



Partnerships for Productivity and Advanced Skills

The Role of Colleges in Canada's Innovation System

A Background Paper

Cover photos (top to bottom):

Culinary research at Holland College

Share the Warmth home energy efficiency program at Saskatchewan Institute of Applied Science and Technology

MRI-compatible incubator for premature babies developed at Nova Scotia Community College

Soybean research at La Cité collégiale

Executive Summary

The paper provides an assessment of what we currently know about college, institute and polytechnic (collectively described here as colleges) applied research and positions them as key players in Canada's innovation system and in the federal science and technology strategy.

The paper builds upon findings of previous research and reports on the results of the 2008/2009 *Applied Research Environmental Scan* and interviews with colleges on the College and Community Innovation Program. Data for 78 institutions (60 percent) were collected.

Previous analyses found that college applied research is an extension of the traditional partnership between colleges and the private sector. It is institutionally focused, requiring the mobilization of different college resources, whether human, material or technological, to deliver applied research services to private sector and community partners.

The key findings of the 2008/2009 *Applied Research Environmental Scan* provide evidence of increased applied research activity by colleges, institutes, polytechnics, cégeps and university colleges across the country.

Expansion of Institutional Mandates

- All colleges have applied research as part of their mandates, approved by college Boards of Directors.
- Provincial/territorial governments with legislative recognition for college applied research: British Columbia, Alberta, Ontario, Yukon, Northwest Territories, Nunavut and Quebec

Applied Research Partnerships

- 3,602 companies participated in applied research projects during 2008-09, seven times more than reported in 2005/2006.
- Respondent colleges identified 97 research networks at local, regional, provincial and national levels.

Promotion of College Applied Research Services and Areas of Research Specialization

- Over 100 institutions promote applied research services through their websites.
- Colleges identified 142 areas of research specialization, most within the four priority areas of the federal government Science and Technology Strategy.

Applied Research Structures

- Sixty-seven institutions have a dedicated applied research division or unit, more than double the number reported in 2005/2006.
- Between the 2005/2006 and 2008/2009, more institutions reported full-time as opposed to part-time research staff: 54 in 2008/2009 compared to 34 in 2005/2006.
- In 2008/09, 1,209 faculty and staff and 2,513 students participated in applied research projects.
- Sixty-five colleges identified over 140 specialized research centres, up from 72 in 2005/2006.

College Core Budgets and Funding for Applied Research

- Respondent institutions reported a total of \$27.5 million in base budgets for applied research units/divisions or centres.
- Colleges also reported \$7.6 million in targeted funding for applied research projects.

Government and Private Sector Funding

- \$97.8 million in external funding from the following sources:
 - ♦ Private sector: \$45.5 million (\$4.2 million in 2005/2006)
 - ♦ Federal government: \$27.3 million (\$28 million in 2005/2006)
 - ♦ Provincial governments: \$24.9 million (\$13 million in 2005/2006)

Performance Measurement

- Colleges have developed a college-appropriate performance measurement framework which identifies key indicators to measure outcomes and provide direction for framing public sector programs and funding mechanisms.

Summary of Key Findings

College/Institute Applied Research Activity

	2005-2006	2008-2009
Investment		
• Private sector	\$ 4 million	\$ 45 million
• Federal government	28 million	27 million
• Provincial/territorial governments	13 million	25 million
• Colleges	unknown	35 million
Total investment	\$ 45 million	\$ 132 million
Partnerships with companies	515	3,602
Research centres	72	140
Faculty engaged in Applied Research	unknown	1,209
Students involved in projects	unknown	2,500
Areas of specialization aligned with Canada's Science & Technology Strategy	unknown	142
NSERC eligible institutions	13	51
Research networks	unknown	97



A student at Georgian College studies environmentally-friendly solutions

Table of Contents

1.	Introduction	1
2.	Background	2
2.1	An Initial Assessment and Typology of College Applied Research	2
2.2	Colleges' Role in the Research Continuum	4
2.3	Colleges and Small- and Medium-Sized Enterprises (SMEs)	5
2.4	College Research Capacity	5
2.5	Performance Measurement	5
3.	College Applied Research Process Framework	6
4.	Partnerships	7
5.	College Capacity	7
5.1	Expansion of Institutional Mandates	7
5.2	Applied Research Governance Structures	8
5.3	Promotion of College Applied Research Services and Areas of Research Specialization	8
5.4	College Research Centres and Specialized Labs	10
5.5	Funding of College Applied Research	12
5.5.1	College Core Budgets and Project Funding for Applied Research	12
5.5.2	Government and Private Sector Funding Sources	12
5.5.3	NSERC and the College and Community Innovation Program	12
5.5.4	CCI Interviews with Colleges and Institutes	14
5.5.5	Other Federal Funding Sources	16
5.6	Provisions that Facilitate Faculty and Student Participation	19
5.6.1	Faculty Participation in Applied Research	19
5.6.2	Student Participation in Applied Research	19
6.	Applied Research Delivery	21
7.	Performance Measurement of College Applied Research	22
8.	Conclusion	24
	References	25
	Appendix 1: List of Participating Colleges/Institutes	27
	Appendix 2: Research Networks Identified by Respondent Colleges	29
	Appendix 3: Areas of Research Specialization by Category and Province/Territory	32
	Appendix 4: Research Centres and Specialized Labs by Category and Province/Territory	39
	Appendix 5: List of CCI Funded Projects	45
	Appendix 6: Performance Measurement Tools for College Applied Research	49
	Surveys	51

Partnerships for Improved Productivity and Advanced Skills – The Role of Colleges in Canada’s Innovation System

“Shaking off complacency to achieve a more innovative Canadian economy will not only need a dedicated commitment of resources: it will require providing the right stimulus and incentives for innovation, fostering a business culture that sees innovation as a key driver of value; and enhancing the capacity of all elements of our innovation system to work together to create value for all Canadians.”

State of the Nation 2008, Science, Technology and Innovation Council

1. Introduction

Canada’s publicly-funded colleges, institutes, polytechnics, cégeps and university colleges have a pivotal role in provincial and territorial post-secondary education systems, providing a wide range of learning opportunities for Canadians to develop advanced skills for employment. Traditionally, business, industry and community partners turned to colleges¹ for the training and development of highly qualified employees. Over the last decade, these partnerships expanded to applied research services for product and process innovation and commercialization.

For the purposes of this paper, the definition of innovation is drawn from the Science, Technology and Innovation Council (STIC) as being “the process by which individuals, companies and organizations develop, master and use new products, designs, processes and business methods. These can be new to them, if not to their sector, their nation or to the world. The components of innovation include research and development, invention, capital investment and training and development.”²

STIC has recognized the need to strengthen collaboration with business and industry sectors, increase business expenditures to research and development (BERD) and improve Canada’s performance in the commercialization of research.³ Colleges’ extensive partnerships with business and industry, as providers of applied research and commercialization services, makes them an important component of the innovation system that can be used effectively to enhance innovation capacity and the productivity of business and industry.

ACCC is the national voluntary membership association, which serves publicly-funded colleges, institutes, cégeps, polytechnics and universities with a college mandate. Applied research is a means to meet the innovation needs of private sector and community partners in a comprehensive manner – both by providing applied research and commercialization services and support and by supplying graduates with the advanced skills required to support innovation, increased productivity and growth of Canadian businesses.

The number one priority of the ACCC 2009-2012 Strategic Plan is to *promote the excellence of members as the prime providers of advanced skills and applied research for social and economic development.*

Since 2002, ACCC has collaborated in studies on applied research activity and has convened member institutions around exemplary practices through national symposia. This background paper consolidates learnings to date and charts a path for the future for college applied research and commercialization services for business and industry and for social innovation research for community organizations.

¹ “Colleges” is used in this report as an omnibus term representing the diversity of publicly-funded institutions represented by the Association of Canadian Community Colleges (ACCC): colleges, institutes, collèges d’enseignement général et professionnel (cégeps), university colleges and polytechnics.

² Science, Technology and Innovation Council, *State of the Nation 2008 – Canada’s Science, Technology and Innovation System*. 2008/2009. pg. V.

³ As STIC (2008/2009) has indicated, the most recent data available on expenditures in research and development is for 2005/2006 and although Canada ranked 2nd in the OECD for higher education expenditures in research and development (HERD), it has ranked much lower, 15th, for business expenditures in R&D (BERD).

This paper provides an assessment of what we currently know about college applied research and concludes that it is a key vehicle for meeting the goals of the Government of Canada's Science and Technology Strategy. This paper draws and builds upon findings from previous research and reports on the results of the 2008/2009 *Applied Research Environmental Scan*, an on-line survey conducted between June and September, and interviews about the College and Community Innovation Program. Through the survey, data for 78 institutions were gathered. A list of participating colleges is provided in Appendix 1.

2. Background

This section provides an overview of the key reports and analyses, which have laid the groundwork for the development of the college applied research process framework described in section 3 of this paper.

2.1 An Initial Assessment and Typology of College Applied Research

The first comprehensive analysis of college applied research was completed in 2005 by Jim Madder, currently Executive Vice-President Academic at Red Deer College. Entitled *Innovation at Canadian Colleges and Institutes*, Madder's report provides an overview, including access to funding, college governance and institutional policies, human and financial resources and student involvement in applied research. A key contribution of the report is a typology, which outlines four stages of applied research at colleges from *Colleges with No Formal Innovation Policies and Structures* to *Novice Innovation Colleges*, *Established Innovation Institutions* and *Integrated Innovation Colleges*. This typology, provided in Table 1, suggests a progression towards increasingly formal governance structures and more significant human and financial resource allocations to applied research activity.

Madder indicated that these four stages should be viewed as a continuum rather than being discrete in nature and identified some of the key factors which impact upon where colleges are in this continuum:

- significance of innovation in the current institution vision, mission and strategic direction;
- historical mandate and history of innovation at the institution;
- availability and development of the human, physical and fiscal resources to support innovation;
- credentials offered and models of academic delivery used e.g. project-based delivery, work placements;
- nature of relationships with the public and private sectors;
- the focus of the local and regional economy.



*Niagara College students
monitor local wetlands*

Table 1
Typology of Stages of Applied Research at Colleges

<p>Colleges with no Formal Innovation Policies & Structures</p> <p>Characteristics:</p> <ul style="list-style-type: none"> • Undecided institutional commitment to applied research (AR) and no related policies, structures, human resources allocated or dedicated to AR, and no active support by senior administration <p>Activities:</p> <ul style="list-style-type: none"> • Focused on project-based delivery and/or student placements with employers; developed and implemented as “side of desk” activities for faculty, or associated with graduate studies of faculty or staff.
<p>Novice Innovation College</p> <p>Characteristics:</p> <ul style="list-style-type: none"> • Recent launch of AR activities with support from senior administration, with Director of Research appointed & reports to senior VP • Initial policies developed often for compliance with funding agency requirements and ad hoc fiscal & HR systems in place but incomplete, as institutional acceptance of AR activity as part of college mandate is not widespread and some cultural conflict on how AR is related to college mandate • AR activities are done by faculty with some release time or temporary staff allocations and initially more funds are available for capital equipment but less operating capital • A transitional and unstable stage of 3 to 7 years with little active support by administration. Time spent in this stage can be reduced by hiring experienced Director of Research or with intensive PD for college staff responsible for AR. <p>Activities:</p> <ul style="list-style-type: none"> • Potentially all as in the first state • Formal AR activities are usually project-based in collaboration with industry partners, with combination of industry support (cash or in-kind), and are limited in number, scope and framed as pilot projects.
<p>Established Innovation Colleges</p> <p>Characteristics:</p> <ul style="list-style-type: none"> • Comprehensive policies in place related for AR, including fiscal management, human resources and reporting, and facilities and equipment are established but may require renewal • AR human resource policies support more full-time longer term positions and resulting in less turn-over of AR-related personnel, with Director of Research reporting to senior VP Academic, Contract Training or Continuing Education. The systems and HR policies of AR activities have many parallels with those that support contract training. • Increased access to operational funding than can be managed by the existing AR administration and academic and service divisions support AR activities as part of the college mandate and mission. <p>Activities:</p> <ul style="list-style-type: none"> • Potentially all aspects of the first state • AR teams led by faculty conduct multiple projects that interrelate and faculty and staff may be seconded and fully funded to conduct AR activities on a continuing basis. • AR activities may support both local and regional needs and may be integrated with business support services • Funding and AR activities involve multiple public/private sector partnerships • As colleges progress through this stage there is greater focus on longer multi-year projects that provide sustainability for AR activities and greater stability in human resources.
<p>Integrated Innovation Colleges</p> <p>Characteristics:</p> <ul style="list-style-type: none"> • These colleges have integrated AR and business support systems that provide both business development support integrated with AR activities that may be regional/national or international in scope. These colleges are often relatively large with long-standing AR and business development activities. <p>Activities:</p> <ul style="list-style-type: none"> • Potentially all aspects of the first and third models/states • These colleges house business incubators, accelerators or business parks that are supported by and provide support to the college. Companies on campus may access research and development resources to conduct their own AR activities or may sub-contract AR activities to the college.

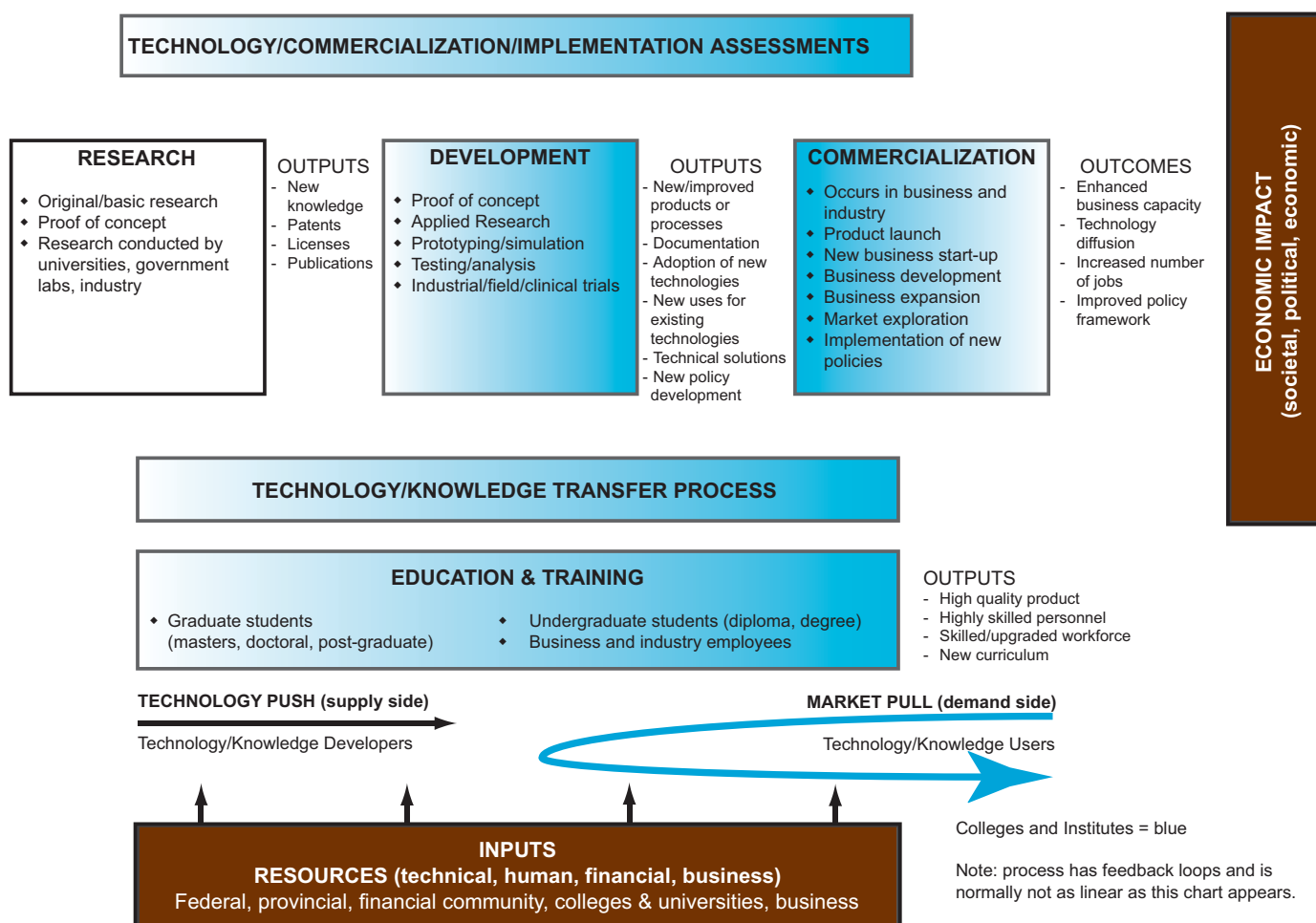
Source: Madder 2005

The Madder report did not provide any indication of the number of colleges that would consider themselves to be at each of these four stages. However, subsequent studies indicated that colleges were increasingly engaged and are structuring themselves accordingly. (Fisher 2008b, ACCC 2005/2006) This trend will be examined in more detail in Section 5. The typology continues to be relevant and is a foundational piece for the development of a college applied research process framework that highlights the key elements institutions require to provide effective applied research services for industry and business partners.

2.2 Colleges' Role in the Research Continuum

The research and analysis led by Marti Jurmain, Director, Research and Innovation at Niagara College, in collaboration with the ACCC National Research Advisory Committee,⁴ has also been instrumental in framing the role of colleges in applied research. The development of a model depicting the role of colleges in the research and development continuum has been key to identifying where and how colleges relate to other actors in the innovation system. This model (Figure 1) provides an overview of the research, development and commercialization process and shows that college research is driven by market pull, or the demand side, and by the users of technology or knowledge, who need to improve, refine or adapt technology to meet client needs. Colleges are positioned at the development, commercialization and knowledge transfer stages of research. This analysis is central to the development of the college applied research process framework, driven by demand from industry and community partners.

Figure 1
Canadian Colleges' Role in Research, Development and Commercialization



⁴ ACCC created the National Research Advisory Committee in 2005. The committee provides advice to ACCC on advocacy in applied research and encourages the development of applied research activities in member institutions.

2.3 Colleges and Small- and Medium-Sized Enterprises (SMEs)

The ACCC/Niagara College report entitled *College and Institutes and Canada's SMEs: A Partnership for Innovation*, reinforced the importance of business and industry partners and stressed how colleges can be instrumental in supporting SME investment in research and development, contributing to this under-served sector of the innovation system. This report defined innovation as “applying new ideas in a way that produces new value for the organization. New ideas do not mean “new to the world”. New ideas mean “new to the organization...”⁵ Applied research within the context of SMEs may not have as broad an impact as research led by large corporations, but has the potential to introduce new products or processes which can increase productivity, preserve or create jobs, contribute to the growth of a company, thus supporting community and regional development.

2.4 College Research Capacity

The 2008 report prepared for Industry Canada by Roger Fisher, entitled *The College Advantage: Private Sector Innovation & Highly Qualified Personnel* provides an update of college capacity in applied research, including the status of provincial legislation, operating grants, research and development (R&D) programs and faculty agreements. The report provides evidence of increased capacity and performance of colleges when compared to the 2002 Industry Canada review of college applied research. The doctoral thesis of Roger Fisher, *A Conceptual Framework for Research at Canadian Colleges* was also informative. The analysis was used for the development of the process framework presented in this paper.

2.5 Performance Measurement

Madder, Jurmain and Fisher all emphasized the importance of assessing the performance of applied research and emphasized the need to develop measures and indicators. The traditional measures used for basic and scholarly research conducted by universities, such as number of peer-reviewed journal publications and citations, patents and licenses are not relevant for measuring the performance of college applied research. A college-appropriate performance measurement framework and approach is presented in Section 7.



A Hydrogen-Electric Hybrid bus developed at Red River College

⁵ *Colleges and Institutes and Canada's SMEs: A Partnership for Innovation*, ACCC and Niagara College, 2007, pg. 13.

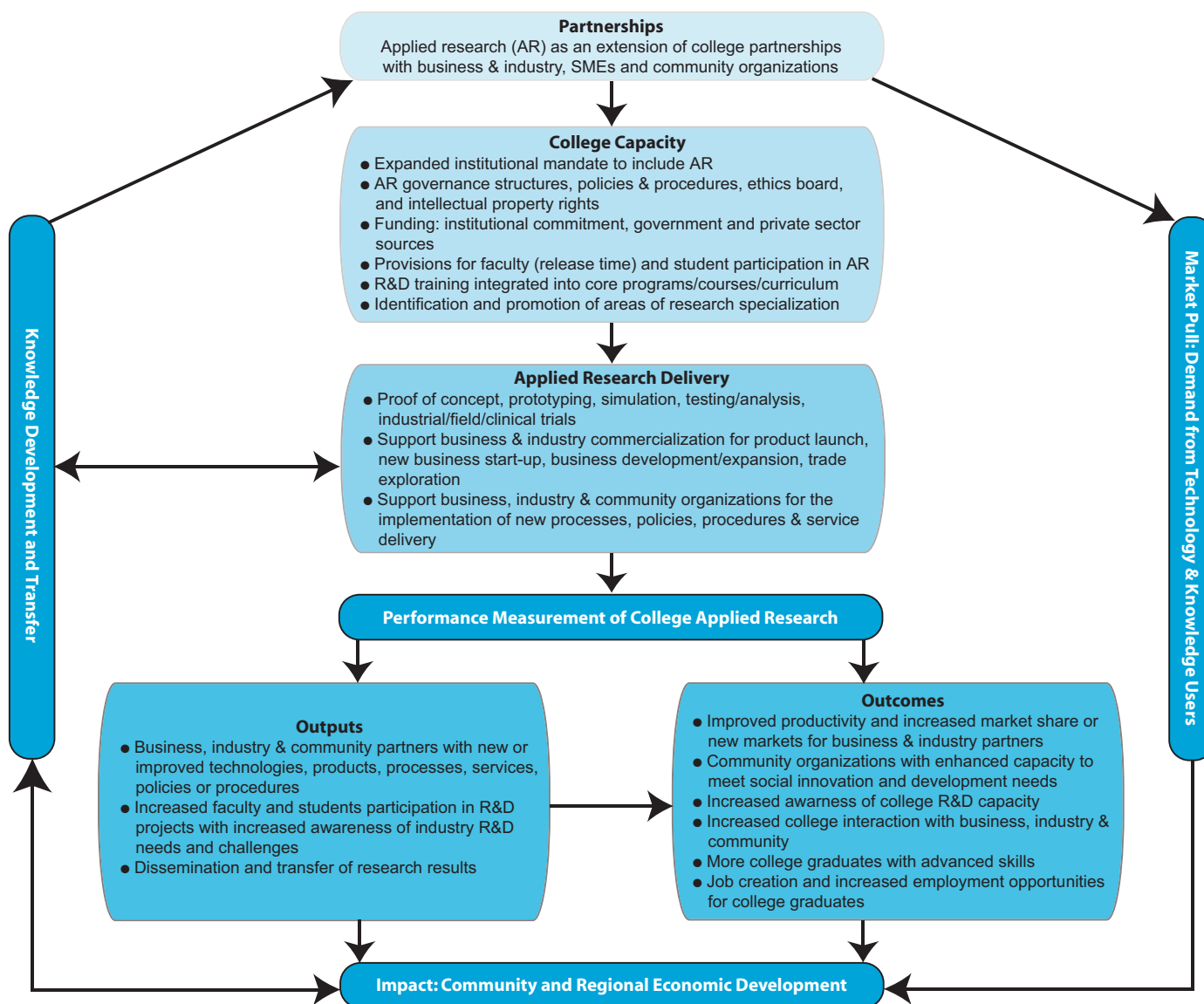
3. College Applied Research Process Framework

The work of Madder, Jurmain and Fisher concluded that college applied research and innovation are institutionally-focused which means that colleges bear the responsibility for the research, compared with university research delivered largely by individual researchers. This institutional approach involves the mobilization of different college resources, whether human, material or technological to support the delivery of client-based services for business, industry and community partners. To illustrate this institutional approach, the College Applied Research Process Framework (Figure 2) was developed to provide a visual overview.

The process framework begins with the “Partnerships” box, the point of departure for college engagement. The arrows to the right highlight how these partnerships drive applied research. The arrows also signify that these activities contribute to community and regional economic development, which in turn, through knowledge development and transfer, fosters new college – private sector partnerships.

The process framework also indicates that the business, industry and community partnerships have led colleges to build capacity. The key capacity elements, the types of applied research services offered and the performance measurement of these services are shown in the centre.

Figure 2
College Applied Research Process Framework



The framework also highlights the outputs, outcomes and impact of college applied research including improved products, processes, policies, procedures or service delivery, enhanced productivity gains and increased market share. Other benefits include an enhanced teaching and learning experience for faculty and students resulting in more college graduates with the advanced skills and innovation talent employers require. The ultimate benefit is community and regional economic development, which contributes to the development of more partnerships.

Each of the elements of the process framework is described in the following sections, with further details and updates on college capacity drawn from recent research and the results of the *2008/2009 Applied Research Environmental Scan* (hereafter referred to as the 2008/2009 Environmental Scan). Where relevant, comparisons are made with the results of the *2005/2006 Applied Research Survey*.

4. Partnerships

As shown in Figure 2, applied research activities are an extension of the partnerships that colleges have had with business, industry and community organizations. These partnerships were first initiated to ensure educational programs are in line with employer needs and to produce the graduates with the advanced skills required locally. Business, industry and community partners have been engaged with colleges at the governance level as representatives on Boards of Governors and members on Program Advisory Committees formed for the development of new programs and to update existing ones.

The *2008/2009 Environmental Scan* included questions on the nature and extent of applied research partnerships. The results provide evidence of increased activity. Colleges reported that 3,602 companies participated in applied research projects during 2008/2009, compared to 515 reported in 2005/2006.

Colleges are building capacity through research networks. The *2008/2009 Environmental Scan* identified 97 research networks at local, regional, provincial and national levels, many of which are sector specific, evidence that colleges are making the necessary research connections. A list of the research networks identified by respondent colleges through the 2008/2009 Environmental Scan is provided in Appendix 2. Examples include:

- **Local research networks:** Edmonton Regional Alliance, TechAlliance (London, Ont.), Toronto Region Research Alliance and York BioTech;
- **Regional research networks:** Central Alberta Regional Innovation Network, Great Plains and Northern Applied Research Network, WestLink Innovation Network, Northern Region Working Group;
- **Provincial research networks:** British Columbia Applied Research Network, Alberta Association of Colleges and Technical Institutes, Colleges Ontario Network for Industry Innovation – CONII;
- **National research networks:** Alliance for Commercialization of Canadian Technologies, Canadian Association of Research Ethics Board, Canadian Association of University Research Administrators; and
- **Sector specific research networks** in accordance with colleges' areas of specialization: Aquaculture Association of Canada, Canadian Inter-professional Health Collaborative, Canadian Council for Animal Care, Canadian Water Network, National Photovoltaic Innovation Network, Solar Building Research Network.

5. College Capacity

The process framework identifies the main elements colleges need for the effective delivery of applied research services. This section analyses and updates the status of college applied research capacity by examining each of these elements, drawing on current research.

5.1 Expansion of Institutional Mandates

The expansion of the institutional mandate, sanctioned by the college board of directors and in some cases by provincial/territorial legislation, is one of the first steps in building college capacity. Given the institutional approach to college applied research requiring the mobilization of resources from across a college, the need for a clear mandate is essential to ensure buy-in and support from leadership and the broad institution.

In 2005/2006, 71 percent of colleges reported that research and development is included as part of the mission and mandate. Fisher (2008b) provided provincial/territorial profiles of college R&D capacity that provided evidence of further progress. All colleges reporting now include research and development in their mandate. An analysis of Fisher's profiles confirms that there are two main categories of institutions:

- Colleges with R&D in their mandates, approved by college boards and with legislative and provincial government recognition and support. Colleges in the following jurisdictions fall within this category: British Columbia, Alberta, Ontario, Quebec, Yukon, Northwest Territories and Nunavut.
- Colleges with R&D as part of their mandate, approved by the Board of Directors but for which the provincial legislation is silent. This category includes the institutions in Saskatchewan, Manitoba and the Atlantic region.

5.2 Applied Research Governance Structures

Madder's typology (2005) highlighted the importance of applied research governance structures with dedicated human resources, responsible for managing the function and developing policies and procedures on matters such as ethics and intellectual property rights.

The *2008/2009 Environmental Scan* asked colleges about current governance structures and the staffing profile of R&D units, divisions or centres. Sixty-six institutions reported a dedicated division or unit, more than double the number reported in 2005/2006.

The number of dedicated staff also evolved. Between 2005/2006 and 2008/2009, the number of respondent institutions that reported having dedicated staff did not change, but after 2005/2006, more institutions reported full-time as opposed to part-time staff: 54 in 2008/2009 compared to 34 in 2005/2006, a 59 percent increase. Table 2 provides the staffing profile of college R&D units, divisions or centres.

Table 2
College Staffing Profile for Applied Research Structures

Category of Applied Research Staff	Number of Full-Time Staff	Number of Part-Time Staff
Management/Administrative	140	34
Technical and Scientific	426	74
Total	566	108

Source: *2008/2009 Applied Research Environmental Scan*

5.3 Promotion of College Applied Research Services and Areas of Research Specialization

Colleges recognize a need to identify the key areas of research specialization in line with the industries present in the communities and regions served. Colleges must develop outreach and promotional capacity to increase the awareness among employers about the services available.

In the *2008/2009 Environmental Scan*, 86 percent of colleges reported knowledge transfer activities carried out by the applied research unit, division or centre. These activities were diverse, including website content, information booths and presentations at conferences, meetings of professional and sector specific associations and research networks, presentations for local industry and community partners. A review of college websites confirmed that over 100 institutions promote applied research services.

The *2008/2009 Environmental Scan* identified 142 areas of research specialization, the majority of which fall within the four priority areas of the federal government science and technology strategy including: 53 in natural resources and energy, 25 in environmental science and technologies; 39 in health and life sciences; and 25 in information and communications technologies. Figures 3 to 6 show the provincial/territorial distribution of

the research areas of specialization by priority. Other areas of specialization fall within social innovation, manufacturing and building technology. The list of all areas of specialization identified by colleges is provided in Appendix 3.

Figure 3
Provincial/Territorial Distribution of the 53 Areas of Specialization in Natural Resources and Energy

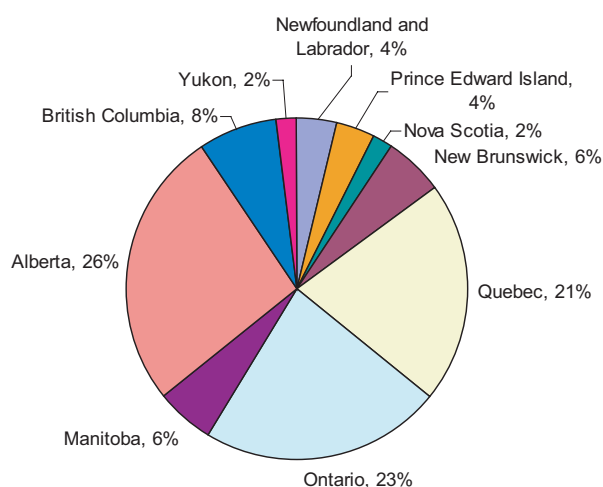


Figure 4
Provincial/Territorial Distribution of the 25 Areas of Specialization in Environmental Science and Technology

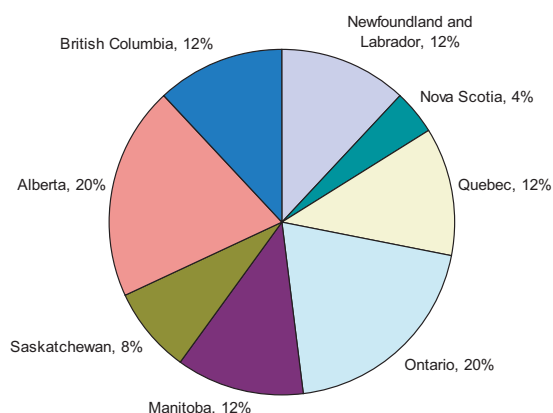


Figure 5
Provincial/Territorial Distribution of the 39 Areas of Specialization in Health, Medical and Life Sciences

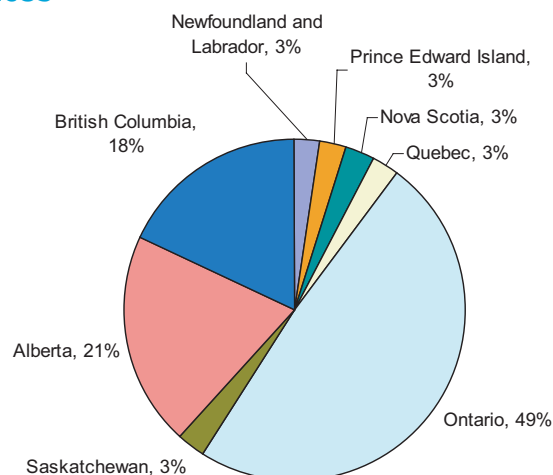
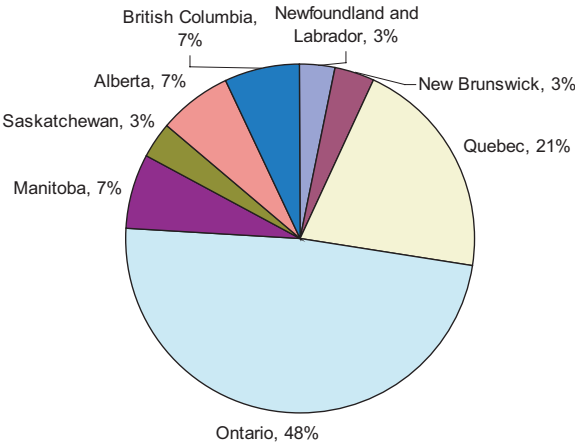


Figure 6
Provincial/Territorial Distribution of the 25 Areas of Specialization in Information and Communications Technologies



5.4 College Research Centres and Specialized Labs

The 2008/2009 *Environmental Scan* asked colleges to identify research centres or specialized research labs at their institutions. The number increased by 56 percent over three years. Sixty-four colleges (83 percent of 2008/2009 *Environmental Scan* respondents) identified over 140 specialized research centres, most aligned with the four priorities of the Science and Technology Strategy: 31 in natural resources and energy, 21 environmental science and technologies, 20 in health, medical and life sciences and 26 in information and communications technologies. Figures 7 to 10 show the provincial/territorial distribution of the research centres by priority. Colleges also identified research centres in areas such as manufacturing, building technology and social innovation. The list of all specialized research centres and labs colleges identified is provided in Appendix 4.

Figure 7
Provincial/Territorial Distribution of the 31 Research Centres and Labs in Natural Resources and Energy

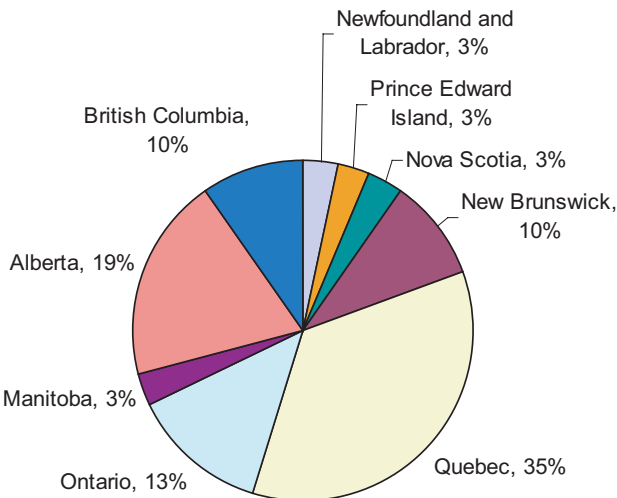


Figure 8
Provincial/Territorial Distribution of the 21 Research Centres and Labs in Environmental Science and Technologies

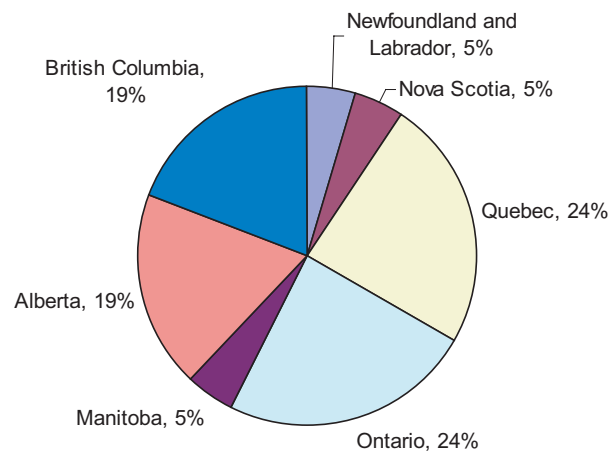


Figure 9
Provincial/Territorial Distribution of the 20 Research Centres and Labs in Health, Medical and Life Sciences

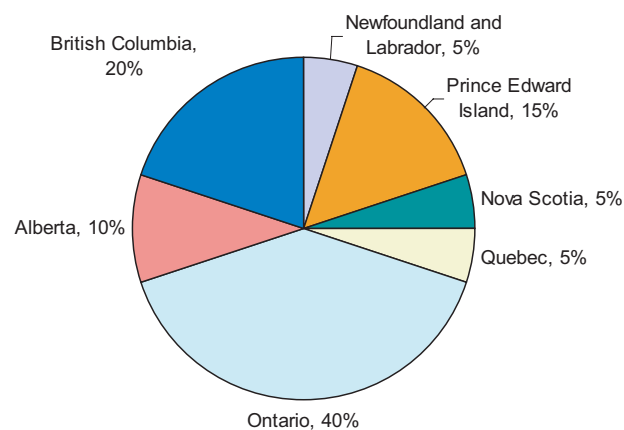
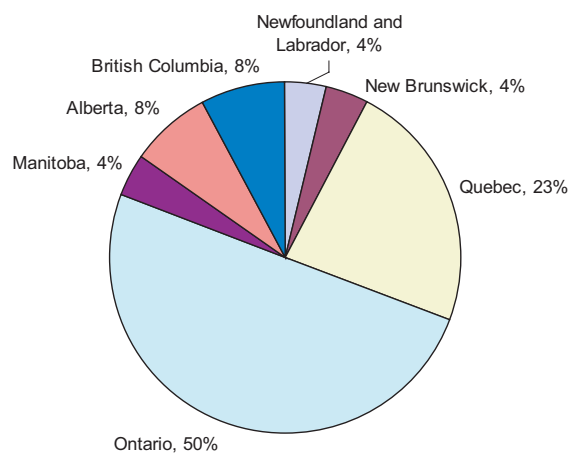


Figure 10
Provincial/Territorial Distribution of the 26 Research Centres and Labs in Information and Communications Technologies



5.5 Funding of College Applied Research

College applied research activities are funded through internal budget allocations and government and private sector sources. Internal budget allocations are key to demonstrating institutional commitment. Resources are increased by marketing applied research services accessing provincial and federal funding.

5.5.1 College Core Budgets and Project Funding for Applied Research

Since applied research is integral to effective program delivery, colleges are allocating part of their core budgets to applied research units, divisions or centres. Through the *2008/2009 Environmental Scan*, 78 respondent institutions reported a total of \$27.5 million in base budgets for applied research units, divisions or centres for the 2008/09 fiscal year. There were significant differences among respondent colleges with some reporting base budgets of \$15,000 to \$20,000 and others reporting base budgets as high as \$700,000. Colleges also reported \$7.6 million in targeted funding for applied research projects during 2008/09.

5.5.2 Government and Private Sector Funding Sources

Colleges were also asked to provide the approximate value of federal and provincial grants, company funding and in-kind support for the 2008/09 fiscal year. They reported a total of \$97.7 million in external funding. Table 3 shows that the largest proportion of the funding came from the private sector, \$45.5 million (\$41.8 million in cash and \$3.7 million in-kind), and that colleges are reporting a major increase from 2005/2006 when only \$4.2 million in private sector funding was reported. Compared to 2005/2006, colleges are reporting a slight decrease in federal grants, \$28 million in 2005/2006 compared to \$27.3 million in 2008/2009. Provincial grants increased from \$13 million to \$25 million.⁶

Table 3
External Funding Sources for College Applied Research

Funding Sources	2005/2006	2008/2009
Private Sector	\$4.2 million	\$45.5 million
Federal government	\$28 million	\$27.3 million
Provincial/territorial governments	\$13 million	\$25 million
Total	\$45 million	\$ 97.8 million

Source: 2005/2006 Applied Research Survey and 2008/2009 Applied Research Environmental Scan

5.5.3 NSERC and the College and Community Innovation Program

The Natural Sciences and Engineering Research Council (NSERC) is a key source of funding, in particular through the College and Community Innovation (CCI) program. One indicator of increased R&D activity by colleges is the number of colleges that have acquired NSERC institutional eligibility: 51 compared to 13 in 2005/2006 according to NSERC.

The CCI program aims to increase innovation at the community and/or regional levels by enabling colleges to increase their capacity to work with local companies, particularly SMEs. This program supports applied research and technology transfer in the four Canadian priority areas of research: environmental science and technologies; natural resources and energy; health and related life sciences and technologies; information and communications technologies; as well as in other areas of research that will advance the principles and goals of the Government of Canada's Science and Technology Strategy.

CCI provides funding on a competitive basis to strengthen applied research capacity, and to carry out applied research and technology transfer activities in a specific area where the college has recognized expertise and that meets the needs of local industries, particularly SMEs. CCI includes a two-year Entry Level Grant for a

⁶ This is largely due to investments by provinces such as Québec for the College Centres for the Transfer of Technology (CCTT) and more recently Ontario.

maximum of \$100,000 per year, and a five-year CCI Grant of up to \$500,000 per year for the first three years, and then four-fifths of the annual base funding for the fourth and fifth years. Colleges that receive the five year grants are expected to diversify their sources of funding through increased collaboration with the private sector. All grant proposals must include a plan to involve faculty and students and an explanation of how they will work with industry partners. Colleges can use CCI funds to cover:

- salaries for staff carrying out applied research, including limited costs for course load reduction for faculty participation in research activities;
- knowledge dissemination and networking;
- research and technology transfer support services; and
- limited operating and equipment expenses and for overhead and administration costs.

To date 22 CCI grants have been awarded. Table 4 shows the number of Letters of Intent and full applications received in relation to the total awards, by category. The list of CCI-funded projects is provided in Appendix 5.

Table 4
Areas of Research Distribution of Awards

	Information and Communications Technology ⁵	Natural Resources & Energy	Environment	Health	Other	Total
Letters of Intent	18	20	15	4	23	80
Full Applications Received	10	10	7	2	9	38
Awards	9	5	4	0	4	22

Source: NSERC CCI Program Statistics

As shown in Table 5, participation in the CCI has fluctuated over the first four competitions, with significant drops in the number of Letters of Intent submitted for competitions 2 and 4. One of the factors that may explain this fluctuation is related to college capacity because colleges have emphasized that although this is a capacity building program, in order to be successful colleges need significant research capacity and experience. Many colleges were managing two applications processes for NSERC eligibility at the same time as the CCI application. In addition, colleges are being strategic with CCI program applications in order to ensure as many institutions as possible benefit from the program. The program is very small thus institutions and their community and business partners are reticent to spend the time and money to conceptualize and submit the initial letter of intent and, if successful, the full proposal. The likelihood of success is low simply as a matter of the budget size. In total, only 25 grants can be awarded within the \$48 million budget envelope and the five year time frame.



*Marine Institute's SmartBay
ocean observation initiative*

Table 5**College and Community Innovation Program – Competition Statistics and Status**

CCI Program Competitions	Letters of Intent (LOI) & Starter Grant Proposals	Invitations to Submit Full Applications	Full Applications	Funded Applications
Competition #1 May 2008 – February 2009	33 LOIs received	13 invitations sent	n/a	Total of 8 funded: 4 Quebec 2 Ontario 1 Alberta 1 British Columbia
Competition #2 September 2008 – June 2009	14 LOIs received	8 invitations for new projects and 6 invited to resubmit from previous competition	7 received	Total of 5 funded: 3 Quebec 1 Ontario 1 British Columbia
Competition #3 December 2008 – September 2009	33 LOIs received	14 invitations for new projects and 5 invited to resubmit from previous competition	Full applications submitted by June 5, 2009	Total of 9 funded: 1 Alberta 1 Manitoba 3 Ontario 4 Quebec
Competition #4 May 2009 – February 2010	11 LOIs and 11 Starter Grant Proposals received	11 Invitations for full proposals	Full applications due November 23, 2009	Decision on full applications by mid-February 2010
Competition #5 November 2009 – August 2010	17 LOIs and 11 Starter Grant Proposals received	Invitations to submit full application to be sent by mid-February 2010	Full applications due by April 22, 2010	Decision on full applications by mid-August 2010

Source: NSERC, CCI Program Statistics and Website

5.5.4 CCI Interviews with Colleges and Institutes

In November 2009, ACCC conducted interviews with 8 colleges with approved CCI grants and 5 colleges that have been unsuccessful in CCI Program competitions to date. The overall conclusion from these interviews is that the CCI Program is a very good model that is well suited to how colleges deliver applied research with private sector and community partners.

However these interviews and previous consultations with colleges identified some challenges colleges are experiencing with the application processes and implementation of CCI Program grants. These challenges and the positive aspects of the program are described below.

Entry Level Grant

- The introduction of the Entry Level Grant option by NSERC is applauded by all respondent colleges.
- Colleges that have been unsuccessful in previous competitions to date confirmed intentions to apply for this grant rather than re-applying for the five-year grant.
- Because the program is so small, an institution that already has a larger grant cannot submit for a smaller grant for another sector of importance to their community, nor can an institution submit in both categories in the same competition.

Program Parameters for Five-Year Grants

- The CCI Program is institutional in nature, tied to an institution's strategic priorities and is intended to build the applied research capacity of institutions to carry out applied research and technology transfer activities with companies, and to build innovation at the community level. The program parameters focus on the four Canadian priority areas of research and not just those of an engineering nature even though NSERC is the administrative lead, thus allowing an institution to respond to community and industry diversity and to build collaboration across disciplines.
- The broader parameters of the program to include social innovation should be articulated more clearly as many colleges do not understand that research areas outside the natural sciences and engineering are eligible.

Program Information and Parameters for Five-Year Grants

- The information on the program has improved however the website still leaves the impression that the CCI Program is pigeon-holed in NSERC university programs.
- The proposal preparation workshop and one-on-one support provided by NSERC staff was acknowledged and very much appreciated by all respondent colleges.
- Regional NSERC meetings were also very helpful, allowing for a sharing of experiences among successful colleges and those thinking of applying.
- There is some confusion about the requirements for the LOI as evaluators' comments suggested they were looking for the level of detail required for a full proposal. There is a need to clarify information about the level of detail NSERC is looking for in LOIs.
- In order to support institutions encountering difficulties with CCI applications, it would be helpful to have a formal mentorship system between successful and unsuccessful CCI applicants.

Application Process for Five-Year Grants

- Although the application process is viewed as being heavy and complex, all respondents indicated that the two step process with a Letter of Intent (LOI) and full proposal upon LOI approval is preferable.
- The application process blends on-line and paper forms and leads to confusion as some requirements are buried in the website. There is a need to improve and streamline the application process by making it completely an on-line.
- Colleges with no projects yet approved noted that they were successful through other mechanisms, e.g. Canada Foundation for Innovation (CFI), but have found the CCI program more difficult. The federal government has invested in the research infrastructure of these institutions but they are now left with the challenge of finding research funding sources.
- NSERC eligibility requirements are very onerous and lengthy, in particular due to the rigorous requirements related to research on animals and human subjects. In order to expedite the eligibility approval process, NSERC should consider having different eligibility requirements, rules and regulations for institutions that do not perform research on animal and human subjects.

Evaluation Process for Five-Year Grants

There was inconsistent and contradictory feedback from review committees:

- Colleges invited to re-submit proposals received inconsistent feedback from review committees. For re-submissions, NSERC should ensure review committees have the comments from the previous competition.
- In some cases, evaluators' feedback was contradictory to NSERC rules and requirements. For example, NSERC rules indicated that only 2 letters of support were allowed however evaluators asked for additional letters.
- Some feedback shows a lack of understanding of college applied research as some evaluators are expecting outcomes more associated with university research, such as articles in scientific journals.
- The majority of evaluation committee members should be from colleges and industry to ensure they understand the college context.

Industry Partnerships

- Industry partnerships are an essential component and the program parameters allow for enough flexibility to be responsive to industry partner needs.
- Colleges are reporting some challenges in acquiring cash contributions and five year commitments from industry partners, in particular for SMEs within the current economic context. There is a need

for more clarity on the total financial contribution by industry partners, the weighting of cash and in-kind contributions, and the definition of the types of contributions NSERC considers cash and in-kind. For example, if a partner hires a college student for summer employment it is considered an in-kind contribution when it requires cash outlay for the SME.

- Some college research centres also work with clients elsewhere in Canada and internationally. It seems the CCI is focused more on research projects that have an impact locally. It is unclear whether industry clients elsewhere in Canada could be part of a CCI. For example, Fleming College works with small companies in Nunavut.

Involvement of Faculty

- CCI Program funding for faculty release time is very much appreciated and the program has been instrumental in increasing the number of faculty participating in applied research.
- Another challenge with the integration of faculty in projects is the lead time required to find replacement faculty – up to 6 months notice must be given to department chairs or directors in some institutions.
- Colleges with specialized research centres struggle with balancing the involvement of faculty and students and research professionals employed at these centres.
- There is a need for more clarity about NSERC's expectations with regards to faculty and student involvement and the quality of the research services for industry. Some respondents indicated that the impact on research almost seems secondary to faculty and student involvement in the CCI application. Some clarity is required to find the middle ground on this issue.

Involvement of Students

- Applied research is tightly integrated in the teaching and learning mission of colleges.
- This is a key component as colleges will not become involved in applied research if it does not benefit students.
- This component enables colleges to provide students with direct exposure to applied research through part-time research assistant and summer employment opportunities.
- Giving students experience in the execution of applied research is essential to meeting the needs employers and helps to increase productivity.

Provisions for the Use of Funds for Five-Year Grants

- CCI provides enough flexibility for the use of funds.
- CCI allows a modest allocation of 20 percent of total project cost to overhead and administration. Colleges are not eligible for the Indirect Costs Program that covers overhead and administration for university research at 30 to 40 percent of total project cost. With a future expansion of the CCI program, overhead and administration should be increased to match the amounts available through the Indirect Costs Program or alternatively colleges should also be eligible to apply to this program.
- Provisions for student participation allow for minimum wage however this is not sufficient to attract students to work at colleges in some regions where students have higher paying opportunities in industry.
- Use of funds for faculty release time require some clarity in terms of whether they can be used to pay faculty in summer months, and to increase part-time faculty to full-time status through involvement in research projects.
- Colleges expressed confusion about the type of activities that can be funded under the two expense categories "Research and Technology Transfer Support Services" and "Knowledge Dissemination". Clarity is required on the definitions of these two categories and examples of eligible activities should be provided.
- Many colleges do not receive base funding for applied research, as such in-kind contributions to CCI projects are a strong sign of institutional commitment. The CCI program budget summary should include a section for college in-kind contributions, and this contribution should be included as part of the total value of the project.

5.5.5 Other Federal Funding Sources

In addition to the CCI, there are other federal departments and agencies which either have the potential to support college applied research or have done so in the past. The *2008/2009 Environmental Scan* did not ask for the specific sources of federal funding. However it is important to understand the other funding mechanisms available.

Canada Foundation for Innovation

The Canada Foundation for Innovation (CFI) is an independent corporation created by the Government of Canada to fund research infrastructure, including state-of-the-art equipment, buildings, laboratories, and databases required to conduct research. CFI is mandated to strengthen the capacity of Canadian universities, colleges, research hospitals, and non-profit research institutions to carry out world-class research and technology development that benefits Canadians. CFI normally funds up to 40 percent of a project's infrastructure costs.

Since its creation in 1997, CFI has committed almost \$5.2 billion in support of 6,353 projects at 130 research institutions. To date, colleges have received a minimal amount of funding through CFI: \$49 million for 136 projects. In the last round of applications, 16 colleges applied and none were successful. In an effort to identify ways to increase college participation and success, CFI held consultations with colleges across Canada in 2008/2009. In order to increase colleges' success in accessing CFI funding, some key areas need to be examined further and addressed:

- The CFI guidelines and criteria for funding currently reflect a university mandate making it difficult for a college to qualify for funding. CFI may need to modify the guidelines and criteria for the college model. In addition application review panels should include representatives who understand colleges and industry, including SMEs.
- It may be necessary to create a college-specific CFI.

National Research Council – Industrial Research Assistance Program

The National Research Council's Industrial Research Assistance Program (NRC-IRAP) is an innovation assistance program for SMEs at all stages of the innovation process. NRC-IRAP helps SMEs understand the technology issues and opportunities and provides linkages to the best expertise in Canada.

NRC-IRAP assists 10,000 firms each year, sharing the financial risks with some 2,800 of these for R&D projects and pre-commercialization activities. NRC-IRAP provides non-repayable contributions to SMEs interested in growing by using technology to commercialize services, products and processes. NRC-IRAP also provides mentoring and invests on a cost-shared basis for research and pre-competitive development technical projects, upon assessment of a project and firm by a team of Industrial Technology Advisors. NRC-IRAP's partner organizations also receive contributions to provide technical and research assistance to Canadian SMEs.

NRC-IRAP has a national network of more than 100 partners and a field delivery staff of 240 Industrial Technology Advisors through seven regional offices:

- three sub-regions for the West: British Columbia and Yukon; Alberta & Northwest Territories; and Saskatchewan and Manitoba;
- Ontario;
- Quebec; and,
- two sub-regions for the Atlantic: New Brunswick, Nova Scotia and Prince Edward Island; and Newfoundland and Labrador and Nunavut.

The NRC – IRAP website does not provide information about college involvement in IRAP initiatives. However, IRAP has recently contacted ACCC for information on college applied research activity. It would seem that there is potential for future collaboration with NRC – IRAP.

Regional Economic Development Agencies

The federal regional economic development agencies all include applied research and innovation components and are potential sources of funding for college applied research. In the past, colleges in the Atlantic region have accessed R&D funding from the Atlantic Canada Opportunities Agency (ACOA), colleges in Northern Ontario have accessed research funding from the Federal Economic Development Initiative for Northern Ontario (FedNor), and colleges in British Columbia have accessed funds through Western Economic Diversification Canada (WD). Access to funding through the regional development agencies needs to be explored further. A profile of the type of innovation and applied research funding available through these regional development agencies is provided below:

- **ACOA** assists partners with applied research and development through:
 - ♦ the **Atlantic Innovation Fund** which provides financing for R&D projects in natural and applied sciences, social sciences, humanities, arts and culture. In order to qualify for funding, these projects need to be linked to the development and commercialization of technology-based products, processes or services.
 - ♦ the **Business Development Program** which provides unsecured, interest-free loans to help businesses research and develop new or improved products or services.
- **FedNor** provides assistance to organizations for the infrastructure and conditions to facilitate applied research and development and the development, application and transfer of new technologies to the North. Past areas of FedNor support have included state-of-the-art mining technology, medical research and biotechnology.
- **Canada Economic Development for the Regions of Quebec** provides support to SMEs through the Innovation and Natural Resources Testing and Experimentation Support program for the management of new product, process or service development.
- **Western Economic Diversification Canada (WD)** supports a strengthened western Canadian innovation system by supporting the creation and growth of knowledge-based clusters in new economy sectors that contribute to an increase in knowledge-driven and value-added economic activities, largely achieved through the Western Diversification Program.
- **FedDev Ontario**, the new development agency for Southern Ontario, was recently launched and has issued its first call for applications. The agency's programs will support economic and community development, innovation, and economic diversification, with contributions to communities, businesses and non-profit organizations.

Social Sciences and Humanities Research Council

The Social Sciences and Humanities Research Council (SSHRC) is mandated and funded by Parliament as an arms-length granting council. SSHRC grants and scholarships fund social sciences and humanities research projects which address areas and issues which are important to Canadians, including health care, education, Aboriginals, immigration, the environment, economic and monetary policy, business, justice, human rights, arts, culture and literature.

While colleges and institutes are actively involved in social sciences and humanities research, relatively few college faculty have applied for and been funded by SSHRC. Annually since 1999 less than 0.5% of the standard research grants have been provided to college faculty.

In October 2004, ACCC submitted a response to SSHRC's national consultation process and outlined a number of issues that impede the participation of college and institutes in SSHRC programs including but not limited to the full funding of faculty release time. SSHRC's final report on the consultations did not reference the ACCC submission nor did it indicate a change in policy that would increase support for faculty at colleges and institutes.

In 2007, there was some support for colleges and institutes through SSHRC's collaboration with the Canadian Institutes of Health Research (CIHR) and the Natural Sciences and Engineering Council (NSERC) under the College and Community Innovation Program.

Canadian Institutes of Health Research

Created in June 2000, the Canadian Institutes of Health Research (CIHR) is the major federal agency responsible for funding health research in Canada. It aims to create new health knowledge, and to translate that knowledge from the research setting into real world applications.

CIHR consists of 13 institutes, each headed by a Scientific Director and brings together researchers, health professionals and policy-makers from voluntary health organizations, provincial government agencies, international research organizations and industry from across the country with a shared interest in improving the health of Canadians. The works of the institutes embraces the four pillars of health research: biomedical, clinical, research respecting health systems and services; and the social, cultural and environmental factors that affect the health of populations.

Even though colleges are eligible for CIHR funding programs, no CIHR funding is flowing to colleges. The collaboration of CIHR with SSHRC and NSERC under the College and Community Innovation (CCI) Program will provide opportunity for increased participation within CIHR.

5.6 Provisions that Facilitate Faculty and Student Participation

Given the institutional approach to applied research and the teaching focus of colleges, the need for provisions that facilitate faculty and student participation in applied research are essential.

5.6.1 Faculty Participation in Applied Research

College faculty are first and foremost teachers and compensated for this work. A national survey of college faculty participation in research (Fisher 2008a) confirmed that:

- there is strong interest among faculty to participate in research activities;
- their primary goal for becoming involved in applied research is to enhance the learning experience of students; and
- the lack of faculty release time is the primary barrier to faculty participation and the expansion of applied research in colleges.

This was also reported in the 2005/2006 survey. The *2008/2009 Environmental Scan* found that 1,130 college faculty and staff participated in applied research activities in 2008/09. No point of comparison is available as this question was not part of the 2005/2006 survey.

Given the hands-on and applied nature of the learning experience in colleges, the time required for faculty to be present in the classroom cannot be compromised. Within the college research context, the provision of faculty release time is essential. (Fisher 2008a). Fisher (2008b) also assessed how collective agreements in each of the jurisdictions address the participation of faculty in research. Based on Fisher's assessment the status across Canada is as follows:

- **Atlantic:** Collective agreements are silent on the role of faculty in research with the exception of Marine Institute, Nova Scotia Agricultural College, Cape Breton University and Université Sainte-Anne – Collège de l'Acadie. The collective agreement for faculty at the College of the North Atlantic does not explicitly address research and development, but the college recently launched a faculty research development plan.
- **Québec:** The Ministry of Education, Leisure and Sport has a faculty release time program recognizing and supporting the involvement of cégep faculty in research.
- **Ontario:** Collective agreements are silent on the role of faculty in research, however the Framework for a Research Policy for Ontario noted that although research is not required under the terms of employment of college faculty, many are interested in research.
- **Manitoba:** The three colleges in Manitoba have negotiated separate collective agreements and applied research is recognized as a faculty activity.
- **Saskatchewan:** Collective agreements are silent on the role of faculty in research.
- **Alberta:** Colleges have the legislated mandate to perform R&D, however information on faculty recognition to participate in research was not included in Fisher's report.
- **British Columbia:** For college faculty collective agreements, research activities are negotiated as a local provision. University colleges and institutes have included language regarding research activities in their local collective agreements.
- **Territories:** The collective agreement of Yukon College explicitly supports faculty involvement in research. Although Aurora College and Nunavut Arctic College both have territorial government recognition to perform R&D, specific information on their faculty collective agreements was not included.

Although faculty release time is typically not an eligible expense as part of federal granting council programs, as noted in section 5.3.3, the CCI Program does allow for some limited costs for course load reduction for faculty participating in research activities. This aspect of the CCI Program should be examined further to assess how well it is working from both the colleges' and granting councils' perspectives, with a view to determining how this provision can be expanded through other granting council programs.

5.6.2 Student Participation in Applied Research

Applied research projects are designed to include student participation to ensure graduates leave college with the advanced skills, including research and development skills, employers are seeking. Through the *2008/2009 Environmental Scan*, respondent colleges reported that 2,513 students participated in applied research activities in 2008/09.

Colleges have adopted three main approaches to include students in applied research: integrating research in the curriculum of college programs; providing financial support for student research projects; and providing student employment opportunities related to research projects. (Madder 2005 and ACCC 2005/2006) These are described below with some examples colleges provided through the *2008/2009 Environmental Scan* on how students participate.

- **Integration of Research into the Curriculum of College Programs:** Results of past research indicate that employer representatives on college program advisory committees are requesting that research skills and capacity be included as program competencies. (ACCC 2005) Colleges have integrated research competencies into college programs including project-based learning modules, incentives for applied research projects such as awards and senior year research projects. Some examples identified through the *2008/2009 Environmental Scan* are as follows:
 - ♦ **Olds College** is incorporating renewable energy applied research into the new on-line Renewable Energy and Conservation Program.
 - ♦ **Fanshawe College** has offered six Research Readiness Workshops for faculty and staff on topics such as: *Showcasing and Publishing Research, Writing Funding Proposals, Research Ethics and You, Managing Research Budgets, Engaging Students in Applied Research, Working with Industry.*
 - ♦ **La Cité collégiale** has provided training related to research projects, in particular for two courses that are part of the Baccalaureate Biotechnology Program.
 - ♦ **Niagara College** is developing a Student Research Portal that will also be shared with 20 other Ontario colleges.
 - ♦ **Conestoga College** provided training for students on non-disclosure agreements and intellectual property.
 - ♦ **Cégep de Jonquière** invites researchers from CCTTs⁷ to present to students and identifies students to participate in research projects.
- **Financial Support for Student Research Projects:** In 2005/2006 some colleges reported student research grants or competitions with prizes as incentives for students. Through the *2008/2009 Environmental Scan* Olds College confirmed that it offers Student Research Competition Presentations with prizes awarded annually.
- **Student Employment Opportunities in Research Projects:** In 2005/2006, a larger proportion of institutions identified this as a key approach. Colleges offer students research assistant positions, either part-time during the academic year or full-time during the summer months. Some programs include work placements, internships, directed field studies or co-op options. Examples of student employment opportunities identified through the *2008/2009 Environmental Scan* include:
 - ♦ **Lethbridge College** offered four student summer research projects in poly-pharmacy, health community of practice, community living and human-animal interactions.
 - ♦ **Niagara College** offered a week-long training session for 30 student research assistants in research protocols, intellectual property, ethics, technologies for research, internet research, work plan development and presentation techniques.
 - ♦ **Algonquin College** offered an in-house orientation for student research assistants that includes a review of all institutional applied research directives.

⁷ CCTTs are College Centres for the Transfer of Technology

6. Applied Research Delivery

As highlighted in Figure 2, college applied research services are focused more on the development, commercialization and knowledge transfer stages of the innovation process. The main types of applied research services include:

- Proof of concept, prototyping, simulation, testing and analysis, industrial/field/clinical trials;
- Support for product launches, business start-ups, business development and market expansion, and implementation of policies and procedures.

These services help business and industry, in particular SMEs, to assess and develop commercial concepts to minimize the resources expended on concepts that have little commercial viability. Commercial concepts that arise from the new application of existing knowledge, the integration of existing technologies or improvements in product/process development are particularly suited to the capacity of colleges. To illustrate the types of applied research services provided by colleges, the following page provides examples in the priority areas targeted by the federal Science and Technology Strategy. Additional examples are available in ACCC's 2008/2009 publication *Colleges, Institutes & Polytechnics: Accelerating Innovation, Productivity & Competitiveness*.

Colleges are also supporting community organizations and partners in areas related to social innovation such as early childhood development, social economy, justice and public safety and social services and teaching and learning. Social innovation research supports community organizations by developing or adapting policies, procedures, processes to enhance the delivery of services.

Examples of College Applied Research Services in the Priority Areas of the Government of Canada Science and Technology Strategy

Environment

Northern Alberta Institute of Technology's novaNAIT Boreal Research Institute is conducting over \$2 million on the reclamation of disturbed sites in Alberta's boreal forest region. The focus is on conventional well sites, pipelines, and forestry roads. The goal is to provide cost-effective reclamation methods, products, and education to enable industry to meet the new reclamation standards on forest lands. The research will identify solutions on how to re-establish native plant communities in different ecological zones of the Alberta forest.

Instructors of Renewable Resources at **Selkirk College** are taking an inventory of backcountry energy, water and waste management systems. The backcountry wilderness of Alberta and British Columbia is receiving a great deal of international recognition. The objectives of this study are to: compile an inventory of off-grid, backcountry facilities in British Columbia and Alberta; to determine what environmental technologies are being used at these facilities; to assess the effectiveness of these technologies; to determine challenges in obtaining this information; and to make recommendations for future research.

Natural Resources and Energy

LuminUltra Technologies Ltd. approached the Bioenergy and Bioproducts Applied Research Lab at the **Collège communautaire du Nouveau-Brunswick (CCNB)** Campus d'Edmundston to assist it in providing a proof of concept for new potential applications of its technology in the bioenergy sector (ethanol and biogas production processes). The ability of the college to be able to conduct applied research in a short time period, the college's industry network with bioenergy companies, as well as its experience in student training were all factors that contributed to LuminUltra working with the college.

The Energy Institute at **Centennial College** and REGEN Energy Inc. are engaged in a collaborative research project to evaluate, refine and adapt REGEN's patent-pending load management devices to new markets. Wireless controllers implementing a distributed, swarm logic algorithm smooth a building's electrical demand by intelligently operating cycles of fans, compressors, pumps and other large loads. Electricity users save money and energy while pollutants and greenhouse gases from generating plants are kept out of our atmosphere.

Health, Medical and Life Sciences

Mechanical engineering students and faculty at **Nova Scotia Community College** designed a mechanical ankle to help a below-the-knee amputee to go from walking to a swimming position just by pressing a button and repositioning the foot. In addition, a lifting, transportation and surgical table for large animals is being prototyped for a company that produces prosthetics and assistive devices for the veterinary market.

TransBIOTech is a biotechnology transfer and applied research centre at **Cégep de Lévis-Lauzon** with a mission to help companies in the health field to innovate. To date, TransBIOTech has developed various animal pathology models to assess the therapeutic potential of natural health products or pharmaceutical molecules in treating conditions such as diabetes and lipid disorders. One plant extract tested as part of pharmacodynamic studies proved effective in preventing lipid disorders through one of these models, thereby fostering future development.

Information and Communications Technologies

Combining GPS and GIS technology with 3D computer modeling, **Niagara College** has developed a Scene Assembly Tool (SAT) for rapid bridge design. Until now, creating 3D objects has impeded the design process because of the intimate knowledge required to use modeling software. SAT provides a database of pre-made 3D bridge parts and models and a graphic user interface(GUI) that allows road planning professionals to “drag and drop” sections of bridges and highways into their plans.

By integrating Global Positioning Systems, Global Information Systems and emergency response to 911 calls in the rural municipality of Buckland, the **Saskatchewan Institute of Applied Science and Technology** is making emergency response more effective in rural communities. In such areas, the location of 911 calls typically generated a “land description” instead of an address. By marrying technologies, SIAST and its industrial partners, mapped the entire municipality and integrated the results with a database facilitating the most direct routing of emergency personnel to critical locations.

7. Performance Measurement of College Applied Research

Just as colleges are accountable to provincial/territorial governments for the success of education programs, they must measure their performance in applied research services. Previous research confirmed the need for college appropriate approaches, metrics and tools. The performance measurement approaches for university research are not suitable for colleges given the focus on peer-reviewed publications, patents and licenses. Patents and licenses are not an effective performance measure for colleges because applied research projects are conducted mostly through industry partnerships and the patents and licenses remain with the industry partners.

A literature review conducted for the development of an R&D assessment framework concluded that assessing the socio-economic effects of R&D would provide a more comprehensive measure of research performance at colleges, and that the logic model is the strongest overall framework for segmenting the effects of R&D programs and linking these effects to college R&D activities. The logic model is an internationally-recognized performance measurement framework that provides a systematic and visual way to present and share an organization’s understanding of the relationships among the resources available to operate programs and services, the activities planned and the expected results. (VISTA 2007)

As a performance measurement framework, the logic model allows colleges to measure the impact of applied research on the institution, on partner companies or community organizations, as well as on faculty, staff and students. The logic model framework for college applied research (see Appendix 6) is a holistic approach that assesses impact by examining the following:

- inputs: resources, contributions and partnerships;
- activities: events and actions;
- outputs: products, processes and services;
- outcomes: results, namely the short-term changes in people, organizations or systems; and
- impacts: social, environmental or economic changes overall.

The key variables for measuring the impact on institutions, company or community partners, faculty and staff and students are outlined below.

The impact on the institution is assessed and measured by examining variables such as whether an institution:

- has an applied research office, core budget, staffing and internal grants, and has been successful in receiving external grants to support applied research projects;
- promotes applied research services internally and externally, offers workshops or events aimed at building internal capacity for applied research, as well as outreach and events to build external awareness of college capacity for applied research;
- has a governance structure and policies and procedures for applied research, provides training for students, and has incorporated R&D training and/or competencies into courses and programs; and has identified institutional areas of research specialization;
- has increased capacity to conduct R&D including more internal support for R&D projects and activities, enhanced curriculum for core college programs and college membership in research networks;
- has positive financial returns from applied research activities;
- has increased student satisfaction through the participation in applied research projects, an enhanced curriculum, the establishment of research centres or specialized labs; and
- benefits from an enhanced reputation within the community and region served.

The impact on partner companies or community organizations is assessed and measured by examining the following variables:

- investments of cash or in-kind by partner companies or community organizations;
- college contacts with partner companies or community organizations, as well as direct services such as R&D needs analyses or projects;
- partner companies or community organizations have new technologies assessed or new or improved products or processes;
- partner companies and community organizations have increased awareness of college capacity for R&D and more interaction with colleges; strategies for ongoing relationships between colleges and research partners;
- partners have increased employment, market share and/or new markets; and
- the community and/or region served benefits from economic growth.

The impact on college faculty and staff is assessed and measured by examining the following variables:

- whether faculty release time is provided for participation in R&D projects and activities and the types of research resources, facilities and equipment that are available to support R&D;
- training in R&D procedures or new equipment that is available to support research projects;
- the number of faculty participating in R&D projects and whether there is increased participation;
- how the institution supports the dissemination of research project results and enhances program and course curriculum; and
- how involvement in applied research contributes to enhanced professional development of faculty and staff and strengthens linkages with companies and community organizations.

The impact on college students is assessed and measured by examining the following variables:

- the types of support and training colleges have in place to facilitate student participation in R&D projects and activities;
- the number of students participating in R&D projects and activities and increased awareness among students of industry R&D needs and challenges;
- students' satisfaction rate with their involvement in applied research projects and activities; and,
- students employment success with partner companies

Questionnaires have been developed which colleges can use to collect feedback and perspectives from industry partners, faculty/staff and students. These questionnaires align with the key variables in the logic model framework and enable institutions to collect the data needed to report on progress in applied research. They are provided as part of Appendix 6, *Performance Measurement Tools for College Applied Research*.

These key variables are guidelines on the types of data needed to measure the effectiveness of applied research services and capacity. This college-appropriate performance measurement approach provides direction for federal policy makers when considering future programs or funding mechanisms.

8. Conclusion

This background paper has provided an assessment of what we currently know about college applied research. The *2008/2009 Environmental Scan* provides evidence of increased applied research activity by colleges across Canada that is impacting upon industry and community innovation.

College partnerships with business, industry and community organizations have expanded to include applied and social innovation research. Over the last three years, there has been a dramatic increase in the number of companies partnering with colleges for applied research projects and colleges are now extensively involved in regional and national research networks. Colleges are demonstrating increased commitment and capacity by allocating human and financial resources, and structuring themselves effectively to deliver applied research services. Most institutions are promoting applied research services, have identified areas of research expertise, and increasing numbers have specialized research centres and laboratories, most in areas related to federal government S&T priorities. While they report increases in provincial funding for applied research, federal funding has decreased. Despite limited resources and competing demands, colleges have responded to partners' needs by offering applied research services that help them improve products, processes and services, resulting in increased growth, productivity and community economic development.

This clearly positions colleges as key players in Canada's innovation system and the federal science and technology strategy. Colleges are key instruments for helping the federal government meet the goal of increasing business investment in research and development, in particular by SMEs. SMEs are at the heart of Canada's competitiveness and productivity, and the principal source of job creation. ACCC has recommended that the Government of Canada review its research investments from the perspective of SMEs with a view to balancing investments in discovery research with increased support for the practical side of research that helps businesses start, develop and grow and thus improve productivity and competitiveness.



*Aquaculture research at
Cégep de la Gaspésie et
des Îles*

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Appendix 1

ACCC 2008/2009 Applied Research Environmental Scan List of Participating Colleges/Institutes

British Columbia/Yukon

British Columbia Institute of Technology
Camosun College
Douglas College
North Island College
Okanagan College
Northwest Community College
Selkirk College
Yukon College

Alberta/Northwest Territories

Bow Valley College
Grande Prairie Regional College
Grant MacEwan University
Lakeland College
Lethbridge College
Medicine Hat College
Mount Royal University
NAIT
NorQuest College
Olds College
Red Deer College

Saskatchewan/Manitoba/Nunavut

Assiniboine Community College
Collège universitaire de Saint-Boniface
Red River College

Saskatchewan Institute of Applied Science and Technology
University College of the North

Ontario

Algonquin College
Canadore College
Centennial College
Conestoga College Institute of Technology & Advanced Learning
Durham College
Fanshawe College
Fleming College
George Brown College
Georgian College
Humber College Institute of Technology & Advanced Learning
La Cité collégiale
Lambton College
Loyalist College
Mohawk College
Niagara College
Northern College
Seneca College
Sheridan College Institute of Technology and Advanced Learning
St. Clair College
St. Lawrence College

Québec

Cégep André-Laurendeau
Cégep Marie-Victorin
Cégep régional de Lanaudière

Data Provided by Réseau Trans-tech for the following cégeps with College Centres for the Transfer of Technology:

Cégep Beauce-Appalaches

Cégep de Baie-Comeau

Cégep de Chicoutimi

Cégep de Drummondville

Cégep de Gaspésie des Îles (individual institutional response also provided)

Cégep de Jonquière (individual institutional response also provided)

Cégep de l'Abitibi-Témiscamingue

Cégep de La Pocatière

Cégep André-Laurendeau

Cégep John-Abbott College

Cégep de Lévis-Lauzon

Cégep de Rimouski

Cégep de Sainte-Foy (individual institutional response also provided)

Cégep de Saint-Hyacinthe

Cégep de Saint-Jérôme

Cégep de Sherbrooke

Cégep de Sorel-Tracy

Cégep de Thetford

Cégep de Victoriaville (individual institutional response also provided)

Cégep Trois-Rivières

Collège Ahuntsic

Collège d'Alma

Collège de Maisonneuve

Collège Édouard-Montpetit

Collège Lasalle

Collège Lionel-Groulx

Collège Shawinigan

Atlantic

College of the North Atlantic

Holland College

Nova Scotia Community College

Collège Communautaire du Nouveau-Brunswick

Appendix 2

ACCC 2008/2009 Applied Research Environmental Scan Research Networks Identified by Respondent Colleges

Regions	Research Networks
Western Provinces	
Alberta	AACTI - Alberta Association of Colleges and Technical Institutes ACCC - Association of Canadian Community Colleges Alberta Rural Development Network CAEP - Central Alberta Economic Partnership CARIN - Central Alberta Regional Innovation Network CARMA - Central Alberta Rural Manufacturers Association CREBA - Community Research Ethics Board of Alberta Cropping System Platforms for Biodiesel Feedstock Quantity and Quality Network Canadian Cybera Edmonton Regional Alliance SAIPN - Southern Alberta Intellectual Property Network WestLink Innovation Network
British Columbia	ACCC Applied Research Affinity Group BC Applied Research Network BCARN - BC Applied Research Network CAURA - Canadian Association of University Research Administrators VICRA - Vancouver Island Community-based Research Alliance Westlink Innovation Network
Manitoba	GPNARN - Great Plains and Northern Applied Research Network MZTRA - Manitoba Zero Tillage Research Association TRLabs partnership WestLink
Saskatchewan	ACCC National Research Advisory Committee GPNARN - Great Plains and Northern Applied Research Network (3 colleges from Manitoba and SIAST) TRLabs partnership WestLink
Ontario	ACCC - Association of Canadian Community Colleges BIC - Bioindustrial Innovation Centre Canada Health Infoway Canadian Association on Water Quality Canadian Council for Animal Care Canadian Water Network CAURA - Canadian Association of University Research Administrators

Regions	Research Networks
	<p>CIHC - Canadian Inter-professional Health Collaborative</p> <p>CNRC - Conseil national de recherche du Canada</p> <p>CONCERT- Consortium on New Media, Culture, and Entertainment R&D</p> <p>CONII - Colleges Ontario Network for Industry Innovation</p> <p>Génome Ontario</p> <p>HAR - Heads of Applied Research</p> <p>HEQCO - Higher Education Quality Council of Ontario</p> <p>Institute for Watershed Science</p> <p>International Polar Year Program</p> <p>MaRS</p> <p>National Photovoltaic Innovation Network</p> <p>Northern Research Working Group</p> <p>OCE - Ontario Centres of Excellence</p> <p>OCRI - Ottawa Centre for Research and Innovation</p> <p>OnSETT - Ontario Society for Excellence in Technology Transfer</p> <p>Ontario Golden Horseshoe Biosciences Network</p> <p>Ontario Onsite Wastewater Association</p> <p>Ontario Vineland Research and Innovation Centre</p> <p>Polytechnics Canada</p> <p>SCA - Sustainable Chemistry Alliance</p> <p>SharcNet</p> <p>SOBIN - Southwestern Ontario Bioproducts Innovation Network</p> <p>Solar Building Research Network</p> <p>Standards Collaborative Working Groups</p> <p>TechAlliance (London Ontario)</p> <p>Toronto Industry Innovation Centre of Markham (ISCM)</p> <p>TRRA - Toronto Region Research Alliance</p> <p>York BioTech</p>
Québec	<p>ACFAS - Association francophone pour le savoir</p> <p>AQPC - Association québécoise de pédagogie collégiale</p> <p>ARC - Association pour la recherche au collégial</p> <p>Association aquicole du Canada</p> <p>Association des industriels de la pêche du Québec</p> <p>Association des pêcheurs propriétaires du Québec</p> <p>Associations de pêcheurs indépendantes</p> <p>CAPA</p> <p>CAPRES - Consortium d'animation sur la persévérance et la réussite en enseignement supérieur</p> <p>CCDMD - Centre collégial de développement de matériel didactique</p>

Regions	Research Networks
	<p>CIRST - Centre interuniversitaire de recherche sur la science et la technologie</p> <p>Comité d'experts du Programme de recherche et de développement Moule en Gaspésie</p> <p>Comité de développement du programme ACCORD</p> <p>Comité sectoriel de main-d'œuvre des pêches maritimes</p> <p>CORAMH - Corporation de recherche et d'action sur les maladies héréditaires</p> <p>CQRDA - Centre de recherche et de développement de l'aluminium et autres avec des universités (ETS, Sherbrooke, Polytechnique, Laval)</p> <p>CREPAS - Le Conseil Régional de Prévention de l'Abandon Scolaire</p> <p>CRRE - Consortium Régional de Recherche en Éducation</p> <p>CRSNG - Conseil de recherches en sciences naturelles et en génie du Canada</p> <p>CSMOPM - Le comité sectoriel de main-d'œuvre des pêches maritimes</p> <p>Fédération des cégeps du Québec</p> <p>IRSST - Institut de recherche Robert-Sauvé en santé et en sécurité du travail</p> <p>MAPAQ - Ministère Agriculture, Pêcheries et Alimentation du Québec</p> <p>MPO - Ministère Pêches et Océans Canada</p> <p>PARÉA - Programme d'aide à la recherche sur l'enseignement et l'apprentissage</p> <p>Réseau Aquicole Québec</p> <p>Réseau des universités du Québec</p> <p>Réseau Trans-Tech (CCTT)</p> <p>RSTM - Ressources, sciences et technologies marines</p> <p>SADC Rocher Percé</p> <p>SODIM - La Société de développement de l'industrie maritime</p> <p>STEP - Service de technologie en pêche</p> <p>Université du Québec à Rimouski et l'Université Laval</p>
Atlantic Provinces	<p>ACCC National Research Advisory Committee</p> <p>ACCT - Alliance for Commercialization of Canadian Technologies</p> <p>APCCC - Atlantic Provinces Community College Consortium</p> <p>AUTM - Association of University Technology Managers</p> <p>C-Clear</p> <p>Comité directeur sur la recherche postsecondaire du Nouveau-Brunswick</p> <p>Conseil sur la recherche et la productivité du Nouveau-Brunswick</p> <p>Flintbox.com</p> <p>NSERC Atlantic Advisory Committee</p> <p>Protocole de collaboration en innovation pédagogique signé en janvier 2008/2009 avec le Centre de recherche et de développement en éducation (CRDÉ) de l'Université de Moncton</p> <p>Sous-comité conjoint (CCNB/Université de Moncton) sur la recherche</p> <p>Springboard Atlantic</p>

Appendix 3

ACCC 2008/2009 Applied Research Environmental Scan

Areas of Research Specialization by Category and Province/Territory

Natural Resources and Energy - 53 Areas of Specialization	
Province/College	Area of Specialization
Newfoundland and Labrador College of the North Atlantic	Petroleum Engineering Renewable Energy
Prince Edward Island Holland College	Food Production Development Sustainable Energy
Nova Scotia Nova Scotia Community College	Energy Sustainability and Environmental Technologies
New Brunswick Collège communautaire du Nouveau-Brunswick	Biofermentation, Biocarbons and Bio-analysis Fisheries and Aquaculture Forest Product Transformation Technology
Québec Cégep de Baie-Comeau Cégep de Gaspésie des Îles Cégep régional de Lanaudière Cégep de La Pocatière Cégep de Rimouski Cégep de Sainte-Foy Cégep de Saint-Hyacinthe Cégep de Thetford Cégep de Trois-Rivières Collège d'Alma	Boreal Forest Wind Energy Fisheries Food Processing Bio-Products Forest Product Transformation Forestry Agri-Food Metal Technology Pulp and Paper Agriculture
Ontario Centennial College Fanshawe College George Brown College Georgian College Lambton College Loyalist College	Sustainable Energy Technology Alternative Energy & Sustainable Environments Green Technology (computer, construction, architecture) Alternative Energy/Systems Environmental Sustainability Solutions Alternative Energy, Energy Conversion, Storage and Conservation Biodegradable Thermoplastic Vulcanizates (TPV's) CO2 Extraction

Niagara College	Horticulture & Greenhouse
St. Lawrence College	Viticulture and Wine Making
	Agricultural Extension: Artisanal Cheese
	Renewable Energy
Manitoba	
Assiniboine Community College	Horticulture/Greenhouse/Regional Diets
	Renewable Energy
Red River College	Development and Operation using Renewable Fuels
Alberta	
Grande Prairie Regional College	Bio-Carbon Initiatives (CO2 captures, effluent as irrigant, company response to the green agenda)
	Improving Survival and Growth of Conifer Species Seedlings
Olds College	Alternative Energy Feedstock Trials
	Bio-Fuel Production and Testing
	Feed Efficiency Studies
	Sustainable Waste Management
Lakeland College	Field Crop Trials
	Grazing Management/Habitat Restoration
	Livestock Trials
	Renewable Energy
	Wildlife Use of Natural Area
Lethbridge College	Aquaculture and Aquaponics
	Sustainable Housing
Medicine Hat College	Ecotourism and Sustainability
British Columbia	
British Columbia Institute of Technology	Energy
Camosun College	Ocean and Marine Technology
Douglas College	Biological Pest Control in Greenhouses
North Island College	Fish Farm Waste & Reclamation
Yukon	
Yukon College	Alternative Energies in Cold Climate
Environmental Science and Technologies- 25 Areas of Specialization	
Province/College	Area of Specialization
Newfoundland and Labrador	
College of the North Atlantic	Geo-Informatics
	Petroleum Engineering
	Physical Sciences
Nova Scotia	
Nova Scotia Community College	Geomatics

Québec Cégep de Chicoutimi Cégep de Sorel-Tracy Collège Shawinigan	Geomatics Industrial Ecology Electrochemical and Environmental Technology
Ontario Conestoga College Fleming College Loyalist College Niagara College Seneca College	Environment Water and Wastewater Treatment Technology CO2 Extraction Environmental Management Environment
Manitoba Assiniboine Community College Red River College	Environmental Management Geomatics Sustainable Infrastructure
Saskatchewan Saskatchewan Institute of Applied Science and Technology	Environment and Natural Resources Urban Development
Alberta Lethbridge College Medicine Hat College Northern Alberta Institute of Technology Red Deer College	Environment and Ecology Water Resources Boreal Forest Reclamation Green Chemistry and Engineering Environment and Ecology
British Columbia British Columbia Institute of Technology Selkirk College	Environment Sustainability Geographic Information Systems
Health, Medical and Life Sciences - 39 Areas of Specialization	
Province/College	Area of Specialization
Newfoundland and Labrador College of the North Atlantic	Health
Prince Edward Island Holland College	Health
Nova Scotia Nova Scotia Community College	Medical Technologies
Québec Cégep de Lévis-Lauzon	Bio-technologies

Ontario Algonquin College Centennial College Conestoga College Fanshawe College George Brown College Humber College La Cité collégiale Lambton College Mohawk College Sheridan College St. Lawrence College	Health Care Health Sciences Health Health & Human Services Nursing Health Services Health Information Prosthetics Orthotics Nutrition and Health Promotion (recipe development, scaling up for industrial production, health ingredient alternatives) Health Technologies Clinical Health Biotechnology Health and Wellness Health Informatics Health Sciences Elder Health Research Nursing Biotechnology
Saskatchewan Saskatchewan Institute of Applied Science and Technology	Health Education
Alberta Bow Valley College Grant MacEwan University Northern Alberta Institute of Technology Mount Royal University NorQuest College Red Deer College	Health Nursing Psychology Health Sciences Health and Wellness Health Care Health Community of Practices & Independent Living Poly-Pharmacy
British Columbia British Columbia Institute of Technology Camosun College North Island College Selkirk College	Health - Herbal Analysis and Evaluation Health - Adaptive Technologies for People with Disabilities Sport Technology Food Security Health Care Delivery Health Care Education Occupational Health

Information and Communication Technologies - 29 Areas of Specialization	
Province/College	Area of Specialization
Newfoundland and Labrador College of the North Atlantic	Nano Technology
New Brunswick Collège communautaire du Nouveau-Brunswick	Computer and Information Technology
Québec Collège Ahunatic Collège Lionel-Groulx Cégep André-Laurendeau Cégep de la Pocatière Cégep John-Abbott College Cégep de Drummondville	Graphic Communications Micro-Electronics Optic and Photonic Technology Optic and Photonic Technology Optic and Photonic Technology Sound Technologies
Ontario Algonquin College Conestoga College Fanshawe College George Brown College Humber College Niagara College Seneca College Sheridan College	Photonics Design of Virtual Environments Information and Communication Technologies Telecommunications Advanced Media Digital Media Design Applied Technology Music Technology Data Management and Visualization Technology (photonics, electronics, energy) New Media/Digital Media Open Source Computer Studies Digital - Gaming
Manitoba Assiniboine Community College Red River College	Wireless Technology Information and Communications Technology, including digital multimedia
Saskatchewan Saskatchewan Institute of Applied Science and Technology	Information Technology and Communication
Alberta NorQuest College Mount Royal University	Print Media Wb 2.0 Technologies
British Columbia British Columbia Institute of Technology North Island College	Information Technology Remote Web-based Science Lab

Manufacturing, Building Technology and Other - 41 Areas of Specialization	
Province/College	Area of Specialization
Newfoundland and Labrador College of the North Atlantic	Manufacturing Engineering
Nova Scotia Nova Scotia Community College	Mechanical Engineering
New Brunswick College communautaire du Nouveau-Brunswick	Metal Manufacturing Technologies
Québec Cégep André Laurendeau Cégep de l'Abitibi-Temiscamingue Cégep Beauce-Appalaches Collège Édouard-Montpetit Cégep de Jonquière College Lasalle Cégep de Lévis-Lauzon Collège de Maisonneuve Cégep de la Pocatière Cégep de Rimouski Cégep de Sainte-Hyacinthe Cégep de Saint-Jérôme Cégep de Sherbrooke Cégep de Victoriaville	Transport Logistics Industrial Residue Technologies Industrial Mechanics Aerospace Technologies Automation Manufacturing Fashion Industrial Robotics Chemical Technologies Food Packaging Technology Physical Technology Maritime Innovation Textiles Advanced Transportation Composite Development Integrated Production and Manufacturing Wood Manufacturing
Ontario Algonquin College Centennial College Conestoga College Fanshawe College Georgian College Humber College La Cité collégiale Lambton College Mohawk College	Mechanical Engineering Engineering Technology Manufacturing Advanced Manufacturing Product, Prototype and Process Development Maritime and Marine Simulation Prototype Development Building Technology Engineering Technology Advanced Extrusion Process Identification and Control Process Control and Optimization and Simulation Energy Technologies Engineering Industry Projects

Sheridan College St. Clair College	Manufacturing & Design Technologies Manufacturing Materials
Manitoba Red River College	Advanced Design and Manufacturing
Alberta Grande Prairie Regional College Northern Alberta Institute of Technology Red Deer College	Innovation Services (Technology Commercialization of client driven R&D) Product Development and Prototyping Productivity Improvement Advanced Manufacturing
British Columbia British Columbia Institute of Technology	Building/Construction
Social Innovation - 19 Areas of Specialization	
Province/College	Area of Specialization
Québec Cégep régional de Lanaudière	Social Economy
Ontario Centennial College Conestoga College Durham College Fanshawe College Sheridan College Institute of Technology and Advanced Learning St. Lawrence College	Emergency & Disaster Preparedness Business Self Advocacy for Students with Disabilities (delivered by Centre for Students with Disabilities CSD) Business & Entrepreneurship Securities Social Innovation Applied Behavioural Analysis
Manitoba Red River College	Early Childhood Education
Alberta Bow Valley College Grant MacEwan University Lethbridge College Mount Royal University Red Deer College	Test Workplace and Essential Skills Business Behavioural Aspects of Worker Safety Public Opinion Polling Justice Human-Animal (bear) Interactions
British Columbia British Columbia Institute of Technology Camosun College North Island College Selkirk College	Learning & Teaching Human Factors Analysis Homelessness & Housing Rural Economic Development

Appendix 4

ACCC 2008/2009 Applied Research Environmental Scan Research Centres and Specialized Labs by Category and Province/Territory

Natural Resources and Energy - 31 Research Centres	
Province/College	Research Centre
Newfoundland	
College of the North Atlantic	Agrifoods Research Centre
Prince Edward Island	
Holland College	Wind Energy Turbine Facilities and Labs
Nova Scotia	
Nova Scotia Community College	Energy Sustainability
New Brunswick	
Collège communautaire du Nouveau-Brunswick	Centre d'excellence en sciences agricoles et biotechnologiques (CESAB) Centre d'innovation et de transfert technologique des métaux (CITTM) École des pêches du N.-B.
Québec	
Collège d'Alma	Agrinova
Cégep de Baie-Comeau	Centre d'expérimentation et de développement en forêt boréale (CEDFOB)
Cégep de Gaspésie et des Îles	Technocentre éolien
	Halieutec
Cégep de Sainte-Foy	Centre d'enseignement et de recherche en foresterie de Ste-Foy inc. (CERFO)
Cégep de Saint-Hyacinthe	Cintech agroalimentaire
Cégep de Saint-Jérôme	Institut de transport avancé de Québec (ITAQ)
Cégep de Thetford	Centre de technologie minérale et de plasturgie inc. (CTMP)
Cégep Trois-Rivières	Centre intégré de fonderie et de métallurgie (CIFM)
	Centre spécialisé en pâtes et papiers (CSPP)
Cégep de Victoriaville	EQMBO – Entreprises Centre d'aide technique et technologique inc. (transformation du bois en produits finis)
Ontario	
Georgian College	Alternative Energy Solutions
	Green Innovation Centre
Lambton College	ALTE lab - Alternative Energy Research
Niagara College	Wine and Viticulture Research Labs
Manitoba	
Red River College	Advanced Transportation & Energy Centre
Alberta	
Lakeland College	Renewable Energy Cabin
Lethbridge College	Aquaculture Centre of Excellence
Olds College	BioFuels Research Centre

	BioProcessing Pilot Plant Compost Technology Centre Turner Research Center
British Columbia British Columbia Institute of Technology	Centre for Energy System Applications Integrated Molecular Biology Lab Internet Engineering Lab (IEL)
Environmental Science and Technologies - 21 Research Centres	
Province/College	Research Centre
Newfoundland College of the North Atlantic	Geospatial Research Facility
Nova Scotia Nova Scotia Community College	Applied Geomatics Research Group
Québec Cégep de Chicoutimi Cégep de La Pocatière Collège Shawinigan Cégep de Sorel-Tracy Cégep de Thetford	Centre de géomatique du Québec inc. (CGQ) Biopierre – Centre de développement des bioproduits Centre national en électrochimie et en technologies environnementales inc. (CNETE) Centre de transfert technologique en écologie industrielle (CTTEI) Oleotek inc.
Ontario Conestoga College Fleming College Loyalist College Niagara College	Built Environment Centre for Alternative Wastewater Treatment CO2 Extraction Environmental Research Labs (living labs) Research Greenhouse
Manitoba Red River College	Centre for Applied Research in Sustainable Infrastructure
Alberta Grande Prairie Regional College Northern Alberta Institute of Technology Olds College Red Deer College	Carbon Sequestration Pilot Project unit novaNAIT Boreal Research Institute Grow-Safe Research facility Environmental Ecology
British Columbia British Columbia Institute of Technology Douglas College Selkirk College	Centre for Architectural Ecology Rivers Institute Institute of Urban Ecology Selkirk Geospatial Research Centre

Health, Medical and Life Sciences - 20 Research Centres	
Province/College	Research Centre
Newfoundland and Labrador College of the North Atlantic	Entomology Research Lab
Prince Edward Island Holland College	Bioscience and Environmental Science Lab Canada's Smartest Kitchen (food product development) Simulation Facilities in Health Labs
Nova Scotia Nova Scotia Community College	Medical Technologies
Québec Cégep de Lévis-Lauzon	TRANS BIO TECH centre collégial de transfert en biotechnologies
Ontario Centennial College George Brown College La Cité collégiale Mohawk College Seneca College Sheridan College	Biotechnology/Microbiology Labs Simulation Lab Health: Nursing Simulated Practice Centre; Interprofessional Learning Clinic; Prosthetics and Orthotics Lab; Emergency Management Simulation Centre Nutrition: Culinary Studio Biotechnologie Health Informatics Bio Chem Applied Research & Training Lab (BCART) Sheridan Elder Research Centre (SERC)
Alberta Mount Royal University Red Deer College	Integrative Health Rural Health Research
British Columbia British Columbia Institute of Technology Camosun College Douglas College	Herbal Analysis and Evaluation Lab CREATE (Centre for Rehabilitation Engineering and Technology that Enables) Sport Innovation Centre Centre for Health and Community Partnerships
Information and Communications Technologies - 26 Research Centres	
Province/College	Research Centre
Newfoundland and Labrador College of the North Atlantic	Nano-technology Research Lab
New Brunswick Collège communautaire du Nouveau-Brunswick	Centre d'excellence en informatique (CEI)
Quebec Cégep de Drummondville Cégep de Lévis-Lauzon	Musilab inc. Centre de robotique et de vision industrielles inc. (CRVI)

Centre collégial de transfert technologique en optique-photonique OPTECH Collège Ahuntsic Collège Lasalle Collège Lionel-Groulx	Cégep de La Pocatière, Cégep André-Laurendeau et Cégep John-Abbott College Institut des communications graphiques du Québec (ICGQ) Centre de transfert technologique de la mode (CTTM) Centre d'innovation en microélectronique du Québec (CIMEQ)
Ontario Algonquin College Centennial College George Brown College Humber College Niagara College Seneca College Sheridan College	 Design Centre CNC/Rapid Prototyping Lab HDTV Digital Broadcasting and Film Studio Design: Institute Without Boundaries; Game-Design Laboratory; StudioLab Technology: Automated Manufacturing Laboratory; Surface Mount Laboratory; Construction Technologies Laboratories; Computer Laboratories, Including 3D Modeling; Computer Numerical Control (CNC) Lab; Radio Frequency Identification (RFID) Lab; Infrastructure Industrial Design Prototyping Lab RhyTHM Lab Wireless Lab Creative Advertising Centre Technology Research Centre Augmented Reality Research Labs and Centre for Land Use Technology Centre for the Development of Open Source (CDOT) Visualization Design Institute (VDI)
Manitoba Red River College	 Centre for Aerospace Technology & Training
Alberta Northern Alberta Institute of Technology NorQuest College	 Prototyping Laboratory (School of Electrical and Electronics Technology) Centre for Excellence in Print Media
British Columbia British Columbia Institute of Technology	 Advanced Prototyping Hub Dr. Tong Louie Living Laboratory
Manufacturing, Building Technology and Other - 34 Research Centres	
Province/College	Research Centre
Newfoundland College of the North Atlantic	 Innovative Manufacturing Lab
New Brunswick Collège communautaire du Nouveau-Brunswick	 Centre d'excellence en bois ouvré (CEBO)
Québec Cégep de l'Abitibi-Témiscamingue Cégep Beauce-Appalaches Collège Édouard-Montpetit	 Centre technologique des résidus industriels (CTRI) MÉCANIUM inc (production mechanization and automation) Centre technologique en aérospatiale C.T.A

<p>Cégep de Jonquière</p> <p>Cégep de La Pocatière</p> <p>Cégep de Rimouski</p> <p>Cégep de Saint-Hyacinthe</p> <p>Cégep de Saint-Jérôme</p> <p>Cégep de Sherbrooke</p> <p>Collège de Maisonneuve</p>	<p>Centre de production automatisée (CPA)</p> <p>Centre spécialisé de technologie physique du Québec inc. (CSTPQ)</p> <p>Innovation maritime</p> <p>SEREX Corporation du service de recherche et d'expertise en transformation des produits forestiers</p> <p>Groupe CTT inc</p> <p>Centre de développement des composites du Québec (CDCQ)</p> <p>Centre de productique intégrée du Québec inc. (CPIQ)</p> <p>Centre d'études en procédés chimiques du Québec (CÉPROCQ)</p> <p>Institut de technologie des emballages et du génie alimentaire (ITEGA)</p>
<p>Ontario</p> <p>Conestoga College</p> <p>Georgian College</p> <p>Humber College</p> <p>La Cité collégiale</p> <p>Lambton College</p> <p>Sheridan College</p>	<p>Manufacturing</p> <p>Applied Design & Manufacturing Solutions</p> <p>Maritime Research and Modeling</p> <p>Innovation Humber Centre (business resources for SMEs)</p> <p>Métiers de la construction</p> <p>Génie</p> <p>AMER lab - Advanced Materials Engineering Research</p> <p>APCS - lab - Advanced Process Control & Simulation</p> <p>Sheridan Research - Research Office Special Projects</p> <p>Centre for Advanced Manufacturing & Design Technologies (CAMDT)</p>
<p>Alberta</p> <p>Grande Prairie Regional College</p> <p>Northern Alberta Institute of Technology</p> <p>Red Deer College</p>	<p>Innovation Services - Centre 2000 (leased) (invention development)</p> <p>NAIT Shell Manufacturing Centre (manufacturing and productivity services for SMEs)</p> <p>Center for Innovation and Advanced Manufacturing</p> <p>Innovation in Manufacturing Centre</p>
<p>British Columbia</p> <p>British Columbia Institute of Technology</p> <p>Camosun College</p>	<p>AFRESH Home</p> <p>BCIT Canadian Housing & Construction Centre</p> <p>Building Envelope Test Hut</p> <p>Building Science Centre of Excellence</p> <p>Food Processing Research Centre</p> <p>Vancouver Island Advanced Manufacturing and Prototype Development Centre</p>
Social Innovation - 17 Research Centres	
Province/College	Research Centre
<p>Ontario</p> <p>Centennial College</p> <p>Mohawk College</p>	<p>Inter-professional Education Lab</p> <p>Millennium Foundations for Success</p>

Québec Cégep régional de Lanaudière	Centre collégiale de recherche en économie sociale
Saskatchewan Saskatchewan Institute of Applied Science and Technology	Early Childhood Demonstration Lab Day Care Centre (in process of development) Interprofessional Simulation Learning Centre Labs
Alberta Bow Valley College Mount Royal University NorQuest College	Test of Workplace and Essential Skills (TOWES) Foundational Learning Centre Institutional Analysis Evaluation Unit in Learning Resource Services Intercultural Education Child Well Being Non-Profit Studies Teaching & Learning Centre for Excellence in Education in Continuing Care Centre for Excellence in Intercultural Education
British Columbia British Columbia Institute of Technology Selkirk College	Learning & Teaching Centre Regional Innovation Chair, Rural Economic Development

Appendix 5

List of CCI Funded Projects

The following 22 Colleges and Communities Innovation Project initiatives were selected for funding in 2008 and 2009:

Name	Description	Competition #
British Columbia		
Clothing/Textiles Advancements Sensor Development and Human Performance Enhancement Camosun College	Camosun College will explore the use of “smart” fabrics and “intelligent” textiles for applications related to sports performance, rehabilitation, patient monitoring, emergency response personnel monitoring and defense.	1
The Emily Carr Centre for Moving Interaction Emily Carr University of Art and Design	Emily Carr University’s applied research projects focus on the convergence of 3D virtual worlds, games and information representation.	2
Alberta		
Biodiesel Production, Alternative Feedstocks, and Commercial Adoption Olds College	The project proposed by Olds College will expand the capacity of the BioFuel Technology Centre, will enable an investigation of alternative non-edible feedstock and the optimization of biodiesel processes, by-products and integrates solutions to enhance commercialization.	1
Green Building Technologies Lab: Net Zero Applied Research and Innovation SAIT Polytechnic	SAIT Applied Research and Innovation Services established a Green Building Technologies (GBT) program with three main goals: to lead industry in implementing green-building technologies; to provide training for students in these technologies; and to enhance commercialization of green technologies for Canadian industry. GBT’s applied research program focuses on four main research areas: Net Zero Envelope and systems monitoring; architectural ecology; integrated renewable energy/alternative energy; and education and industry transformation.	3
Manitoba		
Improving the Energy Performance of Buildings - Sustainable Infrastructure Technology Research Group Red River College	The Red River college will establish a Sustainable Infrastructure Technology Research Group to build on the experience of the Centre for Applied Research in Sustainable Infrastructure (CARSI). The group will work with Manitoba’s emerging sustainable infrastructure cluster on collaborative applied research projects to improve building and construction technologies and reduce energy consumption and waste/greenhouse gas emissions.	3
Ontario		
Algonquin College Design Centre Algonquin College	Through its applied research program, Algonquin College collaborates with industry, government, hospitals, community organizations and NGOs in the area of User Experience Design to develop products, processes and services with human-machine interfaces. The college also provides applied research services to small- and medium-sized enterprises in Ottawa’s information and communications technology (ICT) sector.	3

Name	Description	Competition #
Centre for Sustainable Energy and Environments Fanshawe College	The Fanshawe College Centre for Sustainable Environments (CSE) will enhance the college's ability to conduct multi-disciplinary, industry-driven research and development in the area of sustainable environments. CSE will focus on industry-driven projects related to "green" building, energy conservation, alternate fuels, new agri-products, energy conservation, sustainable landscaping and urban design and other initiatives.	3
George Brown College Research Labs George Brown College	George Brown College will develop a suite of Innovation Support Services to help local industries accelerate the innovation-to-market cycle, including: Innovation Receptor Support Services, Multidisciplinary Collaborative Problem-Solving and, Innovation-Market Assessment Services.	1
Applied research and technology transfer program to support the regional socio-economical development in biotechnology La Cité collégiale	La Cité Collégiale, along with its Bachelor of Applied Technology-Biotechnology program, supports companies in various fields of biotechnology. The current project deal with the valorization of agro-industrial residues, protein and probiotic stability in ruminant food processing, genetically-assisted crop selection and production of recombinant proteins in biofermentors.	2
Building the Canadian Electronic Health Records Solution (EHRS) Reference Implementation Mohawk College of Applied Arts & Technology	Mohawk College's project team and their industry partners will build and demonstrate options to simplify and standardize connections to the EHRS by doctor's offices, hospitals, laboratories, pharmacies, etc. The Mohawk research team will also create a new software development program to train health informatics professionals in Canada.	2
Sustain Niagara: Supporting Innovation in Agricultural Land Management Niagara College	Niagara College's Land Use Technology (LUT) Centre will work with companies to develop better land management information. Using remote sensing technologies and high performance computing, the college will use this data to assist local producers in improving agricultural production processes and land use, adopting new technologies, and ultimately becoming more competitive and environmentally sustainable.	1
Centre for Real-time Production Sheridan College	The Centre for Real-time Production research team will develop new digital media technologies; facilitate innovation and commercialization across screen-based sectors and between content, service and platform companies; and investigate the challenges and opportunities new digital media technologies present for content development companies operating across multiple platforms.	2
Research and Development for Increased Usage of Flight Simulation in Flight Training Seneca College	Seneca College, along with industry partners, is proposing research into the feasibility of using more simulation technology in pilot training. The research will respond to a decline in the number of student trainees and in the viability of pilot training schools, and to a gap in the skill sets of new pilots. Findings will help revitalize flight training businesses. The research will identify when and how to incorporate simulation into pilot training, the benefits of a move from prescriptive regulations to performance-based outcomes, and the necessity of ongoing "proof of concept" trials for operational efficiency and quality of newly trained pilots. The exercise will help Canada's aviation training industry become more competitive internationally.	3

Name	Description	Competition #
Québec		
Applied research and support to SMEs in Abitibi-Témiscamingue and Nord-du-Québec for the valorization of biomass residues Cégep de l'Abitibi-Témiscamingue	The Cégep of Abitibi-Témiscamingue in collaboration with the CTRI CCTT will focus on helping regional SMEs to develop and commercialize products from branches, barks, leaves and tree needles, left by wood industries after logging. The team will also work on a project to transform residue from the agribusiness.	1
Applied research and support to SMEs in Abitibi-Témiscamingue and Northern Québec for the valorization of industrial irons and copper/ores Cégep de l'Abitibi-Témiscamingue	The project led by Cégep de l'Abitibi-Témiscamingue and its partners will support regional SMEs for the development of marketable products using abandoned residues and waste from quarry exploration. The projects aim to develop a process that will eliminate the need to transport the residues and waste over long distances; to fabricate concentrated muscovite, garnet, cyanite and silica drawn from the residues from quarry exploration; to make a finished product from industrial minerals extracted from these residues; and to develop mines for other types of minerals.	3
Development of laser welding and hybrid laser welding /GMAW optimized platforms for improving products and processes in manufacturing industries Cégep de La Pocatière	The Cégep de La Pocatière in collaboration with the CSTPQ CCTT, will focus on addressing emerging issues regarding industrial laser welding. The team will investigate the stability of welds performed by laser welding, hybrid welding of thick plates and will develop a new on-line inspection method.	1
Development of platforms for the analysis of the bioactivity of molecules (preventive as well as therapeutic) aiming at the improvement of human health Cégep de Lévis-Lauzon	Lévis-Lauzon, in collaboration with the TransBIOTech CCTT, will focus on commercializing research in several fields related to biotechnology, such as immunology, molecular biology, analytical chemistry, microbiology and pharmacology.	2
Applied Research in Eco-Construction and Bio-Products in the lower St. Lawrence Region Cégep de Rimouski	The region of the lower St. Lawrence has many SMEs working in the transformation of forest products. The team of researchers from this project will: provide solutions to improve the fire resistance of wood construction materials; improve the physio-mechanical and anti-fungal properties of soft wood lumber; enhance soft wood lumber through thermo-compression; fabricate natural insulation products and durable wood-based eco-materials; improve the production processes of charcoal and valorize the sub-products generated; and, conduct applied research on bio-products and bio-energy.	3
Development of innovative firefighter clothing and adapted applications for other workers Cégep de Saint-Hyacinthe	The Cégep de Saint-Hyacinthe, by the means of CTT Group and its partners, proposes to develop a new bunkersuit concept to improve thermophysiological comfort, mobility and thermal protection, as well as to confer interactive and adapted functions to insure optimal health-security of firemen at work.	1

Name	Description	Competition #
Innovative technologies to reduce environmental waste in the production of composite material parts Cégep de Saint-Jérôme	Within the context of international competition where environmental legislation and workplace health and safety issues are key concerns, the researchers at Cégep de Saint-Jérôme and its partners will experiment with the treatment and reinsertion of certain residues, such as widely used polymer composites and fibreglass, with a view to reducing their environmental impact.	3
Technology Centre for Advanced Alloys Cégep de Trois-Rivières	The Cégep de Trois-Rivières, through its Centre intégré de Fonderie et métallurgie, intends to conduct R & D activities to benefit the titanium and advanced alloys industry cluster. The goal is to develop technologies or products with significant technology transfer potential for suppliers of the aeronautical and medical markets.	3
Supporting innovation among businesses related to bioresources Institut de technologie agroalimentaire	The Institut de technologie agroalimentaire, by the means of Biopterre and its partners, propose to develop new agroenvironmental technologies, processes and biomass products in such fields as pharmaceuticals, cosmetics, energy and food.	1

Appendix 6

Performance Measurement Tools for College Applied Research

Logic Model Framework Canadian College and Institute Applied Research Performance Measures

Goal: Enhancing Canada's Competitiveness by Building College Capacity to Support Industry Innovation

AREA OF MEASUREMENT	INPUTS Resources Contributions Partnerships	ACTIVITIES Processes Tools Events Actions	OUTPUTS Products Processes Services	OUTCOMES Results Changes in people, organizations and systems	IMPACTS Social, environmental, economic changes over time
Impact on Institution	1. Research office 2. Core budget 3. Core staffing 4. Internal grants 5. External grants	1. Presentations, promotion, workshops, events to build internal capacity for applied research 2. Presentations, outreach, events to build external awareness of college capacity for applied research	1. Governance structure 2. Policies and procedures 3. Training for students 4. R&D training incorporated into core courses 5. Identification of areas of research specialization	1. Increased capacity to conduct R&D 2. Increased support internally for R&D 3. Enhanced curriculum 4. Membership in research networks	1. Positive financial impact 2. Increased student satisfaction 3. Establishment of research centres/ specialized labs 4. Enhanced reputation
Impact on Company or Community	1. Investments of cash and in kind by companies or community organizations	1. Contacts with companies/community agencies 2. R&D needs analyses 3. R&D projects with companies/community organizations	1. New technologies assessed 2. New products or processes 3. Improved products or processes	1. Increased awareness of college capacity for R&D 2. Increased interaction of companies and colleges 3. Companies and colleges build strategies for ongoing relationship 4. Company satisfaction with college R&D projects 5. Job creation 6. Increased market share or new markets	1. Economic development 2. Positive impact on community
Impact on Faculty and Staff	1. Faculty release time for R&D 2. Research resources, facilities, and equipment	1. Training in R&D procedures or on new equipment	1. Faculty participation in R&D projects 2. Dissemination of research results	1. Increased faculty/ staff participation in R&D projects 2. Courses/curriculum enhancements	1. Enhanced professional development of faculty and staff 2. Close links with companies and community

AREA OF MEASUREMENT	INPUTS Resources Contributions Partnerships	ACTIVITIES Processes Tools Events Actions	OUTPUTS Products Processes Services	OUTCOMES Results Changes in people, organizations and systems	IMPACTS Social, environmental, economic changes over time
Impact on Students	1.Support for students to participate in R&D activities	1.Training in R&D procedures and on new equipment	1.Student participation in R&D projects 2. Increased student awareness of industry R&D needs and challenges 3.Dissemination of research results	1.Satisfaction rate 2.Students receive jobs with companies resulting from/linked to R&D experiences	1.Enhanced employability

Canadian College and Institute Applied Research Survey

Industry Partner Survey

As an Industry Partner, your feedback is crucial for documenting the outcomes and impacts on the companies of working with Colleges or Institutes on applied research projects. This survey seeks to capture the impacts your organization has realized through collaboration with COLLEGE NAME.

Please review the list below and check those outcomes you believe your company achieved directly or indirectly through your collaboration with COLLEGE NAME.

Improved Capacity for Industrial Innovation/ Applied Research	Improved Competitiveness and Sustainability	Improved Profitability
Development of new and/or improved products, processes and services	Improved strategic and business planning and decision-making	Reduced production/operation costs
Better understanding of the link between innovation and competitiveness	Improved supply chain relationships	Improved access to financing and investment
Increased knowledge of the best practices/ processes for industrial innovation	More effective marketing efforts	Increased profits
Increased skill in conducting industrial innovation	Job retention/creation	New/renewed contracts
New corporate goals to increase spending in R&D	New markets	Increased value of exports
Plans to collaborate with COLLEGE NAME on future industrial innovation projects	New clients/customers	Reduced R&D costs
Increased awareness of the value of the expertise and resources available at COLLEGE NAME for supporting industrial innovation/applied research	Reduced sales cycles	Reduced time to market
	Reduced production time	Increased sales/revenues
	Improved financial and budget planning and management	
	Increased market share	

What do you feel is the most important benefit of your collaboration with COLLEGE NAME?

Canadian College and Institute Applied Research Survey

Research Staff Survey

This survey is intended for staff involved with managing, administering and coordinating innovation support and applied research at Canadian colleges and institutes. Please check those outcomes you believe have occurred at your institution.

Improved Institutional Capacity for Industrial Innovation/Applied Research	Improved skills and competencies for managing, coordinating Industrial Innovation/Applied Research	Industrial Innovation/Applied Research Recognized as Key Mandate for Colleges
New/improved policies, procedures for managing, administering and delivering industrial innovation and applied research	Increased skills in managing administering and delivering industrial innovation and applied research	Increased external support for industrial innovation/applied research (non-industry)
New partnerships/collaborations (non-industry)	Improved access to and use of resources for managing, delivering and administering industrial innovation/applied research	Local political interest/support for industrial innovation/applied research in the College
Increased support for industrial innovation/applied research from senior management	Increased understanding of the needs of SMEs for industrial innovation/applied research	Broader community awareness of College-based industrial innovation/applied research
Increased number of projects	Increased skill in project management	Increased external funding for industrial innovation/applied research
Increased awareness and support for industrial innovation/applied research within the College	Improved skill in proposal writing	Increased industry involvement in industrial innovation/applied research
Increased complexity of projects	Increased collaboration with colleagues at CONII member institutions	
Increased student participation in industrial innovation/applied research		
Increased faculty participation in industrial innovation/applied research		
New industrial innovation/applied research jobs (part-time, temporary, full-time)		
Increase number of staff (non-faculty) involved in managing, administering and delivering industrial innovation/applied research		
New resources (excluding financial and human resources) for managing, administering and delivering industrial innovation and applied research		

Please list the 3-5 most important benefits of your involvement in applied research over the past 2 years.

Canadian College and Institute Applied Research Survey

Student Survey

As a Student Research Assistant working with Industry and Faculty on an applied research project, please provide feedback on the outcomes and impacts of this research activity. Please review the list below and check those outcomes/impacts you believe you have achieved directly or indirectly through your research project.

Improved Capacity for Applied Research	Improved Skills in Applied Research	Improved Linkages to Industry
Development of new and/or improved knowledge related to applied research	New/improved skills in conducting applied research	Increased knowledge of employment opportunities
Better understanding of the needs of industry in research and innovation	New/improved skills in presenting results of research to various audiences	Increased linkages to potential employers
Increased knowledge of the practices/ processes for R&D	New/improved training for students in R&D	Increased employability
	Increased student satisfaction with course/curriculum	Hired as a result of research experience
	New/improved equipment/facilities to conduct research	

Please list the 3 most important benefits of your involvement in applied research projects over the past 2 years.

**Partnerships for Productivity and Advanced Skills:
The Role of Colleges in Canada's Innovation System**

