

## **Title**

Enhance ICT Environment to Enable and Increase Research Success

## **University Themes Supported**

- Accelerate Research Momentum
- Champion Faculty Recruitment and Retention
- Enhance the Student Experience
- Foster an Engaged University

## **Description of Initiative**

### *Context*

Today, research involves teamwork, multi-disciplinary approaches and collaborative partnerships among faculty, students, universities, governments and industry. It involves the collection and analysis of very large datasets. In addition to being collaborative, research is also entrepreneurial and competitive.

Research relies heavily upon information and communications technology (ICT). ICT is used to collect, store, manage, integrate, mine, visualize and analyze data in all disciplines including the arts and humanities. It enables communications and collaboration among researchers anywhere in the world without the necessity for travel. ICT often provides researchers the “competitive” advantage they need to be leaders in their field.

Many government and university studies have found that advanced information and communications technologies (commonly called cyberinfrastructure) are critical for research success and for economic development. Three studies are referenced in the Comments section below.

In 2007, Alberta created Cybera (Alberta Cyberinfrastructure for Innovation) to provide advanced information and communications technologies to researchers within the province. Alberta also invested \$1.25 million in Cybera this year; a further \$10 million (over four years) will be invested upon approval of the 2008 provincial budget.

The Office of the Vice President (Research) four-year plan recognizes that advanced information and communications technologies are a critical element of the University’s research infrastructure (initiative F “Enhancing Research Infrastructure”). The initiative proposed here supports that initiative and initiative G “Student Experience in Research” in their plan.

### *The Initiative*

This initiative will enhance the University’s research ICT environment (cyberinfrastructure) so that it helps increase research productivity, helps attract and retain graduate students and faculty, enables electronic communications and collaboration, supports experiential and discovery-based learning and helps fosters University engagement.

This initiative consists of two components.

The first component fulfills recent service commitments (e.g., Digital Media Research Centre, WestGrid) and builds upon recent improvements to, and expansion of, the ICT research environment (e.g., GIS, high performance computing, 3D visualization). These service improvements were primarily funded from one-time (“soft”) monies (including ITS contingency) without an increase in operating budget. ITS intends to use contingency to continue providing these services this year and during the 4 –year planning cycle. The funding will be used for staff salaries and benefits (primarily to extend existing term positions) to:

- Continue support for the use of digital media technologies especially in arts and humanities scholarship (through the Digital Media Research Centre in partnership with Arts and Sciences).
- Continue Geographical Information System (GIS) support.
- Continue support for advanced 3-D visualization (partnership with Saskatchewan Resource Council).
- Provide and support more ICT tools for electronic communications and collaboration (e.g. beyond e-mail).
- Increase the ICT advice and assistance available to researchers in developing research proposals and to those undertaking research projects that have a significant ICT component.
- Provide ICT advice and assistance to new faculty to help them establish their research and teaching programs quickly.
- Continue to provide ICT advice and assistance as required within the University’s accountability process for CFI proposals.
- Help implement the data storage and AccessGrid collaboration facilities recently approved by CFI to be located at the UofS (in collaboration with Dr. Ray Spiteri, principal investigator and WestGrid).
- Operate the facility recently developed in Spinks to house research servers that require high electrical and air conditioning capacity.

The second component of this initiative further enhances the University’s ICT research environment as outlined below. New funding will be required to:

- Meet the University’s five-year operating obligations to WestGrid, as well as to provide a modest amount of High Performance Computing (HPC) support to UofS researchers so that they can take advantage of the facilities being established on campus and at other Canadian universities.
- Provide system management support so researchers are freed from the time-consuming and complex tasks relating to workstation and server administration (e.g., applying system upgrade and security patches).
- Provide automated tape backup services for research workstations or servers to reduce the risk of research data loss.
- Support the expanded use of ICT tools by more researchers in more disciplines, as well as to investigate emerging technologies.
- Provide ICT staff resources to help manage research projects that have a large IT component.
- Provide additional support for researchers and instructors that require 3-D visualization.

## **Objectives/Outcomes by 2012**

Enhance ICT Environment to Enable and Increase Research Success

An enhanced ICT research environment will:

- Help faculty be more successful in research (related to proposals that can utilize the ICT research environment).

ICT advice and assistance will be available to help faculty develop research proposals and to undertake research projects that have a large ICT component. New faculty will be given ICT advice and assistance to help get their research and teaching programs established more quickly. Researchers will be able to rely upon the existence of a supportive ICT research environment (e.g. GIS site license, access to 3-D visualization facility, access to Canadian and international research networks) and will not have to address it in their proposals. In some cases, researchers may be able to include elements of the ICT environment as in-kind contributions.

- Bring more funding to the University and the province (see Revenue and Costs section for examples). This will result in more people working in the province’s knowledge-based economy.

- Help increase research productivity.

Researchers will be able spend more time on research rather than on the time-consuming and complex tasks related to keeping their ICT environment operational and secure (unless ICT is the subject of the research). An automated tape backup service would also reduce the risk of accidental research data loss and the resultant damage to the University’s reputation.

- Help attract and retain graduate students and faculty.

A capable research environment and increased research success will improve the University’s reputation and will help make it a more preferred place to study and perform research.

- Provide tools and services that can be used in experiential and discovery-based learning at the undergraduate and graduate level.

- Enable our researchers to communicate and collaborate with other researchers located anywhere in the world without the need for travel

The outcomes above will also help foster a more engaged University.

## Revenues and Costs

### Costs

As outlined in the Initiative Description section above, ITS contingency will be used to fund the first component of this initiative. The funding requirements for this component are significant. The specific allocations from contingency for this initiative will be finalized as the initiatives and priorities of the University’s next 4-year plan are finalized. It should be noted that funding the ICT research environment from contingency is not sustainable in the long-term.

New funding will be required to further enhance the ICT research environment as outlined in the table below.

<b>ICT Research Environment Enhancements Requiring New Funding</b>	<b>Yearly Cost</b>
Operate and support, for a five-year period, the WestGrid data storage and	\$156,000 to

<p>AccessGrid collaboration facilities recently approved by CFI to be located at the UofS (in collaboration with Dr. Ray Spiteri, principal investigator).</p> <p>The current estimate is that about \$625,000–\$750,000 of new University funding will be required over five years to meet our operating obligations to WestGrid, as well as provide HPC support to UofS researchers so that they can take advantage of the facilities being established on campus and at other Canadian universities. It should be noted that CFI, Compute Canada and WestGrid are still finalizing project and operating budgets and service level expectations; this figure may change as a result.</p>	<p>\$187,000 per year on average</p> <p>[\$625,000 - \$750,000 estimated total over 5 years]</p>
<p>Provide system management support so researchers are freed from the time-consuming and complex tasks relating to workstation and server administration. (1 FTE ASPA 2)</p>	<p>\$80,000 per year</p>
<p>Provide automated tape backup services for research data (on workstations or servers). (0.5 FTE ASPA 2)</p>	<p>\$40,000 per year</p>
<p>Extend hours of support for core ICT services to include evenings and weekends.</p> <p>Core services include the network, Internet access, e-mail, web services, PAWS, Blackboard, as well as operating the servers that run SiRIUS, About-US and e-payments. The extended hours of support would include evenings and weekends. The support will include help desk staff to help resolve student, faculty and staff ICT problems and other staff to monitor and fix networks, servers, application software and databases in order to restore service as quickly as possible..</p> <p>While also supporting research, this objective more directly supports the initiative relating to enhancing the teaching and learning ICT environment. As such, the budget required for this objective is included in the other initiative.</p>	
<p>Support the expanded use of ICT tools by more researchers in more disciplines. Provide additional staff and software resources to support the expanded use of more ICT tools by researchers in a broader range of disciplines and to investigate technologies of particular interest to them. (0.5 FTE ASPA 2 plus other costs)</p>	<p>\$55,000 per year</p>
<p>Provide project management support for research projects that have a large IT component. (1 FTE ASPA 3)</p>	<p>\$90,000 per year</p>
<p>Provide additional support for researchers and instructors that require 3-D visualization. (0.5 FTE ASPA 3)</p>	<p>\$45,000 per year</p>

## Revenues

The existence of a capable and supportive research environment (technology and people) enables and assists researchers to secure more research grants and thus generates more revenue for the University and the province. For example:

- The existence of a viable GIS service unit and the assistance it has provided have been instrumental in the award of a number of large research grants. These include grants for Drs. Monique Dubé, Cheryl Waldner, Lawrence Martz, Carlson Martz and Goeff Cunfer. The overhead revenue associated with Dr. Waldner’s research contract alone is on the order of \$1 million and would not have been possible without the expertise and capacity of the GIS service unit.

- The existence of a high performance network (as a result of the USR-net project) enabled the Alberta Synchrotron Institute (ASI) to connect to the Canadian Light Source (CLS) at speeds similar to those available to UofS researchers. This connection may not have been possible (or would have been more difficult) without an adequate campus network infrastructure. To date, the ASI has contributed close to \$10 million towards the construction of the CLS.

Some granting structures permit leveraging the University investment in research. The CFI and provincial matching funds for the USR-net CFI project, for example, added millions of dollars to the University's own funds for infrastructure renewal at the University. The WestGrid project is expected to have a similar affect. The CFI funding for these projects also increases the University's share of indirect costs of research funds.

Some donors are willing to contribute towards initiatives that improve research success. For example, the University received a \$500,000 donation to help develop a facility to house high performance computers (Spinks).

The University received over \$13 million of external funding to upgrade its campus research and educational network. We are only one of three Canadian universities that received funding for network renewal. Other universities have had to use operating funds to renew their network infrastructure.

By participating in the WestGrid project, UofS researchers will receive technical support and have access to \$150 million worth of high performance computing facilities located at Canadian universities. This includes a \$5 million data-storage (petabyte or larger) facility and an AccessGrid collaboration facility located on campus. The project will also help the UofS to build local expertise in High Performance Computing. The researchers who can take advantage of HPC can come from many disciplines including chemistry, physics, geology, engineering, health sciences and computer science. The data storage facilities will also benefit CLS researchers. Had the University chosen not to participate in this project, we would have been the only medical-doctoral university in Canada not to host any significant part of the national HPC infrastructure; this would have diminished our profile as a major research institution.

Investments in research, including in the ICT research environment, appear to provide a very good "return" to the University and the province.

### **Performance Measures/Metrics**

- Number of research grants funded that use the ICT research environment
- Value of the research grants funded that use the ICT research environment
- Number of people employed as a result of grants that use the ICT environment.

### **Responsibility**

- Ed Pokraka, Director, Information Technology Services Division
- Keith Jeffrey, Manager, Educational and Research Technology Services

### **Timeline**

The portion of this initiative that is funded from ITS contingency builds upon recent improvements to, and expansion of, the ICT research environment. As such, this component of the initiative is currently underway.

The remaining initiatives will be undertaken once the required funding is available.

### **Comments**

An ICT research environment (cyberinfrastructure) includes:

- sophisticated data gathering equipment, sensors and laboratories with remote online access capability,
- database management systems and very large data storage facilities,
- high performance computers to process, transform and analyze large databases (as well as rooms with adequate power and air conditioning to house those computers),
- backup devices to help ensure that research data is protected from loss.
- specialized, complex software applications (e.g. modeling, visualization, simulation, GIS)
- digital media technologies (for arts, humanities and other disciplines)
- electronic communications and collaboration tools
- high speed network connectivity on campus and to/from the outside world
- technical expertise – qualified people who can provide advice and assistance regarding the effective application of the above technologies.

Many government and university studies have found that advanced information and communications technologies (cyberinfrastructure) are critical for research success and for economic development. Three of the studies are referenced below.

- "Cyberinfrastructure Vision for 21st Century Discovery," US National Science Foundation, <http://www.nsf.gov/pubs/2007/nsf0728/index.jsp>
- "Alberta Cyberinfrastructure for Innovation: Recommendations for Alberta's Research Infrastructure for the Years 2006-1016," Alberta's Cyberinfrastructure Task Force, October 2006,
- "Final Report of the Indiana University Cyberinfrastructure Research Taskforce," May 2005, <https://scholarworks.iu.edu/dspace/handle/2022/469>.

On April 5, 2006, Indiana University announced the acquisition of the nation's fastest university-owned supercomputer and largest disk-based storage facility (<http://rac.uits.indiana.edu/spotlight.shtml>).