UNIVERSITY SYSTEM OF MARYLAND
Board of Regents' Response to the Joint Chairs Report Request

e-learningMaryland
Technology Empowering Higher Education in the 21st Century

August 2000

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The best way to predict the future is to create it.
- Alan Kay, Apple Computer
Executive Summary

The JCR has requested a report from the University System of Maryland (USM) Board of Regents on institutional responses to a recent Board of Regents’ policy establishing a Minimum IT Standard. Additionally, the JCR requests a statement of those information-technology issues that must be overcome in order to make the USM institutions more competitive.

This response fulfills those requests and articulates a vision for the USM institutions that holistically addresses the broader need for higher education in Maryland to assure that its graduates have the skills and understanding to function effectively in our technology-enabled, knowledge-based society. The Internet, and in particular, e-business, are redefining traditional business processes in ways unforeseen as recently as five years ago, whether in the creation of new business-to-consumer or business-to-business channels. Therefore, sophisticated technology skills will continue to be necessary to developing Maryland’s future workforce and cultivating the leaders who will craft the next-generation technologies that are essential if Maryland is to become “The Digital State.” These skills also are critical to prepare Marylanders to be lifelong learners, active and informed citizens, and contributors to our economy and to society.

**USM institutions have proposed an array of solutions to assure “24 X 7” access to computing resources for ALL students as a means of bridging the “digital divide.”**

This report also articulates the role that technology should play within the University System of Maryland as it provides key services in support of the State’s ambition to cultivate a high-tech society. Each of the USM institutions is crucial to the State’s economic wherewithal and to providing for the educational and enrichment needs of its citizens. As the writer William Butler Yeats said, “Education is not the filling of a pail, but the lighting of a fire.” The institutions of the USM must have the ability to
“light the fire” for generations of Marylanders to come. In the 21st century, that means technology.

The Board of Regents’ vision for fulfilling the USM’s responsibilities to the citizens of Maryland is captured by the theme e-learningMaryland. That vision is predicated upon creating a full-immersion technology environment on each USM campus. Within the context of e-learningMaryland, each member of the USM community – students, faculty, and staff – will use appropriate information-technology tools to enable their day-to-day activities. Information technology will be part of the teaching, learning, research, and outreach equation for each of the institutions, and the institutions themselves will provide customer services to students, employees, and the public using contemporary business tools.

Full immersion is important for at least four reasons:

- To realize the full potential for technology to enhance teaching, learning, and research on USM campuses.
- To produce flexible, knowledgeable graduates who are prepared for the workforce of the future, can adapt quickly as the workplace changes, and can support Maryland’s technology goals.
- To provide fertile ground for researchers and students who will create the next stage of technological developments that will fuel Maryland’s economy.
- To operate our institutions in a manner that maximizes efficiency and service.

The Board of Regents’ Minimum IT Standard, which encompasses nine standards in all, articulates a beginning for this vision. First and foremost, the standard seeks to ensure access to appropriate networked workstations 24 hours a day, seven days a week. USM institutions have proposed an array of solutions for assuring this “24 X 7” access to computing resources for all students. The Standard also assures
appropriate services and resources as well as technical support and training.

This response lays out the USM institutional responses to the Minimum IT Standard, in individual and summarized form. It also outlines what must be done in order to fulfill the full e-learningMaryland vision.

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**Education is not the filling of a pail, but the lighting of a fire.**
- William Butler Yeats

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The overall cost for all of these initiatives is **$120,000,000** in one-time costs and **$44,000,000** in annual recurring costs. (See Appendices I & II.) The USM institutions can ultimately sustain the recurring costs, through reallocation of resources, if the funding guidelines are met, but will need additional appropriations to address the initial one-time costs. Of the initiatives to fulfill the e-learningMaryland vision, three areas have been targeted for additional appropriations:

- Improving campus and inter-campus network infrastructure to enhance teaching/learning activities both on and off campus and to enable access to electronic services.
- Implementing new Customer Services Systems\(^1\) that will allow for efficient operation of the institutions in the current e-business, customer-oriented manner, particularly with regard to online student services
- Fully integrating technology into classrooms to enhance their value as venues for learning.

For these three areas, there will be a one-time, unfunded cost of **$100,000,000**. In order to underwrite this need, the USM is requesting three annual appropriations under Pay-Go. The rationale for the request is contained within this report.

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\(^1\) Student services, human resources, financial management systems and grants management systems for research institutions, providing contemporary services to users.
The three historically black institutions within the USM are concurrently responding to a request related to the Office of Civil Rights (OCR) settlement. There is some overlap between their needs as articulated in this response and the OCR response. The USM will adjust the cost estimates for IT initiatives depending on funding received from either source.

In the **Introduction and Vision** section of the report, we share the USM strategy for realizing e-learningMaryland. We offer cost estimates for the plan in **USM Strategy and Cost Implications.** In the **Scenarios** section, we provide four scenes that describe how our students, faculty, staff, and alumni might work and learn by the year 2006, based on the decisions made by State leaders in 2001. These scenarios are intended to be illustrative of what the future may hold and to give a sense of what is possible; they are not intended as literal descriptions.

In **Current Capabilities,** we explain the institutions’ current IT capacity and discuss what must occur for us to create the full-immersion environment we envision. The full Minimum IT Standard adopted by the Board of Regents in April follows.

Next, in **Minimum IT Standard Responses,** we discuss the issues identified by the institutions in their responses to the standard, and the competitiveness issues facing the University System institutions.

The section on **IT Competitiveness** features bar charts that measure selected USM institutions’ technical capabilities in several areas relative to those of their peers. The charts are intended to underscore where we are ahead in IT competitiveness, and where we are falling short.

In **Implementation & Timetables,** we provide a suggested plan for implementing the program and timetables for doing so. Last, in **Outcomes & Accountability Metrics,** we discuss expected outcomes from the IT investments as well as metrics for measuring progress in achieving these outcomes.
In the past, the State invested millions of dollars in bricks and mortar projects on USM campuses, and that investment continues. The challenge today is to invest, in a similar way, in the technology that will sustain our institutions in the 21st century.
Rather than ‘an age of knowledge,’ perhaps we should aspire instead to building a ‘culture of learning,’ in which people are continually surrounded by, immersed in, and absorbed in learning experiences.

- James Duderstadt, President Emeritus, University of Michigan
Introduction and Vision

Within the University System of Maryland, one of our premises is that our success as individuals and as a society will increasingly be contingent upon our ability to understand and operate in a technologically complex environment. The evidence of this trend is all around us, from the way we conduct business with our banks and check the progress of our investments, to how we monitor world events.

The University System of Maryland Board of Regents’ Minimum Information Technology Standard makes it clear that IT “has become a major component of everyday life,” resulting in “the emergence of new concepts at an explosive pace.” (See Section on Board of Regents Minimum IT Standard.) Additionally, the Board earlier this year approved a resolution requiring institutions to develop plans “to assure all graduates of USM institutions are information-technology fluent, commensurate with the needs of the marketplace in their chosen majors and/or career choices.” (See Appendix IV.)

To put it bluntly, whether Maryland’s future will be bright or dismal depends almost entirely on the quality, capacity, and performance of Maryland’s entire education system, from kindergarten to graduate school. The USM’s role and responsibility in this endeavor cannot be overstated.

- USM Strategic Plan, July 2000

The Strategic Plan adopted by the University System underscores the primacy of technology to our ability to serve citizens of Maryland. The State of Maryland, to remain competitive in the 21st century, will require the best-educated workforce in the country. In essence, the talents and skills of Maryland’s workforce – particularly the workforce’s technological
abilities – will largely determine and drive our State’s success on the
global stage. The USM Strategic Plan states: “To put it bluntly, whether
Maryland’s future will be bright or dismal depends almost entirely on the
quality, capacity, and performance of Maryland’s entire education system,
from kindergarten to graduate school. The USM’s role and responsibility
in this endeavor cannot be overstated.”

The Strategic Plan also emphasizes that because our economy is
increasingly dependent upon intellectual and technological mobility,
industries will migrate to regions “with the richest pool of highly
educated human resources.” If Maryland is to be considered one of the
world’s most desirable locations for industry, the University System of
Maryland and its ability to produce a highly sophisticated workforce are
the key.

The State of Maryland itself has placed a priority on creatively using
technology to strengthen our economy, make possible “cradle to grave”
education, and enable citizens to access government services “24 X 7.”
Our State has designated itself **eMaryland, The Digital State**, one in which
technology is pervasive and is an important tool in improving the lives of
all Marylanders.

The University System of Maryland has an obligation to support
**eMaryland** as it continues to grow. To help the initiative reach its full
potential, the USM proposes to develop **e-learningMaryland, The
Networked University System**, a community of 13 institutions in which all
members, from the smallest to the largest, are immersed in technology.

Within such an environment, technology will touch on and have
implications for nearly everything we do. Technology will enrich the
teaching/learning and research activities of each institution. It will
enhance what students are taught, how they are taught, and how their
knowledge is tested. Technology will affect how new knowledge is
created and disseminated. But more fundamentally, technology will
impact each institution’s operations on a day-to-day basis, each
institution’s delivery of services to its students and employees, and each institution’s myriad interactions with the public. Because technology will be such a pervasive force within e-learningMaryland, our institutions will provide a context for living, learning, and working in the 21st century that will influence the graduates of the University System of Maryland’s institutions long after they have left their campuses.

The concept of immersion in technology need not be restricted to the traditional campus setting. In fact, a key service to the citizens of Maryland as articulated in the USM Strategic Plan depends on reaching learners wherever they are, whenever they have the need for education. Lifelong learning is a necessity in our society, and USM institutions need to be able to support this need in many ways, each of which must be suited to the circumstances of the learner. For learners who may not find on-campus instruction convenient or necessary, the USM must create an immersive learning environment that is comparable to that on campus. Whether the need is for distance training for corporate employees, Professional Development Schools that fine-tune the skills of public-school teachers, or Agricultural Extension services, we must be prepared to meet the needs of our communities. All of these activities require state-of-the-art IT capabilities in order to be effective.

Furthermore, total immersion in and a full understanding of the technologies of today will ensure for our State a citizenry that will be well prepared for the tremendous technological changes that will undoubtedly occur in decades to come. E-learningMaryland will be a major USM strategy for achieving that reality.

Immersion in technology as an integral part of education will also lead to graduates who will be the business leaders in the State of Maryland and help to fuel our State’s economic growth. Why is this so? Because the economy of Maryland is largely being shaped by technologies. For example, some of the country’s leading biotechnology companies can be found in the Baltimore-Washington corridor. They have chosen to locate here because of the rich academic landscape this area offers (the
intellectual and technical capital) and because that landscape has created the potential for fascinating collaborations between industry and academe. In short, it is in their best interest to be here. And while biotechnology drives the research needs of these companies, they are heavily dependent upon information technology – and graduates with IT skills – to support this research and the basic enterprise. It is therefore in our best interest to make the investments that will continue to attract them and support them.

Applied research is, of course, a major driver in economic development, and therefore, universities have helped to create high-tech locales across the country – including Boston’s Kendall Square, Raleigh-Durham’s Research Triangle Park, and northern California’s Silicon Valley. Those areas that have been most successful in the new economy have benefited greatly by having strong academic institutions support basic research, which generates spin-off companies that commercialize the concepts. Maryland is fortunate in having a rich collection of public and private higher education institutions as well as an unusual concentration of national laboratories and facilities. As the University System of Maryland, the USM should play a central role in creating, disseminating, and transferring new knowledge. In addition to the spin-off benefits in terms of new businesses, USM research by itself is a half-billion-dollar-a-year activity that generates substantial income to the State and many new jobs.

IT is also essential to creating an environment in which researchers can focus on research itself and not on the tools that are required to undertake research. At a minimum, this will require that the campus network give high-speed access to each researcher. Additionally, the appropriate tools for communication (e.g., e-mail), collaboration (e.g., conferencing capabilities, shared electronic work environments), and publication (e.g., WWW servers) should be available. The overhead of applying for and managing grants requires specialized systems that institutions need to provide for researchers on the campus.
The economic opportunities for Maryland are endless. If the State is to cultivate this potential and create additional opportunities, Maryland needs two types of graduates from its universities. It needs all graduates to be totally fluent in the tools of the knowledge economy and able to transfer their skills from the classroom to the workplace. And, it needs graduates with high-level technical skills who will develop the next generation of the knowledge economy.

To have technologically fluent graduates from USM institutions, we must have technologically fluent faculty. In particular, the USM faculty will need opportunities to learn how to take advantage of the capabilities of the electronic medium to enhance instruction. This is recognized on each of the campuses, and e-learningMaryland provides for such faculty development. As with other activities, opportunities for collaborative solutions to providing this service across campuses will be explored as well as specific institutional approaches.

If we are to realize the environment of total immersion that will make the foregoing possible, we must invest in IT now. IT infrastructure is built up over many years, and investments in it must be consistent if they are to produce a substantial payoff. Catching up to peers that are already ahead in IT is made all the more difficult because they have momentum and are not standing still. In this report, we will make the case for the kind of deliberate investment in the University System of Maryland that will create e-learningMaryland, secure our reputation as a technology innovator, and assure that the State of Maryland competes well for the high-tech industries and workforce of the future.

Moreover, the investment we are seeking will allow us to attract the talented students and faculty - the intellectual capital - that the University System of Maryland must have in order to thrive. This long-term investment will allow our institutions - some of which are decades behind in terms of their technological capabilities and capacities - to leapfrog into the 21st century.
We must invest in technology within the University System of Maryland not for the sake of technology itself, but for the immense benefits it holds for the State of Maryland. Doing so will enable the USM to accomplish our foremost goal: to meet the educational needs of all Marylanders. Today, we can envision **e-learningMaryland**. Whether it becomes reality depends upon the wherewithal and commitment of our State to achieve it.
The illiterate of the 21st Century will not be those who cannot read and write, but those who cannot learn, unlearn, and relearn.

- Alvin Toffler
As stated in the Introduction, the vision of e-learningMaryland is one of creating an educational environment of total-immersion in information technology services to produce a highly sophisticated workforce, and to provide the wide range of educational and other outreach services Marylanders need. This requires universal access, appropriate connectivity, a wide range of contemporary electronic services and applications, electronic content, and robust support organizations to engineer, deploy, maintain, and make all of these technologies usable.

Each USM institution has been investing in each of these components of the campus information technology landscape. Since there is variation in institutional missions, faculty and student composition, and available resources for information technology, USM institutions have given different weight to each component over the years. The Minimum IT Standard established this year by the Board of Regents is intended to assure that every institution in the USM at least meets a minimum set of expectations across the board. However, the e-learningMaryland vision is much more aggressive than just meeting a set of minimal expectations.

The proposed strategy for meeting these needs, their ongoing maintenance, and the continuing costs of funding the other components of e-learningMaryland is for the USM institutions to reallocate resources to support continuing cost items pertaining to the Minimum IT Standard, but to request a special appropriation for identified one-time cost items.

E-learningMaryland supports the ability of each USM institution to use information technology as an attracter in the competition for the best faculty and students. Furthermore, fully achieving e-learningMaryland is
essential if each USM institution is to produce graduates who are prepared for the knowledge economy, educate citizens wherever and whenever a need exists, and create efficiencies of operations that make the best use of available resources.

Given that an increasing percentage of USM students are non-traditional age learners who may not be on campus, we also require the technologies that will support this new reality. Thus, an adult learner on the Eastern Shore who needs a course offered at a USM campus elsewhere in the State will need to find that course, get advising relative to the appropriateness to his or her needs and abilities, register for it, be billed for it, and pay for it. Most importantly, that student will need to be able to participate fully in this course without ever visiting the campus wherein the course originates.

This is all possible, but the strategy for achieving this vision must be very aggressive - and the vision will be more of a reach for some institutions than for others. Institutions will redirect priorities to invest more heavily in information technology. Some of the components and activities have significant up-front costs; others are inherently more weighted toward continuing costs. The activities with continuing costs perforce must be funded from budget increases and reallocation of existing resources. To the extent possible, the USM institutions are prepared to do this. However, there are projects integral to the e-learningMaryland vision that have significant up-front costs that the USM institutions will have trouble undertaking, and which will also conflict with their ability to keep up with the continuing costs associated with other components of the vision.

Following are estimated up-front costs for selected projects necessary to achieve e-learningMaryland.

- **Implementation of systems that allow for online operational services:** $72,151,000 (See Appendix II.)

That USM institutions are not well prepared to provide an array of online services in day-to-day operations is not due to a lack of understanding
of their importance. Instead, the current inability to provide such services stems from the fact that very old systems underlie the operation of USM institutions, and they have been hindered from moving from 1970’s technology to contemporary technology because of the cost. The cost of implementing these systems across all USM institutions is estimated to be $72,151,000. Where needs, timing, and capability allow, USM institutions will collaborate in procuring and implementing these systems.

• **Upgrading campus networks and UMATS: $15,941,000 (See Appendix II.)**

We live in a network-based society. Our institutions were in the forefront of developing and implementing the Internet as it is understood today, and several of our institutions are heavily involved in developing, deploying, and using Next Generation Internet technologies. Academic institutions’ budgets work on long timeframes, with, in general, an 18-month to two-year span between developing a budget and actually spending the allocation. Our economy, however, works on “Internet time,” which usually is measured in months. The entire e-learningMaryland vision is predicated on having the network infrastructure that is scalable, reliable, and robust enough to meet continually growing demands for the educational services that are crucial to assuring Maryland’s future. While, as with other matters, various USM institutions are currently at different states in terms of the capabilities of their campus networks, each institution faces substantial challenges in keeping this critical piece of infrastructure current with increasing demands. The same challenge is true of the collaborative, inter-campus network, University of Maryland Academic Telecommunications System (UMATS). The estimated cost of upgrading all campus networks and UMATS to a maintainable standard that will meet expected needs for at least the subsequent three years is at $15,941,000.

• **Classroom upgrades: $11,920,000 (See Appendix II.)**

Finally, while the e-learningMaryland vision includes creating opportunities for students in non-traditional settings outside the
classroom, for many institutions, the classroom will continue to be a focal point of student and faculty interactions. However, dynamics within the classroom will change significantly. The classroom itself may not be centered around blackboards and chalk; the focus may not be a lecture at the front of the room. USM institutions have, to varying degrees, invested in making classrooms much more technology enhanced, which in turn brings the world into the classroom and offers faculty members a variety of options for creating a learning environment. Given the large number of classrooms across the USM institutions, the ability to upgrade all classrooms to some degree of technological enhancement is a matter of availability of financial resources. It is estimated that the cost of such a classroom upgrade across the USM is $11,920,000.²

Thus, the total for those projects with significant up-front costs across the USM is $100,012,000. This sum can be spread over three years. The proposed strategy for meeting these needs, their ongoing maintenance, and the continuing costs of funding the other components of e-learningMaryland is for the USM institutions to reallocate resources to support all continuing cost items (staffing, maintenance, replacement, training, etc.), but to request a special appropriation for these up-front, one-time cost items. (The breakdown of the cost allocation over three years is attached in Appendix II.)

The e-learningMaryland strategy has the potential to transform the teaching, research, and outreach in which the University System of Maryland engages. Following are scenarios that depict how a student, a professor, a staff member, and an alumnus might work and learn in the year 2006 based upon e-learningMaryland.

² See the bottom of page 37 for a description of smart classrooms.
In the past, people came to the information, and the information was at the university. In the future, the information will come to the people, wherever they are.

Mary is a freshman at one of the University System of Maryland institutions. She has been on campus for close to two months now. While she had used her own personal computer at home all through high school and her teachers had increasingly used online resources as an integral part of her education, she is finding the University to be light-years ahead of anything she had experienced.

Mary is benefiting from the integration of technology and teaching, an experience that will serve her well when she’s in front of her own classroom.

Her entering class was the first to be required to purchase wireless digital assistants. This book-sized device is set up to look first at her personal University Portal. From anywhere on campus she can communicate with classmates and faculty, take a preliminary look at the notes and materials that the professor in her next class will be discussing, and access library materials. In fact, many of her textbooks have been downloaded into the digital assistant as well, so that she has all of her materials, wherever she is.

The first thing she did upon receiving her assistant was to take advantage of the training that was provided earlier in the semester. What she learned during the orientation allowed her to personalize her portal so that she can not only access all her classes, but also follow her favorite sports, read her hometown newspaper, and be alerted when her financial aid is electronically deposited into her University account. The University can automatically populate her “to do” list with the academic calendar, registration and payment deadlines. Her personal assistant will notify her

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3 Hand-held, wireless computer-tablet.
of upcoming events based on her stated preferences or on her prior expressed interests.

The time to register for Spring Semester is quickly approaching, and Mary, a prospective education major who wants to teach in middle school, has already had numerous communications and a visit with her faculty advisor. She can register through her digital assistant, which will alert her when her scheduled registration time is approaching. Mary’s registration activity will be monitored by a “smart” system that is no longer a passive receiver of transactions. This system automatically links her degree progress status to her course selections and will warn her if she is not registered for a needed course. If Mary does not register for enough credits to maintain her scholarship eligibility, the “smart” system can analyze her individual financial aid files and will remind her that her credit load is not adequate. Once registered, Mary can order her hardcopy books directly from the bookstore or download text directly into her personal assistant. The presence of her course syllabi will allow Mary’s personal assistant calendar to be updated with class meeting times and places, with exam dates, research deadlines and other assignments. She will be automatically enrolled in required course chat rooms and be placed on her teacher’s e-mail distribution lists.

Her classroom discussions are always lively, and because each student has a digital assistant, there is no need to focus on taking notes. Therefore, each student can participate fully in the dialogue. The materials are available in a variety of formats on a campus server. Additionally, the observations her professors write on blackboards can easily be downloaded into each student’s digital assistant after class, thanks to the technology built into her university’s “smart classrooms.” More formal lectures, including those given by distinguished visitors, are videotaped and are viewable on demand at any time over the campus high-speed network. Mary has a more traditional computer in her dorm room that is connected to the high-speed campus network and which synchronizes information with her digital assistant.
The University has created an environment where she can focus on learning and living. She spends little time on the “administrivia” of managing her life on campus; instead, she is able to fully immerse herself in a world of ideas. More importantly, she has the tools to access and organize those ideas as well as to communicate with the members of her new community. Mary may not realize it, but she is benefiting from the integration of technology and teaching, an experience that will serve her well in a few years when she’s in front of her own classroom.
Professor Land has been at the University for many years. Although he was educated in the last half of the 20\textsuperscript{th} century, he has to admit that the 21\textsuperscript{st} century has yielded developments that have made him a better teacher and researcher.

Professor Land started his career developing classroom lectures, as his professors had done before him, and he still occasionally teaches a course in lecture format when appropriate. But over time he has become convinced that a more interactive style – one in which teams of students work collaboratively – is better in many courses. His role has shifted: No longer is he the source of all learning, but instead, the knowledgeable mentor.

\textbf{The investment in electronic services has made Professor Land a much more productive faculty member.}

The University has provided many electronic tools to enable these changes to occur. While the classroom discussions still play an important role in understanding complex issues, students spend much more time communicating electronically outside of class. His course materials are always available online to members of each of his classes. At first, creating these materials in electronic format was time consuming, but the University offered support and training to simplify the job. Easy-to-use course development and course management tools were licensed for all faculty. Training in how to use these tools, and more importantly, in how to create a learning environment in an electronic medium, was provided. And since the electronic medium is increasingly critical to teaching and learning, the University has made certain that support services function\textsuperscript{4} –

\textsuperscript{4} Technical support for integrating and maintaining servers, campus networks, faculty and staff workstations, technology-enabled classrooms, and other services.
and function well – all of the time. This has required a significant investment in technical support personnel, which the University has continued to make.

It has become clear that the old model – that of each professor creating the materials for a course, teaching it once for a class, and then repeating it for another class – is not an efficient use of resources either by the professor or by the University. In the new paradigm, Professor Land’s University has collaborated with other institutions in the University System of Maryland to create an exchange of “course objects” – small learning units that a professor created for a particular course, but which may be used by another professor in another course. It is somewhat analogous to the parts of a “course Pak” that Professor Land used when he was a student. However, in the electronic world, these course objects can contain simulations, animations, and video clips, as well as high-production quality pictures and text.

Because of the investments in IT networks the institution has made, Professor Land is able to work much more collaboratively with industries in Maryland that are interested in the professor’s research. The professor also holds video chat sessions twice a semester with employees at a new company across the state. The company relies on the expertise from Professor Land and several of his colleagues to help solve productivity problems. In turn, Professor Land can reflect the company’s “real-world” experiences in his lectures to students on campus, further preparing them for what they will find in the workplace. Occasionally, he connects the two groups – through technology.

Professor Land’s research activities have also been significantly impacted by the availability of electronic services. His graduate students now submit theses and dissertations electronically rather than on paper. This allows them to be much richer documents, showing videos of an experiment, for example, in addition to the outcomes of the experiment. Statistical analyses can be run within the dissertation as the parameters of an experiment are changed. These theses, together with a wide range
of electronic materials, are available to all in the discipline once they are submitted to the Maryland Digital Library.

When Professor Land can’t attend conferences, he can participate in sessions via video-conferencing from his office. He uses the same capability, along with a shared electronic work environment, to collaborate with colleagues at other universities without having to leave campus. He and his colleagues can even manage experiments at remote locations from their respective offices.

Professor Land has been relieved of much of the clerical work of managing his communications with both the university and with his individual students. He is provided with an electronic grade book that he can use throughout the semester. He can use the grade book to establish automated e-mail contacts, chat rooms, and distribution lists to facilitate his providing additional resources directly to students. He can handle students’ routine requests electronically, giving him more time to spend with students discussing academics, career goals and strategies. As an Advisor, he has access to tools, which give him more detailed information about the performance of his advisees. He can create models of different academic approaches to career goals to help the student understand alternative course paths to meet the students’ goals. By setting minimum performance standards at various milestone points in the semester, his grade book can trigger messages to students falling below acceptable levels to advise them to see the Professor or to refer them to remedial help sources on campus. At the end of the semester, a simple upload procedure moves his grades to the official record of the student.

The investment that the University has made in electronic services in recent years has thus made Professor Land a much more productive faculty member.
Maria is an Admissions Officer at the University. Recent electronic services have increased her productivity and made it less time-consuming to manage the details of her own employment.

Her position requires her to split her time among the Admissions Office and various events, school visits, and admissions fairs she must attend off campus. She has both a desktop computer in her office and a digital assistant that allows her to communicate with her office, and, more importantly, to access candidate information she needs while on the road. How is this possible? A personalized portal brings together the information and services that she needs in order to function as well outside the office as she does in it.

**Information technology has made the admissions process much more personalized.**

The online information about prospective students is much better than anything the Admissions Office previously had. Each candidate’s information is available in a single record that Maria and the other admissions officers can easily review, annotate, and rate. Much of the initial information comes from online submissions by prospective students, their teachers, and references. They need no special tools in order to submit this – they simply fill out straightforward Web forms, which are automatically collected into a common admissions file.

Information technology has made the admissions process much more personalized. Prospective students can easily find out the status of their

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5 An entry point to the Web that provides a combination of personalized content and services to the user. Portals typically include features like customizable start pages, e-mail, user-selected application services and information content, personalized news and sports headlines options, chat rooms and message boards, advanced search engines, and personal homepage construction kits.
application, and regular communication with each student can be established in automated fashion that fosters an immediate affiliation with the University. In addition, postage and production costs are reduced, and admissions officers such as Maria feel they can use their time more productively in talking one-on-one with students or making decisions.

What’s more, the admissions system is integrated with student records, which manages all of the information for matriculating students. Both are tied to the financial aid system that calculates and manages the packaging of aid for students. These systems are also integrated with career planning and alumni systems. Each contact with the student, either originating from the student or from the university, is tracked in enough detail to avoid requiring the student to rehash prior conversations giving the student confidence that staff “know” about the student’s circumstances. Thus, the University easily and efficiently tracks and manages its relationships with students from their first inquiry for information about academic programs, through their years as active alumni.

Maria’s life as an employee of the University has become more efficient as well. With her digital assistant, she can coordinate meetings and arrange travel in consultation with her colleagues. Her travel is arranged through a service accessible from her portal. Similarly, all of her travel vouchers are submitted through the portal immediately upon her return to the office. This voucher service is integrated with the University’s accounts-payable system so that reimbursements are deposited directly into her bank account, usually within a week. This is a far cry from the processing of travel arrangements and reimbursement requests that used to consume the time of admissions officers and support staff alike.

This is October, so it’s time for Maria to re-enroll in the University benefits program. All of the information she needs is available to her online and the re-enrollment process itself takes her about 15 minutes. A confirmation is posted to her portal from the Human Resources Office the
next day, which checks that she has entered the benefits that she intended.

Maria feels more satisfied in her job than she did five years ago. She has more “face” time with prospective students and the complexities of her job have been reduced.
Eric grew up in Virginia, but he went to a University System of Maryland campus since he felt that the curriculum would better support his interests and prepare him for entering the workforce following graduation. Even when he was in high school, Eric had been aware of e-learningMaryland and knew that the University System’s institutions were ahead of the curve in infusing technology into every aspect of campus life. Once he enrolled at the University and began to trade experiences with friends who were in college elsewhere, he knew he had made the right choice.

Eric had been aware that the University System’s institutions were ahead of the curve in infusing technology into every aspect of campus life.

Eric’s passion has always been art, but he realized that it would be difficult to make a living in that field. The universities in Maryland have in recent years made technological fluency a component of every part of the curriculum, and students regularly come into contact with technology throughout their college years. As a result, Eric was able to graduate as an Art major, yet he was well prepared for his job with a Maryland firm that is developing the next generation of online multi-media services.

He hopes to translate his experience – which combined the traditional and the new – into the products he is working on for his firm. The fundamental skills, communication and critical reasoning skills, and broad liberal-arts background he gained have allowed him to be an active member of his work team. That he also had significant experience in electronic design, was skilled in a variety of contemporary software tools, and had a deep understanding of how online design should work, meant
that he could get the job he desired. It also meant he could hit the ground running with his first assignment with the firm.

There is much about living and working in Maryland that Eric has come to value. The state is rich in cultural opportunities. Additionally, he appreciates that most government services are easily available at any hour of the day or night through information technology. For Eric, it meant not having to use valuable leave recently when he needed to replace his lost driver’s license. And given the pervasive high-speed networking that the state has encouraged, he can often avoid rush hour traffic by working from home until mid-morning on most days. In fact, he is currently working on his master’s degree by taking online courses from several of the Universities in Maryland. He does this in his spare time at work, but also in the evenings and weekends from home. The flexibility of online learning is a nice fit with his lifestyle, and he enjoys the opportunity to take classes with students from all over the world who have enrolled in the same program.

Because he thoroughly enjoyed his experience at the University and felt extremely well prepared for his chosen career, Eric spreads the word about the high-quality, technology-enhanced education he received. Twice a year, he talks to local high school students about the University’s programs and encourages them to consider attending. Throughout his time at the University, Eric relied upon his campus portal to bring the world to him. Upon graduation, the University continued his access to that portal, keeping him in direct contact with the University, updating him on services and activities, news about University faculty and his classmates and alumni opportunities for support. He continues to have a direct contact point with Alumni Development.
Performance is the only reality.
- Harold Geneen, former chairman, ITT
As the scenarios indicate, information technology has the potential to transform higher education in ways none of us could have envisioned 20 years ago. Yet it is important to keep in mind that we are probably only at the beginning of a curve that is continuing its trajectory - and no end is in sight. Because each institution within the University System is unique, each is at a different point along that curve. What is imperative is that we not fall behind the curve; in fact, our institutions have the potential to lead the way by being pioneers in infusing technology into the curriculum and into their business operations.

The real literacy of tomorrow entails the ability to be your own personal reference librarian - to know how to navigate through confusing, complex information spaces and feel comfortable doing so.

- John Seely Brown, Change Magazine, March/April 2000

By legislation and by practice, the University System of Maryland is “institution-centric.” This means that while the Board of Regents has the overall governing authority for the entire system, each institution has the latitude to establish its own mission and implement strategies for achieving that mission. No area more clearly reflects this latitude than how each institution has approached information technology.

Some institutions have invested heavily in IT over the years; other institutions, while also investing in IT, have done so at a much lower level. As a result, the 11 degree-granting institutions of the USM are at much different stages in their ability to support the IT immersion implicit in the e-learningMaryland initiative.
Although there have been, of necessity, different approaches to investing in and supporting IT, it must be made clear: All USM institutions have perceived IT as critical to attracting good students and faculty, imperative to producing well-rounded graduates, tied to their ability to provide distance education and outreach services to businesses and other consumers, and inextricably linked to remaining competitive. Research has indicated that higher education must embrace new technologies in order to accommodate our students’ learning styles, not to mention their schedules. Consider the traditional college students of today – those between the ages of 18 and 23. Among many of those students, familiarity with computers and other technologies is so pervasive that it seems to be de rigueur. Many of them have been computer-literate since elementary school. They are more visually oriented than students of earlier generations were, and they are used to surfing the Net.

Because information on the Net is highly unorganized and in constant flux, these students need to know how to navigate and sort through this information. They must be able to evaluate its quality – separating the wheat from the chaff – synthesize it in a way that makes sense, discard what they don’t need, and make use of the rest. They must also be able to quickly understand new technologies, digest them, and apply them to their lives.

In this new environment, higher education has a very important role to play. Not only are academic institutions at the forefront of creating technology, but they also are the key evaluators of technology.

**Requirements for Total IT Immersion**

Several ingredients are necessary for our institutions to be ahead of the curve and to ensure that IT is a pervasive force on our campuses. To create the total immersion environment we envision, there must be:

- Assured access to networked computers and other devices for all students, faculty, and staff.
• A campus network infrastructure that is scalable, reliable, and robust enough to support the needs of a campus community that depends on this infrastructure for all of its activities.
• Appropriate network access to the current Internet and the evolving next-generation Internet.
• Services such as e-mail, electronic conferencing, calendaring, etc., that support the communications and time-management needs of an electronic-based community.
• Electronic content appropriate for the teaching, learning, and research missions of the institution.
• Tools that allow faculty easy use of the networked environment to enhance instruction.
• Training faculty in the use of technology tools for customizing learning environments and conducting research.
• Classrooms that are fully “technology-enabled.”
• Business systems that support the many processes necessary to manage the institution and which are fully customer-service oriented. The needs for Student Information Systems are particularly critical and complex.
• Technical staff to design, deploy, and maintain all of the above in addition to training and supporting the users of these systems.

Technological Fluency and the Minimum IT Standard

During the 2000 Academic Year, the Board of Regents established two resolutions that will undergird the e-learningMaryland vision. In January, the Board put in place a policy requiring that each graduate of a USM institution be technologically fluent. According to the policy, every individual who obtains a degree from a University System institution should have an understanding of and skills to use current information technologies so that as the technologies change, the individual will be able to master the newer technologies that come along.

In April, the Board took another step toward e-learningMaryland by adopting the Minimum IT Standard. That standard includes nine
expectations that are intended to assure each student of appropriate access to computers, networks, and electronic resources. A highlight of the standard is the requirement that institutions assure students access to a computer, 24 hours a day, 7 days a week. (The full standard is found in the next section.)

The standard also includes a requirement that each institution develop mechanisms to compensate for the “digital divide” that the technology revolution has created. That divide can be found at every USM institution to one degree or another. Even on campuses reporting the highest percentages of personal ownership of computers, at least 20% of all students are coming to campus without a personal computer. Given that reality, the Board of Regents expects institutions to either lower the barriers to ownership or develop institutional plans to assure access.

**Where Do We Stand?**

Given this context, how close are USM institutions to fully achieving the e-learningMaryland vision?

Most USM institutions have continued to invest in physical infrastructure, such as campus networks and public access laboratories. Basic services, like campus e-mail, are, with some exceptions that are being addressed, part of the day-to-day environment for most members of the campus communities. On some campuses, for instance, close to 100% of dormitory beds have a network connection. (However, while the rooms are connected to the campus computer network, that does not mean that all students have computers.)

At some institutions, IT is a key part of all planning, and there is an attempt to assure that new technologies are a part of most academic programs. Increasingly, some of our institutions are supplementing traditional classroom instruction with IT resources, such as computer-based simulations and computer-based labs. Most are also recommending to students that they own computers, and on all
campuses, at least 70 percent of faculty members, administrators, and staff have computers at their desks.

Most USM campuses also view providing IT training and support as “very important,” even if they are not currently able to budget sufficient funds for adequate training and support. Institutions also continue to invest individually, and collaboratively, in online academic materials. In these areas, the biggest challenge is to keep up with fast rising demand.

However, there are areas in which the USM institutions are far behind in fully achieving e-learningMaryland.

The vision was predicated on each USM institution’s operations’ being supported by customer-oriented e-commerce systems, those that would allow, for instance, students to register and pay tuition via computer. In fact, some online services have been implemented at various institutions – most commonly, services that allow users to access academic course catalogs, event schedules, faculty/staff directories, and student newspapers. Yet, at most USM campuses, the business processes are perforce predicated upon a student’s ability to visit various campus offices for advising, registering, applying for financial aid, and paying bills. This is due in part to legacy systems that were adequate 20 years ago and supported the needs of more traditional business processes, but are not Web-based or consumer-focused. We must implement new systems if we are to properly serve on- and off-campus learners of Maryland in the same way that, for instance, our State wishes to serve the citizen who must transact business with the State at his or her convenience.

The State has recognized the power of self-service in its Electronic Government Initiative. While higher education was exempted from the legislation supporting this initiative, the USM institutions should be leading the charge to interact with their communities and conduct all manner of business online because:
• Such interactions are fundamental to the e-learningMaryland vision and its potential to benefit a wide variety of Marylanders.

• Our community of users – students, faculty, and staff – are already among the most technologically adept in the State of Maryland.

• The Internet and network-based services have a long history within higher education and the USM.

• Because of that history, the USM has the insights into how customer-oriented services over the Internet should evolve.

Each USM institution’s capabilities to deploy these services is stymied by the inability to move beyond legacy systems. Today, we have the historic opportunity to create a full-immersion environment in which information technology has implications for every academic program, research pursuit, and service we provide. If we are able to accomplish our goal, the institutions of the University System of Maryland will, indeed, be a pioneering force in this new realm.
The technology revolution includes continuous, rapid and
dramatic new developments in information technology services
as well as hardware and software. It is, therefore, imperative
that each campus, the University System Office, and the Board
of Regents of the University System of Maryland provide a
minimum level of information technology proficiency.

- USM Board of Regents Minimum IT Standard
UNIVERSITY SYSTEM OF MARYLAND
MINIMUM INFORMATION TECHNOLOGY STANDARD

I. Preamble

Information technology has become a major component of everyday life and is continuously evolving. This has resulted in the emergence of new concepts at an explosive pace. The technology revolution includes continuous, rapid and dramatic new developments in information technology services as well as hardware and software. It is, therefore, imperative that each campus, the University System Office and the Board of Regents of the University System of Maryland provide a minimum level of information technology proficiency.

Accordingly, the Board of Regents establishes the following as the minimum information technology standard to be achieved and maintained by all campuses with the recognition that:

(1) It is intended that each institution be given the responsibility to define the specific interpretation of these standards for its particular community, including specifically the institutional interpretation of the broad qualifiers such as “appropriate,” “adequate,” and “effective”; and

(2) Given the diversity of institutions within the University System, it is recognized that each institution may develop a unique institutional response; and

(3) The timetable for implementation of this Minimum Standard shall be determined for each USM institution by the Board of Regents after responses are received to the Assessment and Implementation Process questions from each institution and appropriate inquiry made to the Chancellor, all USM Presidents, the Information Technology Coordinating Council, CIO’s and other stakeholders. Each campus is encouraged to begin initiatives immediately to comply with all elements of this standard wherever possible.

Finally, it is acknowledged that interpretation of the various elements of this system-wide minimum standard may vary from campus to campus depending upon individual needs and circumstances and that some campuses may wish to exceed one or more elements. Therefore, the Board of Regents entrusts each campus to exercise its best considered judgment and “best practices” to achieve compliance in keeping with the timetable to be developed.

II. Minimum Information Technology Standard

(1) Each institution will establish a policy to assure that all students shall have access to a computer 24 hours a day, 7 days a week.
(2) Each student shall have access to appropriate software and electronic learning materials to complete course assignments.

(3) Students, faculty and staff shall have access to a campus network of adequate bandwidth connected to the Internet 24 hours a day, 7 days a week.

(4) Faculty and staff shall have access to appropriate computer technology in their offices or workplaces to do their work. Each campus, as well as the University System Office and the Board of Regents shall have a plan to enable faculty and staff to apply technology effectively.

(5) Each campus shall provide access to email communications for students, faculty and staff and an explicit website policy as part of its campus technology policies.

(6) Given the importance of access to training and technical support, each campus as well as the University System Office and the Board of Regents shall have an explicit training and support plan that will assure that all faculty, students and staff can take advantage of the computer technology available on their campus.

(7) There shall be a technology plan for each campus, as well as the University System Office and the Board of Regents, which will explicitly address staffing and support as well as upgrade, maintenance and replacement of computer and network hardware and software so that the system is periodically modernized.

(8) Each campus shall, in cooperation amongst themselves and with others where collaboration will be beneficial, and with the USM Office, explore and form technology partnerships, where appropriate, to provide cutting edge information services incorporating e-business to students, faculty and staff.

(9) The technology revolution has, unfortunately, created a "digital divide" between those who can afford access to information technology equipment and services and those who cannot. Each campus, therefore, shall, in cooperation with other USM institutions where beneficial, develop and maintain mechanisms whereby all students, irrespective of financial means, shall have access to the information technology equipment and services available to students on their campus.

Board of Regents:

by:  Nathan A. Chapman, Jr., Chair

Board of Regents Information Technology Committee:

by: William T. Wood, Chair
Clifford M. Kendall, Vice Chair
Lance W. Billingsley
Jeong H. Kim
Charles R. Larson
Donald Z. Spicer, Staff
At its April 7, 2000 Board meeting, the Board of Regents adopted a University System of Maryland Minimum Information Technology Standard. In order to establish a timetable for implementation of this Minimum Standard for each campus, the Board of Regents requests that each institution respond to the following questions (separately for each campus where an institution has multiple campuses) no later than June 15, 2000:

1) Does your campus meet each element of this standard?

2) If not, what must be accomplished to meet each element?

   a) What will it cost? Please be very specific with respect to the initial implementation costs and estimated annual recurrent costs of each element of this standard. Also provide total initial costs and total estimated annual recurrent costs.

   b) What institutional funds are available?

   c) What other resources are available?

   d) When can compliance with each element realistically be achieved?

As stated in the Minimum Information Technology Standard, it is acknowledged that interpretation of the various elements of this systemwide minimum standard may vary from campus to campus depending upon individual needs and circumstances and that some may wish to exceed one or more elements. Therefore, the Board of Regents entrusts each campus to exercise its best considered judgement and "best practices" to achieve compliance in keeping with the timetable to be developed.

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Donald Z. Spicer, Staff
For the first time in history, children are more comfortable, knowledgeable, and literate than their parents about a technology central to society.
Each of the 13 University System of Maryland institutions was asked to respond to the Minimum IT Standard, indicating their ability to meet the standard, and any challenges they foresaw in doing so. Certain key themes emerged in their responses. Notably, two overarching issues were common among all institutions:

- Recruiting skilled technical support staff, and retaining an optimal number of technical support staff to meet campus needs.
- Adopting sustainable models for renewing and maintaining institutional information technology infrastructures.

The USM institutions face a number of challenges related to meeting the Board’s Minimum IT Standard requirements. Yet, meeting the standard is crucial to making USM services available across the State.

**KEY INSTITUTIONAL ISSUES**

The USM institutions face a number of challenges related to meeting the Board’s Minimum IT Standard. Yet, meeting the standard is crucial for positioning higher education in Maryland at the forefront of contemporary information technology services and to making USM resources available to students and workplaces across the state. These challenges primarily concern student access to computing resources and the digital divide, faculty and staff access to computing resources, intra- and inter-institutional network infrastructures, electronic services, and training and support.

**Achieving “24 x 7” student access and bridging the digital divide**
(Standards 1 and 9)
To facilitate 24 x 7 access to computing resources for all students, the USM institutions have proposed an array of solutions. This mix of initiatives includes:

- Opening 24 x 7 public computer laboratories for students.
- Enhancing the number and quality of computers in public laboratories.
- Requiring students to own computers and including this requirement in the financial aid consideration.
- Leveraging the size of the USM to effect partnerships with vendors, enabling students to purchase computers at discounted prices.
- Establishing a “laptop university” initiative to provide all incoming students with laptops.
- Leasing computers to students.
- Subsidizing the purchase of computers by students.
- Initiating computer-loan programs.
- Obtaining donations of high-end computers.

Providing access to software and electronic learning materials for students (Standard 2)

In addition to computers, the quality of students’ learning experiences will significantly depend on the software and learning materials available to do coursework. Many USM institutions include or intend to include students in the Maryland Educational Enterprise Consortium (MEEC) software agreement with Microsoft. This agreement allows students to license the latest releases of the Microsoft operating system, Microsoft Office Suite (Word, Excel, PowerPoint, Access, Publisher), Microsoft FrontPage, Microsoft Outlook, and other Microsoft products, paying only a minimal charge.

USM institutions also continue to enhance specialty-computer laboratories that have discipline-specific software for students in disciplines such as engineering, medicine, writing, music, geographical-information systems, computer engineering, and nursing. Another USM initiative involves creating “smart classrooms” that integrate computer,
multimedia, and network technologies. Smart classrooms could be equipped with permanent ceiling or tabletop projectors, computers, Internet connection, sound systems, VCRs, and DVD players. In addition, some USM institutions have proposed enhancing the availability of digitized materials, including online access to course reserves, electronic journal subscriptions, and multimedia images such as photographs and slides used in courses.

**Upgrading the network infrastructure to enhance access and services**

(Standard 3)

A key concern for all USM institutions is connectivity, particularly in an increasingly distributed technology environment. Recognizing the importance of the network in providing access to contemporary information and communication services, many institutions have proposed upgrading the bandwidth and, in some cases, the pervasiveness, of their institutional network infrastructures. Specific initiatives include:

- Upgrading the campus network backbone.
- Installing needed cabling in residence halls.
- Increasing the availability of mobile and public access networking.
- Connecting more classrooms to the campus network.
- Investing in improved off-campus access via an enhanced University of Maryland Academic Telecommunications System (UMATS).

**Contemporizing and renewing computer technology in faculty and staff offices**

(Standard 4)

While using technology to improve teaching and learning is a given in e-learningMaryland, the immersive environment includes improving administrative processes as well. Therefore, the USM institutions have proposed establishing sustainable models for renewing computer technology in faculty and staff offices. Two key concerns across the USM have emerged in this area:
• Modernizing computer technology in faculty and staff offices.
• Renewing or refreshing computer technology in faculty and staff offices on a three- or four-year cycle.

Providing access to e-mail for students, faculty, and staff (Standard 5)

USM institutions already provide e-mail services to faculty and staff and most institutions also provide e-mail services to students. All institutions intend to expand e-mail services to include all students by 2001. In addition, some institutions plan to establish a public key infrastructure (PKI) to enhance the security of e-mail communications and other services that require such security.

Expanding training opportunities and providing technical support (Standard 6)

USM institutions recognize that the effective use of information technology depends vitally on the availability of relevant training as well as the effectiveness of technical support. In particular, the USM faculty will need opportunities to learn how to take advantage of the capabilities of the electronic medium to enhance instruction.

To meet this requirement, some institutions have proposed establishing centralized facilities and support resources within their institutions, while others plan to expand existing services. As with other initiatives, the USM will seek ways to address this need by collaboration among institutions as appropriate.

Creating technology plans for periodically modernizing the institutional IT infrastructures (Standard 7)

All USM institutions have developed strategic information technology plans in 2000.
Collaborating within the USM and forming external technology partnerships (Standard 8)

The USM institutions have collaborated and continue to do so extensively on information technology initiatives within the System. They also have formed partnerships with the State of Maryland, the corporate sector, the federal government, and other institutions and organizations. Some examples of collaborative projects and partnerships:

- Oracle student information system development initiative to provide a host of contemporary online services.
- Leveraged educational computing initiative to facilitate ownership of computers.
- Networking initiatives, including Internet2 and Abilene (high-speed networks).
- Library Information Management System and the Maryland Digital Library.
- UMATS, a USM network infrastructure consortium to provide wide area network connectivity and interactive video services to all USM institutions.
- The USM Service Center for legacy administrative systems.
- Partnerships with IBM, Microsoft, Sallie Mae, Comcast, Nortel Networks, Aether Systems, RWD technologies, SAP (University Alliance program), NASA, National Science Foundation, National Security Agency, the Smithsonian Institution, and the World Bank.
- Shared educational TV networks, community TV collaborations, and other collaborations to create various technology initiatives.
- Partnerships with the State of Maryland and private industry to develop eMaryland.

A copy of each USM institution’s response to the Minimum IT Standard is in Appendix III.
Nobody "Owns" the Learning Franchise

- Network learning eliminates barriers to entry.
- New roles will emerge - facilitators, intermediaries, and learning agents.
- Higher education needs to embrace transformation to compete for the learning franchise.

- Michael Dolence and Donald Norris, Transforming Higher Education: A vision for learning in the 21st century, Society for College and University Planning 1995
The transformative potential of information technology provides significant opportunities in nearly every area of higher education. Increasingly, institutions of higher education are availing of these opportunities to enhance learning and teaching, expand access, and improve customer services.

Higher education, like other service industries, is shifting from a centralized to a decentralized, customer-centric service model. In this model, personalized services are available to consumers at any time, from any place, with much less need for “intermediated assistance” from employees. In essence, the need for the “middleman” who has traditionally served as the gatekeeper to certain services is disappearing. In this model, face-to-face interactions emphasize higher-value activities for the provider and the client – students, alumni, faculty, staff, administrators, state representatives, industries, the general public, and others.

In response to this emerging reality, USM institutions have the potential to differentiate their educational environments through the infusion of technology, creating a competitive advantage in being perceived as a technology leader among higher education institutions. The right investment choices today will enable accomplishing the e-learningMaryland vision in the next few years.

**Key Issues**

When the USM held its annual information technology retreat in June 2000, USM technology leaders identified seven key IT challenges and priorities that are strategic to their institutional missions:

- **IT Staffing** – hiring, retaining, and retraining optimal numbers of information technology staff.
• **Network Infrastructure** – upgrading and maintaining pervasive campus networks and an inter-institutional wide-area network providing high-speed connections for emerging electronic services.

• **Customer Services Systems** – migrating 1970’s legacy technology administrative systems to an integrated suite of customer services and course-management information systems, enabling the delivery of cross-functional, customer-focused information, web-integrated interfaces, common reporting tools, e-business services, personalized services, and self-service flexibility.

• **Workstation and Server Renewal Programs** – adopting models for the sustainable renewal of computer technology in student public-access laboratories, and faculty and staff work places.

• **Learning and Teaching Using Technology** – providing faculty the flexibility to customize learning environments to meet the needs of diverse student groups. The critical enabling services include the tools and support within each USM institution to facilitate the development of online courses for the web. Additionally, a technology supportive learning environment requires sufficient numbers of “smart classrooms.”

• **Electronic Services Architecture** – deploying authentication and directory services, security mechanisms, a public key infrastructure and other core “middleware” to support electronic services in a networked world.

• **User Support and Training** – developing responsive technology support organizations, including help centers and collaborative models, to help users understand and use technology.

EDUCAUSE, an academic-technology consortium whose members include 1,700 academic institutions and 150 corporations interested in campus computing, released a survey this year of critical IT issues facing
campuses. The survey identifies similar challenges in the deployment and management of information technology on campuses. Ten key themes emerged:

- **Funding IT** “to renew and replace PCs, administrative systems, network infrastructures, and institutional support systems and to provide competitive IT salaries, training, and additional staff to support new services.”

- **Faculty Development, Support, and Training** in recognition of the fact that “technology-enhanced teaching and learning is rapidly reaching a critical mass.”

- **Distance Education** as “just-in-time lifelong learning and the growing desire to be educated anyplace and anytime are driving demand.”

- **E-learning Environments** that are fundamentally changing the teaching and learning process, “supporting new pedagogical approaches and creating new forms of learning communities.”

- **Enterprise Administrative Systems** “to support changing ways of doing campus business.”

- **IT Staffing and Human Resources** to meet the increasing demand for IT services.

- **IT Strategic Planning** as “the huge costs associated with IT investments argue strongly for good institutional planning,” which could be in the form of “an iterative series of short-term plans that address strategic institutional issues.”

- **Online Student Services** “to meet the expectations of current or prospective students, who increasingly look to the Internet as the place to conduct business. Such online student services must be an integral part of a broader campus e-business strategy that integrates...”
enterprise transaction systems, customized transaction systems, course management systems, portal technology, and customer relationship management.”

- **Advanced Networking Challenges** stemming from new initiatives in local and wide-area networking. “Internet2 applications will require end-to-end network connectivity, which will lead to major upgrades in campus networks. Voice, video, and data are merging into a common digital infrastructure, and connectivity will increase between wired and wireless networking.”

- **Support Services Demands** as “across the country, campus IT centers are challenged to find ways to provide new services, enhance existing services, and extend the availability of those services.”

The USM, like other higher education institutions, needs to quickly take steps to address the issues identified in the EDUCAUSE survey. Looking ahead, the USM institutions’ emergence as technology leaders, and therefore, their ability to support the State’s eMaryland vision, will depend on making immediate and sustainable investments in IT infrastructure and services.

**Peer Analyses of Selected IT Indicators**

Using data from a national survey of information technology in higher education in 1999, selected IT indicators were analyzed for USM institutions relative to their peers.* While most USM institutions, although not leaders in IT, are competitive, some institutions are behind in critical areas.

For example, the proportion of classes using computer-based classrooms and electronic mail is lower at some USM comprehensive institutions as compared with peers (see chart 1).

*A summary of all comparative data for USM institutions is available from the USM Office.
Chart 1

What is your best estimate of the proportion of classes that use the following information technology resources?

![Bar chart showing the percentage of classes using computer-based classrooms or labs across different institutions.]

**Notes:** The peer group was selected from respondents to the survey. Public Master 1 represents the average for all respondents to the survey for that Carnegie classification.

Critically also, some USM comprehensive institutions do not offer the online student services available at peer institutions (see charts 2 and 3).

Charts 2 and 3

What academic and institutional resources and services are currently available on your campus WWW site?

![Bar chart showing the percentage of campus WWW sites offering e-commerce and student transcripts across different institutions.]

**Notes:** The peer group was selected from respondents to the survey. Public Master 1 represents the average for all respondents to the survey for that Carnegie classification.
Additionally, in the areas of student ownership (charts 4 and 5), student access to public workstations charts 6 and 7), and user support (charts 8 and 9), some USM institutions have better, and some, lower metrics relative to their peers.

**Charts 4 and 5**

What is your best estimate of the proportion of individuals in your campus community who have or own desktop or notebook computers?

<table>
<thead>
<tr>
<th>Percentage of students</th>
<th>A USM Research University</th>
<th>Peer Group</th>
<th>Public Research University I</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.0%</td>
<td>85.0%</td>
<td>66.7%</td>
<td>67.4%</td>
</tr>
</tbody>
</table>

**Notes:** The peer group was selected from respondents to the survey. Public Master I and Public Research University I represent the average for all respondents to the survey for those Carnegie classifications.

**Charts 6 and 7**

Do students have the access they need to computing resources?

<table>
<thead>
<tr>
<th>Number of students per public workstation</th>
<th>A USM Comprehensive University</th>
<th>Peer Group</th>
<th>Public Master I</th>
</tr>
</thead>
<tbody>
<tr>
<td>25.00</td>
<td>23.15</td>
<td>14.78</td>
<td>14.77</td>
</tr>
</tbody>
</table>

**Notes:** The peer group was selected from respondents to the survey. Public Master I and Public Research University I represent the average for all respondents to the survey for those Carnegie classifications.
Charts 8 and 9

Number of headcount students per technical support person (computed metric).

Notes: The peer group was selected from respondents to the survey. Public Master 1 and Public Research University I represent the average for all respondents to the survey for those Carnegie classifications.

These key IT issues, peer metrics, emerging market trends and technologies, along with the State Executive Branch Agency expectations of 50% to 80% online services by 2004, increase the need for special one-time investments in bolstering IT infrastructures and services at the USM institutions.
Technologies such as computers (or pencils) don’t have predetermined impacts; it’s their uses that influence outcomes.

- Stephen C. Ehrmann, Change Magazine, March/April 1999
IMPLEMENTATION AND TIMETABLES

**Implementation**

The activities described in this response fall naturally into two categories: enhancement of current operational activities and major proposed projects. E-learningMaryland is not starting from a dead stop. The various IT offices at the 13 USM institutions currently provide a wide array of IT services day-in and day-out to a community of 150,000 individuals and support teaching, learning, research, outreach and the operation of the institutions. E-learningMaryland for these activities proposes a significant enhancement of these operational services with an emphasis on issues of assured access for all students, faculty, and staff. The strategy is to do much more of what already is being done. The ongoing operational issues which have recurring costs would be funded from institutional budgets via institutional priority setting. Appendix I details 133 targeted actions that each of the 13 USM institutions proposes and provides a timetable for completing each action.

Complementing these are the three proposed major projects: network enhancements, replacement of Customer Services Systems, and classroom enhancements. To remain competitive, the USM institutions need to undertake these projects over the next three to five years as well. These are major undertakings. In the case of Customer Services Systems, for many institutions this will be a “once in 20 years” investment and overall will cost the USM institutions on the order of $72,000,000. Overall, there is no way for the institutions to reestablish operating budget priorities to both enhance services and address these major projects.

There is a proposed institution-by-institution timetable for implementing these projects. The network enhancement and classroom enhancement projects are relatively straightforward and in most cases can be designed and implemented over a one- to two-year period. The technical
knowledge needed for implementation is available on the campuses; therefore, the process is largely a matter of local design, contracting for services, and managing those contracts.

The Customer Services Systems are a much more complex issue. The USM institutions are at various stages of developing strategies for dealing with this issue - and they all must deal with it. Most institutions have done a needs analysis and are prepared to move forward with procurements, or already have procurements underway. Typically, they will be seeking integrated suites of software that manage student information, human resources, and financial information. Research institutions will also seek grants management software. Implementation involves teams consisting of internal functional staff, internal technical staff, and outside consulting specialists with experience in the particular application and tools being implemented. The modules are implemented over the course of three years at a minimum and the separate projects are dovetailed.

Timetables

The e-learningMaryland vision is very aggressive and holistic. There are many components that must come together if it is to become reality.

Current priorities are articulated in the Minimum IT Standard. Using increases in annual state appropriations (based on the funding guidelines), the USM institutions are committed to meeting the priorities articulated in the Standard, which focuses on assured access, networks, training, and electronic resources. These priorities are typically weighted toward operational, current costs.

- The USM institutions have made assured access for students a priority and by Fall 2001 will address that issue in the various manners described.
- The USM institutions will continue to upgrade faculty and staff desktop computers, but without relief from other demands, this may
occur over a longer replacement cycle than the three- to four-year cycle proposed.

- The USM institutions will continue to invest in network enhancements, but without additional funding allocations, the campus networks will always lag behind the demand curve.
- The USM institutions will also continue to invest in training, but enhancements in training capabilities will depend on availability of resources.
- The USM institutions will continue to invest in electronic content, primarily in the form of software licenses and content licenses through the Maryland Digital Library initiative and other library funds. Without additional funding, the pace of growth will be slowed.

If additional appropriations are received for the three targeted projects, then internal institutional resources will be reallocated to move the Minimum IT Standard issues forward faster. The projects themselves will be laid out as described above. Networking and classrooms will be undertaken within two years. Customer Services Systems will be rolled out on a few campuses within three years and on those remaining within five years. The detailed timetables, institution-by-institution, are in Appendix II.
Technology - with its unpredictable changes and vast expenditures - has made flying blind much more dangerous than it used to be. The good news is that some institutions are learning how to see.

- Stephen C. Ehrmann, Change Magazine, March/April 1999
Throughout this report, we have sought to make the case for enhancing the USM’s IT capabilities through a joint investment by the University System and the State of Maryland.

Information technology has changed our society in many ways, and there is every reason to believe the changes will continue, at an increasingly rapid pace. As the State’s only system of public, four-year institutions, the USM has the responsibility to prepare Maryland citizens for what the future may hold. In the final analysis, the outcomes of the investment in information technology will be:

1. **Technologically fluent graduates who can enter the Maryland workforce prepared to contribute to the enhancement of the State’s knowledge-based economy.**

2. **A technology-based environment in which academic research can thrive and technology transfer can more readily occur.**

3. **The creation of a more attractive environment for the recruitment and retention of students, faculty and staff.**

4. **More efficient operation of each USM institution.**

These are highly complex outcomes with multiple measures for determining success. Certainly, enhancing the infrastructure, tools, and services in the electronic context for the many activities described will not, by itself, lead to success for academic institutions. However, it is increasingly apparent that the advanced electronic context described in this report is one of the most important prerequisites for success in the 21st century higher-education enterprise.

The metrics that we will use to measure progress in achieving these four objectives are:
• Achievement of information-technology fluency by 2002 by all graduates of USM institutions, commensurate with the needs of the marketplace and the chosen major and/or careers of the graduates. The Board of Regents has a policy requiring technology fluency of all USM graduates and the USM will develop a mechanism for assuring adherence to this policy.

• Improvement of services to principal investigators at designated research universities in managing their grants as measured by surveys.

• Contribute to the improvement of graduation rates, retention metrics, and admissions selectivity.

• Availability of at least 50% of business services as an online option within three years of beginning to implement a new suite of Customer Services Systems.

In conclusion, the e-learningMaryland strategy holds many economic and educational benefits for the State of Maryland and its citizens. By investing in this strategy, State leaders have the opportunity not only to enhance the University System of Maryland’s 13 institutions, but to move Maryland forward, as well.