

2012-2016 Information Technology Roadmap for the University of Alberta

Jonathan Schaeffer
Vice Provost and Associate Vice President (Information Technology)

Executive Summary

This document is the successor to *Interchange 2007-2010*, the first information technology (IT) plan for the University of Alberta. Whereas *Interchange* aimed to build the foundation for IT at the University, the roadmap described here constructs the pillars that will enable technology to be used in new and efficient ways. The roadmap presents the architecture of a vision, not the details required of a plan. That vision can be succinctly stated as “To empower the University community through information technology excellence.”

The information technology roadmap for the University of Alberta is built on five pillars that will allow the University to be well positioned to meet the major trends in technology that seem inevitable. These pillars are:

- A. Mobility
- B. Green Computing
- C. Open Data
- D. Operational Excellence
- E. Best Practices

The pillars themselves are not a solution; they are a means to an end. It is difficult to predict where technology will be in the year 2016, however by adopting a strategy that puts key foundational policies, resources, and infrastructure in place, the University of Alberta will be well positioned to lead and adapt to changes in information technology for the benefit of our institution.

A Vision of University of Alberta Information Technology in 2016

Accurately predicting how information technology will change our lives is obviously very difficult. Nevertheless, some directions seem clear in the near and not-so-near term. The recommendations given in this document will facilitate realizing a future which is described below. Clearly, we will need to be nimble, recognizing and capitalizing on changes in direction and opportunities that arise.

Figure 1 below illustrates some of the goals of this plan and some of the strategies that are proposed to realize those goals. The strategies are built around five pillars that will facilitate the University of Alberta improving its current information technology environment and well position us to meet future challenges. The pillars are:

- A. Mobility
- B. Green Computing
- C. Open Data
- D. Operational Excellence
- E. Best Practices

Although these names may not resonate with most readers, they will allow us to create a modern, even leading-edge, information technology environment that will empower our user community.

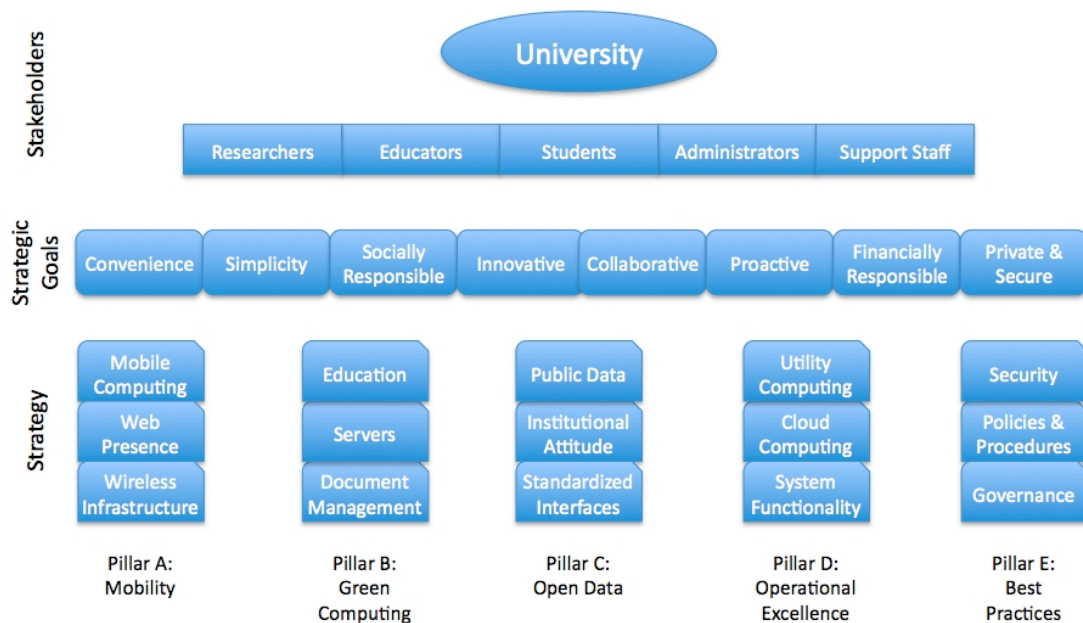


Figure 1. IT Roadmap Overview

What will the world of 2016 look like for the University of Alberta community?
The following scenarios are realistic possibilities, given our current understanding of the ever-changing nature of technology.

Looking into the crystal ball for the University community (students, staff, and faculty):

- An enhanced on-line presence that will allow you to work where ever you want, when ever you want
- Collaboration where ever you want, when ever you want
- A single, seamless on-line environment that encompasses most/all of your daily technology tools, enabling a better and simpler user experience
- Most/all of the documents you need for research, teaching, administration, and studying are available wherever you are
- Your smart phone is your virtual OneCard that can be used for making purchases and gaining access to secure spaces
- Software applications that can tailor their response to your current location
- Shared services for scanning and printing from any device providing secure document delivery
- Reducing/eliminating the “campus run around” to activate services when joining the University community either as a student, staff or visitor
- Wait time for services to be activated or deactivated reduced/eliminated

Looking into the crystal ball for students:

- “Mobile U” -- all your course material, including textbooks, available on your mobile device
- New uses of technology in support of teaching and learning
- Social networking for your University-related activities
- Access to student-related university data sets, empowering students to create novel applications to enhance our environment
- A more environmentally responsible (“green”) computing environment
- A student annotates his wikibook¹ text and shares it with his study buddies to help explain a tricky concept. His voice-over description and animation of a figure is attached

Looking into the crystal ball for researchers/teachers:

- Your computer desktop, including most/all of your applications, available wherever you are
- New opportunities for technology to enhance your teaching, both inside and outside of the classroom
- The office of the future: replacing the traditional PC and monitor with a large flat-panel screen displaying a virtualized desktop
- Collaboration from your desktop (or anywhere else that you want to be)
- Obtain all your grant ‘signatures’ electronically even though it’s after hours the night before the grant deadline and her chair is out of town

¹ An online, annotatable book.

What's in it for staff/administrators?

- Your computer desktop, including most/all of your applications, available wherever you are
- University of Alberta documents available on-line
- Greater integration of administrative systems
- Office becomes a large-screen monitor with a virtualized desktop
- The office of the future: a large-screen monitor displaying a virtualized desktop (i.e., no desktop computer)
- Collaboration from your desktop (or anywhere else that you want to be)
- Reduce/eliminate time spent on routine processes
- You have not physically signed a form in months, yet you have confidence that appropriate authorizations are happening and procedures are being followed

Looking into the crystal ball for the university as an institution?

- Environmentally conscious ("green") computing, saving in power and recycling costs
- Electronic documents management system, allowing on-line access for university records
- Use of so-called "cloud" and "virtualization" technology, reducing the number of computers that need to be purchased
- An environment that ensures security and respects privacy
- Enhanced administrative computing, streamlining processes and reducing manual effort
- Centralization of core "utility" services, eliminating duplication

All these examples aim to illustrate how advanced technologies can enable members of the university community to be more effective and innovative in achieving their goals, and do so in a way that is more cost effective and environmentally responsible for the institution.

1. Motivation

Information technology (IT) is transforming the University's research, teaching, learning, administration and communication activities in dramatic ways. Many technologies in common use today, such as wireless networks, podcasting, cloud computing, and virtualization, were either non-existent or in their infancy just a decade ago. In 2002 the United States National Research Council wrote about the impending and dramatic changes that information technology would have on research universities:

The pace of information technology evolution is likely to continue for the next several decades, and could even accelerate. Institutional barriers will be reshaped and possibly transformed. The impact of information technology on the research university is likely to be profound, rapid, and discontinuous. Digital technology will change how the university is organized, financed, and governed. Procrastination and inaction will be dangerous for colleges and universities in this

time of rapid transition. It is difficult to predict the impacts of information technology with precision, but it is essential for institutions to develop the capacity to grasp potential changes and see where technology might drive the university.²

Even then they understood that the pace of change might accelerate, but they did not foresee how rapid this would become. Terms such as cloud computing, social networking, and tweeting had not yet been invented. No one understood the impact that companies like Google, Facebook, and Twitter would have to change society.

The relentless pace of technological advances is impacting the academic environment in far-reaching and unanticipated ways. Today's students demonstrate this clearly: the "wired" generation is comfortable with and even embraces technology, a seismic change in the demographics of students that has happened in less than a decade. The impact of these changes will be enormous. Internationally known technology writer Don Tapscott (a University of Alberta alumnus) has written that:

There is fundamental challenge to the foundational *modus operandi* of the University — the model of pedagogy. Specifically, there is a widening gap between the model of learning offered by many big universities and the natural way that young people who have grown up digital best learn.³

Because of information technology, the skills set and expectations of today's student are dramatically different than they were a decade ago, and the transformation is not yet complete. This is the most profound change to the way that universities operate in the past 100 years. For example, consider the learners entering the University of Alberta in 2016: they will be used to using technology for almost all their assignments (little reliance on paper and pencils); they will carry powerful computing devices (able to work and communicate any time, any where); and they will use on-line resources for information discovery (reduced role for the library).

When it comes to information technology, the University of Alberta must become more nimble and receptive to change. It is critical that we as an institution understand where the technology is going and attempt to keep pace with the major developments. That does not mean that we should be on the leading edge of each technology development, but we need to be seen as leaders if we are to strengthen the University's national and international reputation. Standing still only means we are falling behind.

² U.S. National Research Council, *Preparing for the Revolution: Information Technology and the Future of the Research University*, National Academies Press, 2002.

³ D. Tapscott, "The Impending Demise of the University," *Edge: The Third Culture*, edge.org/documents/archive/edge288.html#tapscott.

This roadmap builds on the IT foundation of the University of Alberta, created and evergreened over the past decade. From this foundation, five new pillars are being proposed, structures that will allow the University to be well positioned to meet the major trends in technology that seem inevitable. These pillars are:

- A. Mobility
- B. Green Computing
- C. Open Data
- D. Operational Excellence
- E. Best Practices

Much of the groundwork for change is a result of the Google Apps for Education project (it began in November 2008, but only became reality starting December 2010). This initiative was critical to the formulation of this plan, because it broke new ground in several key areas: recognition that an IT service could be considered a “utility”; agreeing to a single University standard (in this case email); use of non-local cloud-computing-based services; and recognition that there are cost savings and service improvements if we work together. *United we grow; divided we status quo.*

Since this document does not present the details required of a plan, it is really the architecture of a vision and presents a roadmap as to how the University should move forward with IT in the next four years. While none of these pillars in and of themselves builds a grand vision of the future, each contributes to making the University better positioned to meet the needs of current and future technology demands. The pillars combine to achieve an over-arching vision:

To empower the University community through information technology excellence.

This roadmap is based on ensuring that the following requirements are met:

- Supports the Academic Plan;
- Is financially prudent;
- Is achievable (by 2016 some of the IT action items will be completed, and others well under way);
- Benefits teaching, research, and administration; and
- Improves student engagement and student-centered learning.

Paul Sorenson, the University of Alberta’s first Vice Provost and Associate Vice President for Information Technology, produced *Interchange 2007-2010*, the first strategic plan for IT in the University’s history. This document is its successor, intended to cover the period July 1, 2012 to June 30, 2016. There is a gap between the plans (2010 to 2012), a consequence of the desire to align the new plan with the recently approved Academic Plan.⁴

⁴ *Dare to Deliver. Academic Plan 2011-2015.*

2. IT Action Items

Most of the following action items do not have the cachet that would resonate with the broad University of Alberta community. Rather, they are intended to create an environment that will enable the institution to provide a leading-edge information technology infrastructure, create the ability to be nimble and proactive at addressing change, and address financial and fiduciary responsibility. Whereas the University's first IT Plan created the foundation for central IT, this document defines the pillars to enable innovation and change.

There are many more IT-related activities that are currently under way or are contemplated for the near future (see Section 3 "On Our Radar"). The pillars were chosen, in part, for their need to have a high profile because of 1) the need for institutional change, 2) the associated costs (not always financial), 3) external pressures, or 4) assuming a leadership position.

At the heart of many of these recommendations is a reliance on Academic Information and Communication Technologies (AICT), working with the Office of the Vice Provost (Information Technology), to get the work done. This requires that AICT continue to build a strong relationship of trust with the University community. Recent initiatives, such as the re-vamped Help Desk, the Google project, and the transparency on AICT performance, have gone a long way to foster such a relationship.

Another condition of success is collaboration and communication: all parties involved in information technology at the University of Alberta must work together with a spirit of cooperation. This includes the Office of the Vice Provost (Information Technology), AICT, AIS, and the 56 additional IT groups in faculties, departments, and administrative units that are centrally funded, as well as extending beyond institutional boundaries to include our provincial and national counterparts.

The primary principles that have guided the formulation of the roadmap are:

- Students are major drivers for information technology change;
- Economies of scale can be achieved by eliminating duplication where appropriate;
- Mobile computing will continue to grow in importance;
- The University needs to be environmentally conscious and socially responsible;
- The quality of IT services should be raised across the board to a (high) minimum level;
- The costs of centralization should not be borne by the units; and
- My personal mantra for the University of Alberta: *United we grow; Divided we status quo.*

Pillar A: Mobility

The world is going mobile. A 2010 report shows that 63% of students have smart phones⁵ and this percentage will approach 100% well before 2016. We must recognize this important shift in how information is accessed and disseminated. It is critical that the University of Alberta invest in keeping current in this area.

Remember when people used to carry around a laptop and a phone? It's something we're seeing less and less of because increasingly, what people used to do on their laptops, they now do on their phones. You don't need a separate computer to browse the Web, work on documents or play games because phones are computers.

One implication of this business trend is that you need to be sure your business is mobile friendly. Are your web pages available in mobile versions so they look good on phone screens? Another implication is that some of the desktops/laptops in your business may be redundant or replaceable with phones.⁶

Figure 2 shows the growth in the number of wireless (UWS) users at the University of Alberta.

This pillar is in line with the the University of Alberta Web Strategy.⁷ This pillar supports the Academic Plan in the following areas: Talented People (enhances Recruitment, facilitates Welcome Centers, supports fostering a collegial Research Culture and Learning Culture); Learning, Discovery and Citizenship (supports Research Constellations); Connecting Communities (supports Alumni Engagement); Transformational Organization (Progressive IT; Web Enhancement; Social Spaces).

⁵ S. Smith and J. Caruso, *The ECAR Study of Undergraduate Students and Information Technology, 2010*, EDUCAUSE Center for Applied Research (ECAR), October 22, 2010, www.educause.edu/Resources/ECARStudyofUndergraduateStuden/217333.

⁶ S. Ward, *Top 5 Business Trends 2012*, sbinfocanada.about.com/od/management/a/Top-Business-Trends.htm.

⁷ J. Chesney, *Advancing the Digital Learning Environment*.

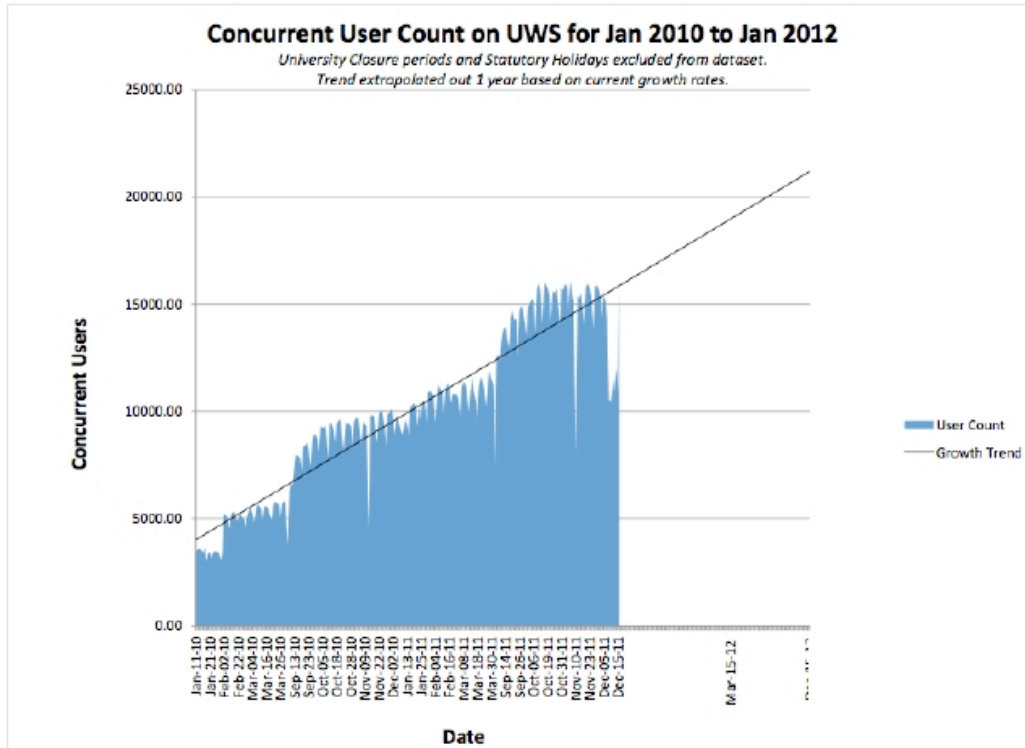


Figure 2. Number of concurrent wireless users.

Recommendation A.1: Evergreen⁸ the costs of keeping the wireless infrastructure (UWS) current and with the capacity to stay ahead of the growing demand.

Discussion: Wireless usage is growing. In 2010, the record was 12,000 users simultaneously accessing UWS; in 2012 the record became 17,300. To meet the needs of our entire university community, spread out over five campuses, we need an extensive infrastructure in place and properly supported. Given the breadth of the wireless infrastructure (currently 150 switches serving 3,500 access points), any change is a large project requiring substantial time to deploy. Hence it is imperative that wireless usage be monitored and extrapolated to anticipate usage growth well in advance of actual needs. In this way the University can be proactive, without waiting until lack of bandwidth becomes a problem.

Evaluation metric: Whether the wireless infrastructure has been evergreened at an appropriate level.

Recommendation A.2: Invest in increased mobile phone application functionality (“apps”) and access to content to meet the needs of students, staff, and faculty.

⁸ Evergreen means to put aside base funds to ensure that the resources are in place to renew the infrastructure on a regular basis.

Discussion: Mobile apps are one of the ways for making university services and content available on mobile devices. By creating mobile-friendly programs that complement web services and face-to-face interactions, the university community can be empowered to carry out their university-related business any time and anywhere.

Evaluation metric: The number of university services and content accessible using mobile devices. The number of mobile applications (e.g., by departments, students) that are integrated into the UAlberta mobile platform.

Recommendation A.3: All university, faculty, department, and unit web pages become mobile friendly.

Discussion: Many University of Alberta web pages do not render well on a small mobile device (such as a cell phone). The University of Alberta should develop guidelines and standards for mobile-friendly and accessible web pages, and have tools for validating that pages comply with these standards. This recommendation is far reaching since it affects every group at the University of Alberta that has a web presence. It is strongly recommended that individual and research web pages also comply with these standards. Figure 3 shows that growth in mobile devices accessing our web pages.

Metric: The percentage of university, faculty, department, and unit web pages that pass an established standard for mobile compatibility (e.g. HTML5).

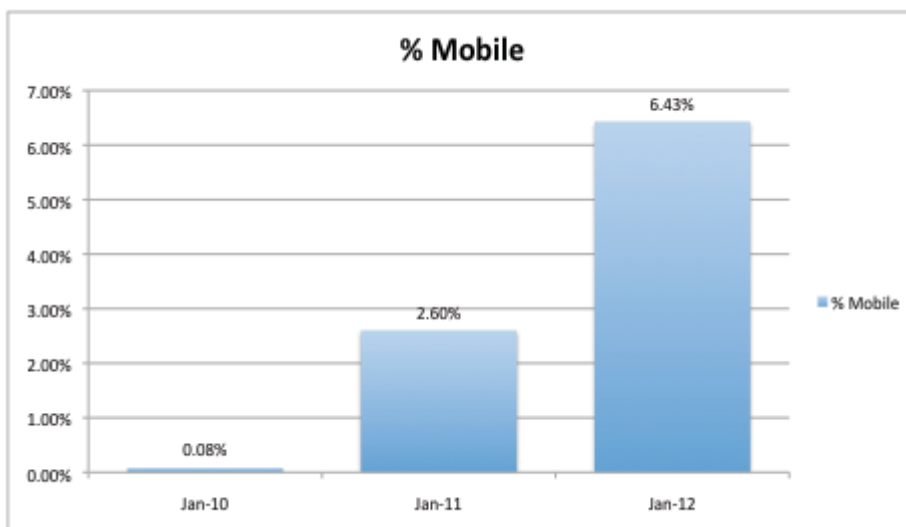


Figure 3. Growth in web traffic originating from mobile devices.

Recommendation A.4: Improve the usefulness, presentation quality, and organization of web content.

Discussion: The web is our primary face to the external world. As such, the image we present has to be professional, informative, and helpful. All groups and

individuals at the University of Alberta have the responsibility of keeping their web presence current.

Metric: Increase positive perception of the University of Alberta online (e.g., survey results, feedback). See University Web Strategy Metrics.⁹

Recommendation A.5: Plan for a future where mobile communications is emphasized over conventional desk telephones.

Discussion: The wired telephone is being replaced by mobile phones. In the not-so-distant future (perhaps even in the four-year horizon of this plan), the University's wired telephone infrastructure will disappear. We need to prepare for this major culture shift, in particular by running pilot projects to better understand the upcoming technological, business, and cultural changes of replacing wired communication with wireless.

Metric: Putting in place a mobile phone funding package (partnering with a commercial vendor) that facilitates the adoption of mobile technology for University business usage.

Recommendation A.6: Provide the information technology services needed to facilitate the growth of the University's on-line course delivery initiatives.

Discussion: The importance of on-line delivery of course material is growing in importance. The University of Alberta should develop a vision for building an on-line presence that matches the strengths of the institution and the needs of our current and future students. The issues are all on the pedagogy side, but technology must not be a limiting factor.

Metric: The extent to which technology facilitates progress towards the University's vision for its on-line presence.

Pillar B: Green Computing

*Green computing*¹⁰ involves reducing the University's environmental impact of its information technology usage. We must be seen as being socially responsible. The OECD estimates that computing consumes 2-3% of the world's energy resources, comparable to that of the airline industry.¹¹

At the University of Arizona, campus sustainability through the reduction of energy usage and greenhouse gas emissions has become a vital mission. An

⁹ sites.google.com/a/ualberta.ca/ualberta-web-strategy/the-university-web-strategy/strategic-goals-and-success-criteria

¹⁰ Green computing is "the study and practice of designing, manufacturing, using, and disposing of computers, servers, and associated subsystems—such as monitors, printers, storage devices, and networking and communications systems — efficiently and effectively with minimal or no impact on the environment." [San Murugesan, "Harnessing Green IT: Principles and Practices," *IEEE IT Professional*, January–February 2008, pp 24-33.]

¹¹ *Greener and Smarter: ICTs, the Environment and Climate Change*, OECD, September 2010.

estimated 45% of the 17,000 computers on campus are left on after standard working hours. This wastes up to 3 million kWh of electricity and releases an extra 2.8 million pounds of carbon dioxide into the atmosphere a year, equivalent to the annual gas emissions from 250 cars. Just this lack of control over our computer hardware is costing the university an estimated \$175,920 annually. What can you do? Just by changing a few simple actions, you can help improve energy management, increase energy efficiency, and reduce waste.¹²

This pillar will support the University of Alberta's Sustainability Plan 2012-2016. It supports the Academic Plan in the following areas: Talented People (supports Learning Culture), Learning, Discovery and Citizenship (supports Undergraduate Research, opportunities for Attributes and Competencies, opportunities for Capstone Courses); Transformational Organization (Sustainable Foundation; Progressive IT).

Recommendation B.1: Provide information to the University community about being more socially conscious of the environmental impact of computing-related infrastructure.

Discussion: Computing equipment has a wide range of environmental impact. For example: some popular computer models consume more than twice the power of other models; some computer peripheral devices have a poor record of recycling parts, while others do much better; and many users have the misperception that turning off a computer every night will damage the machine. The University community needs to learn and adopt best practices for environmentally conscious computing. This can include initiatives such as making power consumption one of the evaluation criteria for purchases, recycling e-waste, and turning off desktop machines at night.

Metric: The provision of information to the community, through print articles, web articles, blogs, twitter feeds, posters, etc.

Recommendation B.2: Encourage the use of *virtualization*¹³ technology to reduce the aggregate amount of computing resources needed.

Discussion: Many University computers have low resource utilization. Applications such as email, web browsing, and document-editing tools usually consume little in the way of resources. In many instances, rather than have multiple computers for dedicated access (by a user, or for an application), fewer shared computers can achieve the same results (and at less cost). Virtualization technology allows multiple computing environments (including different operating systems and desktops) to share the same physical computer. For desktop machines, it is commonplace to see 10 or more such machines being replaced by one server. At the University of Alberta, the virtualization of servers has frequently reduced the amount of equipment needed by a factor of three.

¹² www.fm.arizona.edu/fm-dept/greencomputing.html.

¹³ "Virtualization, in computing, is the creation of a virtual (rather than actual) version of something, such as a hardware platform, operating system, a storage device or network resources." [Wikipedia]

Note that this initiative need not be only local to the University of Alberta; economies of scale can be greater with a province-wide strategy.

Metric: The aggregate degree of virtualization for known computer servers deployed at the University.

Recommendation B.3: Reduce the usage of standalone desktop printers, scanners and fax machines.

Discussion: Data from 2011 estimates the number of desktop printers at the University of Alberta as being over 3,000. These printers are expensive to run (black and white printing is typically 5x more costly than on a high-performance printer), occupy space, use power, have a poor recycling record, and consume a disproportionate amount of support personnel time (usually fixing printer jams). Where practical, desktop printers, scanners, and fax machines should be replaced by powerful multifunction devices.

Metric: The number of desktop printers, scanners, and fax machines used at the University. An alternative metric (that is easier to compute) is the number of multifunction devices deployed.

Recommendation B.4: Increase the number of paper-based processes that can be replaced by an on-line process, including on-line approvals.

Discussion: Paper-based business processes are, by their very nature, slow and inconvenient. On-line processes allow University business to take place anywhere that there is an Internet connection. This will reduce costs, improve efficiency and enhance user satisfaction.

Metric: The number of paper-based processes replaced by on-line processes.

Recommendation B.5: Consolidate IT server infrastructure into a small number of server rooms that are compliant with audit best practices.

Discussion: There are over 100 locations at the University of Alberta that are housing computer servers and related equipment. By consolidating into a minimum number of server rooms, there will be many advantages including reduced power consumption, less air conditioning infrastructure, reclaimed space, improved physical security, 24x7 monitoring of equipment, and cost savings.

Metric: The number of rooms at the University used to locate computer servers and related equipment.

Recommendation B.6: Deploy an electronic document and record management system (EDRMS) to replace paper filing with electronic filing.

Discussion: The University of Alberta is drowning in paper. For example, Human Resources archives over 100 linear feet of paper per year. An electronic document and record management system would allow paper documents to be replaced by their electronic counterpart. This saves space, reduces paper, and improves business efficiencies (in particular, these documents can be accessible

over the web). Part of this project includes increasing the number of business processes for which the approvals can be done on-line.

Metric: The number of units that have switched over their administrative processes from paper to the EDRMS.

Pillar C: Open Data

There is a worldwide movement to make data sets public (while respecting privacy, legal and security issues). For example, the Canadian government has adopted a policy of Open Government, and launched an Open Data pilot project.¹⁴ SSHRC, NSERC, and CIHR are considering policies whereby data created through their grants must be made open (where practical). Open access extends to resources including data created through public funding (institutional data, research data), source code, and educational artifacts. Open data creates opportunities for students, staff, and faculty to create innovative applications that can benefit the University of Alberta community.

It is one of Latin America's best-known and biggest schools, with five times more students than UCLA and a treasured spot in Mexican life as the people's house of higher learning. But to prove it really matters, the 100-year-old National Autonomous University of Mexico, or UNAM, is placing its work on the Internet.

All of it.

In an effort of staggering scope, UNAM hopes to upload everything it has — from 18th century newspapers and vintage films to hundreds of thousands of student theses and a still-to-be-gauged sea of classroom teaching items — and let the world have it free of charge. ...

More than 200 universities around the world have posted classroom materials online during the last decade as part of an open-access trend in higher education. The Massachusetts Institute of Technology, for example, estimates it has reached more than 100 million people worldwide through a 9-year-old program called OpenCourseWare, with material from 2,080 of its courses.

But UNAM's longer-term plans extend far beyond providing lecture notes and classroom handouts by giving users digital access to libraries, special collections, conferences and the research of students and professors that previously was often buried from view.¹⁵

This pillar supports the Academic Plan in the following areas: Talented People (Fostering a Collegial Research Culture and Learning Culture); Learning, Discovery and Citizenship (Undergraduate Research, opportunities for Capstone Courses); Transformational Organization (Progressive IT; Web Enhancement).

Recommendation C.1: Create an institutional attitude that fosters the making of institutional, educational, and research data artifacts open.

¹⁴ www.data.gc.ca/default.asp?lang=En&n=F9B7A1E3-1.

¹⁵ www.chicagotribune.com/topic/la-ca-culture-mex-20111225,0,1242708.story.

Discussion: By default, most data artifacts are not accessible except by authorized users. Content creators and custodians need to learn to question whether the reasons for confidentiality are necessary. The granting councils are moving in the direction of insisting that the artifacts of publicly-funded research be made publicly available. In consultation with the Library, the University of Alberta's digital archive infrastructure and support resources will need to grow.

Metric: Number of institutional data artifacts made openly available.

Recommendation C.2: Create standardized programming interfaces to University open data.

Discussion: To simplify access to data for use in applications, standardized programming interfaces must be created. A centrally supported group needs to identify and adopt international/national standards and apply them consistently across the University.

This matter gives rise to a bigger issue -- developing an Enterprise Architecture for the University of Alberta's information technology infrastructure. A proper architecture would consolidate many/all of the authoritative data sources into a coherent architecture design that would simplify the flow and access of information. Because IT is highly decentralized at the University of Alberta, this issue is hard to tackle until there is a stronger governance model in place.

Metric: The number of open web services created using institutional data sets.

Recommendation C.3: Encourage innovative use of this data, especially by students.

Discussion: Students have already tried to access University data, with mixed success. Good examples are the BearScat (the precursor to BearTracks) and BearBook projects. We should create incentives that will encourage use of open data for the development of apps that will benefit the University community. For example, considering providing prizes and/or programmer/analyst support for exciting ideas.

Metric: Number of programming interfaces or web interfaces accessible to application developers. The number of interesting applications developed using open data (quantify any major successes).

Pillar D: Operational Excellence

The efficiency and effectiveness of information technology personnel can be improved by reducing duplication, streamlining processes, and increasing communication. The University community can be well served by automating and/or simplifying common business processes using IT. This frees up resources (especially people time) that can then be allocated to furthering the university's research, teaching, and administration agendas.

At an executive session of more than 50 CIOs at Campus Technology 2011, one message came across loud and clear: For IT departments to survive—even

thrive—in the new normal, they have to reinvent themselves. IT shops need to shed commodity services—functions that could just as easily be handled by outside vendors—and assume a more strategic, integrated role on campus.¹⁶

This pillar supports the Academic Plan in the following areas: Transformational Organization (Progressive IT; Administrative Barriers).

Recommendation D.1: Create and encourage use of central services for common “utility” computing needs.

Discussion: The University of Alberta has numerous basic IT systems and expertise duplicated across the campuses. Email was the classic example, but there are others. For common systems, such as system administration, backups, networking, Active Directory,¹⁷ security, printing, and desktop support, the University should build a case for consolidation into a centrally supported service or a federation of distributed services. Implicit in this action item is the intent to improve performance and functionality by consolidation, without undermining the needs of individual units.

Metric: The number and degree of adoption of centrally supported/federated utility-computing services.

Recommendation D.2: Consolidate common server infrastructure into a large shared-services cloud, to be used across participating units for teaching, administration, and research.

Discussion: Through the use of virtualization, computing infrastructure can be consolidated into a multi-purpose computing facility (a cloud). Appropriately done, this common resource can merge desktop, administration, teaching, and research resources in a cost-effective way. The shared nature of the resource allows for priority activities during working hours (e.g., desktop, administration, and teaching) and re-purposed during non-prime-time hours (e.g., research computing).

Metric: The number of units and the number of servers that join the cloud.

Recommendation D.3: Educate users about administrative system capabilities and, where needed, enhance system functionality to reduce the need for *shadow systems*.¹⁸

Discussion: Shadow systems exist usually because of historical practices, lack of user education, a service/functionality that is not being centrally provided, or a service/functionality that is centrally provided but is inefficient, expensive, or awkward to use. They present a major security risk to the University, as they

¹⁶ campustechnology.com/articles/2011/12/27/mission-support.aspx.

¹⁷ A network-based directory service for computers running Microsoft operating systems.

¹⁸ Shadow systems (*aka* shadow data systems, data shadow systems, shadow information technology, shadow accounting systems or in short: shadow IT) consist of small scale databases and/or spreadsheets developed for and used by end users, outside the direct control of an organization's IT department. [Wikipedia]

often contain sensitive data. Functionality that is used by multiple University units and is not provided centrally needs to be identified and, if practical, properly integrated into central systems.

Metric: Documented and anecdotal evidence of shadow systems being eliminated by central initiatives.

Recommendation D.4: For key University business processes, automate, improve, and/or simplify them using information technology.

Discussion: The University of Alberta has some manual processes (*e.g.*, submission of grades) and/or inefficient on-line processes (*e.g.*, too many click-throughs for some PeopleSoft functions). These should be identified and examined for potential improvements through applied technology.

Metric: The number of business processes improved, as measured by 1) the average time to complete the process, and 2) a reduction in the number of participants abandoning the process mid-stream.

Recommendation D5: Encourage and facilitate the upgrading of faculty and staff IT skills.

Discussion: IT is always in a state of flux, with new tools and ways of doing things constantly appearing. Everyone is “too busy” to attend training sessions, yet the investment of a few hours can lead to a multiplicative effect in terms of future time savings and efficiencies. We need to create an environment where members of the university community understand the benefits of periodic IT training.

Metric: The number of faculty and staff attending IT training sessions.

Pillar E: Best Practices

The University of Alberta is a \$1.5 billion entity, and with a publicly funded institution of that size comes public scrutiny. The University of Alberta’s information technology practices must comply with directives from the Office of the Auditor General of Alberta and the Office of the Information and Privacy Commission of Alberta. Changing the University IT culture to conform with the Alberta government requirements will improve IT practices resulting in a better performing and safer technology environment.

The good news is that IT security is getting better. The bad news is that cyber criminals continue to gain access to more sophisticated technologies. The security issue that IT organizations need to address in 2012...is going to be how proactive they want to be about security versus simply waiting for the inevitable security incident to wreak havoc on their IT systems. Based on the amount of time and energy that goes into fixing systems in the wake of such an attack, the return of investment from a more proactive approach to IT security is readily apparent.¹⁹

¹⁹ M. Vizard, Four IT Security Trends to Watch in 2012, www.itbusinessedge.com/cm/blogs/vizard/four-it-security-trends-to-watch-in-2012/?cs=49375.

This pillar supports the Academic Plan in the following areas: Transformational Organization (Progressive IT; Administrative Barriers).

Recommendation E.1: Deploy best practices for information technology security, including a public education campaign, encryption, physical security, and audits.

Discussion: The University of Alberta must continue to be vigilant with respect to information technology security. Both the Auditor General and the Freedom of Information and Privacy offices are requiring this.

Metric: A measure of the number of institutional information technology risk areas that have had the risk greatly mitigated.

Recommendation E.2: Deploy a *control framework*²⁰ across major central IT units and educate other IT groups.

Discussion: The Office of the Auditor General is requiring the University of Alberta to adopt a control framework (such as ITIL²¹ and COBIT²²), adding discipline to our information technology processes. For example, when making a change to a critical system, ITIL would require a well-defined series of steps to be followed to ensure that the proposed change has been properly thought out, security issues addressed, proper testing conducted, *etc.* before it is deployed. Instituting a control framework at the University of Alberta is the right thing to do, but will take considerable effort to educate IT personnel and change the IT culture.

Metric: Number of personnel with control framework training. The number of IT groups deploying control framework practices. Progress as reported in the annual reports from the Office of the Auditor General.

Recommendation E.3: Create an information technology project management office (ITPMO) to manage all major IT projects at the University of Alberta.

Discussion: There are many factors in the successful deployment of an IT initiative, but it all starts at the top. Proper project management is essential to mitigating risk and maximizing the chances that the project is delivered on time and within budget. All major (to be defined) IT projects -- whether University-wide or localized to a unit -- should have a project manager.

Metric: Creation of the ITPMO. IT Governance mandate that all major IT projects have a project manager.

²⁰ IT control objectives relate to the confidentiality, integrity, and availability of data and the overall management of the IT function of the business enterprise. [Wikipedia]

²¹ The Information Technology Infrastructure Library (ITIL), is a set of good practices for IT service management (ITSM) that focuses on aligning IT services with the needs of business. [Wikipedia]

²² COBIT is a framework...for information technology (IT) management and IT Governance. It is a supporting toolset that allows managers to bridge the gap between control requirements, technical issues and business risks. [Wikipedia]

Recommendation E.4: Development of a comprehensive suite of information technology policies and procedures in UAPPOL.

Discussion: The Office of the Auditor General is requiring the University of Alberta to entrench key information technology business process as UAPPOL policies and procedures. Again, this is the right thing to do, but will take many years to formulate all the required documents and shepherd them through University governance.

Metric: From the Auditor General's point of view, the number of information technology policies and procedures in UAPPOL is the metric. From the University's point of view, the number of IT units that are compliant with the policies and procedures is the metric.

Recommendation E.5: Conduct a review of IT governance at the University of Alberta.

Discussion: The University of Alberta does not have an over-arching information technology board/committee to ensure institution-wide standards. This exposes the University to excessive risk, as individual IT units are independent and are not mandated to follow institutional best practices.

Metric: The degree of adoption of the review's recommendations.

3. On Our Radar

During the IT Plan discussions, numerous suggestions were made for expanding and enhancing the IT offerings at the University of Alberta. Many of these suggestions are being or will be investigated by 2016. These suggestions, although important to consider, do not have (nor do we foresee them having) the priority to be elevated to the status of a pillar.

- Unification of financial interfaces
- Increase IT standardization
- Collaboration at an institutional level
- Collaboration at a national/international level
- Examine our identity management needs
- Define an enterprise architecture
- Expand the use of single sign-on/portals
- Data archiving
- Create a future technologies group
- Create a project management office
- Increase research computing support
- Enhanced PeopleSoft functionality
- Electronic textbooks
- Increased number of online courses
- Social networking

- Deploying virtual worlds technology for research and teaching
- Improved electronic communication to faculty, staff, and students
- Creation of an Intranet
- Professional education and re-training opportunities for IT personnel
- Common CV
- Expand the Help Desk
- Deployment of the Virtual Computing Laboratory
- Data warehouse
- Customer relations management
- ...

As the above list makes obvious, there are no shortage of interesting and important projects that need to be addressed.

4. Final Comments

In the area of information technology, the University of Alberta is well positioned compared to our Canadian peers, as evidenced, for example, by strong support from senior administration, evergreened core IT systems, and high-speed University-wide wireless infrastructure. A successful deployment of this 2012-2016 plan will ensure the University community will be empowered with information technology excellence and that the University will enhance its leading position in Canada in this area. Some of the initiatives proposed in this road map can scale to be province-wide (Campus Alberta) and be the prototype for national efforts.

Appendix A: Recommendations

The following are the recommendations for the 2012-2016 information technology plan for the University of Alberta.

Pillar A: Mobility

Recommendation A.1: Evergreen the costs of keeping the wireless infrastructure (UWS) current and with the capacity to stay ahead of the growing demand.

Recommendation A.2: Invest in increased mobile phone application functionality (“apps”) and access to content to meet the needs of students, staff, and faculty.

Recommendation A.3: All university, faculty, department, and unit web pages become mobile friendly.

Recommendation A.4: Improve the usefulness, presentation quality, and organization of web content.

Recommendation A.5: Plan for a future where there is less dependence on wired telephone technology.

Recommendation A.6: Provide the information technology services needed to facilitate the growth of the University's on-line course delivery initiatives.

Pillar B: Green Computing

Recommendation B.1: Provide information to the University community about being more socially conscious of the environmental impact of computing-related infrastructure.

Recommendation B.2: Encourage the use of virtualization technology to reduce the aggregate amount of computing resources needed.

Recommendation B.3: Reduce the usage of standalone desktop printers, scanners and fax machines.

Recommendation B.4: Increase the number of paper-based processes that can be replaced by an on-line process, including on-line approvals.

Recommendation B.5: Consolidate IT server infrastructure into a small number of approved server rooms.

Recommendation B.6: Deploy an electronic document and record management system (EDRMS) to replace paper filing with electronic filing.

Pillar C: Open Data

Recommendation C.1: Create an institutional attitude that fosters the making of institutional, educational, and research artifacts open.

Recommendation C.2: Create standardized programming interfaces to University open data.

Recommendation C.3: Encourage innovative use of this data, especially by students.

Pillar D: Operational Excellence

Recommendation D.1: Create and encourage use of central services for common "utility" computing needs.

Recommendation D.2: Consolidate common server infrastructure into a large shared-services cloud, to be used across participating units for teaching, administration, and research.

Recommendation D.3: Educate users about administrative system capabilities and, where needed, enhance system functionality to reduce the need for shadow systems.

Recommendation D.4: For key University business processes, automate, improve, and/or simplify them using information technology.

Recommendation D5: Encourage and facilitate the upgrading of faculty and staff IT skills.

E. Best Practices

Recommendation E.1: Deploy best practices for information technology security, including a public education campaign, encryption, physical security, and audits.

Recommendation E.2: Deploy a control framework across major central IT units and educate other IT groups.

Recommendation E.3: Create an information technology project management office to manage all major IT projects at the University of Alberta.

Recommendation E.4: Development of a comprehensive suite of information technology policies and procedures in UAPPOL.

Recommendation E.5: Conduct a review of IT governance at the University of Alberta.