IT Strategic Plan - DRAFT

2012 - 2020

The University of Montana

June 20, 2012

Online version: www.umt.edu/it/strategicplan
# Table of Contents

**INTRODUCTION** ................................................................................................................................. 3  
  Role of IT ................................................................................................................................................. 3  
  Structure ................................................................................................................................................ 3  
  Governance ............................................................................................................................................ 4  
  Vision ...................................................................................................................................................... 4  

**APPROACH** ........................................................................................................................................ 5  
  The Team ............................................................................................................................................... 5  
  The Timeline ......................................................................................................................................... 6  

**CURRENT SITUATION** ....................................................................................................................... 7  
  Trends and Expectations ....................................................................................................................... 7  
  SWOT Analysis ..................................................................................................................................... 8  
      Process ............................................................................................................................................... 8  
      Findings .......................................................................................................................................... 9  

**VISION** .............................................................................................................................................. 11  

**IT MAPS** .......................................................................................................................................... 12  
  IT Personnel ........................................................................................................................................ 13  
  Network ............................................................................................................................................... 13  
      Wired ........................................................................................................................................... 13  
      Wireless ........................................................................................................................................ 14  
  Data Centers ....................................................................................................................................... 15  
  Servers ............................................................................................................................................... 16  
  Enterprise Applications ....................................................................................................................... 17  
  Computer Labs .................................................................................................................................... 18  
  Classroom Technology ....................................................................................................................... 19  
  HelpDesks .......................................................................................................................................... 20  
  Desktop Support ................................................................................................................................. 21  

**MAJOR ISSUES** ................................................................................................................................. 22  
  Infrastructure ...................................................................................................................................... 22  
      Data Centers ................................................................................................................................. 22  
      Network ......................................................................................................................................... 23  
  IT Culture and Management ................................................................................................................ 25  
      Culture .......................................................................................................................................... 25  
      Organization .......................................................................................................................... 26  
      Governance ................................................................................................................................. 27  
      Funding ......................................................................................................................................... 27  
  Academic and Research Computing .................................................................................................. 27  
  Enterprise Computing Systems .......................................................................................................... 28  
  Online Student Resources .................................................................................................................. 29
Introduction

In the summer of 2011, UM President Royce Engstrom directed interim Chief Information Officer Loey Knapp to develop an information technology strategic plan that envisioned more efficient and effective operation of central and distributed IT services.

This report details the planning approach and participants, provides current situation analyses, outlines major issues to address and provides a set of strategic goals and recommendations for moving forward.

The planning process sought answers to four questions:

1. What is the role of information technology in supporting the mission of the University?
2. What organizational structure provides the most effective delivery of IT services while making the most efficient use of limited resources?
3. How should IT be governed?
4. How must the campus culture change to meet rapidly growing expectations for robust, reliable, innovative and secure technology infrastructure and services with limited financial resources?

Role of IT

Central IT has traditionally supported the campus network, central data centers, identity management, and enterprise applications while providing limited help desk support. In the past decade, the central IT organization has evolved to provide web support services and more advanced presentation technologies. Central IT has taken a lead role in state, regional and national networking issues in recent years, and has developed some innovative web applications, but generally, Central IT has been reactive to campus needs. The CIO, until recently, was not part of the cabinet and had little or no influence on strategic decisions.

In reaction to an understaffed and limited central IT organization, colleges, schools and departments invested resources in IT support staff. Today, there are approximately 70 staff employees in Central IT and another 70 employees with technology support responsibilities distributed across campus.

It makes sense to explore ways that central and distributed IT operations can be partners in supporting the University’s mission, as well as a valued participant in strategic decision-making.

Structure

The CIO—who directs the Central IT organization—currently reports to the President. The academic sector, which employs half of the distributed technology staff, has no IT manager. IT staff in academics typically report to deans and chairs. Student Affairs and Administration and Finance sectors have small technology teams, but also have IT staff working in individual departments. The results are duplicated efforts and staff working at cross-purposes or creating vulnerabilities because of lack of depth.
This is the time to consider whether UM would benefit from a different organizational structure that could be more agile, innovative, proactive, secure and cost-efficient.

**Governance**
A distributed IT model requires effective policies and collaborative decision-making processes to ensure integration of systems, responsible spending and adherence to security requirements. UM’s formal IT governance structures are obsolete or dysfunctional. A significant outcome of this planning process should be the redesign of an effective IT governance structure, policies and processes.

**Vision**
This plan will recommend specific technology initiatives to support the University’s mission, but long-term success will require leadership that can forge a shared vision and create an IT culture that is built on trust and shared values.
**Approach**

The intent of this strategic plan is to look at the whole of IT services on campus, whether provided by central IT or distributed IT staff. That challenge required an effective process and broad participation by representative from all sectors.

Two external advisors—Dr. Polley McClure from Cornell University and Mr. Daniel Ewart from the University of Wyoming—recommended a strong focus on campus-wide input and communication throughout the process. They also suggested engaging outside consultants to review UM’s plan after data had been gathered and goals had been drafted. We have attempted to follow their advice.

A planning team was formed that included representatives from all university sectors. The team engaged in numerous data and perception gathering exercises, including mapping current IT services, conducting a campus-wide SWOT analysis, examining trends and expectations and reviewing IT needs outlined in strategic plans from other sectors of campus. Academic Affairs and Student Affairs sectors also provided written statements of their IT priorities as part of the process.

Members of the team have provided updates to stakeholders throughout the process, including presentations to the President’s cabinet, academic officers, Student Affairs managers, and Tech Partners.

**The Team**

The 16-member team listed below, representing all sectors of campus, conducted most of the planning activities. Other faculty, staff, administrators and students were involved in various activities.

<table>
<thead>
<tr>
<th>Student Affairs</th>
<th>Jesse Neidigh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic Affairs</td>
<td>Bonnie Allen</td>
</tr>
<tr>
<td></td>
<td>Tom Gallagher</td>
</tr>
<tr>
<td></td>
<td>Joel Henry</td>
</tr>
<tr>
<td></td>
<td>John Greer</td>
</tr>
<tr>
<td>Research and Sponsored Programs</td>
<td>Judy Fredenburg</td>
</tr>
<tr>
<td>Administration and Finance</td>
<td>Karen Moore</td>
</tr>
<tr>
<td>External Relations</td>
<td>Jennifer Sauer</td>
</tr>
<tr>
<td>UM Foundation</td>
<td>Art Held</td>
</tr>
<tr>
<td>Information Technology</td>
<td>Loey Knapp</td>
</tr>
<tr>
<td></td>
<td>John Thunstrom</td>
</tr>
<tr>
<td></td>
<td>Janet Sedgley</td>
</tr>
<tr>
<td></td>
<td>Tom Travis</td>
</tr>
<tr>
<td></td>
<td>Gordy Pace</td>
</tr>
<tr>
<td></td>
<td>Tony Jablonski</td>
</tr>
</tbody>
</table>

In addition to the UM team, consultants were brought on board to assess the draft plan and make recommendations against a number of proposals for organization, governance, and funding. Rather than employ a single consultant for a long period of time, the team decided to employ three consultants, all with a unique perspective on Information Technology, for a much shorter period. Central IT selected a
consultant with a strong background in IT strategic planning. Academic Affairs recommended a consultant with expertise in academic and research computing. The third consultant, selected by representatives from Student Affairs, A&F, and the president’s office, has a background in financial and administrative computing.

The Timeline

<table>
<thead>
<tr>
<th>Plan Components</th>
<th>2011</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>J A S O N D J F M A M J</td>
<td></td>
</tr>
<tr>
<td>Team Formation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SWOT Analyses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Trends</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Maps</td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Mission &amp; Vision</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Review Process</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Campus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Consultants</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Final Plan Document</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Current Situation

Trends and expectations
Technology trends unfolding beyond the borders of campus increasingly shape—and raise—expectations of students, prospective students, faculty, staff and other stakeholders of the University.

Today, we expect technology services to be available at all times, at high speed, wherever we are and accessible on a multitude of platforms and devices, all synched together of course. This expectation challenges IT organizations to provide a reliable technology infrastructure and support services around the clock.

The pace of technological change is staggering, and there’s little to suggest that it will slow down. Big, complex organizations like universities struggle to adapt. Even the most adaptable organizations have a difficult time knowing what the future holds. As Apple’s Steve Jobs once said, “You can’t just ask customers what they want and then try to give them that. By the time you get it built, they’ll want something new.” To survive, IT organizations have to become more strategic, more agile and more innovative.

As technology advances, so does the volume of information we must manage. Eric Schmidt, former CEO of Google, estimates that every two days, Earthlings produce as much information as was produced by all of mankind for the 20,000 years leading up to 2003. This impacts the University in many ways. Research projects generate massive amounts of data that must be transferred and stored securely. Students, faculty and staff are inundated with messages from email, social media and other electronic systems, challenging the University’s ability to communicate effectively.

The web has been the catalyst in all of this. As entrepreneur and best selling author Seth Godin points out, “the web changes everything it touches.” The web has disaggregated and disrupted the music, publishing, journalism, software and travel industries to name a few. Higher education will not be spared. Web-inspired transformations will continue to challenge centuries-old traditions of teaching and learning and the model of conferring college degrees based on time spent in a classroom.

The web has changed how we expect service to be delivered as well. Our students will become increasingly frustrated by the challenges of navigating a complex organization that operates in bureaucratic silos. Technology makes it possible to deliver services to users based on unique individual roles, desires and limitations rather than forcing users to conform in mass to organizational structures and bureaucracy. We need to focus on integrating our systems and simplifying our processes across departmental boundaries to meet students’ service expectations.
SWOT Analysis

<table>
<thead>
<tr>
<th>POSITIVE</th>
<th>NEGATIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strengths</strong></td>
<td><strong>Weaknesses</strong></td>
</tr>
<tr>
<td>Customer service / support</td>
<td>Staffing levels</td>
</tr>
<tr>
<td>Flexibility</td>
<td>Funding model for IT</td>
</tr>
<tr>
<td>Dedicated, enthusiastic staff</td>
<td>Lack of strategic planning</td>
</tr>
<tr>
<td>Web development services</td>
<td>Lack of service level agreements</td>
</tr>
<tr>
<td></td>
<td>Lack of standard operating procedures</td>
</tr>
<tr>
<td></td>
<td>Central/distributed IT not coordinated</td>
</tr>
<tr>
<td></td>
<td>Inconsistent departmental websites</td>
</tr>
<tr>
<td></td>
<td>Technology training / orientation</td>
</tr>
<tr>
<td></td>
<td>Bureaucracy</td>
</tr>
<tr>
<td></td>
<td>Communication</td>
</tr>
<tr>
<td><strong>Opportunities</strong></td>
<td><strong>Threats</strong></td>
</tr>
<tr>
<td>Economies of scale</td>
<td>Hostile security environment</td>
</tr>
<tr>
<td>Cloud computing</td>
<td>Accelerated expectations vs. capacity</td>
</tr>
<tr>
<td>Integration of systems</td>
<td>Inconsistencies in keeping up</td>
</tr>
<tr>
<td>Wireless</td>
<td>Funding levels and priorities</td>
</tr>
<tr>
<td></td>
<td>More devices to support</td>
</tr>
</tbody>
</table>

**Process**

IT conducted three sessions in September and October 2011 to explore strengths, weaknesses, opportunities and threats related to campus information technology services, central and distributed. Rick Curtis from the Curry Health Center moderated a student session. Bill Muse from the Office of Budget and Planning led two SWOT sessions with faculty staff and administrators. A full list of participants and notes are included in the appendix.

In addition to the three campus sessions, a member of the strategic planning group met individually with deans, directors and IT personnel from 23 colleges, schools and departments representing all sectors of campus. The meetings were meant to inform key decision-makers about the strategic planning process and encourage them to conduct a SWOT analysis with their own stakeholders as part of the process. IT received formal feedback from the College of Arts & Sciences and the UM Foundation. Central IT managers also engaged in a SWOT process. The notes from all of those sessions are included in the appendix.
Findings

Strengths

- Employees gave high marks to IT support staff across campus for their expertise, dedication, flexibility and the quality of service they provided.

- The reliability of the campus network and enterprise systems was seen as a strength.

- Students praised the availability of computers and said it was easy to find help.

- Students specifically highlighted library services and some online services like Academic Planner, OneStop and Moodle as strengths.

- The UM Foundation and the College of Arts and Sciences noted improvements in communication and relationships between central IT and distributed IT staff.

Weaknesses

The discussion of IT weaknesses among employees focused primarily on four areas: 1) funding and staffing levels, 2) policies and processes, 3) IT support and 4) strategic planning.

- Participants agreed that a lack of depth in technical staff was cause for concern. There was also acknowledgement that lack of funding for IT was a concern, but perhaps more concerning was a central IT funding model based on largely on telephone and network port charges. Funding levels and stability also create recruitment and retention issues for technical staff.

- Both groups spent considerable time discussing weaknesses related to coordination of central and distributed IT services. The groups pointed to lack of Service Level Agreements (SLAs), lack of standard operating procedures, lack of governance and poor communication as significant weaknesses.

- Lack of effective governance and coordination is tied to IT service delivery and support weaknesses. The groups identified inconsistency, bureaucracy and inefficient business processes as weaknesses.

- A fourth area of concern was IT strategic planning. Employees expressed concerns about lack of structure and transparency in planning and decision-making.

- Students expressed frustration with inconsistencies in the quality of campus websites, and inconsistencies in technology in computer labs and classrooms. They said that many campus web systems are not user-friendly and are not integrated with each other. And they listed a lack of wireless network coverage in some areas as a significant weakness.

Opportunities and Threats

While internal strengths and weaknesses were relatively easy for students and employees to identify, the groups had more difficulty envisioning external opportunities and threats.

- Employees identified opportunities for improving efficiency and reducing costs through economies of scale, collaboration and cloud computing. Employees and students both listed expansion of wireless network access as an opportunity.
The most significant threat envisioned by faculty, staff and administrators was the challenge of balancing the University’s technology capacity with rapidly rising expectations. The groups also listed security challenges, legal mandates and economic conditions as threats.

Students recognized that growing demand for technology creates a threat. They suggested that the rapidly growing range of mobile devices might create a threat to the quality of support. Students also recognized the strain that growing technology demands would place on the University, expressing concerns about budget priorities. Finally, students identified concerns about access to technology in cases of emergencies.
Vision

The University of Montana’s vision for Information Technology, as outlined by President Engstrom and his cabinet, has three components:

1) We have an immediate and urgent need to establish and maintain basic service levels for infrastructure and support across our campuses. Reliable, coherent connectivity and access will be available to all students, faculty and staff. Infrastructure will be solid, with the network, servers, workstations, software, and security all functioning together to deliver a strong computing and communications environment. IT governance and funding will focus on ensuring the core infrastructure is kept current and vibrant.

2) In the mid-term we will develop our IT capabilities to make them a strategic tool in meeting the primary campus goals and objectives. A robust computing environment will be built, based upon customer focused processes, redundant networks, and a professionally staffed and managed tier two data center. UM will be competitive amongst its peers, implementing up-to-date information systems, technology and related training and support services. Priorities include the development of a long-term strategy for deploying emerging educational technologies and supporting the research community. New governance and funding structures will be developed, facilitating long-term alignment with evolving campus needs and maintaining technological continuity.

3) In the mid- and long-term we will build upon our core infrastructure to support and expand UM Programs of Distinction that require advanced computational resources and facilities. Support includes the development of state-of-the-art, shared facilities, helping to attract and establish new programs by providing access to in-house expertise, and including these Programs of Distinction in the development of long-term IT plans that promote their growth and success.

This section of the IT strategic plan was updated April 4, 2012.
**IT Maps**

A strategic plan looks forward to new goals and strategies, but it is helpful to understand the current situation before planning the future. The ‘IT maps’ are a reflection of the current state of IT on the UM campus, broken down by service layer. A model for the breakdown of service layers within IT is shown in the figure below. This excerpt from the University of Wisconsin/Cornell University model shows the percentage of each service layer that is typically managed centrally, in a shared governance structure between central and distributed IT, and in a totally distributed manner. The primary use for this model was to determine the service layers that would be mapped by the strategic planning committee.

Gold: Services that can be leverage through standardization and collaboration, some more centralized than others  
Maroon: Edge Services that are unique to departments

Not all of the layers have been mapped at the time of this report but it is expected that this activity will continue over time in order to understand the full IT commitment on campus. The layers that have been addressed are:

- Personnel  
- Network; wired and wireless  
- Data centers  
- Servers  
- Enterprise applications
• Computer labs
• Classrooms
• Help desks

The IT strategic planning committee worked with the campus sectors to identify their IT resources by service layer. All of the information collected was self-reported by the sector and may be underreported if organizations were not asked or did not respond to the committee’s survey.

The abbreviations in the IT Maps refer to the following sectors:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>AA</td>
<td>Academic Affairs</td>
</tr>
<tr>
<td>A&amp;F</td>
<td>Administration and Finance</td>
</tr>
<tr>
<td>SA</td>
<td>Student Affairs</td>
</tr>
<tr>
<td>R&amp;D</td>
<td>Office of Research and Sponsored Programs</td>
</tr>
<tr>
<td>IT</td>
<td>Central Information Technology organization</td>
</tr>
</tbody>
</table>

**IT Personnel**

Definition: IT personnel are those that are in some significant way associated with IT operations.

UM enterprise IT follows a distributed model with 50% of the IT personnel reporting to central IT. Academic Affairs has the next highest percentage of IT staff with 26% and the highest percentage of student IT workers. The Academic Affairs staff would include those that are associated with research computing activities as the Research and Development office only pertains to the Office for Research and Sponsored Programs.

*The President category includes Athletics, External Relations, UM Foundation, and the Alumni Office.

**Network**

**Wired**

The campus network is funded and managed entirely by central IT. The figure below shows the status of the campus building upgrade project, a project that has been underway for a number of years. The intent is to provide a minimum of 100mb to the desktop in all campus buildings.
The COT east is wired with 100 mb to the building and 100 mb to the desktop. The COT west is wired with 1.5 mb to the building and 10 mb shared to the desktop.

**Wireless**

Central IT also manages the wireless network and access on campus. The funding model for wireless, however, is distributed. In the last year buildings that were upgraded were also equipped with wireless coverage, funded by the building upgrade project. School/college or organizational requests for wireless are currently funded by the requesting party.
The COT east has partial wireless coverage and the COT west coverage is marginal.

**Data Centers**

Definition: a room or facility dedicated to servers.

The figure below shows the distribution of the twenty-three data centers on campus. The two largest facilities are managed by central IT and are located in the basements of the Social Science and Liberal Arts buildings.
Servers
The number of data centers does not clearly reflect the level of computing associated with each sector. The server count shown below indicates that Academic Affairs manages 45% of the servers but sixteen separate data centers versus central IT which manages 41% of the servers in three data centers. The size of the distributed data centers are therefore much smaller, and in some cases no larger than a big closet.

Servers for research computing are included in the Academic Affairs count as the Research servers are for the Office of Research and Sponsored Programs.
**Enterprise Applications**

Definition: software that is cross-departmental, large in scale, and vital to the operations of the university or of a smaller scale but tied to UM’s ERP, Banner.

Enterprise applications are purchased and managed by all sectors on campus as shown in Figure X below. The most far-reaching system is Banner with its human resources, financial, and student data. Banner is managed by central IT and overseen by a campus-wide advisory group, ModSquad. IT also manages the campus directories which provide authentication and authorization services for nearly all applications. Besides the systems shown on Figure X, there are numerous sector-specific applications.

There are three exchange systems on campus, one run by central IT with the majority of the users, and two run by Academic Affairs personnel in the School of Business Administration and the College of Forestry and Conservation. A wide variety of email clients are used on campus with Outlook being the most prevalent.

Central IT has implemented the Central Authentication Server (CAS) software for single sign-on. At this time the majority of the systems used by students are accessed through CAS including CyberBear (self-service interface to Banner), Moodle, UMConnect (Live@Edu), Academic Planner, wireless, electronic library resources, and others. Employee systems are partially accessed through CAS and efforts are underway to ‘casify’ more systems where appropriate.

Off-the-shelf application software which is used by most sectors, such as Adobe Creative Suite, Microsoft Office Suite, SPSS, ESRI GIS software, and others are purchased and managed in different ways. Adobe products are purchased on an individual departmental basis, Central IT purchases and distribute MS products, SPSS is managed by the College of Arts and Sciences, and ESRI products are purchased and distributed by the College of Forestry and Conservation.

At this time there is no acquisition oversight by either central IT or a campus governance group.
Computer Labs
Definition: a room with computers dedicated to academic purposes

Academic Affairs manages the majority of the computer labs with a total of sixty-five labs housing 1,357 computers. The majority of the AA labs are dedicated to specific subject areas with the exception of the library computer lab which is open to all students. Central IT manages three large labs, only one of which is truly open to students at all hours. The IT lab in Liberal Arts is fully scheduled for teaching and the smaller IT labs in Fine Arts is dedicated to that department. Student Affairs manages several small labs in the various residence halls. Not included in the number below is the new computer lab at the
Bitterroot College Program facility in Hamilton, currently managed by the BCP staff but supported by central IT.

A recent review of the campus computer labs was conducted by a joint employee-student committee, who published their findings in November, 2011. The committee surveyed over 1,000 students in order to understand their satisfaction with computer labs on campus as well as their concerns. The full report can be found in Appendix E, but in summary the committee reported the following:

- The communication about computer lab services on campus is lacking or confusing
- There is an expectation of the student user that the quality of the labs should be consistent
- The mixed purpose labs cause confusion for users in determining availability

Overall students report a 56% level of satisfaction with lab hours and 40% level of satisfaction with software access.

What has yet to be studied is the level of support, both financial and staff, that is associated with each lab. While it is clear from the lab survey that there is inconsistency across the labs, it is less clear whether this could be addressed through more collaborative management or whether additional resources are required.

**Classroom Technology**

The campus adopted a classroom technology project in 2009 to upgrade or install new, standard technology in classrooms. It is expected that all classrooms, other than those managed by non-participating schools/colleges, will be completed by 2015.
Equipment replacement is an explicit part of the funding model so the classrooms will continue to be upgraded over time. This model, which provides central funds but distributed, collaborative oversight and implementation, has been very successful. At this time 64 classrooms are equipped with the standard technology suite with two more to be completed by the end of 2012.

![Classroom Upgrades](image)

**Helpdesks**
Definition: a place that provides IT support and services.

Eight helpdesks have been identified on campus but the nature of these facilities has not been clearly identified. The Central IT helpdesk provides a broad range of services to students and employees while others may be limited to specific services or applications such as Moodle. Additional work is required to establish the suite of services provided by each facility.
Desktop Support
Definition: IT personnel that provide individualized services at the requester’s place of work

Desktop support has not been explicitly mapped in the sense of identifying specific resources dedicated to that activity. Central IT has recently offered a desktop support model through which any requesting party can pay for yearly desktop support. At this time ORSP and the provost’s office are taking advantage of the new support model. Other than this small, centralized offering, desktop support is widely distributed with a wide range of support levels. It is suspected, but not documented, that many departments have little or no consistent desktop support.
Major Issues
Over the past decade Information Technology organizations on the UM campus have made steady progress and have managed to maintain a satisfactory level of service despite limited resources. Significant improvements have occurred in the area of external networking, web applications, consolidated funding for IT Utilities, and system standardization across affiliate campuses. However, much remains to be done. This section outlines the major issues that are confronting the campus and which drive the prioritization of goals, strategies, and actions.

Infrastructure
Funding for IT across the UM campus provides for steady state operations and maintenance, perhaps not at the level desired and not consistently across sectors, but with some success. However, that funding does not cover major upgrades that must occur to ensure the IT infrastructure can support 24/7 operations with minimal downtime.

Portions of the central IT infrastructure are now past the vulnerable stage and well into the risk stage, posing a threat to business continuity and the security of UM intellectual property. There are also significant inefficiencies associated with the use and maintenance of out-of-date environments and equipment. The primary areas of concern are the central IT data centers in Social Science and Liberal Arts and the core network.

Data Centers
Data centers, facilities which are specifically designed to house servers, network equipment, and storage devices, are the hub of information technology activity that impacts the work and study life of every campus constituent. Depending on the level and redundancy of power, network connectivity, cooling, environmental controls, and security, data centers are rated as Tier 1 through Tier 4.

With more than 15,000 students and 2,500 employees, The University of Montana should be housing core servers, campus network equipment, and critical data in a Tier 2 facility. Instead the two central IT
data centers are rated less than a Tier 1, putting the university at serious risk of business continuity failure and wasting resources, both energy and human, in maintaining the facilities.

**Significantly below Tier 1**

- Highly susceptible to disruptions
- Single path for power
- No redundant components
- Placed in vulnerable locations (basements)

Some of the problems associated with the central IT data centers are the lack of redundant cooling capabilities, power, and dual fiber connections, the lack of security, and inadequate environmental controls. High pressure water lines and sewer lines are in close proximity to expensive, core servers.

Compounding the data center problems at UM is the fact that there are 21 additional data centers on campus, maintained by distributed IT personnel. Each of these centers requires space, energy, and dedicated personnel. Resource sharing, in terms of data archival, virtualized servers, and systems administration, is currently not part of the enterprise IT culture at UM.

**Network**

A major network project over the past several years has been the implementation of the Northern Tier network from Seattle to Chicago. The Northern Tier, with its 10gb bandwidth across the state of Montana, provides high-speed connectivity from UM to other campuses, both nationally and internationally. This very successful project has shown network leadership at the national level.
The issue that the campus faces is that the core campus network capabilities are not adequate to take advantage of the Northern Tier to the fullest extent possible. In 2011 nearly 20 buildings had network speeds of 10-100mb and all campus network traffic is currently constrained by a 5gb firewall. The campus has an ongoing building upgrade project funded at a rate of $200K per year but progress is slow as each building upgrade is costing $100K or more. Funding for core network upgrades such as the replacement of core switches and a new firewall is virtually nonexistent. Central IT funding covers operational costs but significant capital expenses are problematic and often delayed beyond the equipment’s expected lifespan.
IT Culture and Management

Two major objectives of the IT strategic planning process are to examine the role of IT on campus and to determine ways in which IT can be better organized, advised, and funded. With the infusion of technology in all aspects of campus life and with the rapid change in the availability of tools and services, it is clear that IT can play a stronger role on campus, partnering with the various sectors to understand and implement appropriate technology. The questions for IT at UM are whether and when to move towards a stronger leadership role. With increasing financial and competitive pressures, we must investigate ways to improve the decision-making process to avoid redundancy and, where possible, share resources across the enterprise. Organizational and governance structures are at the heart of this issue and must be addressed in the IT plan.

Culture

While there are exceptions, Information Technology on the UM campus has not reached beyond the level of a service center into the role of true partnership with the academic, research, or student life sectors. The SWOT exercise indicates that, even at the service center level, enterprise IT must make significant improvements to ensure efficiency, reliability, and consistency of service.
From a service delivery perspective, IT processes and procedures err on the side of ad hoc versus formal and group-specific versus standardized. Service level agreements are beginning to be put in place but are not the norm. Multiple problem tracking systems are in use and communication with customers is not consistent. Systems for tracking servers, network equipment, and other assets along with their status are not in place. Finally, collaborative working groups involving staff across enterprise IT are in their infancy. Trust between the various IT groups must be built over time to foster these emerging working groups.

Traditionally, though again with exceptions, the culture of IT on the UM campus has been one of service rather than leadership. While partnerships between other sectors, e.g. Academic Affairs and Student Affairs, are commonplace, collaborative projects between other sectors and central IT are occasional. For IT to become a true partner, contributing the full potential of technology in support of institutional goals, a culture shift will is required at all levels, from staff to management.

Organization
The organization of IT at UM is not very different from peer institutions. According to the Educause 2011 Core Data Service Report, 56 percent of IT resources report to a central IT organization while at UM that number is 50 percent. The organizational issue at UM has less to do with central versus distributed than with a clear, logical allocation of functionality to the various groups. For example, central IT continues to manage two academic labs and one open lab while Academic Affairs manages sixty five academic labs. Another example is the number of data centers on campus. Many higher education IT organizations offer centralized, secure facilities and services to campus constituents, but UM data centers operate on a very distributed model. Ownership of resources and responsibilities has been more a function of events than informed decision-making.
**Governance**

As important as organization, the IT governance structure of a campus aids in the prioritization of resources and can lead to a more collaborative, as well as potentially more efficient, approach to IT decision-making. IT advisory groups, tasked to view IT from a campus perspective, can help balance the ‘have’ and ‘have-not’ environment associated with a silo approach to technology.

Currently the IT governance structure at UM is limited. The academic, administrative, and identity advisory committees have not met for several years and the IT Advisory Council has been folded into the regularly scheduled cabinet meetings. There is a serious need for a robust IT governance structure, one that is more comprehensive in scope and more collaborative in terms of enterprise IT involvement.

**Funding**

While a broad review of enterprise IT funding could be valuable, the most pressing requirement is a reassessment of the means by which central IT is funded. The current model for funding central IT activities beyond certain state salary funds is campus chargebacks for telephone and network services. In particular, the port charge is an irritant on campus. To avoid a port charge, departments are opting for wireless service which is cheaper but provides far less bandwidth on a per person basis — often insufficient for departmental needs. With intent to maximize network resources, so critical to today’s work environment, a funding structure that results in better decision-making should be found.

**Academic and Research Computing**

While there are strong pockets of IT resources in the academic and research community, there has been minimal emphasis on a cohesive approach to academic and research computing. Central IT has provided some support to individual schools/colleges upon request and has worked to provide applications such as the Academic Planner and OneStop for students, but a comprehensive technology plan for teaching and learning is nonexistent. Academic Affairs has had limited input into the development and deployment of central enterprise systems such as Banner and the modules therein. Schools and colleges, by necessity, have hired IT staff, implemented data centers, and built academic computing labs to meet local needs, with success relative to the amount of funding allocated. The largest issue with this approach is the lack of a formal Academic IT structure that has resulted in their inability to have a body that can work with Central IT to prioritize directions and needs. However, there are other issues with the current approach. Inconsistency relative to student computing leads to confusion on the part of students as to what is available and where. Funding for academic computer labs and student staffing is based on a Student Computer Fee that does not take into account technological needs but simply size of a college. Software licensing for widely used packages like the Adobe suite is purchased in a piecemeal fashion leading to higher prices and inefficient distribution.

Resources for research computing are controlled entirely by the research organizations. With a lack of centralized IT support it is understandable that well-funded research groups would develop their own computing environments. However, the result of a totally decentralized approach to research computing is a dearth of resources for new and less well-funded research activities. Discussions
regarding research computing requirements, the need for secure computing facilities, and the potential for shared use of high performance servers and data archival facilities could result in a consolidated quest for the requisite resources.

**Enterprise Computing Systems**

There are several issues associated with enterprise computing systems at UM. The first is the lack of governance. The second is the lack of a standard interface to Banner—UM’s enterprise resource planning (ERP) system. And the third is the degree to which Banner has been modified, leading to an enormous ongoing investment in UM-specific code.

The purchase and management of enterprise applications is widely distributed at UM with the various sectors taking responsibility for systems most pertinent to their area. While there may be inefficiencies associated with the provision of support for each of these systems across the campus, the primary issue is the lack of a campus-wide enterprise application advisory group. The purpose of such a group would be to ensure that each proposed application met certain criteria relating to security, identity management, and Banner integration and to prevent application redundancy. For example, the campus is currently supporting twelve room scheduling systems, four email systems, and multiple reporting systems, all of which could be consolidated to free up support resources across the sectors. Without cohesive oversight there is little/no short or long term planning for the enterprise as a whole. As an example of a short term issue, central IT has no sign-off on the purchase of systems but is often expected to provide both identity management and Banner integration services without prior knowledge of the coming workload. From a long term perspective, there is no clear campus direction in terms of the procurement or implementation of application functionality which in turn enforces the sector approach to the fulfillment of requirements.

Over time, with the implementation of numerous systems that require an interface to Banner, multiple approaches to that interface have been developed. As systems are upgraded, the individual interfaces must be maintained. There is a need to assess whether a standardized, service oriented architecture, could be developed.
The third issue relative to enterprise computing systems is the degree to which the UM Banner system has been modified over the last twenty years. Early on these modifications were required to provide the functionality desired by the campus but the practice of adding code rather than adapting business practices has resulted in a system that is far from baseline. A large department is required to maintain these modifications as the system moves through version upgrades and transitions in operating systems. Moving to a baseline system would free up resources to be used to support the increasingly complex array of enterprise systems on campus.

**Online Student Resources**

A major student complaint is the requirement to navigate a myriad of systems to accomplish their needs as they move through their academic careers. An attempt has been made to solve this in part through a single sign-on process. As many systems as possible are now accessed through the central authentication service (CAS) which allows the student to utilize one set of credentials for all of the functionality under that umbrella. That now includes the LMS (Moodle), email (Live@Edu), campus notifications (OneStop), course planning (Academic Planner), registration and payment (CyberBear), online library resources and wireless access.

The issue is that student requirements have not been analyzed from a broad perspective to ensure that appropriate functionality is being provided at all points of their career. While the applications that are available have been chosen or built with concern for functionality and usability, there is little cross system integration and no clear roadmap for the student to follow. Most of the systems have not been designed or adapted to take advantage of mobile devices, of increasing importance to students. Finally, from an IT perspective, there is no established architecture against which to evaluate new systems.

The figures below gives a pictorial view of the confusion students face and a vision of an ordered, comprehensive approach to student systems.
Strategic Goals

1. Information Technology Infrastructure in support of University Strategic Goals

   a. Work toward building a modern data center and providing data services that support campus units and the strategic goals of the University.

   b. Develop and improve core network infrastructure including connections to affiliate and satellite campuses and pervasive wireless connectivity in support of a dynamic learning environment.

   c. Refine and expand systems and services to provide a robust and secure IT environment.

   d. Investigate cloud computing and hosted services initiatives and implement these technologies where appropriate.

   e. Meet ADA standards and campus policies for technology accessibility.

   f. Provide identity management services in support of a campus and system-wide unified identity for students, faculty and staff.
2. IT Enterprise: Structure, Governance & Funding

a. Create an enterprise-wide IT organizational structure that provides clear authority and responsibility. Integrate IT leadership and planning across the University into a consolidated decision making process that respects control of individual core activities while centralizing and standardizing the governance, funding, management and delivery of routine, commodity and enterprise-wide functions.

b. Structure IT governance to unify planning, eliminate duplication, and coordinate budgeting, while allocating global resources across all segments of the campus population.

c. Build an IT funding model that maximizes efficiency and sustainability and integrates funding decisions with enterprise strategic planning.

d. Develop IT policies that meet both short term needs to conduct business successfully and provide a framework and support for the development of essential efficiencies and infrastructure consolidation and improvement.
3. IT for Teaching, Learning and Research

   a. Involving Academic Affairs and Research work to develop a vision for academic and research computing, build out infrastructure and partnerships to enable education for the global century.

   b. Involving sector expertise work to assess current technology offerings to students and identify technological barriers to student academic success. Collaborate and partner with sectors to explore and evaluate innovative ideas related to new learning spaces.

   c. Partner with Academic Affairs to assess support structures and needs for emerging educational technology, student and instructor technology literacy, and application accessibility & consistency.
4. IT for Institutional Administration, Decision Making, and Innovation

a. Align enterprise computing systems with University and MUS strategic goals and policies.

b. Implement IT service delivery processes to achieve broad understanding of IT responsibilities and service levels while maximizing the customer service experience.

c. Collaborate with Business Services to achieve IT operating and purchasing efficiencies through economies of scale.

d. Align electronic business processes to maximize investments in enterprise level software and human resource capital.

e. Provide a robust data warehouse and reporting/data analysis toolset to aid in assessment activities in support of strategic goals.

f. Establish a multi-campus approach to computing systems to ensure strategic alignment and to provide bulk purchasing opportunities.
5. IT to Enhance the Student Experience

a. Involving student focus groups, assess current technology offerings to students, identify gaps in technology offerings on campus. Study and predict the expectations of future students and cutting edge technologies.

b. Guided by the results of this research, UM will take steps, such as allocating funds and prioritizing projects, to meet the expectations and ensure accessibility to all students. The transparency of this process is critical to its success.
Appendix A: Efficiency in Information Technology

A small group met to discuss the ways in which the current IT structure on campus creates inefficiencies. The following tables reflect their findings.

<table>
<thead>
<tr>
<th>IT Inefficiency Across Campus</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redundant Services</td>
<td>Maintaining multiple reporting systems, data warehouses, email, event/room scheduling, SSL cert acquisition.</td>
</tr>
<tr>
<td>Duplication of effort - developing the same systems</td>
<td>Multiple IT groups developing the same product because there was no communication between the groups.</td>
</tr>
<tr>
<td>Inconsistent computer lab software</td>
<td>The computer labs have inconsistent software so students have to locate a computer lab with open hours and the correct software set.</td>
</tr>
<tr>
<td>Maintaining multiple security systems</td>
<td>Third party software that does not authenticate against CAS causing staff to maintain security in multiple places.</td>
</tr>
<tr>
<td>Software security restrictions</td>
<td>Qualified staff not having access to software due to the lack of compartmentalized security to software.</td>
</tr>
<tr>
<td>Lack of sharing code</td>
<td>Qualified staff not being able to look at code from other departments.</td>
</tr>
<tr>
<td>Wasted time passing along code to other departments</td>
<td>Lack of low priority projects getting accomplished because they get postponed because of high priority projects.</td>
</tr>
<tr>
<td>Wasted time relearning projects that have been postponed</td>
<td>No university wide project prioritization process, No official governance group.</td>
</tr>
<tr>
<td>Running security requests through multiple people</td>
<td>Security is approved by the departments but maintained by DBAs.</td>
</tr>
<tr>
<td>Running people around</td>
<td>Departmentalization run around - because of unwillingness to satisfy customer service and lack of communication.</td>
</tr>
<tr>
<td>Projects being developed without all departmental input</td>
<td>No formal way of developing projects with seeking input from all departments creating wasted time redeveloping when products don't meet needs.</td>
</tr>
<tr>
<td>Lack of sharing e-commerce software development</td>
<td>Separate campus unites creating &quot;shopping-carts&quot; for e-commerce.</td>
</tr>
<tr>
<td>Inconsistent work request tracking processes and standards</td>
<td>No common system for capturing, tracking, closing and reporting on IT work requests; No way for requestor to get update on progress; no notification of delays.</td>
</tr>
<tr>
<td>Limiting resources and inefficient projects</td>
<td>Management resources or oversight for large and/or multi-unit projects.</td>
</tr>
<tr>
<td>Inefficient projects because of closed decision making</td>
<td>Teams seldom welcome suggestions or discussion of alternative approaches from outsiders. Limiting discussion of existing policies or practices.</td>
</tr>
<tr>
<td>Wasted time researching projects</td>
<td>Incomplete documentation of software, errors, and modifications.</td>
</tr>
<tr>
<td>Wasted time researching limited documentation</td>
<td>Lack of enforcement of standards so documentation is consistent.</td>
</tr>
<tr>
<td>Wasted time tracking down people to escalate a problem</td>
<td>No formal process for escalating a technical problem.</td>
</tr>
<tr>
<td>Utilization of inefficient technology</td>
<td>No review process of current technology.</td>
</tr>
<tr>
<td>Inefficiencies in IT not being resolved</td>
<td>No current method of assessing or reporting inefficiencies.</td>
</tr>
<tr>
<td>#</td>
<td>IT Inefficiency Across Campus</td>
</tr>
<tr>
<td>----</td>
<td>-------------------------------------------------------------------</td>
</tr>
<tr>
<td>1</td>
<td>Convoluted permission change process</td>
</tr>
<tr>
<td>2</td>
<td>Wasted staff time</td>
</tr>
<tr>
<td>3</td>
<td>Unable to find necessary resources</td>
</tr>
<tr>
<td>4</td>
<td>No published security/privacy standards</td>
</tr>
<tr>
<td>5</td>
<td>Wasted time dealing with waste paper</td>
</tr>
<tr>
<td>6</td>
<td>Wasted time for server restoration when power goes out</td>
</tr>
<tr>
<td>7</td>
<td>Wasted time for university students and guests finding web access</td>
</tr>
<tr>
<td>8</td>
<td>Inability to efficiently determine services that are available</td>
</tr>
<tr>
<td>9</td>
<td>Unresponsiveness to departmental email needs</td>
</tr>
<tr>
<td>10</td>
<td>Unresponsiveness to departmental courseware needs</td>
</tr>
</tbody>
</table>
### Campus wide IT ORGANIZATION

<table>
<thead>
<tr>
<th>#</th>
<th>IT Inefficiency Across Campus</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Departmental Fragmentation</td>
<td>Qualified staff not having access to data because they do not work for a specific department</td>
</tr>
<tr>
<td>2</td>
<td>Lack of consistent training</td>
<td>IT staff utilizing inefficient techniques of developing programs due to lack of knowledge of more efficient techniques</td>
</tr>
<tr>
<td>3</td>
<td>Lack of staff backup support and cross training</td>
<td>IT projects being held up or stopped because of loss of staff or project expert</td>
</tr>
<tr>
<td>4</td>
<td>Help desk not supporting departments</td>
<td>Help desks refusing to not help because they don’t support that area so end-users must search for another help desk</td>
</tr>
<tr>
<td>5</td>
<td>Solving problems that have already been solved by others</td>
<td>No formal sharing of knowledge on how to solve problems</td>
</tr>
<tr>
<td>6</td>
<td>Time wasted researching service disruptions</td>
<td>No formal process for contacting distributed IT staff of service interruptions.</td>
</tr>
<tr>
<td>7</td>
<td>Inefficient purchasing of IT related services</td>
<td>Lack of pooled purchasing for IT services such as GoToMeeting, data plans, hardware and software, hardware recycling</td>
</tr>
<tr>
<td>8</td>
<td>Not cooperative in assisting units with IT infrastructure</td>
<td>Obstructs some kinds of installations, not familiar with riser diagrams, delays giving permissions for unreasonably long periods of time</td>
</tr>
<tr>
<td>9</td>
<td>Multiple data centers</td>
<td>Operating 23 data centers across campus is highly inefficient, costly for the university, state, taxpayers and the environment.</td>
</tr>
<tr>
<td>10</td>
<td>No help desk expertise listing</td>
<td>Students have to go to multiple help desks to find the experts in the area</td>
</tr>
<tr>
<td>11</td>
<td>Lack of on campus training</td>
<td>Lack of campus wide training program at all levels</td>
</tr>
</tbody>
</table>

### Campus wide IT FUNDING

<table>
<thead>
<tr>
<th>#</th>
<th>IT Inefficiency Across Campus</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Inefficient use of technology and lack of innovation</td>
<td>Lack of resources and deluge of demands limits interest and ability to innovate and use existing hardware and infrastructure to its fullest extent.</td>
</tr>
<tr>
<td>2</td>
<td>Inefficient projects due to lack of access to experts</td>
<td>Core teams often have expertise that smaller units could use; but excessive demands make it impossible for experts to consult, assist, or advise.</td>
</tr>
<tr>
<td>3</td>
<td>Inefficient port charge funding and tracking</td>
<td>Tracking ports is challenging because of port turnover, ports are not utilized as much, end-users would prefer annual billing</td>
</tr>
</tbody>
</table>
Appendix B: Trends

Below are summaries of IT issues and trends from two respected higher education technology communities—Educause and the New Media Consortium—that address the most significant challenges facing higher education.

Educause top 10 IT issues

Educause is a nonprofit association that supports professional development, applied research, strategic policy advocacy, teaching and learning initiatives and more. The association publishes an annual list of the top 10 IT issues based on a survey of IT leaders. Here are results from the 2011 survey with supporting comments.

- **Funding IT**
  “The focus in the past has largely been on securing a stable and predictable level of funding. Although that remains a critical need, the IT leader now also needs to factor in the perspective of the campus community members and to show them the value of existing services and investments as well as the true cost of future decisions.”

- **Administrative/ERP/Information Systems**
  “Is the time right to disaggregate the monolithic ERP system and use best-of-breed solutions, especially those that may be offered in the "cloud" as Software as a Service (SaaS)? Is it time to change the focus from desktop access for administrative information to access via the ever-growing types of mobile devices?”

- **Teaching and Learning with Technology**
  “The perspective needs to encompass not only classroom technologies but also the ubiquitous use of instructional technologies to support the educational mission of the institution overall.”

- **Security**
  “Security poses a dualistic need for perspective. On the one hand, higher education institutions are increasingly seeking and securing cloud-based services to meet campus needs. On the other hand, the institutions are themselves cloud-based service providers—to the members of their own communities. This "man-in-the-middle" position requires IT leaders to understand the needs, the perspectives, of both consumers and providers.”

- **Mobile Technologies**
  “Mobile Technologies is the number one issue that IT leaders felt had the potential to become more significant. In the past, many viewed mobile technologies as a nonessential nuisance to the networking and user services groups. Now we all find ourselves struggling to meet the growing demands for wireless services on a multitude of mobile devices that are owned by individuals, not by the institution.”
• **Agility/Adaptability/Responsiveness**
  
  “IT leaders and the campus as a whole must realize that technological change demands flexibility and nimbleness. New technologies and new requests for services cannot and should not be perceived as detracting from the institutional mission. Rather, IT leaders need to remember that anticipating and responding to such change is a fundamental requirement of our organizations. We need to change our perspective to see how new technologies and services can enhance the services that are provided to or consumed by the campus community.”

• **Governance, Portfolio/Project Management**
  
  “All institutions need a strong IT governance model or "structure and process of authoritative decision making across issues that are significant for external as well as internal stakeholders."\(^5\) A mark of authoritative decisions is that they are well understood and widely accepted.\(^6\) As CIOs lead institutions toward good IT decision-making, they will need to both demonstrate excellent decision-making skills and support good decision-making throughout the organization. CIOs will need to engage partners and help them understand that the factors involved in an IT decision will not change much whether it is the CIO who makes a particular IT decision or someone else.”

• **Infrastructure/Cyberinfrastructure**
  
  “As services spread out to the cloud, and as institutions rely more on their internal networks for access to on-site and off-site services, campus IT connectivity and integration—that is, the infrastructure/cyberinfrastructure—continues to be of strategic importance. The connection to the Internet is used not just for access to external services unaffiliated with the institution but also for critical cloud-based campus services such as e-mail, learning management systems, ERP, and other administrative functions.”

• **Disaster Recovery / Business Continuity**
  
  “All campuses need to maintain or restore business and academic services when circumstances disrupt normal operations. Business continuity encompasses disaster recovery—the activities that restore the institution to an acceptable condition after a disaster—but also includes activities such as risk and impact assessment, prioritization of business processes, and restoring operations to a "new normal" after an event. The core of the concept is a collaborative and integrated approach in which every department understands and prepares for the role it will play in keeping the institution functional in a crisis and viable in the long run.”

• **Strategic Planning**
  
  “IT leaders understand that aligning resources to enable the IT organization to serve the campus mission and to support business needs is essential to demonstrating the value of information technology. Yet the strategic planning process—as well as the extent to which an institution adopts and executes strategic planning processes—is often outside the scope of the IT organization. As a result, the ability of IT leaders to leverage strategic planning processes is often a function of the campus culture.”
New Media Consortium

The New Media Consortium (NMC) is a community of experts in educational technology. Below are summaries from two NMC initiatives related to technology trends. The first is a list of 10 megatrends shaping educational technology formulated at a retreat of higher education IT leaders in January 2012. The second is a summary of emerging technologies from NMC’s 2012 New Horizon Report.

New Media Consortium “Megatrends” Shaping Educational Technology

- The world of work is increasingly global and increasingly collaborative. As more and more companies move to the global marketplace, it is common for work teams to span continents and time zones. Not only are teams geographically diverse, they are also culturally diverse.

- People expect to work, learn, socialize, and play whenever and wherever they want to. Increasingly, people own more than one device, using a computer, smartphone, tablet, and e-reader. People now expect a seamless experience across all their devices.

- The Internet is becoming a global mobile network — and already is at its edges. Mobithinking reports there are now more than 6 billion active cell phone accounts. 1.2 billion have mobile broadband as well, and 85% of new devices can access the mobile web.

- The technologies we use are increasingly cloud-based and delivered over utility networks, facilitating the rapid growth of online videos and rich media. Our current expectation is that the network has almost infinite capacity and is nearly free of cost. One hour of video footage is uploaded every second to YouTube; over 250 million photos are sent to Facebook every day.

- Openness — concepts like open content, open data, and open resources, along with notions of transparency and easy access to data and information — is moving from a trend to a value for much of the world. As authoritative sources lose their importance, there is need for more curation and other forms of validation to generate meaning in information and media.

- Legal notions of ownership and privacy lag behind the practices common in society. In an age where so much of our information, records, and digital content are in the cloud, and often clouds in other legal jurisdictions, the very concept of ownership is blurry.

- Real challenges of access, efficiency, and scale are redefining what we mean by quality and success. Access to learning in any form is a challenge in too many parts of the world, and efficiency in learning systems and institutions is increasingly an expectation of governments — but the need for solutions that scale often trumps them both. Innovations in these areas are increasingly coming from unexpected parts of the world, including India, China, and central Africa.

- The Internet is constantly challenging us to rethink learning and education, while refining our notion of literacy. Institutions must consider the unique value that each adds to a world in which information is everywhere. In such a world, sense-making and the ability to assess the credibility of information and media are paramount.
• There is a rise in informal learning as individual needs are redefining schools, universities, and training. Traditional authority is increasingly being challenged, not only politically and socially, but also in academia — and worldwide. As a result, credibility, validity, and control are all notions that are no longer givens when so much learning takes place outside school systems.

• Business models across the education ecosystem are changing. Libraries are deeply reimagining their missions; colleges and universities are struggling to reduce costs across the board. The educational ecosystem is shifting, and nowhere more so than in the world of publishing, where efforts to reimagine the book are having profound success, with implications that will touch every aspect of the learning enterprise.

New Horizon Report
The New Horizon Report examines emerging technologies and their potential to impact teaching, learning and creative inquiry. The project is a collaborative effort of the New Media Consortium and the Educause Learning Initiative. The 2012 New Horizon Report identifies six technologies to watch in the next five years.

Adoption within the next 12 months

• **Electronic books** continue to generate strong interest in the consumer sector and are increasingly available on campuses as well. Modern electronic readers support note-taking and research activities, and are beginning to augment these basic functions with new capabilities — from immersive experiences to support for social interaction — that are changing our perception of what it means to read.

• **Mobiles** enable ubiquitous access to information, social networks, tools for learning and productivity, and much more. Mobile devices continue to evolve, but it is the increased access to affordable and reliable networks that is driving this technology now. Mobiles are capable computing devices in their own right — and they are increasingly a user’s first choice for Internet access.

Adoption within 2-3 years

• **Augmented reality** refers to the layering of information over a view or representation of the normal world, offering users the ability to access place-based information in ways that are compellingly intuitive.

• **Game-based learning** has grown in recent years as research continues to demonstrate its effectiveness for learning for students of all ages.
Adoption within 4-5 years

- **Gesture-based computing** moves the control of computers from a mouse and keyboard to the motions of the body via new input devices.

- **Learning analytics** loosely joins a variety of data-gathering tools and analytic techniques to study student engagement, performance, and progress in practice, with the goal of using what is learned to revise curricula, teaching, and assessment in real time.
Appendix C: Swot Analysis

Campus IT SWOT analysis feedback

*September 23, 2011*

**Session 1 – 9 a.m.**

**Participants**

Robert Logan, Forestry/Davidson Honors College
Martin Horejsi, College of Education
Jonathan Crammett, College of Education
Tim Edwards, College of Health Professions & Biomedical Sciences
James Cramer, Law School
Karen Moore, Administration & Finance
Diane Norem, Administration and Finance
Peg Schalk, Facilities Services
Art Held, UM Foundation
Steven Van Grrinsven, Information Technology – EIS
John Greer, Mansfield Library
Danielle O’Leary, Alumni Office
Antony Jo, Student Affairs IT
Jessica Roberson, Student Affairs IT

**Strengths**

- Dedicated staff
- Customer service
- Technical expertise
- Reliability
  - Virtualization
  - Uptime/downtime
  - Communication
- Library system across campuses
- Flexibility

**Weaknesses**

- Staff
- Technical expertise
- Reliability
  - Email
  - Authentication (Central Authentication Services)
• Communication from central IT (source/coordination)
  • Banner downtime
  • Lack of Service Level Agreements (SLAs)
  • Identification taxonomy
  • Failover capability
  • Poor documentation of recovery protocols (central and decentralized)
  • Amount of distributed vs. centralized computing without adequate parameters and coordination (documentation)
  • Depth of staffing
  • Lack of strategic planning
  • Lack of physical storage
  • Video
  • Network capability no comprehensive
  • Bureaucracy
  • Forms
  • Paper processes
  • Lack of life-cycle planning
  • Funding model for IT on campus
  • IT staff salaries not competitive
  • Lack of transparent priority-setting mechanism

Opportunities

• Wireless technology
• Falling costs
• Cloud computing
• Virtualization
• Economies of scale
• Site licenses
• Affiliate campuses cooperation
  • Licenses
  • Leveraged support
  • Failover systems
  • Data
• Video capability

Threats

• Hostile security environment
• Economic meltdown
• Legal/governance environment
• Accelerated expectations
Session 2 – 10:30 a.m.

Participants

Jesse Neidigh, Student Affairs
Michael Braden, School of Pharmacy
Keith Kuhn, UM Foundation
Kent McGowan, Financial Aid/Enrollment Services
Larry Gianchetta, School of Business Administration
Stephen Kalm, College of Visual and Performing Arts
Judy Fredenberg, Office of the VP for Research and Development
Susan Harper-Whalen, College of Education
Loey Knapp, Information Technology
Robert Squires, School of Extended and Lifelong Learning/UMOnline

Strengths

• Student support
• Alumni / Foundation databases
• Enthusiastic desire to help/commitment
• Technical expertise in most institutional systems
• Flexibility / nimble response in distributed support
• Wired network speed/reliability
• Staff levels

Weaknesses

• Lack of staff / stability of funding
• Lack of consistency/coordination of student support
• Lack of Service Level Agreements (SLAs)
• Lack of timelines
• Lack of transparent mechanisms for setting priorities
• Deficiency in identifying/accessing assistance for specific systems
• Stability of workforce
• Funding model
• Security / governance / delegation
• Inconsistent support of new technologies
• Transparency / communication of policy
• Lack of structure for planning/decisions (“Doing things on purpose”)
• IT funding focus
• Lack of integration of IT with strategic directions of UM
• Highly customized enterprise system (Banner)

Opportunities
• Remote computing
• Collective purchasing power
• Collective computing power
• Cloud computing
• Presence of technology as a marketing/recruiting tool
• LMS / integration of systems
• Collaborative / contract external resources

Threats

• “Remote” support
• Cloud computing
• Technological capacity vs. rising expectations
• ID theft / security
• “Shiny” technologies

Student IT SWOT analysis feedback
October 10, 2011

Participants

Andrew Crompton
Adam Ormesher
Michael Callahan
Kristi Viereck
Kris Singer
Jenna Beck
Matt Haefner
Kristy Ernst
Ashley Ferro
Diego Baccino
Katherine Carlson

Strengths

• Centralized administration for users and computers – domain based
• Easy to find help
• Fairly wide wireless access on campus
• Fairly good access to computers
• E-resources at library – fairly good access to
  o Subscriptions
• **E-books**
• **Journals**
• **Online resources**
• **OneStop** – use a lot
• **Web based content reasonably current**
• **Online content easy to navigate**
  • **UM main website**
  • **Moodle**
  • **Blackboard**
  • **Academic Planner**
  • **Library**
• **Computer labs are good / fairly well budgeted**
• **CyberBear works reasonably well**
• **Academic planner works well / very visual / better than CyberBear**

**Weaknesses**

• Spotty uptime in residence halls networks
• Academic Planner is useful, but not always up to date and is completely separate from CyberBear
• Lack of wireless at Lewis & Clark
• Lack of wireless in all of residence life
• Scattered IT departments – lots of hoops to jump through to get things done
  • More than 8 different departments
  • Each academic department has its own support
• Departments host their own websites
  • Style doesn’t match from site to site
  • Difficult to enforce/implement standards
• Residence halls bandwidth is too small
• Technology in classrooms and labs inconsistent / software is variable
• Lack of centralized support to address issues
  • No central “ticket” system
  • Department workers don’t know who to call to resolve problems
• Bugs in logging into campus email. Once you log in, it’s hard to get out of system
• Spam – particularly from Business School (too many/too frequent messages)
• **Moodle is not user friendly**
  • Navigation – too much / cluttered
  • “a million” broken links
  • Sometimes faculty present too much info on Moodle at one time
  • Hate common area
• Initial campus anti-virus install was annoying/frustrating
  • Couldn’t contact anyone on the weekend
  • Renewal was difficult

**Opportunities**

• **Wi-Fi in residence halls**
• **Wi-Fi everywhere**
• Connect Academic Planner with CyberBear
  o Academic Planner needs to be up-to-date (hourly or live)
• Better individual control of email distribution lists
• More centralized, uniform IT
• More help, especially in dorms and off campus
• Advertise IT help opportunities
• Video training for users for more applications (i.e. Academic Planner, it’s great)
• Orientation on basics of everything by an IT person, not faculty
• Integrate all websites into umt.edu to simplify navigation and increase usability/consistency

Threats

• Web template use - Lack of rules / enforcement of rules
• Rising enrollment – more users, more complexity
• Rising tuition – limits opportunities
• More devices creates need for increased bandwidth, support, wireless
• Rapid technology advances makes it hard for University to stay current
  o Some departments advance, others do not
• Wireless – harder to secure student information
• Poor disaster recovery planning
  o Accessing during an emergency
• Money to fund IT – What gets cut?
  o Prioritization
  o Will people support new/increased fees for IT?
Appendix D: Central IT Mission, Vision and Core Values

The team tasked with determining Central IT’s Mission, Vision and Values recognized that the department’s mission and the corresponding vision which will provide focus in achieving that mission are both succinctly stated.

In turn, the team also recognized that the departmental values should provide a solid foundation to guide decision making as we execute the strategic plan.

Mission
To provide sound technology solutions for the University’s educational, research, administrative, and business needs

Vision
To create an agile and effective department capable of adapting quickly to the dynamic technology demands of our students, faculty and staff

Core Values

The bedrock of this foundation is *effectiveness*. IT values providing solutions that deliver measurable benefits to the campus community.

This base supports the three pillars of *agility, efficiency* and *innovation*. An agile department has the proper processes, procedures and personnel in place to quickly respond to the dynamic needs of both the academic and functional departments. Agility in turn requires efficiency to create the maximum output with economy of effort. While innovation provides the creativity and vision to build solutions that deliver value that exceeds expectations.

The capstone of this value foundation is *collaboration*. IT recognizes that collaboration is essential to providing effective and unique solutions to a diverse range of campus needs.
Appendix E: Excerpts from the Lab Committee Report

Committee Charge

The initial charge of this committee was to oversee a pilot for a cloud computing lab which would provide UM campus constituents 24/7 access to software on both lab and personally-owned computers. Discussions with IBM and a proposal from that company for a hardware environment and the front-end scheduling software required to access application software via the web showed promise and led to the concept of a pilot to test this approach to licensing and utilizing software such as Microsoft Office, Adobe Creative Suite, SPSS, and others. In fact, the interest in the Student Computer Fee Committee was so high that funds had been allocated to help fund this pilot initiative. However, research into the cost of licensing applications on a virtual server for concurrent use by campus constituents, regardless of user computer ownership, showed that most companies are not prepared to offer cost-effective licenses in a virtual environment. Specifically, the issue with some software vendors is that software hosted on a UM server cannot be licensed for use on a student or employee-owned computer without paying extravagant fees. These costs make the concept of a cloud lab pilot untenable until such time that virtual lab software licensing is more affordable.

As a result of the cost issues associated with a cloud lab pilot, the charge of the committee was revised. The new charge from Provost Perry Brown was as follows:

“The revised charge for this committee is to identify, evaluate, and recommend ways in which student access to computer lab services could be enhanced. I would like the committee to determine the issues associated with the current computer lab model at UM and the level of prioritization of these issues relative to other needs on campus. For example, is resolving these issues critical to our retention endeavors? Is resolving them critical to effective learning? Against those requirements, the committee needs to consider identifying innovative but affordable solutions. Cloud computing might well be the best alternative, but I would recommend a study of peer universities to understand the successes and failures of their attempts to address lab computing issues. Finally, the committee is asked to provide me with a recommendation, along with a cost-benefit analysis, on how to proceed. I expect that this recommendation will be completed during the fall semester with the intention to implement the findings in spring, 2012. Thus, if we do a pilot experiment, we do it in spring once your recommendation is to me.”
Findings

Survey Results

The committee analyzed the survey responses and summarized their findings with respect to student issues with access to computer lab services on campus. The key findings are as follows:

• Students use the labs, appreciate having them, but have some issues with access due to short hours or use of the labs by classes. However, it is not clear that additional lab hours are a pressing need.
  - 56% of respondents are satisfied with current lab hours while 44% are not.
  - 40% of respondents are satisfied with access to software required for UM classes.

• The top five software applications in use on campus are:
  - Microsoft Office (78%)
  - Adobe Creative Suite (19%)
  - Adobe Premier (15%)
  - SPSS (9%)
  - ArcGIS (6%)

  All other software applications were used by less than 5% of the respondents.

• 92% (824) of respondents have access to a computer outside of the UM computer labs.

• 75% of respondents have access to a DSL/Cable or 3G internet connection on a regular basis and 95% of respondents have the means to access the internet in some way.

• 67% of respondents approve the use of funds to provide 24/7 access to software and 66% are in favor of cloud services.

• Availability of software across labs is inconsistent and information on what software is available in the various labs is lacking but
  - 40% (345 of 873) are satisfied with access to software for classes.
  - 84% reported problems with getting a seat in a lab due to fullness, closure or use of the lab by classes.
  - 1% (11 of 873) said the lab didn’t have the software needed.

• The hardware and bandwidth in some labs does not meet needs and expectations.

• Some students feel it would be helpful to have additional assistance from lab monitors.

• Some students would like to see the library to be available 24/7.

• Some students feel that software is too expensive for purchase and use on a personally-owned computer.

• There are some issues with printing across campus in that users cannot predict ‘how to print’ from one location to another.

• Of the 258 comments provided through the survey, the breakdown of comments is summarized in the table below.
<table>
<thead>
<tr>
<th>Category</th>
<th>Number of Comments</th>
<th>% of Total Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware</td>
<td>36</td>
<td>14%</td>
</tr>
<tr>
<td>Internet Speed</td>
<td>6</td>
<td>2%</td>
</tr>
<tr>
<td>Lab Access</td>
<td>23</td>
<td>9%</td>
</tr>
<tr>
<td>Printing</td>
<td>10</td>
<td>4%</td>
</tr>
<tr>
<td>Software</td>
<td>52</td>
<td>20%</td>
</tr>
<tr>
<td>Support</td>
<td>20</td>
<td>8%</td>
</tr>
<tr>
<td>Wireless</td>
<td>8</td>
<td>3%</td>
</tr>
<tr>
<td>Other</td>
<td>44</td>
<td>17%</td>
</tr>
<tr>
<td>No Issues</td>
<td>59</td>
<td>235</td>
</tr>
</tbody>
</table>
Analysis

The revised charge (April 14, 2011) to the Cloud Computing Committee required the committee is to identify, evaluate, and recommend ways in which student access to computer lab services could be enhanced. The charge breaks down into the following categories:

1. “Determine the issues associated with the current computer lab model at UM and the level of prioritization of these issues relative to other needs on campus. For example, is resolving these issues critical to UM’s retention endeavors? Is resolving them critical to effective learning?"

2. Against those requirements, the committee needs to identify innovative but affordable solutions. Cloud computing might well be the best alternative, but I would recommend a study of peer universities to understand the successes and failures of their attempts to address lab computing issues.

3. Finally, the committee is asked to provide me with a recommendation, along with a cost-benefit analysis, on how to proceed. I expect that this recommendation will be completed during the fall semester with the intention to implement the findings in spring, 2012. Thus, if we do a pilot experiment, we do it in spring once your recommendation is to me.”

The Cloud Computing Committee administered an online survey to students in early May, 2011. The thrust of the survey was not the computer lab model but rather access to software that is licensed for student use by the university. The questions explored preferred modes of access to software such as direct download to student owned hardware and access to university-owned computers that are equipped with software. Questions were asked about overall satisfaction and ability to gain access to software needed for academic support. The survey attracted 1,015 respondents. See Appendix A for details on questions and responses.

While the survey did not specifically address the satisfaction of the computer lab model, the responses and comments provide information about the current computer lab model. External technology reports from Educause, Chronicle of Higher Education, surveys of other institutions, and recent discussions on the Missoula campus surrounding IT strategic planning provide context and addition information to the survey and inform the issues and recommended solutions in this report.

Conundrum about computer labs

1. Why the continuing demand for labs given the personal ownership of computers and wireless access? With the high percentage of students owning computers and the availability of wireless networks, it would be reasonable to predict the lessening of the demand for computer labs but that does not seem to be the case at the University of Montana with similar experiences reported at other university campuses. While the University of Montana survey did not ask about general use of the computer labs, those reporting difficulty in getting into a lab to access software (84%) would indicate a demand for the labs.

2. The demand for computer labs (campus-based technology spaces) goes beyond software. Anecdotal evidence points to convenience of campus computers (rather than carrying around a laptop and being responsible for understanding connectivity to campus networks) and the space to work away from home/dorm distractions are likely drivers for use of campus labs. This is supported.
by the repeated mention of use of labs to escape distractions, need for lab hours around work and the focus on the library as a place to work. For comparison, the University of Minnesota, Twin Cities Office of Instructional Technology has conducted technology surveys every two years to gain better understanding of trending on that campus. In 2009, the survey of 5,721 students at Minnesota reported 89.1% of its students owning a laptop yet nearly 2/3 of its students used the computer labs. Temple University recently opened a 700 seat lab which is open 24/7 that has become the ‘hot spot’ of the campus, serving both academic and social needs.

3. **The focus upon the library in the comments for greater hours and more software availability** indicates the importance of this resource to students as they complete their work. The Library has long recognized this broad scope of use and addressed it with the software for general productivity (media editing from Adobe, statistical packages such as SPSS) with the Learning Commons plan as the next big step to advance this model. There is no indication as yet that additional “tech lounges” as is being installed in the UC will replace this demand though they could serve as a placeholder while funding is found for the broader Learning Commons area.

The survey points to some clear areas for improvement in communication about computer labs and software on campus. A governance structure that is driven by the academic mission would address the campus need for coordination of policies and criteria for establishing labs followed with identifying how the shifts in expenditures of existing fee funding sources would be achieved. Establishing polices that support best practice such as centralizing the software licensing through the purchasing office would support the communication and governance. The collaborative role of the purchasing department and Central IT would address the delivery mechanism of software such as cloud based and virtualized.

**How critical are the computer labs to our retention efforts and student success.**

Increasing convenience factors will be an important element of attracting and keeping students of 2020 according to the Chronicle of Higher Education report, “The College of 2020: Students”. This report focused on the need for the working student to be able to take classes on a personal timetable. Comments in the May survey related to expanded hours of the library or computer labs around work hours. An element of convenience is having easily found and understood information about resource availability and use in order to use time wisely. Better communication around the existing lab service is an immediate and low cost need.
Issues

The current model mirrors the centralized and decentralized IT delivery model seen in other areas of technology on campus. Central IT supports three general computer labs. The sectors also support computer labs for purposes determined by the unit/college/sector with a range of hours, policies, print services and technical support. The selection of software available in the distributed labs is determined by the unit provider with their purpose in mind.

Funding for the general computer labs is primarily the Student Computer Fee. Funding for the distributed labs likely has a variety of sources including the college/sector allocation of student computer fees, donor funds, operational funding and instructional technology funds. To qualify for use of student computer fee funds, the lab has to be available to students, which has likely led to opening up instructional labs to students when the lab in not in use. (See Appendix C for a sample of campus communication concerning labs)

Student comments did not differentiate the labs by types and in the survey referenced the computers in the library, general labs, and the smaller labs in the departments as labs.

Issues Summary:
1. Communication about computer lab services on campus is lacking or confusing.
2. Expectation of the student user that labs quality be consistent.
3. Mixed purpose labs cause confusion for users in determining availability.

Supporting information
1. Communication about labs
   The communication to students about the computer labs is diffuse without a central means of identifying or locating labs.
   - A search of the interactive map of the university web site does not identify the location of any computer lab.
   - Searching the site with the term “computer lab” brings up the mix of unit/college/sector websites providing information on specific school or departmental computer labs.
   - The size of the lab, software availability and hours is reported in varying degrees of detail on each site.
   - Orientation of new students does not provide a comprehensive picture of computers labs on campus

2. Communication about Software
   Software information is equally lacking.
   - A site search for specific software failed to identify the location of that software.
   - Survey comments show confusion and some misinformation. For example, the library has SPSS and the capability of reading .pdf files on its computers but students are unaware of this capability.
   - The inability of students to access software from some computers on campus is likely the result of licensing software on a departmental level as opposed to licensing at a campus level.
The identification of software available to students for purchase is not obvious, although the UM Bookstore advertises the significant discounts to student for purchase software. Information on free, open source software is also not available.

3. Student expectation of consistency
Students experience a range of service hours, variety of hardware, software, and printing policies. The diversity of labs across campus presents a confusing array to students.

- Hours: No two labs have the same hours of operation, even the three general labs under Central IT have different hours. The library is open the latest (1:00 a.m.)
- An IT Student SWOT analysis (October, 2011) with 11 students identified the following weaknesses:
  - lack of wireless access in the resident halls
  - inconsistent technology
  - departmental IT staff not being able to resolve issues
  - scattered IT departments present multiple steps to “get things done”
- Polices and maintenance of labs vary as they are determined at the unit level. Survey comments on slowness of the internet, inadequacy of computers, and printing compatibility could be the result of hardware age, maintenance, and policies but reflect unit decisions for support of the labs.
- There appears to be a lack of governance of computer labs across campus to ensure consistency and adequacy of hardware and software.
- There is likely an uneven distribution of funds for computer lab maintenance leading to inadequate hardware in some labs

4. Mixed purpose use of labs cause confusion for users
- Labs that are primarily for instructional use but are available for general use when not in use by a class means a student does not know when it is “open”
- Mixed purpose use is driven by the need for funds and the student computer fee policy that requires labs to be open for general access if they are to receive SCF funds.
- Departmental labs are likely to have software that meets the needs of specific classes but may not have more general purpose software
- There is a need for a baseline of software requirements for campus and to establish a campus standard vs. departmental needs.

Suggested Initiatives
Despite the issues with virtual licensing, the committee concluded that there are a number of initiatives that would significantly improve the computer lab environment at UM. The committee summarized the issues into two categories which can be translated into two goals:

1. Improve the accessibility of software to students.
2. Improve the consistency of the computer lab environments on campus.

With these two goals in mind, the committee discussed and prioritized various initiatives with the following recommendations.
Year 1

1. **Centralize software licensing** for the major applications used across multiple departments and labs. Centralizing software purchases is expected to reduce the cost per license, increasing the number of licenses available to students for the same amount of money.
   
   A. Conduct an inventory study to determine what software is being purchased and at what levels.
   
   B. Work with administration to develop an appropriate centralized funding model with appropriate resources.
   
   C. Work with purchasing and Information Technology to develop a purchasing and distribution model.

   Cost/benefit: there are enormous savings to be had by eliminating the inefficiency of multiple transactions with a single vendor and by buying at a campus level or buying in bulk utilizing Purchasing’s negotiation skills. The cost would potentially be an additional resource in Central IT for record keeping and distribution and potentially an additional resource in Purchasing. A detailed cost model must be created to verify these assumptions.

2. **Create a standard software image for use in all labs**, providing a baseline suite of applications that could be enhanced by department-specific applications. This would help ensure the consistency of software available across all labs but is dependent on availability of that software through centralized purchases mentioned in #1.
   
   A. Determine what software is utilized across the majority of labs,
   
   B. Utilizing the increased number of available licenses (#1), produce a standard software image,
   
   C. Ensure all lab managers are aware of the standard image.

   Cost/benefit: The benefit of a standard image is substantial and the cost next to nothing once centralized licensing is implemented.

3. **Implement an internal cloud computer lab** which would provide a concurrent licensing structure for use on UM-owned computers. This is an alternative to the standard software image and would require fewer licenses. However, it would also require the purchase of a server(s), installation of the appropriate applications software, and the implementation of a license-tracking system. Depending on the internet speed available to the computer lab, this model may be more or less successful.

   Cost/benefit: The costs involved in creating an internal cloud computer lab include the purchase of servers, license managers, and additional software licenses. Significant resources would also need to be deployed to get this lab up and running and ongoing resources deployed for maintenance and operations. The benefit would depend on the level of site licensing of software – the more software is licensed for use across campus, the less such a lab is required. If few licenses are purchased, an internal cloud computer lab could make that software more accessible across campus and be worth the investment.

4. **Improve the level of information available to students** regarding the availability and location of software.
A. Institute a web-based application that shows the distribution of software across campus and the availability of seats at any given time,
B. Create a web link in OneStop and the Login page that takes students directly the UMConnect documents and Skydrive capabilities,
C. Create a webpage that provides links to free software that can be downloaded to a student’s personally-owned computer.

Cost/benefit: the benefit of these actions would be great and the investment low as the majority of the work could be done with current resources over the period of six months once work was begun. The primary issue is competition for those resources for other priorities.

5. **Reduce hardware costs** to the departments through bulk purchasing and potentially through a more collaborative distribution of student computer fee funds.
   A. Fund sources are instructional technology and student computer fee funding. The two funds should be evaluated for redistribution and purpose
   B. Work with purchasing to institute an annual or bi-annual bulk purchase of computers to reduce overall cost of hardware,
   C. Encourage collaborative evaluation of hardware needs across campus and prioritization of funds to labs with inadequate hardware.

Cost/benefit: the benefit of these actions is great and the investment in dollars is low. Bulk purchasing should make new computers more affordable for departments, giving them incentive to recycle them more often. This in turn should improve the hardware capabilities relative to new, more intensive software. Restructuring the fee distribution could be very beneficial. However, there is likely to be political controversy and inertia based on years of operating in a particular way and to the benefit of certain groups.

6. **Implement one or two additional ‘tech lounges’** in appropriate locations on campus to alleviate the use of computer labs for email and personal use, and to encourage the use of personally-owned computers on campus.
   A. Identify appropriate locations for tech lounges,
   B. Work with administration to identify funding,
   C. Work with Facilities and IT to implement the tech lounges.

Cost/benefit: The benefit of additional tech lounges depends on the success of the first one which is just opening in the UC. The cost of the UC lab, complete with furniture, lighting, electrical work, wireless, email stations, conference rooms, and high resolution monitors was $145,000. It is expected that similar but smaller lounges could be outfitted for $50,000 - $100,000 each.

7. **Institute a governance group** comprising lab managers across campus to encourage consistency and cross-departmental planning and knowledge transfer. It might be useful to consider the integration of a lab governance group with fee governance groups, e.g. student computer fee or technology fee committees.

Cost/benefit: the benefit of a collaborative lab management group is invaluable and the cost is the time it would take for such a group to meet on a regular basis. No additional resources are required.
8. **Continue to evaluate the status of virtual licenses** and peer university initiatives.

   Cost/benefit: This action has value and could be accomplished with current resources.

**Year 2**

1. **Re-evaluate student perception of computer lab services** on campus to determine if steps taken in year 1 had significant effect.

2. Depending on the status of virtual licensing, **reevaluate the feasibility of a cloud computer lab** and implement if possible. For this to be successful it is deemed necessary to provide at least 4 out of 5 of the applications that are most used by campus
Appendix F: Academic Affairs, Student Affairs priorities

Academic Affairs

UM 2020: Dynamic Learning Environment

In order for UM to sustain a world-class, student-centered environment in the 21st century, the Academic Officers propose a fresh focus and set of priorities for technology as it relates to this strategic issue:

Our priorities:

**Campus-wide wireless.** UM offers students, faculty, staff and visitors a spectacular physical environment here. And, today, people also expect we’ll have an accessible, up-to-date technology environment. The rapid expansion of types and uses of mobile devices is seen in every aspect of our lives and is recognized as a critical technology for education in studies of the New Media Consortium (Horizon 2011) and The Chronicle of Higher Education (Digital Campus, May 2011).

Wireless access to the internet should be a key component of our campus technology infrastructure. It opens the door for endless applications and uses in and outside of the classroom, creating a campus that is a dynamic learning environment. With this infrastructure in place, colleges, departments and programs may then move toward specialized development of applications for convenient access and delivery of services and information, and use of new media technology in the classroom by students and faculty alike.

Our first priority is for the campus to institute a robust, comprehensive wireless upgrade with the expectation that this will be a high growth area. This is important for current and prospective students, faculty and staff.

We’d like to see this accomplished within the next 18 months, by June 30, 2013. Estimated cost is $500,000.

**Centralized/distributed coherence, and more flexibility in how we spend existing funds.** We support the efforts that Dean Bonnie Allen and Interim Chief Information Officer Loey Knapp are taking to examine the current structure, justification and funding support for technology. We welcome a vigorous discussion of how to appropriately allocate technology funds that already are available for academic units (student computer fee money, instructional computing funds from the provost’s office).

**A coherent internal digital environment for students, staff and faculty.** Over time, programs, offices, schools and colleges have independently developed an array of digital tools ranging from the online application process with Hobson and then with the availability of “one stop,” Cyberbear, UMOline, UMConnect with access to SkyDrive where a student must use NetID and learn to set up WP2 wireless connections. Bringing these pieces together into a cohesive process would provide improved customer
service by reducing confusion and giving students more effective uses of the technology they have at their disposal. We need to coordinate and simplify the number of tools and the interfaces among them.

**Fundraising priorities.** We believe that prospective donors would be interested in supporting technology as it relates to people, especially to students. *We propose a fund dedicated to the development of technology literacy.*

The effective use of technology is a skill needed not only for the academic careers of students but also for preparation for their work life as they pursue careers based on global connections and interests. Components of technology literacy would include the establishment of Innovation Centers to capture and nurture the talents of students who already have strong technology skills to work with staff and faculty on campus projects. Using the model of internships, The Innovation Center could provide an experiential learning experience for the student as well as a source of technological creativity for the campus.

One feature of the Innovation Center would be a learning and support center where students could apply existing uses of familiar social network media to educational applications. The fund also could:

- Offer technology scholarships, (internships?)
- Offer support for undergraduate research/creative work projects that are strongly tech-related
- Develop a cadre of tech-savvy students across campus to work for various academic units.

**Student Affairs**

*Connectivity:* To ensure the most dynamic learning environment possible, campus should have ubiquitous connectivity to the internet and campus resources. All campus locations should have a reliable network infrastructure with ample bandwidth available for all users. It should enable campus staff to do their jobs and provide services to the campus community. It should allow faculty to access resources and teach in an efficient manner. This infrastructure should also provide adequate speed and throughput to students residing in campus housing or using campus labs or wireless. This connectivity must include reliable campus-wide wireless with a functional and easy to use guest access.

*IT Responsibilities/Obligations:* The current IT situation on campus has grown organically over a number of years and can leave students, staff and faculty at a loss concerning where to turn for support, depending on the nature of their IT related issue.

Student Affairs supports and encourages the current IT mapping project with a focus on complete identification of all IT resources on campus. With this information campus should be able to develop an efficient IT support system for the entire campus community. Such a system should be service oriented, responding to customer or client needs, using well documented policies and procedures that define where IT related responsibilities lie. Such documentation may be in the form of service level agreements or memorandums of understanding between various campus entities.
**Enterprise Support:** In order for UM to sustain a world-class learning environment it must streamline and optimize the efficiency of its business practices. Many paper-driven practices should be migrated to online services utilizing technology to automate processes whenever appropriate. As hardware evolves and our clients become more connected and tech savvy, many of these practices should be made mobile accessible with cross-device compatibility and a focus on task-oriented student needs. Planning for such optimized business solutions should be done considering industry best practices and ROI through conversations including stakeholders from all sectors of campus. Below is a list of some areas Student Affairs believes such systems could benefit the campus community:

A single centralized campus wide timecard and payroll solution for all student and staff employees.

Shared workspace and resources crossing division or departmental boundaries enabling efficient collaboration.

**Communication:** Effective communication is essential for UM to optimally use existing IT resources as well as to move into the future intelligently and intentionally. Such communication should involve all units of campus in making IT decisions which often have broad-reaching implications such as maintenance downtimes. Student Affairs supports the enterprise level system outage notification efforts and encourages further improvements. Student Affairs also would like to see campus move towards a single email address book integrated with the Exchange system, containing all students, faculty and staff. Clear policies should be established on mass-communications to students and the broader campus community as well as a system provided to do such mailings. There should also be a standardized system for campus units to send personalized messages to target audiences, for things such as deadlines, outstanding fees or scheduled appointments.

**IT Funding:** Funding for various IT endeavors on campus currently comes from a multitude of budgets. Making some changes to the current funding model to increase transparency and standardize purchasing and spending practices should minimize the need for IT to be entrepreneurial with projects. Such changes should also decrease some costs by allowing campus entities to take advantage of bulk or contracted savings through centralized purchasing of hardware and licensing.