**Technology Directions**

**McMaster University**

Inspiring Innovation and Discovery

# McMaster University

# University Technology Strategy

*Achieve international distinction for creativity, innovation and excellence enabled by technology*

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To the McMaster community:

The University Technology Strategy, "Technology Directions", has been revised to reflect comments from the McMaster community and will be submitted to the University Planning Committee for consideration.

The Strategy was developed in collaboration with many members of the McMaster community. The process was "made at McMaster" and reflects extensive consultation with faculty, staff and students. Participants in the process conveyed a willingness to embrace change and a strong recognition of the importance of technology to McMaster. The wisdom, reflections, and wealth of ideas contributed by students, staff and faculty are sincerely valued.

The Strategy is intended to enable the bold promise of Refining Directions, address technology risk, meet today's needs, and position McMaster for the future. Much foundation work needs to be done and consequently the Strategy reflects both "catching up" and going forward. At the same time, the Strategy is intended to be a working document and will be informed by the committee working on the education dimension of Refining Directions' implementation, the future plans of the Centre for Leadership and Learning, and the Burlington campus initiative, among others.

Four themes are woven throughout the document:

- Work together as one University

- Create a University without boundaries

- Enhance the student experience from "in line to on-line" and provide individual personal service and support

- Transform the technology model to client-centric service delivery or, put another way, anytime anywhere service and support that meets and anticipates your needs

This is the first University Technology Strategy and marks new beginnings. You are invited to become an ambassador for Technology Directions' implementation. Together, we can transform the landscape at McMaster to "achieve international distinction for creativity, innovation and excellence" enabled by technology.

Sincerely,

Debbie Barrett
Chief Information Officer

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## Acronyms

| | |
|---|---|
| DB2 | Universal Database supplied by IBM |
| CIO | Chief Information Officer |
| CIS | Computing and Information Services |
| CLL | Centre for Leadership in Learning |
| CSU | Computer Services Unit – Health Sciences |
| IMS | IBM's transactional and hierarchical database management system for on-line operational and e-business applications and data.  First introduced in 1969, IMS continues to support many high volume transaction-based processes.  The University has a current release. |
| LTRC | Learning Technologies Resource Centre |
| MVS | Multiple Virtual Storage, the operating system for older IBM mainframes. MVS was first introduced in 1974 and continues to be used, though it has been largely superseded.  The University currently runs OS/390 V2.9 which is a successor to MVS |
| RHPCS | Research and High Performance Computing Support |
| SHARCNET | Shared Hierarchical Academic Research Computing Network |

# 1  Introduction and Summary

*First, listen and understand*

*Then, a vision of what can be*

*Then, projects carefully crafted*

*Then, consultation, collaboration and closure*

*Then, approval and funding*

*Finally, delivery and transformation . . .*

"Significant investments are required in information technology, data access and institutional planning so that these areas are able to provide the support needed to meet the University's goals and objectives."

– Refining Directions 2003

The McMaster University Technology Strategy is intended to guide future decisions and position the University to sustain its vision "to achieve international distinction for creativity, innovation and excellence".  Technology Directions has a University-wide focus and is not intended to reflect individual Faculty or Department needs.  Provision is made, however, for processes to propose Faculty or Department specific initiatives.

This is an exciting and challenging time to reflect on how information technology can support the University.

"Information Technology and Telecommunications (IT and T) are integral to the operations of a modern international university. For a university to be world class, its IT and T policies and infrastructure must at the very least sustain that status and, where possible, confer a competitive advantage.[1]"  Key indicators based on generally accepted benchmarks include:

- Alignment with University strategic direction
- An information and telecommunications agenda or strategic plan
- A budget matching the agenda
- Agreed levels of performance
- Guaranteed infrastructure performance for core activities
- Universal student and staff service provision
- Cost competitiveness and value for money

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[1] Benchmarking: A manual for Australian universities, 2000, p.11

- Performance-based accountability
- Equitable outcomes for students and staff and
- Demonstrable enhancement of communication with stakeholders.

With the exception of the robust and reliable University network, library systems, some specific applications and research, McMaster is lagging when considered in relation to almost every best practice.    For example, best practice in leading universities suggests that "senior members of the university community should have access to corporate information systems that are appropriate to their needs.  Systems should be easy to use, reliable, intuitive and responsive to changing requirements of the university and its stakeholders.  The databases accessed by these systems must be complete and current and satisfy stakeholder needs.[2]"  This is definitely not the case at McMaster today.

Some current thinkers such as Nicholas Carr[3] argue that "IT doesn't matter" and that "as information technology's power and ubiquity have grown, its strategic importance has diminished".  Carr suggests that today's focus should be on vulnerabilities not opportunities and concludes that "IT management should, frankly, become boring.  The key to success for the vast majority of companies, is no longer to seek advantage aggressively but to manage costs and risks meticulously."   As McMaster has not invested in technology in recent years, the challenge is both to address the significant risk of aging applications and infrastructure and to invest wisely to benefit from the commoditization of applications and best practices developed by others. In other words, McMaster needs to turn the challenge of aging technology into an opportunity.

Four themes emerged as the consultative process evolved and are woven throughout Technology Directions:

- work together as one University
- create a University without boundaries
- enhance the student experience from "in line to on line" and provide individual personal service
- transform the service delivery model to client-centric services

**Big Assumption**

Researchers need freedom to use technology appropriate to their work.  Consequently, this Strategy is based on "freedom within boundaries" and specifically excludes computing used by researchers for research work provided that their choices do not impact the rest of the McMaster community.   For example, researchers may acquire and deploy a wide range of servers

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[2] Ibid p. 28
[3] Nicholas G. Carr, IT Doesn't Matter, Harvard Business Review, May 2003, p. 5

("freedom") but should comply with security standards ("boundaries") so that the University network and the campus community are not at risk.

## 1.1  The Case For Change

Three compelling drivers support the need for change: Risk, Alignment with Refining Directions and Financial Challenges.

## 1.1.1 Risk

The first compelling driver, technology risk, was identified in a presentation[4] by Deloitte & Touche, external consultants, in 2003 to the Board of Governors as the number one risk facing the University.  Technology risk is the risk that the University does not maintain adequate systems and is not sufficiently leveraging advancements in technology impacting the ability to achieve the University's goals and strategies.

The presentation described the implications of Technology Risk:

- behind major competitors in the way the University teaches using technology – for example in distance education and web-based learning

- no cost-benefit evaluation of technology investment

- no plan/strategy for the use of technology in the University overall ...largely left to departments to decide how to use technology

- impacts image of McMaster being 'innovative' if IT systems are antiquated or lacking - can also result in missed opportunities

- IT investment not proportionate across the University  -  many dollars invested in large faculties and other smaller areas are suffering as a consequence

- lack of leadership in IT

- significantly behind competition e.g. currently implementing student self enrollment systems about 10 years behind our competition

- under-invested in IT (both from an academic and administration perspective) - as a result now paying the price for going cheap early and hoping for a great solution for little cost

- big need to keep up with technology, also increased risk to new IT solutions, such as student self-registration (e.g. increased risk with electronic access to information, risk with protection of confidential/private information in an electronic environment)

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[4] McMaster University Risk Assessment Report, Deloitte & Touche presentation to the Board of Governors, May 2003

- certain systems do not meet the needs of Collective Agreements thus threatening our ability to comply with legislation

- no infrastructure for a university-wide information system, which seriously compromises our ability to utilize information in making effective, timely decisions

On a scale of 1 to 10 where 10 is high, technology risk was identified as 8.2[5] with a risk management effectiveness rating of 2.9 for a gap of 5.2. While the numbers are merely relative indicators, they suggest that much work needs to be done.

## 1.1.2 Refining Directions

The second compelling reason for change is to enable McMaster to achieve the bold promise set out in Refining Directions.

**Mission**

At McMaster our purpose is the discovery, communication and preservation of knowledge. In our teaching, research, and scholarship, we are committed to creativity, innovation and excellence. We value integrity, quality, inclusiveness and teamwork in everything we do. We inspire critical thinking, personal growth, and a passion for lifelong learning. We serve the social, cultural, and economic needs of our community and our society.

**Goals**

1. **To provide an innovative and stimulating learning environment where students can prepare themselves to excel in life**

   Target: To be consistently among the top three Ontario universities in terms of the quality of students we attract and graduate from our undergraduate and graduate programs as measured by appropriate indicators.

2. **To achieve the next level in research results and reputation by building on existing and emerging areas of excellence**

   Target: To be consistently among the top three Canadian universities as measured by appropriate indicators of research excellence.

   Target: To increase the importance of graduate education so that McMaster's graduate population reaches 20% of the University's total full-time enrolment and is highly ranked in indicators of graduate educational excellence.

3. **To build an inclusive community with a shared purpose.**

   Target: To ensure that all members of the McMaster community feel recognized and valued for their contributions to this shared purpose.

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[5] McMaster University Risk Assessment Deloitte and Touche presentation to the Board of Governors May 2003

Technology Directions has been prepared as part of an umbrella project led by the Provost to coordinate the implementation of Refining Directions and to develop a set of key performance indicators.

## 1.1.3 Financial Challenge

The third driver for change is the ongoing financial challenge exacerbated by the pending pension funding shortfall. The gap between the pension requirements and available funding is estimated to be about $15.9 million in 2005/06 increasing to $35.3 million in 2006/07. Technology may provide an opportunity to contain or possibly reduce some costs provided a commitment is made to change processes and eliminate duplication. The pendulum has swung to a decentralized organization and consequently duplication prevails. For example, today Computing and Information Services has accountability for campus electronic mail but there are about seventy electronic mail servers maintained by others. Other examples include the multiplicity of touch points for students where line-ups occur at start of term rather than presenting an integrated on-line portfolio of services. The potential Burlington campus may also act as a catalyst to provide services on-line to enhance service and contain costs.

This Strategy suggests that business process improvement is the essential first phase of every initiative. However, it is not clear whether there is sufficient willingness to explore new ways of delivering services as, with some exceptions, Faculties, Departments and Ancillary Services work independently today.

## 1.2  Project Initiation and Process

The University appointed a Chief Information Officer in September 2003 with a mandate to:
- develop and implement a University Technology Strategy using a collaborative process
- achieve service excellence and
- create a secure, robust, managed technology environment

The Chief Information Officer met with many stakeholders and consulted with representatives of the campus community in the development of Technology Directions. The guidance, wealth of ideas and investment of time by all contributors are sincerely valued. Appendix A lists some of the many participants and organizations involved in the process who were generous with their time and ideas.

The model[6] used for consultation was simple:
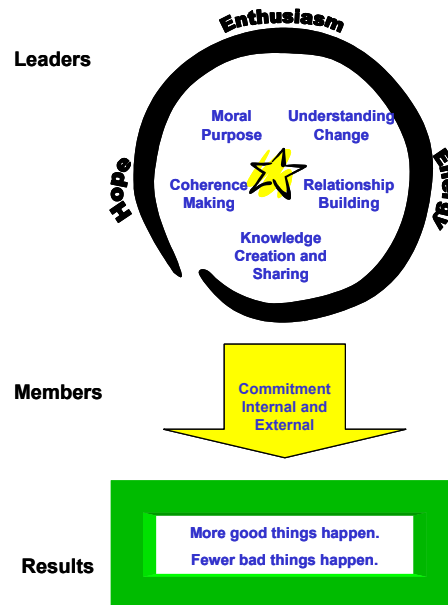


This Strategy is presented as a framework for decision-making which will continue to evolve.  It is acknowledged that expectations for new investments must be carefully managed in the face of significant budget pressures, limited resources, demanding workloads, transformation in education, space and resource challenges as well as competition for funding, grants, and students.

Consequently, what seems to be a straightforward University Technology Strategy is really a change journey that forges new partnerships, explores new ways of working together and delivers a flexible, agile model for the future.   Technology Directions addresses some difficult questions: Is the University community ready to embrace change?   What is the appropriate level of investment in information technology?  What does the governance model for investment in and management of technology projects look like?  How are priorities established?  Who decides?

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[6]   Michael Fullan, Leading in a Culture of Change, Jossey- Bass, 2001, p.  4

The transformation is multi-dimensional as depicted below:

| FROM | TO |
|---|---|
| 1980's | 2009 |
| Straggler | Leader |
| Client frustration | Client satisfaction |
| IT as research focus | IT enables research |
| "Way we've always done it" | Client-centric |
| Manual processes | Electronic solutions |
| Islands of expertise | Integrated client services |
| Silos of technology | Managed technology |
| Anything goes | Freedom within boundaries |
| Standalone applications | Enterprise solutions |
| Independent decisions | Governance models |
| 22 client touch points | Shared services |
| Vendor sales | Managed partnerships |
| Lack of credibility | High performance teams |

Technology Directions describes a series of strategies and projects intended to achieve high-level objectives and mitigate risk.   At the same time, approval processes invite new initiatives and projects annually so that Faculties, Departments, and Ancillary Services as well as faculty, staff and students have ongoing opportunities to sponsor new proposals as circumstances change. The Strategy also envisions putting a stake in the ground with respect to accountability for technology and declares that future technology decisions and investments allocated from the University Technology Fund are made collectively and accountability rests with the CIO and the University Technology Committee.

## 1.3  Objectives

The University identified the need for a comprehensive Technology Strategy.   The Strategy will benefit the University by:

- Enabling the goals and targets set out in Refining Directions
- Addressing the significant concern that technology risk is the number one risk facing McMaster
- Enhancing support for and related satisfaction of students
- Presenting a comprehensive and sustainable action plan based on University needs and aligning staff resources, projects, and funding to address University priorities

- Facilitating the achievement of excellence in teaching, education and research through appropriate access to and use of Information Technology
- Enhancing collaboration with external organizations such as the hospitals, research institutes, City of Hamilton, City of Burlington, Mohawk College, and community organizations, among others
- Optimizing the benefits derived from the investment in Information Technology
- Defining accountability for Information Technology within McMaster
- Enhancing service levels to faculty, staff and students
- Facilitating communications among faculty, staff, and students on Information Technology processes, priorities, and standards

The risks of not implementing Technology Directions include:

- Less than optimal use of money and staff resources to meet University technology needs
- Possible lack of competitiveness with other universities to attract the best students
- Ongoing frustration by faculty, staff and students about the lack of match between technology needs and the resources available to meet the needs
- Lack of ability to deal with the transformation in learning and education in a planned and coordinated manner
- Ongoing opportunity cost as faculty and staff become technology technicians in the absence of support
- Ongoing potential for security breaches, failure to protect privacy, loss of computers and data, and
- Ongoing relationship challenges with external partners.

If this University Technology Strategy conveys only one message, it is this: the time has come to work together as one University to ensure that access to information, applications, and infrastructure is fostered and nurtured and that accountability for decision-making is defined. Barriers that impede access and its sister, discovery, need to be eliminated and a new "can do" spirit created based on communication, collaboration, and partnership.

In this brief study, the barriers were conveyed in many different ways: "You just don't understand how universities work". "We've tried and gotten commitment at the highest level and nothing happens." "Health Sciences is the Quebec of the University federation" "Decisions are made by Committee and at the end of the day no one is accountable." "We're waiting for 'them' to retire." "We know it's the right thing, we just don't have the time/money/resources/will." "Someone suggested that a decade ago and was fired."

A second key message also merits discussion: processes and services need to be client-centric and to start and end with students. As budgets have diminished and challenges increased, the University imperative to attract and support quality students in their quest for education has become even more challenging. Students are "web savvy" and simply expect a robust, integrated technology infrastructure designed to support their needs. They do not expect to line up or visit multiple offices.

Consequently, the University Technology Strategy needs to take into account the needs of students as well as the important roles of Faculties, researchers, educators, and administrators. Students today may be more computer literate and comfortable with the web, personal digital assistants and wireless technology than the faculty accountable for teaching them.

A Toronto Star editorial[7] described the digital divide for the Class of 2006 and noted that these

"are students who can't remember the $2 bill.  Listen to MP3s, not cassettes, or records.  Think TV's always came with remotes.  Can't imagine a microwaveless kitchen. . . .Can't remember when Peter Mansbridge didn't host The National.   Think of Lorne Greene as a space dude from *Battleship Galactica*, not Ben Cartwright on *Bonanza.*  Don't cringe when somebody refers to "The Dead Kennedys".   Have always bought water in bottles.  Think of cappuccino as a bubblegum flavour.  Do their cut and paste without scissors and glue.  And their spell-check without a dictionary in their hands.  And think teens have always had cell phones. . . . "

Technology Directions invites new beginnings, sets aside justifications for previous decisions which were all made with good intentions based on the best available information at the time, and encourages a "go forward" agenda to position the University for success.

## 1.4  Technology Vision

Members of the campus community in a series of workshops envisioned a bold future where:

- McMaster has no boundaries.  Outreach includes partnerships with all levels of government, industry, educational institutions, and the local and global community supported by seamless communications tools and technology
- community, collaboration and trust are fostered
- an institute of interdisciplinary research computing is the focal point for "hot house" collaborations around themed research and includes a "Collaboratorium" multi-media facility
- virtual problem based learning environments simulate real world applications and support undergraduate research at an elite level with award winning professors
- technology is used to advantage to support individual student learning, serve new teaching and learning opportunities, and facilitate transformative teaching
- risk and innovation are encouraged
- access to technology is available anytime, anywhere, anyplace
- student services are integrated on-line
- an intuitive,  voice-activated service portal provides personal, universal 24/7 service
- a "utility grade' infrastructure is so reliable that it seems invisible
- governance addresses alignment of Refining Directions and investments in technology across the University; assumes a baseline of available services; acknowledges the importance of trust, value, transparency and communications; achieves freedom within boundaries; and encourages lone wolves to howl and everyone to discover, innovate and create

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[7] The Toronto Star, November 2, 2002, p. H6

## 1.5  Strategies

In the context of both the vision and objectives, key strategies are proposed to ensure that appropriate technology and processes are available to support the University community.  Taken together the strategies create the North Star for Technology Directions.

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**Technology Strategies**

1.  *Create a University without boundaries.  Work together to develop and implement a "University" Technology Strategy aligned with Refining Directions' implementation.  The emphasis is on one University with Faculties, Departments, Ancillary Services and external partners working in harmony to implement a bold plan for the future.*

2.  *Create a new governance model and priority-setting process for technology which addresses competing interests.  Implement a new investment model and invest strategically.  Be crisp about accountability and decision-making authority.*

3.  *Enhance the student experience at McMaster by providing personalized and customized support and access to information and technology based on student needs and choice of time, location, and channel.*

4.  *Facilitate the differentiation and competitiveness of McMaster as a research intensive university by the effective deployment of technology to support researchers.  Achieve technology leadership among Canadian universities by leveraging McMaster's research focus on information technology and bioinformatics.*

5.  *Facilitate the differentiation of McMaster as a problem-based teaching and learning centre of excellence by the effective deployment of technology to support collaboration and learning.*

6.  *Enable the creation of the premier learning community in Ontario by implementing a community education portal in partnership with the City of Hamilton, City of Burlington, Mohawk College, Sheridan College, Boards of Education among others, and explore partnership opportunities with hospitals and health care providers.*

7.  *Achieve service excellence.  Be client-centric and help students, faculty, staff and alumni achieve self-sufficiency.  Provide clients with the access, information, tools and support that they need.  Implement client-facing portals supported by shared services.*

8.  *Adopt a portfolio-based, integrated approach to information management and technology based on collaborative partnerships both within the University and with external partners.*

9.  *Agree on a standards-based environment and "freedom within boundaries" so that efficiencies are achieved and innovation is encouraged.  The target is a framework based on agility and flexibility which at the same time ensures no or minimal adverse impact on others within the University community.  Put another way, standardize wherever possible and put in place processes to ensure that researchers have freedom to discover without creating risk or consequences for others.*

10.  *Provide an accessible, secure, reliable, robust, managed infrastructure and communications network so reliable that it seems invisible.  Ensure that privacy, security and risk assessment are integral to all initiatives.*

11.  *Complete foundation projects in progress such as the Business Intelligence, Human Resources and Payroll, and Student Self-Registration initiatives expeditiously so that the future focus can be strategic.*

12.  *Position McMaster for sustained success and report on progress against the plan and key technology performance indicators.*

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## 1.6  Context

Chapter two describes the context of the McMaster environment with about 27,000 students in six Faculties and 45 buildings.

## 1.7  Management Recommendations

Chapter three sets out management direction and recommends:

- Creation of a University Technology Committee to set priorities for investments in technology funded from the Technology Fund and to make budget recommendations annually to the University Planning Committee, Finance Committee and the Board of Governors.  The Committee would be composed of the Provost and VP Academic, VP Administration, VP Research, Chief Information Officer (Chair), and would work in consultation with the Senior Management Team and the McMaster community.  Terms of Reference are proposed and attached as Appendix B
- Creation of a Service Advisory Council to implement a client-centric approach to service processes, implement service management and monitor key performance indicators of service excellence to ensure a common approach to service
- Confirmation of a University-wide mandate for the Chief Information Officer to discuss requests for new or replacement technology positions
- Creation of a University Technology Services Department with dotted line accountability for all University technology service providers
- That all Faculties, Departments, and Ancillary Services be requested to provide the CIO with a description of their technology initiatives annually as part of the budget process, to seek the concurrence of the CIO for all investments exceeding $100,000, and to limit their investments to Faculty-specific initiatives not described in the University Technology Strategy.  On an to support so that students, faculty and staff have one stop access to service, and operational level, Faculties and Departments will be requested to consult with University Technology Services prior to deploying any non-standard device or system onto the University network.
- Training and reskilling of staff to match changes in technology
- Implementation of new approaches
- Commitment to risk assessment and risk management

## 1.8 Assessment of Existing Environment

Chapter four describes the existing applications, enterprise networks and infrastructure. The existing application portfolio consists of three workhorses – Payroll, Financial Accounting, and Student Information – and a diverse range of supplementary applications managed by a multiplicity of organizational units. The core applications were generally acquired in the 1980's, do not meet today's needs, and are based on outdated technology and tools. Few management and audit controls are in place.



McMaster Systems Map – 2005-03-01
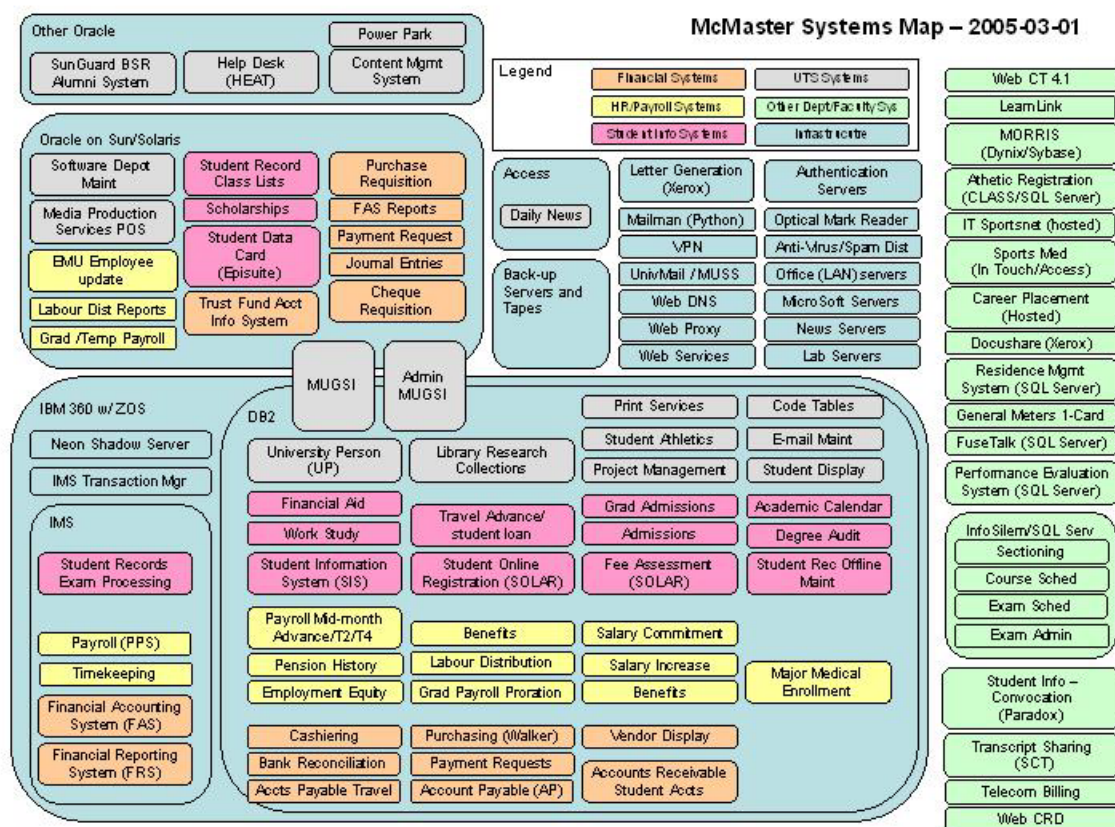
The diversity of solutions presents an integration nightmare and creates a poor experience for students and the entire University community as an individual is considered to be a separate client for payroll, security, parking, hospitality, residence, library and other services.

A range of servers and databases support the many applications. Few standards exist and fewer are enforced.

Limited funding has translated into lack of test, development and production environments. The level of maturity for commonly recognized best practices for incident management, problem management, service management, disaster recovery and business continuity, and version management is dismal notwithstanding the best efforts of committed staff. Limited project management and systems life cycle management processes are in place.

Core systems lack uninterruptible power supplies and access to emergency power. Air conditioning and humidity control in key data centres do not work. Over 400 servers are distributed throughout the campus. Many are not behind a firewall and present a vulnerability to the entire campus community. The absolute basics of physical and environmental protection are lacking.

No requirement to maintain virus protection and currency of desktop operating systems exists. Consequently, staff invest significant time and effort in fighting denial of service and virus attacks. Once an individual faces the loss of access and data, he or she usually becomes much more careful about virus protection and the importance of software updates. Many servers are not located behind firewalls and create security vulnerability.

Support is diverse and fragmented. Over twenty technology service providers offer assistance and/or services. Consequently, it is difficult for the community to determine who to call and lines of accountability are blurred.

Twenty student computing spaces are managed by ten organizational units.

The University is also a study in contrasts: some glorious new facilities such as the Michael G. DeGroote Centre for Learning and Discovery lecture theatres have state-of-the-art facilities including a 3-D theatre while other classrooms use overhead projectors. In many ways, the challenges faced in the technology domain mirror the deferred maintenance program initiated by Physical Plant. Over $170 million in physical building projects are in progress while the annual known capital investment in technology has increased from a typical annual investment of $1 million to $3.5 million in 2004/05.

The University network is a high-speed managed resource connected to the ORION/ORANO network of networks to provide access to high performance computing clusters as part of SHARCNET in various Ontario universities, access to high speed Internet, and communication throughout Canada, North America and the world.

Some glimmers of change have occurred and are symbolic portents of future initiatives:

The Student Registration project is a significant success and provides students with the ability to register on-line, conduct degree audits, calculate fees and withdraw from and add courses.

Business Intelligence is an exciting initiative which has created a University data model and the first data marts to enable collection and analysis of data from diverse sources. For example researchers will be able to consolidate University funding and research grants for the first time and monitor expenditures.  Business Intelligence may also enable the University to track key performance indicators in a "balanced scorecard".

The recent decision to acquire a human resources and payroll packaged software solution is a pivotal change in the approach to application deployment to meet the needs of the campus community and reflects a team-based collaborative approach to implementation.

The number one technology issue on campus a year ago was the loss of productivity related to spam and viruses.  Computing and Information Services staff implemented a comprehensive solution in August 2004 which contained the problems.  However, the solution is not universally effective because of the many e-mail servers across campus and because spammers continue to develop new approaches.

Computing and Information Services in collaboration with other technology service providers across campus reviewed service processes and acquired service desk software which is the first step towards "one stop shopping" for support and quantifiable service delivery measures.

The number one technology issue from students' perspectives a year ago was password setting and resetting.  A new client-friendly solution was implemented in November, 2004.

## 1.9  Technology Recommendations

Chapter five describes target applications portfolios, the technology architecture and infrastructure and sets out principles for the future based on "freedom within boundaries".  One of the key recommendations is to move to a managed, standards-based environment with the exception of technology used for research work.

The schematic below shows a simple high-level architecture for the priority applications identified in the Master Project list.
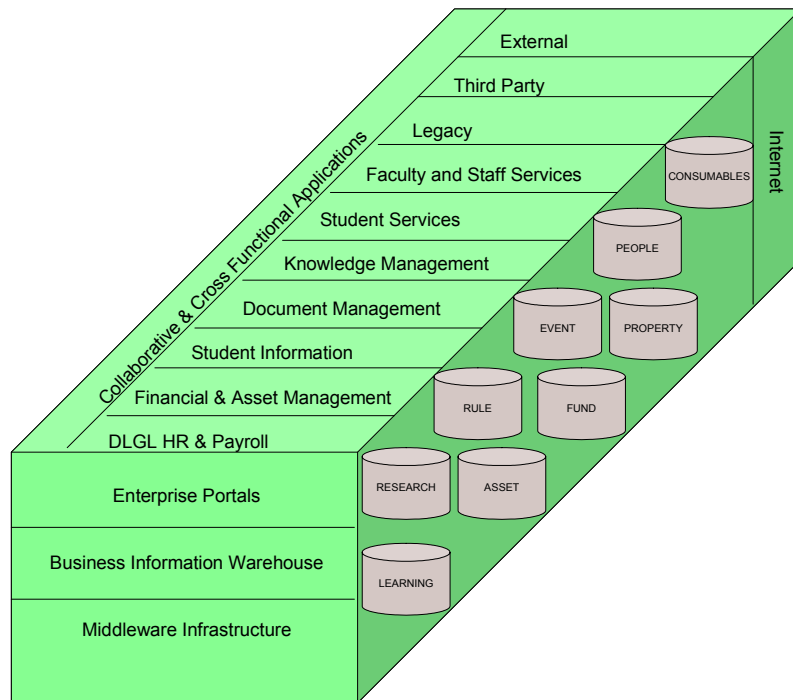


The Strategy envisions integrated portfolios of applications accessing common databases. Both Enterprise Resource Planning[8] Solutions and Open Source[9] should be given careful consideration and represent key decision points in the implementation agenda. University Technology Services should seek packaged software solutions to minimize risk and optimize the potential for ongoing enhancements, commit to open source solutions, and also explore the potential to work in partnership with others to acquire software solutions. In-house development should be a last resort once needs have been carefully defined and available solutions considered.

The University has a secure, reliable, robust communications network which should be maintained and renewed.

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[8] Enterprise Resource Planning (ERP) solutions generally refer to institution-wide applications for financials, human resources, student information and portals. The solution is integrated such that when data is added in one area, information also changes in all related areas and functions. Typically, the solutions are modular in structure. Key business processes are also integrated and enhanced by embedded best practices.

[9] Open source software refers to programs for which the licenses allow users to
- freely access, install, and run the software for any purpose;
- modify the original software;
- redistribute copies of the original or modified programs; and
- share modifications with the community.

A new University Technology Services Department consisting of all University technology service providers should be accountable for coordinating the technology implications of all capital projects and renovations including cabling and planning for future wireless deployment.  Wireless access is a key enabler for faculty, staff and students and the University should continue to be proactive in planning for its implementation.

University Technology Services should also be consulted on all future non-standard technology acquisitions and should optimize deployment of servers, communications devices and access. Standards will be implemented.  Servers should be located in data centres designed to create a secure managed environment.

The technology principles and strategies that guide the design of the target technology architecture are consistent with the principles and strategies articulated in the management recommendations.

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### Technology Strategies

***People, Practices and Technology work together*** - People, work practices and technology will be integrated.  The technology must be designed to support defined work practices and the people involved in the delivery of services.  The first phase of any technology initiative will be the review and optimization of business processes.

***Business Driven*** - Investment in technology will be based on business cases

***Accessibility of Technology*** - clients will have access to the technology and information services appropriate to their roles.

***Common User Interface*** - Applications accessed by a client will have a similar "look and feel", and clients will be able to access other applications through a common application interface, or through a shared database management system.

***Buy vs. Build*** – The University will purchase commercial off-the-shelf application packages

***Leading Edge, not Bleeding Edge*** – The University will emphasize the use of proven technologies with, of course, the exception of research.

***Re-usability*** – The application portfolio will be designed to re-use technology components

***Bulletproof*** - System components will be designed with a high level of independence

***Help Available*** - Documentation (Practices, Standards, Systems) is integrated and available electronically

***Sound Data Management*** - Data will be captured once, and once only, at the point of creation.  .

***Maintainable*** - All systems will be built to support maintainability and re-usability.

***Plug and Play*** – Open, or widely accepted, standards and products are preferred

***Standardization*** - Any unnecessary diversity in the architecture should be restricted.

***Distributed Workflow Network Computing*** - technology infrastructure will be workflow and network centric

***Scalability –*** Preference is given to scalable product lines and products

***Support Available*** – Preference is given to products, service providers, and companies that not only deliver high quality, but sustain the business efforts of their customers by providing cost effective, available, accessible, and quality support and service.

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The University needs clearly articulated technology principles and standards to guide decision-making.  While some may seem to be motherhood statements, all represent a change to the University.  The following eleven principles are proposed and consistent with the "Big Assumption" will not apply to research initiatives:

### Technology Principles

- *Acquire or buy integrated application portfolios*
- *Implement Web-based applications and development platforms*
- *Use a Common Graphical User Interface  and usability standards*
- *Use standard  relational database technologies*
- *Acquire Open System Compliant Products*
- *Implement centralized data, network, and security management and administration*
- *Provide remote support, troubleshooting, and configuration management*
- *Provide continuous Information and Network access*
- *Implement updated security strategies and remote audit facilities*
- *Implement a centrally managed backup and recovery strategy*
- *Integrate diverse data forms from multiple sources using multi-media and imaging*
- *Use standard application interfaces to a defined set of published shared services*
- *Provide 24 X 7 access and support*
- *Manage information as a valuable asset*
- *Maintain software and hardware currency*
- *Achieve continuous, cost effective, improvements*

## 1.10 Master Projects

To achieve the strategies, chapter six proposes a series of over forty projects based on input and advice from the McMaster community.

| University Without Boundaries | Governance | Student Experience | Research/Academic |
|---|---|---|---|
| Business Intelligence | Governance Model Technology Committee | Student Portal | Institute for Arts and Technology |
| Sustained Success | Investment Model | Integrated Student Services | Collaborative Research "Hot Houses" |
| IT Audit and Risk Assessment | Communications Strategy | Knowledge Commons | Shareable High Performance Computing |
| Key Performance Indicators | Inquiry/Problem Based Learning | Student Technology Centres | Knowledge Management |
| Application Portfolios | Support and Outreach Program | Technology Accessibility | Open Information Research Initiative |
| Student Information | faculty Portal | Standards | Service Excellence |
| Financial and Asset Management | Inquiry/Problem Based Learning Centre(s) | Technology Standards and Best Practices | Service Excellence d Service Delivery Model |
| Document Management | Web Conferencing | Managed Infrastructure | Partnership Models Service Advisory Council |
| Alumni and Donor Relationship Management | Smart Classrooms | Wireless Canopy | Foundation Projects |
| Portal Creation and Management | Premier Learning Community | Disaster Recovery and Business Continuity | Student Self Registration |
| Space Planning and Management | Community Education Portal - Connect Hamilton | Data Centre Consolidation | HR and Payroll |
| | Hospital and Community Partnership Model | Campus Expansion and Construction | Project Management Office |
| | | Technology Replacement Program | |
| | | Security Road Map | |

Project descriptions in the same chapter correspond to this Master Projects diagram which in turn links back to the twelve key strategies. A capsule overview of each project describes the scope, sponsor, priority, and funding required. The level of detail and validity of the cost estimates vary considerably depending on the background work done to date. The intent is to present a high level overview and refine the project descriptions and funding proposals prior to submission of business cases to the University Technology Committee. The list is not exhaustive as projects such as the renewal of the McMaster web site will be considered when required.

## 1.11  Implement a new Investment Model for Technology

The University allocation to the University Technology Fund has been about $1 million per year. This was increased in 2004/05 to $3.5 million.  As noted above, money is also spent on technology by Faculties, Departments and Ancillary Services.

The University annual budget is about $580 million.  When compared to the total University budget, the investment in the University Technology Fund is insufficient to meet even basic University requirements and significantly less than the 4% typically used as a benchmark.  A 4% investment equates to $23.2 million if the base is the University budget.  The 2004/05 investment in the University Technology Fund is $3.5 million.  Another $8 million is allocated to Computing and Information Services, Learning Technologies Resource Centre, Research and High Performance Computing Support, University Libraries computing and Faculty computing units.

Because of the minimal investment, faculty and staff in all departments have become webmasters and computer technicians.  While some enjoy the challenge as a diversion from an intense workload, the cost and risk to the University are significant.

The University should enable achievement of key strategic objectives by supporting the University Technology Strategy and investing significantly in projects, applications and infrastructure and at the same time leveraging the existing investment in staff and technology across the organization.

**Investment in Projects**

The recommended investment by project is summarized below.   This is a very preliminary set of estimates intended to be more illustrative than detailed.  Some projects have not been costed as the scope needs to be further refined.    The Strategy proposes an investment of $31.5 million over four years.  There is nothing magical about the four year horizon.  It could be extended to five or six years but given the need to catch-up, a four year roll-out seems appropriate.

| Project | Estimate | 2004/2005 | 2005/2006 | 2006/2007 | 2007/2008 | 2008/2009 |
|---|---|---|---|---|---|---|
| Business Intelligence | 1,090,000 | 375,000 | 415,000 | 300,000 | | |
| Governance Model | 0 | | | | | |
| Investment Model | 0 | | | | | |
| Communications Strategy | 25,000 | | 25,000 | | | |
| Student Portal | 1,565,000 | 65,000 | 750,000 | 500,000 | 250,000 | |
| Integrated Student Services | 1,600,000 | | | 100,000 | 500,000 | 1,000,000 |
| Knowledge Commons | 2,000,000 | | 1,000,000 | 500,000 | 250,000 | 250,000 |
| Student Technology Centres | 2,000,000 | | 500,000 | 500,000 | 500,000 | 500,000 |
| Smart Classrooms | 2,000,000 | | 500,000 | 500,000 | 500,000 | 500,000 |
| Technology Accessibility | 175,000 | | 100,000 | 25,000 | 25,000 | 25,000 |
| Institute for Arts and Technology | tbd | | tbd | tbd | | |
| Collaborative Research "Hot Houses" | tbd | | | tbd | | |
| Shareable High Performance Computing | 750,000 | | | 250,000 | 250,000 | 250,000 |
| Knowledge Management | tbd | | tbd | | | |
| Open Informatics Research initiative | tbd | | | tbd | | |
| Support and Outreach Program | tbd | | tbd | | | |
| faculty Portal | 500,000 | | | | 500,000 | |
| Problem Based Learning Centre of Excellence | tbd | | | tbd | | |
| Web Conferencing | 300,000 | | 150,000 | 150,000 | | |
| Community Education Portal Connect Hamilton | 470,000 | 20,000 | | 100,000 | 100,000 | 250,000 |
| Hospitals and Community Partnerships | tbd | | | tbd | | |
| Culture of Service Excellence | 400,000 | | 100,000 | 100,000 | 100,000 | 100,000 |
| Service Delivery Model | 0 | | | | | |
| Shared Services Model | 50,000 | | | 50,000 | | |
| Student Information System | 3,100,000 | | | 100,000 | 1,500,000 | 1,500,000 |
| Financial and Asset Management | 3,100,000 | | 100,000 | 1,500,000 | 1,000,000 | 500,000 |
| Document Management | 1,600,000 | | 100,000 | 500,000 | 500,000 | 500,000 |
| Alumni and Donor Relationship Mgmt | 400,000 | | | 100,000 | 300,000 | |
| Portal Creation and Management | 650,000 | 50,000 | 100,000 | 500,000 | | |
| Space Planning and Management | 100,000 | | 100,000 | | | |
| Technology Standards and Best Practices | 200,000 | | 50,000 | 50,000 | 50,000 | 50,000 |
| Wireless Canopy | 335,000 | 35,000 | 300,000 | | | |
| Disaster Recovery and Business Continuity | 300,000 | | | 100,000 | 100,000 | 100,000 |
| Data Centre Consolidation | 1,600,000 | | 100,000 | 500,000 | 500,000 | 500,000 |
| Campus Expansion and Construction* | | | | | | |
| Technology Replacement Program | 1,000,000 | | 250,000 | 250,000 | 250,000 | 250,000 |
| Fire and Security Monitoring** | | | | | | |
| Student Self Registration | 1,475,000 | 975,000 | 500,000 | | | |
| HR and Payroll | 4,500,000 | 2,000,000 | 2,000,000 | 500,000 | | |
| Project Management Office | | | | | | |
| IT Audit and Risk Assessment | 200,000 | | | | | 200,000 |
| Key Performance Indicators | 25,000 | | 25,000 | | | |
| **TOTAL** | **31,510,000** | **3,520,000** | **7,165,000** | **7,175,000** | **7,175,000** | **6,475,000** |

* Funded by Building Budget
** Funded by Physical Plant

Projects are distributed by year to level funding implications. This should be used as a guideline only as priorities should be established by the University Technology Committee. While operating costs have not been quantified, an estimate of 15% annually would be reasonable.

Since the Strategy was drafted, budget projections have been developed for the next three year cycle from 2005/06 to 2007/08. Based on the allocation of $3 million per year in the Technology Fund and some infusion of funding from Refining Directions, Strategy implementation would be extended to about nine years. A high level implementation plan based on available funding is show below.

| Project | Technology Strategy Request | Planned Expenditure | 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 |
|---|---|---|---|---|---|---|---|
| Technology Strategy Funds Requested | 31,510 | | 3,520 | 7,165 | 7,175 | 7,175 | 6,475 |
| **Revenue Sources** | | | | | | | |
| Technology Fund Allocation | | | 3,520 | 3,000 | 3,000 | 3,000 | 3,000 |
| From Registrar (For Student Self Registration) | | | 10 | | | | |
| Committed funding from 2003/04 for BI Project | | | 356 | | | | |
| Pension Plan (for HRMS Pension Calculator) | | | | 279 | | | |
| Refining Directions Submission | | | | 3,500 | | | |
| Total Available | | | 3,886 | 6,779 | 3,000 | 3,000 | 3,000 |
| | | | | | | | |
| **Project Estimates** | | | | | | | |
| Business Intelligence | 1,090 | 1,256 | 356 | 500 | 200 | 200 | 0 |
| Key Performance Indicators | 25 | 0 | | | | | |
| HRMS/Payroll | 4,500 | 4,395 | 1,975 | 2,110 | 310 | | |
| Student Self Registration | 1,475 | 1,620 | 1,000 | 620 | | | |
| Portal Foundation and Common Authentication | 650 | 485 | 485 | 0 | | | |
| Student Portal | 1,565 | 1,965 | 55 | 1,400 | 400 | 110 | |
| Web Conferencing | 300 | 15 | 15 | | | | |
| Document Mgmt | 1,600 | 1,649 | | 249 | 410 | 490 | 500 |
| Financial and Asset Management | 3,100 | 3,100 | | 100 | 1,000 | 1,000 | 1,000 |
| Knowledge Commons | 2,000 | 1,800 | | 1,800 | | | |
| Student Technology Centres | 2,000 | 1,280 | | | 280 | 500 | 500 |
| Faculty Portal | 500 | 500 | | | 300 | 200 | |
| Space Planning and Management | 100 | 100 | | | 100 | | |
| Technology Replacement | 1,000 | 675 | | | | 250 | 425 |
| Shareable High Performance Computing | 750 | 0 | | | | | 0 |
| Wireless Canopy | 335 | 50 | | | | | 50 |
| Communications Strategy | 25 | 0 | | | | | |
| Smart Classrooms | 2,000 | 600 | | | | 250 | 350 |
| Technology Accessibility | 175 | 175 | | | | | 175 |
| Culture of Service Excellence | 400 | 0 | | | | | |
| Technology Standards and Best Practices | 200 | 0 | | | | | |
| Data Centre Consolidation | 1,600 | 0 | | | | | |
| Integrated Student Services | 1,600 | 0 | | | | | |
| Connect Hamilton - Education Portal | 470 | 0 | | | | | |
| Shared Services Model | 50 | 0 | | | | | |
| Student Information System | 3,100 | 0 | | | | | |
| Alumni and Donor Management System | 400 | 0 | | | | | |
| Disaster Recovery and Business Continuity | 300 | 0 | | | | | |
| IT Audit and Risk Assessment | 200 | 0 | | | | | |
| Total Projects | | | 3,886 | 6,779 | 3,000 | 3,000 | 3,000 |

The Chief Information Officer appreciates that many important priorities are competing for scarce resources but wishes to convey and reinforce the importance of investment in implementation of this Strategy to the future of the University.

**Creative Approaches to Funding**

The University is superb at seeking research grants and exploring available funding options. However, minimal effort has been made to seek donations, sponsorships or joint venture opportunities for technology investments. Some further exploration with University Advancement may be appropriate.

Undergraduate students today contribute a fee for "technology" which is allocated to Student Services. Some Faculties such as Business also request a "technology" fee from graduate students which is allocated to school-specific initiatives.

## 1.12   Forge collaborative partnerships

As noted above, the organizational environment is exceptionally complex and is unlikely to change. Consequently, the Chief Information Officer spends time looking outward to firstly understand the functions and accountabilities of Faculties, Departments and Ancillary Services, the Hospitals, Research Institutes, SHARCNET for computational computing, and external partners.

The CIO should pursue opportunities to leverage scarce resources to benefit the University and seek collaborative partnerships. Opportunities to work together should be leveraged. For example, Fibrewired is proposing to implement a shared services model for data centres which should be further explored.

## 1.13  Migration Plan

Chapter seven describes the process to implement the University Technology Strategy.

Some steps such as the creation of a Project Management Office have been initiated.
Key steps include:

1. Continue to build trust and forge partnerships around the University Technology Strategy implementation.  Continue the dialogue and discussion with Faculties, Departments and Ancillary Services and maintain the Strategy as a living document to be informed by future policies and related plans. (Chief Information Officer)

2. Recommend the University Technology Strategy, Technology Directions, to the University Planning Committee with a view to seeking approval of the Strategy by the Audit Committee and Board of Governors in the spring of 2005. (Chief Information Officer)

3. Create the University Technology Committee and formalize its terms of reference and composition.  Circulate information concerning the submission process and format of business cases. (Chief Information Officer)

4. Create the University Technology Services Department and put in place processes to support collaboration with all University technology service providers. (Chief Information Officer)

5. Use the Strategy as a framework for decision-making for all future initiatives. (All)

6. Expedite the completion of the three key projects in progress:  Business Intelligence, Human Resources and Payroll and Student Self-Registration. (All)

7. Use the Student Portal Project as an opportunity to demonstrate the concepts and approaches envisioned in the Strategy, invite participation, and deliver a model project. (Chief Information Officer)

8. Once the Strategy is considered by the Board, make recommendations for technology priorities and investments for 2006/07 as part of the budget process. (University Technology Committee)

9. Deliver, deliver, deliver! (All)

10. Report annually to Senior Management and the University Planning Committee on progress against the plan and key performance indicators.  (Chief Information Officer)

## 1.14 Conclusion

Chapter eight recommends approval of Technology Directions, the University Technology Strategy.

In summary, the University Technology Strategy sets out twelve key strategies and describes a series of projects to achieve University goals and objectives, optimize the use of information technology, create a new organization, forge collaborative partnerships, deliver a portfolio of University-wide solutions and ensure that the supporting technology and communications infrastructure is robust, secure and reliable.

This is the first University Technology Strategy and marks new beginnings. The McMaster community is invited to become ambassadors for Technology Directions implementation, and accept the challenge of working together across Faculties and Departments to advance the agenda one project at a time. Together we can transform the technology landscape at McMaster to "achieve international distinction for creativity, innovation and excellence" enabled by technology.

### Recommendation

That Technology Directions, the McMaster University Technology Strategy, be approved.

# 2  Context

## 2.1  Context[10]

McMaster is a full-service university. With well-established strengths in health care, engineering, business, social sciences, science, and humanities research and education, the University offers both students and professors exciting and unique opportunities for research, education, and collaboration.

With a long-standing reputation as Canada's "most innovative" university, McMaster has pioneered a number of programs that have changed how professors teach and students learn. Inquiry or problem-based-learning, pioneered at McMaster, has now spread across North America as a preferred method of instructing undergraduate students.

Through its continued dedication to innovative education and ground-breaking research, the University has earned its reputation as one of the leading post-secondary institutions in Canada. McMaster continues in its commitment to be Canada's most student-centred research university.

McMaster University has gained an international reputation for the educational programming offered by each of its six faculties.

Undergraduate teaching is conducted through the Michael G. DeGroote School of Business, the Faculties of Engineering, Health Sciences, Humanities, Science, and Social Sciences, and the distinctive Arts & Science program.

Interdisciplinary learning is a hallmark of McMaster. Undergraduate and graduate students, as well as our world class professors and researchers, are encouraged to collaborate with and draw from multiple areas of the University.

At McMaster University, the quality of graduate education is maintained at a high standard in a congenial environment conducive to advanced learning. Often rated as Canada's most innovative university, McMaster is a research-intensive centre of learning with excellent graduate programs. As a reflection of that innovation, and in adaptation to a changing world, new graduate programs

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10 Extracted from the McMaster University web site www.mcmaster.ca

continue to be added. The education that McMaster faculty provide is valuable not only for the graduate student's career but also for the student's development as a person.

The Enrolment Profile[11] is shown below:

| DEGREE CREDIT | 2004-05 |
|---|---|
| **Full-time** | |
| Undergraduate | 16,111 |
| Divinity College | 35 |
| Graduate Studies | 2,273 |
| Interns & Residents | 592 |
| Total Full-time | 19,011 |
| **Part-time** | |
| Undergraduate | 2,809 |
| Divinity College | 144 |
| Graduate Studies | 428 |
| Total Part-time | 3,381 |
| **Summer Session** | 4,846 |
| **TOTAL DEGREE CREDIT** | **27,238** |

Quick Facts[12]

The University has about 1,200 Academic and 2400 Administrative staff.

The 2004 consolidated Annual Budget is $580 million.

Bordering a major conservation area, the McMaster campus comprises 196 hectares (296 acres) and the campus has 45 buildings with a total of 367,027 sq. m. of floor space. Some additional facilities are located in downtown Hamilton. Special purpose facilities include a Museum of Art, Nuclear Reactor, Athletics and Recreation, Student Housing, and Conference Services, and a Manufacturing Research Institute, among others.

As Research University of the Year[13], McMaster heads the list of Canada's research universities ranked by Research Infosource Inc. in its annual Top 50 Research Universities report. The

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11 Source: McMaster University Registrar's Report - Table I-1

12 Obtained from the McMaster University web site www.mcmaster.ca

rankings are based on total sponsored research income, faculty and graduate student research intensity, and the number of publications in leading journals. McMaster was ranked in the medical/doctoral category.

For the second year in a row, McMaster placed seventh in the country in overall research income, bringing in more than $218 million. The University was ranked third in research intensity based on research income per full-time faculty position. The rankings are based on Statistics Canada data.

The University focuses on six key research areas: molecular biology, environment and health, information technology, globalization and the human condition, work and society, and science-based innovation in manufacturing and materials.

Refining Directions presents the University's bold promise and concept for the future:

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### Mission

At McMaster our purpose is the discovery, communication and preservation of knowledge. In our teaching, research, and scholarship, we are committed to creativity, innovation and excellence. We value integrity, quality, inclusiveness and teamwork in everything we do. We inspire critical thinking, personal growth, and a passion for lifelong learning. We serve the social, cultural, and economic needs of our community and our society.

### Goals

1. **To provide an innovative and stimulating learning environment where students can prepare themselves to excel in life**

   Target: To be consistently among the top three Ontario universities in terms of the quality of students we attract and graduate from our undergraduate and graduate programs as measured by appropriate indicators.

2. **To achieve the next level in research results and reputation by building on existing and emerging areas of excellence**

   Target: To be consistently among the top three Canadian universities as measured by appropriate indicators of research excellence.

   Target: To increase the importance of graduate education so that McMaster's graduate population reaches 20% of the University's total full-time enrolment and is highly ranked in indicators of graduate educational excellence.

3. **To build an inclusive community with a shared purpose.**

   Target: To ensure that all members of the McMaster community feel recognized and valued for their contributions to this shared purpose.

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[13] The McMaster Daily News, November 4, 2004

Information Technology is an essential University enabler because it supports the University's core businesses – education and research.  Since both will be increasingly driven or supported by technology, the right strategies and an appropriate level of investment are essential over the next five years.

The University Technology Strategy is the blueprint for leveraging available technology, processes and organization to better support the University's core functions.

The strategies are designed to realize the greatest benefits for the University. Implementation of the strategies is intended to provide a framework for the University to acquire and support a portfolio of applications to meet University-wide needs, to put in place and support a robust, reliable, secure infrastructure, to offer a range of proactive client services for technology, audiovisual and learning technologies resource centre support, and to strengthen partnerships with other organizations so that the collective investment in technology can be leveraged to the benefit of the University.

## 2.2  University Technology Strategy Development

The Provost and Vice-President Academic and the Vice-President of Administration in consultation with the Vice-President Research appointed a Chief Information Office in September 2003 with a mandate to develop and implement a University Technology Strategy.  The three Vice Presidents agreed to act as Project Sponsors.

This University Technology Strategy is based on the following information and activities:

- Review of key University documents and reports
- Interviews with the President, Vice Presidents, Deans, faculty, researchers, educators, students, business managers and administrators
- University Technology Strategy workshops
- Meetings with key stakeholders such as the Centre for Leadership in Learning, Learning Technologies Resource Centre, Research and High Performance Computing Support, SHARCNET, Library, Faculty technology staff, ancillary staff, among others
- Meetings with external organizations such as the City of Hamilton, Mohawk College, Sheridan College, Hamilton Health Sciences, St. Joseph's Hospital
- Discussions with the Director and staff of Computing and Information Services and Telecommunications

- Assessment of existing applications and infrastructure

- Review of "best practices" from comparable organizations and Educause

- Facilitated session to develop vision and describe key projects

- Preparation of an application inventory and review of the infrastructure, policies, practices

- Some consultation with other Universities

- Preliminary presentations and feedback at Senior Management Team, University Planning Committee, Board of Governors Finance Committee

- Review of web-based resource materials and a literature search

- Feedback on a preliminary draft circulated for review and comment

The contribution of all participants is sincerely appreciated.  The generosity of spirit and time, candor, and absolute commitment to "make a difference" were very special.  While every effort has been made to carefully represent the views conveyed by the many contributors to the project, the Chief Information Officer cautions that real value of the University Technology Strategy is to introduce processes to invite ongoing collaboration and cooperation.  The intent is to describe a series of strategic initiatives and to invite all stakeholders annually to propose new projects as a result of changing circumstances or needs.

Based on the consultation and research, several key strategies have been identified. It is critical to the success of the University Technology Strategy that these strategies be considered as a foundation or core building blocks towards successful implementation.

Like other elements of the University's decision portfolio, investment in information technology must be based on the University's ability to achieve the objectives set out in Refining Directions, the need to mitigate risk, and the requirement to work within a challenging financial framework.

# 3   Management Recommendations

Management refers to the process of governance of information and information management within an enterprise. It includes organization, roles and responsibilities within Information Technology and across the University, and how information and information technology are delivered and managed.   Significant effort was given to management implications in the development of this Strategy, since establishing good fundamentals for managing technology and mitigating risk are prerequisites to successful Strategy development and implementation.

This Plan recommends a change in the way the University manages information technology to improve the University's overall efficiency and effectiveness and realign the technology organization with the University's goals and objectives.

The review also included the current process for investment in technology which resulted in several recommendations including the establishment of a formal technology investment process to manage Technology Fund allocations.

A strong University Technology Services Department is envisioned working in collaboration with all Faculties, Departments and Ancillary services. All technology investment decisions funded from the Technology Fund should be made by a new University Technology Committee chaired by the CIO and supported by a consultative process.   The Committee will recommend an annual budget and set of priorities to the University Planning Committee, Finance Committee and Board of Governors.

The Chief Information Officer should be consulted about all new and replacement technology positions so that opportunities to optimize resources are considered. All University technology service providers should be accountable for compliance with standards, for working together as a high performance team, for collaboration and cooperation on technology initiatives and for implementation of the University Technology Strategy.

Key findings and recommendations for changes in the University's information technology management environment based on the assessment include:

## 3.1  Confirm a University-wide Mandate

At the highest level, the mandate of the Chief Information Officer should include information management and information technology strategy development and advocacy for the entire University.  Advocacy means representing University interests in diverse forums.

University Technology Services should offer universal desktop, technical and application development and support to the entire University and manage the University technology infrastructure.

The functional definition of technology also needs to be broadened to include all those technologies that are information-based, generate data for management decision-making, apply across the University, and/or involve standard computing platforms running on common communications infrastructures. The definition of technology excluding research includes:

- Computer systems (management information systems, administrative computing, end user computing, database architecture and databases, operating systems, and application software).
- Desktop computing and local area networks including operating systems, applications, middleware, software and hardware.
- Communications technology, including telecommunications architecture, data communications architecture, wide area networks, wireless technologies, and telephony.
- Other technologies such as academic computing solutions, distance learning, video conferencing, computer aided design and document/knowledge management systems,
- Student access to electronic resources in individual and shared spaces and
- Classroom computing and presentation hardware and software and network systems

## 3.2  Implement a new Governance Model for Technology

No process exists for establishing University priorities for investments in technology today. Requests are considered on their merits in various forums.  Minimal or no consultation occurs with the Chief Information Officer except on major cross-functional initiatives such as Human Resources and Payroll.  Faculties, departments and ancillary services invest on an ad hoc basis.

This Strategy recommends a new governance model for technology with the creation of a University Technology Committee composed of the Provost and VP Academic, VP Research, VP

Administration, and Chief Information Officer (Chair) with a mandate to work in consultation with the McMaster community.

The Committee mandate will include:

- implementation of the University Technology Strategy
- monitoring and reporting progress against the Technology Strategy
- review of submissions for new technology initiatives to be funded from the Technology Fund and recommendations for information management and information technology priorities based on consideration of business cases.  Criteria should include:  alignment with Refining Directions and the University Technology Strategy, client impact particularly on the student experience, costs, tangible and intangible benefits, risks, competitive advantage, creativity, discovery,  research, decision support, efficiency and productivity, business process change, sponsorship and leadership, client acceptance, scope and complexity, delivery and project management fundamentals and security and regulatory compliance.
- monitoring progress of priority projects
- recommending the annual technology work program and related capital and operating budget implications
- managing and mitigating technology risk
- development of University policies to ensure the effective use of technology to support, and other matters which may from time to time be considered appropriate

Significant consultation with the McMaster community and Senior Management Team will occur. The Committee will consider requests for technology investments from the Technology Fund. Draft Terms of Reference for the University Technology Committee are attached as Appendix B. One of the first orders of business for the Committee is to review its mandate and composition. Representation from University Planning Committee and the student body may be considered.

The Committee will also be guided with technical advice from University Technology Services, Finance, the Chief Risk Officer and others as appropriate.

Faculties, Departments, and Ancillary Services will be requested to provide the CIO with a description of their technology initiatives annually as part of the budget process, will seek the concurrence of the CIO for all investments exceeding $100,000, and will limit their investments to Faculty-specific initiatives not described in the University Technology Strategy.   On an operational level, Faculties, Departments and Ancillary Services will be requested to consult with University Technology Services prior to deploying any non-standard device or system onto the University network.

**Financial Processes**

The University Technology Committee will be supported by new processes so that Faculties, Departments and Ancillary Services are aware of the mandate of the Committee and what the process is to request new projects and funding from the Technology Fund. Processes will be communicated widely with advice on how to submit requests for new or enhanced technology solutions.

Typically, the Committee would invite an initial submission of requests in a consistent business case format about three months prior to the annual budget deadline. A Project Sponsor would identify an opportunity and then work with the Director, Project Management Office, to refine and cost the request. The Committee would then meet to prioritize the requests according to predefined criteria. The Committee's recommendations would then be made to the University Planning Committee as the University Technology Fund budget submission and would drive the work program for the following year. The Project Sponsor would be accountable to the Committee for reporting on project status and for harvesting the benefits identified in the original business case. The Committee would report on progress in implementation of the University Technology Strategy and performance metrics annually.

 A business case template will be developed and circulated widely prior to the next budget cycle. A preliminary project request template is attached as Appendix C.

The Chief Information Officer will be accountable for the management of the University Technology Fund budget envelope to the University Technology Committee and Budget Committee.

## 3.3  Commit to Manage and Mitigate Technology Risk

The Risk Assessment presented by Deloitte & Touche identified many areas of technology risk. This Strategy places the onus on the University Technology Committee, the Chief Information Officer and Senior Management Team to work in concert with the Chief Risk Officer, Chief Internal Auditor and External Auditors to reduce the technology risk faced by the University and to report progress to the Audit Committee annually.

The key risks identified in the Deloitte report and the related actions proposed in this Strategy are:

| Risk | Action |
|---|---|
| Behind major competitors in the way the University teaches using technology - for example in distance education and web-based learning | An Executive Director, Centre for Leadership in Learning, was appointed in February 2004. The Centre is a resource for everyone who teaches at McMaster University. Services include:<br>▪ help with any teaching issue<br>▪ course feedback<br>▪ course refinement or construction<br>▪ workshops, seminars, symposia<br>▪ peer consulting<br>▪ learning technology<br>▪ resources for teaching<br>The Executive Director will be accountable to the University Technology Committee for reporting progress in the use of technology to support teaching and learning at McMaster. |
| No cost-benefit evaluation of technology investment | The Strategy proposes that a University Technology Committee will consider proposals for investment in technology based on business cases and set priorities according to criteria including alignment with Refining Directions and University Technology Strategy, client impact particularly on the student experience, costs, tangible and intangible benefits, risks, competitive advantage, decision support, efficiency and productivity, business process change, creativity, innovation, research, sponsorship and leadership, client acceptance, scope and complexity, delivery and project management fundamentals and security and regulatory compliance. |
| No plan/strategy for the use of technology in the University overall ...largely left to departments to decide how to use technology | The Strategy proposes a set of University-wide initiatives and processes and proposes compliance with a standards-based data and technical architecture with the exception of research. |
| Impacts image of McMaster being 'innovative' if IT systems are antiquated or lacking - can also result in missed opportunities | Some exciting pockets of innovation exist. The Strategy is intended to transform the technology landscape at McMaster over four years. |

| Risk | Action |
|---|---|
| IT investment not proportionate across the University  -  many dollars invested in large faculties and other smaller areas are suffering as a consequence | Technology investments are currently not considered as a separate item in Faculty, Department or Ancillary Services' budgets. Consequently, it is impossible to determine what the annual investment in technology is. This Strategy proposes that all initiatives seeking an allocation from the Technology Fund - "everything on the table" - be considered and assessed in relative terms prior to recommending priorities and funding to Budget Committee.  Faculties, Departments and Ancillary Services will also be requested to seek the concurrence of the CIO for all technology investments exceeding $100,000, to limit their investments to projects not identified in the Technology Strategy, and to consult with Technology Services prior to implementing any non-standard system or device on the University network. |
| Lack of leadership in IT | A Chief Information Officer was appointed in September 2003.  The onus is on the CIO along with the University Technology Committee and Senior Management Team to support Strategy implementation and to be champions of change. |
| Significantly behind competition e.g. currently implementing student self enrollment systems about 10 years behind our competition | The Strategy proposes an agenda for the future but recognizes that significant "catch-up" must occur before McMaster can be considered a technology leader. |
| Under-invested in IT (both from an academic and administration perspective) - as a result  now paying the price for going cheap early and hoping for a great solution for little cost | True.  Budget restraint continues to be an imperative. The Strategy proposes a significant infusion of funding and rationalization of accountability for technology service delivery.  The Strategy also proposes an open and transparent process for decision-making around technology investments. |
| Big need to keep up with technology, also increased risk to new IT solutions, such as student self-registration (e.g. increased risk with electronic access to information, risk with protection of confidential/private information in an electronic environment) | The Strategy proposes a Security road map and risk mitigation processes. |

| Risk | Action |
|------|--------|
| No infrastructure for a university-wide information system, which seriously compromises our ability to utilize information in making effective, timely decisions | The Strategy proposes a series of projects to create an architected infrastructure and to create protocols around the acquisition and deployment of equipment.  The Strategy suggests that all non-research infrastructure should be managed in a shared services environment. |

## 3.4  Create a University Technology Services Department

A new University Technology Services Department under the leadership of the Chief Information Officer should be created to facilitate implementation of this Strategy.

The establishment of a Technology Investment Process, the creation of a University Technology Committee and the creation of a new Technology Services Department are interdependent actions. The University cannot accomplish the necessary critical changes without doing all three.

Over twenty different organizational units currently offer some dimension of technology services, Key service providers are described in Appendix F.  Full time technology staff in various work units are shown below.  Part-time student resources are also used extensively.

| Work Group | Technology Staff |
|---|---|
| Computing and Information Services | 61 |
| Project Teams (SSR, BI and HR/Payroll) | 15+ |
| Media Production Services | 32 |
| Humanities | 20 |
| Health Sciences | 12 |
| Learning Technologies Resource Centre | 12 |
| Office of the Registrar | 3 |
| Research and High Performance Computing | 8 |
| Telecommunications | 8 |
| University Library | 6 |
| Business | 4 |
| Social Sciences | 2 |
| Engineering | 2 |
| Career Services | 2 |
| Titles Bookstore | 2 |
| Financial Services | 2 |
| University Advancement | 2 |
| Security | 1 |
| Physical Plant | 1 |
| Centre for Student Development | 1 |
| Research Services | 1 |
| Science | ? |
| Total | 197+ |

More than two thirds of those who have some responsibility for technology work outside of Computing and Information Services and many small units exist with no requirement to work within a managed technology framework.  In addition to the decentralized staffing environment, over 400 servers are distributed across campus.

Rather than propose sweeping changes, a shared services or federated model based on a matrix organization is proposed.  Creation of new technology positions and replacement of existing staff should be discussed with the Chief Information Officer to ensure that role clarity exists and resources are optimized.

**Functional Accountability and Leadership**

To achieve the strategies and objectives described in this Strategy, it is necessary to assign accountability to a new University Technology Services department headed by the Chief Information Officer with a mandate to work with the entire University to implement the University Technology Strategy.

The mandate of University Technology Services will include:

- chair and support a University Technology Committee  with responsibility in consultation with the McMaster community to recommend University technology priorities to be funded from the Technology Fund budget to the University Planning Committee, Finance Committee and Board of Governors
- act as an advocate for all University technology needs in collaboration and partnership with the McMaster community and external partners
- create a framework for the successful implementation of projects defined in the University Technology Strategy including creation of a project management office; application portfolio needs definition, acquisition and implementation; implementation and support of a secure, robust infrastructure
- research emerging technology trends and identify opportunities of benefit to McMaster.
- implement and support the technology infrastructure required to achieve the Strategy
- communicate relentlessly
- provide client support through a Service Centre and related support processes
- monitor performance and report on key performance indicators and progress against the Strategy annually to the University Technology Committee and University Planning Committee
- generally manage all aspects of University information management and information technology leadership including creation of a reliable, managed, standards-based environment.

**Client Service**

Because client service is distributed, support is confusing.  The new approach will be to create a single point of client service so that "one call does it all"  or "no wrong door" exists for technology support and services.  This began with the implementation of Service Centre software and reengineered processes in September 2004 and will gradually be expanded to include all technology service providers. A new spirit of proactive client service is encouraged as is a spirit of cooperation among service providers.  It is essential that the old refrain of "no money, no resources" be abandoned and University Technology Services convey a positive customer service attitude supported by defined performance metrics.

The following high level principles were used to guide organization design:

- Be client-centric and achieve one stop shopping with a high level of customer satisfaction

- Achieve results, model high performance and demonstrate value to the University

- Design the organization in consultation with staff and position the organization to offer enriched jobs, attract and retain high performers and  develop staff skills

- Align with Refining Directions, reflect McMaster's vision and goals, and enable management to focus with clarity on complementary technology vision, goals and initiatives

- Be flexible, nimble, agile and anticipate change while at the same time achieve balance with operational service delivery , work program and agility

- Develop a sustainable model which optimizes resource management, efficiency and effectiveness.

Relentless Communication

To meet University needs, the new University Technology Services Department will be organized as shown below.



UNIVERSITY TECHNOLOGY SERVICES
MARCH, 2005
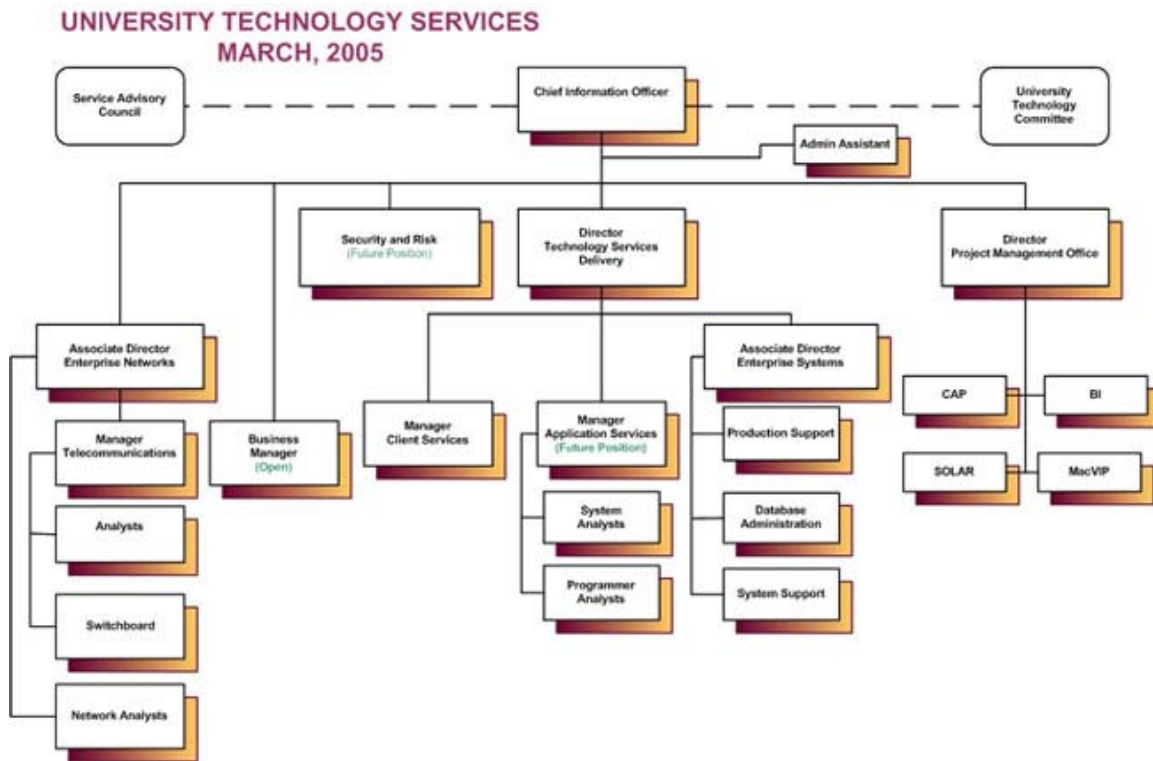
Five functional areas will report directly to the CIO:

▪ **Security and Risk**

Because of the significant technology identified by Deloitte, a new role of Security and Risk Officer reporting to the Chief information Officer is proposed.  The individual will recommend security policies and processes to address or mitigate risk, act as an advisor to all project teams, monitor compliance across the University and make recommendations for future direction.  The Security and Risk Officer will work in consultation with the Director, Enterprise Risk Management, Chief Internal Auditor, AVP Corporate Services, and External Auditors.

▪ **Client Services**

Client Services is the door to client support and offers a Service Centre, student computing centres, advice and guidance on all aspects of technology.

Within Client Services, the Enterprise Systems team researches infrastructure trends and best practices, deploys and manages infrastructure and equipment, monitors availability and reliability consistent with best practices.

Also within Client Services, the Application Support Team maintains, upgrades and enhances integrated systems for Human Resources and Payroll, Financial and Asset Management, and Student Information.

▪ **Enterprise Networks**

The Enterprise Networks team researches network and telecommunications trends and best practices, designs the network and telecommunications architecture, provides and supports the network and telecommunications infrastructure, designs and implements technology for new and renovated facilities in conjunction with Physical Plant, administers the University telephone and network switches, manages network services, provides telephone and network problem resolution, and provides off-campus and wireless connectivity.

▪ **Project Management Office**

This team manages projects and processes that design, acquire, develop, introduce and maintain technology solutions. It is envisioned that a shared services team consisting of Project Managers, a Technical Architect, Database Manager, Quality Assurance Analyst, Test Analyst, and Project Coordinator will work together to support all projects and ensure that scarce technical resources are available to all initiatives.

▪ **Business Manager**

The Business Manager will have accountability for administrative support of University Technology Services, all project teams, and the Technology Fund. Administrative support includes human resources, financial, license and contract management, and some communications functions.

**Networked Matrix Organization**

A variety of functional areas will have a dotted line reporting to the CIO. The dotted line means that Staff will work as part of a high performance University Technology Services organization, will comply with University technology standards and processes, will collaborate and cooperate on the implementation of the University Technology Strategy, and will implement shared services and processes. The CIO will discuss new or replacement positions jointly with the funding Department, Faculty or Ancillary Services.

All solid line reporting relationships are maintained as they are today.
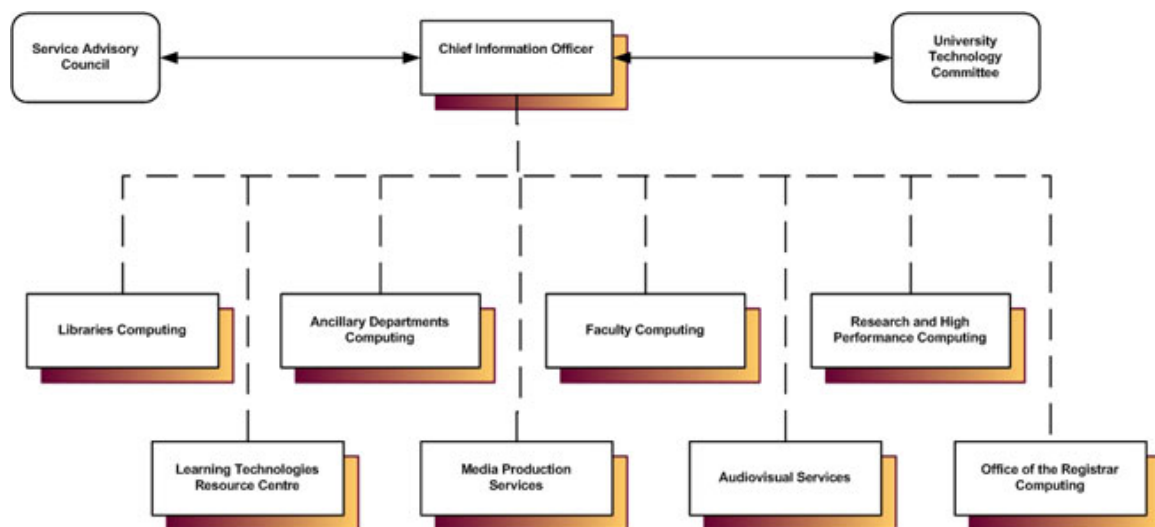


## 3.5 Training and Reskilling

It is essential to provide adequate training and development to technology staff in an environment that changes as dynamically as information technology. New technologies, new software and methods occur at a very rapid rate and this plan envisions a total transformation of applications and service delivery. Staff must also be encouraged to recognize that they share responsibility for developing the skill sets that the University will require in the future and must be proactive in pursuing training opportunities consistent with their career goals and University needs.

The new University Technology Services needs to more effectively deliver appropriate information technology to the McMaster community and to establish its importance to the

University. The Department must begin to be perceived by the University as a leader in providing technology.   Over time, the Department also needs to be viewed as a key contributor to organizational transformation and change over the next five years given the financial challenges facing the University. The University Technology Strategy and ongoing technology opportunities need to be effectively communicated to the University.

## 3.6  Deploy New Approaches to Information Technology

In order to accomplish the effective deployment of information technology into the future, the University will need to change the way it delivers and supports applications. This has begun with the selection of a package ViP from DLGL for the Human Resources and Payroll solution. "Turnkey" installation of new systems; use of "commercial-off-the-shelf" package solutions with minimal modifications as recommended by best practices; use of new Internet/Intranet/web-enabled solutions that demonstrate high return on investment; and replacing the role of in-house programming with project management oversight. This strategic change in practices will facilitate a better focus on University Technology Services core business, more cost effective delivery of services, and enhanced return on investment opportunities.

In summary,  Chapter three sets out management direction and recommends:

- Creation of a University Technology Committee to set priorities for investments in technology funded from the Technology Fund and to make budget recommendations annually to the University Planning Committee, Finance Committee and the Board of Governors.  The Committee would be composed of the Provost and VP Academic, VP Administration, VP Research, Chief Information Officer (Chair), and would work in consultation with the Senior Management Team and the McMaster community.  Terms of Reference are proposed and attached as Appendix B
- Creation of a Service Advisory Council to implement a client-centric approach to service processes, implement service management and monitor key performance indicators of service excellence to ensure a common approach to service
- Confirmation of a University-wide mandate for the Chief Information Officer to discuss requests for new or replacement technology positions
- Creation of a University Technology Services Department with dotted line accountability for all University technology service providers
- That all Faculties, Departments, and Ancillary Services be requested to provide the CIO with a description of their technology initiatives annually as part of the budget process, to seek the concurrence of the CIO for all investments exceeding $100,000, and to limit their investments to Faculty-specific initiatives not described in the University Technology Strategy.  On an to support so that students, faculty and staff have one stop access to service, and operational level, Faculties and Departments will be requested to consult with University Technology Services prior to deploying any non-standard device or system onto the University network.
- Training and reskilling of staff to match changes in technology
- Implementation of a variety of new approaches to technology acquisition, deployment and support
- Commitment to risk assessment and risk management

# 4  Review of the Technology Environment

A high level review of the existing environment was conducted to establish a baseline for change.

## 4.1  Applications

The existing application portfolio consists of three workhorses – Payroll, Financial Accounting, Student Information – and a diverse range of supplementary applications managed by a multiplicity of organizational units.  The core applications were generally acquired in the 1980's, do not meet today's needs, and are based on outdated technology and tools.  Few management and audit controls are in place.



McMaster Systems Map – 2005-03-01
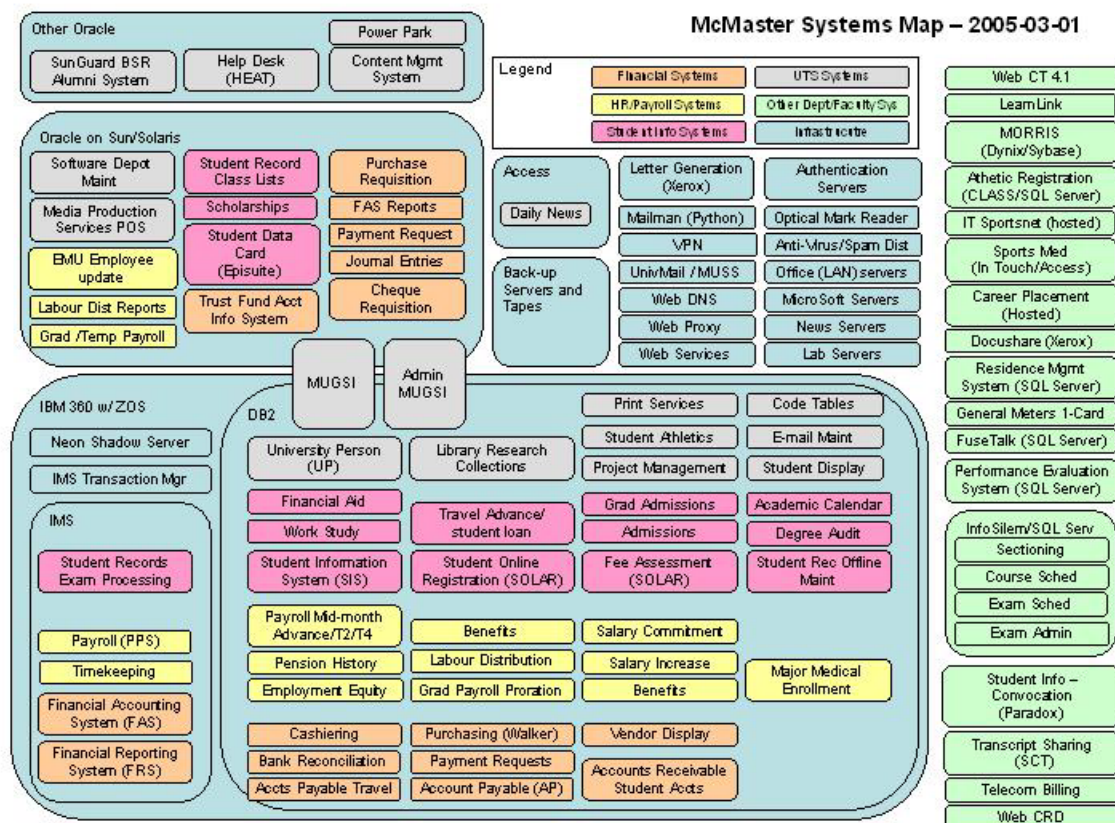
This is the area of highest risk in this Strategy.

University financial decision-making is supported by a set of financial applications that lack appropriate controls, fail to provide timely and accurate information, and use programming languages that are rapidly becoming extinct.

Other portfolios such as the Academic Suite are more current.  Both WebCT and LearnLink are used to support course management, communication and discussion forums, and assignment management with a range of tools from image libraries to integration with personal digital assistants.

Some key business areas lack supporting applications:

- Space Planning and Management
- Document Management
- Asset Management

Appendix D provides capsule summaries of the application assessments.  An extract from the Financial Accounting assessment follows to provide some sense of the magnitude of the challenge:

---

**Financial Accounting**

Good fund accounting system

Poor audit trails

Allows ledger and sub-ledgers to go out of balance.  Labour intensive to maintain

Inflexible sub codes.  Unable to delete unwanted sub codes

May have to recycle accounts.  Oracle reports are not based on current balances, history only

Users feel reports are complex and difficult to understand.

Only a few users have the ability to generate ad hoc queries through QMF or browser.
Severely limited by only having access to 26 months of data.

For data greater than 26 months, need CIS to write COBOL or Easytrieve programs – layout of YTD trans tape differs from DB2 table layout, must spend time in converting fields

No drill down capabilities.  Minimal transaction description (20 characters)

No University-wide chart of accounts

---

With few exceptions, applications were acquired or developed in the early eighties and have been maintained in-house.  The applications generally reflect the early days of application programming:

- green screens without intuitive or common navigation tools
- reports on green and white striped paper produced with tractor feed printers
- multiple screens for one function
- fixed reports with no or minimal flexibility
- spaghetti code poorly documented
- languages such as COBOL which is rapidly becoming a scarce skill set
- multiplicity of interfaces so that it is difficult to determine the source and integrity of data
- lack of naming conventions and standards
- lack of management, financial and audit controls
- lack of documentation

## 4.1.1 Application Integration

Most applications deal with the same core set of information entities. With the exception of the University Person database, few systems take advantage of this commonality to share some of the basic entities. Potential exists to share more information and business events and to streamline business processes and minimize administrative overhead. For example, there are at least four faculty and staff directories and many applications store common data such as name, address, telephone number and employee number.

## 4.2 Enterprise Network and Communications

The University has a robust, reliable communications backbone with Internet connectivity. There are a few locations where switches need to be updated but a plan is in progress to remedy this.

A virtual private network enables secure access from off-campus locations, as well as public data jacks and wireless access (MacConnect) on campus.

Core switches are redundant but many single points of failure exist in buildings. Lack of access to essential power is also problematic.

The University has a Nortel telephone switch recently upgraded to enable voice over internet protocol. The switch and most telephones were acquired over a decade ago. The Michael G. DeGroote Centre for Learning and Discovery is the first facility to be equipped with voice over ip telephony.

The schematic below shows the University network:



McMaster University
Network Core
Revised: 3/14/2005
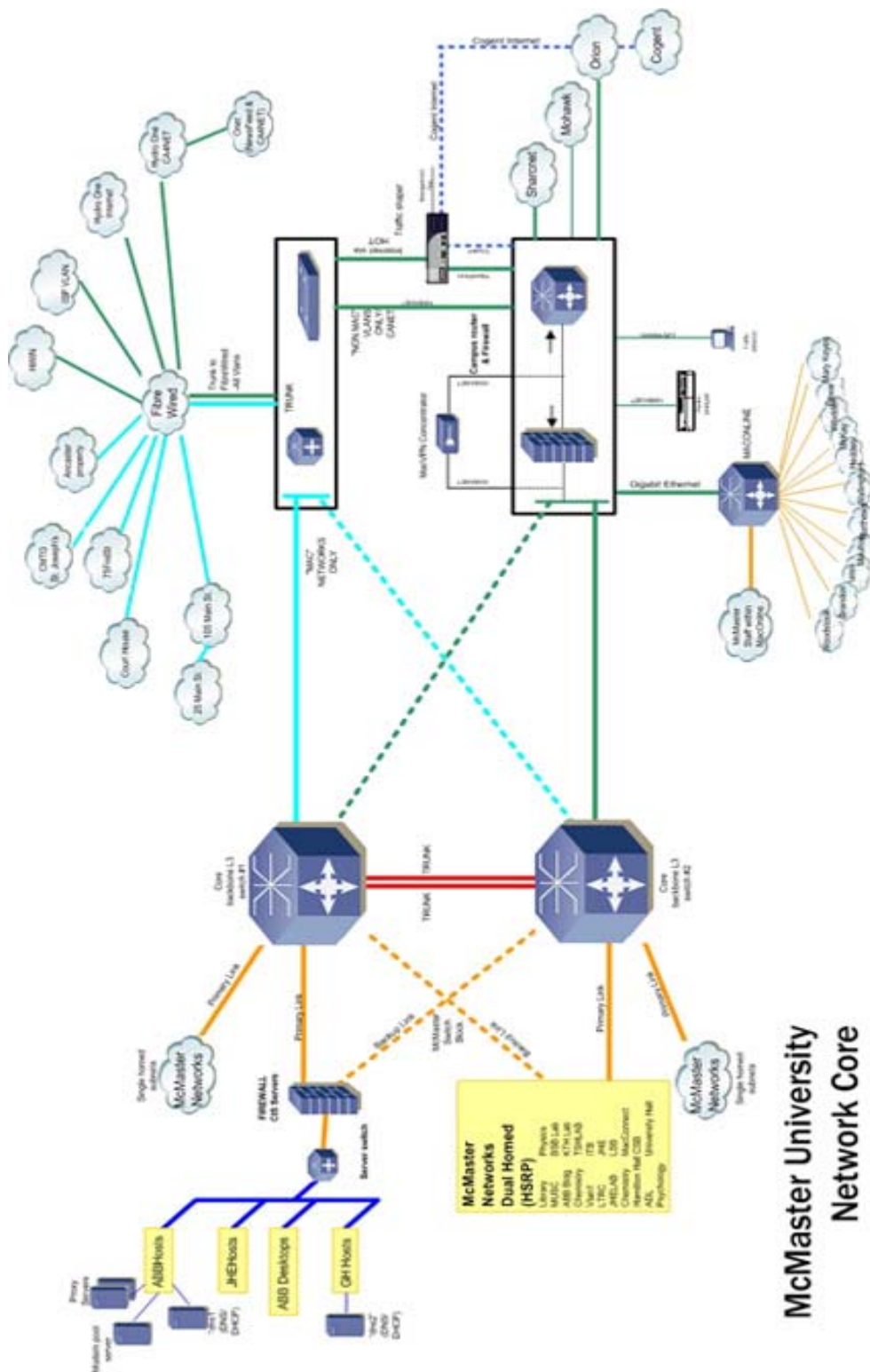
**Wireless**

A wireless standard has been selected and is being implemented in student common areas. The goal is to provide secure, device-independent, location-independent access to network-based University information and resources in student common areas.

The chosen technology using Cisco access points is the widespread WiFi standard 802.11g, backward compatible with the older 802.11b standard. Wireless technology is evolving rapidly, and although standards will continue to change, a common choice is necessary across campus to achieve a seamless canopy with no contention or interference. All concurrent clients share the available bandwidth of the access point they use with up to 20 concurrent users per access point providing acceptable performance. As usage increases, more access points will be required.

Thanks to the generous donation from Mr. and Mrs. Buckingham and an innovative solar-powered solution designed by Craig Thornton and other members of the Wireless Networking Group headed by Professor Terry Todd in Electrical & Computer Engineering, McMaster's emerging wireless canopy is leading edge. Outdoor areas in front of JHE, BSB, HH, as well as courtyards between Mills and MUSC and north of the Student Centre are enabled with wireless coverage using SolarMESH -- solar-powered wireless mesh technology which is both environmentally sensitive and robust. This is a win/win approach where researchers have an opportunity to prove the concept of SolarMESH and McMaster has an opportunity to use innovative technology. Appendix F shows the grand design.

Mr. and Mrs. Buckingham's phase one donation was also used to complete the Student Centre and provide some initial access points in Hamilton Hall. Computing and Information Services and the University Library jointly funded wireless access in open areas used by students in Mills, Thode and Innis Libraries. Wireless access was also installed in the Michael G. DeGroote Centre for Learning, the Information Technology Building, and the Health Sciences Library as part of major construction projects. Additional access points have been installed in the Health Sciences Library, Art Gallery, Technology Service Desk, Engineering Student Lounge and four graduate student areas in JHE.

## 4.3 Infrastructure

The technology infrastructure supporting most University applications is outdated and unreliable. A proliferation of technologies throughout the University consume more resources than would be required if the environment was more technologically homogeneous.

The figure below shows a high level view of today's infrastructure excluding SHARCNET and other research infrastructure:
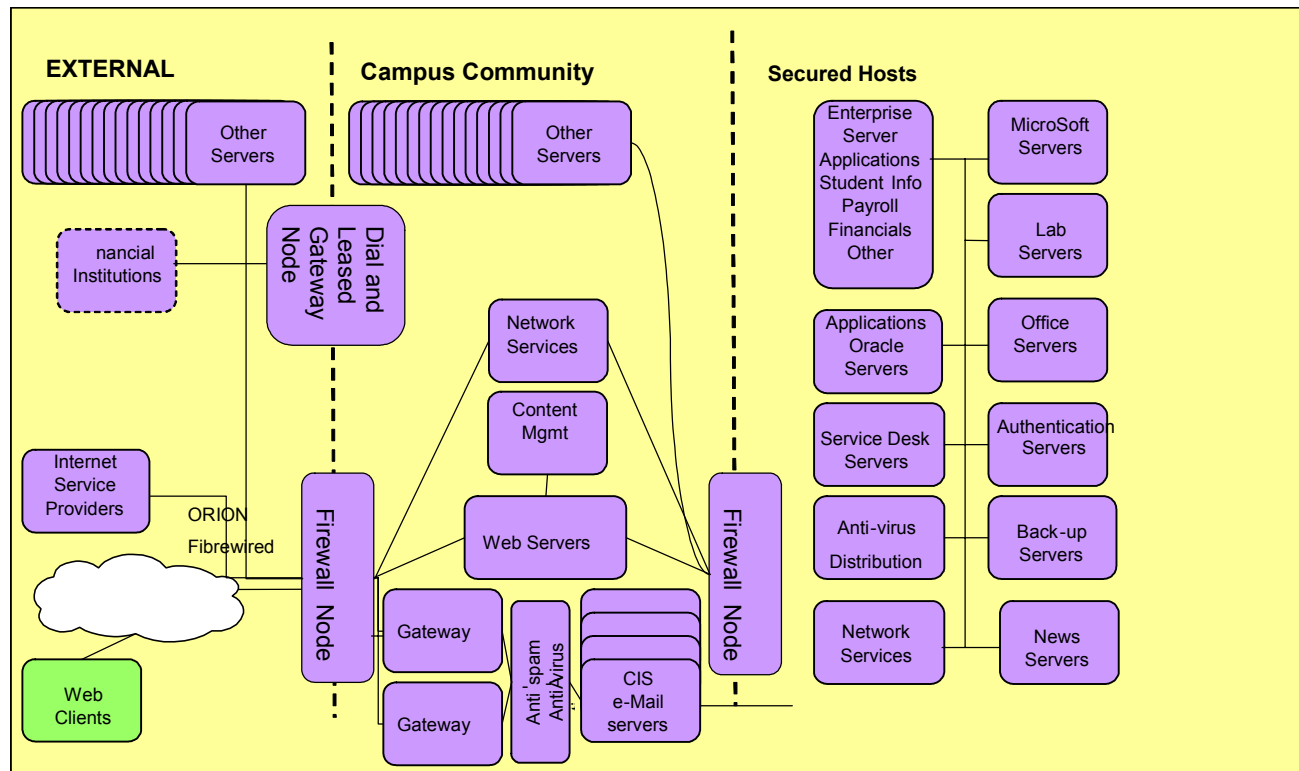
Many servers may not be protected by a firewall and may not be managed to today's security standards. This presents a risk to the entire University Network. No protocols exist to attach a device to the University network and consequently anyone can attach a sniffer or server or indeed any peripheral. The campus network is patterned into sub-nets to restrict the impact of traffic streams from defective devices or sniffing to local areas.

## 4.4   Technology Support

Computing and Information Services provides technology support to administrative Departments. The School of Business, Health Sciences, Humanities, Electrical Engineering and University Libraries have dedicated support units. Research and High Performance Computing Support supports researchers on a fee-for-service basis. Support for other Research computing (HPC, visualization, and other programming) is subsidized by the VP, Research. The Office of the Registrar has a small computing unit. Ancillaries generally have one or two staff dedicated to technology support.

The opportunity cost for the significant investment of faculty and staff time in technology support is significant but cannot be quantified. The risk of poor or inconsistent information management practices, security and privacy vulnerabilities, lack of compliance with software licenses, and lack of optimization of technology infrastructure is significant and very real.

Some staff are paid a stipend to act as a technology resource within their work area. A review conducted by Human Resources suggests that this program has had mixed results and should be changed. This Strategy suggests that technology support should be a function of University Technology Services working with the existing support units. Support directly related to research is excepted. Where on-site report is essential, the function should be part of a job description and compensated accordingly.

This does not mean that faculty and staff should be precluded from web site management, selection of software solutions or non-standard infrastructure but it does mean that the basics of good management practice should be the responsibility of the technology professionals; that minimum standards for licensing compliance, security, and privacy should be required; and that University Technology Services consulted about technology procurements so that there is a comprehensive view of the University infrastructure and opportunities for optimization identified.

## 4.5  Student Computing Labs

Management of student computing labs is disparate and uneven.  About twenty labs are managed by ten organizational units..  One of the proposed projects suggests that the future of the labs be reviewed and management rationalized.  This could include repositioning some of the facilities as Student Technology Centres with access to a range of hardware and software and support for individual and group learning.  A small number of facilities should be retained as instructor-led teaching facilities, some should be used as satellite Knowledge Commons centres for collaborative learning and access to resources, and some should perhaps be closed.

| Organizational Unit/Location | Number of PC's |
|---|---|
| **Computing and Information Services** | |
| ABB | 22 |
| BSB | 139 |
| HSC | 30 |
| JHE | 50 |
| KTH | 85 |
| **Business Michael G DeGroote** | |
| Trading Floor | 20 |
| Computer Lab | 55 |
| 2 eBusiness Labs | 30 |
| **Engineering** | |
| JHE 320 | 50<br>CIS  Assisted: authentication, file server, PC images |
| JHE 219 | 28<br>CIS Assisted: authentication, file server, PC images |
| CAS; ITB 235/236 | Unix Workstations |
| CAS; ITB 237/238/239 | Windows & Linux |
| CAS; ITB 232/233 | |
| **FHS** | |
| Educational Computing Lab HSC-2D8 | 25 |
| **Humanities** | |
| TSH 206/209 | 47<br>CIS Assisted; authentication, file server, PC image |
| TSH 210 | 12<br>CIS Assisted |
| Ann & Neil McArthur Humanities Multimedia Wing TSH 202B | 44 |
| **Science** | |
| Geography GS 317 | |
| **Social Science** | |
| Kinesiology IWC 224 | 25 |
| **Other** | |

| Atlas Computer Lab for Students with Specific Learning Disabilities Commons B104 | Specialized equipment |
|---|---|
| Continuing Education | |
| University Libraries – Wong e-classroom | |

No inventory of computer equipment exists, software licenses are not managed, and support requests and service orders are not tracked.  Consequently, it is difficult to ascertain the total investment in technology and the related support costs.  As an aside, the lack of a University equipment inventory reflects a risk as it is impossible to track ownership and accountability.  It is also surmised that some equipment and some software licenses/versions are not current or not legal in some areas which similarly is a risk to the University.

## 4.6  Classroom Audiovisual and Network Access

New facilities are outfitted with appropriate audio-visual equipment as part of the building construction budget.  For example, the Michael G. DeGroote Centre for Learning and Discovery has state-of-the-art audiovisual equipment including a three-dimensional theatre.  Audiovisual Services has a comprehensive plan[14] to upgrade existing classrooms that accommodate 30 or more students to "smart" classrooms over ten years.

The plan assumes that:

- six rooms will be retrofitted per year with a data projector, vcr/dvd, and control system
- an average of 4.5 classrooms will be constructed annually and outfitted with new technology funded from the construction or capital budget

The cost to outfit 82% of classrooms (with 30 or more seats) managed by the Registrar is estimated at $1.1 million.  The related "ever greening" estimate given the lifespan of the equipment is also estimated at $1 million.  The plan also suggests that additional staff would be required to support more sophisticated equipment.

Note that many classrooms are not managed by the Registrar.  Accordingly the plan does not address Faculty-managed facilities.

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[14] Bart Strong, Executive Director, LTRC (Administration, Classrooms), "Classroom Technology Renewal McMaster University, November 27, 2002

A committee focused on implementation of the education stream of Refining Directions is reviewing audiovisual requirements for classrooms and the committee's recommendations will be encompassed in this Strategy.

In the first three years, the following facilities have been completed:

| Classroom | Installation |
|---|---|
| **2001/2002 BUDGET YEAR** | |
| ITB 137 | Smart Custom Podium, Data Projector, Computer, vcr, overheads, screen |
| TSH-120 | New XGA Video/Data Projector |
| HSC-1A1 | Smart Expression 303 Multi-Media Cabinet, Data Projector, vcr |
| LTRC Demo Classroom (TL-B117A) | Smart Custom Podium, Data Projector, Computer, vcr |
| BSB-B115 | XGA Video/Data Projector replacing monitor |
| CNH-102 | Smart Whiteboard with Video/Data Projector, computer, vcr |
| CNH-107 | Video Monitors and vcr (for September 2002) |
| HSC-1A6 | Smart Expression 303 Multi-Media Cabinet, Data Projector, vcr |
| HSC-1A4 | Smart Expression 503 Multi-Media Cabinet, Data Projector, vcr |
| HSC-4E20 | Smart Expression 503 Multi-Media Cabinet, Data Projector, vcr |
| LSB-B130E | Smart Expression 503 Multi-Media Cabinet, Data Projector, vcr |
| | |
| **2002/2003 BUDGET YEAR** | |
| HH-110 | Smart Expression 503 Multi-Media Cabinet, Data Projector, vcr |
| BSB-B136 | Smart Custom Podium, New XGA Video/Data Projector, vcr, computer |
| TSH-118 | Smart Expression 503 Multi-Media Cabinet, Data Projector, vcr |
| TSH-B124 | Smart Expression 503 Multi-Media Cabinet, Data Projector, vcr |
| REFECTORY CLASSROOM (REF-102) | Smart Expression 503 Multi-Media Cabinet, Data Projector, vcr, overhead |
| TENNIS COURT TEMPORARY CLASSROOM | Smart Expression 503 Multi-Media Cabinet, Data Projector, vcr, overhead |
| | |
| **2003/2004 BUDGET YEAR** | |
| KTH-B132 | New Install, data Projector, VHS |
| KTH-B135 | Upgraded data projector |
| CNH-104 | Upgraded data projector |
| PSYCH 151/152/154 | New Installs, data Projectors, cabling (paid by Psych) |

| Classroom | Installation |
|---|---|
| BSB-B136 | Custom Smart Podium Upgrade with new data proj, vhs, dvd, crestron, mic |
| BSB-B115 | Replaced Data Projector |
| T29-101/105 | (Contractor Installed) data projectors, smart 503's, dvd, vhs, wireless mic |
| HH-104/217/305 | New Installs, data projectors, black boxes, vhs |
| HH-109 | Reinstall Smart 503 w/data projector |
| HH-302 | Reinstall data projector, vhs |
| BSB-106 | New Install, data projector, black box, vhs |
| ABB-136 | Replaced data projector |

The lack of audiovisual equipment in campus classrooms is a source of frustration for lecturers and student presenters.  While Audiovisual Services responds to about 14,000 requests annually and transports and delivers equipment in a timely manner, the current approach is resource intensive and problematic after regular office hours. As the equipment lifespan is generally about three years, a ten year implementation cycle appears to be a project with no end.

This Strategy proposes a project for classroom renewal and suggests that the smart classroom program and related equipment renewal be considered by the University Technology Committee annually with a business case for further investment so that this important initiative can be considered in relation to other requests.  Some rationalization of accountability for audiovisual equipment may also be appropriate as Faculties and Departments have acquired their own equipment in the absence of abundance in classrooms and meeting facilities.  This parallels the technology support generally – when service is lacking, others find a way to fill the void and duplication and inefficiencies may occur.

## 4.7  Assessment Summary

The technology and organizational environments are complex.  With extremely limited resources staff have done a good job of addressing delivery, support and maintenance of applications and technology.

Support is disparate, fragmented and variable across the University.

Significant efforts should be made to replace University applications to meet today's needs. Opportunities exist to increase collaboration, communication, and cooperation in application acquisition, delivery and support.  University-wide leadership is essential in this area.

The University network is robust and current and should be renewed on an ongoing basis.

The University infrastructure should be updated as new applications are deployed. Particular consideration should be given to consolidation of servers in managed data centres, access to essential power, development and testing of disaster recovery processes, creation of business continuity plans for key functions, and rationalization of support.

# 5 Technology Recommendations

## 5.1 Introduction

This section provides a synopsis of the recommended application and infrastructure architectures and principles appropriate to the University to optimize the use of technology to achieve its vision.

## 5.2 Target Applications Portfolios

The University is a complex entity with many functions. The schematic below shows target application portfolios with the "balanced scorecard" or University Intelligence at the top:

Applications access data stored in databases.  The high level target databases are shown below:
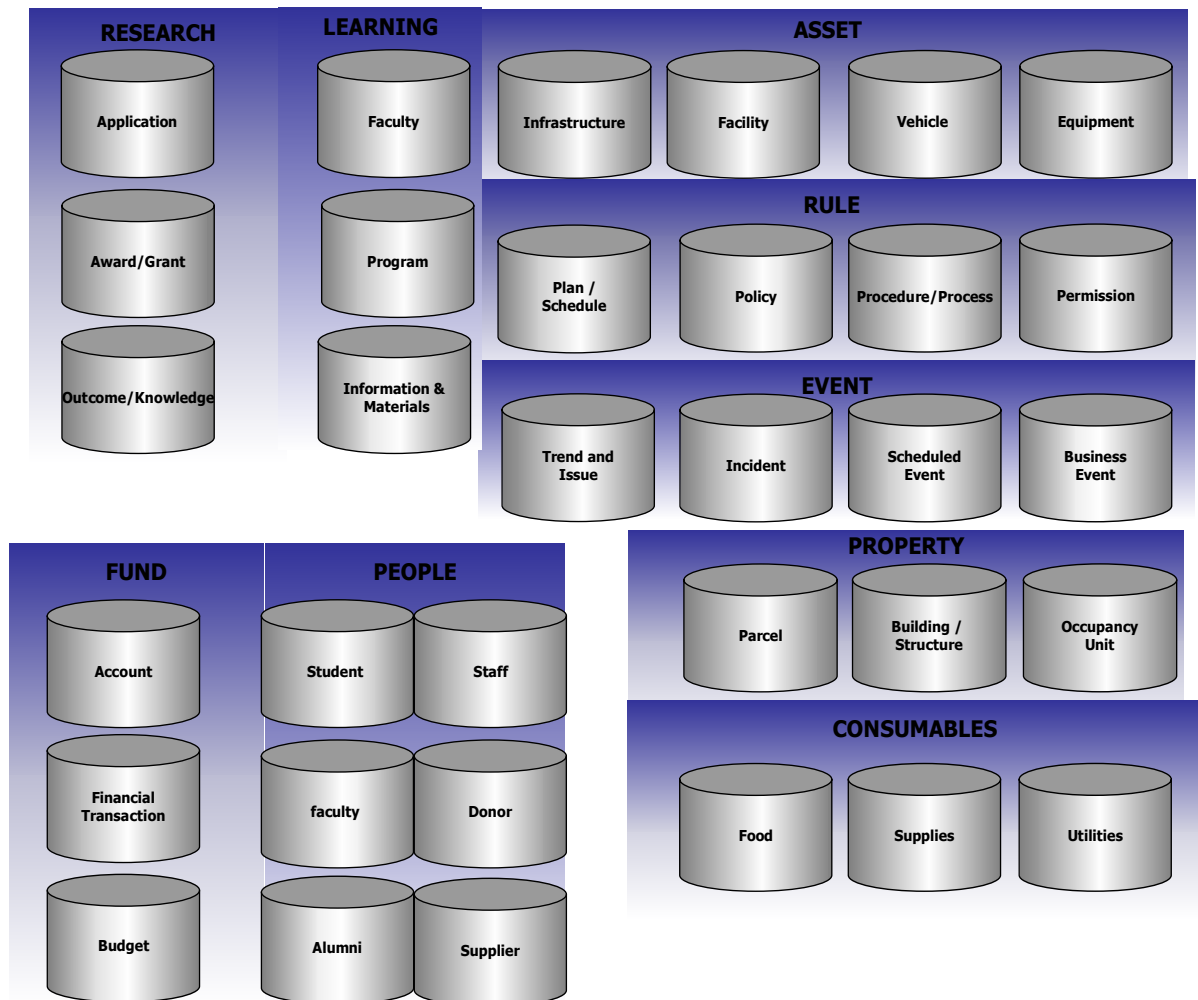


**Application Portfolio – Build versus Acquire/Buy**

The application portfolios for Student Information, Human Resources and Payroll, and Financial Accounting  generally consist of suites of applications developed in-house about twenty years ago. Packages have been acquired to support learning and teaching: WebCT and LearnLink. Debate about Learnlink versus WebCT has been ongoing.  The Executive Director, Centre for Leadership and Learning, reported recently on the results of a review and concluded that both have merit depending on faculty needs and their use should be continued.  Transition costs would also be prohibitive as faculty have used the applications as a repositories for course designs and reference materials.

Given the small number of application developers and maintainers within the University, it would be prudent to seek packaged solutions, wherever possible, so that the applications are upgraded as technology changes and as new functionality is required. Commitment to open source solutions is also encouraged. University Technology Services should seek packaged software solutions to minimize risk and optimize the potential for ongoing enhancements, commit to open source solutions, and also explore the potential to work in partnership with others to acquire software solutions. In-house development should be a last resort once needs have been carefully defined and available solutions considered.

**Consider Open Source**

Open source software refers to programs for which the licenses allow users to:

- freely access, install, and run the software for any purpose;

- modify the original software;

- redistribute copies of the original or modified programs; and

- share modifications with the community.

This is in sharp contrast to use of commercially developed software for which a licensing fee is required and user modifications are not permitted, or when changes are made by the campus IT staff and they are not supported.[15]

"Some members of the higher education community are seriously looking to open source as a viable option for institutional system needs. In fact, many colleges and universities are running open source software such as Linux programs or Apache Web-server software to support critical campus systems. Higher-education-specific open source projects under way include uPortal, used to build campus-wide Web portals; OSPI, an open source portfolio initiative; and Shibboleth, which lets colleges control outside access to information posted on their Web sites. A growing number of institutions are watching with keen interest an initiative called the Sakai Project (www.sakaiproject.org), a two-year collaboration funded in part by the Mellon Foundation. Sakai charter members Indiana University, the University of Michigan, Stanford University, and MIT agreed to pool their collective development resources to create a next-generation course management system scheduled for initial public release last month."

"While some open source advocates feel strongly that maximum efficiencies will result from open source systems designed by and for the higher education community, that open source excitement is matched by the cautious skepticism of others concerned about potential risks, the technical resources needed to implement and maintain systems, and the as yet largely untested experimental nature of open source application solutions."[16]

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[15] Karla Hignite, An Open Mind on Open Source, NACAUBO, August 2004, p.

[16] Ibid p. 3

Given the University's financial challenges, it may be appropriate to explore the potential of open source solutions. This will require careful assessment of risk.

**Consider Enterprise Resource Planning Solutions**

Enterprise Resource Planning solutions generally refer to institution-wide applications for financials, human resources, student information and portals. The solution is integrated such that when data is added in one area, information also changes in all related areas and functions. Typically, the solutions are modular in structure. Key business processes are also integrated and enhanced by embedded best practices.

In a 2002 article in the Educause quarterly[17], Paula King, Robert B. Kravik and John Voludakis noted that of 481 universities surveyed, 56% had implemented an enterprise resource planning solution and a further 10% were exploring this alternative.

Notwithstanding all the horror stories and anecdotes about failed implementations, universities surveyed generally reported that implementations were achieved on time and on budget. Benefits included enhanced and improved service to students, faculty and staff; increased ability to take advantage of new technology; more accurate and accessible management information; enhanced regulatory compliance; increased institutional accountability; enhanced institutional business performance; reduced risk; and enhanced support of the academic mission.

"Enterprise Resource Planning achieves enterprise-wide integration. ERP systems require that data is consolidated, offices coordinate activities, upgrades occur in a synchronized fashion, stakeholders work together and so on. Although one of the goals of ERP is to integrate systems, such integration requires significant behavior changes on the part of organizations that have often operated autonomously. . . . . .Process and organizational change were perceived to be the most challenging barriers to implementation."[18]

The decision to select an enterprise solution or to integrate a variety of "best-of-breed" systems is a pivotal choice in the University Technology Strategy. In the nineties, the University invited proposals for an enterprise solution excluding student information. The market responded and a decision was made to abandon the process partly because of the price tag and partly because of the lack of will to work together on a common solution.

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[17] Paula King, Robert B. Kravik and John Voludakis, Educause Centre for Applied Research, Research Bulletin, Volume 2002, Issue 22, November 12, 2002
[18] Ibid p. 6

The decision to acquire DLGL product for the human resource and payroll portfolio may be perceived as a lost opportunity to acquire an enterprise solution and preclude this direction. However, it could also be argued that the University has one chance to get the future technology direction right and all options should be carefully considered going forward.

Both open source and enterprise solutions should be carefully considered and all sponsors invited to explore a model based on integration and transformation rather than maintenance of today's autonomous silos.

## 5.2.1 Application Architecture

The schematic below shows a high level architecture for the applications identified in the Master Project list.
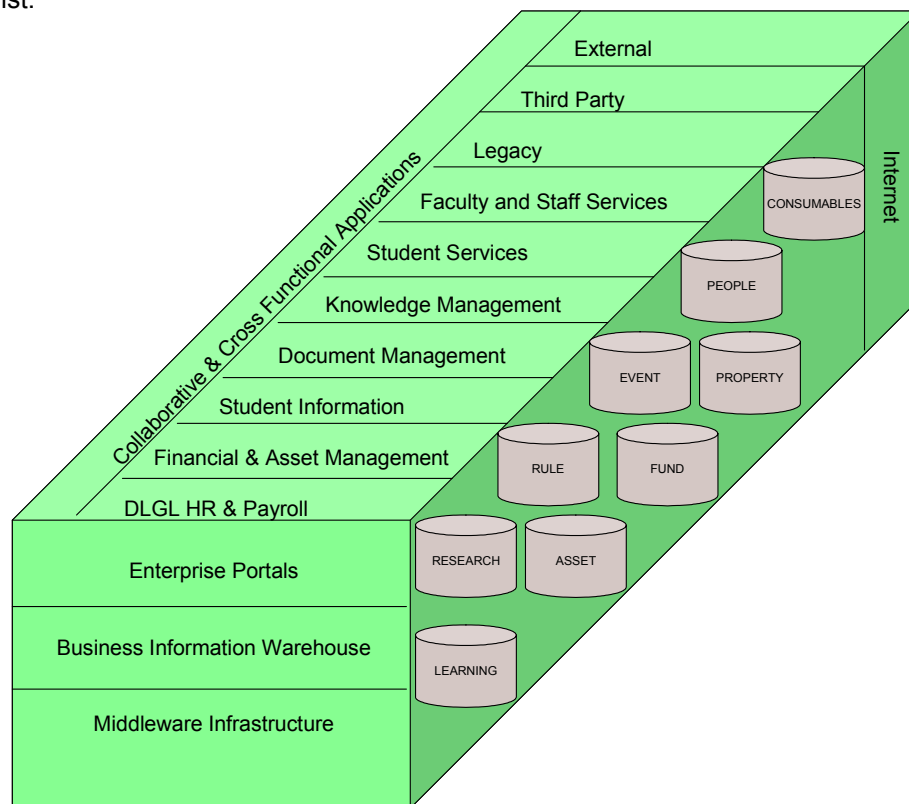


The detailed application architecture will be dependent to some extent on the selection of packaged software and the selection of various standards.

The architecture should enable application integration, position the University to take advantage of web services and web portals, lower the total cost of ownership by providing a scalable integration framework, and utilize best practices.

## 5.2.2 Application Integration

Whether developed internally or purchased as commercial packages, application systems supporting specific business functions will not provide full benefits unless they are integrated.

The benefits of integration are realized in many ways:

- Business processes improve with increased access to information, enhanced communication across organizational boundaries, reduced duplication of work, and increased sharing of resources.

- Customer service improves through more timely and increased sharing of customer information and the ability to establish a single point of contact for all services—which reduces the onus on the customer to contact the appropriate organizational unit.

- Service delivery becomes more cost-effective through the establishment of automated links with vendors, suppliers, regulators, and partners.

- Integration allows authorized users to transparently access information from multiple (new and/or old) systems simultaneously to more effectively perform business activities.

- The quality of business applications improves as the integration architecture allows the selection (and integration) of best of breed applications – independent of vendor and/or technology.

- Technology management improves due to enhanced flexibility, better long term return on investment, improved support, and increased reuse of technology components.

- Growth in IT costs is reduced along several fronts including (a) costs to capture, archive, share, compare and analyze information, (b) costs to develop, maintain and support application interfaces

- Information accuracy is improved due to enhanced and managed data integrity. This is because the integration architecture allows information to be captured once, at source and propagated automatically.

- Integration can also extend the life cycle and enhance the use of business applications.

The University should invest in the planning, design and implementation of a basic integration infrastructure to allow future growth with flexibility. Architecture options include data integration, application integration and process integration.

Some recent developments provide an opportunity to select an integrated set of technologies and tools particularly for portals and electronic transactions.  For example, web services

" . . . provide a language-neutral, environment-neutral programming model that accelerates application integration inside and outside the enterprise. Application integration through Web services yields flexible loosely coupled business systems. Because Web services are easily applied as a wrapping technology around existing applications and information technology assets, new solutions can be deployed quickly and recomposed to address new opportunities. As adoption of Web services accelerates, the pool of services will grow, fostering development of more dynamic models of just-in-time application and business integration over the Internet.[19] "

## 5.2.3 Application Lifecycle Management

The University requires a framework for managing the entire application lifecycle—from inception to retirement to renewal—while ensuring that the application functionality keeps pace with business and technology changes

The framework consists of a set of policies, methods, guidelines and standards to ensure appropriate support levels.

The framework must also ensure that application requests and subsequent development adhere to the following:

- Compliance to standards – as defined by University Technology Services in consultation with the University community and sanctioned by the University Technology Committee.

- Operational funding for ongoing support – to ensure that the total lifecycle of the application is managed and proper support level provided.  This is a current weakness as financial challenges preclude allocation of new operational funding in the next three years.

This framework must be defined in recognition of need to maintain the value of business assets (applications) for as long as there are benefits to be realized.

## 5.3  Project Management

In addition to the core competencies related to technology expertise and customer service, the new University Technology Services needs to focus on developing project management skills so

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that every project has a sponsor, defined deliverables, schedule, resource allocation, and communications plan at a minimum.  A new Director, Project Management Office was appointed in September, 2004 and will provide advice and guidance in this important area.

## 5.4  Technology Architecture and Infrastructure

The section makes recommendations about the technology infrastructure principles, strategies, components and standards required to successfully carry out the renewal of the University's information technology support.

The principles and strategies that guide the design of the target technology architecture are consistent with the principles and strategies articulated in the management recommendations.

## 5.4.1 Technology Vision

The recommended long-term vision for technology is:

*People, Practices and Technology work together -* People, work practices and technology need to be integrated for the successful implementation of Technology Directions.  The technology must be designed to support defined work practices and the people involved in the delivery of services. Business process review is the essential first step in any technology initiative.

*Business Driven* - Investment in systems and technology must be based on a business case that supports University goals and strategies.  The target technology infrastructure should aim to optimize the investment in technology.

*Accessibility of Technology* - All clients should have access to the technology and information services appropriate to their role.

*Common User Interface* - Applications accessed by a client should have a similar "look and feel", and clients should be able to access other applications through a common or similar application interface, or through a shared database management system.

*Buy vs. Build* – The University should purchase commercial off-the-shelf application packages rather than developing custom systems to achieve automation more quickly and inexpensively, while preserving standards for integration of the organization, practices and technology.

*Leading Edge, not Bleeding Edge* – With the exception of research, the University should emphasize the use of proven technologies. Leading-edge technologies may be used, but should be limited to pilot situations where the potential benefits warrant the added risk.

*Re-usability* – The application portfolio should be designed to re-use technology components wherever possible, rather than construct new components each time.

*Bulletproof* - System components need to be designed with a high level of independence so that they can continue to operate if other components fail.

*Help Available* - User documentation (Practices, Standards, Systems) needs to be integrated and available electronically to ensure that it is always up to date, and accessible where and when needed.

*Sound Data Management* - Data should be captured once, and once only, at the point of creation. Replication of data should be minimized, and managed in such a way as to promote accessibility while maintaining its integrity.

*Maintainable* - All systems should be built to support maintainability and re-usability. Service level agreements should be used to define quality and performance requirements for each system.

*Plug and Play* – Open, or widely accepted, standards and products should be preferred to ensure that the acquired components are interoperable - work together properly - to simplify the use of the technology and to reduce reliance on specific vendors where practical.

*Standardization* - Any unnecessary diversity in the architecture should be restricted. This will support a most effective life cycle cost by minimizing maintenance, support, migration and operational costs. While this principle does not apply to legacy technology, it should apply anytime an upgrade or replacement is undertaken.

*Distributed Workflow Network Computing* - The reference technology infrastructure will be workflow and network centric rather than processor centric, to support easy and open extensibility and flexibility.

*Scalability* – Preference will be given to scalable product lines and products, to enable the necessary flexibility to support the migration strategy through an incremental implementation of new functionality, rather than "relying on "big bang" implementations.

*Support Available* – Preference will be given to products, service providers, and companies that not only deliver high quality, but sustain the business efforts of their customers by providing cost effective, available, accessible, and quality support and service.

## 5.4.2 Technology Principles

The fundamental technology direction recommended in this strategic plan is to evolve to a web-based application delivery platform.  This recommendation is accompanied by a number of closely associated **principles** that jointly contribute to the successful cost-effective implementation of open system technology platforms satisfying this strategic direction.  Briefly defined, these **principles** include:

- **Web-based applications and development platforms** position the University for the future integration of cost effective, value added, *shrink wrapped* applications that fully support the emerging technologies.

- **Common Graphical User Interface (GUI) and usability standards** provide cost efficiencies in training and support through the presentation of a standard and highly flexible user interface based on generally acceptable usability principles.

- **ANSI standard SQL and relational database technologies** support the seamless access of information from different database technologies through an industry standard database query language.

-  **Open System Environment Strategies and Products** provide improved cost efficiencies, component integration, and interoperability**,** through the effective integration of multi-vendor technologies and services.

- **Centralized data, network, and security administration** is vital to the overall integrity of the University resources within a distributed data and technology environment.

- ***Remote support, troubleshooting, and configuration management*** provides the organization with a highly responsive and cost-effective centralized support facility to assist remote sites in problem resolution and new technology installation.

- ***Continuous Information and Network access*** provides the departmental workgroups and remote sites with a seamless twenty-four hour access to data and network resources.

- ***Implementation of updated security strategies and remote audit facilities*** is required to control resource access and departmental workgroup resource integrity and audibility within the distributed computing environment.

- ***Centrally controlled backup and recovery strategy*** ensures that all distributed nodes within the network, regardless of location, are recoverable in the event of a failure.

- ***Integration of diverse data forms from multiple sources using multi-media and imaging*** positions the organization for the future integration of video, voice, and data to support improved document handling and information presentation in such areas as research, teaching (basic science and clinical), patient records and administration.

- ***Standard application interfaces to a defined set of published shared services across the University*** minimizes the integration costs and risks of adding new applications and technologies to the existing infrastructure while optimizing the accessibility and re-use of business objects.

## 5.4.3 Technology Strategies

Based upon discussions concerning the University's current technology environment, and future technology directions, it is recommended that the University adopt the following seven high level strategies.  These strategies will be used to evaluate and guide IT investments in infrastructure and application projects.

1. ***Continue to provide and enhance high speed University-wide network access***
   Ensure that every location that requires applications or data or Internet access can do so at high speeds. This strategy will cover the design and implementation of all required components: cables, routers, servers, wireless technologies, desktops, etc.

2. *Provide a secure network infrastructure*

Ensure that the appropriate level of security is established and maintained. The security implementations will cover application and data from both an internal and external perspective.

3. *Migrate towards a standardized technical infrastructure*

The current environment contains several sets of different technologies that may have been justified when the decision to acquire them was made. These varied technologies create a high cost of maintenance and increase the risk of potentially severe interruption to services. By minimizing competing technologies and consolidating functionality the University will be in a better position to leverage existing systems to provide added functionality and consistent support across the University.

4. *Manage information as a valuable asset*

Ensure that the information collected and generated by the different areas of the University, is made available in a useful and consolidated manner.

5. *Buy, not build, integrated application suites*

Ensure that application functionality is acquired and not internally developed. Integrated application suites should be acquired instead of individual application components to ensure integration.

6. *Establish an infrastructure that ensures availability, performance, reliability, and business continuity*

This strategy is about managing the risk of interruption to business services by addressing day-to-day continuous operations, disaster recovery, temporarily extending the life of existing at-risk systems, and ensuring that all systems will be periodically assessed for risk and potentially retired, replaced or consolidated.

7. *Continuous, cost effective, improvements to the quality of technology service delivery*

This strategy promotes the effective management and deployment of IT resources through the use of structured methods and tools, skill improvements and evaluations, client surveys and policy development.

## 5.4.4 University-wide Technology Architecture

Using the framework described above, the following logical technology architecture is recommended for the University.

This architecture should be implemented gradually as new applications and systems are deployed. The technical specification of the nodes in the architecture will be defined by Technology Standards. The key characteristic of this architecture is the security of the University's data through the use of firewalls and a de-militarized zone. The Demilitarized Zone is the middle ground between an organization's trusted internal network and an un-trusted, external network such as the Internet. The DMZ is a sub-network (subnet) that may sit between firewalls or off one leg of a firewall. Web, mail and authentication servers are typically placed in this zone.
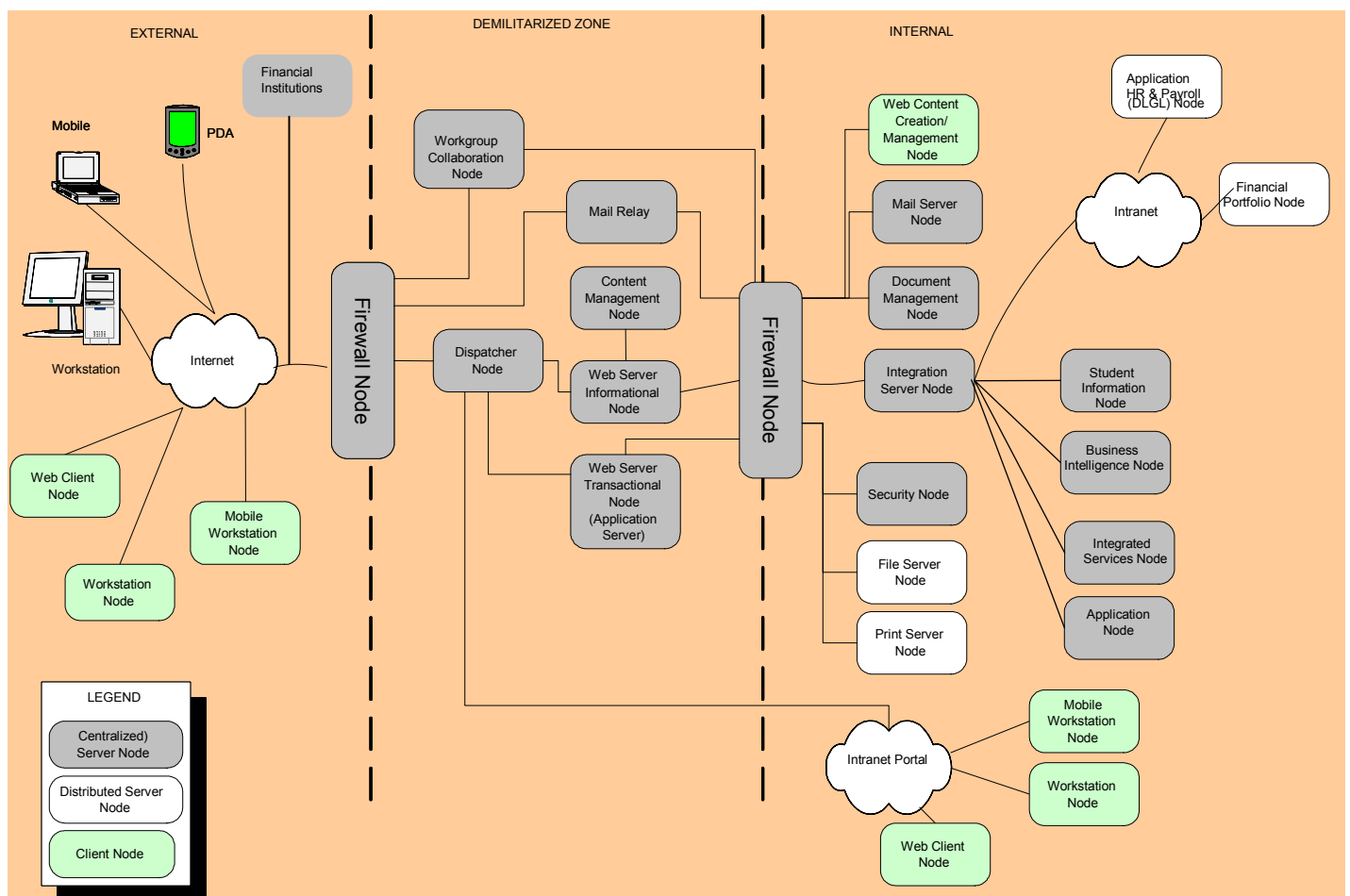
The different kinds of nodes in the architecture will be defined in terms of specific technologies and standards as part of the Technology Standards project


## Server Nodes

*Application Server Node*    This centralized server node hosts the application(s) that support the University's business functions.  There may be a number of these nodes.

*Integration Server Node*    This centralized server node support the integration (data and transactional) among applications.  Only one node of this type may be necessary.

*Mail Server Node*    Provides    University-wide    e-mail,    calendaring,    and    other collaboration functions.  This is a centralized node.

*Document Mgmt. Node*    This centralized node provides document management and possibly other collaboration functions such as workflow, document review cycles, etc.

*Security Node*    This centralized node manages the University wide network security functions such as user authentication validation, credentials verification, etc.

*File server Node*    This distributable node (replicated in a number of locations) provides the file management facilities for the users in the University/Department/remote location.    Appropriate backup facilities, as currently performed, will maintain data integrity.

*Printer Server Node*    This distributable node—which can be combined with the File Server Node—provides network printing support to the users in the University/Department/remote locations.

*Firewall Node*    This centralized node provides services that implement security policies designed to keep a network secure from intruders and unwanted network traffic.    One Firewall Node protects the University's intranet and the other protects the de-militarized zone.

*Mail Relay Node*    This centralized node serves as a mail gateway between the internal mail users and the Inter/Intranet.  It provides protocol translation and may support virus scanning and unwanted mail (spam) filtering capabilities.

| | |
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| *Content Management Node* | This centralized node manages the University's web content, including educational material. It ensures that the correct version of the content is published and manages the access for creation or updates of the different departments' content according to security rules. |
| *Web Server Informational Node* | This centralized node is the University Web Server for supporting publishing of static or relatively stable content (including images, video and sound). |
| *Web Server Transactional Node* | This centralized server supports the provision of application functionality to web-based clients. This node may directly provide business functionality, data access services and proxy access to existing applications. Load sharing among many servers is anticipated. |
| *Asynchronous Workgroup Collaboration Server Node* | This node provides components that enable members of a workgroup to work together and engage in "asynchronous collaboration" regardless of their location within or outside the University. |
| *Dispatcher Node* | This node routes HTTP (web access) messages to the appropriate node for service. |

## Client Nodes

| | |
|---|---|
| *Web Client Node* | These nodes provide web browsing and other internet-based services to end users. |
| *Workstation Node* | These nodes provide office productivity and specialized single-user application services as well as internet browsing and access to application and system management services. |
| *Mobile Workstation Node* | These nodes are the mobile equivalent to the Workstation Node with additional support for wireless networking. |

## 5.5  Defining Target Technology Standards

The migration to a standards-based technology environment requires selection of a set of technology standards.  The Nodes in the University-wide Technology Architecture described above will be used to specify the technical requirements.  The Nodes are specified according to the following table of components.

| NODE SPECIFICATION | | |
|---|---|---|
| **Component Category** | **Component** | **Specification / Standard** |
| **Application & Data Design** | Presentation Logic | |
| | Business Logic | |
| | Data | |
| **Infrastructure Services** | Presentation Services | |
| | Application Services | |
| | Data Services | |
| | Distributed Services (Middleware) | |
| **Base Platforms** | Network | |
| | System Software | |
| | Hardware | |

A target technology standard set for the components required by the proposed architecture will be developed and a migration plan defined. These standards should be consistent across the University to facilitate collaboration, resource sharing and cost savings.

*Browser Selection* – The University should make a decision on the selection of one standard Web browser.  The fact that the recommended application delivery mechanism should be Web browser-based requires that a standard browser is used to ensure compatibility and consistent functionality.  Among other things the selection process should consider virus and security issues and adherence to standards.  Should open source be selected, two browser standards may be appropriate.

*Standard Workstation Platform* - The proliferation of diverse workstation technologies has a number of consequences to the University.  Understanding that in the research areas there is a need to select the appropriate technology for the task at hand, the consequence is that the University will not be able to properly support the potentially large number of technologies that

are, or could be, in use.  It is recommended that the University select a range of standard workstation configurations for general needs except for the highly specialized requirements of the research departments.  The standards should be mandatory for all administrative and teaching requirements and educators and researchers encouraged to adopt standards whenever possible.

*Office Productivity Tools* – Standardizing into one office productivity suite of tools will resolve a number of support and compatibility issues.  Alternatively, the University could consider open source office productivity solutions—as many other organizations in both private and public sectors are doing—that provide compatibility with the industry dominant Microsoft offerings.

*Application Development Tools* – Notwithstanding the previous recommendation of buying vs. custom developing applications, there may be situations where an off-the-shelf solution is not available.  The University must select a set of development tools that support the recommended architecture of Web-based applications delivery (i.e. Browser-based applications).  UTS staff must be trained to use these tools as appropriate.  Tool selection must consider standards compliance, availability of supporting tools, availability of skills (i.e. individuals with expertise in their use), what others are using.

*Database Technology* – The current University applications were developed to exploit the capabilities of DB2 and Oracle. Some older applications use IMS/DB.  Migration to an Oracle environment is recommended.

## 5.6  Enterprise Communications Network

As indicated previously, the enterprise network is robust and reliable.

Three issues needs to be addressed:

- The core switches and edge devices should be supported in all location by uninterruptible power supplies and essential power especially to support the deployment of voice over ip telephony

- As new facilities are constructed, a significant investment is made in new switches but no provision is made for their replacement and maintenance

- The integration of voice and data networks suggests that some further redundancy and elimination of single points of failure would be appropriate

**Future Wireless Direction**

As funding becomes available, the plan is to expand campus coverage dramatically in common areas wherever students use mobile computing or personal digital assistants to meet students' access and service expectations.

The following locations for expansion of the canopy have been identified by Faculties, Libraries and Student Services with preliminary estimates shown below:

FACULTY OF BUSINESS:

| | |
|---|---|
| Michael DeGroote ($65,600) | P1 - student club, lounge & open areas |
| | P1A - major classrooms AB102, AB103 |
| | P2 - twelve other classrooms |
| | P3 - six meeting rooms |

FACULTY OF ENGINEERING:

| | |
|---|---|
| JHE ($2,050) | Chemical Engineering classroom JHE342 |
| ITB  ($27,300) | existing areas (addition includes WLAN) |

FACULTY OF HUMANITIES:

| | |
|---|---|
| TSH Art Studio ($10,500) | no VLANs in existing building net |

FACULTY OF SCIENCE:

| | |
|---|---|
| Psychology ($44,150) | introductory Psych classrooms & PC155 |
| | lobby |
| | seminar rooms - 3/2nd floor, 2/3rd floor and other building areas |
| Life Sciences ($80,450) | Grad Rooms (208,216) |
| | Common Areas  (B130E, 130A, 212A,213) |
| | Labs (102 to 110) |
| | 3rd Floor (305,322,323) |
| | All floors (offices/halls) |
| School Geog/Geol ($4,300) | 1 classroom, 1 seminar room |

FACULTY OF SOCIAL SCIENCES:

| | |
|---|---|
| Sociology ($17,600) | 8 grad student offices |

LIBRARIES:

| | |
|---|---|
| Mills Library ($30,200) | second priority areas |
| | third priority areas |
| Thode Library ($15,050) | second priority areas |
| FHS Library ($9,400) | renovated open areas |

RESIDENCES

| | |
|---|---|
| Various ($20,000) | |

OTHER

| | |
|---|---|
| University Hall ($2,100) | Convocation Hall |

Requests total about $328,700.  Implementation is in progress.

## 5.7 Technology Support

A single point of access for technology support ("one stop shopping") is recommended with technology service providers working together behind the scenes to solve problems and implement proactive service improvements in addition to remedial break/fix support.  Another way of looking at the support model is described as "no wrong door".  Instead of being referred, all front-line support staff have access to the same tools and information.

A Service Centre should be managed by University Technology Services and agreed service management standards implemented and performance monitored.  Over time, resources should be matched with needs.

Desktop support should be close to the customer and dedicated resources available to Faculties, Departments and Ancillary Services.   This presents one of the more challenging set of recommendations as support today is very diverse and funded in a variety of ways.  For example, researchers pay an annual amount to be supported by Research and High Performance Computing Support, a skilled team of technical resources, but many calls are about simple desktop issues that could be resolved by Service Desk staff.  Health Sciences Computer Services Unit operates on a fee-for-service basis.  Some Faculties such as Business and Humanities have dedicated units.  Some faculty have no support and are bounced from one service unit to another seeking a solution.  This has to change.

The target is a single point of contact at the Service Centre and deployment of the appropriate resources to fix the problem.  Implicit in this recommendation is that those Faculties that do not currently have a dedicated resource for technology support should contract with University Technology Services for assistance.

# 6  Master Projects

## 6.1  Introduction

This section describes the projects necessary to achieve the University Technology Strategy.

### 6.1.1 Master Projects

To achieve the strategies, projects are proposed based on input and advice from the McMaster community.

| University Without Boundaries | Governance | Student Experience | Research/Academic |
|---|---|---|---|
| | | Student Portal | Institute for Arts and Technology |
| Business Intelligence | Governance Model Technology Committee | Integrated Student Services | Collaborative Research "Hot Houses" |
| **Sustained Success** | Investment Model | Knowledge Commons | Shareable High Performance Computing |
| IT Audit and Risk Assessment | Communications Strategy | Student Technology Centres | Knowledge Management |
| Key Performance Indicators | **Inquiry/Problem Based Learning** | Technology Accessibility | Open Information Research Initiative |
| **Application Portfolios** | Support and Outreach Program | **Standards** | **Service Excellence** |
| Student Information | faculty Portal | Technology Standards and Best Practices | Service Excellence d Service Delivery Model |
| Financial and Asset Management | Inquiry/Problem Based Learning Centre(s) | **Managed Infrastructure** | Partnership Models Service Advisory Council |
| Document Management | Web Conferencing | Wireless Canopy | **Foundation Projects** |
| Alumni and Donor Relationship Management | Smart Classrooms | Disaster Recovery and Business Continuity | Student Self Registration |
| Portal Creation and Management | **Premier Learning Community** | Data Centre Consolidation | HR and Payroll |
| Space Planning and Management | Community Education Portal - Connect Hamilton | Campus Expansion and Construction | Project Management Office |
| | Hospital and Community Partnership Model | Technology Replacement Program | |
| | | Security Road Map | |

Project descriptions in this section correspond to diagram above. The level of detail and validity of the cost estimates[20] vary considerably depending on the background work done to date. The intent is to present a high level overview and refine the project descriptions and funding proposals prior to submission of a business case to the University Technology Committee.

Strategy 1: *Create a **University without boundaries**. Work together to develop and implement a "University" Technology Strategy aligned with Refining Directions' implementation. The emphasis is on one University with Faculties, Departments, Ancillary Services and external partners working in harmony to implement a bold plan for the future*

| Project ID | | Name | *Business Intelligence* |
|---|---|---|---|
| **Description** | Business Intelligence has two important roles in creating a University without boundaries. The first is that it can act as the glue to bring together in a common store all of the disparate information used by the University community. The second is that it has the potential to provide a scorecard to enable the University to conduct a self-assessment and report on key performance indicators.<br><br>Business Intelligence will:<br>▪ enable creation of a performance scorecard for the University<br>▪ provide autonomy and self sufficiency to those charged with extracting, reporting, and analyzing data (accessibility, timeliness)<br>▪ improve data quality - accuracy, reliability, consistency, validity, and completeness<br>▪ enhance business agility and ensure that data is timely and accessible and can be transformed into meaningful information to support effective decision-making<br>▪ provide an authoritative and secure environment for data management<br><br>Today disparate non-integrated systems involve:<br>▪ Different tools for data extraction<br>▪ Reliance on specialized knowledge<br>▪ Time-intensive security efforts<br>▪ Re-keying, reconciling tasks<br>▪ Incompatible data elements<br>▪ Inconsistent definition<br><br>Risks are significant:<br>▪ data elements incompatible and data definitions inconsistent<br>▪ margin for error and inconsistency increases when data entered and interpreted at several different sources<br>▪ poor quality data can lead to ineffective decision-making, costly errors<br>▪ insufficient time devoted to strategic thinking<br>▪ lack of standardization of data definitions and software tools | | |

[20] Note that the proposed funding allocation by year has not been updated to reflect the budget allocation.

The Business Intelligence project will enable compilation and reporting of performance measures. This will enable the University to self assess its programs, and measure its performance internally, as well as against other institutions relative to external benchmarks (e.g., Maclean's, G10)

The ultimate goal is to:
- Integrate core system data (financial, human resources) with research data
- Provide for interactive capability and facilitate strategic planning, management, and accountability
- Increase ability to respond to needs/criteria of stakeholders
- Increase dissemination of research data university-wide to facilitate improved resource planning and accountability
- Enable the University to be competitive with other G10 institutions and be competitively positioned to take advantage of new opportunities
-

2004/05  Deliverables
- Creation of a financial Data Mart with standardized data definitions and business processes  (Scheduled, automated reporting of month-end account statements)
- Increased knowledge in several areas:
  - Training of Power and Web Users
  - Customized reports and wide dissemination of information
  - Research
- Increased ability to respond to needs/criteria of stakeholders
- Increased dissemination of research data university-wide to facilitate improved resource planning and accountability

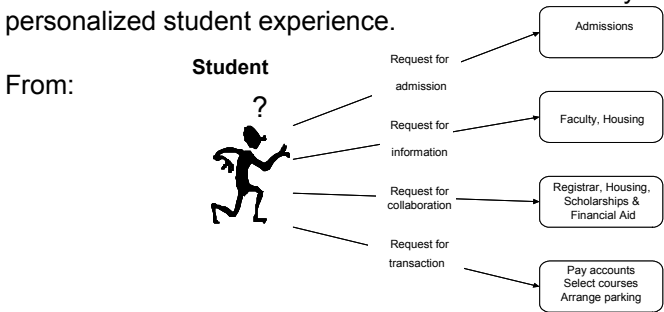| | |
|---|---|
| **Priority** | 2004/05 Research Reports Proof of Concept<br>2005/06 Implementation of Performance Scorecard, Financial Reports, Data Manual to support Undergraduate Program Reviews, Data Manual |
| **Sponsor** | AVP Administration, VP Research |
| **Estimated Cost** | 2004/05 $375,000<br>2005/06 $415,000<br>2006/07 $300,000 |

Strategy 2*: Create a new **governance** model and priority-setting process for technology which addresses competing interests.  Implement a new investment model and invest strategically.  Be crisp about accountability and decision-making authority.*
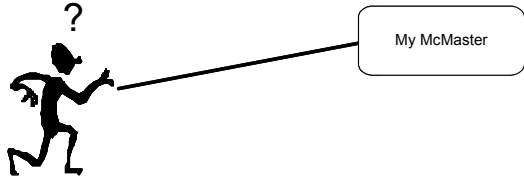
| **Project ID** | | **Name** | ***Governance Model*** |
|---|---|---|---|
| **Description** | Create a University Technology Committee to link strategic technology initiatives with Refining Directions and related strategies<br><br>Initial composition will include Vice President Research, Vice President Administration, Provost and Vice-President Academic, Chief Information Officer (chair) and President (ex-officio).<br><br>Draft Terms of Reference are attached as Appendix B | | |

| | |
|---|---|
| | The Committee is requested to:<br>▪ refine both its composition and Terms of Reference within one year<br>▪ implement a project approval process for new initiatives to be funded by the University Technology Fund with the onus on the project requestor to develop the business case<br>▪ develop a process for consideration of all requests based on business cases, develop a priority-setting process and present a funding model<br>▪ recommend priorities according to agreed criteria and annual budget allocation<br>▪ manage Technology Directions implementation and report on progress annually through UPC to Finance Committee and the Board of Governors |
| **Priority** | 2004/05 |
| **Sponsor** | Vice President Research, Vice President Administration, Provost and Vice-President Academic, Chief Information Officer |
| **Estimated Cost** | Staff Time |

| **Project ID** | | **Name** | *Investment Model, Business Case and Priority-Setting Processes, Best Practices* |
|---|---|---|---|
| **Description** | | | The University Technology Committee will recommend a priority-setting process, provide templates for the development of business cases, review best practices, and recommend approval processes and performance measures to the University Technology Committee consistent with the University Technology Strategy and Governance model.<br><br>The business cases should:<br>• recognize vision, strategies, and business plans<br>• recognize "customer centric" service delivery model<br>• consider "Faculty interest", "Departmental interest" and "University interest" trade-offs<br>• account for all costs and benefits, both tangible and intangible<br>• assess risks and risk mitigation costs & benefits<br>• estimate impacts on information technology and human resources<br>• consider commitment, readiness and availability of resources<br><br>It is envisioned that the priority-setting and approval processes will be collaborative and client-centric and will include criteria such as alignment with Refining Directions and University Technology Strategy, client impact particularly on the student experience, costs, tangible and intangible benefits, risks, competitive advantage, decision support, efficiency and productivity, business process change, sponsorship and leadership, innovation, curiosity, discovery, research, client acceptance, scope and complexity, delivery and project management fundamentals and security and regulatory compliance.<br><br>The business case template is intended to make it easy for faculty, staff and students to propose initiatives in a consistent format and ensure that all information is available to the University Technology Committee to make an informed recommendation. |

| | |
|---|---|
| | The Director, Project Management Office, will recommend the processes and templates to the University Technology Committee and act as a resource to project sponsors.  The Committee may also consider the creation of a Technical Review team with advice from the Director, Project Finance; and Chief Risk Officer; among others |
| **Priority** | 2004/05 |
| **Sponsor** | Chief Information Officer |
| **Estimated Cost** | Staff time |

| **Project ID** | | **Name** | ***Communications Strategy*** |
|---|---|---|---|
| **Description** | Develop a communication plan to invite comment about the University Technology Strategy and engage faculty, staff and students in the submission of projects and implementation of the Strategy.<br><br>The communications plan will be based on relentless communication> Information will be shared concerning the University Technology Strategy, projects, budget, processes, organizational design, service offerings, service level agreements and spirit of customer service.  The communications projects should address the basics from "who to call for what service when" to publication of an annual work program and budget. | | |
| **Priority** | 2004/05 | | |
| **Sponsor** | University Technology Committee | | |
| **Estimated Cost** | $25,000 | | |

Strategy 3*: Enhance the **student experience** at McMaster by providing personalized and customized support and access to information and technology based on student needs and choice of time, location, and channel.*

| **Project ID** | | **Name** | ***Student Portal*** |
|---|---|---|---|
| **Description** | The purpose of this project is to review best practices for the McMaster student experience enabled by technology (excluding teaching and learning), refine the project scope to achieve a shared understanding of what's in and what's out, and prepare a business case to enable submission of a funding proposal as part of the 2005/06 budget cycle<br><br>The project will also identify opportunities for short term improvements or "quick wins" of benefit to students that could be implemented at reasonable cost with minimal resources<br><br>To transform McMaster's student service delivery into a client-centric, personalized student experience.<br><br>From: | | |

<table>
<tr><td></td><td>

To: **Student**

?



My McMaster

The project will identify the scope, present a business case, and map a journey towards integrated student services and a student web portal.

The project will:
- support the Refining Directions objective "to provide an innovative and stimulating learning environment where students can prepare themselves to excel in life."
- support the University Technology Strategy
- support student service expectations for integrated and on-line services and positively impact student assessment of services
- identify priorities and craft a road map for integration of student services and implementation of a student portal
- benefit students, faculty and staff by delivering a plan that will position the University for the future and address today's needs

The following themes have emerged in new student service models:
- *Routine transactions should be automated*
- *Students should have choice to initiate transactions and to have direct access to their own information*
- *Students should have high quality personal assistance when needed*
- *When students prefer personal assistance it should be available at a single location[21]*

The project will define a vision for student service delivery and describe what it will take to get there.
</td></tr>
</table>

| | |
|---|---|
| **Priority** | 2004/05  Planning and development of a business case<br>2005/07  Implementation |
| **Sponsors** | AVP Student Affairs, Registrar, AVP Academic<br>Brian Detlor, School of Business, has kindly offered to act as an advisor |
| **Estimated Cost** | 2004/05  $  65,000<br>2005/06  $750,000<br>2006/07  $500,000<br>2007/08  $250,000 |

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[21] Martha Beede and Darlene Burnett, Planning for Student Services, Best Practices for the 21st Century,  Society for College and University Planning, p. 9

| Project ID | | Name | *Integrated Student Services* |
|---|---|---|---|
| **Description** | According to Darlene J. Burnett, best practices for student services focus on the following[22]:<br><br>▪ *Customer/student satisfaction and success*<br>▪ *Service processes from the student's perspective*<br>▪ *Added value with each person-to-person transaction*<br>▪ *Choice (time, place and service contact)*<br>▪ *Variety of models for one stop centers*<br>▪ *Variety of models for web portals*<br>▪ *Self-service generalists and specialists (70 per cent self-service, 20 per cent generalists, 10 per cent specialists)*<br>▪ *Empowered, skilled front-line staff*<br>▪ *Cross-functional teams*<br>▪ *Service model seen as strategic to the institution*<br>▪ *Executive support and participation*<br>▪ *Shift from transactions to relationship*<br>The possibilities are limitless: | | |

<table>
<thead>
<tr><th>. <strong>From Traditional</strong></th><th><strong>To Contemporary</strong></th></tr>
</thead>
<tbody>
<tr><td>Functional silos</td><td>Cross-functional teams</td></tr>
<tr><td>Segregated departments and processes</td><td>Integrated systems, organization and processes</td></tr>
<tr><td>Lack of communication among departments</td><td>Cross-trained teams</td></tr>
<tr><td>Lines and multiple offices</td><td>"One or None" Philosophy</td></tr>
<tr><td>Limited Access 8:30/4:30</td><td>Anytime and Anyplace</td></tr>
<tr><td>Bureaucratic, paper-driven processes</td><td>One source of data, electronic access</td></tr>
<tr><td>Sometimes inconsistent information</td><td>Consistent information, integrated, and common interfaces</td></tr>
</tbody>
</table>

The AVP Student Services, AVP Academic, and Registrar met and agreed that priority should be given to the student portal. The readiness to embrace integrated student services may be further considered in future.

Ideally a physical student information center and a call center would complement this initiative.

| **Priority** | 2006/07 Planning and Design<br>2007/09 Implementation |
|---|---|
| **Sponsor** | AVP Student Services, AVP Academic, Chief Information Officer, Registrar |
| **Estimated Cost** | 2006/07  $  100,000<br>2007/08  $  500,000<br>2008/08  $1,000,000 |

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[22] Darlene J. Burnett and Diana G. Oblinger, Innovation in Student Services, Society for College and University Planning, page 7

| Project ID | | | Name | *Knowledge Commons* |
|---|---|---|---|---|
| **Description** | In a draft report dated August 31, 2004 the Chief Librarian notes that "The concept of an 'Information/Knowledge Commons' as a new service model in academic libraries is a fairly recent phenomenon. . . A standard definition of terms has yet to emerge, but facilities can range from a simple cluster of computers giving access to digital information and possibly productivity software to a purpose-built facility that integrates all of the resources, services and assistance – technical, intellectual, print and digital – that students would need to carry out their academic assignments and research from 'start to finish' within a single facility." | | | |
| | The University Library is exploring the concept of a Knowledge Commons and has studied the potential to transform the McKay reading room and related areas on the second and third floors of Mills Library into a Knowledge Commons. | | | |
| | The Commons is described in the same report as a "vibrant, user-centred learning facility that provides a single point of integrated access to knowledge, resources, technology, software, assistance, instruction and study space. The facility will support the full range of the discover process, from the initial identification and collection of information to the creation of the final essay, spreadsheet or presentation." The report continues " The Commons will build upon the collection and service strengths of the University Library. The facility is envisioned not as a computer lab, but as a means to integrate the content of the Library's strong print collections with our rapidly expanding digital library." | | | |
| | Finally, the Commons will serve as a gathering space for students and researchers from all areas of campus to participate in the discovery and learning process. The facility will support collaborative learning with innovative workstation and furniture design, together with the availability of enhanced group study rooms. | | | |
| | The preliminary capital estimate is $1.854 million with a related annual operating cost of $280,000 including equipment replacement. This is based on a 24 hour operation. Should the project be successful in Mills, the Knowledge Commons could be expanded to Thode or be part of a larger virtual Commons. | | | |
| | Discussions are in progress among the AVP Academic, VP Student Services, Chief Information Officer and Director of the Centre for Leadership in Learning concerning the benefits to students, success measures, need for flexibility in design, and relationship to the wireless canopy, student technology centers, and the concept of a "virtual" campus-wide Knowledge Commons.. | | | |
| | It is suggested that the project be considered on its merits in relation to other initiatives proposed for 2005/06. From the perspective of the University Technology Strategy, it would be preferable to have a University Knowledge Commons encompassing a range of locations and services to provide students with choice. | | | |

| Priority | 2005/06 |
|---|---|
| Sponsor | Provost and VP Academic, Chief Librarian |
| Estimated Cost | $1.854 capital and annual operating of $280,000 Preliminary estimate for Mills<br>2005/06  $1,000,000<br>2006/07  $   500,000<br>2007/08  $   250,000<br>2008/09  $   250,000 |

| Project ID | | Name | Student Technology Centres |
|---|---|---|---|
| Description | Today over twenty student labs are managed by ten organizational units. The concept of a shared service approach to computing labs within the University should be explored with a view to leveraging scarce resources. This project would inventory existing computing labs, review access and hours of operation, determine needs, and propose a coordinated approach based on shared services across the University taking into account the different Faculty locations and needs.  The project should also address the need for specialized solutions for geographic information systems, multimedia, statistics and consider flexible ways of matching needs to available facilities.  Maintenance and support of the labs as well as the need to replace computing equipment every three years or so should also be considered.  Extended hours of operation are also critical to success.<br><br>The environment also merits careful consideration as many of today's labs lack ergonomic furniture and contemporary equipment.  Indeed, it's a wonder that learning can occur in some of the basement facilities where instructors compete with air handling equipment and taped ceilings contain asbestos.  In the words of some parents, some labs are simply "primitive".<br><br>It is envisioned that the future student technology centers would be flexible welcoming environments and provide access to library and learning resources, fixed and mobile computers, equipment such as multimedia, scanners, printers, notebooks, wireless and projection units so that students can complete assignments and practice presentations using the latest technology.<br><br>This project should also be considered in conjunction with the proposed Knowledge Commons and Inquiry/Problem Based Learning Centre of Excellence to ensure that instructor-led, collaborative and individual learning and access to technology are supported.  It may also be appropriate to consider linkages to the Diversity Café, Student Portal, and Integrated Student Services projects. | | |

| Priority | 2005/06 |
|---|---|
| Sponsor | Chief Information Officer, Deans |
| Estimated Cost | 2005/06  $ 500,000<br>2006/07  $ 500,000<br>2007/08  $ 250,000<br>2008/09  $ 250,000 |

| Project ID | | | Name | *Technology Accessibility* |
|---|---|---|---|---|
| Description | Ensure that McMaster's services delivered using technology are accessible to all members of the McMaster community and are designed specifically to comply with web accessibility and related standards. | | | |
| Priority | 2005/09 | | | |
| Sponsor | VP Student Services | | | |
| Estimated Cost | 2005/06  $100,000<br>2006/07  $ 25,000<br>2007/08  $ 25,000<br>2008/09  $ 25,000 | | | |
| Project ID | | | Name | *Smart Classrooms* |
| Description | Audiovisual Services have proposed a ten year program to transform the classrooms into smart environments with appropriate projection devices, network connectivity, and audiovisual equipment.<br><br>A limited number of facilities have been upgraded to smart classrooms in recent years.<br><br>Two competing drivers intersect with the program:<br>▪ new facilities such as MDCL detract from the staff's ability to focus on the classroom renewal project<br>▪ the need to replace projection units and audiovisual equipment every three years or so means that a ten year program encompasses three refresh cycles.<br><br>The availability of appropriate, reliable equipment has an immediate and direct impact on the student experience.<br><br>Some infusion of funding to kick-start the program would be appropriate. Staff are also exploring ways to provide support in the evening and on weekends in the shared services model as faculty frustration is significant when equipment malfunctions in a three hour session and no after hours support is available.<br><br>Faculties are also encouraged to work with University Technology Services on standard notebook and memory stick/CD configurations for faculty to facilitate ease of use and access. | | | |
| Priority | Ongoing | | | |
| Sponsor | Executive Director, Audiovisual Services | | | |
| Estimated Cost | $500,000 annually | | | |

Strategy 4: *Facilitate the differentiation and competitiveness of McMaster as a **research intensive** university by the effective deployment of technology to support researchers. Achieve technology leadership among Canadian universities by leveraging McMaster's research focus on information technology and bioinformatics.*

| Project ID | | **Name** | *Burlington Campus*[23] |
|---|---|---|---|
| **Description** | Early in 2004, the City of Burlington formed a task force to explore a vision for post-secondary education in the City.  The task force had a broad mandate: to examine Burlington's current and future needs and recommend a strategy designed to attract a college or university presence to the City. Working with the City of Burlington to understand its aspirations and respond to its vision, McMaster University developed a proposal which both draws on the University's established areas of academic strength and responds to Burlington's economic, cultural and social climates.  Building around a core focus on digital technologies, the Burlington campus will begin with a set of interdisciplinary undergraduate and graduate programs at the intersection of arts, business and technology.  It will build outward to develop new programs that retain this core technology focus but that become more specialized in technology or communications studies.   McMaster's intention is also to partner with one or more neighbouring post-secondary institutions to lever their knowledge, facilities and expertise.   As complementary programs develop, building on a common base of values and learning experiences as described in this document, the following diagram depicts a program direction in which the eventual campus could evolve: **BURLINGTON CAMPUS** **EVOLUTION OF INTERDISCIPLINARY LEARNING AND DISCOVERY** The overall planning goal is to create, within a 15-20 year time frame, a campus of about 5,000 students – many of them from Burlington and the surrounding areas, but many others from elsewhere in Canada and around the world.   The campus is also intended to evolve into a research hub working closely with local and national industry players and with researchers from publicly-funded agencies such as the National Research Council. The campus and its research and teaching programs are intended to be closely integrated with the economy and cultural life of Burlington and the Region of Halton.   Close ties with local industry can be created through research projects, symposia and the like; similarly, links to the cultural community could occur through displays of student work and the interaction of students and faculty with local artists and art organizations.  Perhaps most exciting for all partners, this is an opportunity to join in dissolving boundaries, shaping learning to the new century through partnering one of Canada's most innovative cities with one of Canada's most innovative universities. | | | |

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[23] Extract from the **draft** Burlington Campus Project Planning Charter, February 12, 2005, page 1

| Priority | 2004/05 Planning and Approval Process<br>2005/06 Phased Implementation begins |
|---|---|
| Sponsor | Provost and VP Academic, VP Research, Dean of Humanities, Dean of Engineering, Dean of Social Sciences, Dean Graduate Studies |
| Estimated Cost | To be determined. A financial model is in progress |
| Project ID | | Name | *Framework for Collaborative Research: "Hot Houses"*[24] |
| Description | Creative approaches to collaborative research are envisioned where McMaster researchers and students can interact with the world in real time as research evolves. "Hot houses" make take many different forms from a virtual cave which is best compared to the virtual reality Holodeck in Star Trek to a collection of images on a digital screen to individuals connecting with others via the Internet, forums, personal digital assistants or cellular technology.<br><br>The intent is to support researchers by providing tools and channels that facilitate questioning and discovery, capture the evidence and data in digital form, enable processing and sharing of the data and ultimately disseminating the findings.<br><br>A possible collaborative model follows: |

| Collaboration Stage | Technical Interoperability | Information (i.e. Semantic) Interoperability | Business (i.e. Functional) Interoperability |
|---|---|---|---|
| Discover | Can I find data related to my purpose? (e.g. content type, media, location, source) | Can I understand and use the data? (e.g. form, language) | Can I transact with my partnerr? (e.g. business relationship and transaction requirements) |
| Trust | Can I trust the data's source and provenance? (e.g. authentication) | Can I trust the data for my purpose? (e.g. quality, fitness) | Can I trust the transaction? (e.g. partner/supplier service levels) |
| Prepare | How do I get the data? (e.g. access requirements) | How do I prepare to use the data? (e.g. transform requirements) | How do I assure commitment from my partner/supplier? (e.g. agreements, protocol requirements) |
| Transact | How do I accomplish the transaction? (e.g. access registries, repositories) | How do I assure data integrity and accountability? (e.g. currency and completeness requirements) | How do I assure transaction completeness and accountability? (e.g. non-repudiation requirements) |
| Steward | How do I safeguard the data used in the collaboration? (e.g. protection requirements) | How do I safeguard meanings and interpretations used? How do I relate the data to other data? (e.g. integration requirements) | How do I safeguard the transaction? (e.g. archiving requirements) |

| | The 'Hot Houses" may include a creative commons which models digital culture, knowledge mobilization with a global village designed to engage others through exhibit spaces, performance studios and on-line mediation; an open community; open research based on a philosophy of creative technology transfer; and responsive research with the capacity to conduct just-in-time research. |
|---|---|
| Priority | To be determined |
| Sponsor | Provost, Deans |
| Estimated Cost | To be determined |

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[24] Ibid p. 9

| Project ID | | Name | *Shareable High Performance Computing* |
|---|---|---|---|
| **Description** | | | |
| | The Shared Hierarchical Academic Research Computing Network (SHARCNET) is an important resource for McMaster researchers.<br><br>Through the application of high performance computing to research, SHARCNET promotes excellence in research and accelerates the production of research results in the natural and social sciences, engineering, mathematics, and business.   McMaster physics and astronomy professor, Hugh Couchman, is SHARCNET's scientific director. | | |
| | In 2004 SHARCNET obtained a CFI grant to construct a new computer room facility to host a wealth of new computers.  Construction is in progress in ABB. This new facility will enable McMaster researchers to continue to work with others across the Province and around the world on collaborative initiatives and to take advantage of the shared computing resources at Ontario universities.<br><br>The important role of SHARCNET and connectivity to ORANO should be highlighted.  Some shared data storage and back-up capability may be appropriate in future.   The Technical Director, Research and High Performance Computing Support, is requested to develop a plan to consolidate and manage research servers and to propose shared back-up and recovery. | | |
| **Priority** | 2005/06 | | |
| **Sponsor** | Special Advisor to Vice President Research | | |
| **Estimated Cost** | 2006/07  $   250,000<br>2007/08  $   250,000<br>2008/09  $   250,000 | | |
| **Project ID** | | Name | *Knowledge Management* |
| **Description** | | | |
| | Knowledge management is the process through which organizations generate value from their intellectual and knowledge-based assets.<br><br>The University should consider participation in a pilot project led by Google[25] with 17 leading universities around the world, including Cranfield in the UK, to make academic papers and research more accessible on the internet.<br><br>"The world's most popular search engine has turned its attention to the problem of digging out scholarly gems from the mass of material thrown up by its internet searches.<br><br>The new scheme builds on the DSpace superarchive developed by the Massachusetts Institute of Technology and now copied by more than 100 universities, including Cambridge, to hold academic papers, technical reports, drafts of articles, and other work by an institution's academic staff. Because these archives store papers before they are published in expensive journals, they are seen as a major step towards freer publication and the circulation of ideas.<br><br>Some academic staff at Cranfield and other participating universities have been reluctant to put their work into the DSpace archive - partly because of | | |

[25]The Guardian dated April 13, 2004  and circulated by the Chronicle for Higher Education

| | |
|---|---|
| | the extra work involved and partly concern about exposing pre-publication articles to public scrutiny before they have been refereed (and often substantially altered).  Google is being linked to the universities via a search process set up by the Online Computer Library Center (OCLC) a non-profit computer library service based in Dublin, Ohio.<br><br>A pilot test of the project is in progress. If all goes as planned, the search feature could appear on Google in early 2005.<br><br>The participating universities have tagged all the materials in their super archives with metadata tags - hidden codes that contain catalogue information and summaries - that can help a search engine like Google's sort through the material.<br><br>The universities involved in the pilot are the Australian National University, Cornell, Cranfield, European University Institute, Hong Kong University of Science and Technology, Indiana University-Purdue University at Indianapolis, Minho, Ohio State, Parma, University of Arizona, Calgary, Oregon, Rochester, Toronto, University of Washington, Wisconsin." |
| **Priority** | 2004/05 |
| **Sponsor** | Dean Science |
| **Estimated Cost** | To be determined |

| | | Name | Open Information/Research Initiative |
|---|---|---|---|
| **Project ID** | | | |
| **Description** | Create a repository of University intellectual property and make it available in a structured manner with appropriate search and indexing tools.  The University Library has put in place the basics but little use has been made of the repository. | | |
| **Priority** | To be determined | | |
| **Sponsor** | Chief Librarian, Intellectual Property Office | | |
| **Estimated Cost** | To be determined | | |

Strategy 5: *Facilitate the differentiation of McMaster as **a inquiry/problem-based teaching and learning centre of excellence** by the effective deployment of technology to support collaboration and learning.*

| | | Name | Support & Outreach Program |
|---|---|---|---|
| **Project ID** | | | |
| **Description** | Go to classrooms and provide individual support for the effective use of and integration of technology with teaching and learning.  Conduct an audit for entry points to help with learning and teaching problems using technology.  Provide assistance with course development and presentation.  Provide support for the use of LearnLink and WebCT.  Provide mentoring and guidance for those new to the classroom.  Offer individual assistance for those slow to take up the use of technology and tools.<br><br>Purchase expertise to provide an appropriate level of support. | | |
| **Priority** | 2004/05 | | |
| **Sponsor** | Director, Centre for Leadership in Learning and Learning Technologies Resource Centre | | |
| **Estimated Cost** | Staff time | | |

| Project ID | | **Name** | *faculty Portal* |
|---|---|---|---|
| **Description** | Create a faculty portal or virtual support center to provide assistance and resources in the arenas of pedagogy and instructional technology; individual personal access to class lists, teaching materials, class assignments, student information and records; collaboration tools and access to current best practices and resources; access to research and library resources; and informal opportunities to share information.<br><br>The faculty portal should also enable faculty to link with the Human Resources self-service portal and achieve self-service for University administrative functions as parking, hospitality, book store  and so on.<br><br>The conceptual design should proceed in the context of the larger University portal which encompasses students, faculty, staff, alumni/donors  and community.  Needs definition and priority-setting for faculty should be driven by faculty representatives. | | |
| **Priority** | 2008/09 | | |
| **Sponsor** | Provost and VP Academic, Director CLL and LTRC, Chief Information Officer | | |
| **Estimated Cost** | 2008/09 $500,000 | | |
| **Project ID** | | **Name** | *Inquiry/Problem Based Learning Centre of Excellence* |
| **Description** | Create a repository of best practices related to inquiry and problem based learning and create forums to share experiences.  Offer education and support to the McMaster community and external organizations.<br><br>Centrally supported systems linked to pedagogy, funded well (evidence in decision making) | | |
| **Priority** | 2005/06 | | |
| **Sponsor** | Director, Centre for Leadership in Learning and Learning Technologies Resource Centre | | |
| **Estimated Cost** | To be determined | | |
| **Project ID** | | **Name** | *Web Conferencing* |
| **Description** | To provide faculty, staff, and students with access to web-conferencing capabilities to meet their needs and to offer support in the design and delivery of web conferences.<br><br>The purpose of this project is to examine the possibility of implementing a campus-wide web conferencing system that would allow multiple users in various locations to access live conferences, interact, simultaneously share documents and view archived presentations over the Internet.  The focus is on teaching and learning.<br><br>The scope should be carefully defined to take into account the need for course and presentation development, content management, archiving and indexing tools among other items.<br><br>Accountability for support should also be defined. | | |

| Priority | 2004/05 Project Planning |
| --- | --- |
| | 2005/06 Project Implementation |
| Sponsor | Director of Learning Technology, Faculty of Health Sciences |
| Estimated Cost | 2005/06  $150,000 |
| | 2006/07  $150,000 |

Strategy 6:  *Enable the creation of the **premier learning community** in Ontario and perhaps Canada by implementing a community education portal in partnership with the City of Hamilton, City of Burlington, Mohawk College, Sheridan College, Boards of Education among others and explore partnership opportunities with hospitals and health care providers.*

| Project ID | | Name | *Community Education Portal - Connect Hamilton Create Community* |
| --- | --- | --- | --- |
| Description | | | |

*"In a knowledge-based economy, education skills are the only game in town."*

-- Dr. Lester C. Thurow, Professor of Management & Economics, MIT



The City of Hamilton and its Connect Hamilton-Create Community (CHCC) partners including McMaster University and Mohawk College is implementing a comprehensive Community and E-Services Portal. The portal will provide universal access to user-friendly, secure transactional services for a new web presence that will be called www.myhamilton.ca.  The portal will provide powerful searching and collaboration tools.  The CHCC project team is leading a participatory design process to help establish the look, feel, navigation and layout of the portal to ensure maximum usability and use. Using the portal infrastructure, content and applications developed for www.myhamilton.ca will be leveraged on several thematic and organizational sub-portals.

The initial phase will focus on a community portal, electronic registration, payment processing, electronic government services and rural community access.

In the next phase, McMaster proposes to promote the concept of an education portal to enable the community to become Ontario's and perhaps Canada's premier learning community.  It is anticipated that this will further reinforce McMaster's commitment to support lifelong learning and to work with the community. The initiative would also link to community objectives to align world-class learning institutions to the community's economic development strategy and support economic development clusters of advanced manufacturing, biotechnology, film, agriculture, the airport and port.

A proposed research project on the myhamilton.ca portal will be conducted by several researchers from the DeGroote School of Business at McMaster

University: Brian Detlor, Maureen Hupfer, Umar Ruhi, and Norm Archer.

The primary research need driving the proposed investigation is to identify the reasons why users do or do not utilize the community portal. A secondary research need is to gather data and metrics on the CHCC community portal that can be used to report usage activity back to the Ontario Provincial Government and Hamilton City Council.

McMaster will benefit by being able to add to the growing body of research literature on virtual communities, community informatics, communities of practice, and electronic government. Recent reports indicate there is a lack of research on virtual communities though there has been exponential growth in the development of virtual community environments. The research project would also be beneficial towards the training of graduate students. The plan is to align this project with Umar Ruhi's Ph.D. dissertation, tentatively entitled *Sustainability of User Participation in Virtual Communities*.[26]

| | |
|---|---|
| **Priority** | 2004/05 Community and Government Portal<br>2005/06  Education Portal |
| **Sponsor** | President and VP University Advancement |
| **Estimated Cost** | 2004/05 Nominal contribution of staff time, research and $20,000<br>2006/07  $100,000<br>2007/08  $100,000<br>2008/09  $250,000<br>Assumes similar funding from other educational institutions |

| Project ID | | Name | *Partnership Model with Hamilton Health Sciences and St. Joseph's* |
|---|---|---|---|
| **Description** | Clinical departments are supported by technology staff in the hospitals for desktop support and hospital applications.  It is expected that this will continue.  However, communication, coordination, and collaboration are necessary among the University, Hamilton Health Sciences and St. Joseph's to ensure that client needs are addressed and coordination exists where practical (for example, wireless deployment) and the best interests of the clients are served.  This project is designed to create an ongoing partnership with the hospitals with a view to creating community and synergy.  In its formative stage, advocacy and communications roles may be appropriate. It is expected that the relationship will mature into a true partnership with shared decision-making and accountability | | |
| **Priority** | To be determined | | |
| **Sponsor** | Dean and Vice President Health Sciences | | |
| **Estimated Cost** | To be determined | | |

*Strategy 7:  Achieve service excellence.  Be client-centric and help students, faculty, staff and alumni achieve self-sufficiency.  Provide clients with the access, information, tools and support that they need.  Implement client-facing portals supported by shared services.*

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[26] Extract from McMASTER RESEARCH PROJECT OUTLINE Enhancing Participation in Virtual Communities: The myhamilton.ca Community Portal Project dated September 10th, 2004 page 1

| Project ID | | Name | *Culture of Service Excellence* |
|---|---|---|---|
| **Description** | Commit to a culture of service delivery excellence based on one University with all technology service providers working together to support faculty, staff, students, community and alumni.<br><br>In accordance with the Information Technology Infrastructure Library (ITIL) implement improved service processes for all technology services by all University Technology Service providers.<br><br>An independent assessment of Computing and Information Services processes was completed in 2003 by Pink Elephant[27]. The findings from this assessment serve as an internal benchmark of current service process maturity which can be used to develop specific plans for service management improvements and serve as a process review roadmap. Generally, the findings documented a maturity score of 1 to 1.5 on a scale of 1 to 5 where one is low. The findings suggest that there is significant opportunity for improvement.<br><br><br><br>As a result of this study, incident management was selected as a starting point for service improvement because it directly impacts clients and because it is difficult to talk about strategic direction if clients have immediate service issues.<br><br>Incident management includes a vision of "one stop shopping" and "client self-sufficiency" for client service with a central Service Desk supported by Service Desk software, tools, performance tracking,  and support delivered by various service providers including Faculties, CIS, LTRC, HPRC, University Libraries and so on.   Faculty, staff and students will be able to initiate a service request on-line or by telephone and track status.  Service standards and escalation procedures will be implemented and performance | | |

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| | tracked.<br><br>Over thirty processes were reviewed and streamlined. A Request For Proposal was issued for Service Desk software and the product "Heat" selected. Implementation is in progress. Phase two will include deployment in Faculties, LTRC, University Libraries, and Research and High Performance Computing Support.<br><br>Future service improvements over the next thee years will address change management, problem management, service level management and capacity management. It will then be appropriate to review progress against the original 2003 benchmark and determine if the initiative should be continued to address IT Service Continuity Management, Availability Management, Financial Management, Release Management, and Configuration Management. |
| **Priority** | 2004/05 Incident Management<br>2005/06 Change Management, Problem Management<br>2006/07 Service Level Management, Capacity Management<br>2007/08 Prioritize remaining five processes |
| **Sponsor** | University Technology Committee |
| **Estimated Cost** | 2005/06 $100,000<br>2006/07 $100,000<br>2007/08 $100,000<br>2008/09 $100,000 |

| Project ID | | Name | *Service Delivery Model* |
|---|---|---|---|
| **Description** | | | Create a Service Advisory Council to make recommendations about client communication, training, education and accountability related to the delivery of technology services to faculty, staff, students, alumni and retirees.<br><br>Develop Terms of Reference for the consideration of the University Technology Committee.<br><br>Identify technology service needs of the McMaster community<br><br>Develop service performance indicators and monitor performance.<br><br>Provide both structured and informal opportunities for client communication, feedback on what's working well and not so well, review of performance indicators related to service, and suggestions for improvement.<br><br>Report periodically on service performance to the University Technology Committee<br><br>Participants in the University Technology Strategy workshops volunteered to be on the Service Advisory Council. An early task will be to develop terms of reference and review the composition to ensure appropriate representation.<br><br>Volunteers include:<br><br>Simon Ouellet<br>Gina Robinson<br>Ken Moyle |

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|---|---|---|---|
| | Lou Ariano<br>Morag Horsman<br>Donna Shapiro<br>Mohammad Abou Shaar<br>Heather Grigg, Chair | | |
| **Priority** | 2004/05 | | |
| **Sponsor** | University Technology Committee | | |
| **Estimated Cost** | None | | |
| | | **Name** | ***Shared Services Models*** |
| **Description** | Consistent with the themes of looking outward, leveraging scarce resources, and defining accountabilities, this project is intended to build collaborative partnerships among University units with responsibility for some aspect of technology.  As many initiatives (wireless computing, document management, portals) will be driven by different organizations, a proactive approach to communications and collaboration is recommended.<br><br>An informal Technology Roundtable was initiated in 2003 and should be continued.  Current composition includes:<br><br>Chief Information Officer, Chair<br>Director, Client Services, University Technology Services<br>Associate Director, Infrastructure, University Technology Services<br>Manager, Information and Technology Services, DeGroote School of Business<br>Technical Director, Research and High Performance Computing Support<br>Manager, Humanities Computing & Teaching Labs<br>Executive Director, Learning and Technology Research Centre<br>Associate University Librarian<br>Manager, Computing Services Unit, Health Sciences<br>Facilities Manager, Electrical & Computer Engineering<br><br>Representation from Social Sciences and Science is invited.  Other technology service providers are welcome to attend.<br><br>All technology service providers will be accountable for compliance with technology standards (with the exception of Research and High Performance Computing Support) and implementation of the University Technology Standards.<br><br>University Technology Services should also develop partnerships with other Universities where appropriate to share information and consider a shared services model for some specific projects such as disaster recovery and storage management | | |
| **Priority** | 2006/07 | | |
| **Sponsor** | Chief Information Officer | | |
| **Estimated Cost** | $50,000 | | |

Strategy 8:  *Adopt a **portfolio-based, integrated approach to information management** and technology based on collaborative partnerships both within the University and with external partners.*

| Project ID | | **Name** | *Student Information* |
|---|---|---|---|
| **Description** | | | |

The Student Information Portfolio of applications is based on a custom system developed in the 1980's and some related packages.  The system is written in COBOL and it will be increasingly difficult to support and modify to reflect changing circumstances and should be replaced.

The Student Portfolio generally includes:

- demographic and personal information or "tombstone" data
- curriculum: courses, programs, classes, classroom scheduling and lecturers/professors/teaching assistants
- admissions: recruitment and application processing
- financial: student fee assessment and collection
- financial awards and aid: scholarships, bursaries, loans and payment agreements
- registration and student records
- enrolment processes and academic records
- degree audit, and
- academic counseling among other processes

Student Services including residence management, hospitality, parking, and related non-academic services makes up another portfolio.

At least two critical decisions need to be made prior to seeking replacement solutions.  The first is the degree of integration and ownership among the Office of the Registrar, Faculties, Departments and Finance so that role clarity exists around business processes.  The second is the decision around an integrated portfolio or enterprise solution for portals, student information and financial and asset management.  Based on the experience of others, process and organizational change are perceived to be the most significant barriers to implementation.

Considerable discussion and process and workflow mapping should occur prior to resolving the scope of the future replacement of the Student Information System.   Should the University seek one integrated solution for Financials, Student Information and the University Portal?  Is an open source solution a viable alternative?  Should standalone systems continue to be the norm?

At the same time, the University continues to build a web-based front end in the Student Self Registration system which enables students to register for particular classes, drop and add classes, perform a degree audit, do requisite checking, develop a financial and payment agreement, and in future select a course section/tutorial/lab.

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| **Priority** | 2006/07  Planning<br>2007/09  Implementation |
| **Sponsor** | Provost and VP Academic, AVP Academic, and Registrar |
| **Estimated Cost** | 2006/07  $   100,000<br>2007/08  $1,500,000<br>2008/09  $1,500,000 |

| Project ID | | Name | **Financial and Asset Management** |
|---|---|---|---|
| **Description** | | | |

**Description**

The project will initially review best practices for financial processes, streamline business processes, create a new chart of accounts, and prepare a business case for the replacement of the financial and asset management portfolio.  This will lead to acquisition of a new integrated portfolio of financial and asset management solutions including purchasing, inventory, accounts payable, accounts receivable, general ledger, budgeting, preventive and demand maintenance, investigation, scheduling, and inspections.  The project will have particular regard for risk mitigation, financial and management controls, and accountability.

The University acquired a packaged solution for financials in the early 1980's and it has not been supported by a vendor since 1986.  Staff have maintained the solution and cobbled together various enhancements to meet changing policy and legislative requirements but the system does not meet University needs.

As noted above, a key decision point is whether the University should seek an integrated solution with Student Information and Portals.

The diagram below shows the potential scope of an integrated Financial and Asset Management solution:



Space Management could be considered as part of the portfolio but because of the immediate need to provide tools and information, an interim solution should be considered

**Priority**

2005/06 Project scoping and planning
2006/08 Implementation

| Sponsor | AVP, Administration<br>Director, Physical Plant | | |
|---|---|---|---|
| Estimated Cost | 2005/06 $ 100,000 Project Scope, Planning and Business Case<br>2006/07 $1,500,000<br>2007/08 $1,500,000 | | |
| Project ID | | Name | *Document Management* |
| Description | A document management system enables access to and provides management throughout the entire life cycle of documents from creation through to final archiving or destruction. Electronic document management is an enabler that allows organizations to exchange information in new ways and to manage information access and control across the enterprise. The types of documents managed may vary from scanned images, word processing, presentations, spreadsheets, video & voice through to complex documents based on various combinations of document types.<br><br>Bearing Point, a consulting firm, was engaged in 2004 to complete a high level needs analysis of University document management requirements, provide an assessment of current procedures, and complete a market scan to identify document management options. The report to be completed in October 2004 will also address whether an enterprise solution is appropriate.<br><br>Preliminary observations suggest that needs can be categorized in a variety of ways:<br><br>▪ basic document management: tagging storing, searching, retrieving<br><br>▪ advanced document management: advanced searches, taxonomies, distribution<br><br>▪ imaging: scanning, location based OCR, integrating with applications, for examples invoices with AP<br><br>▪ workflow and electronic forms: complete requests and initiate, assign and configure pre-determined tasks collaboration tools<br><br>▪ archiving: long term storage or alternative storage<br><br>▪ records management: cradle to grave management from creation through disposition<br><br>▪ collaboration: real-time interaction through instant messaging and shared workspaces and repositories<br><br>▪ web content management: integrate templates and electronic forms and workflow with web site content<br><br>The University has two document management solutions, one from Xerox used by Media Production Services, and a second from Hummingbird used for nuclear reactor documentation. The rest of the University is generally using manual processes for files and | | |

record keeping.  Access is problematic, productivity is impacted by the time taken to find information, and space is a huge challenge.

Prior to implementation of any automated solution, it will be necessary to define accountability for records management, establish a policy framework, categorize records, develop records retention schedules, establish accountability for management of original documents versus copies, and put in place processes to manage documents from creation to disposal.  This framework is critical to the success of any document management initiative and will become increasingly important as privacy legislation evolves.

An earlier study completed by Saunders, Richan and Associates in October 2000 made a series of recommendations to develop a policy framework, complete records inventory and scheduling projects, consider a records storage facility, develop an archival records project, and consider electronic document management.

Document management doesn't compete well for scarce resources but the challenge of managing over 9000 linear metres of textual records becomes increasingly problematic as time passes.  The impact of lost productivity should also be carefully considered in the development of a business case.

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| **Priority** | 2005/06 Planning and Policy Framework, Pilot projects: Office of the President, University Secretariat, Office of the Provost and Athletics and Recreation  Business Case Development<br>2006/07 System Requirements Definition and Selection<br>2007/08  Implementation |
| **Sponsor** | VP University Advancement, VP Administration, Provost and VP Academic |
| **Estimated Cost** | 2005/06  $100,000<br>2006/07  $500,000<br>2007/08  $500,000<br>2008/09  $500,000 |

| **Project ID** | | **Name** | *Alumni and Donor Relationship Management* |
|---|---|---|---|
| **Description** | Acquire a customer relationship management solution to enable University Advancement to improve its ability to support alumni by tracking and responding to their inquiries, building relationships, identifying potential contributors and tracking contributions. The system may include contact management, marketing automation, client care, and integration with financial applications. | | |
| **Priority** | 2006/07 Planning and Business Case preparation<br>2007/08 Selection and Implementation | | |
| **Sponsor** | VP, University Advancement | | |
| **Estimated Cost** | 2006/07  $100,000<br>2007/08  $300,000 | | |

| **Project ID** | | **Name** | *Portal Creation and Management* |
|---|---|---|---|
| **Description** | Create a policy framework for electronic commerce, develop an architecture, define needs, select of tools, and design and implementation of portals to support student, faculty, staff, and alumni/donor access to information and transaction processing to enable all clients to be self-sufficient. | | |

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| | Key components include: single sign-on and authentication, role-based customization, personalization, standardized service publishing, universal access, content management, and enterprise application integration.

Consider open source and other cost-effective solutions and review the portal component of the self-service human resources services offered by DLGL in the Human Resources and Payroll project.

This is a critical project to ensure that the University portal for students, faculty, staff, alumni/donors and community is integrated with the various application portfolios and reflects a common architecture and standards. |
| **Priority** | 2004/05 Planning and business case development
2005/06 Solution selection, policy framework, student portal implementation
2006/07 Faculty, staff and alumni/donor portal implementation |
| **Sponsor** | Chief Information Officer |
| **Estimated Cost** | 2004/05  $  50,000 Common authentication
2005/06  $100,000
2006/07  $500,000 |

| Project ID | | Name | *Space Planning and Management* |
|---|---|---|---|
| **Description** | Acquire space planning and management tools integrated with as-built drawings, building naming and numbering conventions and space standards to enable the University Planner and Physical Plant to optimize the use of space to best meet the needs of the University.

Typically, space planning and management tools would be acquired as part of a financial and asset management portfolio.  However, given the magnitude of the space challenges at the University and the need to plan and use "swing" space for a range of capital projects, a standalone solution is recommended as an interim measure. | | |
| **Priority** | 2004/05 Business case preparation and system selection
2005/06 Implementation | | |
| **Sponsor** | University Planner | | |
| **Estimated Cost** | 2005/06  $100,000 | | |

*Strategy 9:  Agree on a **standards-based environment** and "freedom within boundaries" so that efficiencies are achieved and innovation is encouraged.  The target is a framework based on agility and flexibility which at the same time ensures no or minimal adverse impact on others within the University community.  Put another way, standardize wherever possible and put in place processes to ensure that researchers have freedom to discover without creating risk or consequences for others.*

| Project ID | | Name | Technology Standards & Best Practices (non-Research) |
|---|---|---|---|
| Description | - To develop University-wide technology standards for non-research functions.<br>- The technology standards should address the following areas:<br>  - <u>Workstation standards</u><br>    - Operating system<br>    - Hardware specifications by class of user<br>    - Productivity tools (word processing, spreadsheet, presentation)<br>    - E-Mail and Calendaring<br>    - Network connectivity<br>    - Web browser<br>    - Personal database<br>    - Virus protection<br>    - Security<br>    - Backup software and policies<br>  - <u>Server standards</u><br>    - Operating system<br>    - Hardware specifications by class of server<br>    - Security<br>    - Network environment<br>    - Backup software and policies<br>  - <u>Database Software</u><br>  - <u>Web Technologies (Inter- and Intranet)</u><br>    - Web server software<br>    - Web page development<br>    - Web scripting language<br>    - Web services<br>  - <u>Network</u><br>    - Physical, Data Link, Network and Transport layers<br>    - Network management tools<br>    - Wireless<br>  - <u>Telecommunications</u><br>    - Switch<br>    - Telephones<br>    - Mobile devices<br>  - <u>Development Environment</u> (for in-house development)<br>    - Programming language<br>    - Scripting language<br>    - Test tools | | |
| Priority | Ongoing | | |
| Sponsor | Chief Information Officer | | |
| Estimated Cost | 2005/06  $50,000<br>2006/07  $50,000<br>2007/08  $50,000<br>2008/09  $50,000 | | |

Strategy 10: *Provide an accessible, **secure, reliable, robust, managed infrastructure** and communications network so reliable that it seems invisible.  Ensure that privacy, security and risk assessment are integral to all initiatives.*

| Project ID | | | Name | Wireless Canopy |
|---|---|---|---|---|
| **Description** | Wireless access will provide secure, device-independent, location-independent access to network-based University information and resources in student common areas.<br><br>Senior Management considered a report in  2004 describing plans to implement a McMaster wireless canopy.  Mr. and Mrs. Richard Buckingham generously agreed to fund student access in the Student Centre, open areas, and Hamilton Hall. Computing and Information Services provided some additional funding and sought matching commitments. Senior Management was requested to identify other priority open space areas for student wireless access.<br><br>The chosen technology using Cisco access points is the widespread WiFi standard 802.11g, backward compatible with the older 802.11b standard. Wireless technology is evolving rapidly, and although standards will continue to change, a common choice is necessary across campus to achieve a seamless canopy with no contention or interference.  All concurrent clients share the available bandwidth of the access point they use with up to 20 concurrent users per access point providing acceptable performance. As usage increases, more access points will be required.<br><br>Thanks to the generous donation from Mr. and Mrs. Buckingham and an innovative solar-powered solution designed by Craig Thornton and other members of the Wireless Networking Group headed by Professor Terry Todd in Electrical & Computer Engineering, McMaster's emerging wireless canopy is leading edge. Outdoor areas in front of JHE, BSB, HH, as well as courtyards between Mills and MUSC and north of the Student Centre will be enabled with wireless coverage using SolarMESH -- solar-powered wireless mesh technology which is both environmentally sensitive and robust.  This is a win/win approach where researchers have an opportunity to prove the concept of SolarMESH and McMaster has an opportunity to use innovative technology.<br><br>Requests for additional wireless access points total about $328,700.<br><br>Faculties, the University Library and Student Services have been requested to review their needs, communicate their top priorities for wireless expansion in relation to available funding, and advise if matching funds are available to the Chief Information Officer.   If no matching funds are identified, available funding will simply be used to address top priorities.<br><br>The next phase will be planned as part of the 2005/2006 budget cycle. | | | |
| **Priority** | 2004/05 – 2005/06 | | | |
| **Sponsor** | Chief Information Officer | | | |
| **Estimated Cost** | 2004/05  $  35,000<br>2007/08  $300,000 | | | |

| Project ID | | **Name** | *Disaster Recovery and Business Continuity* |
|---|---|---|---|
| **Description** | Upgrade the University Data Centre to ensure that environmental conditions including air conditioning, UPS, emergency power and back-up are appropriate to University needs.<br>Acquire contemporary storage management and back-up solutions<br>Document and test Disaster Recovery procedures in the upgrade environment.<br>Develop and test business continuity processes for critical functions in consultation with all Faculties/Depts | | |
| **Priority** | Ongoing | | |
| **Sponsor** | External Auditor<br>Chief Information Officer | | |
| **Estimated Cost** | 2006/07  $100,000<br>2007/08  $100,000<br>2008/09  $100,000 | | |

| Project ID | | **Name** | *Campus Expansion and Construction* |
|---|---|---|---|
| **Description** | Plan and implement technology solutions including fibre connectivity, cabling, wireless, networks and voice communications for the following major projects as well as minor renovations and moves:<br>▪ Burke Sciences renovations<br>▪ Athletics and Recreation Centre<br>▪ New residence<br>▪ Burlington campus<br>▪ Camco research and innovation center<br><br>Develop a standards-based approach based on the following assumptions:<br>▪ Costs of technology related to major renovations and new construction will be encompassed within the building budget<br>▪ Dedicated closet space will be needed to rack-mount switches and uninterruptible power supplies<br>▪ All switches will be supported by uninterruptible power supplies linked to essential power<br>▪ Adequate cooling is provided for the additional equipment located in dedicated closets<br>▪ Dual single mode fibre connectivity is provided to the core network switches<br>▪ Cat5E cable is specified within the maximum distance limitation of 100 metres<br>▪ Voice over ip telephony will be used<br>▪ Wireless access standard 802.11g will be implemented as part of the University Wireless Canopy in areas where students assemble (both interior and exterior) and in major classrooms<br>▪ Provision will be made for pay telephones, elevator telephones, emergency access pull stations, security and fire alarm monitoring, environmental building controls, and facsimile equipment<br>▪ Site-specific requirements for student computing, broadcast center, point of sale, data and network switches, paging, changeable messaging signs and access will be addressed and funded as part of the project<br>▪ Voice over ip telecommunications | | |

| Priority | Ongoing<br>2004/05 Burke Science, MDCL, Multisports Complex Planning<br>2005/06 Burke Science, New Residence, Multisports Complex, Burlington Planning<br>2006/07 Burlington, Possible Research and Innovation Centre | | |
|---|---|---|---|
| Sponsor | VP Administration, Director of Physical Plant | | |
| Estimated Cost | To be included in the building construction costs | | |
| Project ID | | Name | *Fire and Security Monitoring* |
| Description | A "Dupline" system is used to monitor fire, environmental and some specific equipment such as sump pumps in various facilities on the main McMaster campus.  Sensors are installed within buildings and wired back to an enclosure that houses control equipment provided by various suppliers (Simplex, Edwards, Siemens and others) within each facility.  Each facility is then linked to the Dupline, then brings the alarm condition signal back to a server monitored by UCC and Security in the Clarke building.  When an alarm is signaled, Security responds and contacts the appropriate resource: Fire Department for fire alarms, facilities staff for environmental alarms and so on.<br><br>While fire monitoring has critical health and safety implications, environmental alarms can also be significant especially for the building housing the reactor, for animal experiments and for some forms of research. Consequently, a reliable system is essential.<br><br>The Dupline system has failed on occasion in recent months and needs to be replaced.<br><br>At the same time, McMaster has awarded a significant contract to Siemens Building Technologies for fire and environmental monitoring in the new Centre for Learning and Discovery.<br><br>Access Control and other Security inputs across campus are monitored through a system called Axium.  The Axium system will continue to serve as our access control system but all critical fire and environmental alarms will be monitored through a new system replacing the Dupline.<br><br>Given the investment in the Siemens solution and the fact that the award was made through a competitive process, it is appropriate to consider the cost of a Siemens solution. | | |
| Priority | 2004/05 | | |
| Sponsor | Director, Physical Plant | | |
| Estimated Cost | $500,000 Proposed in the Physical Plant budget | | |
| Project ID | | Name | *Technology Replacement Program* |
| Description | To define University-wide policies and procedures for managing the lifecycle of technology components and systems to ensure their currency and sustainability.<br><br>Include workstations, servers, networking equipment, printers, application software, operating systems, database software, etc<br><br>To introduce processes to inventory and label equipment as it is acquired and retired. | | |

| Priority | Ongoing |
|---|---|
| Sponsor | Chief Information Officer |
| Estimated Cost | 2005/06  $250,000<br>2006/07  $250,000<br>2007/08  $250,000<br>2008/09  $250,000 |

| Project ID | | Name | Security and Risk Management |
|---|---|---|---|
| Description | Develop a security road map to create a secure, managed, robust infrastructure including policies, processes, and protocols.  Promote technology security awareness including both physical and logical security of computer and data resources. Ensure that appropriate controls are in place in the development of all projects and deployment of all equipment.  Act as resource to project managers, faculty, and staff to ensure that all financial transactions are processed securely and that all implementations of electronic commerce reflect best practices.  Monitor compliance with all security policies and make recommendations to mitigate or eliminate security deficiencies.  Implement common authentication as a precursor to single sign on and achieve future identity management across all applications for all campus community members.<br><br>Conduct threat, risk and vulnerability analysis and evaluate the adequacy of security safeguards in an environment where service excellence, innovation and discovery prevail.<br><br>This project will be ongoing for the duration of the University Technology Strategy implementation and will be conducted in concert with the University Auditor, Director of Enterprise Risk Management and External Auditors as appropriate. | | |
| Priority | 2004/05 Security Road Map<br>2005/06  Common authentication and single sign-on, electronic-commerce policy and deployment<br>2006/07  Advice to specific projects and threat, risk assessment | | |
| Sponsor | Chief Information Officer | | |
| Estimated Cost | Ongoing Operating cost of Security Officer funded from current budget<br>2005/06  $200,000<br>2006/07  $100,000 | | |

Strategy 11:  *Complete foundation projects in progress such as the Business Intelligence, Human Resources and Payroll, and Student Self-Registration initiatives expeditiously so that the future focus can be strategic.*

| Project ID | | Name | Student Self-Registration |
|---|---|---|---|
| Description | The Student On Line Access and Registration team is now in the third phase of this major project and is now called Student Self-Registration.  Earlier phases of the project delivered on-line student registration, drop and add courses, on-line payment arrangement, degree audit in real time for students, payment agreements for MBA and graduate students.<br><br>Plans for 2004/05 include a new fee assessment system, course selection by | | |

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| | section, creation of master timetable and timetable conflict checking as well as various infrastructure improvements and minor enhancements.<br><br>The significant challenge with this initiative is that a web-based front end is being developed to access an outdated and inflexible Student information System,  packaged software for course scheduling, timetables and classroom assignments, and another system for financials.  The web-based solution is being developed in-house.  While the design is working well, it continues and amplifies the interface complexity among disparate applications. |
| **Priority** | 2004/05 Sections, Timetable conflict checking and fee assessments<br>2005/06 Final phase |
| **Sponsor** | Provost, Registrar, Chief Information Officer |
| **Estimated Cost** | 2004/05  $975,000<br>2004/05  $500,000 |

| Project ID | | Name | *Human Resources and Payroll* |
|---|---|---|---|
| **Description** | After completion of a comprehensive pre-contract study and various approvals, the University has entered into a contract with DLGL Inc. for the supply and implementation of a new Payroll and Human Resources system known as "ViP".  The business case developed in 2002 justified the acquisition based on elimination of risk, legislative compliance and the need to position McMaster for the future.<br><br>Operational, legislative and collective agreement risks associated with current Payroll system include:<br><br>- non-compliance with both federal and provincial legislation<br>- violation of collective agreements<br>- extensive use of shadow systems which lack sufficient controls and may be inaccurate<br>- inability to generate timely and accurate information, use of aging legacy systems dependent on the knowledge of a small number of staff<br>- use of extensive manual business processes, and<br>- duplication of entry of data into multiple systems<br><br>The integrated HR and Payroll solution will mitigate the University's exposure by automating core human resources and payroll functions and enabling employee self service access to information.  It should be noted however that the contemporary system must be interfaced with about 50 legacy applications in the financial and student portfolios and address the multiplicity of collective agreement requirements.  Consequently, payroll will be implemented after careful testing in eighteen months and human resources business functions will be automated in twenty-four months.  Consideration is also being given to acquisition of pension modules and a separate report will be presented to the Pension Committee.<br><br>The pre-contract study also identified the urgent need to implement a University Academic Tracking solution with a common repository for academic status and leave eligibility.  After discussion with the Faculty Business Managers and Office of the Provost, it was agreed that the Human Resources module of the Academic Tracking System developed by health Sciences would be expanded to support all Faculties and the Office of the Provost.  Implementation is in progress and targeted for completion in 2005. | | |

|  | In future, the goal is to have one integrated solution for Academic Tracking encompassed within the DLGL product portfolio and address CPM and CV needs. This continues to be under discussion. | | |
| --- | --- | --- | --- |
| **Priority** | 2004/06 Payroll implementation<br>2006/07 Human Resources implementation | | |
| **Sponsor** | AVP Administration, AVP Human Resources, Chief Information Officer | | |
| **Estimated Cost** | 2004/05  $2 million<br>2005/06  $2 million<br>2006/07  $500,000 | | |

| **Project ID** |  | **Name** | *Project Management Office* |
| --- | --- | --- | --- |
| **Description** | Develop a Project Management Office (PMO) in order to complete current and future initiatives in order to have consistent project management approach and facilitate knowledge and integration.<br><br>The PMO recommends and supports the governance model used to set priorities and invest in technology initiatives in accordance with the University Technology Strategy.<br><br>The PMO is the cornerstone or foundation of successful delivery of quality technology initiatives on time, on budget consistent with client needs and expectations.  Within the context of the University Technology Strategy, the scope of the Office includes:  identification of client needs; development of a framework for preparation of business cases including assessment of costs, benefits, and risks; development of a priority setting framework, gating process and investment model for consideration of senior management; review of business processes; creation of a portfolio framework for projects; creation of project charters and detailed project plans; allocation of technology resources; monitoring performance against the University Technology Strategy and various project plans; and creation of a framework to enable business leads to report on the benefits of specific initiatives; and creation of a set of performance metrics for the University Technology Strategy implementation.<br><br>This PMO will work in collaboration with all Faculties, Departments, ancillary service providers and technology staff.  Significant senior management Faculty liaison will occur with both individuals and committees on complex issues related to priority-setting, problem resolution, resource allocation and project delivery. | | |
| **Priority** | 2004/05 | | |
| **Sponsor** | Chief Information Officer | | |
| **Estimated Cost** | Staff time | | |

*Strategy 12:  **Position McMaster for sustained success** and report on progress against the plan and key technology performance indicators.*

| Project ID | | Name | *IT Audit and Risk Assessment* |
|---|---|---|---|
| Description | In conjunction with the Director, Enterprise Risk Management and the Chief Internal Auditor, develop a risk management model to assess the risk associated with specific initiatives and report annually on key risk indicators. Articulate a set of principles and financial and management controls to guide the design, acquisition and implementation of all technology solutions. Conduct a comprehensive risk assessment to monitor progress in mitigating the significant technology risk facing the University and report to the University Technology Committee, Audit Committee and Board of Governors. | | |
| Priority | 2004/05  Risk Assessment Template for Projects 2005/06  Principles and Financial and Management Controls 2009/10  Comprehensive Audit | | |
| Sponsor | Chief Internal Auditor Director, Risk Management | | |
| Estimated Cost | 2009/10 $200,000 | | |
| Project ID | | Name | *Performance Metrics* |
| Description | Consistent with the critical success factors set out in Refining Directions (Be nimble and efficient.  Reduce boundaries and barriers.  Measure, evaluate and be accountable.) an annual progress report on the University Technology Strategy implementation will be submitted to the University Technology Committee, University Planning Committee, Audit Committee and the Board of Governors. Develop and implement a set of performance metrics including business value indicators for the investment in technology, statistics related to improved processes, support, client satisfaction, availability, reliability and comparators with other Universities. | | |
| Priority | 2005/06 | | |
| Sponsor | University Technology Committee | | |
| Estimated Cost | 2005/06 $25,000 | | |

# 7 Migration Plan

## 7.1 Introduction

The purpose of this Chapter is to bring the most important of recommendations concerning technology, organization and projects together into an actionable plan. This plan will see the University migrate from its current situation, to one where investments are planned on an enterprise-wide basis, using the latest proven technologies and implemented and supported using industry best practices to ensure the needs of Faculties, Departments and Ancillary Services are effectively met to the benefit of students, faculty and staff.

Although the proposed plan has a reasonable implementation pace, it still has a number of challenges that the University must consider, namely:

- Funding limitations to accommodate a major increase in program spending
- Skills available to implement the new technologies and approaches
- Ability of staff in both business areas and the new University Services Department to absorb rapid changes to technological and business process change
- Concept of working together across Faculties, Departments and Ancillary Services to implement a new organization and standards in an environment where freedom has prevailed

The remainder of the Chapter will describe the proposed Capital Program, including project priority, timing and cash flow; summarize Action Items from the previous chapters (essential ingredients for implementing this plan); as well as discuss critical success factors.

## 7.2 Funding

Funding required to implement the priority projects identified in the Strategy is an additional investment of $31.5 million over five years.

The Technology Investment spreadsheet describes the investment in specific projects and is summarized below. This is intended to be illustrative and reflect the relative investments in specific projects. Projected costs will be refined in the development of business cases. The estimated costs reflect hardware, software and design & implementation costs and also anticipate

dedication of some business resources. However, the projections also depend on some significant contributions in kind i.e. departments will be expected to allocate some resources to projects without sufficient backfill funding to deliver the total project.

## 7.2.1 Creative Approaches to Funding

McMaster is superb at seeking research grants and exploring available funding options. However, only minimal effort has been made to seek donations, sponsorships or joint venture opportunities for technology investments.

At the same time, the University should make representations to the Ministry of Health and the Ministry of Education to convey the importance of technology to achievement of University goals and seek additional investments to support specific projects or to support the concept of a shared services model with other organizations.

The University should also try to leverage the investments in Orion/Orano network which links over 19 Ontario education institutions to enable shared data storage or disaster recovery.

The Chief Information Officer should work in conjunction with the University Advancement to explore the possibility of sponsorships, joint venture and investment by third parties in support of the University Technology Strategy. The CIO should also work with the AVP, Corporate Services and Purchasing to leverage the collective investment in technology through better management of licensing, equipment standards and creation of longer term contracts with "vendors of record" Purchasing should continue to acquire technology goods and services consistent with good purchasing practice and should not promote any particular vendor or technology or blur competitive acquisition with sponsorship opportunities.

The VP, Administration, should also be requested to seek creative approaches to funding this important investment.  Initiatives such as the Burlington campus may provide opportunities.

## 7.2.2 Financial Processes

An equipment inventory and related maintenance processes are necessary to minimize the risk of loss and to ensure that the University has an understanding of its annual investment in technology.  At the same time, a refresh strategy is critical to ensure that licenses are current, the University community has access to the latest versions of software and equipment on the network

is secure and supportable. Standards concerning physical and logical security should also be implemented.

It would also be prudent for the AVP, Administration, and Chief Internal Auditor to ensure that compensating controls are in place and an independent review of all financial applications occurs periodically.

## 7.3  Operating Budget

The investment in strategic projects will be complemented by an operating budget impact estimated at 15% of the hardware and software cost. Additional staff costs are also anticipated. Every effort should be made to harvest the benefits of reengineering processes so that operating funding is available from the project cost savings.

## 7.4  Critical Success Factors

A good strategy is easier to formulate than to successfully implement. The successful achievement of this Plan and the related benefits requires:
- unwavering commitment from Senior Management especially when change impacts an individual's area of responsibility
- effective communication of the Strategy
- development of trust and partnership among key stakeholders
- ongoing assessment of performance to Plan and Strategy update

## 7.5  Next Steps

The following next steps are recommended:

1. Recommend a revised strategy to the Senior Management Team and University Planning Committee with a view to seeking approval of the Strategy by the Audit Committee and Board of Governors in the Spring of 2005
2. Create the University Technology Committee and formalize its terms of reference and composition. Circulate information concerning the submission process and format of business cases. (Chief Information Officer)
3. Create the University Technology Services Department and put in place processes to support collaboration with all University technology service providers. (Chief Information Officer)

4.  Use the Strategy as a framework for decision-making for all future initiatives. (All)

5.  Expedite the completion of the three key projects in progress: Business Intelligence, Human Resources and Payroll and Student Self-Registration. (All)

6.  Once the Strategy is considered by the Board, make recommendations for technology priorities and investments for 2006/07 as part of the budget process. (University Technology Committee)

7.  Deliver, deliver, deliver! (All)

8.  Report annually to Senior Management and the University Planning Committee on progress against the plan and key performance indicators. (Chief Information Officer)

## 7.6  More than projects and funding

The implementation of the University Technology Strategy requires leadership. This leadership should be provided by the CIO and by the University Technology Committee and the Service Advisory Council and every campus leader. The CIO will be responsible for initiating the majority of actions required to see the projects and programs get started and progress is reported. The University Technology Committee will sponsor the new processes and encourage Faculties and Departments to support Technology Directions. The Committee will consider new initiatives, advise on project sponsorships; review and approve technology policies and standards; review and recommend priorities and go/no go decisions regarding the master projects and other proposals, and monitor overall progress of the Strategy and projects.

The implementation of the various projects requires a significant amount of capable project management. Coordination and management of strategic initiatives rests with the Project Management Office. A disciplined approach to project delivery and implementation together with a shared services model is intended to position projects for success. The Project Management Office will implement relevant processes, methodology, reporting practices, and time reporting to track expenditures on all projects and activities and to ensure that project sponsors harvest and report on project benefits.

The Service Advisory Council will be accountable for client-facing technology service provision including service management processes, service standards, client satisfaction measures, and key indicators such as reliability and availability.

# 8    Conclusion

Technology Directions defines a clear path for the University to follow for the next  five years.

Although this Strategy recommends a significant investment, the costs of not implementing these recommendations are equally significant.   All students, undergraduate, graduate and post-graduate, must be fully prepared to enter their professional workplaces and excel in life with essential skills in the application of new and emerging information and communications technologies if they are to be successful alongside graduates of other Canadian schools.  Faculty need access to tools and information to support discovery, teaching and research.  Staff need to be able to recommend direction based on accurate, reliable information and to contain administrative costs.  The University needs to sustain its leadership position.

At the same time, this is a clear recognition of the need for change with respect to the effective use of technology at McMaster.  The implementation process must be carefully managed if the direction is to be supported across the University.   Although somewhat "visionary", the recommendations represent considerable investment in the basics or foundation projects.  This may disappoint some who desire to be on the leading edge and frustrate others who want to accelerate implementation.  The spirit of working together is essential to advance the technology agenda.   Accordingly, Technology Directions need to be communicated positively with an explanation of the benefits and importance to the University and with specific accountability for implementation. Senior Management is invited to share accountability for the spirit of working together.

If the University addresses the critical need for implementation of Technology Directions as described in this Strategy, McMaster will have made a major step towards "international distinction" as set out Refining Directions.

In conclusion, it is recommended that the University Technology Strategy be approved.

# Appendix A - Acknowledgements

Many thanks to all who contributed to the development of the University Technology Strategy.

| | |
|---|---|
| Sponsors | Peter George, President (ex officio) |
| | Karen Belaire, Vice President, Administration |
| | Ken Norrie, Provost and Vice President Academic |
| | Mamdouh Shoukri, Vice President Research |
| Project Lead | Debbie Barrett, Chief Information Officer |

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The following individuals contributed ideas and suggestions in meetings and workshops. Many others too numerous to list made comments or provided thoughtful insights. The contribution of all is sincerely valued and appreciated.

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| | Learning Technologies Resource Centre |
| | CSU, Health Sciences |
| | University Libraries Computing |
| | School of Business Computing |
| | Humanities Computing |
| | Science Computing |
| | All who completed various assessments |

# Appendix B – University Technology Committee Terms of Reference

A University Technology Committee will be created with representation as follows:

Karen Belaire, Vice President Administration

Dr. Ken Norrie, Provost and Vice President Academic

Dr. Mamdouh Shoukri, Vice President Research

Debbie Barrett, Chief Information Officer, Chair

In its first year, the Committee will consult routinely with the Senior Management Team to ensure that decisions reflect a collaborative and consultative process. The ongoing consultative process and membership on the Committee will be refined in the first year as the Committee may benefit from student representation and from other communities of interest within the University. Or it may be appropriate to have a representative from the University Planning Committee sit on the Committee to provide a link between the two forums.

The Committee will be accountable to the University Planning Committee and through the Finance Committee to the Board of Governors for recommendations on:

- implementation of the University Technology Strategy
- monitoring and reporting progress against the Technology Strategy
- review of submissions for new technology initiatives to be funded from the University Technology Fund and recommendations for information management and information technology priorities based on consideration of business cases
- monitoring progress of priority projects
- assessing and mitigating technology risk and reporting on progress to Audit Committee
- University policies to ensure the effective use of technology to support, and
- other matters which may from time to time be considered appropriate

Generally, all proposed technology initiatives to be funded from the University Technology Fund with an investment of over $100,000 in staff resources or expenses for hardware, software, and consulting will require approval of the University Technology Committee.

The Committee will use a University-wide perspective in assessing submissions and recommending priorities and funding consistent with the framework provided by the University

Technology Strategy and Refining Directions.  Evaluation criteria will include but not be limited to: benefits, costs, risks, commitment and resource availability.  The Committee will also support the CIO's mandate to develop collaborative partnerships within the University, and with hospitals, public sector organizations such as the Cities of Hamilton and Burlington, community colleges, research institutes and other organizations and will cooperate on mutually beneficial projects.

The Committee will use a University-wide perspective in assessing submissions and recommending priorities and funding consistent with the framework provide by the University Technology Strategy and Refining Directions.  Evaluation criteria will include but not be limited to: alignment with Refining Directions and the University Technology Strategy, client impact particularly on the student experience, costs, tangible and intangible benefits, risks, competitive advantage, creativity, discovery,  research, decision support, efficiency and productivity, business process change, sponsorship and leadership, client acceptance, scope and complexity, delivery and project management fundamentals and security and regulatory compliance.  The Committee will also support the CIO's mandate to develop collaborative partnerships within the University, and with hospitals, public sector organizations such as the Cities of Hamilton and Burlington, community colleges, research institutes and other organizations and will cooperate on mutually beneficial projects.

The table below shows a possible annual gating and approval process:

| FUNCTION<br>I= INFORMED<br>P= PARTICIPATE<br>L= LEAD<br>A= APPROVE | PROJECT MANAGER | PROJECT SPONSOR | PROJECT STEERING COMMITTEE | UNIVERSITY TECHNOLOGY COMMITTEE | UNIVERSITY PLANNING COMMITTEE | FINANCE COMMITTEE | BOARD OF GOVERNORS |
|---|---|---|---|---|---|---|---|
| Define Project Concept and Terms of Reference, Consult with Stakeholders | | A | | | | | |
| Develop Project Charter and Business Case | L | P | | A | | | |
| Submit annual work program, report progress against the University Technology Strategy, make budget and funding recommendations | I | I | I | L | A | A | |
| Develop Project Plan | L | P | A | I | | | |
| Complete Feasibility Study<br>If Business Case is revised, seek approval | L | P | A | A | | | |
| Complete Detailed Design | L | P | A | | | | |

| FUNCTION<br><br>I= INFORMED<br>P= PARTICIPATE<br>L= LEAD<br>A= APPROVE | PROJECT MANAGER | PROJECT SPONSOR | | UNIVERSITY TECHNOLOGY COMMITTEE | | FINANCE COMMITTEE | BOARD OF GOVERNORS |
|---|---|---|---|---|---|---|---|
| Develop or Acquire Solution | L | P | A | I | | | |
| Implement Solution – "Go Live" | L | P | A | | | | |
| Conduct Post Implementation Review and Achieve Business Benefits | L | A | | I | | I | |

The decision gates are:


1.  Project Concept and Terms of Reference


A business opportunity is identified.   The Project Sponsor is prepared to approve the use of resources to examine the potential Business Case for the opportunity.    The onus is on the Project Sponsor to consult with stakeholders, to achieve alignment with the University Technology Strategy, to explore partnership opportunities, to achieve integration with other technology initiatives and to comply with standards.


2.  Business Case and Risk Assessment


A Business Case and Risk Assessment has been developed and the Project Sponsor is prepared to recommend that the Project proceed.   (At this time, if the Project is to continue, the Project Manager, Project Sponsor and Project Steering Committee members must be assigned.)

3.  Completion of the Project Plan


The Project Plan sets out accountabilities, assumptions, deliverables,  resources required, schedule, critical success factors, standards, milestones, methods to mitigate risks and describes the project communication plan.  The Business Case and Risk Assessment is updated with the relevant details as identified in building the Project Plans, Project Schedule and Project Charter.


4.  Completion of the Feasibility Study (if appropriate for projects estimated at more than $500K or using new technology)

For large projects a Feasibility Study may be required to determine what solutions are available in the marketplace and whether a solution should be acquired or developed. For small projects, a Feasibility Study may not be required. If a Feasibility Study is prepared, the Business Case and Risk Assessment should be updated and approved by the Project Steering Committee and the University Technology Committee.

5. Detailed Design

This would include development of specifications and/or solution selection if purchasing a third party provided solution. The Business Case and Risk Assessment are updated with any changes arising from the Detailed Design

6. Acquisition

The final product has been acquired/configured to the design specifications and testing of all components and related business processes has been conducted. Approval means the final product will be installed and all related business changes will be implemented across the organization. The Business Case and Risk Assessment is updated with any changes arising from Development/Acquisition/Testing.

7. Implementation or "Go Live"

The Steering Committee authorizes the implementation of the solution and ensures that appropriate contingency and disaster recovery plans are in place, that risks are acceptable, that financial and management controls are in place and that privacy and security compliance has been addressed.

8. Achieve Project Benefits

The Project Sponsor is accountable for conducting a post-implementation project review, achieving the benefits set out in the Business Case and Risk Assessment, and reporting findings to the University Technology Committee.

# Appendix C – Technology Project Request Form

The University Technology Committee will consider project submissions twice annually in January and July.  Submissions should follow the following format and generally be no more than five pages.  Please consult with the Director, Project Management Office for assistance.

## Technology Project Request

*(Insert project name)*

## Details of Proposed Project

### Background

*Describe the project background.*

### Alignment with Refining Directions and University Technology Strategy /Positioning for the Future

*Explain how this project aligns with Refining Directions and the University Technology Strategy.*

### Opportunity

*Describe the project opportunity and the expected outcome.*

### Resource Requirements

*Estimate the time and resources required.*

| Project Components | Time | Resource |
|---|---|---|
| Use a separate line for each component | | |
| Total Time | | |

### Other Options:

*Are there any other options available?*

### No Go Options

*What are the implications if the project does not proceed? Is there a risk?*

### Value to the University

What is the value to the University?

**Commitment**

*Who is the Project Sponsor? What resources will be assigned to the project?*

**Benefits and Costs**

*What are the benefits and costs over the next five years? Please include both quantifiable and intangible benefits.  Costs should include hardware, software, infrastructure, communications, maintenance, and staff costs.*

**Funding Sources**

*What sources of funding are available?*

*Are you seeking funds from the University Technology Fund?*

*If yes, how much?  Over what time frame?*

**Evaluation Criteria**

*The University Technology Committee will assess the submission according to the following evaluation criteria.  Please note any information relevant to each criterion.*

| Criterion | Project Assessment |
|---|---|
| Alignment with Refining Directions | |
| Alignment with University Technology Strategy | |
| Client impact particularly on the student experience | |
| Costs | |
| Tangible and intangible benefits | |
| Risks | |
| Competitive advantage | |
| Decision support capability | |
| Efficiency and productivity | |
| Business process change | |
| Sponsorship and leadership | |
| Client support and acceptance | |
| Scope and complexity | |
| Delivery and project management fundamentals | |
| Security, privacy  and regulatory compliance | |
| Creativity, innovation and discovery learning impact | |

**Recommendation**

*What is your recommendation?*

_____

Signature and Date  *(Insert your name, date  and contact information)*

# Appendix D – Application Assessments

The following is a capsule overview of University-wide applications based on submissions from various clients.  A more complete analysis describing issues and opportunities is on file for each application.

| Application | Function | Database | Interfaces |
|---|---|---|---|
| Academic - LearnLink | The Faculties of Science, Social Science, Health Sciences, Humanities, Business and Engineering are using a program called First Class Client (by Centrinity Inc.) to provide an interactive electronic environment for discussion. At McMaster, this environment is known as LearnLink.<br><br>This application is particularly appropriate to problem-based learning.  Functionality supports: problem solving, collaborative learning, peer persuasion, participating in discussion groups, interacting with the community, saving trees, personal web pages (50 megs of web/disk space), real-time chat, calendaring, Palmtop™ synchronization and access to everything anytime anyplace. | Package software from Centrinity Inc.<br><br>Version 7.1 installed Version 8 also available<br><br>Runs on:<br>IBM eServer server (Model 8658, dual CPU, main Learn Link   server)<br>* IBM xSeries 350 server (Learn Link Web services)<br>* IBM PC Server 330 server (Learn Link Mail gateway services)<br>* Backup server (Learn Link Post Office Mirror) | Student Information System |
| Academic – WebCT | WebCT (Web Course Tools) is a web-based course management system that allows the instructor to:<br><br>•        Deliver course (or components) on-line without prior knowledge of HTML or programming<br><br>•        Encourage faculty-student and student-student contact<br><br>•        Encourage self-directed and active learning<br><br>•        Provide timely feedback to students<br><br>•        Re-use the basic structure and contents of a WebCT course from year to year or for delivery to | Current version WebCT 4.1 for fall 2004 term<br>* Sun V880 server (main WebCT server)<br>* Sun Enterprise 250 (summer WebCT server) | Student Information System |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | different target audiences<br><br>• Make modifications, add new tools, utilize new features or increase the complexity of the course at any time<br><br>• Actively involve Teaching Assistants or other teaching resources to help with grading, facilitate discussions, or review student performance<br><br>Web CT provides communication tools to enable on-line forums to foster collaboration, electronic mail to a class or individual, virtual office hours, and informal communication among students.<br><br>Course management tools include a syllabus, on-line course materials, integration of quizzes, assignments, and glossary items in a context sensitive manner.  Additional functionality includes an on-line calendar, image library, evaluation tools, and posting of grades. | | |
| Accounts Payable Travel | Pays all University Invoices | Accounts Payable master in DB2<br>Many fixed format, flat file structures<br><br>Programs in COBOL & EASYTRIEVE<br><br>Receives feeds from ORACLE on UNIX machines<br><br>Online access in IMS to DB2<br><br>Sends transactions to FAS | Accesses Walker Purchasing System<br><br>Receives input from departments, AR, Scholarships, Hospitality Services, Payroll, CIBC, Purchasing<br><br>Feeds Bank of America system (foreign drafts)<br><br>Reads and feeds FAS<br><br>Feeds CIBC direct deposit |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | | | Feeds and reads data from ORACLE<br><br>Interfaces with Oracle cheque reconciliation and payment request systems. |
| Accounts Payable - Three Way Matching | This application carries out an electronic three-way match of the invoice payment amount, original purchase order amount and receiving status before releasing payment activity to the Accounts Payable system. When exceptions are detected the system will generate email messages to Accounts Payable and Purchasing Staff. | COBOL<br>Accounts Payable, Purchasing and FAS.<br>DB2 / MVS / Mainframe | |
| Accounts Receivable | Student Receivables controls how much money a student owes the university for fees, residence, etc. | Developed in-house in COBOL and QMF Databases are DB2 , Oracle | Interfaces with Fee Assessment, A/P, FAS, Cashiering and downloads to Oracle. |
| Admissions | Determines if Ontario high school students are eligible for admission | Developed In-House using COBOL in 1999. Resides on MVS | Letgen, Scholarships, Housing, SOLAR |
| Admission System: Average Calculation | Calculates High School averages to be used in the Adjudication process. Averages for Scholarships and Housing are also calculated and used by the respective offices. | Developed In-House using COBOL in 1999. Resides on MVS | Letgen, Scholarships, Housing, SOLAR |
| Admission System: Condition Verification and Rescinding | Checks to see if applicants with conditional offers have passed their conditions. This is currently only done for Ontario high school students | Developed In-House using COBOL in 1999. Resides on MVS Uses DB2 | Letgen, Scholarships, Housing, SOLAR |
| Admissions - Get OUAC distributions and code | This process compares our log files to the files available at the OUAC. Only new files will be retrieved. Multiple code table updates for a given type are combined into one file. | Developed in-house in 2000.<br>Process bbatch files: OUACDIST.BAT, OUACCODE.BAT table updates | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | Distributions are decrypted, unzipped into a text file and then uploaded to the mainframe | | |
| Admissions System Online | Screens were designed for the Admissions office to enable staff to load access and update data. Screens display data loaded onto the corresponding tables | Developed in-house in 1999. DB2 | Letgen Admissions and University Person Transfer Credit |
| Admissions – Graduate Students | This system permits keying of Grad. Student Applications and ongoing maintenance of such data.  The system also feeds the Student Records system with data indicating new post Grad. Status.  In addition Payment Authorization Forms are produced and sent to Faculty Offices. | In-House COBOL, ADF DB2 / MVS / Mainframe | UP and Student Records |
| Admission System: Reversions | Attempts to make an offer to an alternate programme for those applicants who did not receive any offer of Admission from McMaster | In-House development 1999. Cobol DB2 tables Resides on MVS | Letgen Admissions Housing Scholarships SOLAR |
| Admissions: Student number correction process | Merges Admissions data from one student number to another. This is necessary when 2 student numbers get assigned to the same person. Further clean up is done via UP to perform the same process on the UP tables. Coordination with records, payroll and HR is also necessary. | In-house development Cobol DB2 | HR/Payroll Student records system University Person |
| Admission Tables | Stores applicant data | In-house development 1999 DB2 | Letter generation Admissions and University Person screens display data loaded onto the corresponding tables. SOLAR rolls over programme rows based on the information loaded onto Admission tables. OT/PT, Residence and Scholarships |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | | | download/query data from tables |
| Admissions: Transfer Credit Process | The screens give the user the ability to update the specific Transfer Credit awarded to the student and the total overall value to a specific programme. The system is used for both admission and registered student TC course data. The TC Detail Screen replaced the RT Screen | Developed in-house in 2002 DB2 | |
| Bank Reconciliation | As part of Accounts Payable, the main cheque reconciliation takes cheques produced by payroll and a/p, cheque files cleared from bank to produce outstanding cheque reports | Developed in-house in COBOL, QMF Uses DB2 running in MVS on the e-server. | Interfaces with PPS, A/P |
| Benefits | Tracks pension contributions, service, salaries, pensions in pay, retiree health care, and beneficiaries. Calculates contributions plus interest and pension amounts. | Database Will be replaced by HRMS | Information fed from PPS to Benefits |
| Campus Tours Web Form | Allows external (to campus) visitors to find information regarding campus tours and visit days and book tours/visits on-line | php and html | |
| Cashiering | Records payments and refunds by students and departments | Developed in-house in COBOL Uses DB2 under MVS on e-server | Feeds Financial Application Systems |
| Cheque Requisition | The cheque requisition system is a front end system replacing paper forms for departments to request a cheque to be produced through the A/P quick cheque process. | Developed in-house using Oracle Forms | Feeds A/P and PPS |
| CIS Shop System | Records time and material and bills customers for work done by CIS technical staff | COBOL and ADF DB2 running on MVS | |
| Code Table Maintenance | Application allows customers to maintain code tables for administrative applications | SPF COBOL DB2 Individual code tables DB2 running on MVS SPF code table update screens | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | | (approx 170 code table modules) | |
| Content Management System | The CMS uses a web-based interface to allow users to modify website content by dynamically changing stored data in a database. | Cold Fusion and JavaScript/HTML<br>OS: RH7.2 (soon to be upgraded to RHEL3.0, since the current version is EOL on 31Dec2003)<br>App Server: ColdfusionMX 6.2<br>Web Server: Covalent ERS2.3<br>DB Server: Oracle9.2<br>Sits on server CMSWEB1 in GH server room | |
| Daily News | Daily News is the main information source for the goings on at McMaster University.  Where the McMaster University home page is about the university and its services, the Daily News is about its activities, events, and day-to-day news stories. | ColdFusion and HTML<br><br>Access Database on Windows NT 4 OS<br>Application hosted on server webplex01.mcmaster.ca | |
| Docushare | Web-based document and content management system<br><br>Dynamically capture, store, share, manage, retrieve, and distribute information -- regardless of information source, corporate infrastructure, or user skill level or location<br><br>An intuitive interface via  Web browser, no special client software or training required<br><br>Versioning and version control give control to content owners; collaborators, users, and recipients get access to the most current version<br><br>Multi-levels of security controls your content down to the document level, providing explicit access to content wherever it is stored on the system<br><br>Users can add content, update | Turnkey solution from Xerox<br>Database: Postgresql – open source database<br>Server will reside in HSC Media production area, server is commodity Intel hardware / linux platform. | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | versions, change permissions, and assign ownership to others, without involving IT or requiring special clearance<br><br>Significant flexibility in deployment means DocuShare can be set up on the Internet to allow public (guest) access, or can be tightly restricted to only named users behind a firewall<br><br>Powerful workflow engine allows users to create workflows to route content for review, approval, publishing, or acknowledgement | | |
| Employment Equity | Tracks demographic & job information for the data portion of the Employment Equity report | Will be replaced by new HRIS system when implemented<br>Cobol | |
| FAS - Financial Accounting & FAS History | FAS is the main accounting system for the University containing G/L and S/L accounts<br>FAS History is used over year end to access two years of data. | Purchased from Westinghouse (IA) from Rochester in 1985. Maintained by CIS since then. Still in IMS COBOL, QMF, ORACLE forms<br><br>Transactional based system. Transactions are posted in either batch (summary) or detail format. Transactions can be posted in real-time (through IMS screens), or overnight batch processing.<br><br>Oracle reports are not based on current balances, history only<br><br>User's feel reports are complex and difficult to understand.<br><br>Only a few users have the ability to generate ad hoc queries through QMF or browser. Severely limited by only having access to 26 | Interfaces with PPS, Payment Request System, A/P, A/R, Salary Commitments<br><br>Data is fed to FAS through Oracle forms, manual keypunching (video), uploads of data files, or as feeds from other systems (e.g. FM, Printing/Audio Visual, Telecommunications etc.)<br><br>Input is received from SFASS, on-line cashiering, student a/r, fee assessment, accounts payable, purchasing, payroll, FM (facilities |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | | months of data.<br><br>For data greater than 26 months, need CIS to write COBOL or Easytrieve programs – layout of YTD trans tape differs from DB-2 table layout, must spend time in converting fields<br><br>No drill down capabilities<br><br>Minimal transaction description (20 char.) | mgmt.), telecommunications, residence system, retec (bookstore), parking, library, stores, health science finance, hospitality system, media production services etc. |
| FAS reports | Allows departments to access their monthly accounting reports online. | In-house<br>Oracle Forms<br>under UNIX on Informer2 | |
| Fee Assessment | Calculates student fees | In house developed Currently being upgraded in the Financial Phase of Solar COBOL, NEON DB2 under MVS on e-server | Interfaces with S/R, FAS, A/R, Residence, Hospitality Services, SFAS and Payroll |
| FRS-Financial Reporting System (Budgeting) | Keeps salary information month by month for all employees paid by ledgers '2' and '3' (operating).<br>It also keeps track of open positions and leaves. The system can do salary projections. | Developed in-house pre 1980. Modifications made in 2002 to incorporate the new MUSA collective agreement; may be replaced by new HRMS. COBOL, QMF Main system is in IMS with an extract to DB2; application resides on the e- server Budget data base IMS many fixed format flat file structures<br><br>Programs in COBOL & Easytrieve (some SAS) sends transactions to FAS (budget) | Interfaces with PPS ; has ability to feed FAS<br><br>Receives data from departments, payroll, Provost Office, H/R |
| Financial Aid | OSAP data is retrieved from the Ministry and loaded into a DB2 table. This data can then be modified online by Financial Aid and/or Business | COBOL<br>UP<br>. | MUGSI |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | Office staff.  This data is then used to make decisions regarding to the students financially registered status and eligibility for Bursary assistance. The DB2 table is also sent to Oracle so that it can be accessed by MUGSI to allow Students to view the status of their OSAP application.<br>Allows download of MTCU OSAP data<br>OSAP tracking system<br><br>Out-of-province loan tracking<br><br>CIFS tracking | | |
| Grad Payroll-Roll4 | This is a front-end system to replace paper for the departments to submit one time payments for graduate students | Developed in-house using Oracle Forms Will be replaced by new HRMS system. | interfaces with UP and PPS |
| Grad Studies Payroll Proration | The end result of the grad student process is that a student will get a relatively equal net pay throughout the year whether the student is getting paid TA, Tuition Bursary or Scholarship. | This 'system' developed in COBOL is a processing system using a hard-copy input form and flat files. It runs in MVS on the e-server May be replaced by or interface with new HRMS | Uses Student Records, Admissions, and PPS |
| Job Evaluation System | Stores and displays job evaluation profile and history.  Connects employees to jobs and /or displays related information (grade/step, compa ratio etc.) | Introduced in 1988. Last major modification in fall 2001. Will require modifications in early 2004 to accommodate input and storing of job evaluation profile information resulting from development of the new job evaluation system for MUSA. | |
| Journal Entries | Front end system to replace paper form for departments to create journal entries against designated accounts | Developed in-house using Oracle Forms Oracle under UNIX on Informer2. | Feeds FAS |
| Labour Distribution | Labour Distribution contains all labour and benefit costs for the employee by | Purchased from Westinghouse (IA) as | Interfaces with PPS and FAS |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | account. It also contains year-to-date information. | part of the PPS system. Maintained internally by CIS staff. COBOL, QMF Labour Distribution is still a tape system with DB2 extract twice a month at mid-month and the end of the month | |
| Labour Distribution | This system allows departments to view the monthly Labour Distribution online for allotted accounts. The information is by account and employee. | Developed in-house using Oracle Forms Oracle under UNIX on Informer2 | Fed from DB2 version of Monthly Labour Distribution ; also feeds HSC Apollo system |
| Letter Generation | Compuset provides unlimited nested data elements and therefore unlimited combinations.  This creates dynamic letter authoring that allows us to compose letters that are sensitive to the individual student.<br><br>The letters are saved in Post-Script files.  We have 1 data extract per DB2 table. We currently use at least 10 data extracts to extract data against University Persons, Admissions and the interface to the Scholarships system.  Admissions currently uses approximately 25 letter types.<br><br>Creates documents by combining University data extracts with Compuset style sheets.<br><br>Dynamically creates customized correspondence for the students.<br><br>Creates letters in batch, as well as "one-up" letters for students standing at the counter. | Package from Xerox acquired in 1998 Postscript View Compuset 500 Project View Compu Series II Compuset Postscript emitter Production server – GH 226 Pent II Test server – GH 217B Pent II | |
| Liaison Publications | Allows high school students to request either a handbook or specific programme brochure(s) to be mailed to them.  This information is then transferred into a text file and then imported to MSAccess. | Developed in-house (Registrar's Office) Webpages are on the Registrar's website/server | |
| | | | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| MAILMAN | approximately 265 list owners<br>approximately 780 lists<br><br>this is a discussion list<br>-there are many options which can be configured depending on how the list is to behave such as:<br>  -moderating<br>  -viewing the list members<br>  -spam specific postings<br>  -who can subscribe<br>  -archiving | Python Programming Language<br>the actual interface for users to apply for and administer is available on the Web at:<br>http://www.mcmaster.ca/cis/help/mailman/<br><br>-the administration (setting up and deleting ids) is done on 'informer2'. It is UNIX–based. | |
| Media Production Services | A Point-of-Sale type application that is used in mediashop.com and the HHSC area hospitals.  Media Production staff use the application to record, track and bill for the various services and products they provide. | Oracle Developer, Forms and Reports.<br>Delivered via the Web. Oracle database, residing on datasrv1 in Gilmour Hall.  Datasrv1 is a UNIX based server. | |
| Modem Pool Service | Enables access to the University network from a local Hamilton telephone number, at 50 cents/hr., paid for either by voucher purchased in the Bookstore, or by University account number. (Students, to pay for printing in the labs, use the same mechanism and pool of money.) | The software contains C modules on the Solaris systems & various Perl scripts.<br><br>In house software development to extract accounting record files, as well as logs, from the terminal servers that manage the modems & to integrate accounting into the PAS accounting system (lab printing), for customer inquiry & password change, and for main desk updates. | |
| MUGSI | MUGSI allows students to view information about themselves. Access is via student no and pin. After entry, students can see things such as exam<br>Timetables, class timetables, programme and course status, Financial account, Drop and Add, Registration, course evaluations, address changes, scholarship information and degree audits | Perl/Oracle and Neon COBOL/DB2<br>Registrar, Accts Receivable, and Scholarship database copies on Oracle/Unix. System runs on Informer2 and MVS | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| MUGSI - Administration | Admin Mugsi allows administrators to view information about students, as students see information about themselves.   Access is via Admin Oracle id.  After entry, administrators can see things such as exam Timetables, class timetables, programme and course status, Financial account, Drop and Add, Registration, course evaluations, address changes, scholarship information, and degree audits. | Perl/Oracle and Neon COBOL/DB2 Registrar, Accts Receivable, and Scholarship database copies on Oracle/Unix. System runs on Informer2 | |
| MUGSI  admin overview (student academic component) | This is the admin equivalent to what the student is seeing in Mugsi. Started off being identical to Mugsi, however over time Student Mugsi was updated, but admin Mugsi was not. Used in several areas to know what is status of student's data. | Most sections are developed with Perl scripts using Oracle databases that are refreshed nightly. There is some Cobol,  running on Enterprise server<br><br>All data comes from main SIS and is converted to Oracle and gives student basic info about there records.<br><br>DB2<br>Runs on web and oracle servers as well as Enterprise server using DB2 databases | |
| Optical Mark Reader – OMR – scanning exams and course evaluations | Scans exam bubble sheets and provides reports<br><br>Scans course evaluation bubble sheets and provides reports and uploads the answer to the question about overall course | C++ | |
| Payment Requests | This system replaces paper forms for Travel Advances and Expense Reports. It generates direct deposit files or cheque files as well as creating commitments and journal entries | Oracle Forms and COBOL Oracle under UNIX on Informer2; information is uploaded to MVS on  e-server | Interfaces with FAS, A/P, bank |
| Payroll - Pay Period History | The Pay Period History stories details from an employee's pay by earnings, deduction, benefit codes. Information is kept for 48 months | Will be replaced by new HRMS QMF, ADF Can be joined with PPS in queries DB2; runs under MVS on e-server | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| Payroll (PPS) | Core system for payroll functions and some HR functions with links to Benefits and Pensions and Timekeeping Systems. | To be replaced by HRMS system by 2005. COBOL, EZT, QMF Main System is still in IMS with nightly DB2 extracts.  Application runs under MVS on the e-server. | See Payroll Interfaces Walkthrough Document |
| Payroll - Mid Month Advance and T2,T4 system | Keeps track of mid-month advance for employees and continuous one time payments | Will be replaced with HRMS Developed in ADF.  IMS with a DB2 extract; runs under MVS on e-server. | Interfaces with PPS |
| Payroll-Roll  3 Part Time | This system replaces a paper form to record payments for casual employees. It updates PPS nightly. | Will be replaced by new HRMS system Developed in-house using Oracle Forms: Oracle under UNIX on Informer2 | Interfaces with UP, PPS |
| Payroll - Part Time Payroll-Roll 3 | This system replaces a paper form to record payments for casual employees. It updates PPS nightly. | Will be replaced by new HRMS system Oracle Forms Oracle under UNIX on Informer2 | Interfaces with UP, PPS |
| Payroll - Pay Period History | The Pay Period History stores details from an employee's pay by earnings, deduction, benefit codes. Information is kept for 48 months | Will be replaced by new HRMS In-house developed QMF, ADF Can be joined with PPS in queries DB2; runs under MVS on e-server | |
| Payroll - Salary Commitments | Calculates salary commitments for all research accounts taking into consideration that there are multiple fiscal year end for research accounts. | In-house developed using some programs of the PPS systems purchased from Westinghouse (IA). Will either be replaced by or will interface with the new HRMS system. COBOL, ADF, QMF Batch | Interfaces with PPS and FAS |
| *Payroll - Salary Increase* | Allows input of annual salary increases for individuals in TMG and faculty which are then loaded to PPS. Increases for TMG typically consist of | Will be replaced by new HRMS | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | an ATB and merit component. Faculty increases consist of ATB, CP/M, plus adjustments.)  This application was also used in the past to input annual salary increases for employees in MUSA.  Since the introduction of the Collective Agreement and the change in types of increases (ATB and annual step progression), the processing of the increases has been automated and Human Resources is no longer required to input individual salaries into the system. | | |
| *Pension History* | The Pension History table is updated annually as part of the annual T4 process  for the required year<br><br>Fields updated include; Required Pension Contributions, Voluntary contributions, Pension Adjustment amount, T4 Gross amount, Total Taxable Benefit amount, Pension Adjustment Reversal amount, Past Service Pension Adjustment amount and Calendar Year date<br><br>Data is used to determine Pension Adjustment Reversals (PAR's) quarterly and the Salary Disclosure report as per government requirements | DB2 table<br>QMF used to extract information using query | |
| Photo Library | Electronic photo library system. Permits us to properly catalogue, track and locate images for use in our publications.  Currently 447 images are on the system using 83.56MB of storage space. | Package hosted externally by Fibrewired (arranged through Martron Interactive) | |
| Print Services | Records Printing Order Information Keeps track of materials for billing | COBOL DB2/IMS TM DB2 running on MVS | |
| Project Management | Allows Project Managers to allocate projects, allows staff to record time (time sheets), and provides reporting on to the web for customers to see and track | SAS DB2 and COBOL DB2 / IMS TM Project Management DB2 running on MVS | |
| Purchasing Resources | Print PO's<br><br>Receiving logs | Master files are DB2 tables | Reads and feeds FAS<br>Feeds A/P |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | | Programs in COBOL<br><br>Original supplier no longer supports or maintains the system<br><br>System upgrades never purchased<br><br>Very few people know how to make changes to the system<br><br>Some work arounds created to make system work in new location<br><br>Vendor database very large, Clean up can take a long time, no guarantee system will come back up | Shipping/receiving |
| Purchase Requisitions | This application is used by the university community to submit purchase requisitions to the purchasing department.  The requisitions are automatically loaded into the Walker Purchasing system. Once processed by Purchasing Resources staff, the requisitions become official McMaster Purchase Orders. | Oracle Developer, Forms and Reports. Delivered via the Web Oracle database, residing on datasrv1 in Gilmour Hall.  Datasrv1 is a UNIX based server | |
| Recreation Services | Allows Rec Services to keep track of lockers in use in the Towel area. | COBOL TP and COBOL batch<br>Rec Services DB2 running on MVS | |
| Residential Management System (RMS) v.5.0 | − It stores personal information (name and address details) for all students who have applied to residence.<br>− It stores all the available rooms we have in residence.<br>− It can perform room assignments, room changes, meal plan bookings, etc.<br>− Our Residence Life team (Res. Managers) input incidents and actions taken when their students break residence rules. | RMS 5.0 is our web-based database. We use SQL. We used to use Access with 4.5. We have 2 servers - a web and application server, and a data server. They are both Win2k servers. The servers are in their own domain - cods. | We have 3 interfaces with Mainframe (i) Export exports student information to Mainframe. (ii) Import imports student information (like addresses, contact information and checks name |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | | | spellings) from Mainframe and makes/adds necessary changes in RMS.  (iii) Export Finance exports residence and meal plan charges to Mainframe to be uploaded on MUGSI |
| Software Depot | Allows customers to download site licensed software from a central distribution web site | Perl<br>UP PINs Oracle DBMS on Unix DataSrv1<br>Informer2 | |
| Student Data Card (Episuite) | Captures students' pictures and signatures to produce campus id cards.   Cards are used for Library, Rec Services, Meals. | Vendor – Identicam<br> C++<br>Oracle Episuite DBMS on Unix DataSrv1<br>Informer2 | |
| Student E-Mail - MUSS | | | |
| Student Information - Academic Reviewing for Undergraduate students ROSR23academic regs | At the end of each session it is necessary to determine if students are able to graduate, or are able to continue at the university. This process determines who needs to be checked and depending on degree and faculty what their status should be at the end of the session. Part of the process determines the averages (sessional and cumulative) for the students, as well as credits to degree etc. Final part of this process is to produce grade reports that are posted to Mugsi as well as mailed to the student. | Cobol,  running on Enterprise server<br><br>All components of SIS are related in that many in how data is updated and then used<br><br>DB2<br>Runs on Enterprise server using DB2 databases | |
| Student Information - Archiving and off line to online transfer ROSR31archiving | This application determines if a student needs to stay on the active (online) system or it the record can be archived. Actual dates used are determined by customer. Archived records are available for view to selected staff, are used in transcript production and can be moved online if needed via one of the SIS system | Cobol,  running on Enterprise server<br><br>All components of SIS are related in that  many in how data is updated and then used<br><br>DB2 | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | screens. Archived system is a mirror image of online DB2 tables and any table changes done to active/online tables are also done to archived/offline tables. | | |
| Student Information -Calendar Data Preparation | This application maintains all the data that is stored in the Undergraduate Calendar, programmes offered and degree requirements, courses offered and requisite data, sessional dates for various admin groups. Students can only register in programmes and courses stored in this part of the system. | Cobol,  running on Enterprise server

This system is actually being updated to new ADWEB system using NEON software to produce a more user friendly system. The process to develop these screens is also working out new standards for this type of screen, re navigation, look and feel etc.

All components of SIS are related in that many in how data is updated and then used. This system also interfaces with the Infosilem  suite for scheduling courses.

DB2 | |
| Student Information -Class Lists | Lists students in a class

Creates files of student class lists | In House DB2 running on MVS | Student Records |
| Student Information -Class Lists | Lists students by Course or Programme

Creates files of Classes or Programmes | In House Oracle Class Register DBMS on Unix DataSrv1 Informer2 | |
| Student Information  - Convocation | The application allows for the collection of all data needed to manage 10 convocations a year for all student related data.  Includes data required for diploma, programme preparation, tracking of tickets & mailing of diplomas for those who did not attend | Paradox database, using Windows 98 or higher. Currently a stand alone system. | Data is downloaded from S.I.S. several times in process. Files are also sent to printing for diploma print. |
| Student information - Course Requisite Checking | This application determines if a student has met the necessary pre, co and anti requisites to be able to be | Cobol,  running on Enterprise server | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| ROSR15crse requisite | registered in a specific course. SOLAR will not allow course to be added if requisites are not meet. Departments and Faculty offices can give waiver to override this requirement. Requisite are also continually rechecked as grades or other changes occur on student's records. Faculties are informed of any failures that do not have waivers | All components of SIS are related in that many in how data is updated and then used. Course requisite checking is used in SOLAR, online screens and also runs in batch mode as changes are made to students' records.<br><br>DB2<br>Runs on Enterprise server using DB2 databases | |
| Student Information -Degree Audit system | Tracks a student's status towards completing their specific degree requirements. Can be requested as part of Mugsi (currently runs overnight), or can be requested in real time by RO and faculty staff. Results are used in determining eligibility to graduate and in final check to make sure student is really able to graduate.<br>Faculty Offices also have the ability to run 'what if' options if student would like to change programmes. Degree requirements are updated on SH00 (calendar system). | Cobol + C, running on Enterprise server<br><br>All components of SIS are related in that many in how data is updated and then used<br><br>DB2 | |
| Student Information – EDI Smart (Electronic Transcripts) | This application allows us to send to and receive from other trading partners electronic transcripts. Sending and Receiving Electronic transcripts with other Ontario Universities, Universities in British Columbia and Ontario Colleges. OUAC acts as hub for all Ontario Universities. | Package from Systems & Computing Technology Corporation (SCT) Currently runs stand alone on an NT 4.0 server residing in the Registrar's Office. Several scripts locally developed to allow interface with transcripts ordering system. | Interfaces with the IBM |
| Student Information - ESIS for Stats Canada (Enhanced Student Information System) | Stats Canada had always used regular gov't reporting files, however the decision was made to upgrade Stats Canada reporting. McMaster has completed the system and is now working through Stats Can supplied edits to make sure data is clean. There is an option to add MCU reporting data to end of ESIS file | Cobol, running on Enterprise server<br><br>All components of SIS are related in that many in how data is updated and then used<br><br>DB2 | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | which McMaster is doing.  This system has also required the addition of a National Student number which must be assigned by McMaster or the first institution to report the student. This is required on transcripts and if one has already been given McMaster is required to use this one. | | |
| Student Information -Extract files | The student records system from the late 70's created 3 extract files (called 115, 180.864 –based on length of flat file). As the SIS system was converted to DB2 these extracts continued to be created. The extracts are based on data structures and codes that are no longer used in current SIS system. As new types of data are added to SIS it is always a challenge to determine if, how, when it needs to be included in extract files. Extract files are kept for current and previous session and are updated nightly for students who have had changes to their records. There are also frozen copies of files kept from each gov't reporting date for analysis purposes. Institutional Analysis is a major user of these extracts and many of their processes depend on having this data available. However a new method for handling this needs to be developed because there will come a time when old structure simply cannot be used for changes in SIS.<br><br>Extracts also carry personal and bio data. It is not possible to determine which students have changed this data so a total file refresh must be done on a weekly basis. | Cobol,  running on Enterprise server<br><br>All components of SIS are related in that  many in how data is updated and then used<br><br>DB2 | |
| Student information -Gov't reporting | This is the application that reports our student body for government funding. The system takes several of our codes and adjusts to the coding required for reporting purposes. There are a number of edits that run to verify all the information is correct. Actual process is run several times during the year for various sessions and admin groups. Main reporting is | Cobol,  running on Enterprise server<br><br>All components of SIS are related in that  many in how data is updated and then used<br><br>DB2 | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | Nov1 and Feb1 with the November report adding additional biographical info for annual reports | | |
| Student Information - Grade collection and updating | The process of collecting and updating grades is a challenging one due to time constraints. Grade sheets are produced at end of term and this also creates an old IMS system (PEXAM) that allows fast entry of grades by matching grade sheets. There is also a process that allows grades to be submitted on disk in a specific format, however it is still necessary to get a paper copy with all necessary signature.

The university has purchased a web system called GRADEBOOK from DAG. Work has been done to modify to McMaster standards, but RO has no had resources to work on project. Main issues are recording proper electronic approval process, ensuring grade lists submitted match current class lists on system. If this system is to be used, it must be the university standard and not simply one way to submit grades. | Cobol, running on Enterprise server

All components of SIS are related in that many in how data is updated and then used

DB2 | |
| Student Information – Intelligent Responses | Permits e-visitors to get immediate answers to their questions about McMaster. E-visitors can ask their question any way that they want, and if a response is found in the searchable dbase the system responds immediately to the question. If there is not a suitable response to their inquiry, e-visitors can post their question for a personal response.
The information contained on this site has been geared towards Canadian out-of-province high school and international high school and post-secondary students | Application resides with host company. This facilitates upgrades to programme; does not require server space. | Interfaces with email for questions system cannot answer |
| Student Information - Misc reporting and file transfers | There are many reports that can be requested from SIS. They include things like address labels, class lists, student record prints, graduation exception reporting etc that are part of annual cycle of work done. | Cobol, running on Enterprise server

All components of SIS are related in that many in how data is updated | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | There are also files created at various times which are used to feed other systems on campus, WebCT, LearnLink, CPEC | and then used<br><br>DB2 | |
| Student Information - Registration confirmation process | This application is the completion of the registration process. Once students have been approved to continue at McMaster and have made necessary financial arrangements, they are set to fully register and a confirmation of registration letter is prepared. This is mailed to student along with id card (for new students) and validation sticker for id card. If appropriate a HSR bus pass is also included.<br>A copy of this letter is kept in student's file and is the start of official audit trail on the student. | Cobol, running on Enterprise server<br><br>All components of SIS are related in that many in how data is updated and then used. This process is also tied to admission offer rescinding as students cannot become fully registered if offer is being rescinded<br><br>DB2 | |
| Student Information - Returning Student Application (On-line web form) | Permits McMaster Returning Student applicants to apply on-line to McMaster University.  From all appearances, it looks like they are applying directly to McMaster but all of the underpinnings belong to the OUAC.<br>Data is received by OUAC and transmitted to McMaster in the normal part-time application distributions. Through this interface, students may also pay their application fees directly to OUAC.  OUAC keeps its processing fee and transfers funds twice a year same as biannually to McMaster. | Application resides with host company. This facilitates upgrades to programme; does not require server space | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| Student Information - TPH Event Software | The application manages room bookings for Registrar Office controlled space after the start of classes. Requests are made via email and then checked against the system. Responses are done by email as well. | | Interfaces with the IBM and other TPH packages (scheduling, exam, curriculum, exam admin ) Interfaces with the IBM and other TPH packages (scheduling, exam, curriculum, exam admin ) |
| Student Information - TPH Exam Administration Software | The application manages undergraduate exams for invigulators, exam printing, tracking all special exam requirements, all specific exam info for presiders | | Interfaces with the IBM and other TPH packages (scheduling, exam, curriculum, exam admin ) |
| Student Information - TPH Exam Software | The application manages and does all the scheduling of undergraduate exams. | | Interfaces with the IBM and other TPH packages (scheduling, event, curriculum, exam admin ) |
| Student Information -TPH Scheduling Software | The application manages and does all the scheduling of undergraduate course lecture sections, labs and tutorials taking into account faculty, room and programme constraints. | | Interfaces with the IBM and other TPH packages (exams, sectioning, event, curriculum) |
| Student Information - TPHi Sectioning Software | The application enables for the sectioning of students into course lecture sections, labs and tutorials. It creates the data that is used to prepare student personal timetables. | SQL | Sectioner interfaces with the IBM and TPH Scheduler |
| Student Information - Scholarships | record of awards record of scholarships, bursaries, government programs, funding decisions and payments<br><br>FAS feed | 1999 start up COBOL/ORACLE | UP, Admissions, SRECS, FAS, FINAID,TFAIS |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | Transcript notation feed | | |
| Student Information – student data | There are about 60 –70 individual screens which are used to update all data on a student. Almost every data element can be updated via these screens. They are divided in groups by area, general registration data, grades, average and results, special admission data, gov't reporting, entering permission and waivers and giving seat in limited courses. | Cobol, running on Enterprise server<br><br>All components of SIS are related in that many in how data is updated and then used<br><br>DB2 | |
| Student Information - Student Records display screens | There are a set of about 10 screens which display all of a students data in a combined layout. It is possible to view on screen or print the data. The format of the prints can also be requested in a batch overnight process. Several of the screens allow viewing of archived data. Application and display are at least 25 –30 years old. Have been modified as needed over time. | Cobol, running on Enterprise server<br><br>All components of SIS are related in that many in how data is updated and then used<br><br>DB2 | |
| Student Information - System Access Control - Enterprise server | All online access needs to be controlled as to who has access and if they can only view or also update. Application allows staff to assign screens to approved user. System upgraded to allow different customers to assign only screens in their area, (Admissions for Admissions Screens, Scholarships for Scholarship screens etc.). | Cobol, used in all systems (except ADF) to assign access to various SIS screens<br>DB2 on Enterprise server | |
| Student Information - QMF reports | In order to meet the reporting needs of the institution, QMF (Query Management Facility) is the tool used to be able to quickly produce reports. The number of queries both in Admissions and Student Records is quite high and demands a fair amount of time to manage and run. Faculty Office staff have access to some of the tables (including reporting platform) and so do many of their own reports. | Cobol, running on Enterprise server<br><br>All components of SIS are related in that many in how data is updated and then used<br><br>DB2 | |
| Student Information - System Clean Up | There are 2 parts to this application. The first is to do a clean up of paper files that are maintained for a student. | Cobol, running on Enterprise server | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | Basically once a student has not attended McMaster for 7 years all paper is destroyed (provided data is maintained on SIS – Graduate and medicine students' files are not destroyed) The second is to clean up data in DB2 tables that is not required for the students' transcript and permanent record. | All components of SIS are related in that many in how data is updated and then used DB2 Runs on Enterprise server using DB2 database | |
| Student Information Transcript Ordering System | This application allows staff to enter transcript requests and be able to monitor when transcript status including when a transcript was printed. Also integrates with EDI transcripts system for monitoring of status of transcripts | Developed in-house in early 90s with upgrade to include input for EDI transcripts in late 90s Oracle system, Interfaces with SIS nightly to actually produce transcripts. | |
| Student Information - Web support systems | There are a number of small systems that assist various areas in the university to do business. Class/programme lists – given to departments to be able to download up to date class and programme lists for viewing or entry into other systems (grades). Id card lookup – to see status of ID card Mugsi status – screen to assist staff in determining why a student may not be able to access Mugsi Student Pin Reset – before the new Mugsi staff were the only ones that could reset Mugsi pins. This was system to do it. Verifies Email Id – gives you ability to verify students email address. | Not sure if these are true Oracle or simply perl scripts accessing Oracle data. Data is downloaded nightly from SIS and is the some of the same data used Mugsi All components of SIS are related in that many in how data is updated and then used | |
| Student Information - Undergraduate Calendar SGML Editor and Converter | The text files for the calendar were originally marked up in SGML. Each year changes are made in the SGML files (through Author/Editor) and are then converted to RTF files and placed in PageMaker for the text version of the Calendar. The same SGML files can also be converted to HTML files to produce the web version of the Calendar. | The applications run on Windows and the applications reside on individual PC's within the Office of the Registrar. Both Author/Editor (SGML Editor software) and Converter were vendor supplied but are no longer supported | |
| Student Records | Application takes care of all facets of recording and reporting all data | COBOL DB2/IMS TM ADF | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
|  | associated with a Student during their years at McMaster University Records updating, University Calendar, Reporting Platforms, Scheduling, Exams, Registration, Programme change, Govt Reporting, Transcripts, Student Displays, Class lists, Archiving, Grade Reporting and Management | Student Records DB2 running on MVS |  |
| Student Records Batch Maintenance | There is a process in SR that allows for updating of data in batch. There are many processes in the system that create data files that are then updated through this nightly batch update process. Almost all students' data can be updated in batch. Files are created from several areas: Graduate Studies admissions, registrations, fees; grade processing; canceling of courses; Mohawk college; alumni data; intern and resident data; MBA admission and grades. | Cobol, running on Enterprise server

All components of SIS are related in that many in how data is updated and then used. Receives data from many areas (see below) but also creates data for UP updating. All personal and bio data can come in via Student forms but are updated onto the University Person system.

DB2 | Student Records |
| Student Records Exam Processing | Application allows customers to enter exam results to be fed into main Student Records database | COBOL TP PEXAM IMS DB/DC on MVS |  |
| Student Records Offline Maintenance | Application stores, moves students from an offline Database to an online database, and vice versa | COBOL DB2/IMS TM Student OFFLINE DB2 running on MVS |  |
| Student Records Registration - SOLAR | Provides a fully integrated system infrastructure, to enable students to register in their programme and manage their course selections via the internet. Student Modules: Level 2 Programme Selection; Undergrad Registration and Course Selection; School of Graduate Studies Course Selection Administrative Modules: Permissions, Waivers & Seat Authorizations Processing; Improved Limited Enrolment Course | Predominately COBOL, some HTML and JavaScript DB2 / MVS / NEON / application runs on the E-Server (mainframe) |  |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | Management and Reporting; Programmes for Registration Administration; Audit Trail Capture and Display | | |
| Student Records Tax certificates | The institution is required to prepare T2202A forms for all students who are fully registered and have paid tuition. This is a complex process that develops certificates based on gov't regulations (which programmes are eligible, type of credit –full or part time, tuition and fees paid). This system needs input both from Student Records as well as Account Receivable.  It also includes several edit steps (e.g. for addresses ) | Cobol,  running on Enterprise server<br><br>All components of SIS are related in that many in how data is updated and then used. This application is integrated with Financial Systems.<br><br>DB2 | |
| Telecommunications | Keeps track of the accounting end of billing for telecomm services | COBOL Telecommunications Flat File system, no database | |
| Timekeeping | The Timekeeping system collects hours worked for all of the trade employees at McMaster including Hospitality Services. It contains all of the rules in the collective agreements for multiple unions and feeds gross earnings to PPS to pay the employees. | Will probably be replaced with new HRMS COBOL, ADF Data base is IMS; system runs under MVS on the e-server. | Interfaces with PPS and FM system |
| Travel Advance (MVS) & Student Loan | It extracts info from FAS for any activity against student loan accounts and populates a student load data base. | In-House COBOL FAS, A/R DB2; runs under MVS on e-server | |
| Trust Fund Accounting and Information System (TFAIS) | TFAIS is used by Trust Fund administrators to:<br>- look up information about specific funds<br>- update trust fund information<br>- view summary and detail reports Keeping Trust Fund information up to date helps ensure the yearly Endowment Statements to Donors are produced correctly. | Oracle Developer, Forms and Reports. Delivered via the Web. Oracle database, residing on datasrv1 in Gilmour Hall.  Datasrv1 is a UNIX based server.<br><br>26 months of data is stored in DB-2 and Oracle<br><br>Can access data through browser queries, QMF queries | Oracle application. Looks at information from other systems rather than duplicating the data in TFAIS. Some information is entered and stored in TFAIS (terms, unitized market values etc.)  Other information resides in other systems such |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | | | as SFASS (recipient data), Advance (donor contact), and FAS (FAS transactions). |
| University Email Maintenance | Keeps track of email and aliases for all University Persons.   Feeds and creates distribution lists with active people.  Creation of LDAP directory, CSO lookup, WHOIS lookup | COBOL DB2/IMS TM University Email DB2 running on MVS, also Oracle clone on Unix Email and alias storage, automatic creation of emails for students and alumni.   Creation of McMaster LDAP | |
| University Email Maintenance | Application keeps track of address and telephone numbers and id numbers of all university people, students and staff/faculty | COBOL DB2/IMS TM University DB2 running on MVS, also Oracle clone on Unix | |
| UnivMail | Electronic mail | Software from Stalker used as the enterprise electronic mail application POP -IMAP -Web Interface the operating system is Solaris -the server is cgpsrv2 | |
| UseNet News Service Licensing | | | |
| Virtual Private Network Service http://www.mcmaster.ca/cis/network/vpn/ | Secure authentication as a member of the McMaster community, followed by traffic encryption during the session between the client machine and the campus backbone point to which the VPN Concentrator is attached | Cisco IOS in the Concentrator; authentication using Radius server in a Windows 2000 workstation running Cisco Secure software, against the AP1 authentication database. | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| WebCRD | End Users: <br> Fast easy ordering (one step reorders) <br> Single and multi document orders <br> Automated, reliable PDF for proofing and production <br> Address book for frequently used shipping and billing locations <br> Order status at anytime via Web browser or email updates <br> Table-driven job cost estimating <br> Private user folders store commonly used documents <br> Authorized shared access to forms, other documents <br><br> Production: <br><br> Electronic job ticket from client directly drives production printers <br> WebCRD SurePDF™ and CentralPDF™ workflow options eliminate points of failure <br> Direct job submission to all networked production printers <br> Route jobs to "live" production print queues <br> Review and schedule new orders <br> Manage work at all production stages- including offline finishing and outsourced work <br><br> Administration : <br><br> Export production activity reports to accounting, CRM systems <br> Charge codes for cost allocation/accounting or customer invoicing <br> Configure drop down menus based on the availability of print center services <br> Import user data for fast, easy setup <br> Corporate branding configurations easily established | WebCRD is delivered on a scalable, secure, and reliable Sun platform. <br><br> This is a modular web submission and print production system. | |
| WebDNS – distributed Domain Name System management tool. | Allow designated individuals within their permitted support areas to register computers and assign IP addresses, as well as to update current registrations and delete old ones. Provides a protected 'front-end' to the DNS | Perl scripts <br><br> Web interface to submit changes to the DNS database used by the Domain Name servers. Web forms are on Sun | |

| Application | Function | Database | Interfaces |
|---|---|---|---|
| | | Solaris server netman | |
| Web proxy service | Two purposes: (1) from on-campus, authenticate as a member of McMaster community before gaining off-campus access; (2) from off-campus, the web proxy provides the appearance of a McMaster IP number in gaining access to off-campus publishers who restrict access to the McMaster community.   Latter function recently superseded by proxy service offered by University Libraries. | Open source – Squid Proxy Cache software http://www.squid-cache.org/<br><br>Sun Solaris o/s on servers Percy & Edmund, Sun Ultra 10s, aliases *proxy* & *libproxy* receive traffic load-shared by the two servers (DNS round robin) | |
| Web Services  (not including Content Management Services) | Web services provide internet technology for developing and displaying website content to the university community and abroad. This includes the range from static informational web pages to dynamic database driven interactive applications. | Existing primary development platforms HTML, JavaScript, PHP, Perl, Cold Fusion Primarily Access or flat file Operating Systems include Windows NT4, Solaris 2.6 | |
| Work Orders | Work orders are set up by helpline and printed in tech services. Technician signs out printed copy of work order and indicates work done in writing.  Submits to helpline who update the system.  The customer is billed and a completed work order is generated and sent to the customer outlining the charges. | Cobol – MVS application<br><br>Will be replaced by new Service Desk application | |
| Work Study | record of work study apps and decisions<br><br>record of employer data and decisions | ORACLE/NEON/COBOL UP/SRECS NEON/DB2 MVS Mainframe | |

# Appendix E – Technology Architecture Framework

A technology framework defines a series of software and hardware functional component interactions that support the overall interoperability requirements of an organization. The technology environment and its interconnectivity requirements are best illustrated through a functionally layered model that clearly defines the services, products, applications, tools, and interfaces. This appendix presents a logically layered reference model that provides the contextual framework for analyzing and evaluating component category products and services within the proposed technology framework. The base framework used for the definition of the University's technology architecture is shown in the figure below.
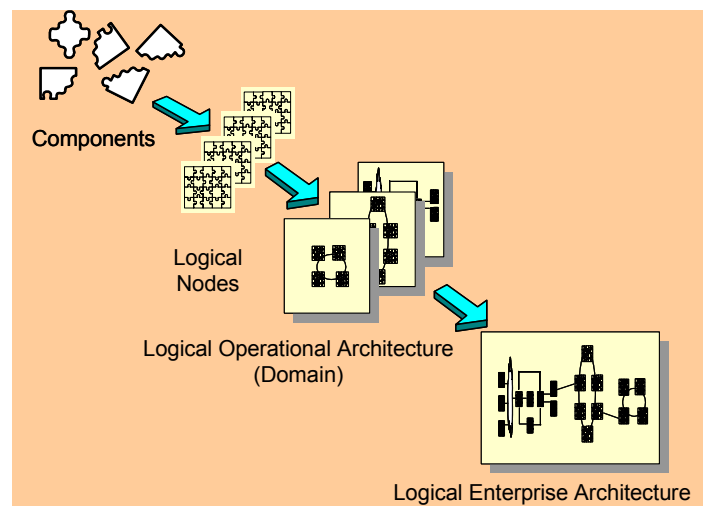


Figure 1 - Technology Framework Elements

The elements of the framework are defined as follows:

### 1. Components

A Logical Component is a notation for expressing the basic elements of an architectural model. It represents a combination of functionality, which can be defined once and then reused. By using Logical Components to define the logical architecture model, it is possible to identify areas where the same Logical Component function might be reused across multiple platform solutions. Each Logical Component is independent of the underlying physical implementation and does not imply, or exclude, a specific physical architecture.

Defining Logical Components in this way also promotes standardization. This will ultimately lead to more consistent product decisions, better solution integration and lower support costs.

Logical Components can be thought of as 'Lego Blocks' which are snapped together in different ways. Even though each Logical Component provides the same modular functionality, the ways in which they are put together into a Logical Node, can create an environment to meet a totally different set of user requirements. For example, using common components for E-mail, File, Print, Workflow, Security Services, etc., a 'base' Application Node might be defined. By combining this 'base' with one or more unique building blocks, such as Business Logic and Data, Application Nodes for many different user groups can be defined.

The Logical Components have been grouped into five categories further broken down on the page following:

- Application and Data Design
- Infrastructure Services
- Base Platforms
- Systems Management
- Security

# Classification of Logical Components

## Application and Data Design

- **Partitioning Guidelines**
  - Presentation Logic
  - Business Logic
  - Data Access Logic
  - Data
- **Application and Data Placement Guidelines**
- **Application Design Models**

## Technology Architecture – Infrastructure Services

- **Presentation Services**
  - Browser Services
  - Graphical User Interface (GUI) Services
  - Multimedia Services
  - Print Services
  - Terminal Emulation Services
  - Voice User Interface (VUI) Services
- **Application Services**
  - Application Integration Services
  - Collaboration Services
  - Decision Support Tools
  - E-Mail Services
  - Fax Services
  - Help Services
  - Java Virtual Machine
  - Office Productivity Tools
  - Standard Message Services
  - Telephony Services
  - Transaction Management Services
  - Web Services
  - Workflow Services
- **Data Services**
  - Database Services
  - Data Transformation Services
  - File Services
- **Distributed Services**
  - Application to Application Communication
  - Data to Data Communication
  - Directory Services
  - Time Services

## Technology Architecture - Base Platforms

  - Network
  - System Software
  - Hardware

## Technology Architecture – Systems Management

  - IT Administration Management
  - Change Management
  - Configuration Management
  - Network Management
  - Operations Management
  - Performance Management
  - Problem Management

## Technology Architecture - Security

  - Identification & Authentication Services
  - Authorization Services
  - Confidentiality Services
  - Audit Services
  - Data Integrity Services
  - Virus Protection Services

# Appendix F – Key Technology Service Providers

## Humanities Media and Computing

**Role and mandate**
Humanities Media and Computing consists of the Teaching Labs, the Ann & Neil McArthur Humanities Multimedia Wing, the Research Computing Centre, and the Lyons Instructional Media Centre. The combination of these areas offers a coherent set of facilities and services to the research and instructional community in the Humanities.

*Margaret and Edward Lyons Instructional Media Centre*

*Video Library*
The Audio Visual library consists of approximately 1900 pieces including videotapes, 16mm films, videodiscs, DVDs and audio CDs. The collection is primarily used by faculty for classroom screening or individual study. There is a selection of feature films as well as subject specific videos which cover a wide range of topics such as Anthropology, Women's Studies, Sociology and Drama (as well as a large selection from the BBC Shakespeare Series). McMaster is also a member of Interfilm, which provides access to over 19,000 film and video titles.

*Slide Library*
The Slide Library houses a collection of slides and photographs that can be traced back to the 1930s, when history of art courses were first taught at McMaster. It currently house over 105,000 slides and 36 running metres of mounted photographs and reproductions.

*Other Services*
Besides the technical maintenance and administration of lab services HMC staff is also responsible for the installation and maintenance of administrative computers (hardware and software), as well as web support and development for the entire Faculty. HMC also supports several multimedia seminar rooms throughout the Faculty (SOTA, Mod Lang, Classics) and offers a full range of technical services to faculty members in Humanities.

**Applications**
In addition to the standard University wide productivity applications we also support (in our labs and in admin/faculty offices):
- Adobe products including Premier, Photoshop, Audition
- MacroMedia products including Flash, Director, FreeHand, Dreamweaver
- Alias Wavefront's Maya,
- Cubase VST Score
- Final Cut Pro and Express
- Media 100 video editing suite
- Also see server section for server applications.

**Labs**
*Humanities Teaching Labs*
One key advantage of the Humanities Teaching Labs is their flexibility to accommodate cross media materials and provide various digitizing hardware.
The break down for the Teaching Labs is as follows:
TSH 206 and TSH 209 are the public PC labs. They house 47 PCs in total, which are jointly owned by Humanities and CIS.  CIS supplies the machines with the initial image (software configuration) that are

identical to other public labs on campus. The image is then customized to make it fit with Humanities course requirements.  HMC is also responsible for daily upkeep, image restores and maintenance of this equipment.

TSH 209 also houses 3 video viewing stations (VCR and monitor) and 2 Kodak PhotoCD stations. This equipment is used by Classics, Drama, French, Music and Japanese course students. HMC offers a library service for video media whereby an instructor drops off course materials that can be signed out to students. This service is also offered for other course related materials such as audio tapes, textbooks, software manuals, Multimedia CD titles, headphones, microphones, digital camcorders and digital still cameras –some of these library services are also handled by the Lyons Instructional Media Centre (LIMC).

TSH 210 is a Macintosh based lab and it houses 12 Macintosh G4s.  These machines are primarily used for Humanities course work –this includes courses in Music, Philosophy, Japanese and Multimedia.

TSH 208 houses the advanced midi lab and recording booth. The midi lab is used by upper year Multimedia courses. The recording booth is used to record live audio onto digital audio tape decks (DAT).  In addition, HMC offers a cassette tape duplication service whereby students bring in their own cassette tapes and audio is dubbed onto them from a master tape. This service is used by French, German, Italian, Japanese, Chinese, and Spanish course instructors.

TSH 201 and TSH 203 are multimedia-classrooms that are used by various courses. The classrooms have Data/video projection systems, surround sound audio systems, multiformat VCR, DVD player, cassette tape player, visualizer (video overhead projector) and both a PC and Macintosh based computer (fully networked with off campus access).

*Ann & Neil McArthur Humanities Multimedia Wing*
The wing is housed in TSH 202B and contains three separate labs with a mix of PC and Macintosh based computers (45 in total) with Gigabit Ethernet connectivity. The lab offers 24/7 access and Multimedia students and instructors primarily use the wing for hands on tutorials and for work on assignments and projects. The wing also houses various research equipment for IRIS – a CFI funded research project on streaming video.

*Research Computing Centre*
TSH 202 is the graduate lab housing 6 PCs, 1 Macintosh and 1 laser printer. The lab is primarily used by graduate students working on their thesis and has 24/7 access. This area also houses research equipment for a CFI funded research project awarded to the Institute on Globalization and the Human Condition

**Servers**
HMC is responsible for the administration and maintenance of servers used to support the Labs and a number of research projects (15 servers in total). These include the Faculty Webserver (www.humanities.mcmaster.ca), Hume (the FirstClass server), IRIS/IRIS2 (video and audio streaming servers), Cherion (research web server), Humlink (student web server), Tactweb (electronic text web server) , Tapor (Text analysis portal –CFI project to go online by June 2004), an SQL server (for LIMC cataloging system and a faculty management system), several other storage, file, and administrative servers.

**Human Resources**

Total of 20 employees - the breakdown is as follows:

1 TMG

8 MUSA members – includes 2 administrators, 1 computer technician, 1 server administrator, 1 web developer, 1 AV Specialist/Librarian, 1 Slide Curator

2 contract positions – 1 computer technician, 1 library technician

9 part-time (OSAP) student employees

**Budget**

$25,000 yearly operating budget. Salary budget figures, if needed, should be obtained from the Faculty of Humanities' Budget Manager.

## Business

DeGroote Computer Services Unit

Mandate

Our unit mandate is to provide IT support to faculty, staff and students supporting research, administrative and student functions.  Our mission is to enable our clients to perform their required functions.  Implicitly we are responsible for making sure that the schools technology environment and services meet the needs of our constituent parties.  We also serve as a conduit linking faculty, staff and students to university information technology resources and services.

Our unit recommends, purchases, deploys and services all of the IT hardware, software, servers and systems purchased and owned by the school. We also provide help desk, technical support, backup and web services to our users.

Applications Specific to School of Business

School of Business Information System (SBIS) – includes web based and visual basic modules supporting, our MBA Co-op and Commerce Internship programs. Contact Management Module, Deans Area Module)

MBAIS (MBA Information System- managing the MBA admissions process) – Paradox based system to manage the MBA Admissions Process.

We have PowerBasic application that takes the data files from the OMR course evaluation process and produces a school report and an import to the current SBIS administrative module.

We have four different software programmable keying systems controlling access to the schools computer labs running four different proprietary software systems.  We also have two different programmable mechanical systems.

Servers

The schools computing environment is Microsoft Windows based.  We have in excess of sixteen computers providing server based functions.  The majority of these servers are IBM server class machines running Windows 2000 Server with a few Windows 2003 and Windows NT 4.0 Server. A few of the computers providing server based functions are workstation class.  The following is a description of the current server environment

| | |
|---|---|
| FACBUS2000 | - primarily the schools main administrative file server |
| FACBUSQL | - MS SQL Server |
| FACBUSPRN | - administrative print server servicing faculty & staff |
| FACBUSWEB2 | - school's main web server supporting 16 school and school affiliated web sites |
| BUSCOM | - main server supporting schools computer labs and student accounts |
| SAPSEM | - newest school SAP server |
| SAP-IDES | - R3 educational SAP system |
| INSTRUCTOR | - main file server Gould Trading Centre (private network) |
| INSTRUCTOR2 | - provides proxy service to Gould Trading Floor |
| FACBUSDSC | - primary server for Decision Support Centre Group Systems |

Software
FACBUSUS          - SUS server (also being used by Rocco Piro's Group)
FACBUSMS          - Microsoft SMS server
FACBUSPDC         - Primary Domain Controller
PC-FACBUS-BDC     - Backup Domain Controller
FACBUSGS          - Symantec Ghost Server – used to deploy images on lab systems
FACBUSBUEX             - Veritas Backup Server
ECOURSE               -  Web based course developed for TVO (WebCT)

In addition we have 17 network attached printers.   Five of the printers are servicing our student labs through our PAS software.

Projection and A/V Equipment

We have installed projectors, speakers, amplifiers and VCR's in : MGD B105, B106, B107, AB102, AB103, A102, A116 and  KTH B124.  We have also installed DVD players in all of the AIC wing classroom/lab facilities.

Computer Labs

At present we have the following computer Labs:
- Ecommerce Lab (MGD B106), 20 workstation classroom/computer lab
- EBusiness Computer Lab (MGD A116) 54 stations
- Decision Support Centre, 25 workstations
- Gould Trading Floor, 20 workstations
- Usability Lab
- MERC Research Lab – 7 workstations
- PHD Student Cluster - 4 workstations

Human Resources

At present we have three computing positions in our unit: Manager (Computing), End User Support Specialist, and Technical Administrator.  We are in the process of hiring a full time Systems Analyst/Web Developer Position.  In addition we normally employ one summer student full time during the summer term and 10 hours a week during the fall and winter terms, as a Computer Services Assistant.   We also employ approximately 20 students during the year to staff our computing labs. The Gould Trading Floor also hires approximately 20 students to manage its lab throughout the year.

Annual Budget

The current computing annual budget not including computing salaries is approximately $260,000/year.  This amount does not include the Gould Trading Floor.

# Health Sciences

The Computer Services Unit (CSU) provides computing and networking support to faculty, staff and students of the Faculty of Health Sciences (FHS) at McMaster University. There are 626 full and 1166 part-time faculty members, as well as 2078 full-time staff.   There are also 1700 full-time undergraduate students and 989 graduate students.  Many faculty and staff are off-site.

**Budget**

CSU was established in 1972 as a fee-for-service, cost-recovery unit.  The 2004/05 CSU budget is projected to be $909,534.  Some base funding is provided for the network infrastructure and operating budget.

**Human Resources**

The Unit has twelve staff members.

- Network Analyst manages the network, with assistance from the Network Technician.
- Network Technician is responsible for the FHS email and file server.
- Four PC technicians provide technical assistance and support.
- One PC technician manages the Educational Computing lab (ECL) and provides video conferencing support.
- Systems Analyst and Programmer Analyst maintain the corporate databases and FHS web server.
- Administrative Assistant provides administrative and front line client support.
- Coordinator is responsible for the coordination of the Unit.
- Director, Health Sciences Library and Computing Services, oversees the Unit.

**Network/Servers/Equipment**

- Windows Active Directory domain
- Email Server (Exchange 2000/Intel Platform) with 800 clients
- File Server (Windows 2000/Intel Platform)
- Compaq Tape Library
- Network-Attached Storage Unit (Intel Platform)
- Hewlett Packard LTO Tape Drive
- Web Server (Sun Ultra 5) (Faculty of Health Sciences)
- Web Server (Sun) (Health Sciences Library)
- HP/3000 Series 922
- Cisco Network Gigabit backbone with 10/100 to desktop
- Cisco Wireless Access Points (3) (Health Sciences Library)
- Nokia/checkpoint firewall appliance
- Educational Computing Lab with 25 PCs
- Video Conferencing Equipment – two rooms equipped with Polycom cameras)

**Applications**

- Adobe Acrobat 6 Professional

- Adobe Photoshop Suite
- Apache
- Clipper (legacy application)
- Cognos Powerhouse
- Cold Fusion
- Corel Suite
- Dbase (legacy application)
- HPMPE
- HP Image
- Hummingbird
- LearnLink
- Linux
- Macromedia Studio MX 2004 (Dreamweaver/Flash/Fireworks)
- Mail Marshall 5.5 (anti-spam software)
- Microsoft Internet Information Services (IIS)
- Minitab
- Netscape Enterprise
- NetTracker
- N-Vivo
- Norton Antivirus 2004
- Norton Systemworks 2004
- NUD*IST
- Office Standard & Professional (2000/XP/2003)
- Oracle SQL
- Oracle Developer
- Reference Manager
- SAS
- Sophos
- SPSS
- Sun Solaris
- Trend Neatsuite (virus protection for desktop and mail server)
- Windows O/S (9X/2000/XP)

**Educational Computing Lab**

- 24 PCs (CD-R/RW, sound card with speakers)
- 1 Instructor PC with DVD, and video projector
- All PCs are networked to the CopiCard print system for print job retrieval in HSC Library, IAHS Learning Commons or other campus libraries.

# University Library

**Role or Mandate**

University Library Information Technology Development and Support develops and maintains information technology to support the delivery of library services.  Primarily we support the three libraries (Mills, Thode and Innis) which constitute the University Library but we also develop and maintain applications which are shared by Health Sciences Library.

**Applications**

Horizon Integrated Library System (Dynix Canada)

MyAccess (to be implemented June-Sept 2004) EZ Proxy authentication for library resources

Electronic Resources Database

Library Website

Webspirs -ERL databases of electronic indexing and abstracting services

Citrix-metaframe installation for locally installed electronic databases

Pharos Print Server software

**Network, Servers, and Equipment**

Library Subnet is for the most part managed by CIS

Sun Solaris Horizon Production Server

Sun Solaris Horizon Backup Server

Sun Solaris Horizon Information Portal and Library Website server

Linux server1 - webspirs

Linux server2 - backups and storage

Intel server1 - CD/DVD server

Intel server2 - CD/DVD server, WordPerfect server

Intel citrix server

Intel domain controller, dhcp services, wins services

Intel public print server (Pharos)

285 staff and public pc's

4 laptops

64 printers

**Human Resources - number of staff and positions**

1 Associate University Librarian (IT)

1 Information Technology Manager

3 Microcomputer Support Technicians

1 Computer Services Assistant

**Labs**

Wong E-Classroom

**Annual Budget**

$180,000 (does not include staff salaries)

## Research and High Performance Computing Support

Role or Mandate

Provide enhanced, front-line desktop computing support for research staff

Provide system administration for multi-user HPC systems and departmental servers

Support research application program development and data visualization

Promote interdisciplinary cooperation and provide technical guidance in development of computing installations and grant applications for computing installations for research.

Applications

Operating systems:
  Solaris, AIX, Linux, MacOS, Windows 98/NT/2000/XP, Irix

System software:
  Samba, postfix, spamassassin, amd, autofs, tripwire, amanda, rsync,
  ssh, imaps, gnome, KDE

Development software
  GNU compilers, Sun Compilers, Cygwin, PHP, Postgresql, Mysql, Apache,
  Tomcat, Perl, J2SDK, Ruby, Tcl/TK, TotalView, MPI

Application software
  Matlab, Mathematica, Maple, Xwin32, BESA, Brianvoyager,
  Fluent, ARCINFO, IDL, TeX, pine, Evolution, IRAF, AIPS, Starlink, R,
  Splus, SPSS, daophot, zeus2d

Graphics/Multimedia
  Chromium, VTK, Qt, X11, OpenGL, Inventor, gnomemeeting, pwc, xsane,
  Xinerama, GIMP, xmgrace, ImageMagick

**Network, Servers, and Equipment**

Our department has 22 computers and 1 wap

We provide contract system administration for researchers in thirteen departments across four faculties; approximately 2000 network connections including desktops, laptops, network switches, wireless routers, servers, HPC facilities, and printers

Human Resources - number of staff and positions

Technical Director
Research Projects Manager
Analyst C (5)
Research Engineer, Visualization (2, contract until August 2004) Programmer/Analyst B (contract until Sept 2006)

Labs

None

Annual Budget

$366,000 operating
$281,000 contract system administration recoveries

# Learning Technologies Resource Centre (LTRC)

Mandate

The LTRC consists of two divisions: Research and Computing and Classroom Audio-Visual Services. This documents the Research and Computing Division.

The LTRC helps faculty teach with technology and provides resources to help students learn. The LTRC runs the two Course Management Systems LearnLink and WebCT, on which a majority of our students take courses. The LTRC provides training, support, consultation, evaluation, and research on learning technologies. We provide custom computing solutions in concert with McMaster faculty.

**Structure of the LTRC – Computing and Research**

**Computing and Research** consists of the Teaching Projects Group and the Teaching Infrastructure Group.

The **Teaching Infrastructure Group** provides Course Management Systems and advanced web services on the LTRC servers. Currently it has 3 full-time staff, a Manager, a LearnLink Administrator, and a Server Analyst.

The **Teaching Projects Group** designs Internet-based teaching applications for faculty members. They also provide consultation for faculty members on teaching technologies and assist with materials for on-line courses. The current 5 staff members include the Manager, Systems Analyst, Graphic Designer, and Digital Video Specialist., as well as the WebCT Administrator.

LTRC Applications

The LTRC runs WebCT Campus Edition v. 3.8 and FirstClass v. 7.1.

Network, Servers and Equipment

Network:

* Cisco Aironet 350 wireless access point
* Cisco 1584 8-port Switch

Servers:

* Sun V880 server (main WebCT server)

* Sun Enterprise 250 (summer WebCT server)

* IBM eServer server (Model 8658, dual CPU, main Learn Link   server)

* IBM xSeries 350 server (Learn Link Web services)

* IBM PC Server 330 server (Learn Link Mail gateway services)

* Backup server (Learn Link Post Office Mirror)

* Mac G4 (Streaming Media Server)

* Dell PowerEdge 1400 SC (LTRC Web, backup/restore and file
  server, bartok)

* Dell PowerEdge 1400 SC (test and backup server for bartok,
  ltrc2)

Human Resources

The LTRC currently has 9.5 positions. The Executive Director, Audiovisual Services' position is also included in the LTRC budget.

Annual Budget
$1,167,789

## Classroom Audio-Visual Services

Mandate:

The overall goal of CAVS in 2004/05 is to seamlessly integrate the new CLAD classroom complex into the structure and workload of the department without adversely affecting the current level of service or staff workload.  Our success in this goal will be measured through a client satisfaction/needs survey and ongoing discussion/monitoring of staff workloads through regular meetings with staff and yearly performance appraisals.

Objectives of Classroom AV Services (2004/05)

1.  Monitor classroom construction to insure standards are maintained
    Ongoing liaison with consultants, contractors and subcontractors to make sure equipment is compatible with the rest of campus, all teaching technology issues have been dealt with before classes start and all support issues have been worked out.

2.  Initial and ongoing Faculty training
    Determine what training needs to take place before faculty can use the new technology, provide initial training to AV staff and faculty scheduled to be the first users.  Set up ongoing training sessions throughout the year for faculty assigned to teach in CLAD.

3.  Integrate CLAD equipment maintenance, service and  delivery into existing framework
    Assign duties to AV staff for equipment delivery, helping faculty with hardware problems, maintenance of room hardware and equipment instruction.  Develop backup support for equipment failure and do an ongoing workload assessment related to the provision of service to 35 new classrooms.

4.  Develop network protocol for monitoring status of classroom equipment and security
    Integrate the network monitoring of the ACS/Siemens security system into our current campus system and develop a protocol for monitoring rooms and providing routine maintenance checks.  We currently do this on an adhoc basis for the small number of classrooms that we can access over the network but this will need to be expanded to include the new building.

Other Income to the Department
Classroom Audio Visual Services recovers approx $47,000 per year primarily from the rental and delivery of AV equipment to non-academic departments and outside organizations using

McMaster facilities.  This revenue is built into the budget and offsets much of our roll-about replacement equipment budget.  Revenue tends to fluctuate depending on facility use by large groups, conferences, etc.  Prices for equipment rental are pegged below outside rental agencies to encourage use of on-site resources and supplement the Departmental base budget.

## Electrical and Computer Engineering

Role or Mandate

To assist with the acquisition, installation, maintenance and operation of graduate research facilities including computers and measurement instruments.

### Applications

Computational Electromagnetics

Computer Aided Design and Test

Microelectronics

Multimedia Signal Processing

Next Generation Networks

Photonics

Power Research

Signal Processing for Communications

Simulation Optimization Systems Research

Telerobotics, Haptics and Computational Vision

Wireless Networking

### Network, Servers, and Equipment

There are 882 systems including computers, network switches, wireless access points and printers located in CRL, ITB and T13, registered in the ECE VLAN, 18 systems including computers and printers in BSB, registered in the BSB LAN and 65 systems including servers and workstations in an HPC cluster on a private LAN in ITB. The facilities in BSB and T13 will be moving to the ITB Annex in the near future along with perhaps 2/3 of the facilities currently in CRL. The HPC cluster will also move to the ITB Annex at which point, an additional 4 servers and 42 workstations will be installed. The ITB Annex will have 575 wired connections and 12 wireless access points. ECE is responsible for the network in CRL while CIS is responsible for the network in BSB and T13 and will be responsible for the network in the ITB Annex.

Computers and associated Equipment

There are approximately 455 computers and 39 network printers including monochrome and colour lasers, a solid ink photo quality printer and a large-format (42") inkjet that are used primarily for research in addition to 6 multimedia projectors used for presentations. The balance of the network connections cited above are used by administrative, research, instructional and student-owned computers that are not my responsibility.

Human Resources
Facilities Manager
Research Computing Specialist

Labs (if applicable)

The "Applications" listed above are in fact the names of the various research labs in ECE.

Annual Budget

Payroll  ~$130K
Infrastructure    ~$30K
Equipment       variable(ranges from $500K to $3000K)

# Appendix G – Wireless Canopy

Green            shows in-building coverage limited to student areas

Blue             shows Planned exterior coverage using solarmesh.

                 Coverage may vary depending on any physical barriers in line of sight

BROWN            shows possible expansion