College of Engineering

Vision Plan for Information Technology

1998-1999

College of Engineering Computer Committee

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Executive Summary

Technology Assisted Learning (TAL) initiatives are the focal point and impetus for this year's College of Engineering Vision Plan for Information Technology. The insight generated by acknowledging the roles of Information Technology (I/T) to enable Life Long Learning through conventional academic curriculum, continuing education, and K-14 outreach have been invaluable in working toward developing an infrastructure that also aptly supports research, administrative operations and facilitates corporate relationships.

Empirical understanding of the role of I/T in each of these venues is helping us to determine an optimal future and to align progress toward these goals purposefully with a Total Cost of Ownership (TCO) mindset. The Laptops for Learning Initiative, a voluntary laptop computer purchase program promoted through the College of Engineering, is but one of the tactics used to implement the spectrum of I/T computing solutions which range from enabling distance education to providing a robust set of application, instructional, web and file services.

Recent I/T efforts such as the UT System Microsoft licensing agreement, the Multimedia Enhancement Task Force (METF), and the Network Master Plan committee are greatly appreciated as they tangibly contribute to and align with College priorities. Service organizations such as the Center for Instructional Technologies (CIT) contribute needed guidance, collaboration and training in support of faculty teaching. Documents such as the "Information Technology and the Future of the University" solicited by SACS provide far-reaching and insightful perspective for internal strategic planning. Groundbreaking forums, such as the Technology Dean's Working Group, have acted as a catalyst to identify key issues and forge I/T futures. These collective efforts provide an invaluable virtual infrastructure that sustains the front-line I/T efforts pursued from within the Engineering College.

The College of Engineering Vision Plan for Information Technology reflects, in the attached table, the priority projects desired for funding as a result of internal strategic planning and alignment with University visions. The individual entries relate total budget requests and relevance to the overall mission along with numerous fundamental campus issues that should be addressed through collective efforts to fully implement the UT vision recommendations. All appropriate College funding, which is not needed to sustain current operations, will be committed to fulfilling the depicted projects. Alternate funding sources will be aggressively pursued to supplement the fee-based revenue and further progress toward achieving the identified goals. Any funding which ITAC could provide toward this objective will be greatly appreciated, and it is hoped that at least the top priorities will be adequately funded.

College vision, goals and objectives, recent progress towards realizing goals

The draft College of Engineering Strategic Plan for 1998 is published on the web at the URL: http://www.engr.utexas.edu/research/strategic_plan/ and once it is completed should be considered the definitive document defining the overarching mission of the Engineering College in perspective to the University's mission. The Strategic Plan relates our core purpose, values, and our Vision, as well as specific goals and strategies for implementing objectives.

The underlying objective of information technology is to support this Strategic Plan and, by the nature of the implementation, increase the value of the information to the enterprise and it's constituency. This year's vision plan strives to take a fresh, hard look at the contribution of information technology toward our fundamental objectives and to discern the processes and projects that need to be implemented to fulfill the Vision. Although this document serves only as a summary of these efforts, as nominally applicable to the academic mission, painstaking efforts have gone into assessing the I/T status quo and envisioning a future system whereby academic, research and business processes will be optimized through the effective use of information technology. The proposed discrete projects depict a transition process to leverage existing resources toward the envisioned future.

Forthright acknowledgement should be made that this is a dynamic process, constantly attempting to correlate an ever-changing reality with a living, fluid Strategic Plan. This admonition is not made to remove accountability, but rather to convey the purposeful design that the implementation details of the vision plan must be nimble and able to rapidly respond to the evolving requirements of the Vision. Thus, this vision plan has a built-in flexibility that allows for the investigation and, if appropriate, implementation of emerging technologies.

The experiential assumption is that we are not making optimum use of information technology within the College. The ad hoc and reactive heritage of I/T acquisitions has reflected a best-efforts mentality by the individual units and has inadvertently created a managed chaos environment whereby even seemingly trivial tasks may be complex and inordinately expensive from a labor requirement perspective. The goal is to evolve the use of information technology as an enterprise resource by assimilating industry best-practices and aligning these resources with enterprise objectives. A Total Cost of Ownership (TCO) model acknowledging the life-cycle cost for I/T will be applied to optimize the return of investment (ROI) for I/T expenditures. Cost-recovery models based upon service requirements and alternative-funding efforts can be provided as necessary.

Enterprise System Management (ESM) mechanisms comprise the main hope we have of affordably and effectively managing our information technology resources. Sustaining the capability for every person within the organization to access properly installed, configured, patched, secured, and maintained applications throughout the enterprise is essential. This necessitates mechanisms and an environment whereby this objective can be reasonably accomplished. Although this objective will not be overtly represented in the proposed projects, it is important to acknowledge the foundation upon which these projects are architected to ensure consistency and success.

Progress toward the envisioned future has been undesirably erratic due to the distributed and autonomous heritage of I/T support and funding structures. Efforts are being made to acknowledge the strengths of this diversity, develop new partnerships, and nurture cooperation through a best-practices focus to improve services and alleviate redundancies. These efforts are further illustrated in the Life Cycle Methodology section. Priority projects have focused on enhancing the ability to integrate multimedia capabilities and web-based materials into the curriculum.

Facilities, staffing and other infrastructure

Academic computing support within the College is by in large supported directly from within the six departmental Learning Resource Centers (LRCs). Each department caters to its engineering niche and discipline-specific curriculum needs. Each LRC is independently managed within the department and determines the level and availability of services it will offer to students and faculty through departmental advisory committees and the support staff capabilities. LRCs attempt to offer an approximately 11-to-1, student-to-computer ratio with a mix of Windows, Mac, and UNIX operating systems within their facilities. The specifics of each LRC are published on their respective web pages. Physical space for the individual LRC operations typically have been carved directly out of classroom or departmental lab space in direct competition with these missions. Remodeling challenges are often inadequate, costly, and interminably slow.

I/T support of research is highly variable. Research centers that can afford their own I/T personnel generally hire their own staff, spread them too thin, and seek to outsource for expanding or unanticipated service needs. Too often they may hobble together networks, operating systems, and applications for which there is little or no campus knowledge-base, then their overworked staff gets a better offer from industry and leaves. Smaller research projects typically rely upon graduate students who become amateur system administrators developing useable and employable skills yet detracting from their prime objectives, then graduate, as students do, leaving behind a system that others seldom understand. The other students typically use it until something fails, and then they will pursue LRC staff to help them get it fixed. The LRC staff will typically attempt to help, over-investing time, and detracting from other duties to update multiple versions of the operating system and patch numerous applications, then they may operate satisfactorily for awhile. Unsponsored research generally occurs directly in the LRCs or on PCs tucked away in labs, student offices, or increasingly on student-owned laptops.

Administrative support also is mostly hobbled together by inadequately trained administrative staff and under-funded cost sharing of LRC staff, to the general frustration of everyone. Things still get done, due to hard working and dedicated people, but we would speculate that many have little hope that things can or will get substantially better. This is an unfortunate and unnecessary state-of-affairs.

The networking infrastructure could best be described as “precarious”. Although the departmental and campus staff have done a remarkable job at implementing and maintaining the network infrastructure thus far, the predicted demands upon the system to carry data, video, and voice will bring the system, along with our enterprise productivity, to its knees unless purposeful steps are taken and funding is provided to address these future bandwidth requirements. The current feast/famine/scrounge network sustenance process must be replaced by a funding model and implementation plan encompassing the spectrum from the desktops of distant learners and distributed campus constituents, to building infrastructures, campus backbones, and hearty pipes to the World. Specifics of the network challenges are related in the Appendix 2a, report on the network status.

Let’s not forget our virtual staff, without whom the large issues would not be resolved. ACITS, ACS and OTS offer services and skills that are generally not available within the Colleges. In recent years, measurable progress has been made toward aligning the services of these units in support of College missions but further work is needed at the institutional level to architect a comprehensive, inclusive institutional vision for I/T. College tactics for addressing facility, staffing and infrastructure issues are presented in the Life Cycle Methodology section.

Proposed Projects for College of Engineering Vision Plan 1998-1999

The College of Engineering academic projects, for which funding is being requested, are listed below in priority order. This opportunity also has been taken to list numerous projects and fundamental campus issues that should be addressed through collective campus efforts to fully implement the UT vision recommendations.

#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
1	Multimedia Teaching Podiums	Consistent with the suggestions of the Multimedia Enhancement Task Force (METF), campus teaching centers should be appropriately equipped to facilitate the integration of multimedia into the classroom either through permanent installations or through a responsive service organization.	Direct impact upon engineering students in the classroom as instructors integrate multimedia presentations into the curriculum.	Specifications determined by the METF report as appropriate for auditoria, large, medium, and small classrooms.	$285,000 ITAC Incremental deployment throughout the college as funding allows.	The extent of remodeling necessitated will differ greatly from building to building.	Innovative instruction must be deliverable in trivial fashion else much of the effort and emphasis placed upon these innovative tools will go unrealized. Current capabilities largely require inordinate pre-coordination and labor intensive support to insure a professional presentation.
2	Studio Classroom	At least one additional studio classroom per year within the College will be needed for the foreseeable future. The capacity of the only classroom with this capability has saturated and it is necessary to extend this capability rather than restrict its availability once it becomes a motivating force behind the innovative use of I/T in the classroom.	Direct impact upon engineering students in the classroom in a participatory environment.	20-25 client CPUs, server, networking, multimedia teaching podiums integration, room remodeling.	$230,000 ITAC Per classroom.	Space will be allocated from within the College.	Once the students have experienced the presentation of various technology based tools and been made aware of their capabilities, a portion of these capabilities need to be followed up by hands-on studio classroom activities.

#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
3	Application Servers	Extending application services to all computing platform clients from a unified client/server model leverages many factors and is anticipated to have a significant cost savings on both hardware and software licensing costs in the future. This funding would determine the scalability of these types of applications and gauge the impact upon the networking infrastructure to provide this new service capability.	Initially for Engineering students, but the benefits of this technology could rapidly unfold to the entire campus as Windows- based computing is made available to mobile, remote, UNIX, and MacOS users across the network.	LRC effectiveness could substantially increase as they evolve to support more computationally intensive tasks. The potential contribution to distance education programs is promising.	$90,000 ITAC	Minimal server room space, which is already available.	Liberal Arts, Business, ACS and ACITS would be valuable partners in this groundbreaking endeavor. Network bandwidth requirements could be impacted as the demand and maturity of these services evolves.
4	Engineering Building Bandwidth	Higher network bandwidth connections for Engineering buildings are needed in order to keep pace with increasing service demands. These increased demands are a measure of success of other I/T initiatives and indicate the need to replace existing 10 MBPS network router infrastructures which have been in place for several years in each of the six Engineering buildings.	All six Engineering buildings on main campus.	Primary building network switches, fiber pulls to NOC and client hub/switch capacity. Portions of the cost estimate will provide equipment to the NOC to enable them to provide adequate service to the Engineering complex.	$240,000 ITAC	Existing network control room space within each building will be utilized.	Engineering has consulted with William Green of ACITS/OTS to insure Engineering network upgrades are necessary and in alignment with the total campus networking infrastructure.

#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
5	Enterprise Infrastructure Services	Providing asset management of networking and computing resources with such tools as Tivoli Enterprise will help to evolve the use of information technology as an enterprise resource by assimilating industry best-practices and aligning these resources with enterprise objectives. A Total Cost of Ownership (TCO) model acknowledging the life-cycle cost for I/T will be applied to optimize the return of investment (ROI) for I/T expenditures permitting proactive adjustment to service requirements.	Initially Engineering and scaling with participating campus partners.	Initially 1 FTE and 1 student, control consoles and ESM software working in concert with existing departmental resources. Enterprise System Management (ESM) mechanisms are the best hope we have of affordably and effectively managing our information technology resources. Sustaining the capability for every person within the organization to access properly installed, configured, patched, secured and maintained applications throughout the enterprise is essential. This necessitates a mechanism and environment whereby these objectives can be reasonably accomplished.	$465,000 ITAC/ITF Implementation tools could appear costly, but the ROI cannot be truly assessed in our ad hoc environment. Recurring costs are also substantial. Cost recovery models based upon service requirements and alternative-funding efforts can be provided as necessary.	Office space to house two staff members, initially.	Corporate partnerships will be pursued to substantially reduce implementation costs.
6	Universal File & Web Services	100 MB per student accessible from both Windows and UNIX across the enterprise offering both file and web services.	Initially Engineering and scaling with participating campus partners.	Terabyte sized disk farm, supporting network infrastructure and support staff. (Current game of disk space leap-frog could be alleviated.)	$500,000 per yr. ITAC/ITF (~ $5 per month per user)	Existing space, with power and HVAC adjustments.	Ubiquitous and ample access to this resource are now affordable and the geographical installation could address networking demands.
7	Instructional Design, Implementation and Deployment Team	Service organization catering to the engineering community, facilitating the use of technology in the classroom per METF suggestions and providing adequate instructional support for the design, implementation, and integration of multimedia instruction into the curriculum.	Entire Engineering community.	Professional design staff establishes mechanism and students individually cater to faculty needs. Scaling to 3 FTEs, 2/3 students on-call (from pool of 10-15). Instructional Design and Audio Visual servers, client access standards.	$500,000 per yr. ITAC/ITF	Space will be needed for support staff and associated servers.	Supporting partners will be the College of Engineering Instructional Media Lab and Continuing Education groups and ACITS-CIT.

#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
	Instructional Media Lab Resource Center	The Instructional Media Lab (IML), housed in ETC, strives "to create the technological framework to help present your ideas and thoughts" and is currently providing unique talents and tools to instructors wanting to develop Multimedia based instruction. It serves both Engineering and non-engineering faculty. Funding for this facility needs to be significantly increased as demand outstretches existing resources. Primary thrust areas have been identified for this year and have been separated for consideration as separate funding items.	Engineering and non-engineering faculty, directly impacting the innovative nature of instruction to the students. Evolving the role of the Learning Resource Centers to leverage the	Expanding the capabilities of the existing facility are the primary goals, please visit their web-site at: http://uts.cc.utexas.edu/~iml/ and see if you could make use of their services.	ITF Student fee increases have been proposed to assist in funding this operation.	The existing IML facility is in ETC.	The CIT, ACITS and the General Libraries are complementary partners in providing these services.
	IML-Studio	Improved studio equipment with enhanced capabilities to address the increasingly sophisticated demands of the faculty, such as blue-screening, narration, and custom music scores, which greatly reduces the cost of licensing music for inclusion in instructional media.	Engineering and non-engineering faculty/staff.	Blue-screen improvements, music sequencer, keyboard, and software.	$16,250 ITF	Existing studio space.	
	IML-Field	Procurement of equipment specifically designed to be taken into the field has become increasingly necessary since acquiring footage on-site is essential in many situations (currently studio equipment must be used for both purposes).	Engineering and non-engineering faculty/staff.	Digital camera, tripod, field audio package, field Digital Audio Tape (DAT) recorder, portable field monitor.	$18,500 ITF	The great outdoors and client sites.	Preserves equipment intended for exclusive use in studio environment.
	IML-Distance Education	Quality enhancements are needed to enable high fidelity transmission of instructional materials to the distant classroom, promoting interaction within the virtual classroom.	Engineering and non-engineering faculty/staff and distance education students.	Smartboard, desktop presenter, broadcast quality monitor, higher quality cameras.	$54,400 ITF	Existing studio space	

#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
	IML-deployment	Deployment of selected, mature IML services into the departments is indicated since the demand for these scanning, image processing and OCR services has become widespread.	Extends capability directly to students and faculty within their buildings.	Audio/Visual capable PC, Adobe Premier software, ample disk space, scanner, OCR software, Adobe PhotoShop.	$36,000 ITF ($6,000 for each of the 6 departments.)	Space allocated by departments to integrate desired functionality into their operations.	
	Learning Resource Centers (LRCs)	Learning Resource Centers (LRCs) are the staples of our I/T capabilities, housing our front-line talent and the computing resources that the students use daily. Funding for these centers needs to be maintained and standards for services they provide need to be established and evolved while developing campus partnerships and eliminating redundant efforts.	Direct support of students on a daily basis, department by department or college.	Centralized computing resources need to be well maintained and have well documented standards of operation to serve academic endeavors effectively.	ITF Existing student fees are the primary source of funding.	Space adjustments will be made at the college and departmental levels. A building designed with this purpose in mind is envisioned.	
	Printing	Trivial, reliable access to a spectrum of output devices across campus needs to be made a practical reality. (Inadequate and unreliable IP-based printing has historically caused great frustration on campus and a reliable enterprise solution has still not been identified or developed. Although a small band of ACITS people are committed to helping resolve this issue, this project needs to be significantly escalated in importance to provide widespread utility across campus.)	Entire UT community.	Focused intellects to investigate industry solutions and then customize to our unique campus needs. A long-range plan should be developed in our evolving NT-centric world with an emphasis on reliable printing and identification of media types and physical locations to be supported.	Unknown, but once capability is established and findings are published, it is anticipated that the cost could be largely distributed throughout campus, existing budgets and a cost-recovery basis.	Trivial unless it was determined that RJO sites should be reestablished.	Dismantling the RJOs may have been fiscally necessary, but the fundamental need to acquire output across campus did not go away. ACITS and ACS need to study the breadth of this issue and propose a comprehensive and standardized solution. Departments should not be left to fend for themselves on this pervasive issue.

#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
	Wireless Pilot	Wireless networking is becoming affordable and reliable, and therefore is a practical consideration. A well-documented pilot project, in partnership with a corporate vendor, should be established and tightly coupled with laptop computing capabilities. Effective utilization of wireless technology could fundamentally impact other I/T costs and innovative instruction efforts.	Initial investigation would involve a small control group, but implementation/utilization implications would involve the entire campus.	Total pilot project parameters would need to be matured by participating parities, but would largely use existing staff and infrastructure.	$25,000 ITAC	Loaned and mobile equipment would be used for the pilot project. Space implications would be determined.	ACITS and the Business School would be good partners to implement this pilot by extending existing services. Corporate partner(s) willing to greatly defer cost of investigation should be identified.
	Smart Cards	Smart cards distributed to the entire UT community immediately with authorization for use of such cards handled securely over the web. Desired access to existing LRCs by undergraduate students is of particular concern.	Entire UT community.	Extensive installation/upgrade of card reader across campus is anticipated.	Total cost is unknown, but is anticipated to be relatively small on a per card basis especially when weighed against the existing losses of utilization of expensive I/T equipment.	Minimal space is anticipated at card access sites, but the central authority may need a center of operations.	Poor handling and the lack of campus coordination of electronic access cards definitely gives us a failing grade on providing adequate access to existing I/T resources in a cost effective manner. A single, proactive authority should be given the responsibility and resources to implement the smart card in an intelligent fashion.

#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
	Process Infrastructure	Campus policies and service standards need to be established as the infrastructure within which we work. These parameters will transcend the ever-changing technology. Mission-critical functionality, such as our networking infrastructure needs to be identified and adequately funded. Pervasive impact and synergy will occur once training and help desk support are aligned and evolved with the service standards established. Engineering will pursue coordinating these structures with campus partners to collaborate and establish this framework where a void remains.	The entire campus computing community and setting standards for other institutions (leading the way).	Cooperation and a focus on identifying core business processes are the keys here. It may require distinguishing when autonomy is desirable to promote innovation and when standards may provide more time for innovation.	Reallocation and more effective use of existing resources are most likely.	No known impact	Losses in productivity and energies toward innovation are immeasurable within our functional chaos. Factions currently succeed in spite of all odds, but effective I/T tools need to provide services for our entire campus community.
	Campus classroom connectivity	Full deployment of network connections throughout the College is desired in order to made internet resources available in the classroom as desired by the instructors. Lack of pervasive classroom connectivity hinders innovative instruction initiatives all across campus. Existing deployment, within the College, has been prioritized and implemented aligned with available funding to address the most highly utilized areas. Although several hundred access points have been added within the past year, a significant number of classrooms and labs still lack adequate desktop connectivity due to insufficient funding.	Funding request focuses on only the six Engineering buildings on main campus, but there are also significant needs in other Engineering buildings and many other campus classrooms do not have essential service for the instructor.	Extensive category 5 cabling and associated hub service. Bandwidth upgrades of the primary network switches has been addressed as a separate item on this list.	$750,000 ITAC/ITF This funding request specifically focuses on main campus Engineering needs, general campus requirements need to be address separately.	Existing network control room space within each building will be utilized.	The hurdles to coordinate network connections beyond the realm of Engineering's network control are stifling. This further inhibits adequate deployment of innovative instructional materials developed for the Engineering curriculum. A central campus authority, such as OTS, needs to help establish and coordinate the connectivity of campus classrooms.

#	Project Title	Brief Description	Audience	Resource Requirements (staffing, equipment and materials)	Proposed Budget/ Funding Source	Space	Special Considerations/ Partnerships
	DHCP campus redundancy	A redundant DHCP server to ensure robust DHCP services across campus is needed as dependence upon DHCP services rapidly increases. In the Spring of '97, the College of Engineering donated the funds necessary to establish the first campus-wide DHCP server. The Office of Telecommunication Services (OTS) has agreed to perpetually maintain this service, but is seeking additional funding to ensure the robustness of this service.	The entire campus computing community.	OTS can better describe the total cost of providing this service, Engineering simply would like to convey the importance of the service and insure that adequate funding is made available. The $4,000 reference is what OTS would ask from Engineering in order to provide a secondary server, but additional inquiries should be made with OTS.	$4,000 ITAC	Housed within OTS.	DHCP services have become as necessary as DNS services and should be sustained on campus with total reliability. Limited IP numbers and the mobility of users are two significant factors which require this service be provided.

Administrative, research, continuing education and outreach projects will highly leverage the technologies put into place for accomplishing the academic mission to take advantage of the expertise available within the College. Major thrusts will be the implementation of managed systems, through the use of enterprise system management tools and application servers, to deliver services to customers. Emphasis will be placed on the maturation of data warehouses and collaborative tools that will enhance workflow. Existing funds and grants will attempt to fund these projects.

College I/T funding overview and life cycle methodology

Funding models for I/T, although still inadequate, have been earnestly addressed only within the academic realm, and are founded upon assessing student fees. The academic fee structure has evolved over the past dozen years to three primary fees that largely contribute to the operation of the departmental Learning Resource Centers (LRCs).

Information Technology Fee - $6/SCH	University-wide fee. Approximately 57% is returned to the College initially. Additional funding may be received through ITAC allocations for specific projects.
Instructional Technology Fee - $9/SCH	College of Engineering fee in 97-98
Learning Resource Center Fee: ~$150/semester (six distinct fees aligned with their respective departments)	

Administrative funding of I/T has been a perpetual concern. Operational budgets have not been adjusted for the inclusion of technology as an essential tool to accomplish administrative functions. Research funding for I/T is, of course, project based. One particularly, sensitive issue is the percentage of a project allocated to overhead for infrastructure costs, yet I/T still not being considered part of the infrastructure. In addition to this, research, in many situations, has found it necessary to subsidize the purchase of adequate technology to perform both academic and administrative functions for themselves and to support staff.

This improvisational system is a response to the lack of a purposeful funding mechanism provided by the institution acknowledging the role of technology in accomplishing job-duties. It also has an unfortunate side-effect of units attempting to purchase the most powerful computer they can afford with available funding, which is many times not the most appropriate solution, because they are not sure when the next opportunity to replace the equipment will arrive. An innovative solution for providing appropriate technology and training for an individual to accomplish their job may be something along the lines of a “technology fringe” corresponding to fringe benefits associated with a person’s salary and aligning with their role within the institution. The technology fringe could be allocated to ensure the infrastructure, services and training needed to perform a specific job function are adequate.

The first step in implementing an effective Total Cost of Ownership (TCO) model to improve the Return On Investment (ROI) for I/T expenditures is architecting an infrastructure that leverages existing investments and assesses life cycle costs for all future acquisitions. Where these practices will have the most noticeable impact is upon the migration toward managed desktop computing environments where a user’s application suite can be audited and updated across the network as deemed appropriate to accomplish their job-related duties, transcending the current inability to keep all systems across the enterprise properly maintained. This capability will be implemented by the deployment of enterprise system management (ESM) tools that facilitate the installation and maintenance of applications through a central console and will have an especially significant impact upon administrative and academic installations that deploy numerous instances of the same configuration. Initially, parallel ESM systems will need to be maintained to accommodate the arbitrary diversity of computing platforms, but through attrition over the next few years, managed clients will be able to replace conventional desktops, reducing the overhead and providing better service to the desktop. In the meantime, the establishment of application servers and multi-platform software clients will extend the life of existing hardware until it’s utility is diminished. Similar services will be offered to mobile computing users and system adjustments will be accomplished when the units are connected to the network. Through these mechanisms, software licensing will be afforded several benefits and yield significant savings. Audit capabilities will enable effective license management and application servers will provide network access to high cost or apparent high volume needs through concurrent licensing.

Life cycle standards for multiprocessor workstations, servers, printers and peripherals also will be established and acknowledge the capital expenditure, configuration, training, support, supplies, and maintenance needed to effectively utilize the resources. Coincident with this assessment should be the declaration that multiple CPUs are

rarely needed by a single individual to accomplish their job-duties and every effort should be made to ensure this is a cost-effective situation when it arises. Paramount in the establishment of these standards will be the effectiveness in meeting customer needs and developing supportable standards to ensure that there will be no second-class citizens in the organization. When we give an individual a charge to perform a task that requires the use of information technology, adequate resources should be supplied to that individual to accomplish the task at hand. Both the individual and the technical support staff should feel adequately prepared and trained to perform the task and able to quickly recover from unpreventable circumstances such as hardware or software failures.

Research should adopt these established standards wherever possible to ensure the availability of a campus knowledge-base should service outsourcing become desirable.

I/T staffing adjustments will be needed as various projects are funded and specific roles will be adjusted to accommodate the changing skill set requirements as TCO models are deployed. Staff and student positions capable of ensuring the effective deployment of technology in the classroom and supporting distant education, diagnosing network problems and implementing enterprise system management tools will be of special interest.

The network infrastructure needs to be adequately funded from all participants, academic, research and administrative, and a funding model which implements this needs to be established. Specific challenges to the College of Engineering network are identified in Appendix 2a, but it is believed that an institutional model is needed which does not leave the internal building infrastructure unspecified and without robust diagnostic and bandwidth utilization assessment tools. It is anticipated that adequate networking capability could be provided to an individual for a cost less than that of a telephone handset per month. Capacity offerings could mimic television cable service such and BASIC (~10 MBPS) and PREMIUM (≥ 100 MBPS). An internal, College of Engineering model will be established in lieu of a campus model.

Adequate physical facilities to support complementary academic and research endeavors have historically been lacking and it is suggested that efforts be pursued to construct a building that is specifically designed to accommodate academic and research computing requirements.

Appendices

1. Total I/T expenditures report for 1997-98

College of Engineering
Information Technology Fee Expenditures for 1997-98

			TOTALS
BALANCE FORWARD		258,596	
AMOUNT RECEIVED - Continuing Annual Amount		350,632	
AMOUNT RECEIVED - One-time Allocation		90,000	
AMOUNT AVAILABLE			699,228
SALARIES AND FRINGE:			
	Salaries	(14,823)	
	Fringe Benefits	(3,017)	
			(17,840)
HARDWARE:			
	Computer Purchases (Capitalized)	(190,153)	
	Computer Purchases (Not Capitalized)	(101,296)	
			(291,449)
SOFTWARE:			
	Computer Software		(62,616)
SUPPORT:			
	Telecommunication		(6,581)
MAINTENANCE:			
	Computer Maintenance	(9,455)	
	Maintenance & Repair	(17,486)	
			(26,941)
OTHER:			
	Books and Subscriptions	(791)	
	Consumable Supplies	(12,135)	
	Equipment & Furniture	(61,752)	
	Freight	(11)	
	Insurance	(628)	
	Other Operating Expenses	(9,050)	
	Other Services	(2,629)	
	Renovation Expenses	(20,000)	
	Printing and Reproduction	(323)	
			(107,319)
ENCUMBRANCES			(87,589)
TOTAL EXPENDITURES & ENCUMBRANCES			(600,335)
BALANCE			98,893

2a. Networking Status

The College of Engineering networking infrastructure model is thought of in layers. We consider the physical location of the customer, the ability to offer various protocols to the customer location (with an increasing bias toward IP only), the bandwidth requirements of the customer, the ability to offer enterprise system management and the ability to diagnose and resolve connection issues.

Of particular concern are emerging applications such as distance education that can place inordinate demands upon general-purpose infrastructures when attempting to deliver instructional materials with either synchronous or asynchronous video and audio signals. In a specific project, distance learning capabilities were enhanced between main campus and the Applied Research Lab (ARL) to demonstrate the ease with which distance education may be accomplished when significant scheduling overhead, due to limited bandwidth, is not a deterring factor. This production system has also made clear several enhancements needed to ensure quality instruction at the distant site to accomplish the virtual classroom experience.

Service outages, although historically rare, are noticeably increasing as unpredictable loads and undetectable device failures disrupt functional zones.

Although crucial components of the networking infrastructure are requested for funding through the proposed projects within this vision plan, a comprehensive plan and associated funding model must be established in order to address our increasing reliance upon network services to accomplish our academic, research, outreach missions and administrative operations. Particular attention should be paid to the challenges and capital expenditure associated with adequately networking buildings not located on main campus and the unfortunate circumstance where a unit must be moved from one location to another.

Projects of special importance to the six engineering buildings on main campus:

- 100% of the "Engineering Building Bandwidth" needs to be replaced, as requested in project listing at an estimated cost of $240,000. Funding of this project will upgrade the existing College Uplink to UTnet from its current single-shared 10 MBPS Ethernet channel and replace the aging 10 MBPS infrastructures that were installed in the Fall of 1994.
- Virtually none of the student desktops are wired within Engineering, except for the studio classroom and a few LRC rooms that also can be used as classrooms. Classrooms are currently wired only for the instructor. The cost estimate to complete wiring to the student desktop is estimated to be $750,000 as requested in project listing and will be incrementally implemented per college advisory committee guidelines.

2b. Technology Classroom Inventory

Within the College of Engineering main campus buildings we have:

- 1 fully equipped distance education classroom in ETC
- 1 studio classroom in ETC (fingers crossed on a second via a generous HP grant)
- 1 classroom, at the moment, with permanently affixed multimedia teaching podium equipment (several others are in the final phases of implementation). Presentation needs for the remaining rooms are met with by individual users with roving platforms equipped with an LCD projector, a computer and a VCR that can be checked out from any of the six Engineering departments or the Dean's office.
- 6 LRCs with varying levels of support to accommodate classes within their facilities
- 23 general purpose classroom
- 22 departmental classroom

The table and associated legend below depict an audit of all classrooms located with the engineering buildings, both general purpose and departmental, and the equipment with which they are equipped. A web-based mechanism is under development to facilitate the use of mobile equipment within the classroom and the web-published table will be updated as we progress in our project to better equip the classrooms per the Multimedia Enhancement Task Force (METF) suggestions.

Comprehensive Engineering Classroom Inventory

						Capabilities	
Building	**Number**	**Configuration**	**Authority**	**Capacity**	**ADA**	**Instructor**	**Student**
CPE	2.222	Classroom	ChE	50		CWS, SCR	
CPE	2.204	Classroom	GP	90		CWS, SCR	
CPE	2.206	Classroom	GP	73		CWS, SCR	
CPE	2.208	Classroom	GP	144		SCR	
CPE	2.210	Classroom	GP	73		CWS, SCR	
CPE	2.212	Classroom	GP	73		CWS, SCR	
CPE	2.214	Classroom	GP	144		SCR	
CPE	2.216	Classroom	GP	73		CWS, SCR	
CPE	2.218	Classroom	GP	90		CWS, SCR	
CPE	2.220	Classroom	GP	73		CWS, SCR	
CPE	2.202	Classroom	PGE	26	1	CWS, SCR, TBL	
ECJ	B.102	Classroom	CE	22	1		
ECJ	B.111	Classroom	CE	18	1		
ECJ	B.226	Classroom	CE	28	1		
ECJ	5.410	Classroom	CE	50	1	CWS	
ECJ	5.406	Classroom	CE				drafting tables
ECJ	5.416	Classroom	CE	22	1		
ECJ	7.202	Classroom	CE	22	1		
ECJ	7.208	Classroom	CE	28	1		
ECJ	9.239	Classroom	CE	30	1		
ECJ	1.202	Classroom	GP	176		CWS, SCR	
ECJ	1.204	Classroom	GP	75		CWS, SCR	
ECJ	3.302	Computer lab	CE	20		1 PC	19 PCs
ECJ	1.214	Seminar room	GP	36		MC, TBL, SCR	
ECJ	3.301	Computer lab	CE	15		1 PC	14 PCs
ENS	637	Classroom	ECE	71		CWS, SCR	
ENS	109	Classroom	GP	42		SCR	
ENS	145	Classroom	GP	42		SCR	
ENS	431	Classroom	GP	42		CWS, SCR	
ENS	532	Classroom	GP	36		CWS, SCR	
ENS	507	Computer lab	CE	80	1	CWS, SCR, 1 PC	79 PCs
ENS	317	Computer lab	CE	80	1	CWS, SCR, 1 PC	79 PCs
ENS	340	Computer lab	CE	36	1	CWS, SCR, 1 PC	35 PCs
ENS	334	Computer lab	CE	36	1	CWS, SCR, 1 PC	35 PCs
ENS	302	Media Facility	ECE	100		SCR, PC, VCR, LCD, Elmo	
ETC	2.102	Classroom	GP	32		CWS, MC, SCR	
ETC	2.108	Classroom	GP	150		SCR	
ETC	2.114	Classroom	GP	38		CWS, SCR	
ETC	2.132	Classroom	GP	38		CWS, SCR	
ETC	2.136	Classroom	GP	94		CWS, SCR	
ETC	5.132	Classroom	ME	38			
ETC	7.111	Classroom	ME	24			
ETC	7.146	Classroom	ME	38			
ETC	2.144	Computer lab	ME	38		1 PC	18 PCs
ETC	3.142	Computer lab	ME	26		LCD	26 PCs
ETC	4.160	Computer lab	ME	18			5 PCs
ETC	3.134	Computer lab	ME	11			11 PCs
ETC	3.136	Computer lab	ME	12			
ETC	5.148	Distance ed	ME	30	1	PC, LCDs, CWS	
ETC	4.150	Seminar room	ME	37		TBL	
WRW	312	Classroom	AE	24		CWS	
WRW	410	Classroom	AE	40		TV/VCR SCR CWS	
WRW	413	Classroom	AE	20		CWS	
WRW	102	Classroom	GP	139		SCR	
WRW	113	Classroom	GP	56		CWS, SCR	
WRW	101	Conference	AE	12		CWS	
WRW	219A	Conference	AE	6		CWS	
WRW	310	Conference	AE	18		TV/VCR SCR CWS	

Legend

CNF = Conference Room	MF = Media Facility
CWS = Continuous Writing Surface	PC = Computer
LCD = Computer Projector	SCR = Screen
MC = Moveable Chairs	TBL = Movable Tables.