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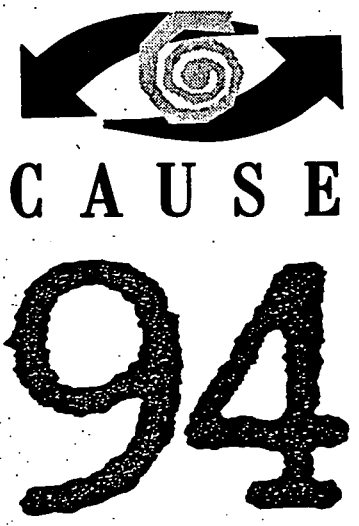
ABSTRACT

Seven papers are presented from the 1994 CAUSE conference track on partnering within and among higher education institutions in regard to information resources and technology. The papers include: (1) "Having Your Cake and Eating It Too: A Recipe for a Collaborative CWIS in a Decentralized Environment," which discusses the development of Johns Hopkins University's campus-wide information system (Lee Watkins, Jr., and Laura O'Callaghan); (2) "Partnerships with the Deans: Delivery of the 'Whole Product'," which describes partnership efforts by the University of Michigan's Information Technology Division (Laurie L. Burns and Cheryl Munn-Fremon); (3) "Models for Partnering with Education," which focuses on partnerships between higher education institutions and elementary and secondary schools (Patricia S. Ernest and John R. Fry); (4) "Building Partnerships on Best Practices: New Alliances for the Nineties," which focuses on process reengineering (David J. Ernst and John R. Fry); (5) "Chasing the Boulder Down the Hill: Reengineering and Architecture at the University of Pennsylvania" (Linda May and others); (6) "Partnering Within the Institution and Beyond," which discusses Virginia Tech's movement from a mainframe to server-based environment (A. Wayne Donald); and (7) "EXEMPLAR! A Consortium for Administrative Software Sharing." (Some papers contain references.) (MDM)

New Opportunities for Partnering



TRACK I
PARTNERING

Coordinator: Dennis R. Aebersold

Proceedings of the 1994 CAUSE Annual Conference

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Walt Disney World Dolphin
Orlando, Florida

HAVING YOUR CAKE AND EATING IT TOO: A RECIPE FOR A COLLABORATIVE CWIS IN A DECENTRALIZED ENVIRONMENT

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ABSTRACT

As a result of a unique partnership between four differing units at Johns Hopkins—Academic Computing, the Eisenhower Library, News & Information, and Student Affairs—a flexible, comprehensive, and inclusive campus-wide information system is now fully developed and highly successful at Johns Hopkins less than a year after inception. JHuniverse, as it known, has knit together faculty, students, staff and alumni across the divisions of the university and around the country in a manner that simply did not exist before, while providing the flexibility and "ownership" that is necessary to remain true to the spirit of entrepreneurial dispersion which characterizes Hopkins. By leveraging the strengths of each organization and capitalizing on the entrepreneurial nature of the institution, the project team was able to implement the system at very low cost while maintaining the commitment to provide universal free access in what is normally a pay-as-you-go internal economy. The result is one of the few true university-wide resources, rather than being perceived as an enterprise of the computing center, the library, or the administration. This presentation describes the genesis and development of—and prognosis for—the interdivisional collaboration, but it is also the story of how JHuniverse has helped make decentralization a win-win proposition for Hopkins.

BACKGROUND

The Johns Hopkins University is a remarkably decentralized, geographically dispersed research university composed of eight very independent schools on three main campuses in two cities, a major research division in suburban Maryland, with numerous centers and affiliates in the Baltimore-Washington region and two in foreign countries. Given such an environment, a comprehensive networked information system would seem to be absolutely essential, yet differing priorities long conspired to prevent such a system from coming into existence.

CAUSE attendees might find it difficult to believe that less than a year ago a world-renowned institution like Johns Hopkins did not have an official campus-wide information system (CWIS). This is especially striking because these systems are now commonplace among universities and colleges. However, anyone familiar with Hopkins' historical emphasis on individual excellence and resistance to just about anything resembling centralized control would not be surprised in the least. This is part of a long tradition extending back to the first president of Johns Hopkins, Daniel Coit Gilman, one of the seminal minds in the history of American higher education. In his installation address, Gilman stated Hopkins' goals as "The encouragement of research ... and the advancement of individual scholars, who by their excellence will advance the sciences they pursue, and the society where they dwell." This simple vision is in fact what gave rise to the modern American research university as we know it today. It has served Hopkins exceptionally well, but it also resulted into an institution firmly committed to independent scholarship and supporting only as much infrastructure as absolutely necessary.

Herein lies the root of a dilemma for Hopkins: in the Information Age, it is no longer possible to advance research and promote excellence in individual scholarship without an adequate information technology infrastructure. This, by it's very nature, requires common standards and goals, which are best attained through coordinated, cooperative effort. Recognizing the need to respond to this and other challenges, in 1992 Hopkins established a Committee for the 21st Century (C21) to "examine critically and imaginatively every aspect of the University's organization and programs...". C21 members were charged "to think along radical and fundamentally new lines ... to assume that many current arrangements will be outmoded and unsustainable by the end of the 1990s...". In other words, if Hopkins is to prosper and remain in a leadership role then nothing can be set aside as sacred, not even our long standing decentralization. C21 also recognized the critical role that information technology would play in any self-transformation, stating that "Universities that succeed in exploiting these technologies in a cost-effective manner will flourish; those that cannot will diminish in stature."

PROJECT ORIGINS

Despite these laudable efforts, the fact remains that Hopkins could ill afford to wait until the 21st century to establish basic institutional networked information resources. At

many schools the establishment of a CWIS was officially mandated by the administration; at others it was initiated by major information providers; in most cases it is operated by or through the computing center. Given that none of these were probable mechanisms at Hopkins (there is no CIO or equivalent position, no university computing center, and even Communications and Public Affairs is decentralized), the question becomes: in an institution focused on individual achievement and where the dominant perspective is that of each separate division, how does a common information system come about? Certainly it would not spring into existence by spontaneous generation. In a sense, however, that is actually what happened, and to some extent this validates Gilman's essential thesis: individuals striving for excellence in pursuit of their goals laid the groundwork for what later evolved into JHuniverse, ultimately advancing the entire institution. The subsequent evolution of the project also reaffirms the value of Hopkins' lack of bureaucracy and willingness to encourage its faculty and staff to challenge the status quo and to implement new ideas and approaches.

Early Adopters

In 1991, faculty and staff members in several areas of the university were investigating the use of newly available Internet applications such as Gopher and WAIS as tools to enable access to research and archival information and to support collaborative work in their disciplines. These included, among others: Prof. Robert Kargon and his son Jeremy in History of Science; Special Collections and Archives of the Milton S. Eisenhower Library, primarily the efforts of staff member Brian Harrington; and the groundbreaking work of the JHU School of Medicine's Welch Medical Library with the Online Mendelian Inheritance in Man and the Genome Data Base projects, and the related Computational Biology.

In October of that year the current technical manager of JHuniverse heard a presentation on CWISes at EDUCOM, and as a result he then attended in the spring of 1992 the American Society for Information Science Mid-Year meeting on networked information systems. This proved to be an revelatory event, occurring as it did at a significant juncture in the development of this field. The conclusion seemed obvious: the combination of ever more powerful com–puters, a robust and ubiquitous network, and simple, reliable information dissemination and navigational tools would lead to a revolution in the way computers are used and to an immeasurable increase in their value for research and scholarship.

The ASIS meeting made it clear that these developments were more than simply another, albeit very effective, communications medium, and they could potentially provide much more for Hopkins than just a typical CWIS (and since JHU has several campuses, the term was never really apropos in the first place). Here, finally, was the realization of the promise of information technology to provide a solution to a problem that is otherwise effectively insoluble—to transcend the bounds of physical and political geography by providing a "virtual commons", a shared information and community space for an institution perpetually in danger of succumbing to the centrifugal forces

which threaten to decompose it into a "multiversity"[1] connected only by a common name; or worse, to tear it apart altogether. It is this idea that was the inspiration for the first part of the title of this talk. Information technology is one of the few tools that could provide a way for a decentralized institution to have its cake and eat it too—that is, sharing information, collaborating more easily, and participating in a common communication environment, while remaining dedicated to the simple principle of individual excellence.

Pilot Project

As it turned out, the Unix system administrator for Academic Computing at the JHU Homewood campus had already ported the gopher server software to run on our Unix system. This was quite a pleasant surprise; that there were also several fully developed gopher-based information services already operating at Hopkins was downright exciting. An interesting challenge was how to get them to join together under one "root gopher" when each viewed itself as a separate research project with no particular interest in the larger picture. We chose not press the issue, but instead tried to make it to their advantage to cooperate. As the official keepers of the jhu.edu domain, Homewood Academic Computing established the address 'gopher.jhu.edu' and registered it with the Univ. of Minn. as the main point of contact for The Johns Hopkins University. We publicized the availability of gopher, wrote articles about the wonders of gopherspace, distributed pre-configured versions of gopher client software and offered free short courses on Internet topics. By supporting the efforts of the early adopters and making it easier for Internet users to find their services, we engendered a good degree of cooperation and over the next year brought on board many new and enthusiastic participants.

Victims of Our Own Success

By the spring of 1993, Homewood Academic Computing had established a modest but successful network-based information service. This was effectively a pilot project, even though we did not initially conceive of it as such. However, it quickly became clear that continued development of the project would not proceed without the involvement and support of other pertinent groups outside of computing. Homewood Academic Computing has a limited mission within Hopkins, and its resources are insufficient to support a full-blown CWIS. We were fortunate, however, that the project was well positioned to play into a series of converging events which were about to catapult it into a new phase.

GENESIS OF THE COLLABORATION

In the summer of 1993, talk of the "Information Superhighway" was just beginning to explode into the national spotlight. The significance of this was not lost on the leaders of three major Hopkins service organizations, who separately were investigating the potential application to their organizations and looking for ways to capitalize on the

[1] Attributed to Milton S. Eisenhower, eighth president of Hopkins, in "A Brief History of Johns Hopkins Univerity", John C. Schmidt, JHU Press, Baltimore, 1984.

networked information revolution. These were Larry Benedict, Dean of Student Affairs; Scott Bennett, Director of the Eisenhower Library (now Director of the Yale University Libraries); and Dennis O'Shea, Director of News and Information. In various discussions with each other they recognized their common interest in and need for a campus-wide information system. David Binko, Director of Academic Computing, brought to their attention the prototype CWIS that already existed in his department, and offered this as the basis on which to build a complete system. He also noted that there were no significant technical barriers in offering such a service—all that was needed was a sound organizational basis for a widely-used CWIS.

Defining the Rationale for Action

Three of the units sponsoring the new CWIS carry on extensive service programs and need to disseminate substantial amounts of information about these services. The primary activity of the fourth unit—News and Information—is the dissemination of information university-wide. It was clear that these four organizations would carry out their missions more effectively when their clients have access to a highly flexible, technologically advanced, and easily used CWIS. They all produce numerous publications and other documents which could be made available via the CWIS, so that communication with clients would be more timely, accurate, and potentially more cost-effective. Each understood the tremendous advantages that might be realized by leveraging the substantial investment in networking infrastructure and desktop computers, which at that point was being vastly underutilized.

What is notable about this is not that the four organizations recognized their common interests and the value of working together, as this was fairly obvious, but rather that they developed a pragmatic action plan and implemented it almost immediately. This group held its first meeting in September, formalized the details of the collaboration in October, announced the project publicly in December, and went on-line in January. This kind of rapid response was to become characteristic of the project. Hopkins has remarkably few barriers to impede innovation, which is a fundamental strength of the institution. In addition, there was a marked lack of territoriality among the four sponsoring units, which is unusual to say the least.

Setting Fundamental Objectives

In order to maximize the effectiveness of the system, certain defining characteristics were agreed upon which have proved to be critical to the subsequent success of the project:

- No initial cost for information providers or consumers
- Universal access (dial-in, telnet, etc.; no login required)
- Flexibility (central coordination but local control)
- Broadest possible audience (internal, external, alumni, etc.)
- Simplicity (easy to use and to implement)

While some of these objectives were the subject of considerable debate, they have

resulted in a system which is uniquely attuned to the nature of our institution and which is truly inclusive. Some were agreed upon largely because we had no alternatives, but have proven to be valuable in their own right. For instance, we cannot load information for other departments because we do not have the staff to do so. Instead, we rely almost entirely on the departments themselves to upload their data. They retain control over their information and of the directories where it is located. For our part we provide written guidelines and instructions, software tools, classes and personalized training. This system borne of necessity has lead to a genuine sense of ownership, and a high level of commitment to the project.

By committing ourselves to serving the university community in the broadest sense, we hoped to become a primary means by which the community informed itself, and in so doing developed a greater sense of itself as a community. This objective would be of value to any institution, regardless of size, budget, or organizational structure.

Distributing the Work, Capitalizing on Our Talents

To collaborate means literally to work together. In our case, none of the founding units could have successfully carried off this project on its own, so working together was a first a simple necessity. As a whole, however, we proved to be much greater than the sum of our separate capabilities. Initial organizational decisions were primarily based on the best fit of the skills and resources of each department, with each bringing a unique and complementary set of strengths to the project. The Eisenhower Library provided critical early leadership, and lent the project scholarly credibility. The participation of Student Affairs gave the project credibility with the schools and the administration due to their institutionally-critical mission. Academic Computing had the computer and network resources, technical expertise, and training skills to ensure that these vital aspects of the project were handled professionally. News and Information brought to the project their extensive communication and presentation expertise, organizational skill, and an important public relations perspective. Thus, from the very beginning JHuniverse has given nearly equal consideration to serving the local Hopkins community and to providing information about Hopkins to our extended family and to the world at large.

The ongoing leadership role of News and Information (a part of university Communications and Public Affairs) has proven to be instrumental to this project. Robin Suits of Wright State University argues in a recent paper ("Campus-Wide Information Systems: A way to leverage information technology investments to meet strategic communication goals", obtained from the author, rsuits@nova.wright.edu) that a communications office may often be best suited to running a CWIS, since it is in their charter to "focus on the big picture of cross-disciplinary communication" and because "it also is the office charged with employing the most effective tools and techniques for meeting a university's strategic communication needs". In this respect the JHuniverse team is nearly unique, and has developed a management approach which is well-suited to the evolving nature and increasing importance of these systems to the institutions they serve.

SECURING INSTITUTIONAL SUPPORT

Building a successful Campus-Wide Information System requires developing the support of those who are going to use it, presumably everyone on campus—faculty, students, administrators and staff—as well as alumni, prospective students, other academics and the general public. Because some people at Hopkins had already created their own gophers at Hopkins and due to the decentralized nature of a university in which most people are unaccustomed to centrally coordinated systems, it was doubly important to develop strong support for or, at least, acceptance of our system. We began by building formal support from the units that provided the start-up funds for JHuniverse, and informal support from the broader university community.

The four founding units agreed from the beginning that News & Information and Homewood Academic Computing would administer the CWIS. Those departments together with the other two founding units that also formed a Policy Board that would oversee the project. Initial funding for the project consisted of donations from each department based on the size of their budget, along with donations of staff time and other in-kind services. These commitments were guaranteed through FY96. One-time startup costs (mostly equipment) were evenly divided between the four units.

The project manager developed a plan detailing the responsibilities of each of the managers and the policy board. Although we have not had much need to refer back to this document, it helped clarify our respective roles and responsibilities in project, and also brought to light several philosophical issues about the goals and mission of JHuniverse that were important to discuss.

Informal Support

The only group whose formal support the managers sought in the beginning was that of the JHuniverse Policy Board. It is important to note that while the Policy Board meet four or five times between the inception of the project in September 1993 and when it went on-line last January, the Board did not become involved in the day-to-day management decisions of JHuniverse. This hands-off approach allowed the managers to develop the system quickly and avoided any of the negative effects that committees can, at times, have on projects.

Other than Policy Board, the managers did not seek formal support from the university. We did, however, inform the Provost that we were undertaking this project and requested $5,000 to help fund the networking of the News and Information Office. The request served to gain additional financial support and to inform the Provost of our activities. The Provost, in turn, urged us to make sure that the Policy Board included individuals from throughout the university since the original members were all located on one campus. In response, we expanded the board to include the director of the Welch Medical Library who was also the head of the new Biomedical Information Sciences division on the East Baltimore campus and an individual from the School of Continuing Studies' Montgomery County campus.

We spent a great deal of time soliciting additional informal support from the university community. First, we publicized our efforts in the university-wide newspaper of which

the project manager, conveniently, was editor. We also called and talked regularly with key faculty members, computer administrators, divisional administrators, other staff members and students. We also talked informally with senior officials in central administration. Another form of dialogue occurred via e-mail. Surprisingly, the largest volume of mail came from alumni who were extraordinarily interested in our efforts and wanted to see if we could provide additional services such as e-mail. The project managers personally and promptly answered every e-mail letter.

We also conducted a great deal of outreach, targeting departments and offices that we felt should put information on-line sooner rather than later, and in the process we discussed the project with them and solicited what types of services and information they thought should be included on JHuniverse. Some of these meetings were one-shot deals, others involved a series of meetings over a period of months.

Early on in the process we felt that we should create an advisory board made up of faculty, staff and students to act as brain-storming group. Because we have been so short staffed and struggling to keep up with the most pressing issues, we have not created such a board yet although we will before the end of the year. Their advice will be especially important as we design a comprehensive WWW-based system.

Formal Support

This fall, the project team recognized the need for dedicated staff. The initial funding provided by the consortium is simply not sufficient to even respond to current demands of the gopher-based CWIS, much less the more complex demands of a multi-media WWW-based system. We therefore decided to approach the university for additional funding. Accordingly, we discussed with Ross Jones, vice president of the Project Manager's division, our progress on the project and the need for additional funding. That meeting ultimately resulted in a presentation the Provost's Information Systems Coordinating Council, a university-wide group of senior administrators responsible for technology-related issues. A copy of our written presentation was also given to Hopkins' president, William C. Richardson. While no commitment has been made yet about providing additional funds for the project through FY94, the response from everyone has so far been very positive.

One of the advantages of having a system in place and developing informal university-wide support has been that when we did formally present the concept to the central administration, we had a strong track record. One point which has generated a great deal of interest in these presentations is the fact that four major grants awarded to Hopkins were tied, to some degree, to the fact JHuniverse existed. A fifth extremely large grant was received, in part, because the information and expertise they develop will be made available on the Internet through JHuniverse. We have been able to show that not only is JHuniverse necessary to survive in the last few years of the 20th century, but that it also makes economic sense, generating research grant revenue and saving money in publications and marketing for undergraduate admissions.

Tapping into Emerging Institutional Priorities
The need for senior institutional support is critical at this point for JHuniverse for more than financial reasons. This fall the university released a report by the Committee for the 21st Century. A report issued by a subcommittee of C-21, states: "...the university must be committed to establishing an advanced managed interdivisional information system for students, faculty, and staff to generate, manipulate, preserve, and communicate information of all types in carrying out their education, scholarly, administrative activities."

We needed to point out to the university administration that JHuniverse was such a system, and to ensure that other duplicative projects were not created due to a lack of knowledge about JHuniverse. We also needed to become more formally involved with others at Hopkins working on information technology projects. Finally, we needed top level university support to resolve interdivisional issues. The creation of centrally coordinated information systems often highlight of the problems that can develop within highly decentralized institutions. For example, the Johns Hopkins Institutions have at least three phone books, with different and, at times, conflicting information. There was a limit to the authority that the project managers could exert to resolve these types of problems. In our presentation to the Provost, he agreed, noting that it was time for us to "come in from the cold."

Future Plans for Increasing Support
As mentioned earlier, we will be forming a university-wide committee of faculty, staff and students to serve as a source of ideas for ways in which we can expand and improve JHuniverse in both the Gopher and WWW formats. Another top priority, if we are able to expand our staff, will be expanded outreach. We need to contact and work with many more departments and offices throughout the university to help teach them how they can use JHuniverse to reach their academic, research and organizational goals. We will also continue to provide training for information providers so that they can continue to upload their own information as we move into WWW.

The Policy Board will undoubtedly be further reconstituted in the future and may become a subcommittee of some other existing university body, such as the above-mentioned Council. Additionally, we need to work more closely with other Hopkins' groups that are working on technology-related issues such as placing student registration on-line and distance learning, areas in which JHuniverse has yet not been involved.

Turning Good Intentions Into Success
In a cooperative project such as this that is going to be used by a wide spectrum of individuals, it is essential to be fair, open-minded, flexible, and accommodating. When we started this project, each member of the consortium had different needs and expectations. When the Policy Board met, it was important to explore these different philosophies. Also, we found that our vision for the project expanded rapidly. While some others in the group had not envisioned JHuniverse as being, for example, a research tool or a forum for alumni, they were willing, fortunately, to allow us to experiment.

Another important issue that arose early on was the format of JHuniverse. One of the librarians on the Policy Board was concerned that it didn't follow an organizational pattern that might have been created by librarians. However, the former Director of the Eisenhower Library noted that while this might be true, the new format might better serve the purposes of the project.

Throughout the process of developing JHuniverse—an ongoing process that may never be "completed"—we have felt that it is critical to listen and respond to both suggestions and criticisms. This is a system that everyone owns, and the more input and support we receive, the stronger it will be. In a sense we must treat our users with the same level of respect as we would customers of a commercial product, because if they do not like JHuniverse the technology exists for them simply to create their own system, and at Hopkins they can and will. This does not mean, however, that anyone within the university will be charged for using JHuniverse. The founding members of the consortium were adamant that it be a free system. While we initially planned to cover the cost of developing and administering the system by charging information providers, we quickly decided this was not practical. We continue to explore options for generating income for the project without imposing direct chargeback.

As we approach our first anniversary and begin to "come in from the cold," the stakes are getting much higher. If we are more formally sanctioned and funded by the university, we will have to build a larger, more comprehensive system. University scrutiny will increase, and there is the danger that University funding will entail centralized control, with the consequent loss of some of the of the unique features of our current collaborative arrangement. Balancing these forces will be difficult, but we look forward to the continuing challenge of providing innovative and quality service.

THE FUTURE IS NOW

As information technology continues to advance and as JHuniverse grows, there will be many issues and problems that will arise. The key for us will be to maintain that delicate balance between stability and technological advancement. Thus, it is imperative to stay informed of new developments, to keep an eye on the future and always have something in place to anticipate it, but also to not change things so often that people get frustrated. Despite the lure of better software and new organizational ideas, for instance, we try not to significantly alter JHuniverse more often than twice a year. Even so, it is important to be willing to take risks when the reward is potentially great. Our greatest reservoir of creativity and initiative is our students, and by tapping into this source we can make great strides forward very quickly. This is why we recently made it possible for students to publish their own WWW "homepages" through JHuniverse, even though we have not worked through all the administrative issues just yet. We would rather seize the opportunity while the potential rewards are greatest, and deal with any unforeseen consequences later.

We must continue to focus on content and communication, rather than on technology. If we are able to do this and to maintain the cooperative spirit that has seen us through this far, we will continue to meets the needs of the Johns Hopkins community.

Partnerships with the Deans: Delivery of the "Whole Product"

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The UM Information Technology Division (ITD) began its partnering efforts with one UM college in 1991. This year, the lessons learned from that experience are being applied as we expand the partnership concept to the other academic units.

There are four goals: advance the units' academic priorities; create closer working relationships; increase the University's information technology capabilities; and ensure that ITD products and resources support unit needs.

The major benefit to ITD comes from our increased understanding of our academic customers and in our resulting ability to create "whole products" they will choose to use. Four new partnerships provide case studies for the creation of whole products.

Partnerships with the Deans: Delivery of the "Whole Product"[1]

DESCRIPTION OF UM AND ITD

The University of Michigan, founded in 1817, is a public research university located in Ann Arbor with two regional campuses in Dearborn and Flint. The University was originally founded in Detroit and moved to Ann Arbor in 1837. There are 19 academic units on the Ann Arbor campus. The mix includes undergraduate, graduate, and professional schools and colleges, and a large teaching hospital. The total annual operating budget is approximately $2.5 billion. The community includes 25,439 faculty and staff, and 36,845 graduate and undergraduate students. The Information Technology Division (ITD) reports, through the Vice Provost for Information Technology, to the Provost.

ITD is responsible for the central computing activities in support of both academic and administrative computing, including the voice and data networks, the campus computing sites, and the administrative mainframe. We still have an academic mainframe, but we are in the process of phasing out mainframe service in favor of a distributed computing environment.

INTRODUCTION

ITD's partnership program with the deans and directors of UM academic units officially began in 1993, but in a very real sense it had begun two years earlier. In May of 1991, ITD entered into an agreement with the University's largest academic unit, the College of Literature, Science and the Arts (LS&A). Going into that agreement, we knew we wanted to work more closely with LS&A and experiment with distributed support. In a more general sense, we also knew that the kind of relationship we were pursuing with LS&A would lead us to better serve our academic customers across the University. What we didn't know was that it would develop into a new way for us to do business with the University's entire academic community. Although we were studying total quality and marketing principles, we hadn't made the leap to understanding what these lessons meant for serving the thousands of customers on our campus.

Circumstances in the spring of 1993 made us look more closely at our academic customers, especially the deans. What we saw gave us many reasons for concern. We found that the majority of the deans were alienated from current information technology activities. Major changes in the computing environment on campus—a transition away from a familiar, mainframe-based system to "new and improved" distributed computing—held potential for even more alienation.

Despite various efforts over the years, the deans had not seen ITD bringing them technology that seemed directly responsive to *their* strategic priorities. We had little ongoing involvement in their planning for the future and they had little involvement in ours. Our services were most often provided to departments or individual faculty, staff, and students, not to them directly—yet, the dean pays the bill for services acquired by departments and faculty. More to the point, the deans hold the political power on campus. It is important they view our information technology services as benefiting them and supporting their objectives.

Our partnership with LS&A and our continued study of total quality, marketing, and ultimately whole products helped us address the issues we faced. The LS&A partnership

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[1]Geoffrey Moore, Crossing the Chasm: Marketing and Selling Technology Products to Mainstream Customers (USA: Harper Business, 1991).

helped us better understand the balance between centralized vs. local control. The study of whole products led us to see the value of providing more than just a core product or technology; for the product to be valuable, it has to be augmented by other services for the customer to get full value from its use. Focusing on the dean as customer gave us the push to look at value from their perspective, and the partnership program gave us the opportunity to do so.

THE BEGINNING: THE COLLEGE OF LITERATURE, SCIENCE AND THE ARTS (LS&A) PARTNERSHIP

The partnership between LS&A and ITD grew out of discussions between ITD's Deputy Vice-Provost and LS&A's Associate dean for Research and Computing about how ITD, a large, centralized service organization, could better serve the particular needs of LS&A, a large, decentralized academic organization. The college itself mirrors the diversity and complexity of the University, with over 60 departments, programs, and centers; 2,000 faculty and staff; and 17,000 graduate and undergraduate students. The partnership discussions identified two primary needs in LS&A: development and use of instructional technology, and on-site (i.e., intra-departmental) computing support for faculty and staff. ITD saw benefits in a closer working relationship with the college and the opportunity to pilot new models for distributed support. ITD and LS&A each committed financial and personnel resources to the following activities:

- an ongoing program of instructional application development. The college assigned an instructional expert to work with faculty on the promotion, investigation, and selection of projects for funding, and with ITD's Office of Instructional Technology on the development, curricular integration, and evaluation of projects. This arrangement allows the college to make decisions about which projects go forward, and to take advantage of technical expertise in ITD for the development and deployment of instructional applications in the classroom or lab. This model has proved extremely successful and has been replicated in other partnership agreements;
- on-site Unix systems administration, initially for 9 departments and centers, now for 11. The LS&A Unix systems administrators are assigned to specific departments but function as a team to work on cross-departmental projects, back each other up, and generally provide college-wide Unix support; and
- instructional equipment upgrades for faculty and instructional support staff;
- a selection committee to advise ITD on instructional software in its central campus computing sites operation;
- on-site consulting and training for faculty and staff in various topics determined by LS&A. This part of the partnership also provided for needs assessment and planning activities.

Three years later, these components have gone from pilots for on-site services to being fully integrated into the college, providing significant and measurable benefits to LS&A faculty, staff, and ultimately, students. In an era of budget constraints and concern over the cost of technology, our work with LS&A gave us insight into how we could balance centralized services with the need for local control. Departments and individuals receive direct services from the instructional and support programs in accord with their particular needs, and economies of scale have been realized through the use of teams and pools of expertise.

MARKETS, PRODUCTS, AND WHOLE PRODUCTS

At the same time we were piloting the partnership with LS&A, we were beginning to adopt total quality principles, examine our relationships with our customers and change our assumptions about marketing, markets, and products. This helped us understand why some

aspects of the partnerships were so successful and gave us a conceptual framework in which to develop future partnerships.

To learn more about marketing principles, we studied and borrowed ideas from experts such as William Davidow[2] and Geoffrey Moore. Later we discovered a Kodak research publication[3] written by Michael J. Lanning and Dr. Lynn W. Phillips that discussed some of the same issues and concepts.

Reading about and practicing total quality helped us to think of our users as "customers" but did not lead us immediately to understand how to deal with the large number of customers we serve. ITD has over 40,000 individual and departmental customers to serve and satisfy. We were looking for a way to create products and services that they would choose to use without having to create a product for each customer. And so we began to think about markets. A market is a grouping of customers for particular services or products who have a common set of needs or wants and who look to one another for advice when making a buying decision.[4] But how were we to group our customers into markets?

Markets

One tool we found very helpful was to look at our customers using the technology adoption life cycle.[5] This model distinguishes technology adopters or customers by their characteristic response to the introduction of new technology and is helpful when used to cluster customers into two distinct markets: the Early Market and the Mainstream Market.

The Early Market consists of technology enthusiasts and visionaries, those who like innovation and enjoy trying new technologies. They will spend the time necessary to get new untried products to work. They have the insight to match emerging technologies to strategic opportunities to achieve a fundamental breakthrough in their business.

The Mainstream Market, by far the larger of the two markets, includes pragmatists and conservatives. Their goal is to use technology to make a measurable improvement in productivity. They may be confident in their ability to handle technology but prefer a thoroughly thought-out solution to a known problem rather than receiving the latest and greatest. Service is critical to this group of customers.

After many lengthy discussions about the application of these principles, we began to understand why some of our products and services were so successful in the beginning, when we were dealing with the innovators and early adopters, yet met so much resistance when we tried to get them used by the majority of our customers. The importance of the product itself and its unique functionality in comparison to the importance of the auxiliary services and the context in which it is used is at its highest with the technology enthusiast and at its lowest with the conservatives. We, however, were creating products as if all our customers were innovators or visionaries.

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[2]William Davidow, Marketing High Technology (New York: The Free Press, A Division of MacMillan, Inc., 1986).
[3]Michael J. Lanning and Lynn W. Phillips, "Building Market-Focused Organizations (A More Realistic Path to Business Success)", Copyright 1987-1993.
[4]Geoffrey A. Moore (pg. 28).
[5]Both Geoffrey Moore (pg. 9) and William Davidow (pg. 30) refer to this adoption curve and the resultant marketing model.

The majority of the deans, as one could predict, shared the characteristics of the Mainstream Market in terms of the adoption of computing technology for general use in their schools and colleges. If they were going to accept new technology and support the new computing environment, we would need to understand their research, curriculum and administrative goals, gather their requirements, understand the key value of each product to them, and provide them with technology that was directly related in measurable ways to accomplishing their vision. We had to find a way to walk in the deans' shoes and understand their schools' culture, financial constraints, and practices.

Whole Products

We went on to validate the model against our past experiences and the many comments we had gathered from working with our customers. This abstract understanding of what had been happening led us to the next important and helpful concept: complete or whole product.[6] This concept is summarized by Moore:

> "There is a gap between the marketing promise made to the customer—the compelling value proposition—and the ability of the shipped product to fulfill that promise. For that gap to be overcome, the product must be augmented by a variety of services and ancillary products to become the whole product."[7]

A whole product is the totality of what a customer buys. It starts with the device or service from which the customer gets direct utility and also includes a number of other factors, services, or perceptions, which make the product useful, desirable, and convenient. According to Moore, the whole product must be available from the start to satisfy the Mainstream Market.

In ITD whole product means that for each product or service we create or offer, we must think about the ancillary needs for additional software, additional hardware, network connections, remote access, training, documentation, consulting support, publicity, standards and procedures, installation, and system integration services (accounting, billing, authentication). To get our products successfully adopted by the majority of customers, we must ensure that if any of these is necessary to use the product, it is available to the customer. If we cannot provide it directly, we must seek alliances with those who can.

Identifying and understanding our customers in addition to knowing ourselves and our capabilities is the key to our understanding the reason a customer buys or uses our products. This is also the key for identifying the ancillary services and products that must be available. We believe we will be successful if our whole products are oriented toward our customers' processes. Our partnerships with the deans are a critical factor in this understanding.

By working closely with the deans as well as faculty and student on the projects they perceive to be important to their missions, we are able to understand their business, to know their processes and to assist them in innovations of those processes. Working with the deans is allowing us to refine our "customer characterizations."[8] When we go beyond just listening to our customers and learn to walk in their shoes, we can fully understand their requirements and needs and, most important, create the product that will best provide their "must have"[9] benefits. Our goal is not to leave our customers' success to chance or luck. Rather we seek,

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[6]Concept originated with Theodore Levitt, The Marketing Imagination and is used by William Davidow, Marketing High Technology.
[7]Geoffrey Moore (pg. 110).
[8]Ibid (pg. 94).
[9]Ibid (pg. 101).

through partnership with our customers, to understand their problems and solutions in their entirety and work to ensure they get the whole product.

THE PARTNERSHIP PROCESS

ITD's partnerships with the deans is one approach to the challenge of creating whole products they will choose. Our partnership program, created to provide customized access to ITD expertise and resources in accord with the priorities of the academic units, has four major goals:

- advance the academic priorities of each school or college;
- create a closer working relationship with the dean and faculty leadership in the unit;
- increase the information technology capabilities of the University; and
- ensure that ITD products and resources support school and college needs.

We identified three essential steps to the partnership process: identify opportunities; create the partnership and negotiate the focus and responsibilities; and manage the partnership. Our goal was to begin the process with five schools in the fall of 1993, but first we needed to get the deans to buy into our plans.

Before we could approach the deans, we needed to sell the idea of partnerships to the Provost. This was made easier by the fact that in April 1992, the Working Group for Academic Information Technology (a group of faculty and staff appointed by the Provost) wrote:

> "...the LS&A–ITD partnership model should be made available to all schools and colleges, so that the critical expertise and resources of ITD can be harnessed to meet unit priorities; such partnership arrangements would reflect significant unit responsibility and accountability for information technology investments."[10]

With the Provost's approval, in September 1993 we presented our proposal for partnerships to the Academic Planning Group, which consists of the 17 deans and 2 Directors of the 19 academic units on campus, and the Provost. We clearly stated the intention that they would reflect significant responsibility and accountability for information technology investment on the part of each school or college. Both ITD and the unit were required to invest significant and equivalent resources; financial commitments had to match. ITD and the school or college had to designate an individual responsible for the joint management of the partnership activities. We did not want the partnerships to be viewed as gifts.

Our proposal did not receive overwhelming acceptance at first. While all academic units on campus are coming to understand the criticality of information technology to the accomplishment of their academic and research goals, we were well aware that some units were farther along the adoption curve than others. Because our intent was to develop agreements that included matching funds and clearly stated priorities, we chose to invest time up front with some units to develop information technology plans that complemented their strategic research and teaching plans. These efforts, along with direct contact between the Vice Provost for Information Technology and each dean, calmed their suspicions and garnered their support. The deans agreed to proceed, and several of them volunteered to begin immediately.

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[10]Wendy P. Lougee and N. Harris McClamroch, Co-Chairs, "Report of the Working Group for Academic Information Technology," (University of Michigan, April 1992).

THE NEW PARTNERSHIPS

The deans who came forward had a range of needs and ideas. A few had been working with ITD already on various joint projects and initiatives, and it was a small step to incorporate these activities into partnership agreements. Others came forward with specific instructional and research goals. And others, recognizing that the campus computing environment was shifting from mainframe-centered to distributed and that the technology investment within the school had to increase, raised the need to engage in comprehensive strategic planning. We went into the discussions in January of 1994 with a commitment to forge multi-year agreements that would address these varied needs.

The School of Education: An Instructional Technology Partnership

Of the remaining 18 academic units, the School of Education was the first to enter into an agreement with ITD. Education enrolls 500 undergraduate and graduate students and has roughly 150 faculty and staff. The School had recently invested significant resources in multimedia and instructional technology, and had received a generous gift from the Prechter Foundation that allowed them to develop an interactive multimedia research lab.

The dean saw a leadership role for the School in integrating instructional technology into the higher education curriculum. The partnership, from his perspective, needed to support increased activity among the faculty for the development of instructional applications and increased investment and support for in multimedia classrooms and facilities. With ITD planning to move one of its campus computing sites into space in the School of Education building and a corresponding shift in the focus of that site towards away from general purpose computing and towards multimedia technology, a three-part environment emerged: an innovative multimedia research environment for Education faculty; a cutting edge, well-equipped multi-media classroom for teaching Education students with and about instructional applications; and an open-access, multi-media computing site where products and services could be deployed and used.

The components of the agreement emerged easily from these discussions. Funding was established for

- an instructional applications development program modeled on the LS&A partnership;
- purchase of specialized equipment and software for Education faculty and as availability allows by faculty outside of the School; and
- onsite technical support in the School's multi-media classroom.

Our negotiations also established processes for decision making. As with the LS&A agreement, a faculty member was designated to work with other faculty in the School and with ITD's Office of Instructional Technology, and the half-time staff member identified to provide support for the classroom was brought into the team of existing technical staff in the School, so that efforts could be fully coordinated. An initial equipment purchase had already been made, for a non-linear video editor, and we agreed to continue collaborative efforts on later purchases.

The School of Natural Resources and Environment: A Geographic Information Systems Partnership

The School of Natural Resources and Environment (SNRE) has 600 graduate and undergraduate students and around 115 faculty and staff. A faculty committee in SNRE had been working with staff from ITD for several months on the development of a Geographic Information Systems (GIS) facility to support research and instruction. The GIS discussions became partnership discussions, and by March of 1994 agreement had been reached on funding and priorities.

GIS technology represents a strategic step forward for the School. Remote sensing and mapping were key elements in many of the School's disciplines, but existing facilities and equipment were outdated. GIS technology is widely used as a resource management tool in the types of public, private and non-profit organizations with whom SNRE collaborates and where SNRE graduates find employment. It was clear to the dean and to faculty that the school needed to invest in GIS, and at the same time, participate in the growing campus-wide efforts as other academic disciplines found application for GIS technology and data. The SNRE dean wanted to provide a leading edge facility for the use of GIS and natural resource scientific computing, and support for the integration of GIS into the SNRE curriculum.

The SNRE faculty committee, with ITD, had already identified a key element in developing a facility: the space. SNRE and ITD agreed to renovate and refocuse an existing ITD campus computing site located in the school. The space lent itself to subdivision—a smaller research area in roughly a third of the space with restricted access to high-end GIS equipment and applications, and a larger instructional facility in the remaining two-thirds for teaching and using GIS applications and data. The instructional side would also remain an open, general purpose computing site, which allows ITD and SNRE to leverage existing resources for the maintenance of standard workstation platforms and productivity applications.

The partnership included funding for

- renovation of the space (removing a closet, building a wall between the research and instructional sides;
- Unix, DOS/Windows, and Macintosh workstations and servers;
- GIS applications (ArcInfo, Erdas, Atlas GIS, etc.);
- technical staff support for the research side and coordination with ITD Campus Computing Sites group on support for the instructional side; and
- operating costs to pay for site license and software maintenance; supplies and consumables within the facility; and equipment repair and replacement. Fees were established for the research side to recover a portion of the operating costs.

The Institute for Public Policy Studies: An Information Resource Partnership

The Institute for Public Policy Studies (IPPS), with 135 graduate students, is one of the smallest academic units on campus. With a quantitative social science focus, the Institute relies heavily on access to statistical and econometric data and information resources. Several faculty members are already well known for their work in economic policy and the national information infrastructure. The Institute Director designated two faculty members to work with us on the partnership. Our discussions focused primarily on developing an archive of social science and telecommunications research information. The archive would be a well-edited, well-structured collection of policy information, accessible through the Internet.

Such an archive would accomplish two major purposes: IPPS could provide its graduate students with experience in the development of information resources and could integrate the envisioned collection into its curriculum, and ITD could collaborate with IPPS on the technical aspects of developing an infrastructure for information resources.

The IPPS partnership represented two other elements that were echoed in several others that followed. One was the need to invest in the unit's technology infrastructure in order to take the next step forward. IPPS needed to upgrade its graduate lab and replace other workstation equipment. It also needed to increase on-site support available to the lab, the Institute's LAN, and the Unix system used as the platform for the archive. The second was the knowledge that there were other areas IPPS and ITD could collaborate on, such as garnering funding for campus-

wide site licenses for commercial resources like LEXIS and Legislate and other tools for information resource development and navigation.

Funding was concentrated on four priorities:

- support for faculty to develop the archive;
- equipment funding for a Unix server and lab workstation upgrades;
- technical staff to provide on-site Unix systems and network administration for the Institute;
- developing other initiatives for the second or third years of the partnership.

The School of Social Work: A Strategic Planning and Instructional Partnership

The School of Social Work enrolls approximately 450 graduate students and has approximately 140 faculty and staff. It is one of the nation's leading schools of social work, and had recently acquired an energetic new dean. It was clear to her that the School needed major investment in technology across the board if it was to continue to make innovations in social work curriculum and research. The dean was also highly committed to building an open and collaborative community within the School, and as we began our partnership discussions she in turn opened them up to a committee of faculty and staff to assist in setting priorities. The Social Work partnership manager, assigned to assist with this planning process, became part of the committee.

The dean set forth a goal to develop the School's internal resources to take advantage of new technologies for research, instruction, and administration. Thinking long term, the Social Work computing committee conducted needs assessments and engaged in ongoing communication with faculty, staff, and students throughout the School. The list of wants and needs was long; identifying priorities was critical. The top priority emerged early in the discussions: equipment upgrades. A recent campus-wide Ethernet project had provided funding for much of the School's connectivity needs, but the workstations available to many faculty and staff were not capable of taking advantage of the higher-speed network. For Social Work to move forward on its agenda for instructional technology development and integration into methodology courses, development of distance learning projects and research initiatives, re-engineering and innovating its administrative data and processes, and taking advantage of the new distributed computing environment on campus for its electronic communication and statistical computing needs, it needed to invest in equipment and support.

As with IPPS, the partnership agreement we negotiated with Social Work included the immediate priority of capital equipment investments, with money set aside in the later years of the partnership for other initiatives that would build on the foundation laid in the first year. The Social Work and ITD representatives, including the dean, also established a communication mechanism for ongoing planning as the School's overall capability was raised. Funding was focused on four areas:

- equipment upgrades, with an additional push to establish a capital equipment replacement fund;
- instructional technology development initiatives;
- process innovation efforts for administrative data and systems;
- distance learning projects, particularly for outreach to community service agencies and social workers in the field for in-service education.

THE FUTURE: LESSONS LEARNED ABOUT WHOLE PRODUCTS

We are still at the beginning of gaining a solid understanding about whole products for an academic audience. Our partnership relationships are helping us see some of the driving forces in an academic unit—the need to show the link between new technology and academic productivity; the need for faculty to drive the integration of technology into the curriculum and research activities; the need to tap the academic spirit of experimentation and innovation by investing sometimes small amounts of money in a piece of equipment or a demonstration project; the need to keep administrative costs low in favor of building faculty quality; and the effectiveness of ad hoc communication (faculty hear information from each other more readily than from official communication from the top or from outside the unit).

Many academic units look for what they can use of what others have done; communicating about projects within each school or college as well as across all of them cuts down on reinventing the wheel, and takes a burden off individual faculty and individual units to research alternatives and options. Academic units are sensitive to the amount of time it takes to learn and use information technology; the payoff for the time investment needs to come quickly, and the transitions need to be smooth and seamless.

The partnerships themselves often include product and service development activities that will allow ITD to experiment with the right mix of ancillary services. Through the partnerships we are learning more about academic unit processes that technology needs to support and facilitate: class preparation, homework assignments and grading, grant submission, administrative information management. A key factor in this learning is making a connection to the disciplines in each school and college. Wherever possible, we have assigned a partnership manager who understands the main business of that unit and the unique ways in which technology is used there. We have also integrated the support staff assigned to each partnership with other support staff in the school or college, creating a team approach to consulting, training, and other support activities.

CONCLUSION

As of November 1994, ITD has negotiated partnerships with 13 of the 19 UM academic units, and discussions have begun with all but one of the remaining 6. By the end of 1995-96, we expect to have 19 agreements. We have seen common themes emerge, many of which fit with ITD's long-term strategic priorities, such as investing in infrastructure and equipment, developing instructional applications, developing distance learning initiatives, information resources management, and process innovation services. We have seen a major trend away from general purpose computing sites towards more specialized ones (Education and SNRE are just two examples), which will have implications for how students do their computing in the future.

Challenges have abounded, and will continue to do so. We have had to balance the need to invest in the future with the need to invest in right now. As we near the end of the negotiations and move into managing these agreements, we will need to continuously revisit priorities. Most importantly, we have established closer working relationships with our academic customers and the deans. By working together on specific planning, development, and support activities, we are truly walking in their shoes.

Models for Partnering with Education

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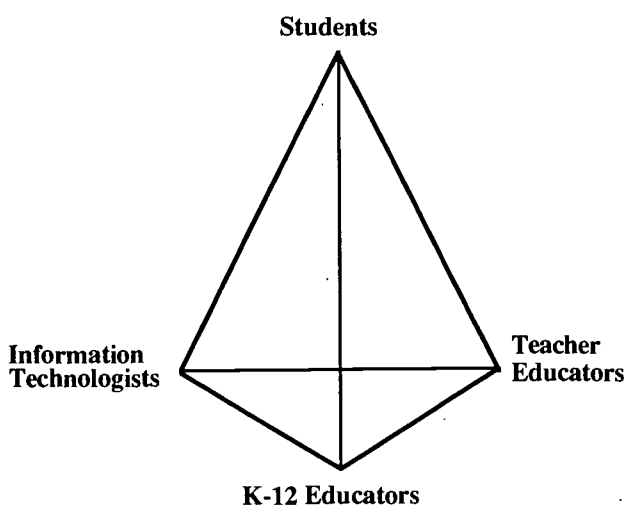
Abstract

The ultimate goal of K-12 education is the creation of students who are seekers of knowledge and skilled in its acquisition. However, limited access to sources of information such as Internet restricts achievement of this goal in most schools. A model in which information technologists partner with teacher educators who in turn partner with K-12 teachers has the potential to effect positive change in the educational environment of K-12 students. This process of triangulation incorporates the technological expertise and resources of information technology, the established collaboration with K-12 of the Colleges of Education, and the classroom rapport of the K-12 teachers.



MODELS FOR PARTNERING WITH EDUCATION

The rate of technological change is both rapid and unpredictable, while the methods for delivering educational services in our elementary and secondary schools have remained primarily unchanged. New technological developments, particularly the emergence of the national network and associated services and multimedia applications, offer renewed hope that the technology can and will significantly improve instruction for K-12 students. Technology supports different learning styles of students and allows students to spend less time with the mechanics of researching topics and more time analyzing and synthesizing the information. What are the respective roles that information technologists and teacher educators in higher education play in the change process?

Model

The ultimate goal of K-12 education is the creation of students who are seekers of knowledge and skilled in its acquisition. However, limited access to sources of information such as Internet restricts achievement of this goal in most schools. A model in which information technologists partner with teacher educators who in turn partner with K-12 teachers has the potential to effect positive change in the educational environment of K-12 students. The illustrated model (Figure 1) capitalizes on the traditional roles and delivery services of the partners, but it reflects a new awareness of technology services and needs. This process of triangulation incorporates the technological expertise and resources of information technology, the established collaboration with K-12 of the Colleges of Education, and the rapport in the classroom of the K-12 teachers.

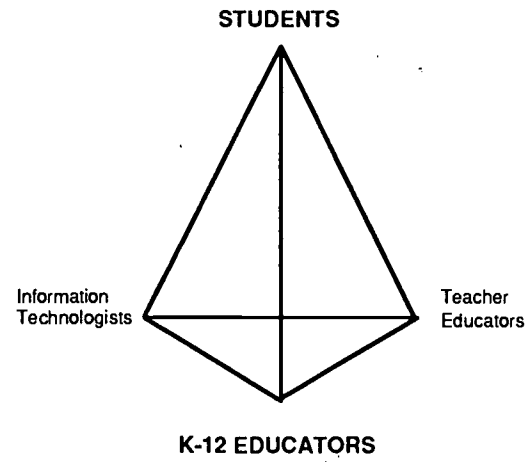


Figure 1: Model for Partnering

Technology holds the promise of supporting a student-centered learning environment, one in which students can explore and develop critical thinking skills, placing the focus on the student as the consumer, the customer. If the K-12 students are customers of the K-12 teachers, then the K-12 teachers are customers of the teacher educators and the teacher educators are customers of the information technologists on campus.

The Coalition for Networked Information (CNI) serves as a good example of a partnership model. The librarians and information technologists function in a natural synergy. The librarians are responsible for managing information content and for providing access to information while the information technologists are

responsible for developing and sustaining the required computing and communications environment. There seems to be a need for a similar cooperative arrangement between K-12 teachers, teacher educators, and information technologists.

Technology in the Teaching and Learning Environment

Higher education is addressing the impact of information resources in teaching and learning. EDUCOM has announced the formation of the National Learning Infrastructure Initiative(NLII). The goal of the NLII is to demonstrate how information technology can improve learning and the cost effectiveness of instruction on a national scale. The technologies that are going to make this goal a reality will exceed those currently available over the Internet. They will utilize the emerging National Information Infrastructure(NII) and the expanded services that will be deliverable over this network of networks. The customers in K-12, the students, need to participate in this network environment and have access to information. Interaction with computers should become a normal part of the daily lifestyle and educational experiences of every student.

In Goals 2000: Educate America Act: A Strategy for Reinventing Our Schools, President Clinton calls for a collaboration of parents, businesses, community organizations and public and private agencies to be part of community-wide efforts to support students and education. Information technology professionals in higher education should play a key role in this partnership by engaging in community and campus outreach programs. The outcome of this collaboration should be the establishment of an institutional plan -- an educational technology partnership model -- that defines areas where there are opportunities for building cooperative initiatives on a grass-roots level. Educators and information technologists seem to share the vision of a new educational environment in which technology improves the productivity of the teachers and the effectiveness of the learning process. What is not so clear is the means by which this will be accomplished and the respective roles of the teachers and the technologists.

The Teacher Education Partner

The business of information technology is technology, and the business of teacher education and K-12 teachers is education. Therefore, technologists and teachers are approaching the educational enterprise from two different directions. Information technologists are creating or providing the impetus for the creation of new resources and devices for accessing and linking resources. On the other hand, educators are seeking ways to improve teaching and learning and view technology resources as potential tools to achieve this goal.

The role of the teacher educator is to project beyond what technology can do to emphasize what should be done educationally with technology. Teacher educators serve as the liaison between the

cadre of knowledge and skills for effective teaching and learning of K-12 students as the trainers of K-12 teachers. The process occurs at two levels: a) at the undergraduate level, they develop course and field experiences for the preservice teachers; and b) at the inservice level, they collaborate with the K-12 teachers to redefine goals, revise curriculum and content, identify new teaching strategies, and evaluate outcomes. In the last decade, assessing the informational needs of the K-12 students, identifying and implementing technology and personnel resources, developing the content and implementing the training/delivery modes for technology based instruction, and evaluating the educational impact of the enhanced access have become critical components in the teacher education process.

Some educators hypothesize that education is changing positively due to students' exposure to computers and other multimedia tools. However, others lament that the technology infusion has weakened the curriculum and emphasized "glitz and glamour." The profession seems to be at a crossroads in terms of the role technology will play and the depth of technology preparation in preservice and inservice education programs. Support for the role of the teacher education partner is provided by the Dean of the College of Education. Budget, personnel, and facility allocations are impacted by a commitment to technology training. In addition, the dean is the key player in negotiations with campus information technology as well as the K-12 sector.

Technology Skills

Identifying the technology skills needed by a K-12 teacher must be predicated on the educational goals for the K-12 students. At the preservice and inservice levels, teachers must achieve a level of comfort with the tools before the technology is integrated into the classroom and used by students. Therefore, the curriculum for teachers must include a strong skill-based technology component: integrated software, networking, hypertext and hypermedia, CD-ROM and laser disk resources, and presentation software.

What is the most effective model for acquisition and implementation of these skills? At the preservice level, students should gain these skills in discrete courses in their first two years. As they continue in the teacher education program, they should have the opportunity to utilize the skills as they design teaching strategies in methods courses and exercise these strategies in field experiences in the schools. At this level, they should be taught using technology, allowing them to experience technology-based instruction, internalize the methodology, and learn to manage the environment. Resources within the College of Education must include a model classroom if the professors are to model effective teaching.

Collaboration traditionally exists between the Colleges of Education and the K-12 sector through preservice field experiences and continuing professional development activities. Therefore, at

the inservice level, assessment, training, and development may take place outside structured graduate courses and may occur at the school site. Due to the extended time from preservice or formal graduate training to access to technological applications in the schools, teachers may lack the requisite knowledge and skills, causing inhibitions and neglect. Teachers need the opportunity to develop personal productivity skills in the school, and intense training conducted in the College of Education or in information technology.

Training

Training needs to be designed to allow teachers to be involved in content preparation rather than technology preparation; teachers do not need to be developers but rather expert managers of technology-based instruction. Training for K-12 teachers should include the following components:

* Access to technology resources and technology-based educational programs
* Assistance in the assessment of how technology will change the roles of teachers and students
* Implementation of strategic planning techniques for formulating district-wide technology plans and implementing successful professional development programs
* Adaptation of teaching strategies to use technology to promote collaborative, interdisciplinary, and multi-level instruction as technology changes
* Development of plans, techniques, and strategies to involve students directly in producing multimedia projects
* Development and effective use of school-wide networks
* Linkage of classrooms to community- and state-based networks
* Utilization of worldwide Internet resources for students

Evaluation

The training designed by the teacher educators should include an assessment component that makes the process interactive (See Figure 2). As training is delivered in the schools, its effectiveness is evaluated by teachers' acquisition of knowledge and skills. As the technology-based instruction is implemented, the effectiveness is measured by the educational impact on the students. However, traditional quantitative assessment instruments are not adequate to measure effectiveness in a technology-based curriculum. In a collaborative environment the emphasis shifts from the acquisition

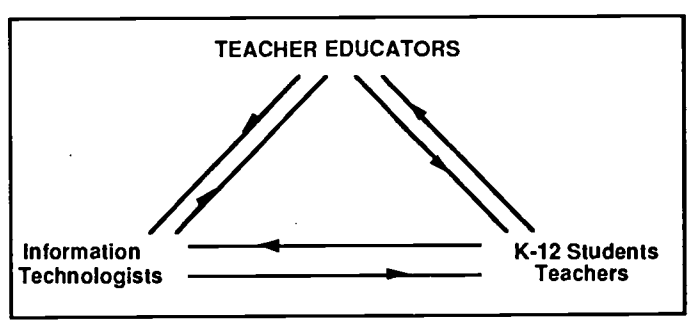


Figure 2:Interactive Planning

of facts to the application of processes to discover, associate, and disseminate information. These changes in goals and outcomes require the development of qualitative measures and training in their use. Feedback from these evaluation measures in conjunction with evolving innovations in resources and access from the information technologists provides data for revisions in content and delivery.

The K-12 Partner

Access to technology-based resources and global networks gives K-12 teachers the opportunity to make learning more relevant to students by providing more "real world" experiences. However, at this time, the concept of "networking" means "sharing printers" to many teachers. Their lack of enthusiasm for having network access may stem from their lack of knowledge of the valuable resources available to them and their students. Limited exposure, lack of quality hardware and software, and haphazard training has combined to cause technology to be viewed as an obstacle in many schools.

The goal is not "technology just for technology's sake" but rather the creation of an environment where multimedia technology is supporting a variety of important skills in a sound instructional design. Teachers can enable students to learn and practice skills to help them succeed in college and/or the workplace, expand their communication skills, emphasize higher-order thinking skills, increase their technology skills, and increase involvement in their own learning.

At the school and district level administrators are significant components of the K-12 partner in the model. Ultimately, the principal is responsible for the school strategic planning process, which includes not only curricular direction but also the financial and management support for acquisition of hardware and software and professional training for the teachers. At the district level, the administrator provides the leadership to partner with the higher education institutions and other community resources.

Examples of specific technology-based skills which K-12 teachers can employ to enhance curricular goals include:

* Publishing, which assists students with the development of writing skills and the ability to work collaboratively
* Graphics, which provides students with the tools to illustrate their ideas and develop symbolic representation
* Hypermedia, which causes students to formulate association of ideas
* Telecommunications, where students have the opportunity to network with public news services, communicate with other students, and participate in linking projects. One international linking project that has been initiated by Vice-President Gore is the GLOBE project. GLOBE provides students and teachers the opportunity to be involved in real-world scientific procedures

collecting data, finding patterns, assessing results; the expansion of cultural, social, and environmental awareness; and in collaborative problem solving

* Multimedia with video technology, in which students create personal story boards to reflect research of a topic and link the content with computer technology to create interactive productions

The Information Technology Partner

Most colleges and universities are currently in the process of building campus networks. They are attempting to integrate classrooms, faculty and administrative offices, dormitories, and off-campus residences into an infrastructure that will support the delivery of new forms of instruction and administrative services. The effective delivery of teaching and learning will be dependent upon technology models that utilize networks and interactive multimedia applications. While most colleges are at least in the process of planning for the transition to a networked environment, the planning is not necessarily happening at K-12 level. It is easy to anticipate that many K-12 school systems will be unprepared to take advantage of the emerging educational technologies.

Information technologists think of building the campus network infrastructure. At the College of Education or the K-12 level, the concern is likely to be just getting a connection to the Internet. Information technology managers talk about building a new systems architecture while school administrators and teachers are frustrated by their lack of on-line access to student records. Information technology planners envision multimedia applications accessible from every desktop when teachers do not have adequate computers to handle applications that are available today. Many schools have microcomputers that are 10 years old. Information technologists think about linking to the national network, while teachers think about just getting access to their first PC or to some adequate training.

Professional education organizations have appealed to the federal government to provide funding for connecting schools and libraries to the national network. Despite the lofty goals of the present administration in Washington, D.C., the solution does not lie solely in federal funding for computers and communications. Technology alone is not the only solution. Information technologists in higher education can provide a very valuable, but not costly, set of services and expertise to promote partnerships with K-12 school systems and to assist local communities.

Before the partnership is established, there must first be a relationship. Information technologists have to first recognize that the integration of technology into K-12 curriculum is not only a national concern but also a basic support commitment for local K-12 schools and affiliated Colleges of Education. The first step is to get a clear understanding of the educational system and the traditional processes by listening, before trying to present new or innovative solutions.

In developing a relationship with a K-12 school systems, it would seem prudent to limit the number of affiliations. Select school systems that already exist within the virtual community: local community schools; schools with strong inservice teacher training relationships; prime feeder schools that provide quality applicants; inner-city or disadvantaged school systems. Beyond the social responsibility for support to the K-12 schools, there are some financial reasons for developing direct relationships with the K-12 schools. It is likely that future federal funding for educational technology in higher education will be strongly influenced by the formation of partnerships with K-12 schools and with other technology providers. This is the case with the National Telecommunications Infrastructure Act(NTIA), which in October 1994, announced the first set of award recipients. Partnering is a major criterion in the proposal guidelines.

After gaining an understanding of the roles and needs of the technology partners, information technologists can begin to evaluate possible means of employing other elements in the partnership model. The following are some ideas of possible community and campus outreach initiatives:

Awareness

The most valuable asset that the information technologists possess is technical expertise and a knowledge of trends in the industry. Organizing awareness sessions and workshops for K-12 teachers and teacher educators or inviting them to participate in existing open campus presentations are a means of exposing them to current applications.

Strategic Planning

Information technologists have expertise in the construction of strategic plans for computers and communication. The campus planning experiences can assist local school systems to develop school, and possibly municipal, technology plans. The addition of the campus chief information officer's name to the school or community plan will add credibility as well as expertise.

Training and Staff Development

The lack of training is the one area that is likely to inhibit the acceptance of technology in the classroom. Information technologists can expand formal training sessions to include higher education teacher educators, K-12 teachers, and students in the same mix. The training should occur on two levels: a) instruction in basic skills; and b) development of a select group of teachers and students who can serve as innovators, role models, and trainers. In many cases the students are going to be more expert in the use of computer software than the teachers. Rather than avoid the issue, the model should encourage the initiative of students. Applications developed by the ultimate consumers, the students, also have the advantage of

drawing attention to the positive use of technology.

Networking

Many institutions have launched community outreach projects, the most common being the support of a "free net" for local access by K-12 teachers and students to services on the Internet. Some institutions have begun to act as central clearinghouses for educational material and allowing access over the World Wide Web. There are also ambitious community-based projects, such as the Boulder Community Network in Boulder, Colorado. The University of Colorado is acting as the central information gatherer and server for a broad range of community information.

Classroom Facilities

Schools of Education need to have lab classrooms that replicate a modern K-12 classroom, not a classroom designed around old technology that may be present in the k-12 schools. Teachers are willing users of technology in the classroom but not at the expense of learning by the students. Teachers want to concentrate on class content, not technology preparation and troubleshooting. The hardware and software vendors need to design and support bundles for the K-12 classroom that are reliable, are easy to use, and provide plug and play capabilities.

Equipment

At times K-12 schools have been the recipients of outdated equipment donations from higher education institutions. This practice may only exacerbate the problem. Higher education institutions need to re-evaluate this approach to consider how to assist with acquisition of at least one multimedia network accessible desktop system. Consider the establishment of seed programs to promote the awareness and use of advanced applications.

Funding

School systems will probably always be grossly underfunded, and the primary appeal to municipal governments will be "We need more money to buy more new computers." One of the anticipated advantages of a strong partnership program is the ability to generate other sources of funding. If the school system is an integral part of a community network, the local municipal officials and businesses can witness the usefulness and effectiveness of technology. Demonstrated results will increase the chances of obtaining funding from both local and government sources.

Other Technology Partners

Information technologists already have long standing partnership relationships with the vendors and providers of technology. For example, one logical partner in the educational technology

partnership model is the cable TV companies that already have coaxial cable running into homes and classrooms. Just as teacher educators can renew and maintain traditional collaborative relationships with K-12 teachers and publishers, information technologists can encourage and coordinate the introduction of other technology partners into the model.

CONCLUSIONS

Information technologists and teacher educators share a vision that technology enables the creation of student-centered learning environments that increase teacher productivity and improve the critical thinking skills of K-12 students. In the realization of that vision teacher educators are going to continue to play the pivotal role of providing formal education and imparting the necessary skills to the K-12 teachers. This process encourages the formation of a coalition on campus, a partnership between information technologists, teacher educators, and K-12 teachers. The strength of the coalition will depend largely on the conviction of the partners and the management support from within the College of Education and information technology. While information technologists will want to promote the technological components of the educational technology partnership model, it is going to take time to break cultural barriers. Information technologists can speed the process of acceptance and implementation by first establishing credibility by attending to the immediate needs for training and operational support.

BUILDING PARTNERSHIPS ON BEST PRACTICES:

NEW ALLIANCES FOR THE NINETIES

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Two major changes have evolved in the management of higher education over the past several years: 1.) repositioning, downsizing, restructuring, and reengineering, have resulted in new ways of administering institutions and, 2.) the administrative information systems (IS) needed to support the "new business model" have not been developed "in house" and are not available "off the shelf" from vendors.

This paper addresses what to do about the immediate IS support dilemma as well as lay groundwork for an overall strategy for *restructuring and the role of information technology*. The emerging role of partnerships among institutions and between consortia of institutions and service/software vendors is crucial to leveraging the gains being made through restructuring.

Context

The impact of business process reengineering is being felt on campuses across the country. In the past two years, many universities have redesigned their core administrative processes and identified dramatic opportunities to improve the quality of service to their customers as well as to reduce the cost of administration. In many of these cases, the successful implementation of the redesigned process will be greatly dependent upon the availability of a new breed of administrative software.

Changing Business Models

The administrative software in use on campuses today, whether it has been custom developed or a vendor package was designed for the business model of the 1960's, 70's, and 80's. That historical model was characterized by:

- large, "back offices" processing transactions in batch or on-line modes;
- use of automation technologies to facilitate paper processes;
- centralized controls and decision making;
- limited information in the hands of customers.

The role of administrative systems in this business model has been to provide effective ways to process large volumes of transactions and provide some capability for the end-user to view the impact of the transaction after it has taken place.

Process reengineering or "BPR" (as well as other initiatives such as Total Quality Management and Organizational Restructuring) is bringing about a fundamental change in higher education's historical business model that will have a profound impact on the systems that support it. While the creativity that is unleashed by BPR will bring about redesigns that vary by campus and process, there are several central characteristics common to all of these initiatives that will define the business models of the 1990's and beyond. These characteristics include:

- placing decisions in the hands of the customer;
- eliminating, not automating non-value added worksteps and transactions;
- placing information in the hands of the end-customer; and
- moving transactions out of the back office and into the customer's without creating an administrative burden.

In this new business model, the focus of administrative systems will shift from "back office" processing to "front office" information. The financial, development, student and human resources systems required to support the implementation of redesigned processes must move beyond automated transaction processing to support the central administration and provide the features and functions required by the end-customer. The reengineered administrative system will need to:

- provide information, not data to the end-user;
- have flexible business rules to enable processes to be customized for different customers;
- support new sets of institutional measures which cut across organizational boundaries; and
- provide an internal control framework that is invisible to the end-customer.

Reengineering, while it seeks to limit the need for technology, still requires a strong set of core administrative systems to support its redesigned processes. These systems however, will be dramatically different tan those available today. The critical question confronting those implementing BPR is what is the best way to develop this new generation of information systems.

(The following points outline the key issues to be developed during the presentation and discussion on December 1, 1994 at CAUSE94. A more detailed outline will be available for the presentation including copies of the slides used. In addition, new issues raised during the discussion will be integrated with the final text.)

The Emerging "Best Practices" in Higher Education

- Restructuring and reengineering
- What have we learned in the process areas (financial, student, procurement, etc.)
- Where is IS support needed?
- The Challenge of the reengineered process confronting the available software

The State of IS Support

- Status Quo institutions
- Institutions in transition

- Institutions "on the verge" -- ready for the next step
- Client/Server "on the lips"

The State of Packages

- What is available today
- What works and why
- How are vendors responding
- Is there life in "off the shelf"
- Encouraging words

Other Options

- Home grown
- Vendor supplied
- Joint institutional development
- Joint vendor development
- Institution/Supplier partnerships
- Resource pooling

Strategies for Action

- Consolidate and propagate restructuring/reengineering gains
- Identify commonalties of interest and administrative practices
- Develop partnership criteria and success measures and milestones
- The "pooled resource" model
- Models for collaboration and project management
- How to get started

Chasing the Boulder Down the Hill: Reengineering and Architecture at the University of Pennsylvania

CAUSE94
Orlando, Florida
November 29-December 2, 1994

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Abstract. Penn is one of the first universities to combine the reengineering of business processes with an information technology architecture. At CAUSE '93 we talked about pushing the boulder up the hill—convincing people to play when the stakes are so high, negotiating consensus, and planning for flexibility. A year later, we're running to keep up with the boulder as it plunges down the other side. Financial processes will look very different at Penn, a data warehouse for management information has been built, and the first pieces of a new client/server financial system will be in place next year. Partnership is still the issue—the pairing of reengineering and architecture, the partnership between the central information technology group and the Division of Finance, and a new set of relationships as the application vendor has joined the mix. And as old boundaries shift in the client/server world, we're finding that the old rules for partnership are changing. This session follows Penn's partnership of reengineering and architecture as it moves from courtship to reality.

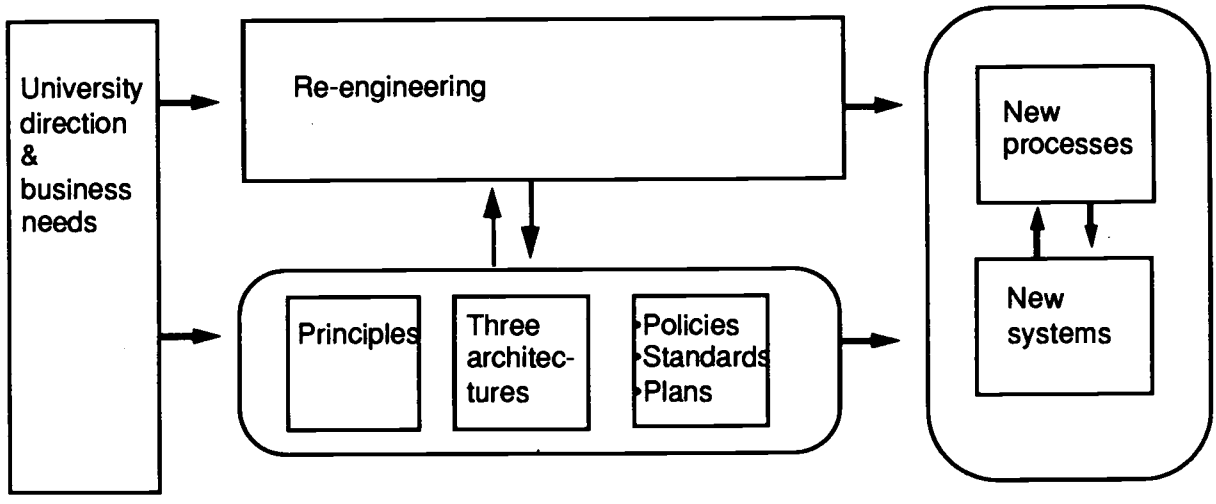
Chasing the Boulder Down the Hill: Reengineering and Architecture at the University of Pennsylvania

Penn is one of the first universities to combine the reengineering of business processes with an information technology architecture. The intent of this multi-year effort, called "Project Cornerstone," is to streamline Penn's business processes and put in place new information systems to help make those changes possible. Cornerstone is a working partnership (keys to each other's offices have been exchanged) between the Division of Finance and Penn's central information technology group. The project pairs two methodologies—Business Process Reengineering, with its techniques for rethinking ways of doing business, and Information Engineering, which establishes an architectural framework.

Since Project Cornerstone began in 1992, Penn has redesigned its purchasing process and its basic accounting structure. We have published principles for using information technology, created a University data model, and defined a technical architecture. We have acquired from Oracle Corporation a new general ledger accounting system and a new purchasing and payables system (to be operational in 1996), along with Oracle's relational database management system and development tools. A data warehouse for management information is in the pilot stage. All will run on Penn's new SP2, a UNIX-based parallel processor from IBM.

Today's talk. At CAUSE93 we talked about pushing the boulder up the hill—convincing people to play when the stakes are so high, negotiating consensus, and planning for flexibility. A year later, we're running to keep up with the boulder as it plunges down the other side. Today's talk focuses on four aspects of Project Cornerstone—reengineering, principles, architecture, and support. We're learning to work with new boundaries and new rules as our complicated new partnerships move from courtship to reality.

Cornerstone machinery. The diagram below suggests the interdependencies that characterize Project Cornerstone. University direction and business needs are the driving force. Administrative processes are reengineered, beginning with Penn's financial functions. A technological foundation is established that includes principles and architectural models. From these flow policies, standards, and plans. The goal is new ways of working, supported by new information systems.



New metaphors. The extensive evaluation process to choose a vendor for the first Cornerstone systems highlighted the new boundaries and new rules we're learning to negotiate. In the past, our vendor partnerships were a little like shopping in a big department store, to borrow a Gartner Group analogy. We went to one store, expecting to find everything we needed. We were familiar with the store; we knew where to find the escalators and where to get a sandwich. We were loyal to the store because it met all our needs. As we evaluated potential Cornerstone vendors, we began to realize that the department store has given way to the mall. Vendors no longer provide *de facto* architectures for their customers. It's an integrator's world, and we find ourselves shopping in the various stores of the mall to pull together a solution. The vendors cooperate among themselves to draw us to the mall where we'll buy their individual products. In that world, our own partnerships with vendors are more fleeting business arrangements, based of necessity on solid negotiation and contracts.

The process of choosing a vendor for the first Cornerstone systems also highlighted the new interdependency of technologists and their business counterparts. The decision points were far too complicated for either side to act alone. The evaluation phase seemed to go on forever, but paid off in mutual learning. It laid the groundwork for the technologists to understand business issues down the road, and vice versa. Both sides began to realize how *hard* the decisions on the other side really are. In the end, the vendor decision was based firmly on business needs as well as technical soundness. This didn't happen by accident; Penn's approach includes a structured evaluation methodology.

Reengineering

Trying on new suits

Penn is a large, decentralized private research university. Many administrative processes have become cumbersome, disjointed, and slow. The division of labor between schools and central groups is not as clear as it could be, and Penn needs to improve its ability to make decisions and make them quickly.

Imagining it. Starting with the purchasing process (the first commandment of reengineering is you have to start *somewhere*), we began to imagine a new way of doing things. Schools and administrative offices will buy and pay for goods themselves, greatly speeding up the results. The central purchasing group will spend its time negotiating with vendors, providing systems and training, measuring results, and generally helping the field—acting as corporate guarantor of quality.

It was hard for the central groups to imagine letting go, to give up their checking and controlling and rekeying. And not everyone wanted to. For the sake of argument, we began playing around with the broader business rules ("OK, suppose the schools own *all* the assets; what then?"). We clarified roles and teased out assumptions as we worked our way back from extremes. We tried variations on a theme ("Say you've got satellite offices out there in the schools.") The old boundaries began to shift as we started focusing on linkages and measures.

It was mostly give and take, but some pushing was necessary. It was hard for some of us in the central groups to articulate the value we bring. If you can't define your own role, however, someone else will define it for you, and it may not be to your liking. So there was always a reason to come to the table.

Making it real. A vision is invigorating, but the time comes to make it real. Implementation is by far the hardest of the three phases of reengineering—diagnosis, redesign, and implementation. Imagining a new process is easy compared to the social and organizational changes required to make it happen. We're finding that reengineering is no more, and no less, than good management. You have to figure out what services you need to deliver and negotiate agreements that are both clear and sustainable. You have to refocus and reward employees. And you have to know when to *get out* of a line of business or adjust an employee relationship that's not productive.

We've learned some practical lessons about reengineering and we'd like to pass on a few. First, you have to have the courage to put a solution out there. Is it perfect? No. Is everything in place? No, and it never will be. But until someone comes up with a better solution, we won't be dissuaded by criticism.

Second, you have to help people see a different point of view, help them get comfortable in different roles. We asked people to try on "new suits," pairing, say, a person who manages research grants with someone from the development office. ("How do you attract funds? Where do you get leads?")

Third, you have to find rewards that work. At Penn, we made it clear that we

would not invest in a new information system without first reengineering the underlying process. People are almost begging to be next in line for reengineering.

And fourth, it's impossible to communicate too much.

Principles

Keeping track of "aha" experiences

At the heart of Project Cornerstone rest twenty-six principles for using information technology, ratified by the Penn community. They include principles about administrative data, applications, infrastructure, and organization, along with a few general principles (see Appendix). The "cost-effectiveness" principle, for example, reads:

> *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.*

We've learned a few things we would do differently if we could start over. First, we would write the principles in simpler, more direct language and we would have fewer of them. If you want people to use the principles, they have to be able to quote them. Second, it's worth asking yourself how the principles are going to *feel*. Some of our principles really sound like Penn; others are visions of what Penn could be. Both are satisfying. Others are a little preachy and didactic, and some come across as Motherhood and Apple Pie.

We've also learned some practical lessons about putting the principles into action. We are well into a number of projects that flow directly from the principles. One is a Data Warehouse for widespread, easy access to management information. A second example is the design of a new network architecture for Penn. As we use the principles to make real decisions in these projects, we're finding that the controversy and intellectual challenge lie in the *interaction* of principles. Each principle by itself seems a little obvious. It's the tradeoffs and interrelationships that are interesting. And now that costs are beginning to be attached to some of the principles, the tradeoffs are etched in sharp relief. In the Data Warehouse project, for example, people are beginning to worry about how much it will cost to have both good security (one of our principles) *and* wide access (another principle).

Second, while it's important to figure out what counts as making the principles official in your institution, that's not the same as making them useful. In our case, "official" means publication in our bone-dry, house journal of record. Our Data Administrator, on the other hand, is particularly adept at making the principles useful. It's an iterative thing, she says; you need a few projects under your belt. "Oh, that's what you mean by 'common base of data' " (one of our principles), people tell her when they hear about the Data Warehouse. She has fifteen other general-purpose, concrete examples that she uses, and she keeps track of "aha" experiences and turns them around on people. She paid a Data Warehouse

marketing call to our facilities director, for example, who was thrilled with the idea that he would soon be able to get information about all categories of people at Penn. She said she wanted to jump up and kiss him because he didn't know it, but he had just bought into the "common base of data" principle. She knows the next time he wants to hold data separately, she can use it on him.

Third, each principle needs at least one champion and a natural home. The principles that seem to be going somewhere at Penn are the ones that have an "owner" (such as Data Administration). It's also important to build in continuity by assigning some of the people who drafted the principles to the projects that bring them to life. These people have used the act of developing the principles to clarify their thinking. That's something valuable; spend that experience on the right people.

Fourth, if you wait too long between ratifying the principles and beginning the projects that flow from them, the community won't make the connection.

And finally, if a concept catches on, don't worry if no one realizes it's "A Principle." While the principles as a formal document may not be widely cited at Penn, the concepts are beginning to be worked and the genre itself seems to resonate. People always seem to be saying lately, "What you need is a good set of principles for that."

Architecture

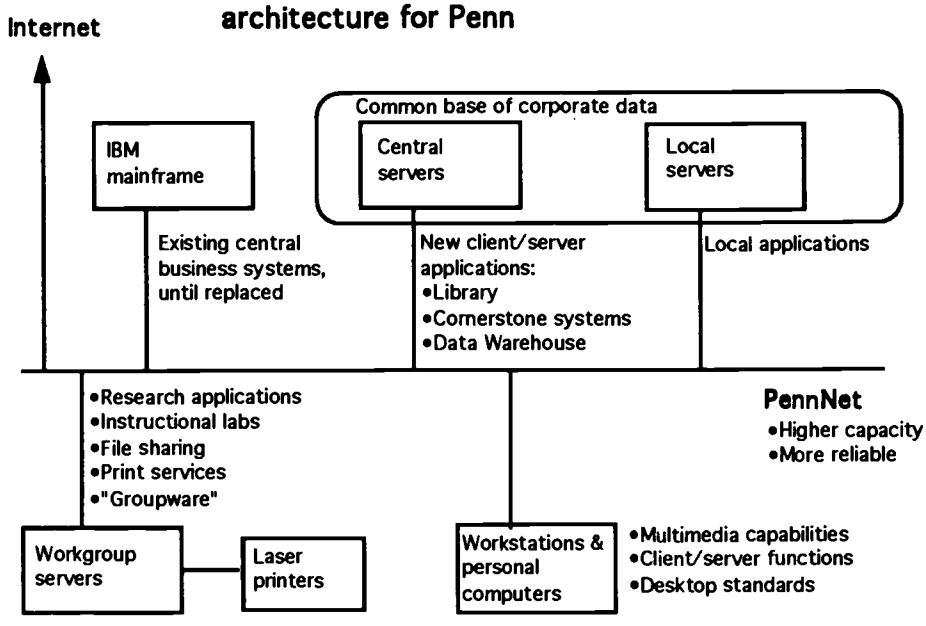
An architect's work is never done.

A technical architecture is a blueprint for making technology choices, a guide for acquiring hardware and software. Architecture is more a process than a product—with constant refinement and updating. Various pieces of the architecture are developed to different levels of detail, at different times, and according to different priorities. Penn uses a structured methodology that considers four main areas:

- The University's overall direction and business need (hard to identify in a period of senior management turnover such as Penn has seen in the last few years).
- Information technology principles (see above)
- The state of the current, or *de facto*, technical architecture
- Technology and industry trends.

Penn's technical architecture for administrative systems is known as "Direction 2000." It is a client/server architecture, focusing on servers that provide information, client desktop computers, the network that connects them, relationships with current systems, and the broader Internet.

Direction 2000—an information technology architecture for Penn



Place holder strategy. It's easy to feel paralyzed by the enormity of developing an architecture. It's important to decide which pieces to tackle first, which to defer, which to handle in depth, and which to treat cursorily. A place holder strategy helped us come to initial closure at Penn. When "Direction 2000" was developed last year, issues of networking and office automation were treated only at a very high level. We're circling back this year to fill in the gaps. (Penn's Network Architecture Task Force, the focus of another CAUSE94 talk, is one such effort.)

Web of teams. Architecture at Penn is developed by a web of campus-wide teams. Each is working on a different piece of the architecture. Coordination is a major effort. We find generally effective a combination of overlapping membership and the activities of selected individuals who "surf" the different teams to maintain focus and share information. One big challenge is keeping strategic-level groups and tactical-level groups from working against each other.

The "A" word. Some people are uncomfortable with the "architecture" metaphor to describe this level of technology planning. For many, "standards" are easier to understand than architecture. In reality, the terms represent a continuum from the highest level of abstraction (architecture) to the lowest (the actual product buy-lists). "Standards" fall somewhere in between at Penn, providing a practical interpretation of the relevant architecture while usually falling short of naming specific brands and model numbers for purchase. A good example is our new

desktop standard. It is a dual-desktop strategy that recommends minimum configurations of Macintosh and MS-Windows PC's without naming specific models. Support for the minimum configurations is "guaranteed" for four years.

The semantics of standards. We learned the hard way that technologists and many in the Penn business community view standards differently. Technologists see standards as a tradeoff between one technology and another, with the goal of reducing heterogeneity. Many business people see standards as a tradeoff between technology and the absence of technology. For them, standards are raising the floor, forcing people to spend on administrative computing. It looks like a choice between administrative computing and the academic mission. Now we realize that the unusually heated discussions about desktop standards revolved around this point. "Don't tell the schools we have to choose fancy new administrative computers over Bunsen burners," our advisory groups kept saying. "But we're only trying to save you money," we kept thinking.

Support

The boundaries keep shifting.

As client/server computing brings the action to the desktop, familiar boundaries are in flux. The desktop computer and the business system flow into each other, as do once distinct areas of technology. New models of support are required.

Integrated, ongoing training. For users of the first client/server Cornerstone applications, learning to do the new business processes cannot be separated from learning to use the new technology. Penn will integrate the two kinds of instruction, and use local trainers to provide it on an ongoing basis. We believe this train-the-trainer approach, in which a central group provides course materials and pedagogical instruction, foreshadows a shift in the way training will be done at Penn more generally.

Single point of contact. With Penn's new client/server systems, the person sitting at the screen won't be able to distinguish a network problem from a desktop hardware problem or an application problem. Technologists will need to collaborate to support that person, forging new links among network engineers, developers, trainers, and hotline staff. Penn's central computing organization is therefore consolidating its separate help desks (we're calling the new entity "First Call") and establishing channels for drawing on second-tier experts.

Wherever we look, it's new partners, new boundaries, and new rules. These are exciting times to be chasing the architecture/reengineering boulder down the hill.

Appendix: Principles for information technology in administration

General

1. **University assets.** Information technology infrastructure, applications, and data must be managed as University assets.
2. **Functional requirements.** University priorities and functionality determine investments in administrative information technology.
3. **Cost-effectiveness.** Information technology must contribute to the cost-effectiveness of the 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 University 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.

Administrative 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 administrative 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.** Administrative hardware and software 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 applications that ensure the quality and cost-effectiveness of specific administrative 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.

Partnering Within the Institution and Beyond

A. Wayne Donald
Virginia Tech
Blacksburg, VA

July, 1994, marked the beginning of an aggressive campaign at Virginia Tech to replace approximately 30 core administrative applications -- moving from a mainframe to a server-based environment in a 3-5 year period. This presentation describes the reasons Virginia Tech officials felt this aggressive implementation schedule was essential, and how the institution is approaching the many project management issues associated with such an effort.

The initiative involves partnering with several different university offices, users, state agencies, and both hardware and software vendors. Redirecting personnel and providing a comprehensive training program dedicated to the administrative systems project has been a major factor for implementation. In addition, re-engineering efforts to promote change in business processes to better "fit" software solutions is important in meeting project goals.

This is a project that will impact how Virginia Tech functions, and is projected to provide more efficient and effective processes to better serve customer needs. It's an exciting project that will have its obstacles, but Virginia Tech officials are confident of success.

Partnering Within the Institution and Beyond

Challenges for Higher Education

Institutions of higher education are facing some of the most challenging times in the history of their existence. Each meeting of system boards, university boards, federal and state education officials, and state legislators brings with it an air of anticipation -- what will we be asked to do this time? This situation is forcing colleges and universities to change, and the change most often becomes a major issue on campuses "because it alters the power bases and comfort zones of people" (O'Leary, 1992).

Academic leaders and administrators are being challenged to evaluate (1) how they can respond to escalating costs with decreasing resources and (2) what management techniques are most effective in working environments for productive change. As was so well stated by Dean Robert Bates, of the College of Arts and Sciences at Virginia Tech, "The three R's in education these days aren't reading, 'riting, and 'rithmetic. They are reviewing, restructuring, and renewing" (Bates, 1994).

The challenges facing institutions of higher education are overwhelming, but if they are to survive and maintain their role in society, they must face the reality that fulfillment of their missions must be accomplished in different and more efficient ways. All constituents associated with these institutions need to be involved in planning and implementing the needed changes. Working together with students, professors, counselors, staff, administrators, researchers, and even outside constituents such as the local, state, and federal governments, other institutions, and business and industry can create a productive team environment that will greatly impact all responses to the challenges of change.

The State Impact on Local Change

Fiscal belt tightening and the continued decline in state financial support are demanding that colleges and universities examine the way business is conducted (Bates, 1994). Since early 1990, Virginia Tech has been feeling the impact of budget reductions from the state government. The results have been a reduced operating budget, increases in tuition and fees, layoffs, and elimination of positions. These measures have impacted overall business operations, academic and research programs, outreach opportunities, and the spirit and morale of faculty and staff, and yes, even the students (Donald and Naff, 1992).

Virginia Tech felt that it was facing what appeared to be a continuing trend for the Commonwealth of Virginia, so the university began a series of initiatives to review, restructure, renew, and reallocate resources that would prepare it for the apparent declines in support. Phase I was designated as the actual budget reductions, and administrators initiated a Phase II effort in 1993 for each academic and vice presidential unit to develop specific goals and objectives.

The most recent action at the state level has been a request from the Council of Higher Education and the Secretary of Education that each state institution submit a "restructuring" plan. The Governor and 1994 General Assembly requested these plans "to effect long-term changes in the deployment of faculty, to ensure the effectiveness of academic offerings, to minimize administrative and instructional costs, to prepare for the demands of enrollment increases, and to address funding priorities as approved by the General Assembly" (*Restructuring Virginia Tech*, 1994). Fortunately for Virginia Tech, the Phase II initiatives that the administration had already requested positioned the university to prepare a rather

detailed plan that, in the words of President Paul Torgersen, would position Virginia Tech to "become the model land-grant university for the 21st century." The *Restructuring Virginia Tech* document contains numerous actions and initiatives for restructuring -- several that emphasize delineating innovative ways for harmonious teamwork with both internal and external resources.

Partnerships for Progress

Partnering is a management technique that has been recognized for quite some time. However, the concept has now found its way into the management issues facing higher education today. For example, the 1994 CAUSE Annual Conference has a track dedicated to partnering and a pre-conference seminar that focuses on partnering concepts.

Whether the partnering concept is viewed as a consortium, collaboration, team, or actual partnership, it is a method for gathering parties working on a common goal. The *Restructuring Virginia Tech* document emphasizes partnerships as one of the central themes for restructuring and lists several examples of existing partnerships with public schools, community colleges, other universities, private industry, and local and state government (*Restructuring Virginia Tech*, 1994). Another possible partnering concept is not mentioned in the list -- partnering within the institution. Because Virginia Tech has been involved in total quality management efforts and has used teams for the last few years, the idea of "internal" partners was probably overlooked in the list, but this method is a very productive way to manage change.

Administrative Systems Initiative

A major project to improve the University community's work/service environment has been approved at Virginia Tech. The effort would not be possible without both internal and external partnerships or using team concepts for innovative productivity. A description of the project is included here from a recent article that appeared in the campus newspaper for faculty, staff, and graduate students (November 3, 1994). It also gives some background information while introducing Project ENABLE to the general university community.

> *Project ENABLE is the name selected to identify one of the most significant and aggressive endeavors ever undertaken by Virginia Tech. As an integral part of the Virginia Tech restructuring, the University has recently committed to a major initiative dedicated to improving the University community's work/service environment.*
>
> *The Project ENABLE initiative focuses on replacing all of the University's major administrative computing systems with new state-of-the-art systems. A special feature of this replacement strategy is the intention to complete the project on an aggressively accelerated and fast-tracked schedule. Project ENABLE also focuses on redesigning the fundamental business processes underlying administrative functions targeted for replacement computing systems.*
>
> *Aside from the fact the state has mandated all higher education institutions to develop and implement major initiatives to improve the efficiency and effectiveness of their operations, the need for a major restructuring at Virginia Tech has become apparent. Decreased financial support from the state combined with generally diminishing resources, obsolete information systems, and ineffective automation tools have resulted in a work environment characterized by overpowering workloads for employees and a*

general inability to provide efficient and effective quality service. The objective of Project ENABLE is to provide a multi-faceted response designed to address these problems directly and aggressively.

Since Project ENABLE's objective is indeed aggressive, it should not be surprising that the primary goals for Project ENABLE are equally aggressive and ambitious. The project's goals include:

- *enhancing the quality of services provided to the University community,*
- *increasing efficiency and productivity of the University's resources, and*
- *improving the collective work environment.*

Other initiatives are underway at Virginia Tech that clearly support the Project ENABLE goals. Information Systems is in the process of developing more effective philosophical and practical approaches to overall information management. This will enhance accessibility to information and impact the way everyone interacts with administrative processes and systems. Other projects include the Faculty Development Initiative and the Administrative Workshop and Literacy Project, both designed to provide financial, technical, and educational assistance to faculty and staff making the transition to new hardware and software systems; and, an ongoing communications infrastructure improvement program designed to accommodate the enhanced computing systems. Several University initiatives that complement Project ENABLE have been described in the recently published document RESTRUCTURING VIRGINIA TECH. The complementary role of these initiatives will become increasingly more apparent as Project ENABLE moves forward.

One particularly interesting feature of Project ENABLE is the unique approach being used to organize and manage the project. Project ENABLE is organized around cross-functional and multidisciplinary teams. The team approach greatly enhances management and organizational flexibility and provides the project with a variety of benefits that would not be possible working in a traditional work environment. Project ENABLE teams are composed of both technical and functional/operational personnel. The latter provides the opportunity to get those most familiar with the day-to-day operations and special needs of the processes being redesigned directly involved in the project. Project ENABLE will realize the benefits of more productive thinking, increased coordination, greater levels of employee satisfaction and development, and enhanced organizational productivity. These teams are being staffed through a reallocation of resources within the University.

One final note of curiosity - an answer to the question "Why the name Project ENABLE?". The word ENABLE was chosen because it so accurately reflects the overall intention of this innovative project. The dictionary defines ENABLE as the process of "supplying the means, knowledge, and opportunities to be or do something". That is exactly what the people of Project ENABLE will be doing as they proceed with the work of redesigning the University's administrative processes and computing systems. They will definitely be "Enablers of innovation ... enabling the University to be its best!" (*Spectrum*, 1994).

A point early in the article suggests the need to consider partnering. Having a replacement strategy designed to complete the project in an aggressively accelerated and fast-tracked schedule requires considering any cooperation effort that can contribute. This might involve vendors, other institutions, or even state agencies that initiated regulations or schemes that created the situation.

Another significant point from this article of introduction is the reallocation of resources to form cross-functional and multidisciplinary teams. The team approach is one method of partnering across the various institutional structures that creates an environment for harmonious interactions.

Establishment of Project ENABLE

When the higher education administration committed to this major administrative systems initiative, it was clear that a strategy needed to be put in place that would be aggressive but yet attainable in a short timeframe. The strategy adopted by management to establish Project ENABLE quickly has several key directives.

- Secure University-wide approval and support
- Assemble an aggressive and productive staff
- Create a team concept that instills motivation
- Establish a communications structure that will garner support
- Utilize a "fast-track" implementation schedule
- Implement a shift in technology architecture
- Emphasize the need for business process analysis and redesign
- Focus on the project as a "period of transition"

Space constraints of this paper do not permit covering each of these directives in detail, however, the key directives that have impacted partnering efforts at Virginia Tech are discussed briefly.

Securing Approval and Support

Once the key administrators (President, Executive Vice President, and Provost) agreed to the initiative and the strategic directives, other constituents were updated through a series of presentations by the Vice President for Information Systems. A project of this magnitude could never be done in a vacuum, nor could it be done with only the limited resources in one segment of the University, such as Information Systems. The inclusion of all appropriate segments and personnel at the earliest states of the project made it possible for all to understand that sacrifices appropriate to each might be required in order to ensure success.

Project accountability has been placed with the Vice President for Information Systems. The overall project leader was chosen for experience in leading a major project and as someone without a lot of "baggage" in the administrative systems areas. The individual selected came from the communications area and was a leader in the successful installation of a major communications systems at Virginia Tech in the late 1980s.

The Executive Vice President at Virginia Tech has always acknowledged that personnel from the administrative offices should be involved in any systems work since they are the ones who use the systems daily and are, in most cases, the ones most affected by any changes. The Executive Vice President is a champion of Project ENABLE and he and

other key administrators have been able to secure broad campus approval for the goals and objectives.

Creating a Team Concepts and Partnerships

When this initiative was approved, the area of Information Systems had 20 people dedicated to administrative systems -- a far cry from the number of people needed for the project. It was made clear that for the project to succeed, the Vice President for Information Systems and the project leader would be allowed to "go after" any person as a participant -- yes, any person.

Key administrators where willing to listen when they were approached with the concept of partnering. People began to understand the importance and advantages of using cross-functional teams in this aggressive project for administrative systems. Support staffs had been established for a number of years in many of the key administrative areas (mainly finance and student systems) and they became targets for the new project from the start. However, these established support staffs were not the people needed to lead many of the administrative projects that would be part of Project ENABLE. Consequently, the University Controller and the Personnel Director were two of those asked to partner with the project. The result has been that an Associate Controller has been assigned full-time to lead the finance effort, and the Assistant Director of Personnel Services will lead the human resources effort full-time. In addition, personnel from the budget office, the office of institutional research, the registrar's office, admissions, the office of internal audit, the information systems areas, and other key areas have been assigned either full-time or part-time to Project ENABLE.

A project of this size obviously needs tremendous support. Some areas of support may not require full-time effort, yet the participation is critical for success. The Vice President and project leader again were able to work with different organizations to establish partnerships for support teams. For example, an Administrative Client Team in the Computing Center is working closely with Project ENABLE to place new Apple Macintosh computers in administrative offices. The Server/DBMS Team, also in the Computing Center, maintains the Oracle database software, helps define server needs, maintains server hardware and software, and provides professional training to Project ENABLE personnel and customers. There are other such partners that work with security, workflow, public relations, training, and so on.

Fast-tracked Implementation and Partners

Strategies for a fast-tracked implementation of "core" administrative systems include purchasing application software from an approved vendor or vendors, using an open systems UNIX operating environment, and utilizing a relational database engine. These strategies have already led to partnerships with outside vendors and laid the groundwork for opportunities with other.

- Virginia Tech currently has a site license with Oracle and is constantly examining ways to improve the partnership in both the academic and administrative arenas.
- A contract has been signed with the SCT Corporation for a human resources system. Project personnel are continually researching ways to work more closely with the vendor to relate the needs of a large research institution.
- Apple Macintosh computers have been selected as the hardware for faculty workshops, administrative offices, classrooms, and labs. Apple continues to work with Virginia Tech to enhance its relationship.

- Apple and Virginia Tech are partnering on the AOCE software and the way it can be used for workflow applications.
- Virginia Tech is a member of the Mandarin consortium and is gaining experience while contributing to future development on the product.
- Financial personnel are partnering with NACUBO on benchmarking information for establishing various measurements for improvement.

This list could be enlarged, but the point is made that outside partnerships are very helpful in any endeavor. In most cases, both parties have something to offer and something to gain from the experiences.

Another opportunity that exists for outside partnerships is with other institutions and with state agencies. The University of Virginia and Virginia Tech are teaming to offer graduate courses in Northern Virginia, while Penn State and North Carolina State are working with Virginia Tech to share extension specialists and other resources (*Restructuring Virginia Tech*, 1994).
Virginia Tech is currently involved with particular state offices to secure more decentralized administration. If successful, such decentralization could be carried over to internal partnerships among the colleges. Efforts are also underway to utilize the State Council of Higher Education, the Secretary of Education, and others.

A Period of Transition

Project ENABLE provides a major period of transition for Virginia Tech. In a reasonably short period of time, new administrative systems will be installed in a client/server environment that will eliminate a dependency on proprietary hardware; a new technology architecture in all administrative and academic offices will provide increased desktop capabilities; and business processes will change to provide more efficient and effective administrative operations. None of these achievements can be realized unless significant partnering occurs within university departments, rank and file staff, faculty, state agencies, other institutions, vendors, private industry, and others. The partnering and team concept will be essential to ensure that the future environment will be acceptable and will "enable" the institution to be its best.

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A special appreciation is extended to other members of the Project ENABLE Staff Support Team for their efforts in promoting the project, and for contributing to the November 3, 1994, *Spectrum* article. Members of the team are Anna Dickerson, Becky Glazener, John Krallman, and Richard Stock.

EXEMPLAR! A Consortium for Administrative Software Sharing

by Kenneth C. Blythe
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Folks, we are being left behind. While our institutions are wanting to move forward faster with information technology, we in administrative computing, often find ourselves challenged by the pace. In spite of all that we've learned in 30 years of mainframe computing, the life cycle of the typical administrative computing project is still way too long. Our institutions are considering distributed computing because they think that we take too long and perhaps distributed computing will break the cycle of delay that is plaguing most administrative computing organizations these days. Our budgets are declining while price/performance improvements are virtually guaranteeing the obsolescence of our computer systems and the business processes that they support.

So, what are we to do? This paper will discuss one of the most undeveloped yet most important ideas to come on the scene in sometime, the idea of sharing. Sharing is not new, it was one of the founding principle of CAUSE more than 25 years ago. Higher education is a choice arena for sharing because of the openness and frequent interaction between institutions of higher education. There is a willingness in higher education to share their works, including computing systems, with others. In spite of the willingness, openness and frequent interaction, sharing is a relatively undeveloped method for handling the backlog in administrative computing applications. While there has been much written about the alternatives of build versus buy, there is very little intellectual development of the success factors of sharing.

A CONSORTIUM FOR THE 1990'S

EXEMPLAR is a consortium of universities that want to share "sound practice" administrative computing applications. In addition, these universities have the common characteristic of sharing a single software architecture, Software AG's toolset, including tools such as ARCHITECT, CONSTRUCT, NATURAL, PREDICT, and ADABAS. Another way of looking at EXEMPLAR is as an extension of Software AG's tools to allow colleges and universities to share administrative computing applications quickly and economically. There have been other attempts at sharing higher education administrative computing applications in the past that were not generally successful because the "choices" were too numerous; there were too many alternatives of hardware and software representing too many different business processes from too many different schools. EXEMPLAR is intentionally limited in scope to Software AG users to increase the probability of success.

EXEMPLAR is just getting started. It is an outgrowth of CAUCUS, the higher education user group for Software AG products. The purpose of EXEMPLAR is to *create an environment for collaboration and sharing of best practice administrative computing applications between higher education institutions.* EXEMPLAR offers the possibility of

sharing software developed at one institution to another by serving as a conduit for transferring and, at the same time, adding value to the software. Acting as a *clearing house* and *"matching"* service, EXEMPLAR provides consortium members the ability to discover best practice applications that can be added to their libraries without major expense.

WHAT IS BEST PRACTICE?

To restate the purpose, EXEMPLAR is a consortium for exchanging best practice applications. What is best practice? Here are the elements:

- Represents Best Business Processes - First and foremost, best practice computer applications represent best practice business processes. It is a fundamental goal of EXEMPLAR to share software applications that elevate business processes because they have good business processes associated with them. EXEMPLAR is not only software sharing but best business process sharing as well.

- PREDICT Data Models - The next element of best practice is a normalized data model. Many institutions would be satisfied just to share data models because they are the first approximation of the entities and attributes of best business processes. These days, the entities in a data model are also the first approximation of objects, representing building blocks toward object oriented programming. Whatever they are called, entities or objects, EXEMPLAR will maintain them in its repository to be shared with others.

- ARCHITECT Entity Relation Diagrams - Best practice also includes entity relation diagrams prepared with NATURAL ARCHITECT. Entity relation diagrams help the recipient institution to understand relationships between entities and attributes that are included in the PREDICT data model.

- ARCHITECT Data Flow Diagrams - To round out the design, best practice also includes data flow diagrams on which applications are based.

- Application Models - Best practice also means computer programs that do not have institution-unique attributes embedded in them. EXEMPLAR wants to exchange application models based on NATURAL CONSTRUCT rather than application code. We believe, as a rule of thumb, that 90% of an application is functionally generic while 10% is institutionally specific. The goal of EXEMPLAR is to simplify the transfer of functionally generic part in the form of NATURAL CONSTRUCT models. Best practice applications are those provided as CONSTRUCT models.

- Written in NATURAL - It goes without saying that best practice applications are those written entirely in NATURAL. The value of NATURAL is obvious. Among other things, it insures that applications can be shared that are readily understood by the recipient programmers (who already know NATURAL.) NATURAL insures that there is no need for programmer retraining. NATURAL is also a 4th generation language that is easily understood by accomplished technicians.

- Structured NATURAL - Not only are best practice applications developed in NATURAL using CONSTRUCT models, they are also developed using the structured form of NATURAL (versus the reporting form).

- Documentation - Best practice applications include a complete set of data, system and program documentation.

Having agreed on best practice, how do we obtain (find) such applications? The answer is the essence of EXEMPLAR. There are no applications today that qualify completely as best practice. Some are close but none are all the way. The purpose of EXEMPLAR is to combine the energies of a consortium of institutions to arrive at best practice.

THE EXEMPLAR BEST PRACTICE PROCESS

It is an underlying premise that it takes more than one institution to achieve best practice. Limited resources and unlimited demands prevents each institution, on its own, from achieving best practice with its own administrative computing applications. In general, when an institution develops an application on its own, it will shortcut many of the best practice elements because their technical staff understands the intimate details of the application. Target dates, budgets and other practical necessities prevent us from achieving best practice the first time around.

EXEMPLAR tries to compensate for first time expediencies with the best practice process. This process has four distinct stages described below:

Stage 1 - Database Buildup

The first stage of the best practice process is to survey higher education Software AG users to identify those who have applications in each of 26 subject areas. The steps involved are:

Database Buildup

- Send Survey
- Gather Data
- Record Survey Results in Database
- Publish Results for all Originators
- Maintain the Database
- Respond to Inquiries

In addition to identifying the institutions that have applications, the survey also identifies the institutions that need applications.

Stage 2 - Matching Service

Using the EXEMPLAR database, it is possible to cluster the needs and haves for each of 26 subject areas. As the survey results are published, there will be a natural tendency to match, informally, those schools that need applications with those that have.

EXEMPLAR will use the matching information to form Advisory Panels for each of the 26 subject areas. Advisory panels will be made up of individuals from each school that either needs or has an application for the purpose of examining the applications that are available in the EXEMPLAR database. To form the advisory panels, EXEMPLAR will first seek one individual from one of the need/have schools to serve as the trail boss or leader of the advisory panel. The trail boss will form the advisory panel and lead it through the examination of candidate applications. It is likely that the trail boss will have a strong interest in (affinity for) the applications. In fact, the trail boss will probably be from a school that wants to be an early recipient (scrubber) of the application. Here are the steps in Stage 2:

Matching Service

- Appoint a Trail Boss
- Form an Advisory Group
- Review Candidate Applications from the Have Schools
- Select the Applications that are Most Likely toBecome Best Practice
- Determine Original Development Cost of the Selected Application
- Continuous On-going Advisory Role

At the conclusion of this stage, we have a single application that has been selected by members of peer institutions to be most likely to be transformed into best practice. Once this selection is made, EXEMPLAR will distribute the information to all consortium members with a positive recommendation. EXEMPLAR will also try to identify one school to be the scrubber for the application.

Stage 3 - Scrubbing

Scrubbing is the place in the EXEMPLAR process where the selected application is transformed to best practice. In the scrubbing stage, a second school, different from the originating school, agrees to take the application and add the necessary value to make it best practice. The scrubbing school will take out any programming that is institution specific. The scrubber will also prepare documentation and fill in any of the missing elements of best practice. The steps of the scrubbing stage are:

Scrubber

- Search for Scrubber
- Pass Application from the Originating School to the Scrubbing School
- Scrub the Application
- Adhere to Best Practice

The application, will be transferred from the originating school to the scrubbing school at no charge. EXEMPLAR will facilitate the transfer by providing transfer documentation and support. Intellectual property rights for the application will be retained by the originating school even though the scrubbing school adds value. The added value of the scrubbing school is returned to the originating school as fair compensation for the free use of the original application.

Stage 4 - Repository

After the application has been selected by the EXEMPLAR Advisory Panel and scrubbed to make it best practice, it will be turned over to EXEMPLAR for keeping and distribution to other members of the EXEMPLAR Consortium for a fee (the fee is set at 10% of the original cost of developing the application by the originating school). The steps of the repository stage follow:

Repository

- Obtain Copy of Source Code and Documentation from Scrubber
- Freeze the Application at a Release and Version Level
- Prepare Final EXEMPLAR Documentation
- Integrate, to the Extent Possible, the Application with other EXEMPLAR Application
- Transfer Application and Request to Consortium Members (for 10% of the Development Cost)
- Insure that Usage Rights, but not Property Rights, are Transferred with the Application
- Determine Cycle of Update to next Release and Version
- Arrange, as necessary, for Training and Support of the Application for a Fee

EXEMPLAR will maintain current versions of the application with source programs and documentation for quick and easy transfer to other institutions.

The four stages of the EXEMPLAR best practice process are intended to raise the quality of all applications that are eventually kept in the repository. It may be that it will be necessary to include applications in the repository, at first, that will not satisfy the full range of best practice requirements in order to fill out the repository from the beginning. In this way, EXEMPLAR will be able to satisfy early member interest with less than best practice but good solutions nevertheless.

BETTER THAN THE ALTERNATIVE

Not to confuse, but there are some very good administrative computing applications in higher education institutions that are somewhat less than best practice. In some cases, these very good applications may be included in the EXEMPLAR repository because they are better than the alternative (having no application). The EXEMPLAR Executive Committee may decide, on the recommendations of an advisory panel, to include a very good application in the EXEMPLAR repository. The Executive Committee can even decide, in some cases, to add an application that is very good to the repository before it is scrubbed if there is sufficient interest among the EXEMPLAR members.

This better than the alternative selection process is only a temporary measure until real best practice applications come available. Remember, there are no best practice applications available today that meet all of the best practice requirements. This better than the alternative process will allow early exchange of very good applications as a placeholder until best practice replacements are available.

When a better than the alternative application is included in the repository, it will be clearly marked as such to avoid confusion among the members.

EXEMPLAR has to (1) raise applications to best practice requirements and (2) accept very good "early" placeholders until best practice applications are available to replace them. It is the responsibility of the EXEMPLAR Executive Committee to waive best practice standards in those cases where it is necessary to achieve full range of early applications for EXEMPLAR members.

PROGRESS TO DATE

The EXEMPLAR administrative office was officially established at Penn State University in September 1993. Survey forms were sent to 148 higher education Software AG customers in November 1993. Fourteen surveys have been returned to date and are being clustered into have and need categories. The following chart shows the results to date for one category, student recruitment and admission:

Student Recruitment and Admissions
Survey Results

	Need	*Have*	*Share*
Brown University		✓	
College of William & Mary		✓	
Georgetown University	✓		
Indiana University of PA		✓	
McGill University		✓	✓
Miami University	✓	✓	
Pennsylvania State University		✓	
University of Alabama, Birmingham		✓	✓
University of California at Santa Barbara		✓	
University of Delaware		✓	
University of North Florida	✓		
University of Wisconsin-Oshkosh	✓		
University of Wisconsin-Stout	✓		
Washington State University	✓		

Notice that there are five schools that need a student recruitment and admissions system, eight schools that have systems and two schools that will share their systems with others. This presentation could be reproduced over again, with different results, for each of the subject areas.

The Inventory Management System (IMS) of Cornell University has been scrubbed already and is available for sharing today. IMS has been scrubbed by Penn State University and returned to Cornell to incorporate the scrubbing changes. IMS represents a wonderful business process that has saved Cornell and Penn State University both thousands of dollars. The same application can be transferred to other institutions for as little as three months of effort and $30,000 (10% of original cost of development by Cornell). IMS will be included in the EXEMPLAR repository this Summer (1994).

Another application, Penn State's award winning Electronic Approval SYstem (EASY), has been scrubbed by McGill University and is also available for sharing today. The EASY system has been approved by auditors as an electronic replacement of paper forms. This system is an essential element of streamlined business processes of the future because it enables institutions to eliminate paper and streamline day-to-day operations. Penn State estimates that EASY, when it is fully implemented, will save $850,000 per year.

In addition, there are at least twelve other applications that are looking for scrubbers. Many of these are currently being prepared for inclusion in the EXEMPLAR repository with the assistance of Software AG system engineers and personnel from the institutions that are *willing to share them.* They are:

- On-Line Report System (ORS)
- EZ Forms
- MVS UNIX Scheduling
- Department Obligations
- Student Kiosk
- Central Tables
- Misc. Accounts Receivable
- Schedule 25-Front-End
- Student Housing
- BSR Front-End
- Cash Receipts
- Work Orders

TRAIL BOSS

One very effective way for an institution with a *Need* to obtain an application is for it to become a Trail Boss. Being a trail boss means your institution is the first to work with an institution that *Has* and is *Willing to Share* an application you want to implement. You work together to have the application "scrubbed" to meet the requirements for inclusion in the EXEMPLAR repository and at your institution. By becoming the trail boss and "scrubbing" the application, you receive the application free of charge. The fee of 10% of the original development cost that was incurred by the source institutions is waived. Not a bad deal at all!!! The obligation for your institution is to work closely with the source institution to insure that the software application being shared meets the criteria for inclusion in the EXEMPLAR repository. These criteria are:

1. Application runs under current version of SAG products
2. Application is in production
3. Has complete documentation

More specifically the application should have its NATURAL programs, maps, DDMs, local data areas, etc. unloaded via SOFTWARE AG's UNLDMAIN utility onto a 6250 bpi 9-track magnetic tape. If UNLDMAIN is not available, then its equivalent should be used. Accompanying the tape should be:

- The name of the utility used to unload the application.
- The processor and operating environment on which the application is executing.
- The version of NATURAL it is operating in and mode (structured or report).
- The number of program modules, maps, DDM, local data area names, etc.
- A list of program names, map names, DDM names, local data area names, etc.
- A DBA contact name, phone number and Email ID.
- Any other documentation that will be beneficial, including structure charts, data flow diagrams and data dictionary.

CONCLUSION

EXEMPLAR provides another alternative to buy vs. build which is sharing; with EXEMPLAR we can buy, build or share. Sharing has been tried many times in the past with modest success because those sharing attempts were not conceived or structured for success. The EXEMPLAR Executive Committee wants to increase the probability of success by reducing structural barriers. Until now, sharing has been a slipshod operation with little commitment (or investment) on the part of either the originator of the application nor the recipient. EXEMPLAR will reduce the barriers by:

- Surveying Software AG Users.
- Providing a knowledge base of available applications.
- Developing a short list of good applications.
- Selecting Advisory Panels to review the short lists to select one for becoming best practice.
- Maintaining best practice and very good applications in the EXEMPLAR repository for other schools to share (at a fee of 10% of the original cost of development).

This process is intended to create the right opportunities for schools which have high-quality applications to pass those applications to scrubbers so that they can be made into best practice applications for other schools that need them. EXEMPLAR is the most advanced effort by educational institutions to share the burden of best practice administrative computing applications.

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