Electronic Commerce in Canadian Universities

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Introduction

The growth and spread of the Internet has created a revolution in human communication and interaction. The impact is being felt in every part of the economy: creating new business models and transforming the way entire industries function. The battle for high tech workers, initially fought in the high tech sector, has spread across the entire economy as companies attempt to obtain the technical and business skills required to cope with the demands of these new business models.

The Canadian E-Business Opportunities Roundtable is a private-sector led initiative formed in 1999 to develop a strategy for accelerating Canada's participation in the Internet economy. After the January 2000 release of its report *Fast Forward: Accelerating Canada's Leadership in the Internet Economy*, the Roundtable devised the 'e-Team' Canada strategy: six issue teams, lead by Roundtable members. The Talent Pool Team, led by Kelvin Ogilvie, President of Acadia University, was mandated with examining the expansion of the e-business talent pool in Canada through the acceleration of skills training and retraining.

To that end, this paper provides an overview of the research and course offerings related to electronic commerce (e-commerce) and e-business in Canadian universities. This overview aims to support both the Talent Pool mandate, and current areas of policy research on the development of e-business clusters and a national research agenda on e-commerce and the digital economy. The brief analysis in Part One is followed by a list of individual university offerings (Part Two).

It should be noted that this report is not comprehensive and is current as of November, 2000. We invite further submissions and corrections. Please send comments or input to eteam.study@ic.gc.ca.

For more information on the Canadian E-Business Opportunities Roundtable, please visit http://e-com.ic.gc.ca/eteam/.

Part One - Analysis

Canadian universities offer a broad range of e-commerce related programs and research opportunities. There are eight universities that offer full programs or house research centres focussed specifically on e-commerce:

- The Concordia Electronic Commerce Institute;
- Dalhousie's Master of Electronic Commerce;
- McMaster's MBA in Electronic Commerce;
- Technical University of British Columbia's Graduate Program in Electronic Commerce;
- University of New Brunswick, Saint John's (UNBSJ) Electronic Commerce Centre;
- University of Toronto's (forthcoming) Centre for Innovation, Law and Policy;
- Écoles des Hautes Études Commerciales Master's Diploma in Electronic Commerce, and
- University of British Columbia's (UBC) Bureau for e-Business Research.

Two universities offer specializations in e-commerce: UNBSJ offers undergraduate and graduate specializations in Electronic Commerce through their Faculty of Business, and Acadia University offers a bachelor of Computer Science with a specialization in Electronic Commerce. Acadia has adopted a unique strategic course offering and is incorporating e-business concepts as an integral part of every aspect of its undergraduate BBA program.

In addition to these specific programs and research institutes, there are a number of programs and institutes that are related to e-commerce. In particular, most universities offer programs related to information technology (IT) infrastructure in the form of Computer Science and Computer and Electrical Engineering Programs. The prominent schools are Carleton, McGill, Queens, Calgary, Manitoba, University of Toronto (U of T), UQAM, Université de Sherbrooke, UNB Fredericton and Waterloo. Also, the following schools offer business programs in the management of IT: Athabasca; Queens; Ryerson; Simon Fraser University (SFU); University of Alberta (U of A); University of British Columbia (UBC); Ottawa; Laval; Waterloo, and Western.

There are a few schools that have developed cross-disciplinary programs and research institutes that house distinct, yet complimentary discipline expertise relevant to e-commerce: The Carleton Research Unit on Innovation, Science and Environment; McMaster's Theme School on Science, Technology and Public Policy; SFU's Centre for Policy Research on Science and Technology; SFU's research group - Innovators of Digital Economy Alternatives; Télé-université's LICEF research laboratory; Trent's Computer Studies Program, and U of T's Information Policy Research Program.

With respect to legal research, only the U of T Law School and the University of Ottawa appear to be engaging in e-commerce issues. In addition to legal research, there is a noticeable absence within the discipline of economics with respect to research on e-commerce and the digital economy.

It should be noted that there are individual researchers, private universities and college and technical schools across the country that are engaging in e-commerce research and teaching from a variety of disciplines. They are not included here.

Part Two - Individual University Offerings

Acadia University

- Acadia University's Jodrey School of Computer Science offers both a Bachelor and a Master of Computer Science with specializations in e-commerce.

- The F.C. Manning School of Business Administration has made comprehensive changes to their traditional Bachelor of Business Administration program. Starting September 2000, e-business management skills will be integrated into most business classes over a two-year phase-in period. The program will be taught from a broad, cross-disciplinary perspective.

- Several business school faculty are actively engaged in research and technology-enhanced teaching related to e-business. These are: web-based analysis for competitive intelligence (Dr. Conor Vibert), virtual learning environment software products for e-business analysis and problem-solving (Dr. Scott Follows) and a forthcoming book on Internet law (Prof. Steve Enman, co-author).

Athabasca University

- Athabasca offers an MBA in Information Technology Management. The program includes a specialized mixture of IT and business and is aimed at managers and IT professionals.

- The Centre for Computing and Information Systems offers courses related to technological infrastructure for e-commerce.

- The School of Business is developing a Bachelor of Commerce program with a major in e-commerce.

Bishop's University

- In the Williams School of Business and Economics there is a Business Computer concentration focusing on information management.

Brandon University

- In the School of Mathematics and Computer Science there are courses offered in Cryptography and Number Theory, Software Engineering, Information Systems, Microprocessors, etc.

Carleton University

- There is a strong technical presence at Carleton. The School of Computer Science offers MA and Ph.D programs through the Ottawa-Carleton Institute for Computer Science, jointly administered with the School of Information Technology and Engineering at Ottawa U. The courses focus on issues such as computer security, cryptography, distributed databases and transactional processing systems.

- There are MA and Ph.D programs in Electrical Engineering that focus on key aspects of IT infrastructure.

- The Electrical and Computer Engineering department houses the Digital Communications Research Laboratory, the Lightwave Communications Research Laboratory and the Multimedia Communications Research Laboratory.

- The Master of Science in Information and System Science is a program aimed at providing training in the use and applications of computers.

- On the policy side, Carleton recently launched the Carleton Research Unit on Innovation, Science and Environment (CRUISE), a cross-disciplinary initiative housed within the School of Public Administration. The initiative aims to strengthen Carleton's focus on public affairs, policy and high technology. Many areas directly related to e-commerce are highlighted as central research issues.

- Finally, there are MA and Ph.D programs in Communications. Central themes of these programs are telecommunications policy, the emergence of the new information economy and its social, cultural, political and economic impacts.

Concordia University

- Concordia recently launched The Concordia Electronic Commerce Institute (CECI) which is run by the Faculty of Commerce and Administration. The institute recognizes the inter-disciplinary nature of e-commerce and engages in a wide variety of issues relevant to e-commerce.

- The Department of Computer Science focuses on research areas such as algorithms and complexity, computer systems and VLSI architecture, databases, information systems and software engineering.

Dalhousie University

- Dalhousie offers a Master of Electronic Commerce and an Executive Master of Electronic Commerce. These are interdisciplinary graduate programs run by the faculties of Computer Science, Law and Management.

- The Faculty of Computer Science has established the Global Information

Networking Institute. With its faculty partners, the Institute has identified e-commerce, software engineering, telemedicine (including e-health), bio-informatics and complex systems modelling and analysis as its research and development areas.

- The Faculty of Law covers many aspects of e-business in courses like Law and Technology, Internet and Media Law, Information Technology Transactions, Intellectual Property Law, International Business Transactions and Electronic Commerce Overview. Still other practices are dealt with as part of larger integrated courses such as Commercial Law, Maritime Practice and Competition Law.

- In the Faculty of Management, the BComm and MBA programs have marketing informatics and data mining as areas of emphasis, while the MBA program has an e-commerce course taught from a marketing perspective. The MBA in Information Technology is designed to produce graduates for careers in e-commerce.

- The School of Library and Information Studies has research projects that focus on the user interface and organizational structure of commercial websites.

École des Hautes Etudes Commerciales

- The École offers a Master's Diploma in e-commerce that focuses on both the business and technical aspects of e-commerce.

McGill University

- McGill is home to a number of research centres that touch on e-commerce issues: the Centre for Intelligent Machines; the Centre for the Study of Regulated Industries, and the Centre for Society, Technology and Development. McGill is also home to a number of relevant Networks of Centres of Excellence (NCEs): the Canadian Institute for Telecommunications Research; the Institute for Robotics and Intelligent Systems; the Microelectronic Devices, Circuits and Systems Centre, and the Telelearning Centre.

- McGill has strong technical programs that focus on a number of areas relevant to e-commerce, including the Department of Electrical and Computer Engineering and the School of Computer Science which includes a focus on cryptography.

McMaster University

- The Michael G. DeGroote School of Business offers a Ph.D program in Management Science and Systems and an MBA stream in e-commerce. The MBA program has a technical emphasis; approximately 40 percent of the courses are technical in nature.

- The Management of Innovation and New Technology Research Centre in the School of Business hosted a World Congress on the Management of Electronic Commerce. The second World Congress will be hosted January 2001.

- The School of Business recently established the Wayne Fox Chair in Business Innovation. Its focus is on e-commerce research. There are seven faculty members with full-time research interests in e-commerce.

- Faculty research and publications span the following areas: business-to-business e-commerce management issues, negotiation support systems, intelligent software agents, intellectual capital and knowledge management, privacy, security, and trust issues, and supply chain management.

- The Bachelor of Commerce program includes a stream in Management and Information Systems.

- The graduate program in the department of Electrical and Computer Engineering has a focus in communications research and offers courses on subjects such as wireless communication networks.

- The Faculty of Engineering is home to a number of research institutes: the Communications Research Laboratory; the Centre for Electrophotonic Materials and Devices; the Design and Manufacturing Systems Laboratory (i.e. CAD/CMM software); the Intelligent Machines and Manufacturing Research Centre; the Software Engineering Research Group, and the Wireless Technology Group.

- The Faculty of Humanities' Combined Honours in Multimedia program is offered in one of the most advanced humanities computing centres in Canada.

Memorial University

- The Centre for International Business closely examines the knowledge-based service sector focussing on the sector's economic importance, global changes, the role of government, the impact of information and communications technologies (ICT) and human resource issues.

- Memorial also hosts the Centre for Digital Hardware Applications Research and concentrates on application-specific integrated circuits. The Centre performs research in switch fabrics for communication networks, encryption systems and error control coding.

- In the Faculty of Medicine there is the Telemedicine Tetra - a research and development facility aimed at the use of ICT in the delivery of health and education services to non-urban, rural and remote areas.

- The Bachelor of Commerce program has a concentration in information systems.

Nipissing University

- The Canadore College of Applied Arts and Technology, with the Department of Business, is establishing a post-diploma program in Supply Chain Management.

Queens University

- The MBA program in Science and Technology, housed in the School of Business, focuses on science and technology management and is ranked as the best MBA program in the country.

- The Queens Management Research Centre for Knowledge-Based Enterprises, also housed in the School of Business, focuses on the needs and challenges of small, technology-oriented enterprises.

- Queens also hosts a number of engineering programs in fields such as electrical, communications, computer and software engineering.

Ryerson Polytechnic University

- The School of Information Technology Management offers a B Comm in Information Technology Management which focuses on the development and management of IT.

- Ryerson also hosts the Centre for Learning Technologies and the Rogers Communications Centre.

Simon Fraser University

- The Centre for Policy Research on Science and Technology (CPROST) is part of the School of Communication and engages in research on the relationship between public policy and technology. Current research programs include: management of technological change; science, technology and innovation analysis; valuation of information services, and the Canadian SR&ED tax credit program.

- In the Faculty of Business Administration there is a Management of Technology MBA program that is designed to address the management needs of the high-tech sector.

- Also in the Faculty of Business Administration there is a Management Information Systems program. Areas of expertise include information technology strategy, telecommunications, database systems, new business trends (i.e., telecommuting) and business process re-engineering.

- The IDEA (Innovators of Digital Economy Alternatives) research team looks at opportunities and obstacles that may arise from the adoption of digital commerce technology.

- The School of Computing Science currently has research projects oriented towards

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intelligent computation and human-machine interaction. The school also houses the TeleLearning Network of Centres of Excellence.

Technical University of British Columbia

- This University offers several graduate programs in Applied Science (i.e., Information Technology, Management and Technology and Interactive Arts) that relate well to e-commerce issues. They also offer a variety of undergraduate programs related to e-commerce.

Trent University

- Trent's Computer Studies has evolved to a multi-disciplinary approach that extends into science, social science, industry and the humanities. Courses are currently offered on infrastructure and architecture; the 'special topics' courses are Distributed Digital Multimedia, Intranets and Groupware and Advanced Topics in Information Systems: E-commerce.

Université Laval

- The School of Computer Science has research grants related to studies in technologies in the workplace, telecommunications, fibre-optics and optic-electronics fields and international jurisdiction of economic integration.
- The university also offers a Master in Technological Entrepreneurship which teaches the creation and management of technology-.; ied companies.

Université de Montréal

- The University has two research centres that touch on e-commerce. CRITERES, the Centre for Economic and Social Regulatory Transformations, looks at the development and impacts of economics, politics and sociology. CIRST, is the Centre for Research in Science and Technology, has interdisciplinary research projects looking into the role of science and technology in developed societies.

Université de Moncton

- The University of Moncton offers a Multimedia MBA which includes many aspects of e-commerce and telecommunications.

Université de Quebec

- The university has many campuses across Quebec with many research groups and centres involved in fields related to e-commerce.

- At UQTR (Trois-Rivières) there is the SME Research Centre which studies technological changes in SME's.
- At UQAM (Montrèal) CRISES (Centre de recherche sur les innovations sociales dans l'économie sociale, les entreprises et les syndicats) studies the effects of innovation on the economy, society and business.
- Centre INRS - Télécommunications Institut National de la Recherche Scientifique is self-defined as Canada's only university institution exclusively oriented to the study of telecommunications in Canada and is based at UQAM.
- The UNESCO-BELL chair for Communications and International Development at UQAM has done research on e-commerce directly. One such study was on e-commerce in Quebec.
- At Télé-université, LICEF is a laboratory that is dedicated to cognitive informatics and training environments. LICEF has a number of research projects underway that revolve around e-business. Recherche et organisation des connaissances (ROC) is one example of a LICEF project, it has developed *Nomino* a tool designed to facilitate document searches on the Internet.
- At UQAC (Chicoutimi) there is laboratory for computer science research - Laboratoire de recherche en informatique et bureautique (REIB) et Groupe de recherche en informatique (GRI).
- At most of the university's campuses there are Master's programs in telecommunications, computer science, electrical engineering and business administration that all have facets dealing with e-commerce.
- At UQAH (Hull) there are e-commerce courses that are offered in both business administration and computer sciences fields at the undergraduate level.

Université de Sherbrooke
- The University offers a Master of Electrical Engineering with specialisation telecommunications and multimedia.

University of Alberta
- University of Alberta offers two e-commerce-related MBA programs: MBA with specialization in Technology Transfer and a joint MBA/MENG degree.
- There are undergraduate and graduate courses in the Computer and Electrical Engineering program related to e-commerce.
- There are research centres focussing on multimedia, and computer control and intelligence systems.

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University of British Columbia

- The Faculty of Commerce focuses extensively on e-business in its courses and research.
- The MBA program has added an e-business focus to its offerings for Fall with a comprehensive set of courses in e-business.
- The B Comm program offers a major in IT management.
- Research in e-business is supported through the Bureau for e-Business Research (BEBR) and the Marketing @ Tech Edge Lab (MATE) within UBC's Faculty of Commerce. BEBR stimulates and coordinates e-business research within the Faculty through workshops, roundtables, research projects and a working paper series. MATE addresses research challenges on the interface of e-business and marketing in the areas of data mining, customer relationship management and Internet marketing.
- The Faculty of Computer Science and the Centre for Integrated Computer Science Research have a number of laboratories and research projects relevant to e-commerce.
- In the Department of Electrical and Computer Engineering, the Signal Processing and Multimedia Group has a number of research projects related to e-commerce issues. The Department also houses the Ultra-Fast Electronics and Fibre Optics Research Laboratory.

University of Calgary

- The University of Calgary has numerous research centres and affiliated networks related to e-commerce: the Knowledge Science Institute; the Multimedia Advanced Computation Infrastructure; the Research Unit for Public Policy Studies; the Telecommunications Research Laboratories; the Software Research and Development Centre; the Convergence Research Network, and the NETERA Alliance for Advanced Networking, Computing and Multimedia Resources.
- In addition there is an affiliation with TR Labs, a leading ICT research consortium, that focuses on data networking, network access, network systems, photonics and wireless communications.
- The Department of Electrical and Computer Engineering is ICT focussed.

University of Manitoba

- The MSc program in Computing and Information Science offers many courses relevant to e-commerce.

- The Department of Computer Science has a number of research groups studying topics such as advanced database systems, computer communications and networking

- The Faculty of Engineering is the headquarters of the NCE for Intelligent Sensing for Innovative Structures and participates in three other NCEs in microelectronics, telecommunications and robotics.

- The Internet Innovation Centre brings together university researchers, government and business to further Internet research and development and to assist industry in gaining access to the latest technologies.

- The Department of Electrical and Computer Engineering and the Department of Computer Science offer many courses related to IT infrastructure.

- The Faculty of Management offers a number of courses and structured programs involving various aspects of e-business.

- The Division of Continuing Education offers an IT Program.

University of New Brunswick (UNBF) and UNB Saint John

- The Faculty of Business at UNBSJ houses the Electronic Commerce Centre.

- Cadmi Microelectronic Inc. at UNBF is a partnership between the University, government and industry to provide state-of-the-art microelectronics technology transfer to New Brunswick businesses.

- The Faculty of Computer Science at UNBF is the home of the institution's Information Technology Centre.

- Related UNBF research chairs include a research chair in Technology Management and Entrepreneurship and the Vaughan Chair of Regional Economics.

- A related research chair at UNBSJ is the Power-Xerox Research Chair in the Management of Technological Change.

Ottawa University

- Ottawa University's Law School offers the following courses: Computers and the Law: Regulation of the Internet and Internet Commerce; Computers and the Law: Regulation of the Internet and Internet Communication; and, Computers and the Law: Electronic Commerce Law Practice Workshop.

- There is a School of Information Technology and Engineering.

- Graduate studies in Computer Science are offered and include courses in knowledge-based systems and computer networks.

- The MBA program offers a course called Strategic Management of Information Technology.

University of Prince Edward Island (UPEI)

- UPEI offers a minor in Information Technology and has a School of Computer Science.

University of Regina

- In the Faculty of Engineering there is an Electronic Systems Engineering program and a certificate program in Software Systems Engineering.
- Among the research centres at the University, two are related to e-commerce issues: the Institute for Computational Discovery and the Centre for Advanced Systems.

University of Saskatchewan

- The Institute for Computer and Information Technology brings together university and industry researchers and developers in the IT sector.
- The Department of Electrical Engineering offers MSc and Ph.D programs and has research groups that focus on both communications and electronics.
- University of Saskatchewan has a Computer Science program.

University of Toronto

- The Faculty of Law is planning the development of the Centre for Innovation, Law and Policy, a multifaceted research, teaching and policy advisory centre devoted to the study of laws, institutions and policies that affect or are affected by, innovation and technological change. The Centre's potential scope encompasses intellectual property, the Internet and e-commerce, biotechnology, telecommunications and the process and effect of innovation and technological change.
- The Faculty of Law, through the Bora Laskin Law Library, has an Electronic Commerce Law and Policy Research Guide with great links and resources
- The Department of Industrial Engineering hosts the Enterprise Integration Laboratory. The Lab's research focuses on enabling businesses to develop, manufacture, sell, deliver and support products and services.
- There is a Computing Disciplines Facility.
- Within the Department of Electrical and Computer Engineering there is the Computer Engineering Research Group whose interests range across a number of e-commerce-related issues.
- The Department of Mechanical and Industrial Engineering focuses on a number of research areas related to e-commerce, including computer aided design,

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engineering and information systems.

- The Department of Engineering's Professional Development Centre offers a one-day course on e-commerce aimed at managers interested in leveraging the Internet in their business processes.
- The McLuhan Centre researches communication issues including the social, cultural and economic impacts of communication technology and new media policy.
- The Faculty of Information Sciences houses the Information Policy Research Program which brings together a network of academics, professionals and interested laypersons to discuss information policy issues. Many papers and conference proceedings have been developed through this program.

University of Victoria

- The Department of Computer Science has five research groups including the Combinational Algorithms Group and the Software Systems and Software Engineering Group.
- Electrical and Computer Engineering Faculty members are involved with the following research groups: the Canadian Institute for Telecommunications Research; the Victoria Group; the Computer-Aided Design of Microwave Integrated Circuits Group, and the Digital Signal Processing Group.
- The University also houses the cross-disciplinary Laboratory for Automation, Communication and Information Systems Research.

University of Waterloo

- The University of Waterloo offers a distance education Management of Technology degree which is aimed at working engineers who deal with technology management.
- The Waterloo Management of Integrated Manufacturing Systems Research Centre for Logistics and Manufacturing (WATMIMS) holds workshops, seminars and lecture series on issues such as supply chain management, agile manufacturing, just-in-time manufacturing and computer integrated manufacturing.
- There are a number of research groups within the Faculty of Engineering, and the Electrical and Computer Engineering Program, that are related to e-commerce infrastructure and systems.
- In the Faculty of Arts, research on electronic marketing, on electronic documents and on SysTrust principles is conducted in the Department of Economics, in the language departments and in the School of Accounting.
- The University of Waterloo Centre for Information Systems Assurance conducts research on audit and assurance domains, on methods of measuring IT

competencies and on systems risks. The Centre co-sponsors conferences and workshops on e-commerce.

University of Western Ontario

- The department of Electrical and Computer Engineering has a number of research centres and laboratories that focus on communications, digital electronics, etc.
- In the Ivey School of Business there is an MBA program in Management Information Systems.

University of Winnipeg

- University of Winnipeg has a Department of Business Computing and Administrative Studies.

Wilfrid Laurier University

- In the Department of Physics and Computing there are a number of courses relevant to e-commerce.