Industry, government, university relations -- Case studies of successful partnerships

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Canadian R&D Gaps

Canada has both a strategic research gap and an innovation gap

- Strategic gap: lack of private sector investment in medium- to long-term strategic R&D in major industrial labs
- Innovation gap: failure to transfer technology and capitalize on the results flowing from government and university research establishments
Percentage of GERD by Funding Sector (1963-1995)

Source: OECD Main S&T Indicators
Industrial Investment in R&D as a % of GDP (1963-95)

Source: OECD Main S&T Indicators
## Percentage of GERD Financed by Industry

<table>
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<th>1993</th>
<th>1994&lt;sup&gt;p&lt;/sup&gt;</th>
<th>1995&lt;sup&gt;p&lt;/sup&gt;</th>
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<tbody>
<tr>
<td>Canada</td>
<td>44.2</td>
<td>44.9</td>
<td>45.7</td>
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<tr>
<td>Japan</td>
<td>68.2</td>
<td>68.2</td>
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<tr>
<td>USA</td>
<td>58.7</td>
<td>59.0</td>
<td>59.5</td>
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* Source: OECD, Main Science and Technology Indicators, May 1996

<sup>p</sup> - Provisional
Bridging the Research Spectrum

Graph showing the relative allocation of resources between Fundamental, Strategic R&D, and Development, with NRC and Govt Agencies, Universities, and Industry. The graph indicates a shift towards more resources allocated to Development.
National Research Council

• created in 1916

  “to bring about united effort and mutual co-operation in solving problems of scientific and industrial research”

• research institutes, facilities, IRAP, CISTI
NRC’s Vision to 2001

To be a leader in the development of an innovative, knowledge-based economy through science and technology

- research excellence and relevance
- collaborations and partnerships in key technologies
- leadership in developing Canada’s innovation systems
- entrepreneurial approach to the commercialization of NRC technology
NRC Collaborations

• NRC is involved in more than 1600 research collaborations with industry

• Types of interactions:
  – Collaborative Research Projects
  – Facilities-based Partnerships
  – Collaborative Research Centres
  – Incubators
  – Consortia
  – Special Interest Groups
Consortium Case Study - SSOC

• Consortium to create a Canadian capability in integrated optoelectronics research for applications in the information industry

• Technology developed: Wavelength Division Multiplexing
SSOC Members

- Bell Northern Research (now Nortel)
- Department of National Defense
- EG & G Optoelectronics
- MPR Teltech Ltd.
- TR Labs
- ITS Electronics
- Seastar Optics
- Communications Research Centre
- National Optics Institute
Consortium Case Study - OPCOM

Mission: to develop and integrate the enabling technologies to build an optoelectronic processor for high-speed processing and parallel access to large data bases

- Five-year, $20 M pre-competitive research venture
OPCOM Members

• National Optics Institute
• Ottawa-Carleton Research Institute
• KOM Inc.
• Spar Aerospace Ltd.
• Optoelectronics Inc.
• Andrew Engineering
• DynaTek Automation Systems
• Oprel Technology
• OPTEX
• National Research Council
OCRInet

- Provides and manages the first ATM broadband network in Canada dedicated to research, development and demonstration of new and innovative network technology, services and applications
**OCRI net founding partners**

- Algonquin College
- Bell Canada
- Bell Northern Research (now Nortel)
- Carleton University
- Communications Research Centre
- Gandalf Technologies
- Mitel Corporation
- National Research Council
- Newbridge Networks
- Stentor Resource Centre
- Telecommunications Research Institute of Ontario
- Telesat Canada
- University of Ottawa
NRC Special Interest Groups

• Provide industry input into pre-competitive R&D

• Help set NRC research priorities

• Members gain information on latest trends and access to facilities and training
NRC Special Interest Groups

- SIGIM (injection molding)
- SIGBLOW (blow molding)
- SIGCAST (die casting)
- BLENDTECH (Polymer compounding)
- SURFTEC (surface technologies in resources and aerospace sectors)
- FOAMTECH (polymer foams)
Natural Sciences and Engineering Research Council

Partnership Programs (est. 96-97 expenditure)

- Strategic Projects ($40M)
- University - Industry Projects ($39M)
- Networks of Centres of Excellence ($23M)
- Technology Partnerships Program ($4M)
- Research Networks ($6M)
- Industrial Research Chairs ($12M)
NSERC Industrial Research Chairs

To assist universities to build up a critical mass required for major research efforts in areas of interest to industry

• 181 Industrial Chairs Awards since 1984 totaling $161 M; industrial commitment of $148 M

• Life Sciences; Engineering, Computing and Statistics; Physical Sciences
Networks of Centres of Excellence

• Links experts across Canada in many scientific and multidisciplinary fields to promote excellence

• Permanent funding established by the 1997 Federal Budget

• Annual allocation set at $47.4 million

• Funding cycles increased from four to seven years
Networks of Centres of Excellence

- Help to retain Canada’s scientists and engineers
- Creates multidisciplinary, multisectoral programs, national in scope
- Promotes commercialization of technology developed
Networks of Centres of Excellence

• 14 Networks cover 5 technology areas
  – health and biotechnology
  – information technology
  – natural resources
  – infrastructure
  – human resources
Networks of Centres of Excellence - Impact

- 35 spin-off companies with 143 employees
- commercialization of technology
- creation of new jobs
- training of HQP in strategic areas
NRC - NSERC Research Partnership Program

A five-year, $20 million jointly funded program to:

- Capitalize on complementary R&D capacities
- Build strong three-way linkages between NRC’s institutes, universities and industry
- Enhance knowledge and technology transfer
- Develop research skills of highly qualified personnel

Two competitions have been held; 31 projects funded


**NRC - NSERC Research Partnership Program**

*example: SiGe Photonic Devices*

- Nortel, Mitel, Gennum, Carleton University, NRC

- study to determine basic optical properties of SiGe layers for potential use in optoelectronic integrated circuits

- pool resources in state-of-the-art facilities at NRC
Facilities-Based Partnership
Case Study - SiGe CVD

Silicon-Germanium Chemical Vapour Deposition facility

- A facilities-based partnership providing state-of-the-art equipment worth $1.2 million

- Founding partners:
  - NRC
  - Northern Telecom
  - NSERC (on behalf of university community)
Consortium for Software Engineering Research - CSER

- Addresses the need to:
  - improve the quality of software engineering education
  - produce more software engineers

- Industry-driven; industry defines research problem

- University staff work on-site, in industry
Consortium for Software Engineering Research - CSER

• Founding partners with collaboration of NRC and NSERC:
  – Bell Canada
  – Mitel Corporation
  – Nortel
  – Object Technology International
  – IBM Canada Ltd.

• Universities: Victoria, Toronto, Waterloo, Ottawa, Montreal, Acadia
Consortium for Software Engineering Research - CSER

- $18 M value over five years
- Demonstration Centre at NRC to exhibit results
- Board of Directors with industry and university representation; NRC provides a Research Director and Operations Manager
O-Vitesse

• Responds to an identified need for trained software engineers
• reskills unemployed or underemployed university graduates
• 16-month mixture of work terms and course work
O-Vitesse

- 431 formal applications received after running an ad in one paper
- over half had post-graduate degrees
- 20% were unemployed; many underemployed
Consortium for Graduate Education in Software Engineering - ConGESE

- A unique program which offers an advanced degree in software engineering:
  - part-time, during work hours
  - at the work site
  - with courses provided by any or all of six universities

- Financially supported by IBM Canada and Nortel, and the Information Technology Research Centre
ConGESE

- Participating universities:
  - Carleton University
  - Queen’s University
  - University of Ottawa
  - University of Toronto
  - University of Waterloo
  - University of Western Ontario

- ConGESE coordinates the program; universities grant the degrees
Government-University-Industry Partnerships: Lessons Learned

• Industry partners must be involved from the outset
• Partnership objectives must be clearly stated
• Access to intellectual property must be defined
• Planning targets should be established
• Partnerships must be flexible enough to allow participation based on competencies and commitment, not size
NRC - NSERC Research Partnership Program

- biotechnologies
- construction technologies
- engineering technologies (including aerospace and marine technologies)
- information and telecommunications technologies
- manufacturing technologies (including materials and chemical processes)
- integrated manufacturing and sensor and control technologies
- molecular sciences, astrophysics and national measurement standards
ASRA Case Study

- Joint funding provided by:
  - Department of Defense
  - NSERC
  - Bell Helicopter

- Equipment provided by:
  - CAE Electronics Ltd.
  - Canadian Marconi Company
  - Litton Systems Canada Ltd.
Facilities-Based Partnership Case Study - ASRA

Advanced Systems Research Aircraft (ASRA)

- a third generation helicopter research platform
- initial cost $4.8 million (Cdn)
Canadian Technology Network

• CTN provides national and international one-stop shopping for SMEs for technology and business related:
  - information
  - contacts
  - expertise
Canadian Technology Network

- Established by Industry Canada and NRC
- Sponsored by NRC’s Industrial Research Assistance Program and Industry Canada’s Strategis
- Partnered by the Canadian Advanced Technology Association’s TechnoGate