

# **Brief to the Commission on Post-Secondary Education in New Brunswick**

## **Faculty of Computer Science University of New Brunswick, Fredericton**

**April 17, 2007**

### **1. INTRODUCTION**

The purpose of this brief to the Commission is to make the case that the Faculty of Computer Science (FCS) at the University of New Brunswick (UNB) needs special consideration if it is to continue to play its central role in educating New Brunswick students for employment in the dynamic Information and Communication Technologies (ICT) industry. This special consideration was understood as essential by the Frank McKenna government in the 1990's when the government first recognized the importance of this industry to the economy of New Brunswick. There is every reason to believe that ICT will continue to play a central role in the economy of the province and probably in most human endeavors. In fact, all developed and developing countries have recognized the central role that ICT plays in their economic prosperity.

With an increase in the demand for new hires in the ICT sector jumping from 35,000 to 90,000 in Canada for each of the next four years and an expected supply of only 7,000 graduates, the downward trend in enrollment experienced by many universities in North America is already turning around. UNB is getting the word out to the high schools that, "the jobs in ICT are there." In fact, the number of the Faculty's Co-op jobs currently exceeds the number of students available by more than a factor of two.

Computing is unique among the professional disciplines. Employers continue to expect that an undergraduate degree in the computing discipline will make the student not only capable of learning the skills necessary to do their jobs effectively, but will have properly prepared them to come to the companies with most of these skills already learned and ready to be deployed. In fact, summer Co-op students hired after only two terms of study are often expected to be immediately productive in developing software. In addition, the computing discipline, which includes software engineering, computer science, information systems and information technology, is subject to a very high rate of change and continues to expand into new areas. This has implications for all academic course content, research, computing and communications infrastructure, and the ongoing need for faculty professional development. There is enormous global competition driving the ICT industry. This means the industry must adapt to continual updates and new technologies. These technologies must be developed, implemented and learned in ever shorter time scales. This puts a considerable strain on the Faculty's academic computing programs, the faculty members themselves and the required infrastructure for the Faculty of Computer Science to remain state-of-the-art.

## **2. THE FACULTY OF COMPUTER SCIENCE**

The Faculty of Computer Science (FCS) on the Fredericton campus is the first such Faculty in Canada and has the oldest accredited CS undergraduate program in the Atlantic region. At present, FCS offers two undergraduate programs: the Bachelor of Computer Science (BCS), and the Bachelor of Software Eng. (BSc SWE) which is offered jointly with the Faculty of Engineering. The Masters and the Ph.D. graduate degrees were the first offered in the region. The size of the graduate program has doubled in the last five years.

From 2002 to 2006, the Faculty graduated 533 students with Bachelor degrees and 117 students with graduate degrees (11 of these with PhDs). The FCS Co-op program (started in 1981) placed 2,432 students with employers during the years 1997 to 2006, an average of 243 student placements per year.

A new Bachelor of Information Systems (BISys) degree program will be offered in Fall 2007 in response to the needs of companies in New Brunswick. In addition, the BCS program will be offered in Singapore from Fall 2007.

Since FCS had an acute shortage of space and laboratory infrastructure, it was given one-time funding for five-years (1998-2003) from the Province and the Atlantic Canada Opportunities Agency (ACOA) to build a new wing named the Computer Science Information Technology Center (ITC) and to support laboratory as well as personnel.

During the period 1990 to 2006, the Information Technology Center (ITC) helped 22 for profit companies (plus 12 other organizations) through research and development agreements to improve their products and services. Twelve different two to four-day ITC courses have been taken by hundreds of IT professionals since 1999.

FCS is one of the strongest research Faculties on the campus. FCS has the second largest number of research graduate students supervised per faculty member at UNB and the highest research output per faculty member. Research and industrial collaboration activities continue to grow. The total research funding is now more than \$2 million per year. As an example, Dr. Ghorbani is leading a Network Security project with Q1 Labs and Dr. Du is a principal investigator in the area of "Knowledge Engineering" with Exigen Inc. (Saint John). The Faculty will be working with Innovatia Inc. (Saint John) in their recent successfully ACOA funded project. At present, the ITC oversees a multi-partner Atlantic Innovation Fund (AIF) project entitled the Communication Networks and Services Research Project. Contract research activities and requests for usability evaluations are increasing as is the ratio of PhD to Masters students. Additionally, FCS has a strong research collaboration with the National Research Council Institute for Information Technology e-Business.

FCS houses the MITACS (Mathematics of Information Technology and Complex Systems) Networks of Centers of Excellence Atlantic office. The Scientific Director (Dr. Bremner) and a Business Development Officer coordinate Atlantic activities. Recently

the main activity has been a computing and mathematical sciences graduate internship pilot program.

The Faculty of Computer Science manages and operates the Advanced Computational Research Laboratory (ACRL) providing high performance computing resources for research and instruction not only to both campuses of UNB, but also to many universities in Atlantic Canada. Recently, ACRL is a part of a \$30 million Atlantic Computational Excellence Network (ACEnet) initiative. FCS is also home of the new ACEnet Advanced Computing Institute.

The Faculty has signed a number of exchange agreements with universities and institutions from India, France, Germany, Spain, Norway and other countries. This opens new opportunities for both students and faculty. The Faculty is also part of a project with Bhutan, funded by the Canadian International Development Agency (CIDA).

The Faculty is also a partner in a Canadian Government sponsored Canada/European Union Cooperation Programme in Higher Education and Training entitled “Towards an Internationally Distributed Computer Science Degree”. Other partners are Warsaw University of Technology, Fachhochschule Bonn-Rhein-Sieg (Germany), University of Crete (Greece), Dalhousie and York Universities. There are also agreements for internships abroad for Co-op students in Spain and Germany.

### **3. ISSUES, QUESTIONS AND ANSWERS**

In this section we address two main issues raised in the Discussion Paper of the Post-Secondary Education Commission (PSE) that are relevant to FCS.

#### **Question 1: Are there ways to improve accessibility, particularly in rural areas?**

**Answer:** To improve accessibility, FCS, community colleges and high schools must work together to provide a seamless integration whereby students receive the supportive education that will enable them to move from one level to another. The work done at one institution must be recognized at the next level. Students must be in a position to exit at the point of their choosing or return later in their careers. In fact they must be encouraged to seek additional education and not left with the feeling that they have reached a dead end or “must start all over again”. We are of the firm belief that the education process in ICT must start earlier in schools. This will have a positive impact on drop-out rates because students will be better prepared.

To this end FCS has been actively involved in discussing curriculum and articulation issues with New Brunswick Community Colleges (NBCC) in Saint John, Moncton and Miramichi since 2004 and has had many meetings in an effort to improve accessibility. It has already been recognized by both parties that minor changes in curricula at all levels can have a significant impact on making the transition to university from the community colleges far easier and more rewarding. In future meetings we also intend to explore the possibilities for research collaborations. It has long been recognized that active research

has a significant impact on the dissemination of knowledge and greatly enhances course delivery.

It is our belief that accessibility can be further improved by exploiting the excellent communications infrastructure of the province using multi-site Internet video conferencing and web-based learning.

**Question 2: How current are our curricula and technology?**

**Answer:** FCS has always been attentive to the changes in the computing field ensuring that its programs remain relevant. To this end, our programs have been accredited several times by the Canadian Information Processing Society (CIPS). Our curricula are based on the guidelines suggested by CIPS, the Association for Computing Machinery (ACM) and the Institute for Electrical and Electronics Engineers (IEEE). We also discuss curriculum issues with NB industry through advisory boards, Research Expos and roundtables. Our Co-op employers also provide feedback on employed students and their education. We also obtain advice from our alumni working worldwide. We are confident that our current course offerings are state-of-the-art, although FCS needs adequate resources to sustain and maintain them.

There are, however, new areas emerging in the computing discipline and an increasing importance and emphasis being attached to some of the older ones. Clearly significant examples of this are: e-health, simulation and modeling, game design, bioinformatics, biocomputing, mobility, networks, and information security as well assurance. At the moment FCS does not have the resources it needs to play an effective role in these areas, yet these areas present opportunities for enhancing the economic prosperity and well being of the province. New Brunswick industry is expressing great interest in any future graduates in these areas. In addition, research opportunities in these areas with industry are presenting themselves, which cannot be pursued further.

We are utilizing our entire faculty to the fullest extent delivering the undergraduate and graduate courses necessary to support the current programs and to deploy the new Bachelor of Information Systems program. Although, in general, these are not seen as times for expanding university programs, we think that education and research in the above-mentioned areas is an exception. This is in agreement with “The New Brunswick Reality Report: Part 3 Policy Directions” which states that “... growth will be led by ...information and communication technology, and e-health.” Clearly to significantly grow computing education in the province requires the active support of the government.

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