The University of North Carolina

Board of Governors'

Committee on the Future of Information Technology

REPORT

September 30, 2004

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EXECUTIVE SUMMARY

The UNC Board of Governors (BOG) established a special committee on the Future of Information Technology in August 2002 and charged it to address the future directions, opportunities, and challenges in the use of information technology throughout the University. This includes networking infrastructure, computing hardware and software, mass storage, high performance computing, training and support to advance the teaching and learning, research, and public service missions of the University and to improve administrative functions. (See Appendix A for a summary of the charge and committee composition.) The extensive work of this committee included a detailed environmental scan and a study of the informational technology landscape. This report will summarize the findings of this committee and its key recommendations (pages 19 -20) for the BOG to consider in future planning efforts.

Today, information technology infrastructure is the scaffolding (Appendix C) that enables and supports our central mission of teaching and learning, research, and public service as well as our most essential administrative functions. For example, new technologies play a key role in extending educational access to citizens across the state, and facilitate collaboration among students and faculty around the world. Also, advanced technologies are now essential for many research initiatives whether for achieving a better understanding of complex biomedical issues or predicting global climate change. Digital technologies enhance public service and make the resources of the University more widely available to citizens across North Carolina. Also, information technology provides opportunities for improving our administrative functions from the development of a prospective student portal to the adoption of an enterprise system for augmenting the analytical and assessment capabilities within and across the campuses. But with the closing of the North Carolina Supercomputing Center, the increasing amount of federal regulations and compliance requirements, and the rising expectations among faculty, staff, and students, the University also faces some significant challenges.

In light of the increasing importance of information technology, and the need to effectively meet these challenges, strategic planning for information technology is more critical than ever before. In the past several months, this Committee refined some important processes for ensuring that future decisions are fully aligned with the strategic directions of the BOG. Also, the Committee developed a set of guiding principles for implementing information technology initiatives.

Through the work of this Committee and on-going IT strategic planning efforts, the BOG will be able to more effectively identify the priorities for integrating information technology initiatives with the goals of the University of North Carolina. While the State of North Carolina granted the University and the BOG flexibility in making IT management decisions, they share common goals with the State in continuing to strive for greater efficiency, effectiveness, and accountability.[1]

[1]As stated in North Carolina General Statute 147.33.80, the University of North Carolina is not considered a State Agency and waivers for the University system from certain governance standards have been legislatively granted and are codified in statute.

INTRODUCTION

Information technology is everywhere. We use it to pay our bills, stay connected with our friends and relatives, listen to our favorite songs, and cook our meals. We use it without even thinking about it and we expect it to function flawlessly. It has transformed our lives.

Not surprisingly, information technology is having a similar impact at colleges and universities. Students register, pay tuition, buy textbooks, and communicate with their peers and teachers without leaving their rooms. Researchers access powerful computers to better understand highly complex genomic abnormalities, devise better treatments, and hopefully, cure some of our most debilitating diseases. Faculty host electronic discussion groups with students and post class assignments and lecture notes on a web page. Throughout the UNC system, information technology is becoming fully integrated into teaching and learning, research, and public service and it enhances our administrative capabilities as well.

UNC MISSION: TEACHING AND LEARNING

eLearning

With the proliferation and relative affordability of multimedia technologies, learners today are much more “visual”, “experiential”, and increasingly “mobile”. Effective educators are continually looking for new ways to adopt new educational techniques and technologies to foster high quality graduate, professional and undergraduate programs *(BOG Strategic Direction #2: Intellectual Capital Formation*). The changing and emerging requirements of today’s learners have made it necessary to deploy and utilize mobile technologies. Also, these technologies help extend the resources of UNC to citizens across the State by making teaching and learning more accessible and independent of a learner’s location.

As a result of the changing needs among students and faculty, there is an ever-greater need for UNC to develop and expand its eLearning initiatives. Moreover, the ubiquitous availability, scalability, and inter-operability of technologies now make eLearning a more viable option. Many of the UNC campuses have made major strides in providing access to citizens across North Carolina through distance education and eLearning. Initially, many of these programs just extended the face-to-face delivery system to new sites at community colleges and other locations across the State. Also, they were supported by new technologies, which allowed access to course materials online. Now, other programs have been developed in a blended/hybrid mode, where some work is done face-to-face, some at a distance, and the remainder of the interaction is Internet based. Another variant is the use of tele - and videoconferencing broadcast to one site or simultaneously, to multiple sites around the State. Still other programs have developed fully online courses and degree programs. And, some schools are partnering electronically to offer virtual "super courses" developed by multiple schools with lectures by many faculties. While each of these approaches and other mixes of delivery modes will be part of UNC’s strategy for extending access, full electronic access will play a larger and larger role in extending the UNC resources to the citizens of the State regardless of their location (*BOG Strategic Direction #1: Access*).

Along with new online and blended course delivery infrastructures, it will be necessary to reinvent educational pedagogy to take advantage of the opportunities these new methods provide. Educational technology has great potential in multimodal delivery of learning materials to reach a wide variety of learners. For example, digital TV may be advantageous as a delivery

medium for UNC because it allows interactive applications to be included with television programming. With eLearning, teaching via lecture and the lab can be supplemented with visualization, simulation, and electronic performance support systems. The next step will likely be the integration of knowledge management and eLearning systems to augment current practices. eLearning relies heavily on technology infrastructure and eLearning designs must focus on providing individual learners with the tools, resources, and tactics for achieving their specific learning outcomes.

UNC is very close to being in a position to initiate major new steps in eLearning. Those steps would be to identify the availability of a select number of bachelor's (in coordination with community colleges) and master's degrees that would essentially be fully online and to assure that they could be fully supported. An eLearning Policy Group, coordinated by the UNC-OP, has been established and has broad representation from UNC institutions. There are also a small number of work groups in place to address specific topics.

Any major eLearning initiative is likely to involve every division of the UNC-OP because of the key role of information technology in the overall institutional mission. Furthermore, as eLearning is a critical priority of every institution, any successful initiative will require major involvement of campuses and their representation on working groups. As a result, there needs to be a leader in the Office of the President to organize the effort, identify committees and work groups that need to be formed, to be responsible for directing substantive matters to the right channels and groups, to establish time lines for each project, and to provide regular reports on progress of the working groups. At the same time, there needs to be a UNC-wide committee to oversee and foster this development and a number of ad hoc committees/workgroups to address special issues. UNC-OP recently re-engaged its eLearning activities, identified and documented current policy issues and reconsidered ways to facilitate the expansion and coordination of eLearning resources across UNC. In spring 2004, the Office of the President and UNC constituent institutions worked together to develop a presentation, *Dreams to Degrees*, that portrays distance education in the UNC system. With the help of staff at East Carolina, a video was created consisting of an introduction by President Broad and four vignettes of students at various UNC campuses enrolled in distance degree programs. The last section of this report addresses these eLearning recommendations as well as many others pertaining to information technology.

Teaching and Learning with Technology Collaborative

There are several on-going collaborative projects that help UNC faculty integrate technology with teaching and learning. For example, the Teaching and Learning with Technology Collaborative (TLTC) supports TLT-related endeavors on the sixteen UNC campuses. Through learning-centered projects and initiatives, the TLTC actively explores collaborative professional development opportunities and assists in identifying and implementing effective practices, common services, and shared resources. The Collaborative's flagship project is the UNC Professional Development Portal, an innovative Internet resource that serves both TLT and other professional communities within the University. In addition, the TLTC conducts programs for professional development such as the annual TLT conference where hundreds of UNC faculty and IT staff learn about the latest techniques and advances in teaching and learning with technology. The organization leads UNC's participation in a first-of-a-kind venture called MERLOT (Multimedia Educational Resource for Learning and Online Teaching), a national program to improve the effectiveness of teaching and learning by increasing the quantity and quality of peer reviewed online learning materials that can be easily incorporated into faculty designed courses. MERLOT provides a continually growing catalog of online learning materials,

peer reviews, learning assignments, and user comments, organized by discipline and created to help faculty enhance their instruction that anyone can use for free. The TLTC recently completed a compendium of best practices in the use of instructional technologies from all of the 16 campuses and a training compendium composed of training and instructional tools to be shared among UNC faculty system-wide.

International Perspective on Education

In today's interdependent, global economy, international education is an important component of every student's educational experience. Technology can play a key role in facilitating global collaboration among students and faculty around the world. The University of North Carolina is committed to promoting an international perspective throughout the University community to prepare citizens to become leaders in a multi-ethnic and global society (*BOG Strategic Direction #5: Internationalization*). Currently, only a small percentage of students across the University are able to participate in study abroad or international exchange programs. UNC campuses are continually searching for cost-effective ways to enable students to interact with their peers in other countries without leaving the campus. Fortunately, the Internet and other low-cost technologies now make such interaction possible. For example, The German Studies Consortium, which delivers interactive video classes to seven member UNC institutions, provides a model for future consortia.

Another example is the Virtual International Seminars developed by East Carolina University, which provides low-cost videoconferencing technology to international partners and links ECU classes with classes in as many as three other countries via the Internet. Real-time audio and video interaction is supplemented by email exchanges, as students work on projects jointly with students from an international partner institution. Not only do these experiences enhance global understanding, but they are likely to motivate these students to pursue travel or study abroad opportunities.

Plans are also underway to establish a web-based Foreign Language and International Resources Portal to support international education and research across UNC. The portal would provide information, teaching and learning resources, support for international and foreign language on-line and distance learning courses, research and grant opportunities, information on international studies programs, international events and activities, and study abroad and student exchange opportunities across UNC.

Teacher Education

At UNC, information technology is playing an important role in supporting the needs of the State's public schools through teacher education, outreach, and professional development (*BOG Strategic Direction #3: K-16 Education*). For example, the North Carolina Teachers of Excellence for All CHildren (NC TEACH) is a statewide teacher licensure program for mid-career professionals, developed jointly by the NC State Board of Education and the BOG. It is a comprehensive program designed to recruit, train, support, and retain highly skilled mid-career professionals who seek to enter the teaching profession. Established in 2000, over 1,000 people have become licensed teachers through the NC TEACH program. NC TEACHers currently serve in over 80 counties and school districts in all regions of the state. NCTEACH is working very closely with the UNC-OP Information Resources Division to implement and use the BlackBoard (BB) Learning Management System (LMS) to put their courses on line and, thus, reach teachers across the State.

Also, the North Carolina Model Teacher Education Consortium (NCMTEC) is a collaborative partnership of a select number of school systems, colleges and universities, community colleges and the public schools of North Carolina. Its mission is to provide affordable, accessible, high-quality education/training to aspiring and practicing educators in participating school systems in North Carolina. This partnership will increase the quantity of highly qualified educators in the school systems. The Consortium is committed to increasing the number of minority educators within the service area. NCMTEC is using various database technologies and tools to track student records, payments, licensures, and courses that count towards their licensure. Furthermore, the NC State Legislature and the NC State Board of Education regularly requests various sets of information and the use of technology has enabled NCMTEC to effectively gather, mine, and report this information.

In addition, the UNC BOG created the UNC Center for School Leadership Development (CSLD) in 1997. The Center was created in order to extend the resources of higher education to the public schools by offering a comprehensive selection of professional development opportunities designed for educators, ranging from novice teachers to veteran administrators and teacher-leaders. Its mission is to promote a community of individual and collective learners who meet the leadership challenges of advancing student and school success in North Carolina via the design and delivery of premier professional development for public school educators and contribute to school-based research providing evidence of best practices. The Center has begun to place more professional development resources on-line as well as offer more professional development courses and seminars on-line using the learning management system (LMS) and other technologies. Also, compact discs with professional development information have been distributed to the public schools in North Carolina. In addition, the public schools are now using other forms of technology (two-way audio and video) to bring professional development resources to the educators in various parts of the State. Moreover, the CSLD is offering various courses, such as Data Driven Decision-Making, to assist the schools and teachers in the utilization of information technology.

UNC MISSION: RESEARCH

For many scientists and researchers, access to the most powerful computers, cutting edge applications, and an advanced networking infrastructure have become essential for their research priorities whether for achieving a better understanding of complex biomedical issues or predicting global climate change or remotely exploring outer space. A research infrastructure was not a part of the original IT Strategy since the majority of the technology based research was either conducted centrally at MCNC, locally on the campuses or in some cases, nationally. Nonetheless, UNC institutions have evolving and expanding requirements for a robust research infrastructure. There exist several building blocks to support UNC researchers with the use of IT and these researchers are often the catalyst for exploring and encouraging next generation technologies and applications. There are various emerging new research communities in North Carolina anchored by UNC institutions.

Current and Emerging Technologies

While many of the following technologies and applications may support other thrusts of the University (i.e. teaching and learning) they play a pivotal role in expanding the frontiers of knowledge in many research disciplines (*BOG Strategic Direction #4: Creation, Transfer and Application of Knowledge*).

North Carolina Research & Education Network

Currently, the entire UNC system, including UNC-TV is served by a state of the art high-speed network - the North Carolina Research and Education Network (NCREN) managed by MCNC. NCREN is one of the country's most advanced communications networks providing statewide research and education services. Many of the UNC institutions serve as a point of presence (POP) for NCREN to provide Internet access to other private colleges, community colleges, public libraries, research institutions, medical centers, and private K-12 schools within the state. The NCREN connects 18 university sites (16 UNC campuses plus Duke University and Wake Forest University) over 600 miles of interactive analog and digital video services and IP data services for over 200,000 host computers across the state. These services include access to each other, national research networks, advanced multi-point video and distance learning services, and Internet access.

Internet2

Internet2 is a research and development consortium led by over 200 US universities working in partnership with industry and government to develop and deploy advanced network applications and technologies, accelerating the creation of tomorrow's Internet. It is a testing-ground network for universities to work together and develop advanced Internet technologies for telemedicine, digital libraries, and virtual laboratories. Internet2 is recreating the partnership among academia, industry and government that fostered today's Internet in its infancy. The mission of Internet2 is to develop and deploy advanced network applications and technologies, accelerating the creation of tomorrow’s Internet, enable new generation of applications, re-create leading edge research and education network capability, and transfer technology and experience to the global production Internet. Since much teaching, learning, and collaborative research may require real-time multimedia and high-bandwidth interconnection, a major aspect of Internet2 is adding sufficient network infrastructure to support such applications. The Internet2 has an increased focus on advanced network infrastructure, middleware, engineering, advanced applications, and partnerships. Even though only the UNC research institutions are members of the University Consortium for Advanced Internet Development (UCAID) or Internet2 Consortium, all UNC institutions have access to the services offered via Internet2. President Molly Broad is a member and the past chair (2001-04) of the Internet2 Board of Trustees. The Internet 2 member institutions actually sponsor the eligibility for access by the remaining UNC campuses. North Carolina’s community colleges and public schools are also eligible so that the entire K-20 community can have access to the Abilene network and Internet2, which is rapidly becoming a vehicle to serve educational and research content.

The Abilene Network

Requiring state-of-the-art infrastructure, Internet2 universities are connected to the Abilene network, which uses regional network aggregation points called gigaPoPs, high-speed facilities, and IP-over-Sonet. The Abilene Network enables the development of advanced Internet applications and the deployment of leading-edge network services to its universities and research labs across the country. The network provides access to a host of other networks in Europe, Middle East, Asia-Pacific and the Americas. The Abilene Network supports the development of applications such as virtual laboratories, digital libraries, distance education and tele-immersion, as well as the advanced networking capabilities that are the focus of Internet2. Abilene complements and compares favorably with other high-performance research networks in the U.S. and internationally.

National Lambda Rail

Additionally, the triangle research institutions (UNC-CH, NCSU, and Duke University are actively participating in the National Lambda Rail (NLR) effort. The NLR is a major initiative of U.S. research universities and private sector technology companies to provide a national scale infrastructure for research and experimentation in networking technologies and applications. It aims to catalyze innovative research and development into next generation network technologies, protocols, services and applications. It puts the control, the power, and the promise of experimental network infrastructure in the hands of our nation's scientists and researchers. When complete, NLR will be the largest higher-education owned and managed optical networking and research facility in the world. This resource, in conjunction with the Abilene Network, will provide the UNC research community a foundation for exploring approaches to developing and deploying a hybrid optical packet infrastructure.

Grid Computing

A grid is a hardware and software infrastructure that provides dependable, consistent, and pervasive access to high-end computational resources (Foster and Kesselman). Grid computing links geographically dispersed computers or computing clusters to, dynamically and virtually, share applications, data, and computational resources. It is concerned with coordinated resource sharing and problem solving in dynamic, multi-institutional virtual organizations, where resources include: the network, distributed computers which communicate among each others, distributed storage systems, mobile devices, scientific experiments, instruments, sensors and sensor nets, databases, software applications, and more. SearchCIO.com, an informational website for CIOs and senior level IT executives, states that grid computing is applying the resources of many computers in a network to a single problem at the same time – usually a scientific or technical problem that requires a great number of computer processing cycles or access to large amounts of data. A good example of scientific experimental facilities shared over a grid is the Network for Earthquake Engineering Simulations (NEES) project. This grid provides scientists all over the country with access to shake tables, tsunami wave basins, geotechnical centrifuges, field testing, and large-scale structural testing equipment.

UNC, as a partner with MCNC, has access to enterprise grid computing services for research and education. The "on-demand" services allow customers to pay only for what they need, when they need it, by accessing resources over the Internet. The shared resources reduce the need for large capital investments for high performance computing hardware and support staff. Grid computing resources offer performance similar to traditional supercomputing systems at a lower cost. Furthermore, the grid simplifies user interaction with these high performance computing systems in several ways.

Grid technologies are very new, rapidly developing and it is too early to predict the scope of their utility for the future. The possibilities of sharing resources are endless. There is already a good working BioGrid in place. In 2001, MCNC and North Carolina universities, in partnership with Cisco Systems, IBM, and Sun Microsystems, launched the North Carolina BioGrid – one of the nation's first grid testbeds for life sciences research. This grid offers a reference platform for developing the high-performance computing, data storage, and networking resources needed for bioinformatics and cheminformatics applications. The testbed currently involves resources from the UNC-CH, NCSU, Duke University, and MCNC. The UNC-OP, along with the MCNC recently kicked-off a statewide Grid initiative that will make North Carolina one of the first states in the nation to deploy a statewide computing grid. Recently, Dr. Edward Cohen, president of

the Cohen Communications Group and fellow of the Economic Strategy Institute performed a study on the projected economic impact of grid computing on the State of North Carolina. The study estimated that given strategic deployment of high quality broadband services and a sufficient supply of technologically skilled workers, grid computing is estimated to give a promising boost to the State's economy through 2010, leading to thousands of new jobs (Cohen 2003). Developed in a planned and organized way, this unprecedented effort will place North Carolina at the forefront of educational institutions and as full participants in the economic development in North Carolina.

UNC MISSION: PUBLIC SERVICE

From their inception, public universities in North Carolina have been engaged with the citizens of the State, addressing their needs, and forging a strong partnership with government and industry (*BOG Strategic Direction #4: Creation, Transfer and Application of Knowledge*). Information technology has provided innovative new ways to more effectively address current challenges from K-12 education to economic development.

K-20 Network

An IT infrastructure is just an expensive asset if it is not used to address the critical needs of the community it serves. North Carolina has a well documented imbalance between teacher supply and demand (see the recent report of the BOG Task Force on NC Teacher Supply and Demand). For this shortage to be addressed, a robust technological infrastructure needs to be in place, which means that a single state-wide network needs to be developed which will connect the K-12 schools and community colleges to the UNC institutions. Several exemplary programs supporting teacher supply and demand could become broader and more accessible by utilizing a connected technical infrastructure serving K-20.

The Internet2 K20 Initiative brings together Internet2 member institutions, primary and secondary schools, colleges and universities, libraries, and museums to obtain new technologies applications, middleware, and content of innovators, across all educational sectors in the United States, as quickly and as connectedly as possible. Currently the UNC-OP facilitates and finances the provision of backbone network services to all the UNC institutions and the Internet2 pass-through services to the K-20 institutions, which has enabled them to utilize some of the content delivered via Internet2. The UNC-OP also plans to continue to work with various entities to facilitate and ensure the provision of high-speed network access to all entities including the community colleges and the K-12 schools.

Economic Development

Information technology has shifted the paradigm of the economy. In a macroeconomic sense, information technology affects the patterns of production, investment, and employment. In a microeconomic sense, information technology changes business activities. In other words, thanks to advanced information technology, knowledge-based workers, who create and utilize information, play a key role in economic activities. In this new economy, converting information into useful knowledge has become a valuable commodity.

Geographic information has become vital to human services, environmental conservation, and business ventures throughout the country. For example, computerized global information systems (GIS) are used by emergency 911 services to locate accident victims and others who

need immediate care. They can also be key in industrial development by providing layers of complex information, such as existing infrastructure, demographics, and natural resources to help a business decide where to locate a new factory or retail building. Thus, organizations such as research institutes and universities that are continually creating new knowledge will play a critical role in driving this new economy.

In this knowledge-based economy, the University serves in a leadership role in economic development in educating and training the State's workforce for high skilled jobs, creating new knowledge to stimulate economic development, and fostering innovation and the development of emerging companies. Dr. Michael Porter from Harvard University in his study for the Clusters of Innovation Initiative of the Council on Competitiveness examined the Research Triangle Region's economic performance and offered recommendations on enhancing its future prosperity. He observed that opportunities to apply advanced technologies exist in nearly every field. "In the modern economy, there are no "low-tech" industries, only low-technology companies that fail to incorporate new ideas and methods in their products and services" (Porter 2002). A competitive 21st century education increasingly means one focused on critical thinking skills and proficiency with leading-edge information technology concepts and infrastructure. The University is well positioned to form strategic partnerships with government agencies, technology corporations, and university faculty and students. It has a renewed interest in promoting innovation, encouraging entrepreneurship and technology -led economic development, improving infrastructure, and empowering people through education and technology. Also, this renewed awareness of economic development served as a catalyst for the development of several regional optical networks in New England, Texas, Michigan, and California among others.

UNC–TV

In this digital age, information technology is changing university outreach, especially at UNC-TV. The impact of information technology on UNC-TV falls into four categories: 1) increasing access to higher education, 2) meeting the needs of public schools, 3) enhancing outreach and economic development, and 4) transforming the ways people teach, learn, and work. Digital television (DTV) now allows increased capacity of point-to-point distribution of needed programs and services to strategic locations statewide. UNC-TV is actively involved in the University's implementation of coordinated approaches to eLearning, health affairs, and technology-related initiatives. By building upon existing content, UNC-TV can increase access to UNC campuses by offering rich media to support existing online courses in addition to full courses on DTV multicast channels. UNC-TV can support public schools with programs and services to help in teacher recruitment, preparation, and continuing professional development and to assist with improvement in the academic achievement of students. Once fully developed, DTV datacasting opportunities can supplement eLearning and outreach efforts for campuses to reach remote sites, classrooms, and student homes. In the future, UNC-TV will play a role in University plans for Internet2 and digital asset management.

UNC-TV provides increasingly important access to college telecourses, and its digital conversion offers enormous potential for new programming and outreach for business and economic development. While the digital assets of UNC-TV are invaluable in delivering interactive content to various parts of the state, its analog assets are equally valuable in delivering standard video content. UNC-TV's adult learning services, which include college credit telecourses, English as a Second Language (ESL), and GED courses, have benefited over 15,500 adults this year.

The digital revolution will not only dramatically improve the quality of the television picture, but in the future it will also make possible the over-the-air delivery of several simultaneous services to viewers. Digital broadcasting will also offer an entirely new form of programming: enhanced television - the fusion of video, audio, images, and text. For the first time, producers will be able to combine the storytelling power of video and film with the enormous data capacity of a digital television signal. Viewers will be able to simultaneously watch an enhanced TV production and, in the background, receive hundreds of megabytes of additional video, audio, text, and images related to the program. Because DTV is digital, curriculum materials, full interview transcripts, children's games, and still photographs can be delivered to your television while you are watching a program. DTV's high digital transmission speeds provide a digital pipeline into the home with a transmission rate many times that of a PC modem. All 11 of UNC-TV's transmitters now transmit a digital signal.

Recently UNC-TV launched a project in partnership with the North Carolina Cooperative Extension to datacast training material to 20 county extension agencies. Thanks to a USDA Rural Utilities Services grant, UNC-TV will provide receiving equipment, workstations, and laptops to each extension agency. North Carolina Cooperative Extension will give UNC-TV training videos, data files, graphics, reports, and other large files that the extension agencies are unable to receive now. UNC-TV, in turn, will place those files into its digital transmission system and broadcast them, along with the digital television signal, to all 11 transmitters. The extension agencies that have the receiving equipment will be able to receive the data into their workstations and then download the information to their laptops to take to the residents in their county. Datacasting brings UNC-TV one step closer to interactive television, which allows people to access Web pages and additional materials on their television set

OPPORTUNITIES TO IMPROVE OPERATIONAL EFFICIENCIES

Not only is information technology impacting teaching and learning, research, and public service but it is changing administrative and business practices throughout the University. Due to the reality of highly constrained technology resources and an ever-increasing demand for such resources, all UNC institutions will need to work in a highly collaborative manner in order to achieve the strategic objectives of UNC. This is borne out by the recommendations put forth by the Final Report of the Commission to Promote Government Efficiency and Savings on State Spending as well as those in the North Carolina Economic Development Strategic Plan. UNC is continually looking for new ways to re-engineer educational and administrative processes to improve efficiency and free up resources for new initiatives and information technology plays a key role in this process (*BOG Strategic Direction #6: Transformation and Change*). For UNC institutions to achieve their objectives in an efficient and effective manner there needs to be flexibility in IT management. Upon the recommendation of the UNC BOG, the NC Legislature has, to date, granted IT management flexibility, subject to full accountability, to 15 of the 16 UNC institutions. Also, UNC must develop a specific planning effort to share the unique competencies of faculty and other resources with collaborating community colleges, universities, and industry, and develop innovative programs that are beyond the capacity of any one institution.

The University of North Carolina has demonstrated a significant increase in capacity and abilities through strategic initiatives. There are a number of major administrative initiatives related to information technology currently under way at UNC such as: the Shared Services Alliance, Coordinated Technology Management, and the Teaching and Learning with Technology Collaborative. These initiatives have allowed many UNC institutions to do things

that they deem critical but would not, otherwise, be able to do. The efficiencies achieved are enormous. For example: 1) Scores of web enabled student services were acquired and implemented at 13 campuses in a little over a year. 2) Over 90 system wide hardware, software or IT services contracts have been established saving on average more than 40% for each campus. 3) Hundreds of thousand of person hours were saved by coordinating IT contracts for the campuses. 4) Over a period of 5 years, more than 1000 faculty and IT staff were served through the TLT conference where, since 2002, with participation of the Faculty Senate, 50% of the participants were teaching faculty from UNC campuses.

Shared Services Alliance

The Shared Services Alliance ("Alliance"), the organizational home for administrative systems, provides a forum for UNC's 16 campuses to explore new and better ways to collaborate on administrative information technology issues. Foremost among the Alliance's goals was to web enable common student services to enhance and improve administration for students, faculty and staff. Another important focus for the Alliance was the development of a prospective student portal that can be customized by UNC campuses to meet their unique needs. The portal will organize information that is important to potential or recently admitted students and interactively guide them through a host of campus resources.

Responding to the need for increased service requirements and operational efficiencies on each campus and across the system as a whole, the Alliance designed a decision-making process to guide the University's search for a new enterprise system for administrative functions. Since June 2002, 14 campuses united to move to SCT's Banner enterprise system to streamline administrative systems, with an emphasis on services for students, in five areas: Finance, Human Resources, Student, Financial Aid, and Advancement.

To avoid duplication of resources and leverage expertise within the University, the Alliance (through its procurement committee) contracts with campuses for products and services when possible and works in conjunction with Coordinated Technology Management on projects requiring outside vendors. In the Banner project itself, the Alliance has, so far, identified 53 common interfaces that are needed for communication and information exchange between the existing information systems and the new Banner system. These interfaces are complex and their development is resource intensive. They will be centrally developed, maintained, and deployed on all UNC campuses using Banner. This "develop once, use 14 times" strategy will be used for common reports as well as other areas. Ultimately, this will result in huge cost-savings for the University.

Coordinated Technology Management

The Coordinated Technology Management (CTM) group concentrates on several areas of interest among the UNC constituent institutions. These include: baseline networking standards and related networking technologies, emerging common technology platforms, documenting campus specific IT architectures, inventory and asset management, and cataloguing of best practices. Additionally, the CTM leverages UNC assets to negotiate contracts and purchase of assets. It works closely with various groups within UNC such as the Teaching and Learning with Technology Collaborative, Shared Services Alliance, University Library Advisory Council, UNC CAUSE, Computer and Internet Legal Issues Council, as well as many other UNC groups.

Unified Financial Data Model

In response to a longstanding need for the flow of timely, accurate, consistent, and relevant financial information between the UNC-OP and the UNC campuses, the Unified Financial Data Model (UFDM) initiative was launched in 2003. This pilot project became operational on a limited basis in July 2004. The UFDM is the data warehouse for summary monthly financial information for all sixteen UNC constituent institutions and the UNC General Administration. When fully operational, it will provide a system-wide view of the financial operations of the University, and will serve as the basis for summary level cash-basis financial reporting. Over the next several months, an executive query environment will be created to enable UNC-OP Finance staff to run a set of standard reports in a flexible and user-friendly manner. The next steps in this initiative are to create a richer set of reporting alternatives and to make the system available for use on the campuses.

Much of the utility of the UFDM will be in helping UNC-OP staff answer inquiries related to multiple institutions from the Legislature, state agencies, Board of Governors, media, and other constituencies. Answers to questions related to specific elements of revenue will be readily available as will be the comparisons of institutional revenues and/or expenditures at an aggregate or line item level. It can help us provide answers to questions like: How much tuition revenue was collected from out-of-state students across the UNC system? What percent of total expenditures was spent for salaries and benefits? How much did the UNC system spend during FY2003-04 on foreign travel? After sufficient data has been accumulated in the UFDM, trend analyses will enable the Financial Affairs staff to track, for instance, how the relative sources of revenue on an individual campus, set of campuses, or UNC-wide has changed over a specific time period; whether or not the percent of the UNC budget spent on salaries has remained constant; how expenditures for need-based student financial aid has grown. The ability to quickly access these types of data in an integrated fashion will allow staff to spend more time articulating the University's message rather than compiling and handling data.

Additional plans are well underway to streamline administrative processes and improve analytical and assessment capabilities within the UNC-OP and various campuses. These include web services for students and faculty (admissions, registration, grades via the web). Also, the UFDM Project is planned to be continued and expanded. Under the auspices of the Alliance, 14 campuses continue to implement common information systems (Banner). Plans are underway also to develop common interfaces and reports between legacy systems and Banner for a smooth flow of information. By pooling the resources from various campuses and sharing the results, the University will expand its ability to develop these common interfaces and system-wide reports.

Sponsored Programs and Research Council

In 2002, the University created the Sponsored Programs and Research Council data system (SPARC), which is the central repository of sponsored program proposals and award data for the 16 constituent institutions of the University of North Carolina and the UNC Office of the President. It contains the data that the 16 institutions have deemed most important for conveying the purpose, nature, scope, and level of UNC sponsored program activities. The system is designed to facilitate exchange of this data within UNC and to make the data easily accessible to the public via summary and customized reports. Sponsored programs are scholarly, professional, and creative activities (e.g., research, teaching and learning, and public service) that University personnel conduct with support from external funding such as grants,

contracts, and cooperative agreements. Sponsored programs help fulfill the University's diverse mission and provide important benefits to the state, nation, and world.

Technology Security and Middleware

Maintaining the security and privacy of records, data, and networks is a critical priority for the University. It affects all areas of the University, but is especially important for the administrative operations of the University. The foundation for UNC's technology security approach is contained in the UNC NetStudy Security Subcommittee Baseline Recommendations, completed in 2003. Based on the success of the original UNC NetStudy Infrastructure Baseline Project, the first major initiative of the original IT Strategy, the NetStudy Security Subcommittee was recently formed and charged with developing the baseline for information and system security to provide a baseline security architecture, which includes policies, standards, and criteria. These components will be utilized to develop information security infrastructure that can be implemented on a campus-by-campus basis. University computer and network systems, by their nature, require a level of academic freedom, thus the baseline is intended to protect the institution's resources and operations, while not interfering with the mission of academics, education and research. The security baseline document provides systemic level components (establishing an information security organizational structure, sample institutional security policies, and specific technical components and their application) required to establish a security methodology at an institution.

Plans are well underway to construct a request for proposal to perform a security assessment and develop a security baseline document with sample policies, templates, and effective practices. This will be followed by a detailed vulnerability assessment and gap analysis on the UNC network and information resources. The final phase of this effort will address the remediation and enhancement aspects of security.

The middleware is the layer of software between the network and the applications and it provides access, authentication, authorization, and accounting (AAAA or "Quad A"). It is used both to find people and things, as with directory services, and to keep them hidden, as with security services. Applications either make do without middleware functions, in which case usability and efficiency suffer, or applications perform middleware functions themselves, which leads to competing and incompatible standards. With the increasing diversification of delivery mechanisms (eLearning, Distance Education) and the mobility of students within UNC, the issues of *access* (enables users to find information and resources), *authentication* (the process of verifying that you are who you say you are), *authorization* (the process of deciding what an authenticated entity is allowed to do), and *accounting* (keeping track of what an authenticated and authorized entity does) have become critical infrastructure issues. These issues must continue to be addressed at a system-wide level to help establish compatible standards and strive for greater efficiency.

CIO Roles and Responsibilities

This array of complex initiatives, however, requires a high level of coordination. Within the UNC institutions, while the roles and responsibilities of the chief information officer are somewhat similar, the titles and reporting structures are quite varied. Their work encompasses every division/department of the campus. As far as the title and reporting structure are concerned, there is a whole range of models within the UNC institutions. Four of the 16 campuses (UNC-CH, UNCG, UNCW, and NCA&T) currently have the CIO position at the Vice Chancellor level serving as a member of the Chancellor's Cabinet, while the remainder of the institutions have a

variety of titles and reporting structures for the CIO. Due to the complex set of campus-wide responsibilities involved and the key role of technology in the overall institutional mission, some of the campuses are beginning to review and evaluate this issue.

CHALLENGES

With the closing of the North Carolina Supercomputing Center, the rising expectations among faculty, staff, and students, and the increasing number of federal regulations and compliance requirements, the University faces some significant challenges ahead.

North Carolina Supercomputing Center

The closing of the North Carolina Supercomputing Center (NCSC) in 2003, has left a void in the area of high performance computing at UNC institutions. Only some of these requirements are currently being met by the supercomputing resources that have been relocated at ECU, UNC-CH, NCSU, and Duke University. For UNC to maintain its status amongst its peers, this need for high performance computing must be addressed in a more comprehensive and planned manner. Due to the complexities involved, and the collaboration and leveraging of resources that will be needed, UNC-OP and the UNC campuses, working with MCNC, will have a key role to play. Recently, the UNC-OP, via a competitive review process, awarded four grants to UNC institutions and their collaborators, in the area of high performance computing, for a period of two years. A key requirement of these grants was that each leading UNC institution collaborates with at least one other North Carolina institution. These four proposals have nearly 20 entities collaborating on a variety of issues. It is important that the current funding for the networking and high performance computing be preserved and supplemented.

At some of the UNC institutions, there exist some critically important and highly skilled human resources. With the disbanding of the Super Computing Center, there is a danger of disintegration of these resources. It is important that UNC address this need for provision, effective utilization, and development of these resources in the areas of computational sciences, engineering, and medicine.

Rising Expectations

As a result of the information technology explosion, the expectations among university constituents for technology infrastructure and services are enormous. Students expect universities to fully integrate technology into the learning experience. Top faculty members expect universities to supply cutting edge technology for pursuing their research priorities. Administrators want to fully utilize technology to help create more efficient and effective administrative and business operations. Among many university constituents, there is an increasing demand for web services, web-based systems, and enterprise-level portals. Also, state and federal governments expect universities to comply with a multitude of new laws and legislative requests for reporting significant amounts of data, sometimes utilizing specific IT applications and equipment.

Federal Reporting and Compliance

Also, there exists a pressing need for compliance with various Federal and State regulations dealing with privacy issues, tracking international students, intellectual property protection, and copyright infringement. There are three major laws that pertain to records privacy and

universities must comply with each one. First, the Financial Modernization Act of 1999, also known as the Gramm-Leach-Bliley Act of 1999 (GLB Act of 1999), includes privacy provisions to protect consumer information held by financial institutions. (In 2003, the Federal Trade Commission (FTC) confirmed that higher education institutions are considered financial institutions under this federal law.) The Safeguards Rule of the GLB Act requires that financial institutions have a security plan to protect confidentiality and integrity of personal information. Second, the privacy provisions of the federal law, the Health Insurance Portability and Accountability Act of 1996 (HIPAA), apply to health information created or maintained by health care providers who engage in certain electronic transactions, health plans, and health care clearinghouses. Third, the Family Educational Rights and Privacy Act (FERPA) of 1974 protects the privacy of student education records.

As a result of the terrorist acts of September 11, 2001, universities are required to submit more extensive data on their international students and employees according to the Student and Exchange Visitor Information System (SEVIS) rules and comply with new Customs and State Department regulations. The SEVIS is a government, computerized system that maintains and manages data about international students and exchange visitors during their stay in the United States.

For the past several years, Congress has searched for new ways to update copyright and intellectual property laws for the digital age. There is significant concern in the entertainment and database industries about protecting intellectual property and preventing illegal sharing or copying of copyright materials. Universities have a unique and expansive role in this area. They are actively working to protect intellectual property and fair use, to educate faculty and students about acceptable use, to uphold student disciplinary procedures when necessary, and manage networks in ways that address core academic values.

STRATEGIC PLANNING AND RECOMMENDATIONS

Strategic Planning

In light of the increasing importance of information technology, and the need to effectively meet these challenges, strategic planning for information technology is more critical than ever before. Having IT priorities fully aligned with the broader institutional and BOG goals and policies will help ensure efficiency, effectiveness, and accountability in IT policy and management decisions. The Proposed IT Efficiency and Effectiveness Life Cycle Management chart illustrated in Appendix E displays several on-going decision making processes for ensuring that IT policy and management decisions are fully aligned with campus missions and planning. The chart also shows how campus policy decisions become aligned with the overall strategic directions identified by the BOG.

The University of North Carolina's current information technology strategy is based on a study performed in 1998 (***A Roadmap to the Future***) when the UNC President and nine of the UNC chancellors began discussing the need for a strategic plan to guide the University in prioritizing IT needs, allocating IT resources, and developing or expanding IT-based services. Their goal was to find ways to complement, and not replace, the IT planning underway at the individual campuses. The UNC IT Strategy is a set of recommendations for all campuses to follow in developing their IT capabilities for the future. This will allow the institutions to optimize their finite resources and maximize the effectiveness of IT-based programs and services. The IT Strategy strongly encourages the campuses to work with each other in finding common

solutions to common IT needs. The overarching goal continues to be the complete alignment of IT priorities with *BOG Strategic Direction #6* (*Transformation and Change*).

The force of continuing and exponential technological change will continue to disrupt established landscapes, will punish stagnant thinking, and will reward adaptive and innovative behaviors. In that context, some of the questions that need to be asked are: Where and how is the IT budget spent? How much does it cost to support various higher education constituencies? How do we compare against other institutions? How much funding is required to maintain the IT infrastructure? What is the IT value proposition (excellence in teaching and learning, promote scholarship and research, public service through economic development, better, faster, and timely decision making, operational effectiveness, and the like)?

In order to answer these questions and more, it is critical that the next UNC IT Strategy document continue to be carefully guided and fully aligned with the other UNC strategies as articulated in the UNC BOG Strategic Directions. However, a review of these BOG Strategic Directions might allow for some further adjustments. The newly revised UNC BOG Long Range Plan 2004-09 has recently been adopted by the UNC BOG and will serve as a guide for further planning. It is recommended that the proposed Guiding Principles for the UNC Information Technology Strategy (Appendix C) be fully adopted as a basis for this. These guiding principles were developed as a result of a thorough environmental scan performed under the guidance of the BOG Committee on the Future of Information Technology. It displays the components that are necessary to implement IT initiatives. For example, in order to build a Smart Classroom, an institution must first have the necessary infrastructure (see the box at the bottom of the flow chart). Then, proceeding up the flow chart, each component necessary to consider in the implementation strategy is identified in separate boxes. For instance, decision makers must determine the necessary applications, the shared resources and services, the decision support systems, and the customer service and skill development. This process helps outline the infrastructure, financial resources, and campus personnel integral to each stage and creates a standard process for considering each new initiative. Since IT strategic planning is a component of the University's planning process, it is recommended that this effort continue as a function of the BOG Committee on Education Planning, Policies, and Programs.

It will also be useful for UNC to create a central repository of the most effective practices on various campuses in different areas. As the infusion of technology becomes more pervasive, the issue of review, promotion, and tenure of faculty will need to be considered different from what it has been in the past.

Recommendations and Future Directions

The following is a list of specific recommendations for the BOG, UNC-OP, and UNC campuses to consider in future policies and initiatives:

A. <u>Policy, Planning and Implementation</u>:

1. Adopt the proposed Guiding Principles for UNC IT Strategy (Appendix C)
2. Adopt the proposed UNC Board of Governors Policy on the Use of Information Technology (Appendix D).
3. Adopt the proposed Efficiency and Effectiveness Life Cycle Management Plan (Appendix E).
4. Continue the implementation of the UNC IT Strategy (***A Roadmap to the Future***) and complete the unfinished tasks in accordance with the UNC BOG Long Range Plan 2004 – 2009 and the previously recognized opportunities to improve IT efficiencies.
5. Establish a subcommittee of the BOG Committee on Educational Planning, Policies, and Programs to guide the future of information technology at UNC.

B. <u>IT Management Practices</u>:

1. Better coordinate all the complex initiatives on UNC campuses. Review the campus CIO roles, responsibilities, and reporting structures and take appropriate steps to address the situation. It is strongly recommended that each campus has the CIO fully empowered with direct access to the Chancellor on policy issues.
2. Initiate and complete the process for requesting IT Management Flexibility for the one remaining UNC institution.
3. Implement the necessary procedures to exercise and retain IT management flexibility at the campus level.

C. <u>Future IT Strategy and Actions</u>:

1. Under the leadership of the UNC-OP, UNC institutions should move toward a more coordinated technical architecture and system integration.
2. Develop a common baseline for faculty and student support standards.
3. Explore the feasibility of UNC-OP becoming a member of the National Lambda Rail.
4. Increase the current funding for the networking and high performance computing that is provided to UNC, in order to effectively meet the increasing and complex needs of the North Carolina institutions.
5. Work with MCNC and other relevant entities to further develop the NCGrid Initiative and develop regional points of presence (rPoPs) in various parts of the state. Identify a small number of pilot projects as demonstrations of grid technologies, tools, and applications.
6. Study the feasibility of a UNC System-wide project to address the issue of “Identity Management” and develop a plan to address it.
7. Identify the core resources in high performance computing, research computing, computational sciences (biology, physics, and chemistry), and computational engineering on UNC campuses and devise ways to support and strengthen these efforts. Plan and develop a pilot “Resident Scholar/Mentor Program” to effectively utilize and develop these resources.

8. Complete phase 1 of the UNC security assessment and begin planning for phase 2 (vulnerability assessment and gap analysis) and Phase 3 (remediation and enhancement) and identify the appropriate funding models and strategies.
9. Work closely with UNC-TV and leverage their resources to provide access to educational resources to North Carolinians.
10. Strengthen and enhance the UNC collaboration with the North Carolina Department of Public Instruction (DPI) and the North Carolina Community College System (NCCCS) and create a comprehensive K-20 database.
11. Encourage faculty use of technology in teaching and learning, research, and public service as a measure in making promotions and tenure decisions.
12. Under the auspices of the UNC eLearning Policy Council, coordinate the campus efforts, articulate a set of goals for the UNC eLearning Initiative, evaluate and update the UNC inventory of programs and courses, recommend and implement the most effective eLearning architecture, and showcase campus successes. Consider directing Academic Planning in the Office of the President to lead and coordinate eLearning initiatives and report to the BOG Education Planning, Policy and Programs Committee on progress in this area.

Acknowledgements

The committee wishes to acknowledge the valuable assistance from various offices and individuals, especially the Information Resources team within the UNC Office of the President. We also wish to recognize and thank all the UNC campus chief information officers for their invaluable input.

Appendix A

Committee Charge

The UNC BOG, upon establishing this special committee in August 2002, charged it to address the future directions, opportunities, and challenges in the use of information technology, (including networking infrastructure, computing software and hardware, mass storage, high performance computing, training and support) to advance the teaching, research and public service missions of the University and to improve administrative functions.

The committee was to review, in the short term (0-3 months), the inter-campus and statewide networking plans, the MCNC business plan for High Performance Computing and Communications (HPCC), and to evaluate how it may serve the needs of UNC campuses. The tasks included are the:

a. Creation of a K-20 education network
b. Creation of a single statewide backbone network
c. Maintenance and expansion of high performance computing resources
d. Development of a NC Bioinformatics Grid as a part of the NC State-wide Grid

In the medium-term (4-10 months), the committee was to review opportunities to utilize information technology to improve efficiency - with an eye toward being well positioned to respond to the Governor's commission on efficiency, chaired by Jim Hyler. This set of tasks included consideration of the costs and benefits of the following:

a.	Consolidating computer rooms.
b.	Consolidating servers.
c.	Creating regional purchasing centers.
d.	Administering all distance education from one campus versus having an administrator on every campus.
e.	Reviewing all computing center contracts to include maintenance, software and networking for consolidation.
f.	Exploring the elimination of shadow systems.
g.	Improving Collaboration among campuses.
h.	Leasing vs. purchasing computer equipment.
i.	Informing the campuses about services that are available through central campus computing.
j.	Exploring the feasibility of outsourcing in the areas of data centers, help desk, networking, repairs, and others, as appropriate.
k.	Investigating the creation of one research-computing center for the entire university.
l.	Partnering more effectively with campuses across the state.
m.	Improving the use of our integrated systems.
n.	Funding priority information technology projects at both the system and campus levels.
o.	Determining where the University and the campuses want to be with technology: pioneers, early adopters, close followers, average, or resistant.
p.	Moving to enterprise wide storage systems.
q.	Delaying upgrades of hardware and software.

r.	Standardizing - an opportunity to push the concept.
s.	Cutting down on printing and pushing for more on-line viewing.
t.	Making sure we are working on the right things.

In the longer-term (12-24 months), the Committee was charged to conduct the next phase of the IT Strategy, building on the areas of common needs identified in the 1999 strategy and incorporating the emerging infrastructure and application requirements for the 21st Century. Here the Committee was to:

a. Look at the successes we have made to date in implementing the IT Strategy and assess its effectiveness and areas for improvement.
b. Identify/confirm new infrastructure and application requirements.
c. Identify funding strategies for recurring costs as well as capital (non-recurring) costs.

Since its inception, the Committee has met a number of times, in person and via videoconference, and has presented updates and progress reports at the regularly scheduled UNC BOG Meetings.

Committee Composition/Membership

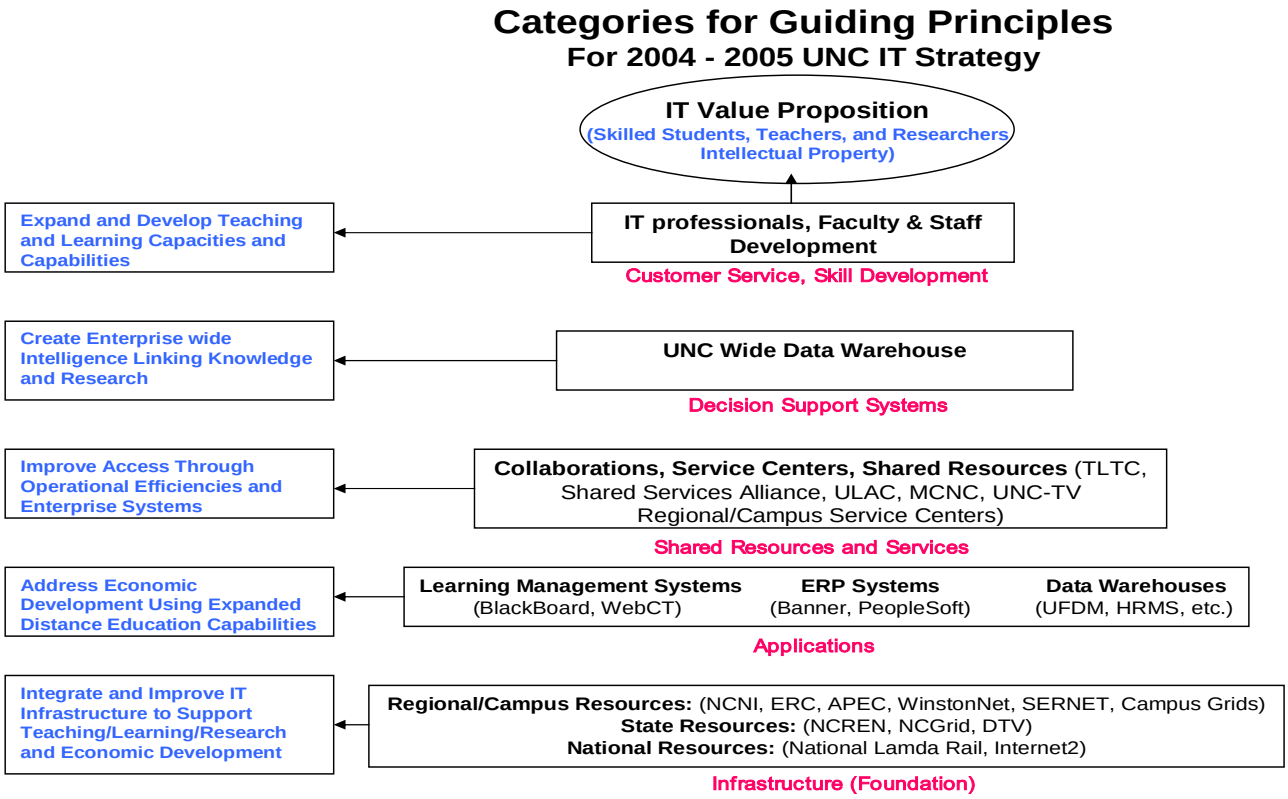
Mr. John F.A.V. Cecil (Chair), Mr. John W. Davis III (Vice Chair), Mr. James G. Babb, Mr. R. Steve Bowden, Mr. Jonathan L. Ducoté, Mrs. Hannah D. Gage, Dr. Willie J. Gilchrist, Mr. G. Leroy Lail, Mrs. Cary C. Owen, Dr. Patsy B. Perry, Mr. H.D. Reaves Jr., Mrs. Estelle 'Bunny' Sanders, and Dr. Ruth Dial Woods.

Appendix B

The University of North Carolina is Guided by a set of Strategic Directions

1. ***Access***: Ensure affordability and access to higher education for all who qualify and embrace a vision of lifelong learning.
2. ***Intellectual Capital Formation***: Through high quality and relevant graduate, professional, and undergraduate programs, develop an educated citizenry that will enable North Carolina to flourish.
3. ***K-16 Education***: Continue to propose and support initiatives to serve the needs of the State's public schools.
4. ***Creation, Transfer and Application of Knowledge***: Expand the frontiers of knowledge through scholarship and research and stimulate economic development in North Carolina through basic and applied research, technology transfer, and outreach and engagement.
5. ***Internationalization***: Promote an international perspective throughout the University community to prepare citizens to become leaders in a multi-ethnic and global society.
6. ***Transformation and Change***: Use the power of information technology guided by IT strategy and more effective educational, administrative, and business practices to enable the University to respond to the competitive global environment of the 21st century.

APPENDIX C



Regional/Campus Resources: (NCNI, ERC, APEC, WinstonNet, SERNET, Campus Grids)
State Resources: (NCREN, NCGrid, DTV)
National Resources: (National Lamda Rail, Internet2)

Today, information technology is interwoven into the very fabric of our teaching, research, and administrative management. Tomorrow, it will be even more so. This essential component is the foundation needed to integrate and improve information technology infrastructure to support teaching, learning, research, and economic development. **Think of this as the network of interstate highways, tunnels, and bridges.**

Glossary

NCNI: The North Carolina Networking Initiative is a consortium of North Carolina research-intensive universities. Its founding partners include North Carolina State University, UNC-Chapel Hill, Duke University, and MCNC. As one of North Carolina's virtual networking communities, NCNI, along with several high technology industries, is dedicated to creating and maintaining nationally recognized technology infrastructure and research programs.

ERC: Education and Research Consortium of the Western Carolinas, comprised of Brevard College, Mars Hill College, Montreat College, and Western Carolina University. Also included in the ERC's activities are Furman University in South Carolina, UNC Asheville and the area's community colleges.

APEC: Albemarle Pamlico Energy Commission (APEC) whose intent was to get natural gas service extended to the communities in eastern NC, but the partnership developed and fiber optic cable was laid along with the pipeline in order to provide access to IT resources in that part of the state.

WinstonNet: WinstonNet is an organization directed towards building a community-based technology infrastructure in Winston-Salem and Forsyth County, NC and to bridge the "digital divide". It is a joint effort between the Idealliance, public and private educational institutions, city and county government and the Chamber of Commerce to prepare the residents of Forsyth County for a technology rich future.

Glossary - *Continued*

SERNET: Southeastern Regional Network is a collaboration between UNC Wilmington, UNC Pembroke, Fayetteville State University, and MCNC facilitated by the UNC OP to provide a robust and redundant high speed access to NCREN. It is a Regional Points of Presence (RPoP)

NCREN: the North Carolina Research & Education Network interconnects and serves as the Internet access provider for the sixteen UNC campuses as well as Duke University, Wake Forest University, 40 private and community colleges, and a number of other educational and research institutions throughout North Carolina. In addition NCREN provides internet service to the NC State ITS Network.

Grid: Grid is a type of parallel and distributed system that enables the sharing, selection, and aggregation of geographically distributed "autonomous" resources dynamically at runtime depending on their availability, capability, performance, cost, and users' quality-of-service requirements.

Internet2: Internet2 is a consortium being led by 206 universities working in partnership with industry and government to develop and deploy advanced network applications and technologies, accelerating the creation of tomorrow's Internet. Internet2 is recreating the partnership among academia, industry and government that fostered today's Internet in its infancy.

National Lambda Rail: NLR is a major initiative of U.S. research universities and private sector technology companies to provide a national scale infrastructure for research and experimentation in networking technologies and applications. It aims to catalyze innovative research and development into next generation network technologies, protocols, services and applications. It puts the control, the power, and the promise of experimental network infrastructure in the hands of our nation's scientists and researchers.

Learning Management Systems (BlackBoard, WebCT)	**ERP Systems** (Banner, PeopleSoft)	**Data Warehouses** (UFDM, HRMS, etc.)

This layer refers to the applications that utilize the infrastructure. **Think of this as the towns that are connected via the interstate highways, tunnels, and bridges.**

Glossary

LMS: A Learning Management Systems provides an easy way to manage classroom-based and e-learning resources, courseware, and events? It helps track and report on student activities which have become more time-consuming and complex and helps streamline the entire organization's educational and training programs, saving time and money. BlackBoard and WebCT are the two leading LMS Systems in the educational environment.

ERP: Enterprise Resource Planning software provides end-to-end functionality for business analytics, financials, human capital management, student information system, financial aid, advancement among others. Two leading ERP systems are Banner and PeopleSoft.

Data Warehouse: A data warehouse is a copy of transaction data specifically structured for querying and reporting. The form of the stored data has nothing to do with whether something is a data warehouse. Data warehousing is not necessarily for the needs of "decision makers" or used in the process of decision making.

Unified Financial Data Model (UFDM) and Human Resource Management System (HRMS) are just two examples of such applications.

Collaborations, **Service Centers**, **Shared Resources** (TLTC, Shared Services Alliance, CTM, ULAC, MCNC, UNC-TV Regional/Campus Service Centers)

This layer refers to the shared resources and services that are made possible via various collaborative and cooperative arrangements. **Think of this as the communities with similar goals, aims, and interests.**

Glossary

TLTC: The Teaching and Learning with Technology Collaborative, an integral part of UNC's Information Technology Strategy, serves as a focal point for the wealth of TLT knowledge created on the University's 16 campuses. The multidisciplinary organization, which includes representatives from each constituent institution, facilitates the collection, development, exchange, and storage of TLT information.

SSA: The UNC Shared Services Alliance ("Alliance"), the organizational home for administrative systems, provides a forum for UNC's 16 campuses to explore new and better ways to collaborate on administrative IT issues. The Alliance spearheads a number of projects to bring new applications to UNC's campuses. The foremost of these is the Banner Project.

CTM: Coordinated Technology Management, in addition to achieving efficiencies in purchases (System wide agreements), concentrates on several areas of interest among the UNC constituent institutions. These include: baseline networking standards, emerging common technology platforms, documenting campus specific IT architectures, inventory and asset management, and cataloguing of best practices. CTM is basing these activities around the Logistics section of the IT Strategy and works closely with all 16 constituent institutions in order to advance the campus IT Strategies in conjunction with the UNC IT Strategy.

ULAC: The University Library Advisory Council.

MCNC: Founded by the North Carolina General Assembly in 1980, the non-profit MCNC was created to drive technology-based economic development by partnering with universities, business and government. MCNC promotes economic development in North Carolina through three lines of business – Research and Development, Venture Funding, and Grid Computing and Networking Services.

UNC Wide Data Warehouse

This layer refers to the decision support systems that provide the information in a timely manner to help make decisions that are so important for the success of an organization. **Think of this as all the information and the analysis needed to make decisions as a member of the community.**

Decision Support

A decision support system or tool is one specifically designed to allow business end users to perform computer generated analyses of data on their own. We cannot say that decision support systems or tools necessarily support the making of decisions. These tools do not analyze by themselves - rather they help a person analyze Data warehousing and decision support systems and tools do not necessarily go hand in hand. Business intelligence seems to have become the vendors' preferred synonym for decision support.

The main uses of decision support tools are:

To check that "everything" is okay
To confirm the "obvious"
To figure out how something "works"
To convey information in a more digestible manner
To compare information about customers, products, cost/profit centers, financial accounts
To compare the same type of information in different time periods
To check performance versus formal and informal goals or constraints
To identify the out of the ordinary
To grab a little piece of information out of a large volume of information
To get around an Information Technology department that does not have the time or the resources to write reports
To provide a report "of record"
To confirm and sometimes to discover trends and relationships
To help advocate a position
To provide data for a what if analysis or a forecast

IT professionals, Faculty & Staff Development

This layer refers to the customer service and skill development that are two of the key objectives in an organization. **Think of this as learning and developing the skills needed to be a productive member of the community.**

IT Value Proposition

This layer refers to enterprise function strategy designed to help it become more competitive, creating more value. **Think of this as the conducive environment or ambience within the homes in the community that enables the utilization of skills by the members of the community. In a way, it is the ultimate outcome/product of the decisions made and activities performed along the way. It may or may not always be overtly tangible or obvious.**

APPENDIX D

The UNC Board of Governors Policy on the Use of Information Technology

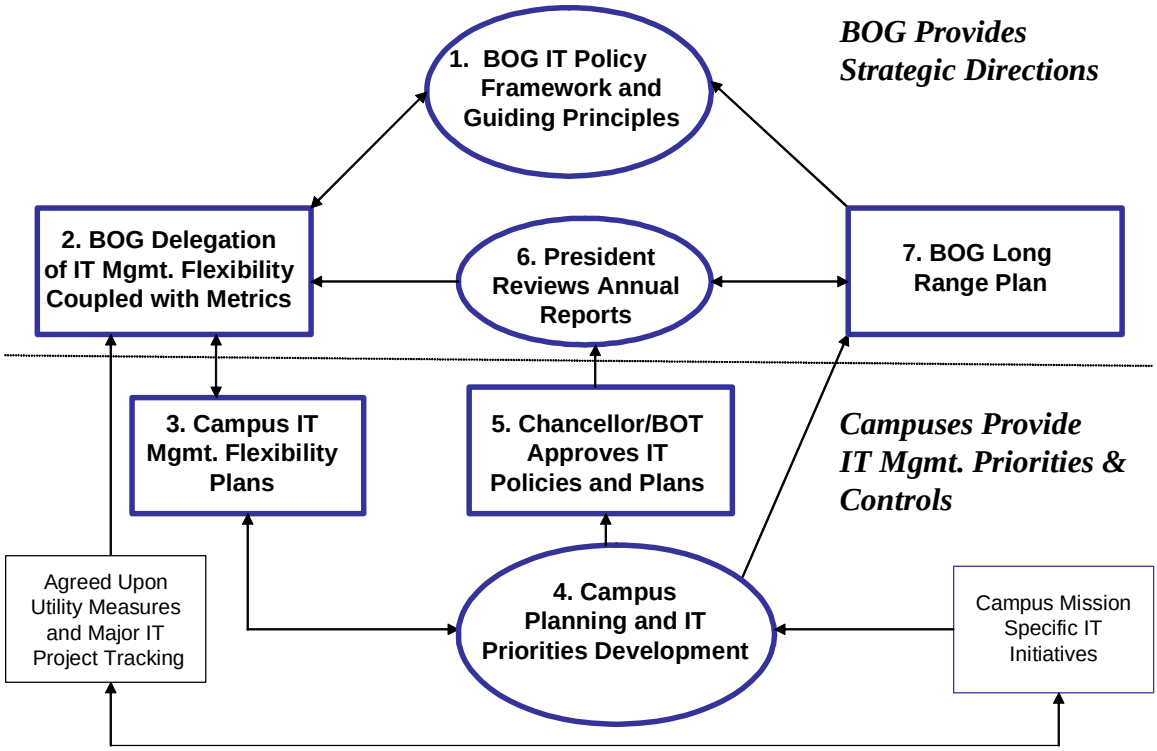
The UNC Board of Governors (BOG) encourages the constituent institutions to use **standards based, compatible,** and **interoperable** information & communication technologies which support their individual missions and enable interaction and information exchange among the UNC campuses, UNC affiliates, and the UNC Office of the President.

Through appropriate and effective practices and with information technology management flexibility, the BOG seeks to affirm that each institution is making steady progress in the appropriate uses of information and communication technologies. These include the use of information and communication technologies as a tool in enabling quality teaching, creating administrative efficiencies, performing effective research and conducting public service. Effective information technology planning and management should be evident in the institution's plans and annual reports. The BOG encourages the UNC President to review these plans and annual reports for demonstrations of effective and efficient uses of information and communication technologies.

The President should acknowledge and recognize campuses that achieve excellence in these and other technology areas and should address areas for improvement or take remedial action as appropriate. Retaining delegated authority of IT management flexibility is contingent upon evidence of effective and efficient use of IT.

Each constituent institution should demonstrate progress by:

- establishing and maintaining a minimum baseline of IT infrastructure including human resources, networking, communications applications, and enterprise systems.
- providing the appropriate instructional tools, faculty development, and support services to enhance and maintain teaching and learning inside and outside of the classroom.
- providing access to various technologies for faculty and students to conduct research and collaborate with colleagues across the university, around the state, the country, and the world. This capability will assist in attracting and retaining excellent faculty and students, sponsored programs and external funding.
- increasing access, outreach, and economic development through distance learning, resource management, online applications and communications with internal and external communities who engage in public service.
- providing planned and cyclical rotation of information systems and components so that campuses do not operate obsolete systems.
- establishing distance-learning opportunities for North Carolina's K-12 students.
- recognizing the innovative and creative uses of information and communication technologies by the faculty.
- ensuring that the institution's use of information technology is properly aligned with its mission and that its Chancellor and his/her team establish the resource priorities.

APPENDIX E

Proposed UNC IT Efficiency and Effectiveness Life Cycle Management