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ABSTRACT

Seven papers from the 1988 CAUSE conference's Track III, Financial Impact and Considerations, are presented. They include: "Providing Applications Development Services in a Competitive Environment" (Donald E. Heller and Mary Ellen Bushnell); "The Cost of Not Staying Current" (Jack T. Tinsley and Betty R. Nyer); "Project Management in Higher Education: Making It Fit the Due Date" (Anthony P. D'Andrea and Robert DeBruin); "Funding Strategies for Information Technologies" (Raymond D. Smoot, Jr.); "Community Education: A Role for the Information Center?" (Phyllis A. Sholtys and Deborah Chalk); "Building Strategic Partnerships with Industry" (Arthur S. Gloster II and James L. Strom); and "Using Computer Models to Consider Computer Center Growth Options" (Judith V. Douglas and Donald E. Harris). (SM)

Information Technology: Making It All Fit

Proceedings of the 1988 CAUSE National Conference

TRACK III: Financial Impact and Considerations

November 29 - December 2, 1988
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TRACK III: Financial Impact and Considerations 209

Track III
Financial Impact and Considerations

Coordinator:
Renée Frost
University of Michigan

Although the cost of hardware per unit of output is decreasing, the costs associated with software, m·.intenance, training, and staffing compel close attention to the financial impact of integrating information technologies into an organization.

Papers in this track address financial management techniques such as funding models, project planning/project management, cost determination and justification strategies, monitoring and controlling project costs, and identifying alternative funding sources.

Betty R. Neyer
Florida Community College at Jacksonville

Donald E. Heller
Massachusetts Institute of Technology

Providing Applications Development Services in a Competitive Environment

Donald E. Heller
Director
Administrative Systems Development

Mary Ellen Bushnell
Manager, Documentation Services
Administrative Systems Development

MIT • Information Systems
Massachusetts Institute of Technology
Cambridge, Massachusetts
November, 1988

Many applications development (and maintenance) groups are moving from being overhead units to ones that must recover their costs from customers within the institution. In addition, they are finding themselves in a more competitive environment on two fronts: users who hire their own programming staffs, and outside consultants who sell their development services to users. This paper discusses one institution's experience, and will provide information that can be valuable to all managers. Some of the issues addressed include marketing and promotion, contracting with clients, project management, and time accounting and billing.

Introduction and Background

The provision of applications development and maintenance services is changing with the introduction of new technologies and organizational pressures into the university environment. The traditional development group is often faced with the task of restructuring itself in order to meet the challenges it faces if it is to continue to be a strategic resource to the university. These challenges, which have acted to change the monopoly position traditionally enjoyed by the central mainframe-based development group, must be recognized and turned to the advantage of the central group if it is to survive.

At the Massachusetts Institute of Technology (MIT), as at most universities, administrative applications development has until recently been provided exclusively by a department within the central data processing group. Information Systems (IS) at MIT provides a full range of services, including applications development and maintenance, data center operation, voice and data communications services, and end-user support. As recently as 1982, the central development group, now called Administrative Systems Development (ASD), had a virtual monopoly over the market for developing administrative or business systems. However, the introduction and wide-scale availability of mini-computers, followed shortly thereafter by personal computers, has brought other players into the market. In the days when the only available platform for running an application was on the large, centrally-controlled mainframe computer, IS maintained tight control over the development of those applications because of its ownership and control over the mainframe computing resources. Clients had no choice but to come to the central development group if they wanted to have a system developed or enhanced. With the advent of powerful minicomputers, though, those departments with a large enough demand for computing resources found that they could cost justify both the ownership and operation of a minicomputer, as well as the resources necessary to develop and maintain an application.

These large users who purchased their own minicomputers generally developed applications in one of two ways. If the demand for programming services was deemed to be of a short duration, with no need for ongoing applications support, then an outside consultant was often brought in to develop the application. After completion of the project, tne consultant would be retained to provide a designated level of support and enhancements. Certain staff in the user areas would be designated as the "computer expert", and would be provided with minimal training to provide operational support on a day-to-day basis. Depending on the size of the minicomputer, it either would be operated at the data center by the central IS organization (if it required computer room facilities), or would be located in and operated by the user department itself.

As this migration away from the central development group was beginning, some users were able to create dedicated programming positions (often staffed by enterprising students) from within their own department. Thus, we soon had a mixture of consultants and client-owned programmers developing business applications for minicomputers, and shortly thereafter, personal computers. As with many other institutions, the next logical step (and one that was advocated very strongly by the client community) was the migration of some of the mainframe applications programmers from the central applications development group out into the client departments. Today, business applications development across all three platforms (personal computer, minicomputer, and mainframe) is performed by a mixture of the central group, outside consultants, and client-based programmers. This dispersion of responsibility is part of a trend described recently as "...the devolution of influence over IS activities, computer power and applications to user organizations...[caused by] company pressure for competitive systems, increasing availability of and familiarity with powerful desktop systems, and economic pressures to reduce IS expenses."[1]

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1 Kay Lewis Redditt & Thomas M. Lodahl, "Leaving the IS Mothership", CIO Magazine, October 1988, p. 56.

Parallel to this shift in the control over development resources have been demands for greater accountability and better performance on the part of the central group. Since it no longer enjoys the advantages of a monopoly, the central group has had to change to become more able to compete with other service providers. No matter whether the central group has operated on a chargeback basis, or strictly as an overhead (non-cost recovery) unit, survival in the competitive environment now depends upon the group's ability to adapt to its new challenges. Phrases like *market research, marketing, service level agreements, cost recovery strategies,* and *customer service,* which in the past have been all but unknown to the central development group, become key factors in the competitive environment.

Establishing Revenue Goals

The first step in the move towards the competitive environment is that of deciding upon the organization's cost recovery goals. Occasionally a change in strategy is proposed by the central group in response to its recognition of the need to compete with other service providers or because of perceived budgetary pressures; often the decision is thrust upon the organization by senior management of the university. There has been much emphasis recently in the press on MIS accountability and on making it "pay its own way", and universities have not been exempt from these trends. Simultaneously there has been a movement towards more sharing of the responsibility for systems development between MIS and the users of the system. At MIT for example, this sharing of responsibility has been described as follows:

- Central administrative departments serving as custodians (not owners) of central Institute data with responsibility to insure that the data are accurate, consistent, timely, and accessible.
- Central administrative departments with responsibility for all applications related to their areas of functional responsibility, where applications include those used within a central administrative department as well as across the Institute.
- Implementation and support of applications carried out, at the department's discretion, by a combination of Information Systems staff, vendors and the administrative department's computer support personnel.[2]

Regardless of the origin of the decision, clear and concise cost recovery goals must be established so as to provide a framework for the transition. Figure 1 below shows examples of various targets in the continuum from organizations that are purely overhead to those that are run as profit centers.

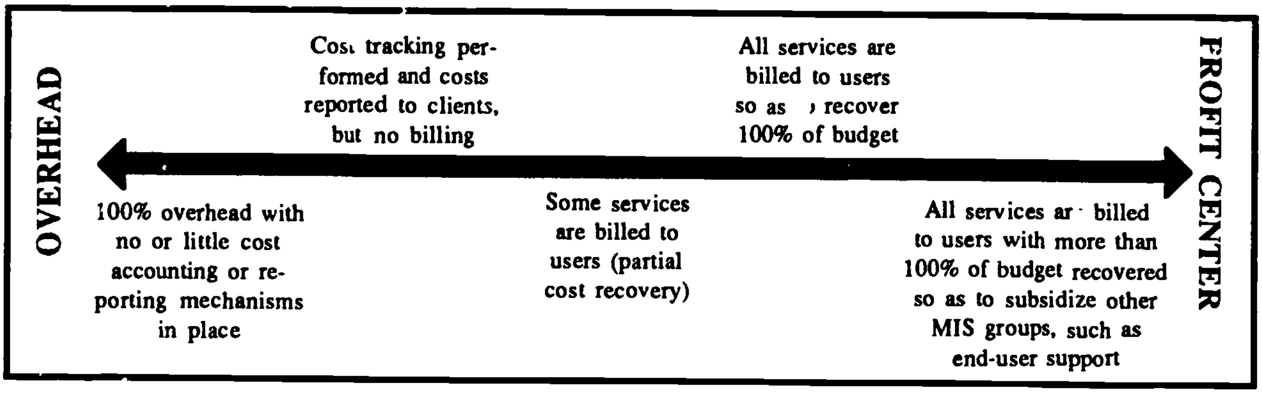


Figure 1

2 "A Proposed Administrative Information Systems Strategic Plan", MIT, March 1986, p.19

The decision of where to target the location of the central development group on the continuum depends on the answers to questions like these:

- What is the precedent in the university for the chargeback of services by other central groups (such as buildings and grounds, telecommunications, or the data center)?
- What is the budget situation of the central group's clients? Are they mandated to be cost recovery units or are they strictly overhead units?
- What cost accounting mechanisms are in place or can be put into place (i.e., can/should services be recorded and charged hourly, per person-month, or person-year)?
- How much control over its costs does the centre development group have? If the demand for its services drops temporarily, can it use layoffs or will staff have to be carried as overhead for a period of time because of university personnel policies?
- How strong are the pressures for decentralization of the group, and how available are substitute services?

There is no single formula that dictates where on the continuum the central development group should fall. However, there are advantages and disadvantages to each end of the scale, as well as the gradations in between. Figure 2 outlines some of these.

	OVERHEAD	COST RECOVERY/ PROFIT CENTER
ADVANTAGES	• No need for reporting of costs to clients • Provides a perceived cost advantage to clients over using other service providers • No disruption to the organizational structure and culture of the central development group	• Provides better understanding of the costs associated with applications development • Provides more incentive for clients to accept more responsibility for their role in development • Provides opportunity for funding other MIS functions indirectly • Provides more of a baseline for competing with other service providers
DISADVANTAGES	• Lack of metrics for comparing costs and performance with competing service providers • Devaluing of service by clients, i.e., the "you get what you pay for" syndrome • Less participation in the development process by clients	• Cost accounting/reporting/billing mechanisms have to be put into place and maintained • Charging for services may cause clients to examine other alternatives they would not have otherwise considered • The need to achieve certain revenue goals may cause instability in staffing, which could harm staff morale

Figure 2

At MIT, the decision was made to use a phased approach to move ASD from being a $5 million overhead unit to a 100% cost recovery organization. In the first year, ASD would charge for the maintenance and support of existing applications, while continuing to provide development of new applications from overhead funds. In order to minimize the impact on the clients' budgets, a portion of the ASD budget corresponding to the value of the services being provided was transferred to the client in order for them to purchase back those services. In the second year, all services (maintenance, support, and development) would be billed to the clients. During the budget preparation process for that second year, ASD would negotiate with each client a level of services to be provided that second year. The client would then include in its budget submission the funds necessary to contract with ASD to purchase the services, and ASD would include the expected revenue from each client in its budget. Thus, the ASD budget would show 100% cost recovery for the year. In both phases, written service level agreements between ASD and each client were negotiated and signed so as to clearly identify the roles and responsibilities of both parties (these agreements are described in more detail on page seven).

No matter what revenue goal is established, it is important that the goal be clearly defined *and* communicated to clients, the staff of the development group, and senior management of the university. As with any other organizational or cultural change, there are a number of concerns that are raised by various parties that need to be addressed. Clients, for example, may be concerned about their need to estimate and justify the *explicit* expenditure of budgeted funds on applications development. Staff will be anxious about the need for cost accounting and their future job prospects as the group begins to compete with other service providers. The best way to alleviate these concerns is to inform all parties of the changes that are to be made and how those changes will affect them or their organizations. Discussions with both staff groups and client groups, where they have an opportunity to ask questions and make suggestions, can be a critical success factor in the process.

Marketing and Promotion

Once the organization's cost recovery goals are established, the focus must be shifted to marketing and promoting the group's services. When the central development group enjoyed a monopoly on its services, and in an era when demand for its services was growing continually, it could sit back and wait for clients to come to it. In the competitive environment, however, it is necessary to promote the organization's services to both existing and new clients. Remember that these clients have a wealth of alternatives to the central group's services: outside consultants, student programmers, software packages, and local experts. The central development group must inform its clients why the hiring of experienced and professional developers in-house can be to their advantage.

The first step is to identify and define the services that you are offering. *Applications development and maintenance* can be thought of as one or more of the following discrete services:

- Business Analysis
- Project Management
- Technical Writing
- Systems Analysis
- Programming
- Training
- Systems Design
- Testing
- Production Support

Many more types of services could certainly be added to this list. The central development group must decide which services it is providing, how the services are defined, and what mix of these services it is aiming for. For example, developing a new business application for a client may entail all of these services, from business analysis through to production support. This has been the traditional market served by the central development group. In the competitive environment, however, some clients may choose to purchase only certain services. A client that has its own programmers on its staff may purchase technical writing support, rather than hiring its own technical writers. Similarly, the central group may perform a business analysis and design a new system for a client who may have its own programmers perform the coding.

The next step is to assign a price to each of the services. Services can be priced on an hourly, daily, weekly, monthly, or annual basis, or can be based on fixed price quotations for each project. Two main factors determine the pricing of services: 1) cost recovery goals, and 2) market considerations. The cost recovery goals will determine the total revenue to be raised. If, for example, the goal is to recover 100% of the group's costs, then the services must be priced on a unit basis so that if 100% of the available units (hours, days, months) are billed out, the entire budget will be recovered. The availability and pricing of competing services in your geographic area will provide information needed to determine the relative prices among the differing types of services to be offered. Figure 3 provides a detailed example of a pricing model similar to one used at MIT.

Example of a Pricing Model

Cost Recovery Goal: Recover 100% of budget ($2,000,000)

Staff Size: 1 Director, 1 Administrator, 3 Managers, 5 Project Leaders/Senior Analysts (PL), 20 Programmer/Analysts (PA), 3 Technical Writers (TW)

Market Assumptions: PLs are billed at 1.25 times the PA price; TWs are billed at .75 the PA price

Overhead Calculation: There are 52 forty-hour weeks in a year; from this, you have to subtract: 120 hours vacation, 96 hours of holidays, 80 hours of sick time, 80 hours of training/development, and 200 hours of miscellaneous overhead. Thus, a person who can be billed out can bill:
2,080 - 120 - 96 - 80 - 80 - 200 = 1,504 hours each year. Overhead rate = 28% (576 / 2,080).
Assume that Director, Administrator, and Managers are not billed out.

Pricing Formula: If P$ is the hourly cost of a Programmer/Analyst, then:
$2,000,000 = (1,504 x 5 PL x 1.25 x P$) + (1,504 x 20 PA x 1.00 x P$) + (1,504 x 3 TW x 0.75 x P$)
= (9,400 x P$) + (30,080 x P$) + (3,384 x P$)
= 42,864 x P$
therefore: P$ = $2,000,000 / 42,864 = $46.66
Programmer/Analysts: $46.66 x 1.00 = $46.66/hour
Project Leaders/Senior Analysts: $46.66 x 1.25 = $58.33/hour
Technical Writers: $46.66 x 0.75 = $35.00/hour

Figure 3

An important factor to keep in mind is the group's overhead rate. *Overhead* is used here to mean time spent on "non-billable" efforts, i.e., time spent not working directly on a project for a client. This includes categories like vacation, internal staff meetings, professional development, and marketing. In the model in Figure 3, which is fairly typical of many central development groups in universities, each staff member bills only 29 hours (40 x 72%) in an average work week. An organization that has not bothered to take its overhead activities into account, or has calculated the rate inaccurately, will find it difficult to meet revenue goals as well as project deadlines.

One overhead item that many organizations underestimate is that of the skills and professional development requirements of the staff and managers. In the pricing example above, 80 hours, or two weeks each year, were reserved for training and development. The experience at MIT has been that this is a fairly conservative estimate, and depending upon the mix of projects and existing skill level of your staff, the number will vary. An organization that has traditionally worked on mainframe computers using third generation languages will find that it will take much work to upgrade its staff's skills to take advantage of such technologies as relational databases, fourth generation languages, computer-aided software engineering (CASE) tools, and the like. It is also important to upgrade less technical skills such as project management and business analysis. This upgrading of skills is a requirement for positioning the group against competing providers who may specialize in certain service areas.

The actual marketing of the group's services is not a difficult task. Generally, the potential clients to whom you are marketing are a small group within the university — organizations like the financial office, admissions office, and registrar. These are the clients with whom the central development group has been working for a number of years. Do not overlook, however, less traditional clients like academic department offices who have the need for business computing. The most important part of marketing the group's services is to be constantly aware of the business plans of your clients. By knowing what the short and long term plans of your clients are, you will be in a position to inform them as to how information systems can help them to achieve their goals.

In promoting the group's services to clients, you should emphasize the advantages of working with your group over working with outside consultants or establishing their own programming staffs. The following are typical advantages that the central development group often possesses:

- *Stability:* Your group will be there next year to support or enhance the system, while an outside consultant (or more importantly, part-time students) may be gone or not interested any longer.
- *Professionalism:* Emphasize the professionalism you bring to a project, your group's project management skills, knowledge of existing systems and their integration, and knowledge of the university. Remind the admissions director that managing data processing professionals is very different from managing admissions counselors.
- *Relationship with other branches of IS:* Capitalize on your group's ability to offer "full service computing" in concert with the data center and information center.

When you have learned of a project either through a conversation with administrators in client offices or in some less formal way, move quickly to set an appointment to learn more about the proposed work and to assess the potential for your group to bid on the project.

The following sections focus on how ASD delivers development services as they are propelled by a series of project management documents.

Selling and Customer Service

One way to approach the issue of selling and customer service is in terms of the documents that support those activities. In ASD, three documents move us from potential to actual work: *proposal, service level agreement (SLA),* and *project plan.*

If an organization follows a methodology closely, a formal proposal will be the first step in establishing a relationship with the customer. ASD's offices are in a building which also houses many of its long-term administrative clients, so that a great deal of the proposal activity is conducted in ad hoc meetings and conversation. For this reason, ASD often does not prepare a formal, written proposal.

A service level agreement is the second document in the correct sequence of business documents. An SLA's purpose ". . .is to create a common understanding about what services will be provided, what resources are available (i.e., both people and equipment), and what level of service users can expect, and what priorities will apply."[3] At MIT the term *service level agreement* means either a contract to work on a specific project, or a contract to provide one or more services at some level of effort for a period of time, often a fiscal year.

If the service level agreement is a contract for a specific project, ASD will draw up the project plan first, since some of the facts and figures in the SLA are drawn from information gathered for the

[3] Naomi Karten, Editor, "Establishing Service Level Agreements", Managing End-User Computing, November 1988, p. 1.

project plan. When there is a written proposal, much of the requ red information is already available.

When the contract provides services for a period of time, then projects and/or tasks will be defined within it, though they may not all be identified at the beginning of the term. In this case, as projects come into foc s, ASD develops a project plan for each.

Each of these documents follows a standard format, and can be available as a template to the project leader or whoever is the author. To project the department's professionalism these documents should be carefully written and reviewed. In ASD the director reviews all of these documents before releasing them to the customer.

Proposal

The proposal is in part a *marketing document* throughout which the service provider conveys its special qualifications for being chosen to do the job. The proposal contains sections covering:

- A description or overview of the current situation
- Scope and approach of proposed services and/or
- A description of products (if any) to be developed
- A list of tasks and associated cost estimates
- Schedules for doing the work
- Names and qualifications of staff who will work on the project
- Assumptions about client participation and responsibilities, and availability of other resources
- Description of management control procedures

The project leader gathers information for the proposal through interviews with staff in the client office. Since a proposal is a standard document, it is just a matter of fitting the interview information, solutions, and schedules to the proposal template. Short biographies of staff may be kept on file to retrieve as attachments. Similarly, management control procedures, which will likely not vary significantly from project to project, can be adapted from some general description of them.

Service Level Agreement

The service level agreement is a *contract do ument* and comprises the following parts:

- A general statement naming the contracting departments
- The terms of the agreement (start and end dates)
- The kind of service to be performed (analysis, programming, technical writing)
- The development group's responsibilities
- The client's responsibilities
- Special conditions related to confidentiality, copyright, subcontractors, and vendors
- Method and rates of compensation

The project leader prepares a service level agreement using a template as a starting point and referring to existing SLAs as models. The director reviews the agreement before it is delivered to the client for approval and a signature. When the project leader and client agree on all the content, the client signs and returns the agreement for the director's signature.

Project Plan

The project plan is a *project management document*. It defines the project in full detail, drawing on information gathered for the proposal if one was written. It includes:

- An introduction that summarizes the scope of the project
- A list of related documents that have accumulated around the project
- A statement of work, including development tasks, documentation tasks, support tasks, training and education tasks, test plans, and when appropriate, plans for benchmarking vendor-supplied application software
- A description of how the project is organized, how information about project progress will be communicated, and of the development methodology and associated tools
- Names, titles, and full-time equivalent levels of all staff assigned to the project including client staff with roles and responsibilities for each
- Hardware and software resources
- Schedules — a schedule of phases, and a detailed schedule of tasks
- Development standards for programming, documentation, testing, and audit/control

The project leader also prepares the project plan and submits it to the director for his approval. Client sign-off is required on the project plan, as it is important as a communication medium to clarify all aspects of the project. The client representative (generally the person who authorizes the contract) receives a draft version to review and comment before ASD publishes the final plan for his approval.

Managing the Project in the Competitive Environment

Once the project is underway, it is essential to stay in contact with the client as work progresses, providing periodic updates on project progress, hours spent, and costs. Close tracking will provide plenty of warning if the project begins to wander off course either in focus or hours spent. The need for good project management techniques is not unique to the competitive environment, but it takes on additional importance in determining the group's success.

Accounting for Project Efforts and Costs

One of the first controls that ASD adopted in its move towards cost recovery was the weekly *Time Accounting Form*. The Time Accounting Form is divided into two sections. The top grid is designed to capture the hours a staff person has spent by project and by activity within each project (analysis, design, programming, testing, implementation, production support, documentation). The lower grid collects hours spent on overhead activities such as professional development, vacation, or general support.

Every week, ASD staff members fill out a form accounting for hours spent in the previous week The data are entered into a database system from which are generated monthly reports in various formats. A Project Effort Report for a client shows hours worked for the month by staff member and by activity, the total value of the effort, and the billable amounts. ASD managers receive another version of the same report, but formatted differently, and including all ASD projects. Figure 4 on the next page shows a sample of the report that is sent to the client.

Clients are billed monthly for ASD services. A separate general ledger transaction (journal voucher transfer) is prepared, and a copy sent to the client with the monthly Project Effort Report.

M.I.T. Administrative Systems Development
Project Effort Report

Project Name: *Undergraduate Admissions System Support*
Department: *Admissions Office*
Client Contact: *John Batteson, 3-108*
ASD Project Leader: *Wanda Meredith, E19-439, X1507*
Report Period: *October, 1988*

Employee Name	Hourly Billing Rate	Services (number of hours): Analysis	Design	Program-ming	Testing	Production Support	Docu-mentation	Project Management & Other Tasks	Total Hours	Total Value of Services	*	Total Billable Services
Lou G. Bernard	$38						34.5		34.5	$1,311	Y	$1,311
Strom Lawrence	$52			36.0	27.5	27.0			90.5	$4,706	Y	$4,706
Strom Lawrence	$38						9.0		9.0	$342	Y	$342
Wanda Meredith	$59	5.0	2.5			1.0		12.5	21.0	$1,239	Y	$1,239
Flannery Peters	$52	1.5							1.5	$78	Y	$78
Conrad Victoria	$52			8.0					8.0	$416	Y	$416
Totals:		6.5	2.5	44.0	27.5	28.0	43.5	12.5	184.5	$8,092		$8,092
							Mainframe Computer Charges:			$1,845		
									Total:	$9,937		$8,092

Account Number: 17688
Object Code: 421

Total equivalent full time (EFT) effort on this project during the period: 1.18

This report details for you the number of hours worked and the total value (at prevailing ASD billing rates) of the services we have performed on this project during the period shown above. Also shown is the total cost of the mainframe computer charges (if any) that were incurred by ASD in support of this project. If you have any questions about this information, please contact the ASD Project Leader shown above. This report is for your information only, and no action is required on your part.

* **Note:** A "Y" in this column indicates that the services on that line are billable to you under the terms of the Service Level Agreement that governs our efforts on this project. If there were any billable charges on this project, a journal voucher for the total billable charges has been forwarded to the CAO (copy attached).

Figure 4

Reporting Project Progress

In addition to the Project Effort report which is generated and distributed from headquarters, the project leader is also responsible for preparing a periodic project status report according to whatever has been agreed to in the project plan. While there are no standards yet in place for this report, the memo format is convenient. Report content is fairly standard and should provide a list of tasks accomplished with hours spent; a list of tasks planned for the next reporting period with hours estimated; and number of hours remaining under the contract. Also included is a comments section in which the project leader reports any problems, delays, or general information.

Maintaining and Modifying the Contract

No amount of careful planning and estimating will ever ensure that a project will run from start to finish without changes, either because the client wants something more or different, or because of some snag that the technical staff encounter. Changes, of course, must be thoroughly defined and incorporated into development plans and project management paperwork. ASD has done this either with an addendum to the SLA or with a Change Request Form.

The addendum method simply rewrites the sections of the SLA that the change affects. For example, the duration of the project might be extended, thus changing the terms. Or a new activity such as documentation might be added requiring changes to provision of work, ASD responsibilities, and compensation. The addendum is more suitable to high level and administrative changes, and therefore requires the signature of the ASD Director and the highest level client involved in the project.

The Change Request Form is less complicated to prepare and is suited to documenting new or changed tasks. The form names and describes the task, and gives new time and cost estimates. A change at this level may also impact work that has already been done, so there is space to account for other parts of the system that may be affected. This form must be signed by both the project leader and the client representative.

Completing the Project

Closing out a project can be one of the greatest challenges facing a project leader. Ultimately the end must be declared when the contract has been fulfilled and the system is working, even if either customer or ASD staff long to add just one more feature or change one more thing.

The system can be signed off in stages using a *Task Acceptance Form* that is oriented to tasks rather than phases or whole systems. In addition to providing all the identifying information about the task (system name, project name, client and ASD names, and finally task name) the form provides space for ASD comments to the client. The client has the option to accept the work as done, to accept the task as done but with conditions, or not to accept the task. If the task is accepted only conditionally or not at all, then the client is expected to explain the conditions or objections in the space provided. Thus, each task is finished and signed off by the customer until the last task is signed off and the project is complete.

As for the additional features and enhancements that surfaced in the course of development, these may be viewed as new work to be renegotiated under a new service level agreement, or defined as a new project.

Summary

At MIT we found there were a number of factors that were critical to our achievements to date, and that will continue to influence our success in the future. While every university is different, we believe that a number of these can be applied to many other organizations who find themselves in a position similar to ours:

- Clearly define your organizational cost recovery goals, and communicate them clearly to staff, clients, and senior management of the university.
- Clearly define and communicate the array of services to be offered.
- Identify overhead rates and incorporate them into project estimates and schedules.
- Establish credibility and recognition as a business unit that is interested in competing with other service providers, rather than simply enjoying a monopoly position.
- Plan and manage projects effectively and consistently across the organization.
- Maintain and upgrade staff skill levels, both technical and managerial, to make use of new technologies.

THE COST OF NOT STAYING CURRENT

PRESENTED BY:
JACK T. TINSLEY
BETTY R. NEYER

FLORIDA COMMUNITY COLLEGE

CAUSE 1988 CONFERENCE

INTRODUCTION

Florida Community College at Jacksonville began operation in August 1966 with an enrollment of 2,610. Today the College enrolls more than 72,000 students annually. The College offers the associate in arts (A.A) degree, associate in science (A.S.) degree, adult basic education leading to the the high school diploma or the GED diploma, certificate programs and self-enrichment courses.

OVERVIEW OF CHANGES

A brief overview of the changes that have occurred over the past two and a half (2 1/2) years is presented to provide a pcint of reference of what was needed for the College to "catch-up" with technology.

STUDENT SUCCESS

New programs in microcomputer specialist and word processing specialist for disabled students and displaced homemakers have been added.

Lab facilities have tripled in size.

Computer science courses,which previously were taught on a Prime computer, are taught on the IBM 4381 computer.

AutoCad offerings have been expanded to include mechanical engineering and landscaping architecture.

Students enrolled in the travel agency program are gaining experience in using computers to make airline, hotel and motel reservations.

Students in the medical assisting program are using computers to learn medical office management.

ENHANCED COMMUNICATIONS

Electronic mail is used throughout the college by over 600 (or 60%) full-time employees.

Almost 500 microcomputers and terminals are linked to the mainframe with an average of 300 signed on simultaneously at any one time.

Documents may be transferred from one microcomputer to another through the host computer system.

Job vacancies, job descriptions, college catalog, course descriptions and outlines, phone book, and administrative procedures are updated and available on the network.

Touchtone telephone registration has been installed and is used by more than 10,000 credit students (67% of all credit students) each term.

A new financial system is being installed which will replace a 19 year old package. It will also automate the purchasing function which heretofore has not been automated.

VALUED EMPLOYEES

450 new microcomputers have been installed throughout the college.

Faculty are using technology to manage their gradebook.

Scanners for grading and scoring tests are available for one of every 10 faculty (these scanners also communicate with the gradebook software).

A Support Center is available at each campus for use by faculty, students, and staff in generating laser-quality hard copy, color transparencies or overhead slides from microcomputer generated data.

INNOVATION FOR EXCELLENCE

A new graphics arts course utilizing computer graphics software has been added to the curriculum.

A new course in desktop publishing (and two desktop publishing labs) have been added.

A new program in information systems specialist is being added.

Transcripts may be transferred electronically to any other Florida educational institution.

Faculty and staff are using desktop publishing software to produce filers, bulletins, newsletters, and presentation materials at their desk.

An on-line room scheduling system has been written which will significantly impact the scheduling of over 1,000 meetings for external community groups.

IMPACT ON THE MAINFRAME ENVIRONMENT

To accommodate actual and planned growth, significant enhancements have been made to the mainframe environment.

Over 20 miles of cable has been laid.

The processing power of the mainframe has increased 66%. All old terminals were replaced in order to take advantage of newer technology.

The amount of data that may be stored on tapes has quadrupled and processing speed of the drives has been doubled.

Disk storage capacity has more than tripled.

Operating systems have been upgraded.

Data communication rates have doubled and the number of data communication line increased from 5 to 15.

IMPLEMENTATION ACTIVITIES

In order to move the college ahead, several activities needed to be accomplished.

First, additional staff and organizational changes had to be made to ensure the success of the technological advancements.

Second, a planning process and a plan were needed to determine the direction for technological advancements at the College.

Third, hardware and software standards needed to be identified to meet the needs identified through the planning process.

Fourth, hardware and software needed to be purchased and installed.

Fifth, a program was needed to train faculty and Information Systems and Services staff to ensure technology was incorporated quickly and effectively.

Finally, hardware and software needed to be maintained and upgraded in order to keep up with changing technology.

ORGANIZATION

In order to move the College ahead quickly, several organizational changes were made. A technical support person was added to ensure new equipment and enhancements were implemented smoothly and effectively. Applications programming staff have been added to update existing systems and install new systems. A new department, Information

Resources Planning and User Services, was added to coordinate planning and procurement, and provide training, maintenance, installation, and consultation to end users. (A copy of the organizational chart is included in Appendix A.)

ORGANIZATIONAL ISSUES

Who will handle maintenance? Will maintenance be done in-house or through an outside vendor? Will maintenance be handled centrally?

Will academic and administrative computing be combined? What will the relationship be between academic and administrative computing?

Who will handle hardware and software installation? How will software be upgraded when a new release is available?

Will a training program be needed?

How will the College replace its trained workforce? We are facing the problem that when a loyal, long term employee leaves, the College is having difficulty finding a replacement with a similar skill level in the use of technology.

How will planning be accomplished?

What committees will be needed?

PLANNING

Almost three years ago, Information Systems and Services was charged by our President to "bring the College up-to-date technologically."

To accomplish this assignment, an assessment was made of where the College was. Concurrently with this assessment it was also vital to assess the future directions for technology at the College.

This first year, over one-half of the College employees were interviewed in small groups. A bottom-up planning process was utilized. Staff, then department chairs followed by assistant deans and deans were interviewed with each level setting priorities for areas reporting to them.

Based on the interviews and priorities set by interviewed staff, a three-year plan was developed with the major objectives of:

1. Fostering the transfer of technology into the classroom;
2. Utilizing technology to enhance communications;
3. Increasing access to College information;
4. Supporting the automation of offices; and
5. Ensuring optimal operation of mainframe resources.

The Information Resource Plan was reviewed and approved by the Information Systems Council, consisting of vice presidents, the Associate Vice President of Information Systems and Services, and representatives of instructional and non-instructional staff.

PLANNING ISSUES

Commitment from the top: Success is directly related to commitment of the president.

Top-down or bottom-up approach: The bottom-up interview approach has been beneficial to Information Systems and Services staff in developing an understanding of College operations and enhancing credibility. This approach has also fostered a proactive rather than a reactive posture in implementation. As the College community becomes more technologically sophisticated, the planning is becoming more reactive.

Level of involvement of college community: As each year passes, the planning process becomes more formalized and structured. We have moved from one planning group (Information Systems Council) to two planning groups, one for instruction and one for non-instruction.

Although there are two planning groups, the final product is combined into a single plan.

Interface with other planning processes: Initially, the Information Systems Plan was developed separately from the College Strategic Plan. Data collection is now performed through the same process but the development and approval of the plan remains separate. Each year, at the beginning of the College's planning process, funds are set aside for the cost to continue, strategic plan and information resources.

Funding, centralized or decentralized: Centralization of funding enables the College to monitor computer-related expenditures as well as maintain continuity with the Information Systems Plan. In addition, centralization enables the Information Systems and Services staff to ensure support resources (e.g.,training, installation, and consultation) are available to assist in the successful implementation of funded activities.

Level and source of funding: The College has committed an additional $800,000 to 1,000,000 in new funds each year (almost 2% of the College's total operating budget). Now that the College is beginning to "catch up" and is in a better position to compete for funds, more funds are becoming available through the Foundation and grants.

HARDWARE AND SOFTWARE STANDARDS

Development of standards provides significant opportunities to save money (through volume purchases), reduces the time spent in ensuring software and hardware works together, reduces maintenance and trouble-shooting costs, and expedites the introduction of technology.

HARDWARE AND SOFTWARE STANDARDIZATION ISSUES

1. Compatibility with mainframe directions;
2. Connectivity to the mainframe and to each other;
3. Transportability of software from one package to another;
4. Ability of software or hardware to function with existing standards; and
5. Maintainability in terms of training, upgrading, repairing, redistributing, and trouble-shooting.

For office automation, the standards are:

IBM Microcomputers with Color Monitor and Graphics
Word Processing (Displaywrite 4)
Spreadsheets (VP Planner)
Database (Q&A)
Graphics (Harvard Graphics and Freelance Plus)
Desktop Publishing (First Publisher and Pagemaker)
Communications (Crosstalk)
Emulation (3270 Emulation Program)
Terminals (Telex and IBM)
Gradebook Management (Parscore)
Menu System (Fixed Disk Organizer)
Backup Utility (Intelligent Backup)
Network (Novelle)

For instruction, no software standard apply across all labs. Within a single teaching lab, the same hardware and software configuration is maintained (i.e. same software, same keyboard, same hard disk size, same display, and the same printer type).

ACQUISITION AND INSTALLATION

All computer and related purchases are submitted through the Information Systems and Services Department. Equipment installations as well as software installations are handled by the department.

ACQUISITIONS AND INSTALLATION ISSUES

Centralized versus decentralized acquisition: Centralized acquisition provides the College an opportunity to realize considerable monetary savings. In addition, centralization ensured that all the right features (such as adapters and cables) as well as necessary software and furniture are ordered. As new equipment is purchased and "old" users outgrow their machines, new equipment may be assigned to an "old" user and displaced equipment redistributed to the new user.

Centralized versus decentralized installation: All microcomputers in labs and offices have a standard configuration. A faculty or other employee may move from one machine to another and be able to operate the equipment easily. Since all machines are configured similarly many user problems may be handled over the telephone instead of through an on-site visit.

Equipment storage: Since installation is a centralized function at the College, sometimes it is necessary to store equipment. To reduce the time spent on installations, workstations are not installed until all parts have been received. Many workstations have parts ordered from as many as five vendors which, at times, causes significant delays in the arrival of all components.

Extra equipment and parts: The College carries extra parts (keyboards, software, adapters, and cables) so that equipment repairs may be handled quickly. Extra printers are also carried in stock.

TRAINING

Personnel must be trained in the use of technology to make effective use of resources. This applies to the end users of technology as well as to the staff who support them.

TRAINING ISSUES

Training information systems staff: For the most part, programming, technical support and operations staff are trained on-site by bringing in external trainers or by attending local seminars. For microcomputer training, one individual is sent to a training school and then returns to train the staff and the faculty of the College.

Training format: When is it preferable to provide one-to-one tutoring versus classroom training versus self study? Will motivators (college credit, monetary rewards) be used to encourage staff to receive training? What are other training methods (newsletters, user groups)? Under what circumstances will employees attend outside (more costly?) seminars?

Training new employees quickly: How can new employees be trained quickly to support continuity within departments?

Training as a requisite for hardware and software: Should training be a prerequisite to the receipt of hardware and software?

Supervisory support of training: Are supervisors committed to their staff being trained? Are supervisors aware of their responsibilities in maintaining reliable systems?

HARDWARE AND SOFTWARE MAINTENANCE

The cost of maintaining (or not maintaining) hardware and software is high. Maintenance involves not only keeping equipment operational, but handling user problems and upgrading users who have outgrown (or need new functionality from) their equipment. The College has approximately one full-time person per 125 workstations to handle maintenance. An outside vendor serves as backup for hardware problems. Approximately 90% of user calls are not caused by hardware malfunction. With outside vendors, we spend approximately $20,000 per year to maintain over 600 microcomputers, 400 printers, scanners, lasers. and other miscellaneous peripheral devices. A newsletter is published bimonthly which keeps users informed of available software upgrades and answers to questions frequently asked of the staff.

HARDWARE AND SOFTWARE MAINTENANCE ISSUES

What maintenance will be handled inside and outside?

Will maintenance be charged to a centralized account or charged to individual departments?

Will maintenance for labs and offices be handled the same?

How can problems other than those related to equipment malfunction be reduced?

How can maintenance be handled efficiently and effectively? Evaluate the cost for on-site warranties.

How can the cost for maintenance be contained?

SUMMARY STATEMENT

The intent of this paper has been to describe how one institution has dealt with trying to "catch-up" with technology and to identify some of the issues that surface during such a process. Additional issues have also been presented for the reader to consider.

Project Management in Higher Education
Making It Fit the Due Date

Anthony P. D'Andrea
Director, Software Client Programs
Systems & Computer Technology
4 Country View Road
Malvern, Pa. 19355

Robert DeBruin
Assistant Vice President /Administrative Affairs
Central Michigan University
354 Warriner Hall
Mt. Pleasant, MI 48859

Abstract: We all manage projects. Every day we are called on to possess the skills of a project planner. Typical questions we receive are: "How long will it take?"; "Who will be available to do this?"; "What will it cost to do this?"; "When will it be done?". If you have answered questions like this, then you're a project manager! How you answer questions quite like these may have a severe impact on your institution. What will be scheduled or cost justified based on your answer? Can you approach these issues in a systematic way that will yield a high probability of accuracy? This session will address the answers to these questions by first examining some of the underlying principles of classical project management. Then give some insight into the current state of data processing project management. Finally, an abbreviated methodology will be given for the fast track approach to project management.

Welcome to Project Management in Higher Education, better known as "Making it fit the due date." Today we will review some underlying principles of classical project management. Then we will delve into the current state of data processing project management with a brief review of an implementation project. Then we will conclude with an abbreviated methodology that I call the "fast track" approach to project management.

What is a project? We all manage projects. Every day we are called on to possess the skills of a project planner whether it be the publication of a departmental report or the completion of an expensive development project. In a nutshell a project is a collection of tasks which consumes resources leading to the completion of an objective. So the project must have a measurable objective and consume resources. What is an example of a measurable objective? In the early 60's, the late president John F. Kennedy called for a project to land a man on the moon by the end of the decade and - this is the part that the astronauts liked best - return him safely to earth. Is this measurable? You bet. There is a time limit and a task objective. On January 1, 1970 would you be able to measure the result of the project? Absolutely. This is a good example of a measurable project objective.

What is a task. We have seen that a project is a collection of tasks: but how is a task different from a project? Surprisingly, a task in one project may be a project to the resource assigned to complete it. But in general a task is more detailed than a project. It also must have a measurable objective and consume resources. The resources may be time, dollars and/or people. If a task consumes no resources, why would you do it? How would you measure it? Never list a task that has no outcome.

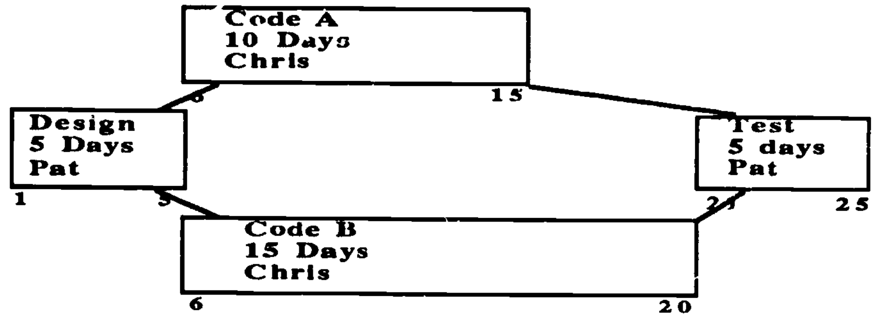
What is a dependency? A dependency is relationship between two or more tasks. There are many relationships that are used. The most popular is the finish to start. This means that you must finish the first task before the second task may start. For instance, I can't fill a foundation hole with concrete until the foundation has been dug. In data processing this is rarely as concrete as ... concrete. Don't you sometimes start coding before the design is done? This, if it is planned, could be a lead or a lag relationship which is really nothing more than an overlap of tasks. Start to start means that one task can not start before another task has started. It does not mean that both tasks must start at the same instant. Finish to finish you can explain if you understand start to start. As the professor would say, "do that as an exercise tonight." Date determined relationships are driven by a milestone. For example, the arrival of a bulldozer on August 1, 1989 will be the trigger for the bulldozer operator to begin clearing the land. The arrival of the new database package will be the trigger for the systems programmer to begin installing the new product. Resource constrained dependencies are usually not predefined but rather occur, when for instance the systems programmer is at a CAUSE conference.

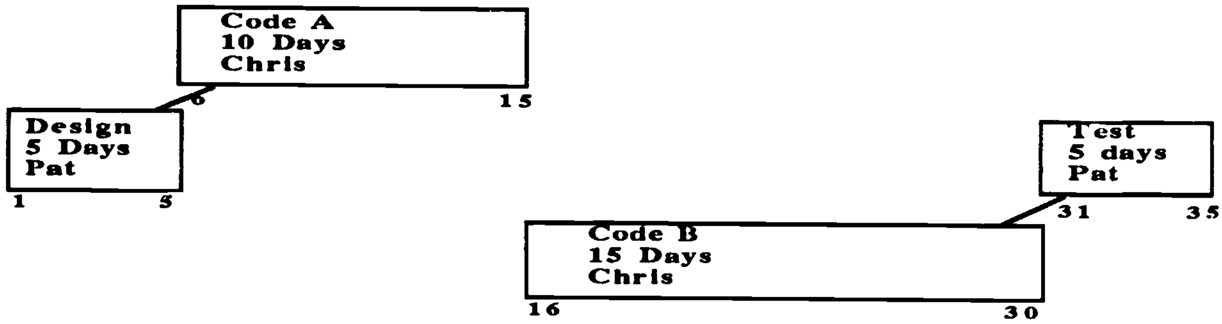
After defining your project and its tasks and relationships you will calculate the critical path. What is the critical path? The critical path is the sequence of tasks from the beginning of the project to the end of the project which has the longest duration of time to complete. That sounds hard but is actually quite easy with the computerized tools that are available. The hard part is that the definition should end with "at this time." The critical path will change as progress or the lack of progress is reported.

Let's now take a look at how a software project would evolve. If I am given a project to create a program, the first thing I have to do is define the project objective. This is sometimes wrongly called the requirements definition. I need a more global but measurable objective. For instance I am to create a program that will read a text file and print it to the laser printer within 25 days using my 1 systems analyst and my 1 programmer. I determine the steps to be: design step, coding of the file read is module A and coding of the print is module B. The modules will be unit tested as part of the coding task. A systems test will be done when the two modules are completed.

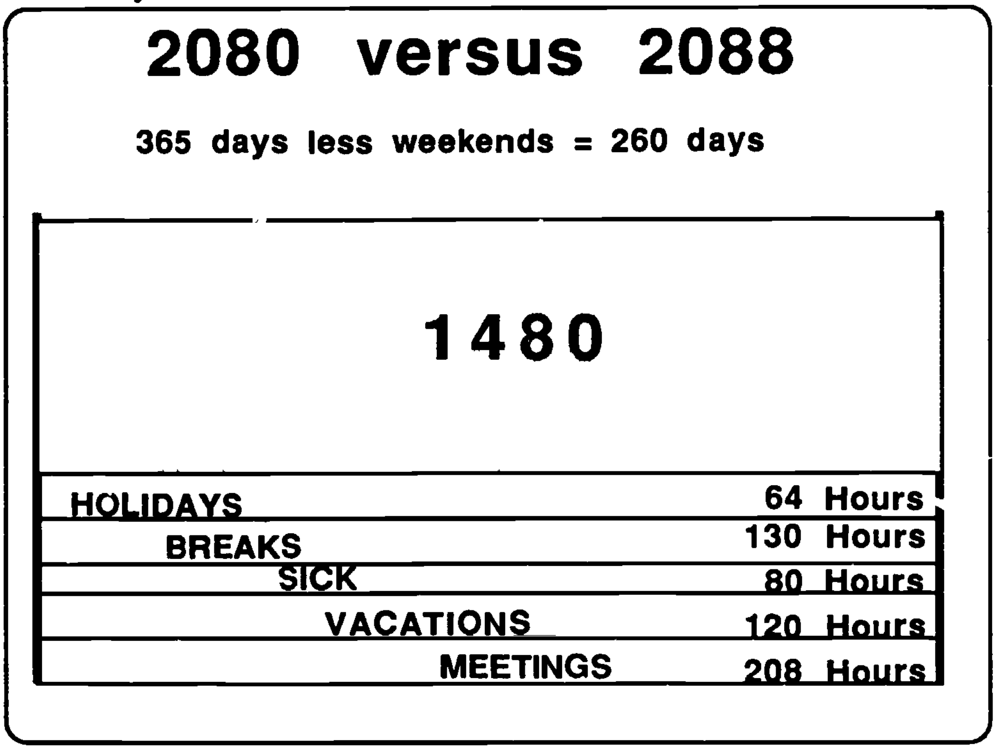
After listing the tasks I will now estimate the time. Design should take 5 days. The coding of module A might take 10 days and module B's coding might take 15 days. I will allow 5 days to test the system. It looks like the whole project will take ...... 15 days. What's that? You don't think you can code before the design is done? Really? How many of us have done just that? Okay, you're right. We do need to define some dependencies or relationships. Let's use finish to start relationships such that the coding can't start until the design is done and system testing can't happen until the coding is done. Now how long will the project take?
To be sure, we must learn to calculate the critical path. We start with Design which begins on project day 1 and is scheduled to last until day 5. Then Code A may begin on day 6 and run until day 15. Code B will also start on day 6 and run until day 20. Test may start after both of the relationships known as predecessors have completed. Test may begin on day 21 and run until day 25. Right on target with our objective.

Now it's time to add resources to the tasks. Remember that I have 1 analyst and 1 programmer. Pat is my analyst and will do the design and system testing. Chris is my programmer and will perform all of the coding. Now the project looks like this. Well.... does it? We know Design will start on day 1 and run until day 5, then Code A will start on day 6 and run until day 15. But Code B can't start on day 6 since Chris is working full time on Code A. What happens now? In the real world, if I can't get another programmer then Code B will start on day 16 and finish on day 30!





Testing will begin on day 31 and finish on day 35. That's 10 days over schedule! If you aren't planning this way or making certain that your project planners are planning this way you're in trouble. Anything else you should worry about? How about meetings, vacations, sick time, snow days and all of the other various distractions that often account for project overruns. Have you seen the mythical year of 2080 (2088 during leap year) hours. When you start subtracting your holidays etc. you may find that 1480 hours (1488 during leap year) are all that are left. What I am saying to you is to allow a block out of 30% of your resources time. This will make your estimates more accurate.



Now that we have a plan we need a way to tell if our project is a success. At the end of the time we must first evaluate whether we met the objective. Does the program read a file and write it to the laser printer accurately? After that criteria is met we can evaluate our performance. Were we on time? In our example, if our resources met our estimates we are on time. But we are 10 days over schedule. We are probably on budget but if we had had to rent equipment and keep it for 10 extra days we may be overbudget. From a human resource benefits standpoint, we may have allocated 10 additional days per resource to the project and could be overbudget because of that overhead. Any of these things could have happened even though my resources finished their tasks in the amount of time estimated and budgeted.

I'd like to introduce Bob DeBruin of Central Michigan University to share some stories with you about a real live project. Bob... (See three pages immediately following)

Thanks Bob that certainly helps put things into perspective.

I'd like to focus in now on methods we can use to help make the project fit the budget. Do we think that the Data Processing field is any different from Construction with regards to project management? Actually the difference is in the tools that are available not in the techniques that are used to plan and schedule. First of all we have several fine methodologies available that tell us 1) what to do, 2) when to do it, 3) how to do it and 4) why you do it. Most methodologies fall into one of two categories: the so called standard methodologies which are characterized as third generation techniques and structured methodologies that are capable of handling fourth generation technology and techniques such as CASE (Computer Aided Systems Engineering) tools.

What the standard methodologies bring us first, of course, are standards. These help us maintain consistency across large project teams so that integration and maintenance will be less costly in the future and enable us to share and reuse code during development. The standard methods lead us from interviewing the user to arrive at a requirements definition through the post implementation review and measurement of project success. They unfortunately also brought us paperwork by the ton. The newer structured methodologies brought us better standards able to take advantage of the automated tools for dataflow diagramming and entity relationship drawing that enables us to save time on coding both at development time and at maintenance time. The structured methods give us the capability to "prove" the correctness of our code before coding begins. They also brought us structured paperwork. This leads me to some advice. When you adopt a methodology it is not necessary to use every form and technique in the book. Part of implementing the methodology is to select those parts that are appropriate for new development projects, maintenance projects or small projects. Remember, methodologies give us the steps we need to do, guidance on estimating time, reminder of dependency relationships and guidance on the skills and knowledge necessary for a resource to perform a task.

Speaking of estimating, there are several very strong tools that assist you in estimating task time. They all generally come down to one of two methods. The empirical method is direct observation. I saw this coding performed on a similar project and it took 10 days. Sometimes this is called "seat of the pants" or guesstimating. The other is the implicit method which stretches the duration of tasks based on the number of influencing variables. For instance, you would break the task of interviewing down into manageable parts such as how many interviews, how long to write each report and how long to summarize the findings. By breaking each task into its component parts you are able to deal with estimates of things that are more easily grasped by your mind.

The net outcome of these estimating techniques and methodologies is something like this. For a standard methodology the four major development phases are the requirements definition, specification, design and coding. Coding will take up to 50% of the time allocated. With a structured methodology the coding time may be as little as 3%! This is because the structured techniques force you to design to a greater level of detail thus saving ambiguity later.

Finally, we should look at project tracking and monitoring. I called this the missing piece. There are three types of tracking. Time tracking which is measuring the time spent by a resource on the performance of a task. You better be also getting an estimate of time remaining not a subtraction of time spent from time budgeted. Deliverable tracking is a method of breaking all tasks into chunks of 8 to 80 hours so that you may see the delivered product at the end of each task. Milestone tracking is a more global method but is the same idea as system testing compared to unit testing. Milestone tracking measures the movement of the group toward the objective. All three methods should be used on each project.

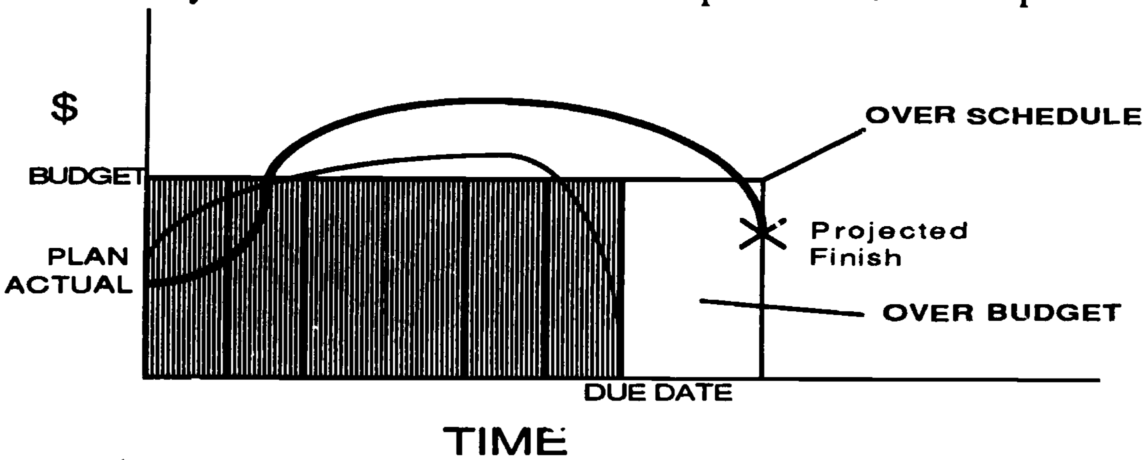
The carrot/stick question is frequently asked. When you track someone you must monitor their performance. Sometimes their performance will fall short of your expectations. When do you use the reward and when do you use the punishment? That is a question that every manager must decide at each step of monitoring. I wish there was a hard and fast rule but the best decision maker is the manager who is closest to the task.

Now that we understand the scheduling part of project management, we may turn our attention to cost monitoring by looking at a typical life cycle of a project. We will eventually build up to comparing budget vs. plan vs actual by time by schedule by budget. Isn't that how you evaluate projects in Finance?

Step 1 of the Life Cycle takes the budget and evenly distributes it over time up to the due date. In our sample project that we looked at earlier we evenly distributed our budget over 25 days. This is dollars on the left axis and time on the bottom axis. Step 2 we create a project plan and see that the "actual" consumption of resources will not be a straight line. In our example we had only Pat working the first five days then had Chris working double time in the middle and finally dropped back down to only Pat working on system testing. This does not represent a major deviation but it does have some cash flow implications in the middle.

Step 3 of the project life cycle could be called the discovery phase. Here we learn that Pat didn't work 100% on the project. Early on it looked like we were beating the budget for this project. Then we learned that Pat was being used for other short tasks, going to meetings and writing reports. To compensate we would normally steal time from other projects to help Pat. We also would suddenly realize that Chris couldn't do two 100% tasks at once and would have to have other help assigned. Now we also begin to run into the mythical 2080 hour year and find that the design and coding tasks are running over schedule. There is a fact of life that we run into here. Some tasks can not be improved by adding resources. In Data processing you'll hear the idea that if one programmer can do a task in 5 days how long will it take with two programmers? The answer is 10 days because they'll argue about how to do it and each do it their own way. A corollary to this is the idea that if it takes the Queen Elizabeth 9 days to cross the Atlantic how long will it take 9 Queen Elizabeths to cross the same ocean?

The heavy dark line indicates the awareness phase of time consumption.



At this point we finally reschedule the project. We now find that the project will cost more and take longer than we expected. The only way to make the project fit the due date and budget now is what? We must reduce the functionality. Instead of reading the file and writing it to the laser printer - now we will only read the file. If this is unacceptable then you need the additional time and the additional dollars. How do you make the project fit the due date? You have to do it during the early planning and on going management of the project. What have we learned?

There is a practical approach to project management. Here is what I call the Fast Track Approach.

1. Identify the tasks that are required. Use a methodology if you can.

2. Define the relationships between tasks. Do this realistically. If a relationship exists indicate it but do not create relationships that do not exist.

3. Estimate the effort required. Use a methodology. Use empirical or implicit methods but be honest and allow for resource down time. Under no circumstances allow yourself to be badgered into reducing an estimate. And never, ever when asked "How long will it take?" say "when do you want it". Say "Let me evaluate the project. What priority does this have? Is it more important or less important than the project I am currently working on?"

4. Schedule the project. Do a critical path schedule using one of the numerous fine scheduling systems that are available. Look at the critical path does it make sense or did you make a logic error?

5. Assign resources. If you don't know who will be available do it generically as programmer 1, analyst 1, etc. Look at the results. Can you do with one less resource? Do you need one more?

6. Reschedule the project. Yes, reschedule! Remember the critical path can change.

7. Evaluate costs. Now apply the resource rates and equipment costs to the project and look at the results. Only now are you able to correctly project a budget.

8. Reschedule the project. See how the cash flow is effected by using real rates for the project. Prepare your financial people for the cash flow.

9. Track progress. Ask questions. Check on the progress. Remember that tasks progress rapidly until they are 90% complete then it takes an equal amount of time to complete the last 10%. Are the deliverables on time? Are we meeting the milestones? Do you really think you will make up the time between the milestones?

10. Reschedule the project. You did remember to ask for new estimates of time remaining when you updated the progress didn't you?

11. Monitor completion of the objectives. Does the project do what we intended it to do?

Now you can relax. You have done your best job of managing the project. Your rewards will be many. You will be rewarded with more projects to manage. Good luck.

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During the mid-1980's Central Michigan University (CMU) was evaluating what we believed our computer hardware and software needs to be for the 1990's and beyond. We had two hardware systems - one academic and one administrative - some purchased administrative software and some developed in-house, particularly our student data system. A decision was made to replace all our administrative software and to replace hardware, if needed. In late 1986 and early 1987, we chose to go with:

* an IBM 3090 mainframe for all administrative computing and for all academic computing except for Computer Science
* a VAX system for Computer Science
* a SCT Symmetry administrative systems software, using CINCOM's SUPRA database

Our project was to implement four major SCT systems:

financial system - IFIS
human resources system, with both personnel and payroll functions- HRIS
student system - ISIS
alumni and donor development system - ADD

with due dates as follows:

IFIS on July 1, 1988 (one year after installing the IBM hardware and the SCT software)
HRIS on January 1, 1989
ISIS on September 1, 1988 for admission of students who would begin attending Summer or Fall 1989, and on March 1989 for the first registration of students attending Summer 1989 classes
ADD, no date was established, but it was to follow ISIS

In addition to these SCT systems, the University began implementation of the NOTIS library system during the Fall 1988 semester.

As you can see, this schedule was a very aggressive one - designed so that we could pull the plugs on our existing hardware and save associated costs. In determining the schedule, we at Central Michigan did not do a critical path analysis for the entire project, but relied on our own experiences as well as SCT's experiences. The due date for any one of the systems appeared reasonable, but could we stay on schedule for all systems. Looking back from the vantage point of today, I think that it is difficult for the purchaser of a major administrative software system to do a detailed critical path analysis until some of the consultation and training phases are completed and the user community on campus begins to understand exactly how the system works.

What does Central Michigan's implementation schedule look like today?

* On July 1, 1988, on schedule, the accounting functions of the IFIS financial system were up and running. We are still "shaking down" the system, but our daily and monthly accounting reports are coming from the new system. Presently our staff is testing fixed assets and budget preparation subsystems and also a purchasing subsystem added to the product after we had received IFIS. These latter subsystems all are expected to be in production use in early 1989.

* Key to our project management and measuring how we were fitting to our due date were:
  * weekly status meetings with agenda and detailed minutes
  * a comprehensive listing of questions/issues/concerns that we, SCT or both needed to address
  * dedicated staff

* Earlier this month (November 1988), we took a measurement for HRIS and for ISIS and have decided to change the due dates for these two projects.
  * The revised due date for HRIS (personnel and payroll) is going to be April 1 or July 1, 1989, the specific choice to be made next week. Although we believe that we will be ready for production on April 1, we may wait until July 1 for fiscal year reporting considerations.
  * The ISIS implementation dates will be put back exactly one year - admissions going-live Fall 1989 with the first registration for Summer 1990 students.

* The ADD due date is being reviewed in the context of the above revisions.

As we at CMU look back over the last 17 months of this project, we found the following major reasons (in on particular order) for the schedule changes.

* We underestimated what it would take our Computer Services staff to become familiar with the operation of the IBM hardware, the SUPRA database, and the related software.

* We underestimated what the implementation would take in terms of additional staff - both in user areas and in Computer Services - to operate the existing administrative systems as well as to learn, test, and train on the new systems.

* At CMU the SCT software was running in essentially a new environment - IBM 3090, SUPRA, latest levels of CICS and COBOL, integrated systems. Both CMU and SCT have discovered problems as a result of this environment that have slowed the implementation.

* We ran out of time to do all the necessary testing. Testing is essential to learning how the system works. Documentation by itself does not provide you all the answers to your questions.

However, while the decision to delay caused disappointment, we at Central Michigan University are not discouraged. We recognized from the start of the project that our schedule was aggressive. We have worked hard to stay on schedule; what we now know convinces us that we can fit the revised due dates.

FUNDING STRATEGIES FOR INFORMATION TECHNOLOGIES

Raymond D. Smoot, Jr.

Virginia Polytechnic Institute and State University

Blacksburg,

Virginia

The information technology officer and the business affairs officer must work together closely to assure that financial resources are available to fund major computing and communications initiatives. Innovative financing techniques, use of university-related corporations, and the creation of state-level equipment trust funds have been used in various combinations at Virginia Tech to provide over $50 million in the past five years for supplemental funding of computing and communications projects. This paper discusses several of those projects and suggests ways colleges and universities may enhance their funding of information technology.

Colleges and Universities today are striving to provide the most effective and efficient computing and communications systems possible to their students, faculty, staff, and often to constituencies beyond the campus. With technological advances and changes taking place so rapidly, it is often a challenge to determine which technology best responds to program needs. Once this determination is made, the even greater challenge of funding the desired technology is given to the university's business officer. In times of competition for limited resources, this challenge is indeed very real as projects must be prioritized and funding alternatives found that take advantage of unique project characteristics. In an environment of ever changing technology, the information systems officer and the business officer are continually struggling to provide faculty and students with state-of-the-art computing and communications equipment.

Several observations may be made about the role of information technology in society and in higher education which are applicable to practically every campus:

- Information technology expenses represent a significant portion of our operating budgets.

- Academic computing capabilities and computer assisted instruction are becoming a widespread reality and computer literacy will become a fundamental requirement for an educated and productive society.

- Colleges and universities will and must move toward the concept of a paperless society through the use of computers and communications networks that will facilitate and streamline administrative processing.

- Computing and communications are integral to all facets of a university's mission: instruction, research, and public service. They are becoming increasingly important to the way we store, retrieve, and disseminate information.

- The world of tomorrow will be shaped to a significant degree by the attitude we have toward the development and application of computers and technology as tools for functioning in society.

This paper will discuss some alternatives used at Virginia Tech to fund computing and communications equipment and projects which have helped this university to be on the forefront of technology today. Over $50 million in supplemental funding beyond normal operating budgets have been provided from the sources discussed in this paper over the past four years. Many of these alternatives represent sources of funding which do not require information projects to compete with other critical capital projects or operating budgets for limited resources. They enable the business officer to work in concert with the information systems officer to provide the campus community the best possible technological capabilities.

PERSONAL COMPUTER PROGRAM

Beginning in the mid 1980's, entering students in Engineering and Computer Science were required to have a personal computer and related hardware and software. Concern about increasing costs to students resulted in several strategies to reduce costs:

1. Aggressive negotiation of deep discount:

   - Team composed of college or department personnel, information systems staff, business affairs staff, and legal counsel.

   - Deep discount obtained for reasons of publicity, marketing, and increased presence of the manufacturer on campus.

   - Maximum cost of $2,000/student Engineering, $3,000/ student Computer Science.

2. Implementation of a financing plan

   - Permit installment payments over two years at interest rate below market rate.

   - Outstanding balance on loan less than value of used equipment throughout term of loan.

   - Used cash balances in university funds with no reduction in interest compared with other investments.

   - Very low default rate. Block readmission/ transcripts.

3. Creation of university operated maintenance shop.

   - Maintenance provided by Electrical Engineering Department and Lab Support Services.

   - Designated as authorized repair shop.

   - Arranged for "loaners." Campus based pickup and delivery.

4. PC Auxiliary/Bookstore

- Handled ordering, check-out and distribution through auxiliary enterprise.
- Transferred to University Bookstore.
- Sales over $3 million this year.

EQUIPMENT FUNDING

By mid 1980's it was clear that the university would have to supplement traditional state appropriations with non-traditional financing concepts if it was to take advantage of opportunities to expand its research and graduate programs and enhance its computing capabilities.

- $13 million endowment fund note issue.
- Tax exempt variable rate, put/call options. Trade 50-60% prime. Revolving "Line of credit."
- Endowment collateral at no cost.
- Letter of credit can now replace endowment collateral (1986 Tax Act).
- Flexibility to commit to projects as opportunities arise (IBM 3090).
- Increase base state appropriation.
- Favorable publicity, self-help.

VIRGINIA EQUIPMENT TRUST FUND

The favorable reaction to Virginia Tech's equipment note issue led the Commonwealth of Virginia to create the Virginia Equipment Trust Fund. Through the sale of bonds, the Trust provides funding to Virginia public colleges and universities for the acquisition of state-of-the-art equipment and replacement of obsolete equipment.

- $150 million, $90 million over first three years.
- Virginia Tech received $22 million of $90 million allocated to date.
- Did not affect tuition.

TELECOMMUNICATIONS PROJECT

An increasing demand for sophisticated communications services (due in large part to research growth and proliferation of personal computers) and rapidly escalating communications costs created a need for improvements to Virginia Tech's communication infrastructure. A decision was made to install our own voice, data, and video communications system, a $16 million project. Six primary goals:

- Control communication cost.
- Enhance the learning environment through improved voice, data, and video connections in the residence halls, academic and administration buildings, and across the state.
- Install integrated system capable of carrying both voice and data transmissions simultaneously.
- Broaden and upgrade video capabilities with a cable tv system.
- Provide faster speed for data communication.
- Replace antiquated communications cabling with new cable plant to meet university needs for next 20 years.

To finance the telecommunications project, we utilized several strategies:

- Bond anticipation notes during installation period. Variable rate. Favorable arbitrage.
- 15 year fixed rate permanent financing.
- Captured revenue from telephone, cable tv, and data connections to 8,500 residence hall students.
- Resale of long distance service to on-campus students.
- Recoveries from academic and administrative users at rates below cost of continuing previously existing system.

VIRGINIA TECH CORPORATE RESEARCH CENTER

In 1985 the Virginia Tech Foundation began the development of a research park on land adjacent to the university airport. This $15 million project, funded largely through the issuance of industrial development bonds and a grant from the Economic Development Administration, had several goals:

- Enhance the research and graduate programs of the university by providing employment for graduate students and faculty/staff/student spouses.

- Increase sponsored research funding.

- Attract research and development laboratories to the university community.

- Assist in the economic development of the region.

An important component of the marketing plan is access to state-of-the-art computing and communications services. A decision was made to extend the new university communications system to the corporate research center, thus providing communications services not available from the local utility and direct access to the university's mainframe computer. In return, additional revenue will be provided to the computing center and to the telecommunications system. A happy coincidence is that the corporate research center afforded the most desirable location for the teleport which provides the uplink and downlink for the telecommunications system. The teleport's presence also makes a dramatic statement about Virginia Tech's commitment to leading edge technology to potential research center tenants.

FUNDING OF INFORMATION SYSTEMS BUILDING

Virginia Tech's computing center occupies center campus space on the first floor of the administration building. Other information systems departments are located in leased space off campus. A proposal was made by information systems administrators to move the computing center and telecommunications system offices to a new 55,000 square foot building in the Virginia Tech Corporate Research Center. This building, which is costing about $5 million, is financed by the Virginia Tech Foundation which will lease the building to the university.

- Financed by university related corporation issuing public purpose industrial development bonds. Variable rate, put/call options, 20 year maturity, 6.35% current rate.

- University makes lease payment equal to debt service, operating, and maintenance expense.

- University obtains lease payment by capturing revenue from terminated leases and placing a surcharge on computing rates.

- University obtains prime academic space vacated by computing center in center campus.
- Locating of Information Systems Building in Corporate Research Center assists in marketing the center.

COMMERCIALIZATION OF INTELLECTUAL PROPERTY

An expected byproduct of the kind of information technology environment created at Virginia Tech is computer software and other intellectual properties. Colleges and universities, with few exceptions, have historically been ill-equipped to exploit the commercialization of their intellectual properties. In 1985 a university-related corporation was established for this purpose. One of its first tasks was to take library automation software developed within Virginia Tech and find the most desirable way to commercialize it.

- Several options considered: License or sale to software company, continued development within university, establishment of for-profit stock corporation.
- Stock corporation established as subsidiary of university related corporation, which holds 55% of stock.
- Employment increase from 10 to 42.
- Major tenant in corporate research center.
- International company with offices in Sweden, Finland, Australia.
- Model for commercialization of other faculty disclosures.

CONCLUDING OBSERVATIONS

Our experience at Virginia Tech over the past five years in financing a number of information technology initiatives leads to several observations which may be helpful to others considering similar projects:

- The informations systems officer and the business affairs officer must maintain close and continuing communication. They must also encourage their staffs to work closely together.
- Effective planning is necessary to assure that

financial resources are available to take advantage of programmatic opportunities.

- Analyze debt-financed projects carefully to be certain that the terms of the borrowing (maturity, debt service costs) match the life and revenues associated with the project.

- Look to university related entities (foundation, etc.) to assist in funding and operating projects.

- Establish limits on debt exposure. Don't mortgage the future of the university for present needs.

- Be creative and innovative. Use financial and tax consultants when needed.

- Look for sources of funding that do not compete with other capital projects or operating budgets within the university.

Community Education: A Role for the Information Center?

Phyllis A. Sholtys
and
Deborah Chalk

Northern Kentucky University
Highland Heights,
KY 41076

Continuing education directors must often scramble to meet demands for word processing, database and spreadsheet courses for the business community and the general public. Courses developed by an information center to train university staff to use microcomputers are equally suited to continuing education clients and they represent a potential resource for the harried continuing education office. Offering the Information Center program to the public under the aegis of the Continuing Education division can produce a synergistic relationship that expands the effectiveness of both units.

This paper will discuss the operating philosophy and methods that enabled an information center to respond to a need for public classes at a time when the center was hard pressed to handle its established workload. The paper will describe the problems encountered, institutional benefits realized, impact on instructors and on the Center, and long-term plans for the IC's public service effort.

Background

In the not too distant past, office automation at Northern Kentucky University consisted of electric typewriters in most offices, memory typewriters for the executive suite, and hopes and aspirations for better days ahead. This scene changed quickly in 1984 when, as part of an institution-wide computer literacy effort, one or more microcomputers were ordered for most offices on campus. A faculty-staff instructional lab was established and an information center was formed to provide the necessary instruction and software support for office personnel.

At its inception, the information center was more concept than fact. Although an excellent training facility was available, the staff training and support program began operation with a half-time support position and a pool of funds to provide stipends for part-time instructors. The program was developed and coordinated through the office of the chief information officer, the Assistant Vice President for Information Management.[1] Over the next several years the center grew to its present staffing level of two full-time people to support nearly 400 administrators and office staff. Approximately 40% of class and workshop instruction is still provided by hiring part-time instructors, most of whom already work at the University. Lack of institutional funding for non-faculty lines currently prevents any further expansion of permanent staff for the center. However, the general workload continues to increase in proportion to a rapidly increasing number of microcomputers available in University offices. Moreover, as the expertise of Information Center clients increases, the challenge of meeting more sophisticated instructional and consulting needs becomes greater.

During the period from 1984 to 1987, the Continuing Education office fielded numerous requests for noncredit computer classes for personal interest or professional development. The few classes offered were always oversubscribed. The Continuing Education director was unable to receive access to any of the several instructional computing labs on campus

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[1] The process and problems of "bootstrapping" the young information center were reported at the Cause National Conference in December 1984.

because they were fully committed to classes in degree programs. As an alternative, the Director made arrangements to use microcomputers at several area high schools and at an area technical school. Software was not provided by the area schools and the director found it a continuing challenge to locate competent instructors who also had access to the software needed to support their own classes. Most courses relied on public domain software, which served to introduce computer concepts but did not respond to the growing interests of the business community for classes in popular commercial software. Even with these limitations, the continuing education computer classes had waiting lists for enrollees.

The initial idea of combining forces with the Information Center to offer classes to the public occurred after a staffing crisis in the Continuing Education division. When an instructor quit two days before a scheduled computer literacy class, a panic call was made to the Information Center consultant to ask him to teach the class. The consultant was willing, but requested permission to use the faculty-staff training lab because software and related course materials would be available for use with the lab. The training facility was available for the requisite evenings and the class was moved on campus and successfully completed. The Continuing Education director raised the question of continuing to use Information Center staff and the lab facility whenever available, to expand Continuing Education program options.

The Continuing Education Director believed that a strong market existed for courses with specific office and business focus. The curriculum developed and implemented by the University's Information Center for campus personnel included courses that would be directly applicable to the needs of the public. Thus, the possibility emerged for a joint program to provide courses for the public. The idea was intriguing, Information Center staff were enthusiastic and the University's chief information officer was cautiously supportive.

Situation Assessment

Could we offer Information Center classes to the public? There were a number of reasons for considering the possibility. The Information Center's mission included development of a computer literacy program for university office personnel as well as continuing responsibility to support automation of university offices. Toward these goals, the Information Center implemented a computer literacy curriculum that focused on the knowledge and skills needed by office managers and support staff. At the time discussions began with Continuing Education, the Information Center offered its University clients a full program of classes and workshops in general computer concepts, management issues and concerns, word processing, database, spreadsheet and graphics. The established program was defined down to the level of instructor guides, workbooks and lab materials. Furthermore, the instructors who taught the classes had accrued considerable experience in teaching adult learners, including adults who were initially uncomfortable with, or intimidated by, the prospect of mastering automation technologies. Indeed, it appeared that the Information Center program might be the ideal vehicle to offer to the public, both for professional development activities and general community education.

Moreover, the faculty/staff training lab was seldom used evenings or weekends, the time periods when continuing education activities were at their peak. Also, because Continuing Education instruction focuses on weekends and evenings, some of the Information Center staff and instructors might be available on a part-time basis. Initial discussions revealed that sufficient instructors would be available to support an evening program.

However, a number of barriers to a successful joint venture had to be addressed before any commitments were made. Among these were the need to carefully articulate the expectations and responsibilities of both offices and to insure that appropriate executives were aware of the project and in accord with the concept. Needless to say, nothing about the pilot fit within established organizational, budgetary or accounting procedures at the University. Continuing Education is part of

Academic Affairs and the Information Center reports through Administrative Affairs. It was essential that both Vice Presidents were willing to have their units participate in the joint venture. Further, the Budget Office had to be convinced of the legitimacy of the project. One "minor" problem that ultimately consumed major blocks of time was the need to idenfity an approach to budgeting and distribution of funds generated by the activity. At the outset, it seemed logical to pay all expenses (advertising, mailings, materials, instructor fees, etc.) and divide any remaining funds between the two units.

Despite some concerns about how to accommodate the non-traditional venture within established organizational and budgetary frameworks, all parties agreed the project had merit. Also, because the lab to be used for the project is a shared resource with the Office of Academic Computing, it was essential to develop a program that would fit within the half-time schedule available to the Information Center. After additional discussions, we decided to proceed with a pilot project.

The Pilot Project and How it Grew

The Pilot project started during the 1987 spring semester with two distinct areas of community support, and shortly expanded into a third:

The first area for the pilot focused on an expansion of the established Community Education program to serve the general public need for less intense, generalized training. Specific topics emphasize basic computer literacy, consumer education and general computer awareness.[2]

The second component of the pilot was a series of Professional Development courses, geared toward the professional business person needing immediate intense training in spreadsheet, data base and word processing applications.[3]

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[2] Ray Scott, Office Automation at Northern Kentucky University: Community Support, Spring 1987.
[3] Ibid.

A third component was added after the director of the University's Reemployment Center sought assistance in obtaining computer training for clients of the Center. The Reemployment Center administers a federal grant program to serve displaced workers and long-term unemployed persons in need of introductory training oriented to acquiring new marketable job skills. Because of the increasing emphasis on technology in the work place, the Director of the Reemployment Center believed that an introduction to computers as a business tool would be a valuable addition to the reemployment program. After further deliberation, the Information Center developed a special workshop for the program.[4] This eight-week workshop is comprised of 28 hours of business computer literacy designed to interest individuals in further training. The four introductory areas include operating systems, word processing, spreadsheet, and data base.

Program Review and Assessment

Since the early phase of the project was an extension of the Information Center's existing program, no major hurdles were encountered in developing the first session of classes. Each course and workshop was monitored by Information Center management to determine its effectiveness. Student evaluations of instructors were an integral component of this process. In all cases instructors were carefully selected to teach workshops in specific areas of expertise where their talents had been identified based upon practical experience. In some cases where weaknesses were identified, it was possible to move an instructor into another area where greater competency was demonstrated thereby allowing us to change the weakness into a strength.

The real surprise to the Information Center was the major commitment of administrative time initially required. Many hours were consumed in coordinating the project with executive offices, and in trying and discarding several alternate budget and recharge methods before procedures were finally established. Additional time was needed to contact and schedule instructors. Also, much more time than anticipated

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[4] Ibid.

was needed for continuing lab support. It was a time-consuming process to assemble materials and set up and restore the training lab for each class and workshop session. Ultimately the Information Center established an alternate mechanism: Individual "support packs" were developed for each class, consisting of operating system and program disks, student files, workbooks, manuals and other associated materials. This eliminates the need to constantly reorganize materials for different classes. With that situation corrected, approximately two hours per week are now sufficient to maintain the original lab.

Starting with an initial program offering only four computer courses, this joint project accomplished the successful delivery of 21 classes during the first full year in operation and served 278 students. It also resulted in expanded revenues for the Continuing Education program and new money to the Information Center. Revenue generated from these courses permitted the Information Center to fund one additional part-time employee.

Another major impact from this project was increased visibility with top management. To the delight of NKU's president, we were able to offer competitively priced computer classes, comparable to those administered at neighboring institutions, to the general public at a time when budget constraints precluded expansion of any kind. More importantly, students were provided an introduction to the university and its facilities that could well lead to further interest in pursuing formal instructional opportunities at NKU.

Instructors initially were extremely enthusiastic and supportive of the evening program. It not only represents an opportunity for additional earnings, but also provides increased visibility within the campus and broader communities and recognition for technical expertise. As might be anticipated, some disenchantment set in as the program grew larger, and some of the initial pioneering spirit lags. A number of operating hurdles, including over-enrollment in some class sections, and lack of appropriate communication proved frustrating to instructors. As problems arose, they were addressed and instructor satisfaction with the program has been restored.

Next Steps: Consolidation and Expansion

The initial pilot series of activities had not been completed before plans were underway to continue and expand operations. Because of the lengthy advance scheduling required for publication and communication with potential students, we had to either make an early decision to go ahead or have a hiatus in the schedule during which computer courses would be unavailable for the public. Early results were promising and we decided to continue for the 1987-88 academic year. Completion and final assessment of the pilot project supported its value to the University. Continuation of the joint program, as long as a market exists for the classes, was now planned. Several memos of understanding were developed to formally establish operating guidelines for the future.

During the academic year, it became clear that an expansion of the program was needed. However without additional lab facilities, expansion was impossible. The two offices decided to pursue the possibility of adding a new instructional lab to be financed by the revenues earned from the noncredit courses.

Working with a local vendor, a proposal was prepared which would allow the university to purchase computers for a public lab at a rate well below our established educational discount, and far below retail. A formal business case was developed by the offices of Continuing Education, the Information Center and the Assistant Vice President. A request was made to the appropriate Vice Presidents and the Budget Office for funding to allow the acquisition of the microcomputers, software and other equipment needed to establish a new computer lab. Net revenues generated from Professional Development computer training workshops would be earmarked to repay the university's fund balance account.

A loan of this nature was the first of its kind at the university and posed potential questions of budgeting, ownership, operational jurisdiction, etc. To guide implementation, an operating agreement was written to outline priorities for use and access procedures. The loan was approved and advanced by the university for acquisition of the new lab. A flurry of activity followed during which the new lab site had to be prepared, equipment, software and supplies ordered, and an agenda prepared for its use. The new lab was available for classes beginning in September 1988 and a total of 17 classes were scheduled for the Fall semester. One component added to the lab schedule was the accommodation for two credit courses that generate financial credit which is to be applied to the liquidation of the computer lab account. An immediate impact of the new lab was that, although activity level has increased, "spendable" revenue is down until the lab cost is repaid to the University.

Final Thoughts

In retrospect, would we do it again, if we were to start over? Our answer is "Yes, but..." We would take additional time to define responsibilities in greater detail and to have written confirmation of the internal costing and billing procedures before starting the program. Additional attention to details would have avoided numerous "loose ends" and provided smoother implementation for the program. Overall however, the community service program is a positive influence on the Information Center, its personnel and its ability to provide additional service to University offices.

The economic outlook for Kentucky and the University system over the next several years is bleak. As the likelihood of personnel and budget expansion diminishes and University demands on the Center increase, the Information Center is actively investigating other options for generating revenue. The Center continues to propose new and innovative programs to extend and enhance its current services to the public, and thus indirectly, to the University. At the present time one grant application is under development which would further extend information center services to the northern Kentucky service region. Other grant applications are being considered. Any new ventures will be based upon promoting the proven expertise of the Information Center.

By offering its expertise to serve the public, it appears that an avenue is available to ultimately provide increased support for the Center and its University clients.

BUILDING STRATEGIC PARTNERSHIPS WITH INDUSTRY

By

Arthur S. Gloster II
Vice President for Information Systems

and

James L. Strom
Vice President for University Relations

California Polytechnic State University
San Luis Obispo
California

ABSTRACT: Limited state funding prohibits universities from acquiring information technologies to adequately support academic programs and administrative services. Institutions are increasingly supplementing their computing and communications budgets through industry partnerships. Of nineteen campuses in the California State University (CSU) system, over one-third of the current inventory of industry-donated computing equipment, ranging from student terminals and advanced workstations to large mainframes and complex software, has accrued to Cal Poly, San Luis Obispo through various partnerships with industry. Based on Cal Poly's experience, elements required for developing successful university-industry partnerships are explored.

INTRODUCTION

In this era of limited resources, institutions of higher education are finding it more difficult to meet their basic mission, goals and objectives. Increasingly, they are turning to private industry to supplement state funding of university programs and activities. Information technology requires substantial commitment of resources and dollars to retain academic accreditation, expose students to those tools that are required in their chosen professions upon graduation, and manage the day-to-day administrative activities of the university. While private universities have long recognized the advantages of such support, public institutions have only recently turned to private industry sources for assistance.

BENEFITS

The relationship between universities and industry is basic. Universities train students to enter the world of work upon graduation. However, to be productive employees, students must learn their advocation on state-of-the-art equipment used by those industries. This is even more critical since information technologies are now a fundamental part of nearly every aspect of modern life. Unfortunately, the nature of institutional funding cycles and procurement processes prohibit a rapid turnaround in technology acquisition. Therefore, it is to the advantage of industry to make such technology available to the university at lower cost or through special arrangements. This can minimize the time lag, speed up the educational process, and result in product innovations which directly benefit the industry sponsor.

Obviously, the primary benefit to institutions is direct industry funding or in-kind gifts to replace, upgrade and expand computing systems and facilities. However, universities directly benefit in various ways as shown in Attachment 1. Paying students to work on specific projects or work assignments, using faculty as paid consultants and researchers, and using industry leaders as consultants and advisors to the university are examples of industry-university partnerships. There are indirect benefits as well. By taking a proactive approach to developing partnerships with specific hardware and software vendors, the university is better able to effectively direct development of the information resource environment. At the same time, partnerships can bring the institution into the forefront of computing on a regional or national platform. This can generate interest from other vendors and increase the institution's visibility among its peers. This often results in further partnerships and projects which can aid the university in development, recruitment and other critical activities.

TYPES OF PARTNERSHIPS

Partnerships can take many forms. They can involve academic or administrative computing or both. They can range from small-scale to large-scale projects. A small-scale project might involve a donation of a single networked lab for classroom instruction, one or two faculty workstations for development purposes, or discounts on computing equipment for faculty, staff and students. A large-scale partnership might generate new products, provide campuswide mainframe support, or employ a complex research and development project involving multiple institutions.

The extent of an institution's involvement in partnerships depends upon the resources and other elements which can be brought together by the institution and its industry partners. In general, such partnerships develop along a common evolutionary path. Initially, there may be limited contacts at the department or school level involving individual faculty and/or alumni from industry with specific interests in campus support projects. As these contacts develop, an institution may eventually reach a point at which it proactively pursues industry partnerships which benefit the entire campus. Finally, the campus may be actively wooed to participate in specific industry-sponsored projects or activities. When activity reaches that level, it is beneficial to have a unit specifically established to serve as broker or contractor for a wide variety of industry-related projects.

INGREDIENTS FOR A SUCCESSFUL PARTNERSHIP

A number of factors must be present for industry partnerships to be successful. First and foremost, the university and its Information systems organization must have a clear sense of mission or direction and well-defined goals and objectives. Secondly, the university must develop a strategic plan by which it can achieve its goals and objectives in the allotted timeframe. This plan should identify program needs, areas of strengths, and opportunities for new program development. Another critical element is a strong unified team approach to partnership building by the university. The team should be comprised of representatives from the Information Systems organization, University Relations, Research and Development, Academic Programs, Business Affairs, and industry. The support of the President and other high-level executives as well as the faculty is also necessary to support commitment of the necessary resources to make the project successful. An industry advisory council or board is also helpful in successfully building and sustaining industry contacts. Finally, the campus should identify alternative approaches in case the partnership option proves unsuccessful or short-lived. In general, however, if an institution can deliver, industry will continue to be supportive of that institution's goals and objectives. In other words, success will breed success.

CAL POLY/INDUSTRY PARTNERSHIPS -- AN EXAMPLE

Cal Poly, San Luis Obispo has been very successful in building partnerships with industry over the years because of the elements listed above are. By 1985, Cal Poly had a defined mission and was establishing a strong Information Resource Management organization. Since then, the campus has actively pursued a wide variety of industry partnerships based on a strategic plan developed by the university and a dynamic team approach. A major force in Cal Poly's success to-date has been the existence of the President's Advisory Cabinet. Many cabinet members represent high technology industries which have contributed substantially to the university, including IBM, Hewlett-Packard, Tandem, PG&E, Xerox, Apple Computer, and Northern Telecom. The following is a brief recap of the nature of these partnerships and the benefits derived by the university.

1. **IBM**

   The Cal Poly/IBM partnership extends over three divisions within IBM and has existed since 1983. Cal Poly receives support for faculty research and student instruction in the areas of CAD/CAM, artificial intelligence, expert systems, and other areas of interest through IBM's General Products Division. GPD provides mainframe hardware, software, maintenance and other support to these projects. GPD also hires several Cal Poly students through the university's large Cooperative Education Program and funds faculty and student research projects. IBM's Academic Computing Information Services (ACIS) organization supports the university on two fronts. ACIS is one of the major contributors to the OASIS Project to develop a new administrative computing environment at three CSU campuses, including Cal Poly. They also support academic computing by making mainframe software available at substantial discount through the Higher Education Software Consortium (HESC). As a CADAM grantee school, Cal Poly was one of the first institutions to join HESC. The university is a key participant in the new venture. Finally, IBM's Education Systems Division donated a student lab to support computer-based education, research and instruction at the campus. This relationship is continuing to evolve. In addition, the local IBM representatives have negotiated with the campus bookstore to make IBM PS2 equipment available to faculty, staff and students at substantial discounts.

2. INFORMATION ASSOCIATES (IA)

In conjunction with projects involving IBM and Apple hardware, Information Associates provided the campus with mainframe software to manage student records and other critical information. IA also gave Cal Poly copies of their Executive Support Systems software for microcomputer and mainframe environments. These packages will be used to develop an integrated administrative computing environment at Cal Poly.

3. HEWLETT-PACKARD

The relationship with Hewlett-Packard extends back over many years. HP has supported academic computing in several ways. They have given Cal Poly many workstations to support student instruction. For example, HP donated student labs to Business and Engineering, advanced workstations to Mechanical Engineering and 100 new terminals to support IBM mainframe. HP has supported faculty development projects with advanced workstations. With an Executive Vice President from HP serving as head of the President's Advisory Council, HP continues to be one of the strongest supporters of the university.

4. APPLE

In keeping with its founder's philosophy, Apple Computer has long advocated the integration of microcomputers in courses at all levels of instruction. At Cal Poly, Apple technology is widely used in such disciplines as Architecture, Agricultural Engineering, and Graphic Communications. The Macintosh is now the second leading microcomputer operating system on campus. More recently, Information Systems negotiated with Apple to offer a special discount program to students, faculty and staff through the bookstore. Over 1,000 MACs were purchased during the two-day sale. Based on this demonstration of interest in Apple technology, Apple donated $350,000 worth of Macintosh equipment to support various instructional programs. A key consideration for Apple was the fact that these systems will be used by faculty to develop applications within their specific disciplines.

A second project involving administrative computing was also undertaken during the last year. With equipment and software donated by Apple, Cal Poly will develop a version of Information Associates' Executive Support System using MAC technology to access IA's IBM-based mainframe applications. Apple also funded salaries for two students earning college credit through the university's Cooperative Education Program to develop the new ESS product.

5. PAC BELL/NORTHERN TELECOM

The breakup of AT&T several years ago provided the impetus for exploring alternative communications services. Because of its long standing relationship with Pacific Bell, Cal Poly was able to negotiate a highly favorable contract for Centrex telephone services. This partnership will eventually result in the campus being able to achieve its long desired goal of an integrated computing and communications environment through implementation of standard network architectures and digital service. Information Systems will use the savings realized by the telephone service contract to meet other telecommunications needs. Northern Telecom has aided the university by funding research in human factors engineering and computer integrated manufacturing. More recently, they loaned one of their executives to the campus for one year to explore the possibility of developing a Computer Integrated Manufacturing Center at the campus.

6. TANDEM

In 1987/88, Tandem Computers donated workstations, file servers, printers, networking and software valued at $1 million to support instruction in basic computer literacy. They also provided workstations to Computer Science faculty responsible for developing the computer literacy course curriculum.

These six partnerships represent a substantial investment in computing and communications equipment roughly equivalent to $15 to $20 million in equipment and services over the past two years. Given the existing budgetary constraints on the university, it would have been impossible to provide this level of service without industry support.

A GUIDE TO SUCCESSFUL UNIVERSITY/INDUSTRY PARTNERSHIPS

Once the university has developed its strategic plan and identified specific goals and objectives to pursue, the following steps may serve as a guide in cultivating industry/university partnerships:

1. Develop a list of appropriate corporations and executives.
2. Identify past and current relationships with corporations and executives.
3. Ascertain strength of relationships with corporations and executives.
4. Develop advantages for all parties.
5. Contact corporations and executives for preliminary discussions.
6. Assess synergy.
7. Present complete plan to all parties.
8. Reach conclusion on projects - go or no go.
9. Identify aggressor catalyst.
10. Identify consensor.
11. Continuous strategy modification.
12. Monitor progress and refine project.
13. Step into the pocket, quarterback.
14. Worry, depression.
15. Raise the flag.
16. Victory celebration.

CONCLUSION

By following some of these strategies, other institutions can successfully negotiate partnerships with industry to benefit their Information Resource Management goals, whatever they may be. The main thing to keep in mind is the quid pro quo nature of industry partnerships. To be successful, such partnerships must be a "win-win" effort for both parties.

For the university, it is most important to keep in mind the ultimate goal of improving student services and academic programs by providing the most computing resource at the least cost to the instructional program. A strategic partnership which fails to deliver the expected results to the university or industry will end all prospects of future support and, thus, do more harm than good. Ultimately, it is the impact on students and faculty which matters most. By involving faculty and students in the partnership-building process, the university can be certain that the project and its goals will be accepted.

Cal Poly's success can be attributed in large part to the involvement of a dedicated group of faculty and administrators who have actively sought industry support to further the goals and objectives of the university. With a cohesive vision and sense of direction for Information Systems, Cal Poly has been able to successfully negotiate strategic partnerships with industry and other institutions. Through these partnerships, Cal Poly students are now beginning to realize the benefits of a state-of-the-art computing environment. While much remains to be achieved, the university is on the verge of becoming an "electronic campus" within three to five years. And, undoubtedly, industry support will play a large part in the university's ability to realize its goal of an integrated computing and communications environment.

Attachment 1

UNIVERSITY/INDUSTRY PARTNERSHIPS

- Advisory Board Participation

  University
  School
  Department
  Program

- Recruiting Students
- Co-op Students
- Senior Projects in Real World
- Design/Problem Solving Classes
- Executive Exchange Program
- Faculty Consulting
- Applied Research Opportunities
- Corporate Speakers for University/Student Activities
- Faculty Summer Employment
- Opportunities to Upgrade Laboratory Equipment
- Opportunities to Develop State-of-the-Art Laboratories
- Interdisciplinary Approach to Education
- Enhanced Corporate Visibility on Campus
- Graduates Better Trained
- Helping Meet California's Technical Manpower Requirements
- Increased Hiring Rates
- Faculty Knowledgeable of Current Technology

USING COMPUTER MODELS TO CONSIDER COMPUTER CENTER GROWTH OPTIONS

CAUSE88
Information Technology: Making It All Fit

Judith V. Douglas, University of Maryland
Donald E. Harris, Messiah College

The Setting

The Campus. Located in Baltimore, the University of Maryland Professional Schools Campus is an urban campus including schools of Medicine, Dentistry, Law, Nursing, Pharmacy, Social Work and Community Planning, and a graduate school shared with its sister campus in Baltimore County. Part of the University of Maryland, the campus is subject to a multilayered bureaucracy. Campus decisions and priorities are set by the President, but must be approved by the Chancellor of the University of Maryland and his staff within System Administration. In turn, the University as a whole is answerable to the state, through a specific agency responsible for reviewing its planned acquisitions. All budgetary matters must pass through these three layers of campus, university, and state preparatory to legislative approval.

As an academic health center, the campus has complex interrelationships with the University of Maryland Medical System (UMMS), notably the University Hospital and the Shock Trauma facility on the Baltimore city campus. The schools offer 62 degree programs and residency programs in 20 medical and three dental specialties. Enrollment for fall 1986 was 4,563; the employee population of 3,936 included 915 fulltime and 336 parttime faculty. In fiscal year 1986, total campus revenues were $169,527,435, of which almost $77 million (46%) were state general fund dollars. Grants and contracts generated over $43 million (26%).

The Computing Center The Information Resources Management Division (IRMD) is the unit on campus responsible for meeting academic and administrative computing needs. Reflecting the importance computing holds on an academic health center campus, the IRMD has over fifty employees and is the responsibility of the Associate Vice President for Information Resources (AVPIR). The AVPIR reports directly to the President who also chairs a governance committee made up of the deans and other administrative officers. This Information Resources Management (IRM) Policy Committee advises on policy issues affecting both the IRMD and the Health Sciences Library.

The place of the IRMD in the organizational structure for the campus dates from 1984, when the newly created AVPIR position was filled. The untimely death of the President less than three months later voided informal commitments to additional funding for information resources. This combined with a history of deficit spending placed the IRMD in a precarious position. As a result, demonstrating fiscal responsibility became one of the IRMD's prime goals. As the timing of budgetary cycle precluded any major changes during his first year, the AVPIR moved to resolve the deficit by laying off three employees and controlling operational expenses, while reinstituting contributions to the depreciation account and maintaining funding for training and professional development. These measures gave the IRMD new credibility.

The subsequent year's budget request set forth three levels of funding and described the level of service possible under each. The new President and the Director of Budget supplemented state appropriated funds for the IRMD with campus monies under the President's discretion, in effect granting the IRMD the highest of the three levels.

Planning for Growth. At the same time, the AVPIR worked with the President and the IRM Policy Committee to obtain approval of a campus plan for information resources, developed with the support of a contract from the National Library of Medicine. This plan provided two strategic alternatives and identified the costs associated with each over a seven year horizon. These were reflected in the state mandated planning documents as well. However, before funding for the plan could be identified, the AVPIR left the University of Maryland and the position was filled on an ad interim basis by the newly recruited Director of Academic Computing for eighteen months, at which time she was made permanent.

During this interim period, funding remained essentially level. Although the IRMD continued to prepare for the strategic direction identified in the plan, the campus made no definitive decisions regarding alternatives or funding. The concern of the acting AVPIR that fiscal responsibility be maintained led her to retain Donald E. Harris, who had been Director of Administration during most of the first AVPIR's tenure. Now a faculty member at a nearby college and an independent consultant, Dr. Harris advised on the financial management of the division, working with his successors in the director position at Maryland, as the IRMD continued in a state of organizational flux.

The Model Building Process

Preparing for Model Building. The process of building, testing, and operating a computer based model follows a well defined set of steps. In the two to three years prior to this modeling activity, the IRMD had fulfilled one very important prerequisite, becoming one of the more proficient users of reports and query language processing available on the University's existing financial systems. In addition, IRMD staff developed inhouse tools, using traditional programming languages on campus minicomputers and spreadsheet and database software on divisional microcomputers to track their own accounts payable and receivable.

This effort proved invaluable in determining the base year for the model and in knowing how to make "intelligent guesses" about possible future activity. In a process that is often flawed because available data are substituted for needed data, the development of these tools helped to insure integrity of the model for both the IRMD staff and the campus Budget Office.

Providing an Educational Process. One of the goals of the modeling activity was fulfilled by the process of building the model. Former modelers have repeatedly stated that being forced to define model variables, relationships, growth assumptions, and constraints, provides an education quite apart from actually running the model. Thus the consultant deliberately involved senior IRMD staff as a group in the model building process. Seeking input from many sources, including some outside the division, had a number of visible benefits. Prime among these was the shared responsibility for the accuracy of the data that went into the model and for the integrity of the model itself Because emphasis was put on keeping the model simple (even having a spreadsheet version), IRMD personnel were able to understand some basic concepts of modeling without having to learn another software package.

The goal of education was realized during the model building period. The consultant did not stress numbers or solutions to the IRMD's financial problems. Rather, by focusing on what could be learned about the way the division operated, he took the process beyond the division's budget office and made senior management active participants.

Structuring the Summary Report. The first step of the consultant and his project team was to identify the budget areas to be included in the model. To make its findings easily understandable for those senior managers in the IRMD and the Budget Office who would review it, the summary report of the model was structured to look like the summary reports those managers received each month. However, unlike those monthly reports, the model did include the revenue items for carry-forward of previous year's surplus and various new equipment and personnel on the expense side. To give a target to shoot for, the model used the current year's actual as its base year and the upcoming budget year as the first year in its forecast.

Identifying the Variables. In preparing the model, the challenge was to determine the primary planning variables which drove the change in the defined revenue and expense categories from year to year. Self generated income was broken down into academic and administrative areas. Within these areas, further breakdowns came in terms of various user groups which might share some common pattern of usage such as special research grants on the academic side or auxiliary enterprises which bought time on the administrative machines Once identified, major users were given their own line in the model.

Assigning Growth Factors. Growth factors were then assigned to each of the user groups, including a common growth factor on usage for all users and separate growth factors for each of the various user groups, such as research grants or auxiliary functions. The r odel thus had the option of either driving all self generated accounts together, or adjusting each of a number of groups based on separate assumptions on their usage of computer resources. The final variable in this area was that of rate for computer time. The IRMD's current common rate was placed in the model with a growth factor tied to it.

Establishing Relationships Among the Variables. To allow for relationships among variables, detail was built into the model whenever it could be justified; otherwise, the model was kept as simple as possible. In the area of operational costs, separate sections were established for the division's five minicomputers and one mainframe. This allowed inclusion of exact dollar figures for payments on several of the machines and reflected the wide variation among machines for contractually determined services such as maintenance and software leases. Detail was also purposely included in the new expense area. The model was built to accommodate the addition of personnel in the forecast period and to automatically generate benefits and indirect costs according to the level of the new employee(s). Again, input from a variety of sources insured good assumptions on data such as salary levels, expected growth rates in operational areas, and even expected interest rates should a major loan be sought.

Loading the Base Year. Once the component parts of the model were defined, the base year assumptions were loaded. The challenge here was to determine the factors that make up various budget categories rather than just the dollar figures for those categories. To determine factors affecting self generated revenues, the IRMD ran reports on its accounting programs for different systems to determine the usage of machine resources by group of "paying" customers and even by time of day (the IRMD offers discounts for evening and late night use of machine resources). Once the base year was loaded and inconsistencies with actual budget figures were resolved, a set of assumptions was developed for growth in all areas.

Validating the Estimates. To improve the accuracy of the estimates, information was gathered from a number of sources. Campus users were surveyed as to their plans for future computing activities; a telephone poll was conducted with key users. Vendors were contacted for estimates on how much maintenance cost might increase. Information was collected on what the costs associated with acquiring new hardware and software would be, including personnel. Thus, decisions on growth options could be based on dollar figures that could be traced back to specific documents. The consultant worked with IRMD management to stress the fact that, although these assumptions were not in any way guaranteed, they represented the best guess at what potential costs would be in future years.

Establishing Constraints. The final step in defining the model was to determine the constraints for certain variables. The consultant and his project team realized that running the base year out with the growth assumptions in place would produce a deficit forecast before any additional personnel or machine resources were even considered. Thus the task became one of trying to bring the forecast back in balance using various goal seeking features of the modeling software package. Doing so required defining what variables should be constrained and what high and low values should be defined for these variable values. To keep the process simple, only one constraint was placed on the actual budget figures: there could be no deficit at the close of any year of the forecast. To provide a balanced budget each year of the forecast, a constraint was also placed upon the equipment depreciation fund. The remaining constraints were placed on revenue and expense growth assumptions, always in consultation with key directors in those areas.

Applying the Test of Reasonableness. Here again the attempt was made to keep the process honest by not seeking solutions to the division's financial problems that were unreasonable from a growth perspective. For example, computer usage by cash customers could not reasonably be projected to grow by more than 10% per year given the proliferation of microcomputers on campus. Thus the consultant and his project team did not allow the modeling software to seek a solution to a budget deficit by increasing growth in that area past the high level of the constraint. This process was followed throughout the model.

Conducting the Sensitivity Analysis. After the model was defined and thoroughly tested, one final step preceeded its actual use in addressing possible planning scenarios. A sensitivity analysis was conducted to ascertain that the model was not defined in such a way that it was either too sensitive or not sensitive enough in representing changes and their effect on the entire budget. Ideally a model should show some changes to have a ripple effect upon the budget, such as the increases that may be seen in personnel benefit areas, travel, conference registrations, and the like when a new professional staff member is added to the division. Yet these effects should be reasonable, not overstating the actual expense that would be incurred.

The sensitivity analysis went through each primary planning variable and changed the growth by a factor of 1 or 1% (as the case may be) and then looked at the summary report for the model to examine the effects the change had on various parts of the model as well as the bottom line. A final summary sheet was then produced showing the relative bottom line of a variety of changes to these primary planning variables. Through this process, some minor changes were made to the model. Again, involving individuals not on the project team in this phase of analysis served to establish the model's integrity in many minds both inside and outside the IRMD.

Using the Model to Seek Feasibility

With the model established and tested, the work of addressing the financial concerns of the division began. The course of action was to examine three possible planning scenarios for the IRMD in the coming years:

- Scenario 1: No growth.
  Existing machines, software resources, and personnel would be maintained. Revenue and expense areas would grow in accordance with assumptions set forth in the model.

o Scenario 2: Limited growth.
User services would be increased. No substantial upgrading of resources in terms of an upgraded mainframe or database package would be allowed.

o Scenario 3: Moderate growth.
Machine and software resources would be upgraded and personnel added.

Accuracy in estimating hardware, software, personnel, and maintenance costs was key to the validity of the numbers in the second and third scenarios. Some numbers were obtained from vendor estimates on possible packaging of equipment or software lease costs already known to the IRMD. Personnel costs were checked against salary studies for the area, double checked by the Personnel Office, and then tied to inflation. Thus, if a particular personnel position was planned for year three of the forecast, an inflation factor had already increased the base line for that item so that year three was adjusted for inflation. The campus Budget Office provided loan interest information; if any scenario called for the borrowing of funds, reasonably accurate interest rates could be projected. Again, although various campus offices provided valuable information for the model, the ultimate payoff for involving them was the shared ownership of the modeling process.

As predicted, each of the five year forecasts showed a deficit situation that grew worse as the forecast went on. The consultant and the project team therefore focused on what could be done to make each scenario feasible. The task was to adjust primary planning variables to meet the constraint of a balanced budget without breaking any of the established constraints on the growth variables. IRMD staff were again consulted to determine where costs could be cut without jeopardizing the individual scenarios. The object was to insure that the goals and objectives of each growth scenario were not compromised. Thus some additional personnel were taken out under the assumption that present personnel could be trained, or that hiring of personnel or the acquisition of equipment could be delayed one year. However, when the impact of such changes upon goals and objectives was assessed, items cut from the forecast were often reinstated.

The focus quickly shifted from cost saving measures to the possibility of using the depreciation funds earmarked for equipment replacement and supplementing them with additional funds from the President's office and perhaps a special low interest loan. After several passes at the model, a set of revised planning assumptions was established for each of the three scenarios to provide for a feasible five year forecast. Although the IRMD clearly sought the moderate growth scenario, all three scenarios were written up and presented in a final project book form to the campus Chief Budget Officer.

Outcomes

Since the modeling process was completed, the IRMD has received additional funding supportive of the moderate growth scenario. A significant portion of this funding has replaced special one year appropriations from the President's discretionary funds with ongoing state monies. Funding has been granted for additional positions. Potential funding sources, including the depreciation account, have been identified for the support of major acquisitions. In addition, the campus has identified computing needs as the second highest priority for the campus in the state budgetary process.

Though real and measurable, this increased funding is not the only important outcome of the modeling process. The IRMD has also benefitted as an organization from the educational process. These IRMD staff members have effectively shared their understanding of the dynamics of the IRMD budget with the campus Budget Office. The no growth scenario made clear the financial problems facing the IRMD. Due to unavoidable increases in costs in critical expense areas, even no growth required additional funding to avert a deficit situation. The mechanisms the IRMD was using to maintain budgetary flexibility became obvious; the trends affecting areas such as software maintenance and self generated income were highlighted. The campus Budget Office has acknowledged these trends. Indeed the Budget Office is phasing in additional funding on an annual basis to offset decreases in self generated revenues.

This awareness of the dynamics of the budget had a positive effect on IRMD personnel. Those staff members with experience previously limited to organizations of fewer than 20 staff members and commensurately smaller budgets were made aware of the flexibility that a budget the size of the IRMD's provides and the constraints it entails. For other staff members, the model succeeded in validating trends previously intuited or inferred and in giving them dimension and measurability. Overall, the modeling process helped to mature the IRMD and to bring it beyond the "live for today" philosophy that once placed it in financial jeopardy.

Today the IRMD is distinguished by its attempts to plan for tomorrow. Efforts are underway to build into the forecasts those items that will help the division meet its goal of creating a new information environment for the campus. The campus and the IRMD are finding that there is more today because of the effort that was made yesterday. The bottom line here is that the division is in a better position now than at any other time to address the information needs of its campus.