

6. The future developments in computer systems are now options which are available to CTC. There are no artificial barriers in the way to the use of telephone registration, access to INTERNET, electronic exchange of data files, or other new developments.

7. Users have access to the data on the central system and can download a copy of selected data to their PC for further analysis.

The system configuration has been altered dramatically. Figure 3 is a visual representation of the automated systems before the conversion.

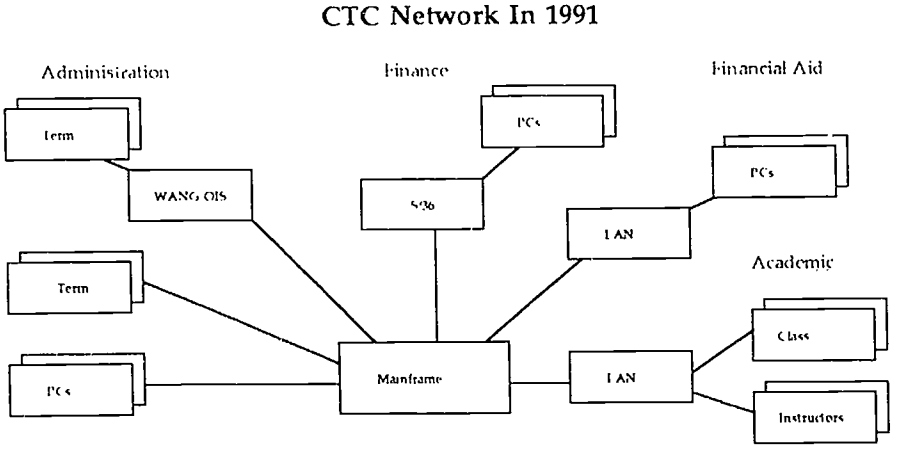

Figure 3: CTC Information Systems Before Update '93

The new Information Network eliminates the hardware variety and network complexity which existed in 1991 and provides simple, direct access to all network services. (See Figure 4.) In summary, the new CTC Information Network provides a solid basis for future growth in the use of the database and in communication across the network. Users are now truly empowered.

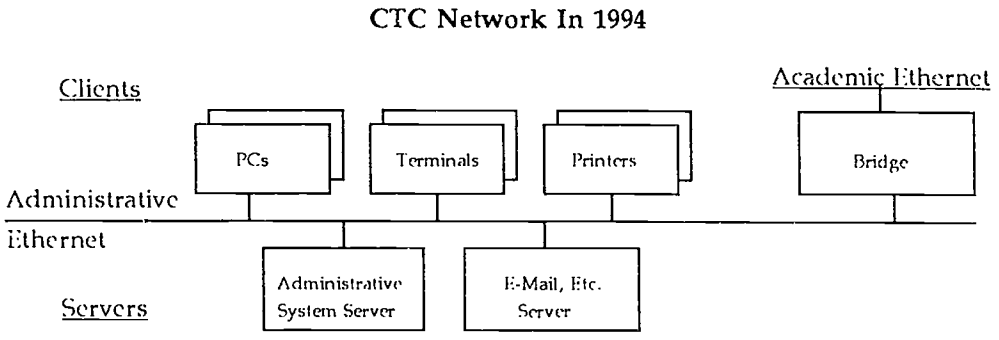

Figure 4. CTC Information Systems After Update '93.

USER-DRIVEN TRAINING -- A STRATEGY FOR SUPPORT

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Abstract

Investment in information technology on the campuses of small colleges and universities has been a high priority in recent years. One important area which seems to get less attention in this rush to attain technological adequacy is the investment in the training and support of our human resources.

At Whitworth College we are implementing a training program based on a strategy for training and support that places the focus of attention on user-identified needs. It is a strategy that identifies the users as the central figures in identifying, defining, and organizing their own training and support needs.

INTRODUCTION

As Whitworth College embarked on a major computer system upgrade which included administrative hardware and software, networking and facilities enhancement, it was clear that the user support services would need to be enhanced. Historically, investment in hardware and software, although not excessive or easily attained, far outweighed our investment in the personnel who would be required to use the equipment and software.

Training and Support...

What Users Need
When They Need It
Where They Want It

As we considered the significant investment that was being made, it was clear that unless commitment was made to training and support, we risked jeopardizing the effective use of upgrades and enhancements. Worse yet, we jeopardized the potential benefits of the new systems.

This program is a response to these concerns. It is based on the desire to gain the most from our investments, and to establish an environment of professional development among our employees with regard to the use of technology.

STATEMENT OF PURPOSE

The training in technology program was designed to establish and nurture an ongoing **atmosphere of training and support** for computer technology on the Whitworth College campus that meets the growing needs of the faculty, staff, and administration of the College. This "atmosphere of training and support" relies on the end user as the central point of focus. The program has created a **USER-DRIVEN** training and support environment that encourages end users to be involved in directing their own professional development. Users play a major role in setting the schedules, identifying topics, establishing training groups, and the identification of training and support needs. The underlying strategy supporting the defined program is dependent upon the continued input from the participating employees.

By asking employees to analyze their own training needs, to consider those who they might be trained with, and to request the style of training they prefer, the resulting training sessions can be both meaningful to the employee and beneficial to the institution. To accomplish this task, a variety of methods and training approaches are required. This program has formalized these ideas which are critical to the success of any training effort implemented at Whitworth.

PROGRAM OBJECTIVES

1. Enhance, encourage, and direct the appropriate use of the College's technological resources through the training and support of our human resources

2. Enhance the skills, knowledge, and technological understanding of campus technology users, enabling them to better accomplish institutional objectives

3. Establish a user-directed system of support and training that provides job related professional development opportunities for the employees

TRAINING STYLES

- **Classroom Training**
- **Workshop Training**
- **Workplace Training**
- **Individualized/Self-Paced Training**

Classroom Training

Classroom training involves the use of formal training sessions which are held in a classroom or lab with both lecture and hands-on training. This traditional format is useful in supplying training for general needs and foundational knowledge. Introductory courses in a variety of topics are well served by this approach.

Classroom training sessions are targeted as one-hour training sessions with 40 to 45 minutes maximum for actual instruction and the remaining time reserved for questions, comments, and discussion.

Workplace Training

Workplace training provides training that is specific to a particular "workplace". The needs of one department are sometimes unique in specific areas of a given application. This type of training takes place in the departments at the actual workplace of the employee(s) receiving the training. By conducting the training in the departments, focus and attention can be given to the specific needs of those being trained. For many employees, this style of training best meets their needs. However, care must be given to protect the training time from potential interruptions common to the workplace.

Workplace training session time schedules are held to one-hour when appropriate. The end-users help to establish the time that is allotted for each specific session.

Workshop Training

Workshop training consists of a concentrated series of training sessions to cover a topic in greater depth. Sessions vary in duration and number of meetings depending on the topic. This type of training may take place outside of normal office hours utilizing

evenings and/or weekends. User input is welcomed in helping to identify topics, time schedules, and possible incentive programs and options.

Workshop training sessions may include the use of off-campus personnel and organizations to provide the training. Issues of cost and associated fees necessary to bring in outside services are assessed for each identified need. User input is critical in making this type of training effective.

Individualized/Self-Paced Training

Individualized training allows for employees to receive training either on an individual basis or as self-paced training. Materials used in providing this form of training include internally developed tutorial workbooks, published workbooks, and audio and video training tapes.

The development and/or purchase of the training materials necessary to support this form of training is important to the success of this style of training. The materials must be thorough and generally available for access by employees.

Although the bulk of this training is self-paced or independent study, some individualized one-on-one training is required. A variety of personnel are involved in providing individualized support for other employees, including peer-to-peer training sessions. Much of this type of training is informal and occurs "naturally" within the daily activities of the job. Use of peer-to-peer training helps to support the growing needs in this area. As personnel are trained in areas of need, they are very willing to share this knowledge with others. In this process, employees learn more about both technology and about each other and the jobs they perform.

TRAINING GROUPS

- **General Training Groups**
- **Positional Training Groups**
- **Departmental Training Groups**
- **Specialized Training Groups**

General Training Groups

This group includes any employee of the College interested in the training being offered. Topics offered to this group are general in nature and provide an introduction to software packages and applications. General training groups are limited in size only by the facility limitations or by the instructor's request.

Departmental Training Groups

This group includes employees who work in the same department. Use of this group configuration allows for meaningful dialogue and discussion during the individual training sessions. It provides a natural environment for departmental cross-training as employees participate in training together. Questions asked during a given training

session are of greater interest to the group. The topics covered with this group type vary and include intermediate and advanced application training. Departments may decide to develop multiple training groups within the department to achieve the most effective training possible.

Positional Training Groups
These groups consist of employees of like appointment and position within the College with similar responsibilities and needs. In most cases they do not work in the same department or even in the same division of the College. Groups of support staff employees, faculty members, administrators, department managers, and professional and technical employees are some examples. Training topics for this group are relatively specific to the job performed. Topics are determined by the needs of the group.

Specialized Training Groups
This group may consist of a variety of campus employees and are formed as a result of an identified special need. These needs may include topics such as use of specific hardware and/or software. Topics covered may become fairly advanced in nature and may be very specific to a given discipline or department, or simply of interest and need to a specific group of individuals.

TRAINING TOPICS

- **Introductory and Foundational Topics**
- **Features and Functions Topics**
- **User Job-Related Topics**
- **Brown-Bag Lunch Topics**

Introductory and Foundational Topics
Topics covered under this category include introductory training for a variety of software packages and technological awareness. These topics cover the basic operations of a given package and provide the user with the skills necessary to operate the software at an elementary level. Other non-application specific topics include file management and data organization, basic hardware maintenance and problem resolution, printer operations, and others.

User Job-Related Topics
As discussed previously, the end users play a major role in directing the training and support services offered. A significant component of the user's role is in providing feedback and suggesting topics for training sessions. In identifying training topics, users are encouraged to provide suggestions based on their job-related needs. Specific functions from a variety of applications may be necessary. No topic is considered to be too minor, too specific, or too elementary.

This approach to topic selection is designed to accomplish at least three significant objectives; 1) Users will be participating in training that addresses their specific needs, 2) users will become more conscious of their training needs and the definition of those needs, and 3) users will be more likely to experiment and try new functions if they know they can request training.

Features and Functions Topics
Topics from this category include specific functions of various software packages that are beyond the introductory level of operation. These topics are offered on an as requested basis and are open to general, departmental, and positional training groups. Some topics require a sequence of sessions in order to achieve the training objectives. Employees are encouraged to participate in appropriate levels of training based on their experience, expertise, and needs.

Features and functions topics are offered in classroom, workplace, and workshop styles of training. The specific style is dependent upon the specific topic(s) to be covered, and the desires of the group and the instructor.

Brown-Bag Lunch Topics
On a regularly scheduled basis, "brown-bag" lunch sessions are held to discuss a variety of technologically related topics. Topics to be discussed are determined through user input and suggestions as well as topics selected by training staff. Computer services staff members coordinate the lunches and provide input (along with attending users) into the topic of choice. Topics range from specific problems with hardware and/or software to issues of policy.

Lunch sessions provide ideas for formal training sessions that are developed and scheduled for training. These sessions provide a consistent resource of meaningful training topics and serve as a mechanism for end user feed back, comments and suggestions.

TRAINING FACILITIES

- **Training Center**
- **Campus Classrooms & Conference Rooms**
- **Computer Labs**
- **Office Work Areas**

Training Center
The training center is located in the computer services area of the library. The facility is utilized for a variety of training sessions and is equipped with 6 networked computers. Formal training sessions with a maximum of 12 participants may be conducted in the center. In addition to formal training sessions, the training center is used for individualized or self-paced training. Users may schedule the training center for a

variety of training sessions. Scheduling of the center is managed by the User Support Specialist.

Computer Labs
Both the Macintosh and the PC computer labs located in the library are available for training sessions. Due to the heavy use of the labs by students and for classes, scheduling is coordinated with academic computing. Training of larger groups (10 or more) may be conducted in the labs when appropriate. The labs can be used for a variety of training topics and styles and offer an ideal environment for training that requires hands-on access.

Campus Classrooms & Conference Rooms
In certain cases, training does not require hands-on experience. At such times, training may take place in lecture classrooms and/or conference rooms throughout the campus.

Office Work Areas
In addition to the use of the formal training facilities, the use of office work areas is also beneficial. Depending upon the style of training taking place, it is often useful to utilize the specific work area of the individual or group receiving the training. This has proven to be especially useful in the training of employees in the use of network printers located in their individual buildings.

TRAINING PERSONNEL

- **User Support Specialist**
- **Department Personnel**
- **Computer Services Personnel**
- **Applications Specialists**

User Support Specialist
The User Support Specialist position supports the ongoing user training and support efforts of the College. It is clear that the potential benefit of the new technologies being implemented throughout the College can only be reached if we provide ongoing training and support for the end-users.

The User Support Specialist is responsible for the coordination of user support services and training programs. This includes the scheduling of training sessions, conducting needs assessment surveys, development and purchase of training materials, and conducting training sessions.

Although conducting training sessions is a significant part of this position's responsibilities, a wide variety of training resource personnel are necessary to provide the desired level of support. The User Support Specialist coordinates the use of faculty and staff instructors to meet the training needs of the campus.

Computer Services Personnel
The members of the computer services organization of the College participate in conducting training sessions in a variety of software and hardware applications. The expertise of the department members is used to provide training and support to the campus users.

Department Personnel
There are a number of employees who have the expertise, skills, and ability to teach a variety of topics. We encourage these individuals to participate in the training program as instructors or tutors. Some train others in their departments, while some become involved in campus-wide training sessions. It is certain that the success of the training and support program relies on the expertise of experienced employees who are willing to share heavily in the training of others.

This program provides the opportunity for employees to support the efforts of their fellow department members and co-workers campus wide. These opportunities provide unique experiences for employees outside of their normal work responsibilities and duties, enhancing their understanding of the needs and responsibilities of others. A resource survey form is used to identify employees interested in training others.

Application Specialists
In certain situations, it may be beneficial to enlist the services of a software application specialist to conduct training sessions on campus. A number of organizations, vendors, and consultants offer this type of on-site training in a variety of applications.

Training Materials Library

We are in the process of establishing a training and support library that will be available to the employees. When completed, this library will include a variety of self-paced and individualized training materials. Users will be able to use the materials on campus and at home for the purpose of software training.

Training materials will be available in the training center and through the Audio Visual department. These materials will include video training tapes, audio training tapes, reference manuals, self-paced work books, quick reference guides, and other resources.

Procedures for Requesting Training

Application of the USER-DRIVEN training and support environment relies heavily upon input from the end users. This input is collected in a variety of ways. Use of user surveys, questionnaires, training request forms, and open comments and suggestions are

vital to the success of the program. All information and requests are processed by the User Support Specialist who directs the implementation of the requested training.

The users are asked to complete a Training Request Form that details the desired training topic, the preferred training style, a suggested time schedule and date, and the training group that will participate in the training. In addition, the requestor s supervisor is asked to approve or validate the user's request before it is submitted. Each training topic is submitted on an individual request form. Users are encouraged to submit as many requests as are necessary to meet their training needs. The only limits are those created by scheduling conflicts and the time allotted within departments for training.

The purpose for gaining a supervisor's approval is to ensure that the training being conducted is appropriate for the specific job responsibilities of the employee making the request. Our intent is to provide the necessary training and support to meet the institutional needs of our users.

Once a user has completed a Training Request Form, it is submitted to the User Support Specialist for scheduling. Verification of the scheduled time and date of the training are sent to the requesting party and members of the specified training group (if applicable). In some cases, announcement of the scheduled training is made to the general campus.

Every effort is made to meet all of the approved training requests. Scheduling conflicts do arise and are resolved based on our desire and ability to maximize our training efforts.

PROGRAM EVALUATION AND REVISION

Every training session is evaluated by the users. They are asked to provide input on the usefulness of the information covered and to provide suggestions for further study and training. This evaluation is intended to provide immediate feedback to the instructor and direction for future training. The evaluation form is quite simple and requires very little time to complete.

In addition to the written evaluation, conversations with participating employees as to the value of the training programs offered has proven to be very beneficial. Taking the time to talk with the users regarding their training needs and experiences is time well spent. These conversations can take place over lunch, in passing conversations, or through electronic communications.

THEORY INTO PRACTICE

Planning and design for this program began in February, 1993. Due to fiscal timing, the User Support Specialist was not hired until August, 1993. Formal implementation of the program was initiated at the beginning of the Fall 1993 term.

Presentations of the training strategy and program operation were made to three major personnel groups on campus; support staff, professional staff, and the faculty. Introduction of the User Support Specialist and the proposed operational procedures were made during these presentations. The concept of the program was well received by the entire campus and some began making their requests immediately.

However, we soon realized that some of our assumptions were a bit optimistic. A number of employees had difficulty defining their training needs, particularly when attempting to identify specific needs. They recognized their need for training but found it difficult to accurately define those needs. There are probably several reasons for this but two seemed to be quite clear.

First, many users simply were unable to identify specific training needs related to specific software. They recognized the need for training in a given area, but were uncomfortable with the terminology. Therefore, they were not sure how to define their requests. As a result, we began to encourage users to define their needs in terms of what they did at their job. We encouraged them to describe their needs in non-technical terms by simply describing their daily tasks. Then we would work with them to match the activities of the job with appropriate training in specific software packages. Using this approach, users can more easily define "what they do", and get support in defining how technology can play a role in supporting their needs.

A second reason seems to be more historical in nature. With a history of not providing adequate training for our users, it is taking them some time to get accustomed to the idea that they can request training as needed. The idea of taking an active role in the directing of their own training required some adjustment. We continue to educate our users as to the purpose and operation of the program emphasizing the important role they play in the success of this program.

As is the case with most strategies and/or theories, they are much easier to develop than they are to implement. We continue to learn from the implementation process and use this experience and knowledge to review and modify the program. As we review and revise our program, the strategy of a "user-driven" training and support environment has been maintained. The users remain at the center of the program and continue to guide our efforts of training in technology.

The End-user's Desktop: New Center of the Computing Universe

CAUSE93

Presented by

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Views expressed in this paper do not necessarily represent the official position of The University of Chicago

The End-user's Desktop: New Center of the Computing Universe

Presented at CAUSE93 by James H. Porter

I. Introduction

Our current approach to end-user support is directed at achieving computer literacy. For the most part we provide our administrators, faculty and students with classroom training in the use of desktop applications running on their personal computer (PC). Little effort is expended on assisting the end-user integrate the PC, the network and the task at hand, whether that be managing a department, recording student grades or researching and writing a paper. As a result, many—and some would argue most—of our PCs are serving as typewriter replacements.

Needless to say, with our PCs serving as typewriter replacements, little of the reduced costs and increased organizational effectiveness expected by many from desktop computing is being realized. Indeed, it could be argued that since we tolerate non-use and our organizations incur the cost of duplicate administrative and communication systems, PCs have contributed to increasing costs rather than reducing costs. For example, we do not require all faculty, staff and students to use electronic mail and we do not require all administrators to use only electronic transactions to submit, say, a purchasing requisition.[1] There is always the option to use a paper form, fax, paper memo, messenger or telephone.

This is rapidly changing. The option to use, or not use, the desktop computer will soon disappear. The end-user's personal computer will soon cease being a typewriter replacement and will become the end-user's only window to the university's administrative applications, electronic mail, analysis tools, information servers and collaborative work. Empowered users will accomplish all work and most communication and information exchange through their networked personal computers. The end-user's desktop will be the new center of the computing universe.[2] Soon, our administrators, faculty, staff and students who do not understand and use their networked desktop computer in accomplishing their university role will become isolated, separated from the administrative and educational mainstream.

Our end-users, our organizations and our technological infrastructures are not ready for this rapidly approaching computer-mediated future. Our users are struggling to master the computers already on their desks. Our support organizations are struggling to train these end-users.[3]

This paper addresses the importance of the end-user's desktop by:

- looking at the university administrator's work environment and how it is changing
- reviewing various user-support and training models
- expanding the definition of end-user to include faculty and students as well as administrators
- reviewing user-services experiences at The University of Chicago
- proposing possible user-services models and organizations

This is a complex subject involving cultural, sociological, organizational and technological issues. A short paper such as this can only explore one or two thoughts in any depth. There is some interesting work being done in the private sector on this theme. Hopefully, others will take these ideas and use them to help us better understand how to build, support and utilize the human and technological infrastructures in our universities.

II. Administrators and Their Work

Outside of our central organizations and the larger academic units, our administrators are "Lone Rangers,"—one person tending to most administrative matters such as purchasing, personnel administration, budget management and report preparation. We have observed that these administrators are generally interrupt driven in that they must deal with the current demand or crisis crossing their desk.[4] The administrators are isolated in that they are the only person in their unit with such responsibilities.[5] Since these administrators report up through their organization, there is little reason to talk to peers in other units—so cross training is limited. We have also observed that these administrators have no forums in which to share common problems and have no champions to advance their agenda.

The administrative work environment has been relatively stable for many years. With the introduction of PCs and networks, the technological knowledge and skill required to perform as an administrator have increased—but individual administrators have not yet fully incorporated networked PCs into their daily work. Since our administrative systems are paper- or mainframe-based, there is limited organizational or peer pressure to master networked desktop computing. In addition, the required network and PC resources are not in place and the required organizational support and direction is not available.

In our work with campus organizations, we have loosely identified three general categories of PC user: the early adapters, the laggards who will never be able to, or will not, adapt and the remaining 'adapt as required' majority.[6] This majority will use technology if they can see that it adds value, if they are trained and if there is an organizational expectation for its use.[7] The early adapters, on the other hand, are the ones who love technology for its own sake. Given the rapid change we will be experiencing, a challenge facing user-services is to adequately train the 'adapt as required' majority and to somehow leverage the talent, enthusiasm and knowledge of the early adapters. More on this later.

III. Rapid Change

The administrator's world is rapidly changing. Figure 1 presents a model of the administrator's environment today while Figure 2 gives a comparable view of tomorrow's environment.

Figure 1. User Model: Today

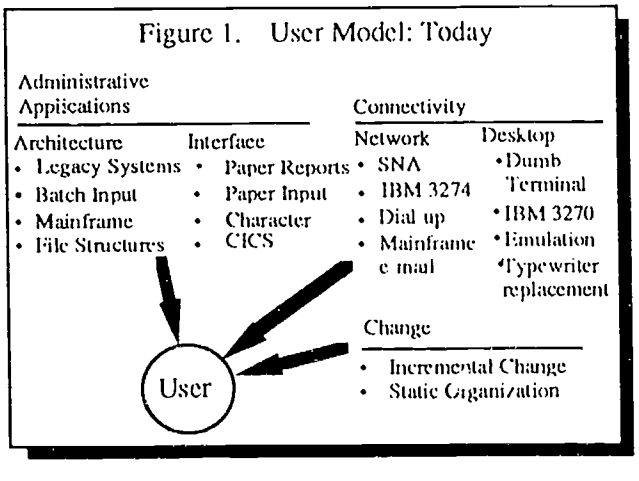
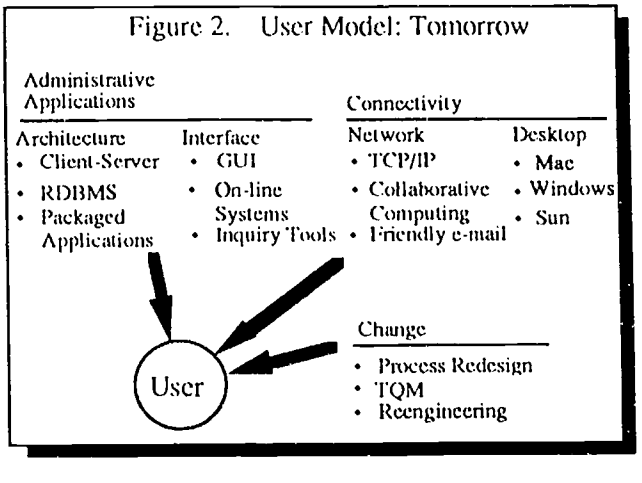


Figure 2. User Model: Tomorrow



Many of the change elements in the 'tomorrow model' are already here. To me, these change models support the idea that, like it or not, we are moving toward an electronic community where we will work, communicate, teach and learn through our desktop. Our organization's effectiveness will depend upon successful interaction through the desktop. Today the desktop is inconsequential. In the rapidly approaching future, the end-user's desktop is critical.

IV. Disappearing Applications and New Organizational Structures

An interesting phenomenon is taking place. Our central applications are losing their identity to the end-users. Today, with our mainframe-based legacy systems, we log into, say, the purchasing system to initiate a purchasing transaction. Likewise, we take specific steps to log into a different system to inquire about a personnel matter.

With the current commercial client-server applications available for the higher education market—which are based upon integrated relational database management systems—end-users log in through the network and select the transactions they need and are authorized to use. The movement between the various traditional systems, such as the accounting, personnel and student systems, is seamless. To the end-user (in this example a departmental administrator) there is one administrative system. The accounting, personnel or other central office that today 'owns' the application and data and processes the paper transactions may, over time, become blurred into one central support office in the minds of the end-users.[8]

Needless to say, the disappearing applications phenomenon has some important implications for user-services, which will be discussed below.

V. What Skills are Required?

How do we prepare our end-users for the electronic organization of the future? Will our current employees make the transition? Do we wait, as one of our administrators suggested, to introduce new computer-based systems until all the people who do not use computers have retired? How can we train the thousands of future system users?

What is required can be better understood if we consider the technical skills used by administrators over the years to record basic business transactions. As indicated in Figure 3, we started off centuries ago with pen and ink and then moved to typewriters early in this century. In this simplified history, we moved to mechanical punched card systems in the 1940s, to electro-mechanical ledger card systems in the 1950s and to mainframe based systems in the 1960s and 70s. Each of these changes required retraining and resulted in new organizational structures to take advantage of the new technologies.

For example, most of the initial mainframe applications concentrated on eliminating manual clerical operations with a resulting organizational structure that concentrated data-entry personnel into relatively low-skilled units.[9]

PCs were introduced in the early 1980s; however, they had little impact on the typical organization because they were not networked, they were used to emulate dumb terminals, the users were not trained and the PC was not integrated into daily business activities.[10] Later in the 1980s, networked personal computers were introduced. Application systems designed to take advantage of networked desktop computing power are being developed and installed in some organizations. Figure 3 suggests that the administrators need to master a well-defined, achievable set of skills to work successfully with networked PCs.

This analysis implies that if we can bring our employees up to a knowledge and skill level adequate to work in the existing networked PC environment and ensure that this skill and knowledge level is maintained, then our end-users will be prepared to successfully handle the additional technical and non-technical skills required as new organizations, redesigned procedures and new systems are introduced. In other words, if we are to successfully change our organization to take advantage of the enabling power of the new networked PC-based technological infrastructure, we must develop our human infrastructure.

Year Introduced	Technology	Representative Required Administrator Skills	Remarks
Centuries ago	Pen & ink	General penmanship	
1900s	Typewriter	Typing	
1940s	Punched cards	Typing	New low-skill backroom activity evolves
1950s	Ledger card machines	Typing	Some ledger card activity moves from backroom to administrative offices
1960s	Mainframe computers	Typing, Some data entry and inquiry through dumb terminals	New organizations created: data entry, programming, computer operations
1980s	Personal computers	Typing, word processing, spreadsheets, Some data entry and inquiry through dumb terminal emulation	PC used as a personal tool.
Late 1980s	Networked personal computers	Word-processing, spreadsheets, on-line transaction submission, inquiry, reporting, e-mail, network navigation, collaborative work	Changing organizations. New communications structures.

Figure 3. Representative Required Administrative Skills

Once our end-users are functioning adequately in the networked PC environment, what additional technologies will they be required to master? Keeping in mind that predictions are difficult, especially about the future, I suggest that possibilities include multimedia, personal digital assistants and virtual reality. Multimedia and digital assistants can be considered an outgrowth of PCs and adequately qualified PC users should be able to master either or both as the need arises. Virtual reality will probably remain in the entertainment realm for the next few years. Anyway, most of our administrators have sufficient real reality to be bothered with the virtual kind.

VI. Who are the End-Users?

At The University of Chicago I would estimate that there are from 700 to 900 or so users of our corporate administrative systems—with a user defined as one who prepares transactions for submission or has on-line access to the corporate systems for transaction entry or inquiry. There are, of course, many more account managers, researchers, faculty and others who have account management or other responsibilities and receive periodic paper reports but have no direct interface with the systems themselves since this is typically handled by the departmental or other administrator as described above under "Administrators and Their Work."

This is rapidly changing. With the new administrative systems we will eventually purchase or possibly build and the administrative procedures and processes we will reengineer:

- account managers will have on-line access to their accounts and can initiate transactions directly
- researchers will have direct access to information on their sponsored research accounts and can, if they wish, initiate transactions

- faculty will have on-line access to appropriate class and student records as well as access to their accounts and the ability to initiate transactions
- employees will have some type of direct access to their own personnel records
- students will have on-line access to their own academic and financial records and will be able to update, on-line, certain information such as their various addresses

Eventually, virtually every employee and student will have some type of access to our corporate administrative systems or to portions of the data. As these new users are given access we will move from hundreds of users to thousands. For The University of Chicago, with 11,000 or so students and approximately 10,000 employees, there is a potential of having up to 21,000 end-users.

VII. Required End-user Desktop Resources

If we consider the networked PCs in place today, we will find that e-mail, remote information access and desktop PC applications are a common denominator among most end-users. What today seems to set faculty, staff and students apart as far as PC usage is concerned is that some administrators have access to corporate administrative systems or other function specific systems, some faculty use computers in the classroom and in their research and students are special because they are students.

If we set aside sociological issues (such as faculty generally not wanting to attend classroom training and staff being reluctant to sit in a classroom with sharp, eager students), I believe that this division of faculty, researchers, staff and students, however defined, into separate groups for PC support is inappropriate. A different model, especially if we accept that over time virtually everyone will have access to and will use the corporate administrative systems, is to consider that all faculty, researchers, staff and students have a common core of PC resources that they must know and use to be productive members of the University community. This core includes access to a networked PC, access to a basic set of desktop applications, access to electronic-mail, access to various networked information sources and services, and appropriate access to the corporate administrative systems. Implied is the required knowledge and skill to adequately utilize these core resources, the organizational and peer expectations that the core resources will be used by everyone and an organizational commitment that the core resources will be made available.

In addition to the core resources there exist at least two special areas of PC usage: computers in the classroom and computers used in research. It seems that support for classroom and research related computer usage are special areas that will be best addressed on an as requested basis. This does not preclude having information technology specialists proselytizing the use of computers in the classroom; however, computers will be widely used in the classroom only when the push comes from the faculty themselves. That push will grow very rapidly once a critical mass of computing skill and knowledge is in place—when all faculty and students are actively using the core PC resources.

VIII. End-user Support Requirements

This paper, so far, has proposed that in our rapidly changing environment:

- We have thousands of end-users that must become proficient in a reasonably well-defined set of core resources
- All faculty, staff and students will work with about the same set of core resources

- Once the core resources are mastered, the end-users are prepared to cope with the evolving networked PC-based technological infrastructure until some new future breakthrough occurs

Bringing thousands of users up to an acceptable level of proficiency with the core resources and maintaining that proficiency is, needless to say, a challenge and requires a bold new approach. I propose that we look beyond the technology and recognize that we are really introducing organizational and cultural change—and then proceed appropriately.

At The University of Chicago we have been very successful in moving entire groups into new technological environments. Examples include our President's Office[7] and the Publications, International Affairs, College Admissions and Special Events Offices. Our methodology puts great emphasis on individual, one-on-one coaching, relating the technology to the individual's work and establishing group expectations for system use. Traditional classroom training, when used in these change efforts, has been less successful than we would have liked.

We have not been very successful in assisting isolated individuals to adapt to new technologies, especially administrators in remote academic departments. For example, we have installed e-mail and other network-based applications for such academic departmental administrators and they aren't used. We believe that the administrator's isolation, the difficulty in setting expectations for use and the lack of a critical mass of PC-based functionality havee contributed to this lack of success.

The installation of electronic mail is a good example of our group approach. We always recommend a micro-based e-mail package. (QuickMail—but other similar products would work as well.) Micro-based e-mail is feature-rich, easy to use and is locally maintained on the front end within the group. Generally, everyone gets their e-mail connection and personal training in its use at the same time, which helps to set group expectations for use. We have installed QuickMail for hundreds of users and have always been successful—where success is defined as everyone in a group using e-mail on an on-going basis.

We have not yet had an entire client group begin to use e-mail where pop-mail, mainframe-based e-mail or other non-micro-based e-mail was used. We believe the individual focus of these e-mail applications, when compared with micro-based e-mail, has contributed to this lack of success.

Our directions and experiences have been substantiated by the literature, including:

- Local, focused, just-in-time assistance is the most effective end-user support. The support person must provide business-related, context-sensitive coaching and training[11]
- Most learning takes place on-the-job, classroom training is typically not effective[12]
- We must change our organizational structures to accommodate and exploit what is valuable in information technology if we are to bring about the information technology revolution[13]

IX. One User-support Model

One approach to providing the required desktop PC support to end-users is to recognize that there are two very different tasks to be accomplished:

I. Bringing end-users up to an acceptable level of proficiency with the core resources

II. Providing on-going support to end-users to maintain and increase proficiency

Task I is best accomplished in natural groups—such as all faculty and staff in a department or all staff in an administrative unit. Bringing together selected administrators from many different academic departments, providing training to one person from a unit and similar splintered

approaches will not be successful due partially to the absence of the group expectations and mutual support which exists when groups are "converted." If possible, the intervention to introduce new technology to a group should be timed to coincide with the group's connection to the network or other significant event.

Our experience indicates that the requirement for support when using the proposed Task I approach drops off rapidly after a short period of intense personal support.

The long-term Task II support can be provided several different ways. We provide a range of support, depending upon the requirements and resources of the unit. For example, we provide on-call support for individuals and small units while larger units have resident experts whom we have trained to provide front-line, just-in-time support, with our organization providing backup. We do have a problem that needs to be addressed: the contribution by our resident experts, who tend to be regular staff with job pressures like everyone else, are not officially recognized in their job descriptions or by the University—and occasionally not by their bosses.

Staffing for end-user support organizations must have an information technology background, understand the university's business processes, know the organization and have excellent people skills. According to the literature, most traditional classroom training and hot-line support personnel lack the educational and business experience to be successful in this newly-defined user-support role.[14]

X. Summary

After years of spending $millions on PCs and related technology with no pay back, we are poised for a breakthrough. This breakthrough will be driven by our institutions achieving a critical mass of networked PCs and the implementation of new processes and organizations to take advantage of the potential these new technological and strengthened human infrastructures provide. The technical infrastructure to achieve this breakthrough is, for the most part, available and could be purchased today, given sufficient funding. The human infrastructure required to achieve this breakthrough is a different matter. For years we have dropped PCs on end-users desks and assumed that somehow they would learn to use them. For years we have treated the introduction of PCs, networks and related technology as if it were another office tool, like a typewriter. For years we have skimped on training and support, forcing our end-users to learn from one-another and support themselves. For years we have tolerated non-use of technology. As a result, our end-users and our organizations are not prepared for the future. Many are struggling to get by with today's technological demands.

The challenge to our universities is not technological. It is a human challenge. We must take bold steps to prepare the entire organization for the future. An initial step is to focus on building the human infrastructure. A first step in building this human infrastructure is proposed by this paper: do whatever is necessary to bring the end-users up to an acceptable level of proficiency with the core resources. And since we are really dealing with organizational change and the setting of organizational expectations, we need to approach this initial task by "converting" groups rather than individuals.

Ongoing support is also very important. If we are successful in getting the core resources into use by all end-users, we will create a tremendous demand for help in mastering new tools and doing new things in addition to assistance in solving routine problems.

The possibilities are exciting. If we are successful in getting an entire university to use at least the core resources, we will build a synergy that has never existed before. Imagine the faculty, students, and staff linked together electronically, supported by new administrative and other support organizations. This will lead, over time, to new approaches in education, research and administration with tremendous benefits to us all.

Notes:

1 Many of our electronic transaction systems are actually mainframe-based legacy systems with the desktop computer substituting for a 'dumb terminal'. For this paper such systems are considered in the same light as the typewriter. They have served their organizations well and will continue to do what they were designed to do; however, such systems are not part of the end-user desktop environment this paper is addressing.

2 The phrase "...new center of the computing universe." first appeared in John P. Halloran's and Brian S. Pappas's article titled "Micro Management" in the April 15, 1993 issue of *CIO* magazine. Halloran and Pappas are affiliated with Nolan Norton & Co.

3 A major theme of discussions in the User Services Special Interest Group meeting at CAUSE93 was that our user services organizations are underfunded, understaffed and that our organizations do not understand the importance of end-user support.

4 This discussion focuses on the 'business' administrator. In academic units there is usually a 'student affairs' administrator who faces similar isolation issues.

5 For a discussion of administrative organizational issues see Therese Nelson and James Porter's article, "Desktop Computing Power: Issues and Opportunities" in the Summer 1991 issue of *CAUSE/EFFECT*.

6 Halloran and Pappas, in the article mentioned above in Note 2, suggest that the early adapter category is 20%. Chris Pickering, in his December 1992 article in *CIO* magazine, "Preparedness Training," suggests that laggards make up 16% of our employees.

7 In "Introducing Technology to Senior Executives: Theory and Practice—a Case Study" (*CAUSE92 Proceedings*) James H. Porter suggested that desktop computers will be used by executives and other senior managers when the applications are easy to use, are meaningful to the executive, and a "critical mass" of functionality is available such that the executive turns on the computer first thing in the morning and uses it throughout the day.

8 If our end-users are empowered through on-line, integrated systems into which have been embedded the university's policies, processing rules, edit and audit rules and legal requirements, will this result in major changes to the traditional roles and organization of our central administration? Do our administrative processes have to be supported by systems broken into the traditional financial, student, human resources and fund-raising modules?

9 This reduction of clerical personnel was offset by the new data-entry, computer operations and computer programming organizations. The apparent savings in clerical costs were used by our systems organizations to justify new and improved systems. Unfortunately, using computers to reduce clerical costs is still expected by many of us while the major benefits from computing are in improving organizational effectiveness and enabling new organizational structures.

10 The typical PC in our organization is used for word-processing and spreadsheet applications. Some use the PC to access information on our legacy systems over the telephone lines or via the campus network. A growing number use electronic-mail as their primary communications medium. However, none of these activities are yet fully integrated into the way an administrator works.

11 John Halloran & Brian Pappas in the article referenced in Note 2 above. Also, "Wanted, MBAs for the Help Desk" in *Information Week*, October 18, 1993.

12 Kavin Moody of the Bank of Boston in *I/S Analyzer*, September, 1992

13 From *What Presidents Need to Know* published by CAUSE, 1993

14 Naomi Kartin in "Mind Your Own Business" published in *Strategies for End-user Computing*: QED Information Sciences, Wellesly, MA, 1990

Architecture and re-engineering: Partnership for change at the University of Pennsylvania

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Abstract. The University of Pennsylvania is one of the first universities to link the re-engineering of business processes and the development of an architectural foundation for information and systems. The presentation explores that linkage, focusing on planning for flexibility in a fast-moving world, aligning information technology with business goals, and negotiating consensus in a radically decentralized institution such as Penn.

The presentation draws on lessons learned in a multi-year effort by Penn's Division of Finance and Office of Information Systems and Computing. The two partners are leading an effort to make Penn's business processes faster, less expensive, and more flexible; develop an information technology architecture of principles, models, and standards; and acquire a new generation of business systems, beginning with a new financial system.

Architecture and re-engineering: Partnership for change at the University of Pennsylvania

Penn believes that finding new ways to manage the institution is critical to the success of the academic mission. With costs growing faster than revenues, demographics shifting, and Federal grants in shorter supply, the belt has to be tightened *somewhere*. The University of Pennsylvania is committed to cutting costs and boosting quality on the administrative side in order to redirect funds to research and instruction. We've started an approach we call "Project Cornerstone." It brings together three related efforts—Total Quality Management, business process re-engineering, and information re-engineering.

The partnership. A many threaded partnership is at work. The organizational partnership links Penn's Division of Finance and the Office of Information Systems and Computing. Their methodologies are also linked. The Division of Finance is redesigning broadly conceived business processes to make them faster, less expensive, and more flexible. Information Systems and Computing is developing the principles, architectures, and standards for a new generation of systems that will support the new processes. James Martin and Company serve as consultants.

Progress to date. Penn has finished its first re-engineering effort in procurement and disbursement and its second in compensation. We have "completed" the principles and architectures, recognizing that they are living, ongoing efforts. We are deep into negotiation with vendors to provide an integrated set of business systems that will support the new ways of doing business. The first system will be financial and the first application will be procurement/ disbursement.

In this paper. This paper focuses on business re-engineering at Penn and on Penn's information technology principles and architectures. The paper pursues three themes—aligning information technology to the business, planning for flexibility, and negotiating consensus. (Penn is radically decentralized; we have twelve schools with substantial independence. Consensus is part of our organizational culture.) We offer you our experiences and the lessons we've learned.

The machinery

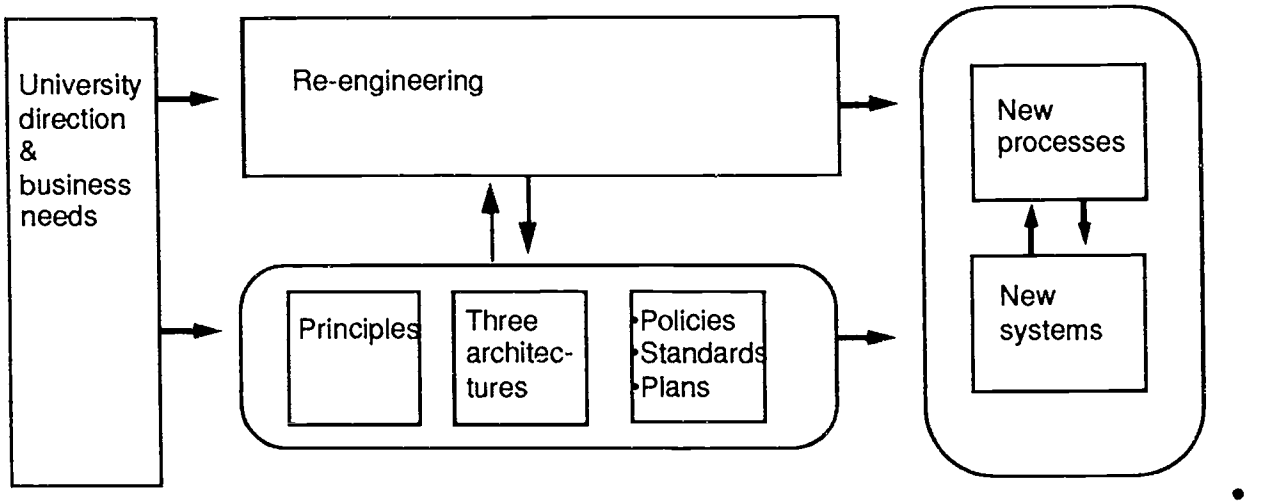
Business re-engineering. *Business process re-engineering* is the fundamental, start-from-scratch, redesign of business activities. Processes are conceived broadly, across organizational boundaries. They start with a customer and are not complete until that customer is satisfied.

Total Quality Management. *Total Quality Management* is a more incremental approach to continuous improvement, also focused directly on the customer.

Information engineering. *Information engineering* is a set of tools and techniques to create a common basis of decision-making for business people and information technologists. Information engineering is based on principles, or basic beliefs about how the institution uses information technology, and on architectures, or frameworks for that technology. There are three of these architectures—information, business systems, and technical infrastructure. On that foundation are built policies, standards, plans, and, finally, systems that work together and share data.

Technology in supporting role. Information technology is seen as a facilitator, an enabler, of the improvements identified in business re-engineering. Technology cannot substitute for organizational and cultural change. It can, however, create an infrastructure for data sharing, flexibility, and ongoing measurement of quality. A new mix of technologies and techniques are required. If we want business processes that are flexible and responsive, our technology processes must be equally flexible and responsive. We will have to meet the challenge of constant change as we develop and maintain the new systems.

The chart shows the interdependencies that are the focus of this paper. It shows the driving force of University direction and business needs and the intimate linking of business process re-engineering and information engineering. The goal is new ways of working, supported by new information systems.



Business re-engineering

Re-engineering isn't warm, friendly TQM. How do you get people to play when the stakes are so high?

How high ARE the stakes? Many groups at Penn have launched Total Quality Management projects to improve specific problems. Project Cornerstone has depended heavily on the TQM teams' analysis of existing processes and has benefited from the discipline and cohesiveness that TQM teams bring to an institution.

Re-engineering, however, is a very different approach. You try to rethink the process, the business, from scratch. You have to nurture absolutely outrageous ideas and make people comfortable exploring the unexplored. For real improvements, you have to tackle processes that are broad enough to have significant impact, which means crossing organizational boundaries. Crossing these boundaries is *very* threatening. You have to negotiate ownership and new roles.

Re-engineering requires much more than changing the flow of work. To change a process successfully you also have to change people's jobs, skills, rewards, tools, organizational structures, and to some extent, their values and beliefs.

Watching ourselves change. The rest of the campus was grateful at first "it's not me." The rest of the Executive Vice President's organizations were glad they weren't the first to try re-engineering, and the schools were convinced it was the central organization that needed to change. In the Division of Finance, we were not happy to be the first in the barrel. We knew, however, that if we didn't take control of our future, someone would do it for us.

The core team had to push itself and others to define the first process broadly enough. We were accustomed to thinking of two central offices, "Purchasing" and "Accounts Payable," when, in fact, the procurement/disbursement process occurs across the entire campus, in schools, departments, and other offices.

We had to blow the roof off our own expectations. Our first estimates were nowhere near the 40% staff reductions and 25% budget cuts we now believe can be achieved in procurement/ disbursement.

Most striking, the Division of Finance has a new conception of its place at Penn. We eventually found ourselves willing to say, "Look, our finance function happens every day out in the schools and centers. And, frankly, our notion of being in the compliance business, double and triple checking, doesn't add a lot of value." We've designed a "paperless" procurement/ disbursement process that lets the people in the local units buy things, receipt the goods, and release payment. The central organization can now focus on identifying the best vendors and negotiating the best prices.

The energizing force. As we changed organizationally, we saw ourselves changing personally. We believe, in fact, that this is the energizing force that gets people excited about re-engineering. We saw changes in our management styles, our focus, and our personal interactions with each other and with our customers. The energy comes also from marshalling forces. We began pulling together alliances of people who like a challenge and have the nerve to do something about it. We sought out people who can deal with uncertainly, as we experimented our way through a methodology new to us—to a result none of us could predict. We also needed people who were willing to take hits from the Penn community, who let us know in no uncertain terms when we were not communicating clearly or inclusively enough.

We tried hard to eliminate the fear of failure within the core teams. We tried to recognize movement toward our goal, not just achievement of the goal. We believe we built trust, respect, and commitment. Penn operates slowly, by consensus—but within the core teams we succeeded in agreeing to disagree. The nature of re-engineering—nurturing the outrageous in search of new ways of doing things—runs counter, in fact, to a culture of consensus. An outside facilitator was key to making all this happen. He encouraged us, kept us on track, and kept pushing us past our own assumptions about the way things have to be done.

Getting it done. We constantly walked the line between Penn's consensus style of drawing others in, inviting them to join teams, paying courtesy calls—and just moving forward with what we knew we had to do. We targeted key people and systematically argued the case that they were part of a broader business process than they were accustomed to considering themselves part of. We demonstrated the links with the process diagrams from the architecture effort. The diagrams are a two-edged sword. On the one hand, they depersonalize the business process, so you can talk about it without getting immediately into questions of turf. On the other hand, they are *so* impersonal that you have to reanimate the process, give it a human face.

We insisted on having fun. One of us had second thoughts, though, when we told a large and very solemn group that we didn't need a new payroll/benefits system; we could all be bar-coded and pass by proximity readers in the morning—and no one laughed.

Information technology principles

I'm delighted when people throw the principles in my face.

What do the principles do? The quote is from co-author Robin Beck, wearing her Director of Applications Development hat. She finds, to her uncomfortable pleasure, that people throw the principles at her when they want something done or want it done differently. The principles have become a rallying cry in some quarters at Penn.

The principles state Penn's beliefs about using information technology to solve business problems. We came up with twenty-six principles, in five categories: data, applications, infrastructure, organization, and an overarching general category. Here's an example of a general principle (see appendix for the entire set):

> ***Cost effectiveness.*** *Information technology must be cost effective from the perspective of the University as a whole.*

For each principle, a rationale is stated and specific implications listed. One implication of this principle is that you have to take the entire life cycle into account, not just the cost of buying the technology in the first place.

The principles are a link, a bridge, between the business people and the technologists. They attempt to make assumptions explicit, which helps both sides identify points of conflict and perhaps start resolving them. The principles are the foundation on which the architectures, policies, standards, plans, and systems are built. They're a stable base that lets those other components be as flexible as they need to be.

Finding the sweet spot on the bat. The principles were the first component of information engineering to which the larger Penn community was exposed. We encountered a great deal of thrashing and negotiating of expectations as we unveiled the draft set of principles and began seeking feedback and ratification. We had to keep telling people what the principles *aren't*. They aren't standards, aren't policies, aren't plans. Until people saw real evidence that these additional components would fall into place, they told us the principles were "not useful." We also had to keep reminding people that the principles are meant to be used in combinations, not separately. People would focus on an individual principle and tell us it's "not useful." The organization principles turned out to be the hardest. They were the hardest for us to develop and they stirred up the most passionate critique in the community. We believe we were running into the fact that organization is far more complex than technology.

When is enough enough? A piece of advice: Don't set yourself up. Don't let substantial discussion with a variety of groups count for nothing because in the end not everyone ratifies every principle. You have to be inclusive. You have to seek both formal and informal feedback. You have to really listen. That's your part of the bargain. But the feedback process itself won't come to a logical end. At some point the sponsor has to step in and say, "Thank you, that's enough."

Language. Another piece of advice: Avoid high-sounding, cover-all-the-bases language. If you want people to use the principles, you have to write them so they can be remembered and repeated. They need to be short and sweet, almost slogans. (We confess we fail this test.) And don't let the committee writing show. Work hard to keep the group effort from obscuring the voice of the document and diluting the power of the message.

Building on the principles. The information engineering methodology guarantees tight links between the principles and the next component, the architectural models. We checked and rechecked the principles against the evolving architectures—to make sure the architectures were true to the principles, but also to make sure the principles held up. It's necessary however, to *communicate* that connection to the larger public. Again to our uncomfortable delight, the community demanded to *see* the links between the lofty principles and the down-on-the-ground architectural models.

Now that the architectures are complete, the process becomes far more public and diffuse. We are making an effort to recruit key people and seed key efforts. We target planners, for example. We want them to post the principles on the wall on big sheets of paper and invent exercises that take the principles into account. We try to draw in advisory groups. The first order of business for our brand new Data Policy Committee, for example, is to build a living structure for the data stewardship principle:

> ***Data stewards.*** *Data stewards are responsible for ensuring the appropriate documentation, collection, storage, and use of the administrative data within their purview.*

Architectures

> *An information technology architecture isn't a product. It's a process.*
>
> *—Gartner Group*

Three architectures. As with the principles, it's important to say what the architectures *aren't*. They aren't a pulpit to preach a particular planning methodology. They aren't a vehicle for technology for its own sake. They have one overriding objective—to improve the performance of the business. They spring from business purpose and are refined with one or two business themes such as faster turn-around or better service.

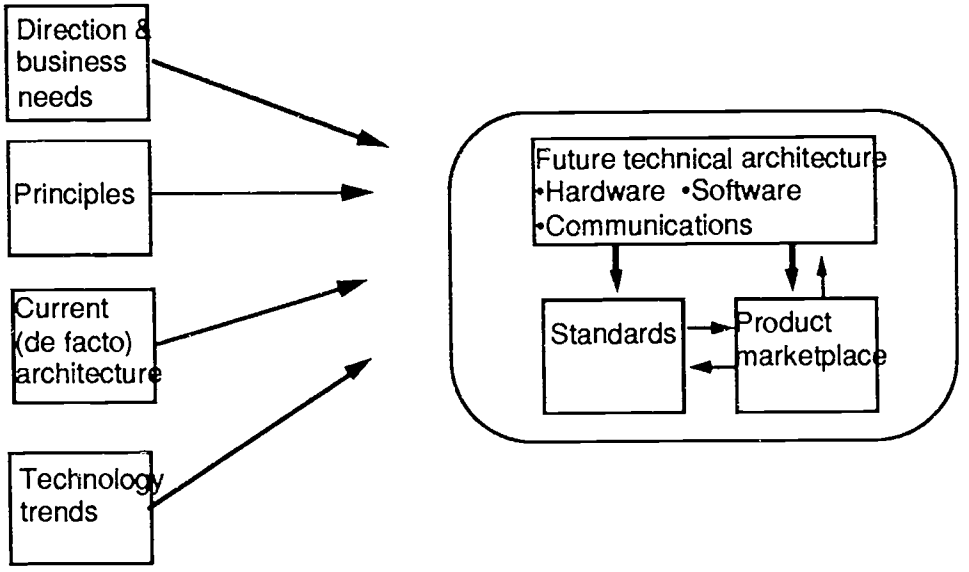
Penn has developed three architectures—information, business systems, and technical infrastructure. All three are models, or frameworks, from which will flow policies, standards, plans, and systems. The architectures themselves flow one from the other:

- The *information architecture* includes an enterprise-wide data model to help Penn understand what data it needs. That's mapped against an enterprise-wide process, or activity, model that helps us understand what the organization is doing. Reconciling the two ensures that actions will be supported by the right data.
- The *business systems architecture* lays out the comprehensive set of information systems and data stores that are needed to carry out Penn's specific business processes. The systems are identified without regard for what's already in place or how the pie is currently sliced.
- The *technical architecture* is a blueprint of the hardware, software, and communications components that will be necessary to implement the first two architectures. It's not a buy list, but a model from which standards and products can be derived.

Focus on the technical architecture. The diagram delves more deeply into the technical architecture. It illustrates four of the streams that feed the architecture. University direction and business needs are paramount. The principles are the second stream. Penn's current, de-facto, architecture—the third stream—greatly affects our migration strategy, so we did a systematic inventory of the current Penn environment. To research the fourth stream, technology trends, we

hosted a campus-wide series of forecasting forums, drew heavily on our Gartner Group membership, and visited a number of software and hardware vendors for non-disclosure briefings. From this raw material we crafted three architectural alternatives: a conservative one, an aggressive one, and one that falls between.

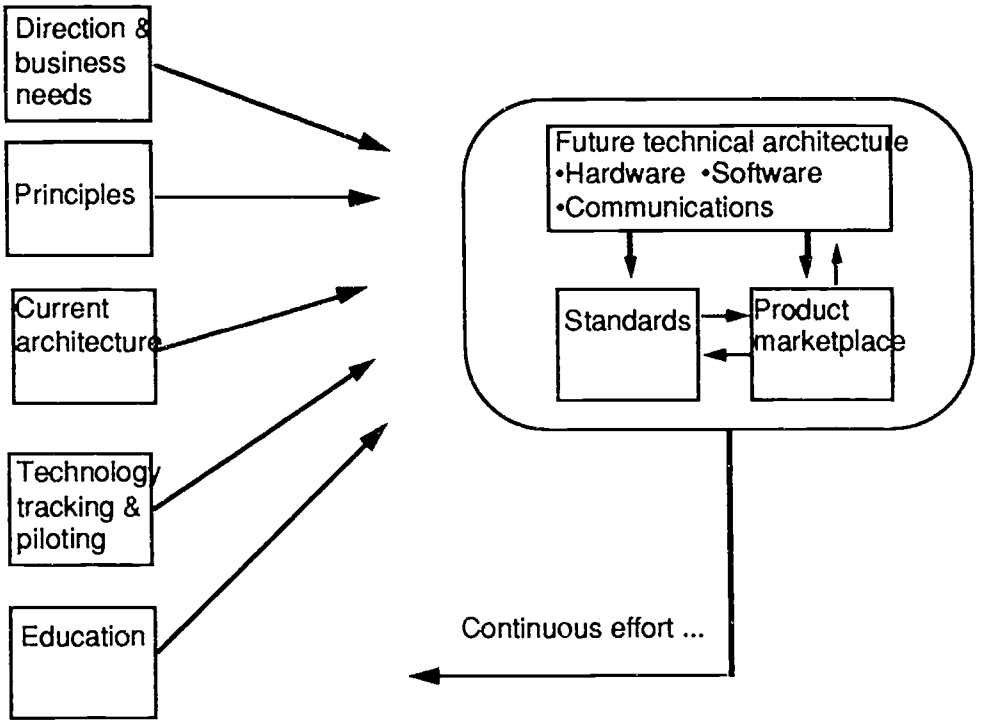
Technical architecture— blueprint for technology choices



Where to start? To avoid paralysis, we fixed some components while we moved the rest around. In our case, the campus-wide network was already stable and in place and we quickly fixed the type of database we wanted. Our consultant greatly simplified our job. He convinced us there's a fairly small set of basic architectural alternatives. Our job was to see which ones make sense for Penn. Place holders were another way we kept things manageable. We recognized there were areas of the architecture (networking and office systems, for example) that required a more detailed approach, a more participatory approach, or an approach that took academic needs more explicitly into account. The core team dealt with these at a high level and then handed them off to other groups.

Planning for flexibility. It's feedback loops that permit flexibility and nimbleness. As the diagram below suggests, we expect the principles to remain relatively stable. The architectures and business needs are less stable, since the environment is constantly changing. It's necessary to track and pilot emerging technology. Penn has no advanced technology group, but Information Systems and Computing makes an effort to coordinate and share the fruits of campus-wide pilot efforts. The ongoing technology forecasting forums are another centrally-facilitated effort. A strong education campaign is also required to build excitement and awareness.

Planning for flexibility



Breathing life into the architectures. Architecture—arcane at worst, cryptic and jargon-ridden at best—is a tough sell. To capture hearts and minds, you constantly have to make the business case—service, productivity, costs. Penn's senior management are fortunately taking the realistic approach that exact numbers can't be known at this point, but orders of magnitude *can* be known and must be demonstrated.

It's useful to have a short, compelling article to hand out. We use Davenport, et al., "How Executives Can Shape their Company's Information Systems," Harvard Business Review, Mar/April 1989.

We've learned that some people respond to images and some to text, so we've tried to communicate the architectures both ways. Our Executive Vice President, brand new to the job, found our highest-level, one-page process diagram of Penn helpful as she tried to understand her new organization. She cut quickly to the chase: These particular functions have huge numbers of inputs and outputs; I should look for opportunities there. And if there are so few inputs and outputs to this function, why are so many people working there?

We're sitting on a treasure trove of data—and need to make more effective communal use of the vast store of diagrams and inventories. They could save other people a lot of work, and could become an important shared lexicon at Penn.

Wrap-up

Keeping the partnership alive. For the partnership to thrive, the Division of Finance and the Office of Information Systems and Computing must understand each other. The technologists need to understand what business Penn is in. The business people need to understand why and when Penn should invest in information technology. Both sides have invested blood, sweat, and tears to understand each other well enough to get to this point. Both are concerned that their own side will treat the effort as a project with an end point and wrap party rather than an ongoing new relationship. Both sides are working hard to institutionalize some of the formal and informal communication channels that have sprung up. A particularly difficult problem is how to maintain the hard-won kernel of knowledge of each other's fields, which won't stay current long in today's fast changing environment. And what's "enough" to know?

A role for CAUSE. Both CAUSE and its business counterpart, the National Association of College and University Business Officers (NACUBO), could be helpful to the growing number of partnerships like this one. CAUSE could go much further than it does to help information technologists teach themselves about business and education trends and stay current on what's happening in Washington. NACUBO could return the favor.

For more information. For more information about Project Cornerstone, contact Janet Gordon or Robin Beck. For a copy of Information Systems and Computing's long-range direction statement, which is based in large part on Project Cornerstone, contact Linda May.

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Appendix: Information Technology Principles

General

1. **University assets.** Information technology infrastructure, business applications, and data must be managed as University assets.
2. **Functional requirements.** University priorities and business functionality determine investments in administrative information technology.
3. **Cost-effectiveness.** Information technology must contribute to the cost-effectiveness of the business functions it supports and must be cost-effective from the perspective of the University as a whole.
4. **Policies, standards, and models.** Policies, standards, models, and methodologies—based on the principles outlined here—govern the acquisition and use of data and information technology. Regular update and communication are required.
5. **Investment criteria.** Investment decisions (even those not to take action) must be based on business needs, cost-effectiveness, and consistency with standards and models.
6. **Training and support.** Penn must put sufficient effort into ongoing support of its information technology assets. Skills and experiences from across the University must be leveraged and communication channels opened.

University Data

7. **Accuracy.** University administrative data must be accurate and collected in a timely way.
8. **Security and confidentiality.** University administrative data must be safe from harm and, when confidential, accessible only to those with a "need to know."
9. **Ease of access.** University administrative data must be easy to access for all groups of authorized users regardless of their level of technical expertise.
10. **Multiple uses.** Penn must plan for multiple uses of University administrative data, including operations, management decision making, planning, and *ad hoc* reporting.
11. **Purposeful collection**. A given set of data should be collected once, from the source, and only if there is a business need for the data.
12. **Common base of data.** A common base of data must be created to facilitate sharing, control redundancy, and satisfy retention requirements.
13. **Documentation.** Detailed information about University administrative data must be created, maintained, and made available.

Business Applications

14. **Ease of use.** Applications must be easy to use for both novice and expert users. Interfaces should be similar enough to present a reasonably consistent "look and feel."
15. **Adaptability.** Applications must be easily adaptable to changing business and technical requirements.
16. **Data sharing.** Applications must use a common base of well defined University data and reference a common repository.
17. **Ensuring data quality.** Applications must help ensure valid, consistent, and secure data.

Infrastructure

18. **Common communications infrastructure.** Academic functions and administrative systems must share common data, voice, and video communications infrastructures.
19. **Connections within the University.** The communications infrastructure must be standardized to allow reliable, easy interaction among individuals, work groups, departments, schools, and centers.
20. **Connections outside the University.** The communications infrastructure must comply with national and international standards that allow reliable, easy interaction with those communities.
21. **Hardware and software choices.** Hardware and software for administrative use will be limited to a bounded set of alternatives. This applies to desktop computing, application servers, communications components, application development tools, and data management tools.
22. **Emerging technologies.** Penn must devote appropriate, coordinated effort to evaluating and piloting emerging technologies.

Organization

23. **Data stewards.** Data stewards are responsible for ensuring the appropriate documentation, collection, storage, and use of the administrative data within their purview.
24. **Process owners.** Process owners are responsible for developing and maintaining the standards, structures, and business applications that ensure the quality and cost-effectiveness of specific business processes.
25. **Information Systems and Computing (ISC).** Information Systems and Computing provides leadership, infrastructure, standards, services, and coordination that permit Penn to take full advantage of its information technology assets.
26. **Schools and administrative centers.** Schools and administrative centers are responsible for creating data and using information technology to meet the objectives of their organizations.

Successful Planning from the Bottom-Up

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Abstract

Most universities generate strategic computer plans from the top down, both conceptually and administratively. The process is instigated by high level administrators and begins with the general institutional mission and environment. Weber State planning goes in the opposite direction. Faculty are asked to describe their particular needs for computer and communication support and from the resulting list are abstracted common objectives and sharing procedures aiming at overall goals. This approach has produced a very practical, useable document; has evoked rapid change; and has increased cooperation across campus. The process is evolving into a potentially revolutionary departure from normal top-down management.

University planning in general, and computer planning in particular, are regarded as explicit, self-conscious acts, initiated by senior administrators, derived from fundamental institutional priorities and effecting high-level policy decisions. Strategic Plans are awarded capital letters by university presidents. At Weber State University (WSU) we have experienced a different phenomenon. Without pretensions of anything more than immediate efficiency and common sense, a series of tactical decisions by faculty committees and administrators have accumulated into a document and a process which serves the institution as a strategic computer plan. "The Plan" was in effect before senior administrators knew of its existence. Comparison of the two approaches affords insights into the nature and benefits of the variety of acts which are called planning.

Top-Down Planning

Computer planning has generally been viewed as coming from above. In a recent paper concerning the adaptation of information technology to challenges facing higher education the authors state, "Information Technology planning needs to be integrated fully into an institution-wide strategic planning and management process ... Senior leadership needs to be involved continuously ..." (Rosser, Kunselman & Penrod, 1992.) Coughlin, in a survey of colleges and small universities, found that major computer resource and policy decisions were made by senior administrators on more than half the campuses, and by high level coordinating committees, such as a President's Council on more than 25% (1986). Faculty committees were used in less than 5% of the responding institutions.

Planning can be top-down both administratively and logically. Administrative top-down procedures are rationalized by arguing that the broad participation necessary for implementation requires directives and incentives which come from the top. The first "lesson" listed as a guide to planning efforts at Rensselaer Polytechnic is "Top administrative commitment and participation are essential to obtain the cooperation of varied elements on campus and to arrive at decisions acceptable to these various groups," (Moss, 1982; p. 140).

Logic based top-down planning consists of deriving computer needs from the fundamental goals of the institution. As Falduto, Golden, Beyer, Conley and Detweiler describe it, "...planning begins with the institution's mission, followed by identification of strengths and weaknesses, development of assumptions about the future, development of a vision of the future and goals consistent with the institutional mission, development of a timeline for achieving these goals, ... and a provision for assessment and feedback ...(1993, p. 19). Such logical development is meant to produce a plan which has general academic validity, which is coordinated with other components of the institution and which is adaptive to institutional challenges and opportunities.

From the high level, mission-based vision successively specific sub-goals and actions are derived as the process moves down. Implementation of the plan occurs as these specific projects are finally accomplished.

The recent planning effort at the University of Montana is a typical example a top-down effort. It was initiated by President George M. Dennison with the explicit goal of a "long range strategic information technology plan", (University of Montana, 1992). After some preliminary work by separate constituency groups, a single task force, representing the widest range of university interests was formed to prepare the plan. Co-chaired by the Dean of the College of Education and the Vice President for Administration and Finance, the task force included 30 people: deans, directors, students and six faculty representatives. A critical first step in the work of this group was to develop a vision with maximum temporal and institutional scope. Perceived immediate needs of particular departments were purposely deferred in the interests of achieving this fundamental encompassing vision. After six months of effort the task force produced a long range "Information Technology Plan" with six major goals for computer development and support administration. Goals are described briefly and are accompanied by few curricular, budgetary or implementation details. In true top-down spirit, various constituent groups have been filling out the Plan with these particulars over the last year.[1]
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The Weber State Experience

Wandering in the wilderness. By 1982 WSU had recognized the value of common goals and operational coherence in computer development, and thus the Coordinator for Academic Computing was charged with developing a campus plan. In collaboration with an ad hoc faculty committee the plan was written and disseminated in 1983. The plan was provided to all department chairs, was reviewed and blessed by the Dean's Council, and was approved by the Academic Vice President.

The document, however, had no discernible effect on the campus and within three months of completion, fewer than ten people remembered that it existed. Curricular, budgetary and personnel decisions concerning computers continued to be based on departmental considerations without any institution-wide reference. A second plan was written in the following year with similar results. In hindsight these failures are easy to understand. The plan came from the Department of Academic Computing which had neither money nor authority to implement it.

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[1] We appreciate the assistance of James E. Todd, Vice President for Administration and Finance, University of Montana, in helping us understand the planning process used at Montana.

Coherence and coordination in computer development was effected through informal discussions between individuals and departments, sometimes expedited through Academic Computing. The written plans appeared to be of no assistance in these efforts in consensus building, and general suspicion of high-level, comprehensive planning developed.

Infusion One. In 1985 a special state appropriation of $700,000 was made available for general academic computing upgrades. Instead of dividing the money among the several colleges, the president and academic vice president appointed a special faculty committee to develop recommendations for how it could be best used. This committee solicited ideas from the faculty and was overwhelmed. It was clear that the majority of faculty desires for computer support could not be met and some hard decisions would be necessary. After sometimes rancorous discussion the committee arrived at a spending plan which excluded many particular requests but which was academically valid and reasonably coherent.

Although the plan had many detractors, the general opinion was that it was an effective compromise. Independence from established departmental and college administrative structures did not appear to have handicapped the process, and some felt that such independence had encouraged rational discussion over political bargaining.

Infusion Two. In 1986 a large, permanent budget increase was provided for unspecified improvements in educational computing. Again the academic vice president chose to allocate the money through a faculty group, outside the regular governance structure of departments and colleges, in this case the newly established Faculty Senate Computer committee.

Following the model of a research grant board, this committee requested proposals from faculty for computer projects, with the initial expectation of simply reviewing these proposals and funding the most educationally meritorious. When the proposals arrived, however, the committee quickly realized that separate implementation of projects, as proposed, would be wasteful and ineffective.

Redundancy abounded. For example, 15 departments (more than a third of the campus total) requested funding for the establishment of new personal computer labs. From one department came two separate proposals for labs from two faculty, apparently unaware of each other's requests. Several departments requested mini-computers, none of which provided additional service beyond that already available on campus.

Many of the proposals were technically incomplete and unworkable. Hardware was requested with no applications software. For many projects no provision for installation, power conditioning, remodelling, system maintenance, or other essentials were made. Many good projects risked early demise, because there was

no space to house them, or funds to keep them in operation, or technical expertise to maintain them. At a more subtle level, it was apparent that inappropriate hardware or software was being requested for otherwise, valuable projects.

Instead of a simple reactive role of funding some projects and not others, the committee decided to get actively involved in using the money to improve computing on campus. The goal became the efficient, workable implementation of the good ideas contained in the proposals. In other words, the committee redefined its role from one of funding computers to one of implementing curriculum improvements. Proposers were asked to provide more explicit and complete descriptions of the educational value of their projects. From these discussions the committee was able to forge a coherent development strategy.

Where common values could be ascertained, it was possible to propose facility sharing, e. g. a single pc facility to support history, social sciences and English for common data analysis, CAI and word-processing needs. In cases where such sharing could be agreed upon, the committee negotiated with Deans and support departments to obtain space, remodelling funds and operational support which would be necessary for success and which had not been adequately accommodated in the original proposals. The value of these larger, shared projects which helped several departments and thousands of students was easy to demonstrate to Deans, and their budgetary and personnel support greatly extended the original monetary allocation.

Discussion of educational intent revealed a natural temporal ordering which allowed priority setting and valid scheduling of projects. Some curricula were not ready for the requested projects, and the committee found it possible to concentrate funds on those areas where there would be an immediate impact. And, of course, some projects did not merit funding and the focus on educational goals helped emphasize their shortcomings.

Using the proposals as a starting point for discussion and negotiation, then, the committee developed its own comprehensive design intended to accomplish, as much as possible, what the faculty had desired in the first place. Through several iterations the design was discussed and refined by the original project proposers and finally adopted and implemented.

Discovering a plan. The campus computer design which emerged from this allocation process became, of necessity, a long term commitment. The new VAX, the large new pc labs acquired through the allocation were major investments which would focus expenditures and activities for several years. The committee also became committed to the procedure which had been established for allocating the yearly budget: request proposals, integrate proposals into a coherent design, implement the design. Although the system was founded on academic priorities, encouraged campus-wide cooperation, reduced redundancy and moved toward long-term stability and commitment, the terms 'strategic' or 'plan' were never used.

Finally, in 1990 the concept of a strategic plan for computing was explicitly introduced in a request from the President's Council. The Council sought some guiding principle for resolving the chronic, and sometimes impassioned, funding requests for student record systems, financial record systems, *and* academic computing. Vice presidents for Business, Student Affairs and Academic Affairs were each asked to develop long-term computing plans. Responsibility for creating the academic plan was accepted by the Faculty Senate Committee, and they approached the task by simply modifying the well-established fund allocation process.

Questionnaires were sent to all faculty asking them to state their specific needs for computer support. Departments were asked to meet to discuss these questionnaires and individual responses to it to prepare departmental statements of need. These department reports were reviewed by College committees in the preparation of College reports on computer needs, which in turn were passed on to the faculty senate committee. Areas of University-wide interest, networking, mathematical and graphics processing, word-processing, computer-based-instruction and student labs, were identified in the initial survey results and groups of interested faculty were asked to develop coherent plans for meeting these needs.

The completed Plan described 61 major projects in 6 general university-wide categories and within each of the 7 colleges. In addition many smaller scale projects were described within individual departments. A total of $6 million and a permanent budget increase of about $600,000 would have been necessary to fund the entire Plan, (Weber State University, 1991).

Like the designs for fund allocation from earlier years the "Plan" was founded on very specific, concrete projects proposed for particular courses, educational programs or research projects, e. g. three DOS pc's with laboratory interface boards to be used by the 25 students enrolled each quarter in Psychology 343, Experimental Design. Also like the annual fund allocation designs, cooperative projects, broad goals, campus priorities were all abstracted from the specifics, rather than specified at the start. It was a bottom-up plan.

Where the Plan differed from the fund allocation process was in its scope. Fund allocation designs were limited to the annual $200,000 budget at the Committee's disposal. The Plan, on the other hand, attempted to show how *all* computer money over three years, real and potential (and perhaps even imaginary), ought to be spent to optimize the academic program. Execution of the Plan would require budgetary support from Dean's and Department Chairs, and fund-raising support from the President and Vice Presidents, even though none of these administrators had had a direct role in the Plan's creation.

Operating with the Plan. The initial Plan was adopted by the Faculty Senate in the Spring of 1991. The Plan was revised in 1993, (Weber State University, 1993) and

is undergoing revision again this year. Currency through yearly revision is a goal of the Computer Committee.

The Plan has been used in three arenas. First, it has been used by the Computer Committee to allocate its yearly budget. Second, deans and department chairs, voluntarily and selectively, have based their own budgetary decisions on it. Finally, it has been the key rationale in appeals for increased funding. Nearly $.5 million has been allocated by the President's Council from University contingency funds in the last two years toward Plan implementation, and an appeal for a special legislative appropriation for some aspects of the Plan is under discussion in the Board of Regents. A review of implementation during the first academic year indicated that of the 61 major Plan projects, substantial progress was made on 17, some progress was made on another 17 and no progress was made on the remaining 27.

Contrast

Using a top-down approach, the President of the University of Montana directs an institution-wide group with a majority of administrators to develop a strategic computer plan. Through consideration of long term trends, basic institutional options and fundamental, common purposes, this group identifies major institutional goals. And finally, implementation details for accomplishing these goals are derived by user groups.

WSU moves in the opposite direction. Implementation decisions involving a single faculty group coalesce into a planning process and ultimately an explicit plan. The process arises from a set of specific faculty projects, and grows to encompass academic computer development in general. No special support, prior to plan creation, is offered by Deans, Vice Presidents or the President. Can strategic direction emerge from such informal mechanisms? How does faculty grown organization differ from that mandated by administrators?

A Closer Look

Top-down planning is meant to integrate computer development within fundamental institutional goals by deriving particular projects from basic, mission-derived goals. Such derivation, however, is not rule bound, or even very constrained. Consider how a reasonably high level goal, such as "Instill in students an understanding of computing and computing applications," might be translated into specific actions. A new course offered by the Computer Science Department in fundamental computer theory and architecture might be developed and equipped. The College of Business might expand its offerings in applications software: databases, spreadsheets, and so on. Each department might be encouraged and supported in the development of computer learning experiences appropriate for its field. Even with strong consensus on the higher goal, there could be deep and genuine educational disagreements on the

best way to achieve it. The philosophical disputes would be exacerbated by budgetary competition and facility rivalry. Mission statements, by design, are an institution's common ground and therefore not very controversial. Disagreement increases with specificity.

This problem can be attacked directly in the planning process. Arguments can be aired, disagreements resolved and specific decisions to do one thing and not another can be made--Computer Science gets the course, the other departments do not. For a plan of major scope there will be many losers as specifics are worked out and these losers may easily become disaffected from the plan and its implementation.

Alternatively these disagreements can be avoided by not forcing the process into specifics, by leaving the plan at the level of broad goals meant to guide decision-making informally. Given the putative goal of increasing computer understanding, deans, curriculum committees and others would do what they could to improve students' computer concepts as opportunities arose. Vague statements of goals with little clear impact on institutional decision-making, however, can be platitudinous and irrelevant to the real needs of faculty.

If the plan develops top-down administratively, that is, is encouraged and supported by the president and vice presidents then the cooperation of faculty may be more likely, but it is not certain. As a matter of fact, the top-down approach contravenes the traditional role of the faculty as masters of the academic program. Faculty are hired and tenured as independent, responsible professionals whose job it is to set curricular and research goals. Generally they have developed their own ideas about the nature of computing support for academic work and may have little patience for a planning process which they perceive to be detrimental, irrelevant or slow and bureaucratic. Beltrametti in a somewhat different computing context recently used a bottom-up approach at the University of Alberta because of the delays and staff resistance which can accompany top-down, manager-directed planning, (1993).

WSU's bottom-up approach avoids some of these problems. Being based on present curricular needs as stated by the responsible faculty it has immediacy and relevance. Since the process begins, rather than terminates, with concrete project descriptions, the elapsed time from funding approval to complete implementation is very short (typically no more than six months). With the narrow, curriculum-specific focus, the projects are very low-risk. Nearly all of the projects are implemented successfully, and have immediate demonstrable academic benefits.

The process is open and collegial, and therefore engenders a high level of trust among faculty. One remarkable consequence of this trust is a *reduction* in total funding amounts of the Plan and its precursors over the last 3 years. Apparently participants feel less inclined to exaggerate needs and pad budgets, since the real needs will be perceived and sympathetically viewed by colleagues. Decision making on funds has become concomitantly more difficult, however, since automatic rejection or trimming of bloated projects is no longer possible.

The discussion of specific projects within a broad faculty forum has helped individuals discover and appreciate the work of others, and has thereby fostered cooperation and inter-departmental sharing. Software standards have been established for faculty and student use. Coordination of hypermedia projects has begun under the auspices of the Instructional Technology Office. An intra-departmental effort has been initiated to combine and upgrade UNIX systems. Five of the largest student labs have combined into a joint administration. The basic design for the universal campus network was initiated and implemented through the academic planning process.

This is not to say that a miracle of selfless sharing has been wrought. There remain individualistic faculty and departments that have gone their own way. The experience at WSU, however, does show that coordinated projects aimed at general institutional goals can emerge from faculty deliberations on immediate curricular needs. Higher administrative direction is not a necessary condition for strategic thinking.

A clear disadvantage of WSU's planning tactic is that its limited scope tends to discourage innovation. Departments and colleges focus on immediate, short or near-term computing needs and do not take risks to innovate for more far-reaching results. While individual faculty may design an innovative computer-related project, there is no incentive to implement a university-wide change. The collaboration and cooperation across departments and colleges fostered by the bottom-up planning process seems to encourage short-term and immediate sharing of resources. The Faculty Computer Committee chair has suggested that some portion of funding be set aside for higher risk projects, but this met with negative feedback from the Committee that specifically wanted to let individual colleges determine where the plan, and consequently the funding, would focus.

The strengths of bottom-up planning are its immediacy, relevance and concreteness. A crucial condition for relevance at WSU was the budgetary allocation given directly to the Computer Committee starting in 1986. People were motivated to work at the process because it made a real difference in the accomplishment of particular projects. Probably no planning effort, up, down or sideways, can be sustained very long unless it has a clear impact on resource allocation. Given the responsibility to allocate too few funds to implement too many good ideas, the Faculty Computer Committee began to explore issues of academic priority and organizational efficiency, in other words began to plan strategically. It is similar resource allocation constraints which motivate presidents to initiate top-down planning efforts. Perhaps the logical problem of optimizing limited resources should be the key concern. Whether the problem is attacked by a president, top-down, or a faculty group, bottom-up, is less important than the logical and political quality of the solution. If the plan and its implementation improves the institution and is supported by the community then its origin is unimportant.

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THE ART AND POLITICS OF RE-ENGINEERING UNDER CRISIS CONDITIONS

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Re-engineering an entire college administration can be daunting -- wholesale change is intimidating and unwelcome to many. Common wisdom from the literature suggests that re-engineering should take place in times of stability and good fortune. In practice, there may be little motivation short of crisis for even launching an encompassing re-engineering project. This paper describes how Bryant College got started on such a project, the crisis conditions under which the project is proceeding, and the lessons we have learned to date.

MIS Project Background

In early 1991, Bryant College's administrative information system (IS) consisted of a set of independent modules for major functions, each with its own internally defined, flat data files. Most had come originally from a package purchased in 1986, but had been extensively modified. Custom linkages had been built between modules to copy data from one area to another. People were reasonably satisfied with existing functions, but requests for changes and enhancements were being met very slowly, or not at all for lower priority offices. In fact, the combined backlog of requests and necessary systems maintenance was estimated in excess of 200 days of programmer/analyst effort.

New leadership in the Development, Alumni, and External Affairs Division found the available IS functions to be inadequate for a proposed major fund-raising campaign. Their inquiry about possibilities for improving existing or acquiring new systems provided the impetus for a College-wide review of administrative IS needs. The Executive Director for Information Technology (EDIT) asked Vice Presidents to name representatives from major administrative offices to an Administrative Systems Advisory Committee (ASAC). The ASAC, which was first charged with articulating needs, became an important forum where members learned from each other about how the College did its business and how similar many of their needs were.

The EDIT then involved ASAC in development of a Request for Proposal to replace the existing administrative systems with a comprehensive set of applications built on an underlying, integrated database. Pricing was requested for initial purchase of Alumni/Development support alone, and for acquisition of a complete system to handle student information and services, and College financial support functions as well. By the time they completed functional evaluation of the candidates, ASAC members concluded that enrollment management might benefit from a new system as much as, or even more than, Alumni/Development. Consequently, ASAC recommended acquisition of a complete new administrative management information system (MIS), and the EDIT proposed it to senior management. The proposal was endorsed by the Board of Trustees in May 1992, a contract was negotiated, and system implementation got underway. Admission and Development, the two sources of College revenue, were targeted for first implementation.

College Context: Crisis and Opportunity

In addition to declining demographics, for which we had been planning, Bryant has also been faced with a Northeast regional economic slump and a significant, unexpected loss of student interest in undergraduate business majors, our academic

specialty. Much of the motivation for the new MIS came from interest in acquiring better tools to support improvements for the Admission and Financial Aid Departments in marketing and recruitment of new students, key activities in our consolidated approach to enrollment management. We also expected to contribute to retention by improving the timeliness of, and enhancing services to, continuing students.

During the fall of 1992, following budget cuts and administrative staff reductions, the College faced growing organizational unrest among its faculty and staff. While the EDIT had always intended for the MIS project to provide an "excuse" to foster examination of business processes, College economics and politics made that more important and more difficult at the same time. The pressure was on all areas of the College to cut costs, increase revenues, and generally do more and better with fewer people. In retrospect, it is easier to see that most participants did not appreciate the time or effort involved in shaping and learning a new system, much less in re-engineering our business. We continue to be faced with constraints on staff time and resources, needing to run up the learning curve and maintain business operations both, in offices already feeling overwhelmed by short staffing.

Project Approach and Major Players

The Executive Vice President (EVP), with primary responsibility for enrollment management and particular focus on recruiting, became the senior-level project champion. The EDIT took overall responsibility for project success, beginning with hiring a Project Manager to be responsible for the team of programmers and analysts. This person was selected by a search committee composed of two IT staff and three ASAC members who would be users of the new system. The EDIT also requested full-time assignment of a Team Leader from user ranks to guide users in shaping the student information system. We described the roles of these latter three as: chief politician, chief technical expert, and chief user advocate. Together they formed a management triad for project direction and execution, picking up leadership for the project from the ASAC.

Because she had chaired ASAC through that activity, the Team Leader easily carried forward the collaborative and educational advantages of ASAC's participation in the MIS selection. Her first task was to fill all the code tables that tell the software package how Bryant wants to work. She drew representatives from every administrative office involved with students to form a Coding Committee. Together they examined and agreed on values for over 100 system tables, while the EDIT had ASAC went on to formulate policy recommendations for who would have access to what data for what purposes.

Guided by the software vendor, all administrative offices participated in an overall project schedule planning exercise. Discussions of work breakdown into tasks and relative timing were later held by the Project Manager with individual offices. The schedule was then adjusted to fit work around periods of peak office activity. The order of implementation reflected expectations for benefit or internal software linkages, e.g., we put admissions first and the group of financial aid, accounts receivable, residence life, and registration second. One thing we failed to do, however, was incorporate the process review and analysis activities overtly into the project schedule -- not even as placeholders for time or staff assignments.

Getting Started -- Admissions and Financial Aid

With our eyes on the potential benefits of making new tools and capabilities available to people responsible for ninety percent of College revenues, we jumped into implementation of the admissions module for the full-time undergraduate Admission department. The first target date, to capture data and generate correspondence for prospective applicants, was missed by three months, primarily due to late delivery, installation, and debugging the setup of hardware. Beyond this, IT did not fully understand, until the module went into live operation, that Admission staff expected to get exactly the same reports (content and format) from the new system as came from the old one. We did discover that management commitment to process review was inconsistent across departments, however, as soon as the EDIT convened a group to assess alternative approaches to data entry. No commitment to consider or implement change was generated. At the time, the perspective from the Director of Admission was that people could not appreciate how different the new system might allow things to be until they had "put their hands on the keyboard" to gain experience. This tended to drive us to take an incremental, rather than a synoptic, approach.

While software implementation activities were focused on undergraduate admissions, we took a different approach with Financial Aid. A faculty member from the Computer Information Systems department offered and was encouraged by the EDIT to begin from a process review perspective. He interviewed Fin-aid staff and documented their existing operational procedures, data flows, and decision processes, and fostered discussions about what improvements they would like to make in their services. People concluded that improvement would be more likely if changes crossed departmental boundaries instead of being confined within Financial Aid. By this time, however, pressure on IT to address Admission's issues was so great that no forum was provided to extend the Fin-aid discussions to the related departments. All IT support for Financial Aid became focused on adapting to the new federal rules under the Higher Ed reauthorization.

In an attempt to consolidate articulation and understanding of Admission's expectations, the EVP was eventually called on to moderate development of a "contract" between Admission and IT that listed functions and reports required to make the software implementation "successful." All available programming resources, including an outside contractor, were then assigned to Admission to clean up outstanding items. A new schedule was proposed, naming a new target for complete live operation by Admission and, after discussions with other departments, dropping the next modules back about six months. The EDIT suggested separating Admission, as Phase I, from the next modules, as Phase II, to formalize what had been learned into a different model for project leadership and management.

Toward the end of the period of intensive focus on Admission, the EVP and EDIT agreed on a quick review by an independent consultant of the project status and recommended schedule and management changes. Interviews were arranged, recommendations received, and proposed changes endorsed. The consultant assisted us to focus and articulate what we had learned so that it could be captured and put to use for the remainder of the project.

Lessons Learned

Probably the most basic lesson we have learned is:

(1) effective re-engineering is difficult to accomplish as a byproduct or side effect of another project.

The level of commitment for time and resources must come from the top down and be consistent across the College. Our financial concerns made the dollar investment in acquiring the IS hardware and software paramount in most minds, focusing staff time and energy on opportunities for cost recovery or revenue enhancement rather than service or business improvements. It is critical to set the context and project philosophy to emphasize customer service enhancement and job effectiveness, NOT the information technology tools. Today this seems rather obvious, but when we started, little practical guidance was available in the literature.

The most important lesson we have learned to date is:

(2) there is a huge difference between user participation and user control.

User departments at Bryant were accustomed to asking IT for data or functions, having IT go away and make it happen. Previous system conversions had been done over a week-end and were largely transparent to user operations. The EDIT's inclusion of ASAC, not just in evaluating candidate systems, but in making the final

selection, can now be seen to fit a familiar pattern of user control, although the process was quite different. The departures came when control transferred to the project management team, and substantial user participation was required, first for coding and then for implementation tasks (such as training each other, learning the query language, documenting procedures, etc. -- things that had been done for them by IT in the past). In retrospect, we had gone from one extreme to another, from complete user control and little participation, to little user control with major requirements for participation.

We've found that an important companion to control is:

(3) users need to be accountable to each other for system decisions that affect overall project implementation schedules.

We really caught ourselves on this one -- with IT, particularly the programmer/analysts, taking all the heat for missed target dates, when users had actually been expanding their expectations and functional demands as they learned more about the new software capabilities. The more energy IT invested in Admission, for example, the less time was available to prepare for the next set of modules. IT staff became incredibly discouraged at not being able to finish things on time, Admission got no nearer to completion, and other users began to lose interest, feeling we would never get to them or would not be able to meet their needs either.

A lesson it has taken us some time to appreciate is:

(4) our vendor did not understand what was involved in, or assume adequate responsibility for, ensuring the success of our project.

Phase II -- What We Plan to Do Differently

After more than one year's work on Admission, the EVP has reconvened the ASAC with a longer-range charge to advise the EDIT on administrative technology needs, serve as a clearinghouse for information related to campus-wide administrative computing, and keep the EDIT apprised of issues. For the duration of the MIS implementation, a subcommittee of the ASAC, called the MIS Steering Committee, will be responsible for guiding the project by defining the scope of activities, setting priorities, and monitoring progress. Membership on the Steering Committee includes a representative from completed modules, to provide insight from experience, and representatives of the modules currently being implemented. The Committee will be chaired by the Dean of Administration; the IT Project Manager and the vendor account representative will provide resources. We thus return

control of the project to the first-line users, giving them back responsibility, and matching that with accountability, for project decisions.

The first task for the reconvened ASAC is to review and finish documenting their policy recommendations for data access, privacy, and security. The EDIT will also ask ASAC to consider the questions raised by senior management about how much process review and design the College can "afford" right now. Our impression is that only a grassroots commitment could rekindle enough enthusiasm to carry the re-engineering effort forward. My concern is that, while necessary, it may not be sufficient so long as a crisis attitude prevails. Every office needs to continue operating with fewer staff, making project time difficult to carve out of routine office duties. This is the new reality, however, and we must learn to cope with it better. Upper level management commitment for any re-engineering is vital; it remains to be seen whether ASAC can generate it. This is another, although possibly local, lesson:

(5) it is difficult, if not inappropriate, for re-engineering leadership to come from IT.

On the other hand, upper management support is clearly necessary, as demonstrated by the success of a process review completely separate from the MIS implementation. A registration process study group was charged by the EVP to examine the various ways and places we perform student registration (full-time undergraduate, part-time undergraduate, graduate, continuing/ professional) and to recommend appropriate consolidations for economy of operation and improvements in service. The MIS Project Manager was a member of the committee, but served only as a consultant on how the new MIS might support any changes under consideration. This group's work was incorporated into a recent restructuring of the Academic Affairs division, but has not been used to advantage as a prototype for other process review activities.

For phase II then, the EDIT will try to focus IT's attention on serving customers with the software implementation. We need to capitalize on what we learned with Admission, including creating more formal "contracts" to specify functions and reports that will constitute "successful" implementation. These will be developed under the supervision of the MIS Steering Committee to ensure College objectives and schedules are met and that required resources (IT and administrative staff) are available or can be obtained. In addition, IT needs to pay more attention to the time required for users to develop a level of comfort in understanding the new system capabilities before certain decisions about the suitability of functions and operations can be made.

During phase II, IT must:

1. Focus on the user by: placing early attention on user needs and expectations; finding ways to build credibility and forge alliances within each user department; paying attention to user business requirements and perspective.

2. Stay grounded in reality by: pairing up visionaries with detailed pragmatists ensuring that planned changes are realistic (e.g., in Admissions, we assisted with redesigning their application form so that data on the form matched the order of items in the new data entry screens).

3. Build user investment by: putting their hands on the system as soon as possible, and guiding them to see it as part of the solution rather than a new problem.

4. Find ways to bring underlying assumptions to the surface by: writing things down (the "contracts"), working beside users in their environment, and checking, checking, checking with those users.

5. Keep things moving by: involving users continuously, building on project momentum, and especially enlisting and encouraging user "champions."

6. Capitalize on user strengths by: encouraging and harnessing user enthusiasm and creativity, making a concerted effort to "see it their way."

7. Encourage the celebration of victories by acknowledging the effort, investments, and progress made by all involved with aspects of the project.

Meanwhile, the Steering Committee will be intimately involved with the detailed progress of the MIS implementation. They will report to ASAC at least quarterly, creating a vehicle to communicate that progress widely. We hope that users of modules still to be implemented will develop a better sense of what it takes to achieve, and the likelihood of, success for their areas. Each will serve on the Steering Committee as we move to their module in the implementation plan. The Steering Committee will also report to the EVP quarterly so that progress can be communicated to the rest of senior management. We expect to use broader communication of objectives, responsibilities, target dates, and progress to focus the community on the MIS implementation as a College-wide, not an IT, project.

A Parallel Implementation

One of the reasons we are disappointed with our progress on the student services and information side is the contrast with our Alumni/Development experience. This area has a much smaller, more tightly knit group of people (consisting of only two rather than twenty department/offices), who were coming from old software that provided separate files for alumni, donors, and giving history, along with some transaction processing. Little customization or enhancement had been done because there had not been consistent leadership in the division for long enough periods. We used a parallel project approach with a team leader for implementation and a user committee to specify the necessary code values.

In working with Alumni/Development staff, we found that the size of the gap between an inadequate old system and a very sophisticated new one was a definite bonus. Reviewing and changing how they did their business became an integral part of discovering how to set up and use new capabilities to advantage. User expectations about the learning time and energy required were more realistic from the beginning, and there was no history of having IT "do it for them." The software modules require outside linkage only to the General Ledger; otherwise they are self-contained. Because this mirrors our organizational structure, it was easy for users to accept -- they did not have to coordinate with formerly independent offices to make the system effective. Successful implementation of very sophisticated functions was achieved in less than one year.

Major benefits of the process and system are quickly being demonstrated. Although key users left the College during the implementation period (the team leader and several directors), we have restructured and combined staff functions from previously distinct areas to reduce the total number of positions and still operate better than ever before. Our first supported phonathon is currently in progress.

Conclusions -- While They May Seem Obvious...

To re-engineer successfully, we now understand better that one must:

1. Emphasize enhancement of customer service and improvements in job effectiveness -- not the information and technology.

2. Get users invested in designing and becoming part of the solutions -- instead of allowing them to wallow in the problems.

3. Coach IT staff into a user-based, customer-service perspective -- instead of allowing them to concentrate on installation of technology.

4. Formalize the process of discovering assumptions, articulating expectations, and building shared vision -- instead of assuming that everyone is moving in the same direction toward the same goals.

5. Create formal, public user stakes in the project.

6. Find ways to create early successes, even if small, and publicize, publicize, celebrate -- don't assume that successes are obvious or that everyone notices them.

7. Make sure that project management is handled by a team with a strong, consistent vision, operating with a single philosophy, and communicating clearly among themselves and with others -- not simply a group of people cooperating during a project term.

8. Set goals realistic for both the people and the institutional setting, and try to establish metrics for assessing benefits to be achieved. Don't allow the vendor to set goals, and don't follow someone else's plan -- it is rare for sister institutions to have similar enough characteristics.

9. Have everyone who is affected by the changes participate -- even if they argue that their contribution will be minor.

10. Recognize the enormity of the effort: the time, energy, people, and physical resources required -- there is no "free lunch."

Above all, expect that re-engineering will be a complex, often bewildering, and typically threatening "change process" for both IT and users. We've found that the management key to successful re-engineering is to reduce the associated personal, process, and organizational uncertainties. We should manage the risks and let the participants design and manage the processes.

Doing More With Less: A Pragmatic Approach to Getting the Work Done

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Abstract

As most higher education institutions in the country are facing budget and staffing cuts, administrators are looking at less staff-intensive methods to accomplish administrative tasks. This paper describes how the University of Delaware's Office Systems group addressed this reduction in staffing issue by identifying it as a new challenge for cost-effective use of Information Technology. The Office Systems group helps departments and colleges face the challenge of implementing automated systems. We guide users through a process of analysis, system design, integration, funding, documentation, and implementation. The approach is one of offering solutions rather than technology. We present our recommendations in a comprehensive package that also includes practical considerations such as physical office space requirements, or the appropriateness of the building's existing electric and telephone wiring. The Office of the Dean of Students project will be presented as a case study to illustrate our approach.

Doing More With Less:
A Pragmatic Approach to Getting the Work Done

The Concepts

From Information Center to Office Systems - Beyond Word Processing

The University of Delaware is a multi-campus university system. It enrolls more than 20,000 students and employs nearly 1,000 faculty and over 2,300 professional and salaried staff members[1]. In late 1984, the University of Delaware's MIS department established a service within its management structure to provide office automation for the administrative branch of the University. The Information Center (IC) was created to conduct needs analyses, document studies, and cost projections for secretarial staff office automation. A task force was established to select a word processing standard, and a plan was laid out to bring the affected staff up to par in terms of computing. Three staff and a manager were hired to start the process, and in the Spring of 1985, the conversion to word processing was started.

Since then, the Information Center has continued its crusade for computer literacy of the University's staff by providing support for the mission-critical mainframe data as well as the many user-developed, microcomputer-based systems that were popping up in the administrative offices as a result of a mainframe system development backlog.

Today, the IC no longer exists; instead, it has been superceded by a new support team for administrative computing called Office Systems (OS). The goal of this new team is to help administrators cope with the significant cutbacks in staff and funding that have resulted from budget reductions over the last four years. Our mission now reaches far beyond simple word processing, and our users are more knowledgeable and computer literate.

Facing a Better Trained Workforce

Desktop computing was introduced in 1984 when office automation began on campus for the administrative offices, and a University grant was established to provide the faculty and professional staff with an opportunity to purchase a personal computer at low cost. Nine years later, this investment has paid off: we now have a well-trained workforce and a good level of computer literacy among faculty and professionals.

From Hand-Holding to Think-Tanking

No longer does the Office Systems staff have to show users the benefits of word processing or electronic record keeping. Our users have experienced the many benefits first hand. Now they want more, and they create their own think-tanks within their departments to come up with new ways to do their daily work. The Office Systems staff helps them put their ideas into a form that is usable within their department without too steep a cost or learning curve. We also try to make the new systems fit into existing ones without too much redevelopment or investment in new software and hardware. Cost-effectiveness and staff productivity are our primary goals.

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[1] Source: Office of Institutional Research, University of Delaware.

Are We There Yet? Planning For Solutions Yet To Come

While we help our users with their automation goals, we also teach them how to plan for new solutions that the University's Computing and Network Services department is envisioning for the future. For example, CNS is currently in the process of wiring our campus for Ethernet. Most of the administrative staff have been working in an SNA environment for more than ten years, and are reluctant to accept the change. They are unaware of the many applications and wealth of information available to them via access to the Internet. It has therefore been the goal of CNS to provide the users with this knowledge and to make them aware of the benefits by creating real-life solutions otherwise not available to them. Other emerging technologies are being implemented on our campus such as electronic forms, kiosks, voice-mail, cable TV and digital technology to all dorm rooms and offices.

Increasing Productivity Within Budget Constraints: The Ultimate Challenge

Because of the continuing price reductions in computing equipment, it has been possible for the Office Systems group to increase productivity in various offices on campus while still maintaining the continuing level of budget reductions required by upper management. Often, this has presented some real challenges and required some very creative suggestions from both users and Office Systems staff. For example, at the time when the staff of the University Secretary was cut in half, a decision was made by the Board of Trustees to significantly increase the number of advisory committees to the Board. This resulted in a tremendous scheduling problem for the staff member in charge of organizing the committee and board meetings. The Office Systems staff provided the staff member with a turnkey system that practically runs the whole process. The new systems selects committee members, prints invitations, creates meeting minutes, interacts with food services and schedules transportation for committee members. What used to take several staff days to do by hand is now done in minutes by one operator.

How Did Office Systems Know You Were Shorthanded? THEY ASKED!

As in the Paine-Webber TV commercial, the Office Systems staff planned for the constraints users' offices were experiencing when faced with staff and budget cuts. We asked our users how they planned to cope with less staff, yet perform the same amount or more tasks with a leaner budget. Many offices were so short-handed that they simply hadn't even thought of how they would cope. Many were so backlogged that they would not even want to hear about changing their work habits or learning new technologies that would help them cope with their workloads. We helped them realize that they needed to streamline their systems and become more efficient in the use of their staff. We also helped them realize that by using the technologies available to them, they might at first see a decrease in productivity because of learning curves, but would soon see a tremendous gain in productivity that would allow them to structure their offices and task assignments in a more effective way. And we gave them our unconditional support and help through the learning period.

Overcoming the Daily Routines: Leaving Room for Planning

One of the biggest obstacles we encountered when helping our users plan for better office systems was the remark "I just don't have time to talk to you right now!" And they didn't! We could see firsthand how overworked some of these people were. In the Dean of Student's Office, for example, we found that we could not speak to anybody for longer than 1 minute before being interrupted by telephone calls. Soon we realized that most of these telephone calls were redirected to the Registrar's Office or to the Admissions Office. So the first suggestion we made was to put an answering machine on the telephone to screen these calls. IT WORKED! Even though they did not quite get an answering machine, they did purchase new telephones with features capable of rerouting calls. This interim solution was preferred while waiting for the campus-wide implementation of voice mail for administrative use during fiscal year 1994.

Involving our Buddy: The CRP

We have a network of "buddies" in place on our campus. They are our departmental contacts and we refer to them as the department's Computer Resource Person (CRP). The CRPs are trained thoroughly in computing applications and receive preferential treatment from CNS in terms of support. In turn, they provide CNS with a resource to funnel information for dissemination to the users and back to CNS. Since the CRP knows the business environment of the department, we work through the CRPs to find systems suitable for automation. They are present during all meetings with the department and are the channel through which we report progress to the department.

Asking the Right Questions and Getting the Right Answers

When thinking about office automation, it is imperative that the Office Systems staff know how to receive correct information from the users. Asking the right questions is therefore key. We make a concerted effort to avoid using computer jargon and to talk business rather than technology. Using this approach has given us many opportunities for opening communications with other departments on campus and often puts two people together to solve issues without our help. For instance, when we interviewed the CRP of our College of Engineering, we learned that one of the secretaries rekeyed into a word processor all the recruitment information received from the Admissions Office about minority students. We spoke with the Admissions Office and asked if this information could be obtained in electronic format. The answer was "certainly."

Is Management Support Necessary?

Attempts to obtain management support for our automation projects have been successful in varying degrees. We found that the degree of departmental management involvement is correlated to the project's successful implementation. Even though most requests come to us from the clerical staff, our most successful projects have been those in which we have involved management from the very beginning. If management is not sold on the process, the projects will not be successful, and a lot of time and energy will be wasted.

What About Funding?

Office Systems staff do not help departments obtain funding for automation projects. We do suggest avenues for the department to pursue to obtain support and funding. One alternative may be to spread implementation cost over more than one fiscal year. Another option may involve requests for grant money matched with department funds. We found that once a department believes in the benefits of the automation project, they will find the funding for it. It is the duty of Office Systems to provide the department with a complete and realistic cost analysis for the project, and to make sure there are no financial surprises during its implementation.

Don't Forget to Implement the Project: Doing It As You Go

As a rule, we take care of tasks not requiring funding during the project analysis period. This "instant gratification" approach encourages the department to continue the project and see it through to completion. Once funding is obtained and the project implementation stage has been reached, we find that we need to make sure implementation goes smoothly and as planned. We monitor progress through the CRP and provide the department with our assistance if deadlines are not met. All too often, departments "forget" implementation deadlines when workloads peak periodically during the semester. While we accommodate these peaks in our project plan, we find that users forget to pick up where they left off after the peaks have passed. We make sure that they continue implementation by offering our help during these periods.

The Process

Background

Before Office Systems begins working on an office automation project, we have a staff meeting and brainstorming session to decide how to approach the project(s). Our objective is to make recommendations for improving office functionality and promoting usage of the facilities and information available to the departments on the central mainframes. We use the following steps as a guide for conducting a successful needs analysis.

Steps Involved in Accomplishing the Objectives

Step 1: Interview all staff members.

Before the project begins, a letter is sent to the CRP (the computer resource person within the department), along with a list of questions we plan to ask. The CRP is instructed to give a copy of the questions to each staff member. The CRP is also involved in scheduling the interviews and may attend each interview, if desired. A sample of the questions we ask is provided in your handout materials.

Step 2: Write preliminary report.

Our findings are compiled during the next month or so, and a preliminary report is written. The report is returned to the CRP to verify that we made an accurate depiction of their office procedures.

Step 3: Perform walk-through with selected CNS staff.

The walk-through is an informal meeting with members of the Computing and Network Services staff. During the walk-through, we review the preliminary report openly and brainstorm alternatives to our recommendations. Members of CNS provide information on what data is available on the central mainframes, and how the department can utilize it effectively. Connectivity issues are also discussed, if necessary. This walk-through helps assure that our recommendations are in line with CNS's long-term strategy.

Step 4: Conduct interviews with departments interacting with the College or Department.

Commonly, the department being analyzed interacts with one or more outside departments on a regular basis. In this step, we meet with staff member(s) in the other departments so we can determine solutions that will be in the best interest of all departments involved.

Step 5: Include recommendations and cost analysis in the report.

In this step, we revise the preliminary report, considering the findings from the walk-through and notes from the outside departments. Also, new equipment recommendations and connectivity needs are included. Finally, we determine the approximate cost of the project.

Step 6: Submit final report and implementation plan to the Dean or Department Head.

The final report is submitted for approval to the Dean or Department Head. If they agree with the plan, then implementation can begin.

Step 7: Find funding sources and obtain funding.

Most departments don't have the money readily available to fund these improvements. So, in these instances, we present our recommendations to the Department Head, who can use it as justification to request funding from their superiors or other suggested sources. Sometimes the Provost's office agrees to fund a portion of the project.

Step 8: Implementation.

This includes everything from ordering new equipment to submitting work orders for data line installation, to installing software and training the users. The time frame for this step is entirely dependent on what needs to be done. It can sometimes take over a year to complete. Finally, a turnover letter is sent to the department to mark the project end.

The Case Study

Overview

The Dean of Students Office (DOSO) consists of four professional staff members, one non-professional support staff member, and two secretaries. The office provides numerous services to students at the University and is also responsible for handling judicial matters. When the new Assistant Dean of Students joined the staff in 1990, she noticed the large amount of manual

work that was involved in tracking a judicial referral through "due process" and thought that there must be an easier way to do it. She also found it difficult, if not impossible, to gather statistics on current cases for her regular meetings with the Judicial Council. Then after losing one of her support staff members, she called on the Office Systems group to take a look at how her office conducts business.

Observations

The following is a list of the major responsibilities of the Dean of Students Office:

- Track Judicial referrals and due process
  Includes scheduling pre-hearings, hearings and related appointments, and preparing *ad hoc* reports and end-of-year statistics
- Track off-campus tickets issued against students
- Process student withdrawals
- Track crisis data
- Maintain office staff sick and vacation records
- Answer telephones and direct calls

We found that most of these functions are performed manually, with an over-abundance of forms and paperwork shuffled within the office and to other departments. The specifics of our research and our recommendations are described below.

Tracking judicial referrals through the "due process" cycle is perhaps the largest and most time-consuming function of the Dean of Students Office. The office receives official complaints which are hand-recorded on a Judicial Referral Form. The referrals usually come from Public Safety (our university police) or Housing and Residence Life, but can be initiated by anyone. Once a complaint is recorded, due process begins.

Each step of due process is tracked manually using the Judicial System Tracking Form. The office staff are using a database to a limited extent to record information, but an application has not been implemented to track the status of a case as it progresses. Approximately thirteen yearly statistical reports and at least one monthly report of current cases are manually prepared (hand-counted).

The Office of Housing and Residence Life (HRL) works in cooperation with the Dean of Students Office. If a case is referred to the DOSO by Housing, it is tracked by both offices. Although the official file resides with DOSO, HRL keeps a photocopy of the file contents for their own records. If a case is referred to DOSO from another source, then Housing does not keep a record of it. This communication gap sometimes results in a student being issued a sanction by the DOSO without HRL's knowledge (behavioral history is an important consideration when issuing subsequent sanctions). HRL uses a simple database on their own Local Area Network to record case information, but no electronic means exists for the departments to share data. Student files are hand-delivered daily between the two offices.

When a student is charged with an offense by off-campus police, the DOSO is also notified. The DOSO retains a copy of the ticket and sends a notification letter to the student. About 200 off-campus tickets per semester are recorded using a WordPerfect file. However, WordPerfect's full

features (*i.e.* Sort and Search) are not utilized when reports are generated, and the data is not organized in any logical order. Crisis situation data is also kept in a WordPerfect document, and, like the off-campus charge data, reports are compiled manually and unsorted.

Student withdrawals are also handled by the Dean of Students Office. When students want to withdraw from the University, they must fill out a form at the DOSO. Then they are advised to personally notify Financial Aid, HRL, and some other departments of their intent to withdraw. An eight-part Withdrawal Notification form is then manually typed by the secretary and distributed to the following: the student, DOSO, Records and Registration, Accounts Receivable, the Academic Dean, HRL, Financial Aid, and Dining Services. A monthly list of all withdrawn students is prepared manually and distributed to eighteen departments.

Miscellaneous office duties of the secretaries include answering telephones and directing calls. The office has eight phone lines. The phones are extremely busy, and many of the calls are directed to another appropriate department. One secretary is also in charge of maintaining the vacation and sick leave records for the staff members. These are kept on handwritten charts -- one per employee.

The secretaries are also responsible for scheduling pre-hearings, hearings, and appellate hearings with the Dean and Assistant Deans. This is all done via paper calendars. Individual calendars are typed up daily for the Dean and Assistant Deans.

Each staff member has a PC with mainframe access; however, these machines are not used to their best capabilities. The Dean, for instance, was using an IBM Model 55sx for electronic mail access only, while his secretary uses an IBM Model 30 for word processing and spreadsheets. The oldest of their equipment was an IBM XT, which is used by the staff assistant.

Recommendations and Justification

We recommended the following be done to help automate the Dean of Students Office procedures:

Provide each member of the Dean of Students staff with a desktop computer with LAN and mainframe access.

Develop a LAN database application to track judicial referrals using R:Base 3.1. This includes developing an official information policy between DOSO and HRL to determine who has the right to access information handled by DOSO and HRL.

Develop a means of tracking off-campus tickets and crisis data using R:Base.

Develop an automated means of notifying the necessary departments of a student withdrawal.

Purchase WordPerfect 5.1 for office staff for use with VASS (Vacation and Sick System) to track staff vacation and sick leave.

Purchase R:Base 3.1 LAN 5-pack.

Evaluate an automated telephone answering system to direct calls.

Provide training to the staff members.

Since each member of the DOSO staff already had a PC with mainframe access, it was not necessary to make major hardware purchases. There was already a Banyan network in place in the DOSO's building (and HRL owns their own Banyan server), so the PC's only required token ring cards to connect to it. There was, of course, a connectivity charge for this. The only system that needed to be completely replaced was the oldest PC/XT, which was incapable of running the latest R:Base version efficiently. Other PC's would be swapped around the office to make the most of their functionality.

We also recommended they purchase WordPerfect 5.1 and R:Base 3.1. Our campus has been somewhat standardized on these vendors for many years now. The Office Systems group developed a macro, using WordPerfect 5.1's Table feature, to track employees vacation and sick leave. Since the DOSO and HRL already had data in older versions of R:Base, we recommended they continue using that product to develop the new and improved judicial tracking database, which would also include the off-campus offenses. The crisis data, which was already kept in a WordPerfect file, could be easily imported into a separate database, also within R:Base.

The electronic mail package that is most widely used by the administrative users on campus resides on our IBM mainframe and runs under TSO. This package includes a calendaring system, bulletin boards, conferences, and the ability to use electronic forms. Thus, two of the DOSO problem areas could be addressed by simply utilizing the tools already available on the mainframe. By granting the secretaries access to the appropriate person's e-mail account, they could easily schedule appointments and print daily calendars on the fly. We recommended that an electronic form be developed to notify the necessary departments via e-mail of a student's intent to withdraw from the University.

We also recommended that an automated telephone answering system be evaluated so most calls could be directed without secretarial input.

Implementation

The first step of implementation was to obtain the necessary funding. We presented our report to the Dean of Students stating our findings and recommendations, as above. The Dean used our report as justification to ask his Vice President for the funds. His Vice President agreed.

Once funding was acquired, Office Systems prepared the requisitions to order the hardware and prepared the work orders for the Data Communications group to do the wiring. Upon delivery, we set up the equipment, loaded software and swapped machines among users. We conducted one-on-one training sessions to get the users familiar with the Banyan environment. We also provided a custom R:Base training course for the DOSO staff members, which incorporated their own data into the class exercises.

Office Systems supplied a development team to design the new judicial database system. This new system has been in use for about two years now. The Dean of Students staff members have

taken enthusiastically to it and strongly depend on it. As the staff members have become more familiar with R:Base, they are able to create their own *ad hoc* queries and reports quite painlessly. Office Systems provides support, along with some updates and enhancements.

Once the judicial database was fully functional, HRL was granted access to the DOSO server to query the data. Although HRL has not developed their own shadow system of the data, they have on several occasions exercised their new query privileges.

Office Systems also developed an automated fill-in form, which is used to notify departments and colleges of a student's intent to withdraw from the university. The electronic form is sent to 24 recipients, and only one hardcopy record is maintained in the DOSO files. This new procedure has drastically reduced the paper flow between offices, and each office is responsible for keeping its own records of withdrawals.

After some preliminary research, our recommendation for an automated telephone answering system was ruled out because of its extensive cost. As an alternative, new phone sets were installed in the office which offered more features than a standard push-button phone. We are awaiting implementation of a voice-mail system, which the University plans on making available to staff and departments sometime this fiscal year.

Conclusion

The Dean of Students Office is only one of the several projects that has been successfully implemented by the Office Systems group during the past two years. Other departments served are the College of Physical Education, the College of Education and the Department of Music. As the news of our successes spreads across campus, we have been approached by more users who require automated solutions for both big and small projects.