Evaluation of the College and Community Innovation (CCI) Program

Final Report

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Natural Sciences and Engineering Research Council

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Executive Summary

The evaluation of the College and Community Innovation (CCI) program was conducted in 2012 by Goss Gilroy Inc. in collaboration with Evaluation Division at the Natural Sciences and Engineering Research Council (NSERC). The purpose of the evaluation was to provide an assessment of the program's relevance and performance. The evaluation was also designed to ensure that NSERC meets the requirements of section 42.1(1) of the *Financial Administration Act*, the Treasury Board *Policy on Evaluation* (2009) and the timing of the evaluation stipulated in the program's initial Terms and Conditions. A mid-term review of the CCI Pilot Program was conducted in 2007. Therefore the present evaluation was to cover the period from full program inception in fiscal year 2008-2009 to fiscal year 2011-2012. Considering the fact that the permanent CCI program is relatively new, the evaluation focused on the most mature program component – the Innovation Enhancement (IE) Grant.

The evaluation methods were structured to collect information on each of the ten evaluation questions using a multi-method approach. Lines of evidence included document and administrative data review, file review, key informant interviews, a survey of partnering companies and case studies. While the overall evaluation design benefitted from multiple lines of inquiry, it had two key limitations: limited representativeness of some of the findings (in that only eight of the 13 colleges funded in the first two competitions were selected for in-depth case studies) and limited consistency in how college performance data was reported. These limitations were taken into consideration during analysis and when drawing conclusions about the program and were mitigated by incorporating data from file reviews of performance information from all 13 colleges as well as surveys of partners of colleges from all competition years.

Conclusions

Effectiveness

The evaluation found that the CCI program IE Grant is achieving or is on track to achieve its expected immediate and intermediate outcomes. These impacts were assessed primarily through case studies, which are not considered representative of all funded colleges from the first two rounds. This qualitative evidence was complemented by the file review from all 13 colleges in the first two rounds and a survey of business partners from all competition years (resulting in some responses from firms that are still in the early stages of realized impact from their interaction with the college).

In particular, the evaluation found that the IE Grant changed the nature and intensity of relationships colleges typically had with SMEs prior to the funding in terms of providing firms greater access to faculty, students, and college facilities. Most companies were satisfied with their interaction with the college (86%) and they plan to undertake a collaborative research project with the college in the future (69%). Outcomes pertaining to businesses that have been realized include the development of collaborative applied research partnerships with colleges and increased R&D activities. Overall, the survey found that, seven in ten (70%) companies had experienced some type of impact on their business or their R&D capacity in particular. Specifically, almost two in five (39%) had experienced some positive impacts on annual revenues, number of new customers or the number of employees as a result of the IE Grant-funded partnerships. More than two-thirds (69%) of companies had also experienced impacts on

at least one aspect of their R&D capacity (i.e., either on their ability to introduce new or substantially improved products, processes or services; their ability to introduce new or substantially improved products, processes or services to market; their ability to attract investments or their ability to make research investments). The case studies, conducted with eight of the 13 colleges funded in the first two funding rounds, provided an even more positive picture of the impact on SMEs. There were many examples of SMEs that have seen commercial impacts attributable to the collaborative R&D partnership, including the development of new products, processes and technologies and/or the improvement of existing products, processes and technologies.

The evaluation also found that the capacity at colleges to meet the needs of SMEs has also been increased as a result of the IE Grant. Key areas in which capacity was increased include faculty release time, access to equipment, and development of applied research programs. Faculty release time, in particular, was identified as a key success factor leading to increased college capacity, but is one area where challenges remain to counteract the cultural and systemic barriers to this approach. A few colleges have used dedicated resources for administration and management of the IE Grant, such as project managers, that allows faculty to focus primarily on research aspects of projects.

Generally, the evaluation found that most colleges would need continued government support if they were to maintain their existing capacity and resulting applied research project support for SMEs. Continued reliance on government funding appears appropriate since SMEs are challenged to support applied research capacity at colleges.

While the evaluation did not assess to what extent student impacts have occurred overall, case studies suggest that student impacts have been realized. Most college representatives consulted for the evaluation emphasized that in an educational environment such as the college system, impacts for students are an important area of focus for projects undertaken through the IE Grant. Besides increasing their knowledge, technical skills, soft skills and interest in applied research, students were able to enhance their CVs and improve their access to job opportunities and outreach activities. These impacts were achieved through direct involvement in IE Grant collaborative research projects as research assistants, research associates, interns, co-op students, and participants in in-class projects. The effectiveness of training opportunities was further strengthened by company-student interaction where students' participation in applied projects with business partners provided them with greater opportunities to apply knowledge learned during class in concrete projects with tangible results for businesses. The evaluation found that, on average, 10 more students per college receive training opportunities with industry because of the IE grant. These student-level impacts led to improved student employability. The survey of partners revealed that 30% of respondents had hired one or more students as a result of the IE Grant-funded project. The case studies were also able to provide anecdotal evidence of students being hired in their field which was described by most to be attributable, at least in part, to their involvement with the IE Grant.

Design and Delivery

The evaluation found that the IE Grants have been implemented as planned for the most part. Where deviations have occurred (e.g., in the turnover of SME partners), these have not adversely affected the success of the IE Grant in most cases.

Characteristics of the IE Grant's design and delivery approach that are contributing to the overall success of the program is the flexibility afforded to IE Grant recipients to tailor the

implementation of the grant to their own context; there is no one model of success. Two areas that did emerge as promising practices (depending on the context at the implementing college) are the assignment of administrative and grant management tasks to dedicated resources (thereby freeing up faculty members to focus on the applied research project), and the strong leadership at some college's senior management levels as being vital to the successful implementation of faculty release time.

The evaluation did not reveal any factors that limit or inhibit the achievement of outcomes of the IE Grant. However, there were some concerns on the part of some college representatives and a few business partners regarding the amount of performance monitoring. While the progress reporting template has been recently updated, it does not appear that the amount of reporting has decreased. This suggests that there are still opportunities to improve the consistency of how the information is presented by colleges which may help to decrease the reporting burden.

Efficiency and Economy

With respect to efficiency and economy, the evaluation found that the cost of administering the program is reasonable considering the life-cycle of the program. The operating ratio was high (19.8 cents for each $1 of grant funds awarded) in fiscal year 2008-09 when the pilot was expanded, below the operating ratio for RPP as a whole for the following two years (4.2 and 5.3 cents) and slightly higher, but identical to RPP's operating ratio, when the CU-I2I and the IRCC components were launched in fiscal year 2011-12 (6.6 cents).

Relevance

The evaluation found that the IE Grant continues to be consistent with current federal government priorities as well as the strategic outcomes and priorities of NSERC and SSHRC. The program is also aligned with CIHR's strategic outcome, but less so with the agency's Commercialization Strategy from 2005, which is currently being revised.

While all 5-year IE Grants has a focus that falls within the NSE, many of the IE Grants include components that fall within the SSH and health areas. While the CCI program's primary aim is to contribute to economic development by supporting business innovation, there appears to be a desire on the parts of SSHRC and CIHR for greater take-up through awareness-raising on the part of these organizations.

Availability of Performance Information to Support the Evaluation

The evaluation partly relied on the file review prepared from the 18-month progress reports submitted by the 13 colleges that received funding in the first two competitions. Overall, the file review report did provide valuable information for the evaluation. While there were some areas for improvement, there was evidence pertaining to most areas of performance explored for the evaluation. Future evaluations would also benefit from efforts on the part of NSERC to improve the completeness and accuracy of information on partners (e.g., information on company size and up-to-date contact information to partners).

Recommendations

1. Continue funding the CCI program IE Grant

The evaluation found that the program has or is on track to increase applied research capacity in businesses, increase college capacity for technical problem solving, and provide high quality training opportunities for students. Moreover, the program is aligned with

current government and Council priorities and there is a clear continuing need among SMEs for this type of assistance. Of course, the evaluation only focused on one type of grant under the program because it is too early to assess impacts for the other program components.

Because the evaluation found that sustaining the applied research capacity at most colleges requires more than contributions from SMEs, the CCI program should explore the potential need for, and criteria whereby, current IE Grant holders could apply for subsequent IE Grants. Alternatively, the program should ensure that other CCI grants provide funding to help sustain the applied research capacity, especially with respect to support for faculty release time and college personnel to facilitate research with businesses.

2. Establish a mechanism to encourage the sharing of best/most promising practices and lessons learned among colleges.

The evaluation found there are many ways to successfully implement IE Grants. However, there are pockets of expertise in many areas that would be of benefit to be shared, such as governance, SME outreach, the treatment of intellectual property, administrative support/capacity and approaches to reporting. Such a mechanism does not need to be overly complex or costly and could build on current mechanisms NSERC uses to communicate with colleges.

3. Continue to make improvements to grantee reporting templates and the completeness and accuracy of information on partner organizations.

The data collected through the program's current performance measurement strategy did provide valuable information for the evaluation of the CCI program. However, a few areas of improvement were identified over the course of the evaluation. The evaluation advice the program to:

a. Review and revise (where necessary) IE Grant progress reporting templates and provide guidance to colleges on CCI program expectations regarding interpretation of indicators and level of detail required.

b. Continue to improve the completeness and accuracy of information on partner organizations in the Council's administrative database.

List of Acronyms

ACCC	Association of Canadian Community Colleges
ARD	Applied Research and Development Grant
CCI	College and Community Innovation
CCTT	Centres collégiaux de transfert de technologie
CECR	Centres of Excellence for Commercialization and Research
CIHR	Canadian Institutes of Health Research
CONII	Colleges Ontario Network for Industry Innovation
CSTPQ	Le Centre spécialisé de technologie physique du Québec
CTRI	Centre technologique des résidus industriels
CV	Curriculum Vitae
ECUAD	Emily Carr University of Art and Design
GBC	George Brown College
GGI	Goss Gilroy Inc.
GOC	Government of Canada
HR	Human resource
IE Grant	Innovation Enhancement Grant
IP	Intellectual property
KI	Key informant
LOIs	Letters of Intent
NCE	Networks of Centres of Excellence
NRC-IRAP	National Research Council Industrial Research Assistance Program
NSE	Natural sciences and engineering
NSERC	Natural Sciences and Engineering Research Council of Canada
OCE	Ontario Centers of Excellence
OECD	Organization for Economic Development and Cooperation
OMAFRA	Ontario Ministry of Agriculture and Rural Affairs
PSAB	Private Sector Advisory Board
RFID	Radio frequency identification
R&D	Research and Development
SME	Small and medium enterprise
SSH	Social sciences and humanities
SSHRC	Social Sciences and Humanities Research Council
S&T	Science and technology
TEN	The Evidence Network
TBS	Treasury Board Secretariat
VCH	Vancouver Coastal Health

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1.0 Introduction

This report presents the key findings, conclusions and recommendations from the evaluation of the College and Community Innovation (CCI) program. Goss Gilroy Inc. was mandated to conduct the evaluation in collaboration with Evaluation Division at the Natural Sciences and Engineering Research Council (NSERC). The purpose of the evaluation was to provide senior management at NSERC, the Social Sciences and Humanities Research Council (SSHRC) and the Canadian Institutes of Health Research (CIHR) with an assessment of the program's relevance and performance. The evaluation was also designed to ensure that NSERC meets the requirements of section 42.1(1) of the *Financial Administration Act*, the Treasury Board *Policy on Evaluation* (2009) and the timing of the evaluation stipulated in the program's initial Terms and Conditions.

A mid-term review of the CCI Pilot program was conducted in 2007. Therefore the present evaluation was to cover the period from full program inception in fiscal year 2008-2009 to fiscal year 2011-2012. Considering the fact that the permanent CCI program is relatively new, the evaluation focused on the most mature program component – the Innovation Enhancement (IE) Grant.

The introductory section of the evaluation report includes: background information on the CCI program and the evaluation scope and questions. The methods are summarized in Section 2.0, including methodological strengths and limitations. The findings of this study are presented by the evaluation questions in Sections 3.0 to 6.0, with the conclusions and recommendations presented in Section 7.0. The bibliography for the evaluation is presented in Appendix A.

1.1 Overview of the CCI Program

The College and Community Innovation Pilot (CCIP) program was launched in 2004 with the intent to help colleges build or increase their capacity to support applied research in their community and/or region. The rationale for this pilot program was that, while Canada is a world leader in the provision of public funding for research and development (R&D), Canadian businesses and especially small and medium enterprises (SMEs) generally do not invest a significant part of their budget in R&D compared to other Organization for Economic Cooperation and Development (OECD) countries.[1] Colleges were deemed to be well positioned to foster SMEs' R&D investments after a 2002 NSERC study showed that these institutions were already involved in a wide range of research and innovation activities in partnership with local businesses, such as

[1] NSERC. (2007). College And Community Innovation Pilot Program Mid-Term Review.Page 5.

technical problem solving, product/process/prototype development and market studies[2]. The targeted colleges include over 150 community colleges, institutes of technology and Cégeps[3] in over 900 communities across Canada that were already receiving funding from their respective provincial government to contribute to the socio-economic development of their region. Since colleges as well as their innovation activities were not typically funded by NSERC, the intent of the pilot program was to validate over three years that colleges could help SME's with research and innovation prior to the implementation of a permanent program.

Based on the success of NSERC's College and Community Innovation Pilot program, the permanent College and Community Innovation (CCI) program was officially launched in 2008-09 following a Government of Canada (GOC) announcement in Budget 2007, and in the Federal S&T strategy[4]. The program initially only included the Innovation Enhancement (IE) Grant. Later on, additional components were added, including:

- The Applied Research and Development (ARD) grants;
- The Applied Research Tools and Instruments (ARTI) grants;
- Technology Access Centre (TAC) grants;
- The Industrial Research Chairs for Colleges (IRCC) grants;
- The College University Idea to Innovation (CU-I2I) grants; and
- Entry Level IE grants.

The IE Grant currently has the largest share of the program budget, with about $22 million available for Entry Level and Five-Year grants. The ARD, ARTI and the TAC grants were launched in 2010, following a $15 million additional commitment from the federal government to support partnerships between colleges and businesses through the CCI program. More recently, CU-I2I and IRCC Grants were launched from new funds announced by the Government of Canada in Budget 2011. Budget 2011 provided $3 million in 2011–12 and $5 million per year on a permanent basis starting in 2012–13 for the IRCC grants and provides $1 million in 2011–12, $2 million in 2012-13, and $3 million per year on a permanent basis starting in 2013–14 for the CU-I2I grants.

2 Ibid, Page 1.
3 Hereafter "colleges" will be generally used to refer to colleges, institutes of technology and Cégeps.
4 NSERC. (2008). Joint Results-based Performance Measurement Strategy for the College and Community Innovation (CCI) Program.

1.1.1 Logic Model

The logic model identifies the linkages between the activities of a program and its final objectives. It delineates the set of activities that make up the program and the sequence of outcomes that are expected to flow from these activities. As such, the logic model developed for the CCI program serves as a "roadmap", showing the chain of results connecting activities to the final outcomes, and thus, identifies the steps that will demonstrate progress towards their achievement (see Figure 1.1)[5]. The shaded areas of the logic model are those activities, outputs and outcomes that pertain specifically to IE Grants that were explored during this evaluation. The logic model does not include the recently launched CU-121 and IRCC grants.

Activities

The CCI program management undertakes a number of core activities intended to bring about its intended outcomes. It implements a two-stage process to evaluate applications from eligible colleges - a Letter of Intent (LOI) stage and full application stage. The program communicates with the college community to inform them of competition dates, and invites LOIs. During the LOI stage, the LOIs are first evaluated against selection criteria by a multidisciplinary CCI Review Committee comprised of members nominated by NSERC who understand the role of the colleges in economic development and their connection with SMEs, and have experience in innovation activities at the community level. The CCI Review Committee makes recommendations to NSERC as to which colleges should be invited to submit full applications. NSERC reviews the selection recommendations for approval. Each college that submits an LOI receives a confidential LOI evaluation report that includes comments from the CCI Review Committee.

During the full application stage, the applications undergo a peer review by external referees. The CCI Review Committee synthesizes the results of the peer review, and provides advice and comments on each application to NSERC as to which colleges should be funded. NSERC reviews the funding recommendations and approves the final selection. Each college that submits a full application receives a confidential full application evaluation report that includes comments from the external referees and the CCI Review Committee.

Over the term of the grants, NSERC engages in ongoing grant administration and financial and performance monitoring through progress reports, the conduct of financial reviews, and periodic program evaluations.

[5] NSERC. (2008). Joint Results-based Performance Measurement Strategy for the College and Community Innovation (CCI) Program.

Outputs

Each activity has an output associated with it, which is located in the second row of Figure 1.1. Outputs are the immediate results of the activities; they are tangible products and/or services that are produced or delivered through the activity and, as such, demonstrate the implementation of the activities (e.g., applications to the CCI program, and the CCI grants: IE grants, ARTI grants, ARD grants, and TAC grants). NSERC has direct control over program outputs and are accountable for them. Although the outputs provide an indication of the volume of work being carried out, they do not reflect the benefits or changes as a result of the activities; these are reflected in the outcomes.

Immediate Outcomes

The immediate outcomes of the CCI program are the initial results that occur as a result of the activities and outputs. While the program has influence over these outcomes, they are directly controlled by the funded colleges. These outcomes focus on the actions of the grantee institutions, their faculty and students, local industries and other organizations or other stakeholders involved in the funded project(s). The direct outcomes of the funded colleges are: that colleges will implement the research project based on the approved plan and budget, and comply with CCI guidelines; colleges will acquire, develop, and use the required equipment for applied research collaborations with industry; and that colleges provide technology and management services to address the innovation needs of industry. These initial outcomes should lead to increased applied research, development, and innovation projects between colleges, local companies, and other organizations. Increased applied research activity at colleges should lead to: enhanced teaching activities and course content at the college level, and increased involvement of college faculty, staff, and students in applied research, development and innovation; this in turn should lead to an increased number of college students with applied research knowledge and industry experience, as well as industry's use of knowledge and/or technology. At the same time, the increased applied research, development, and innovation capacity of colleges to respond to technical issues of industry should result in industry's increased awareness of the capacity of colleges to assist with their research, development or innovation needs. The immediate outcomes are expected to occur during the funding period; however, given the varying degrees of complexity of these outcomes, some may occur after the term of the grant.

Intermediate Outcomes

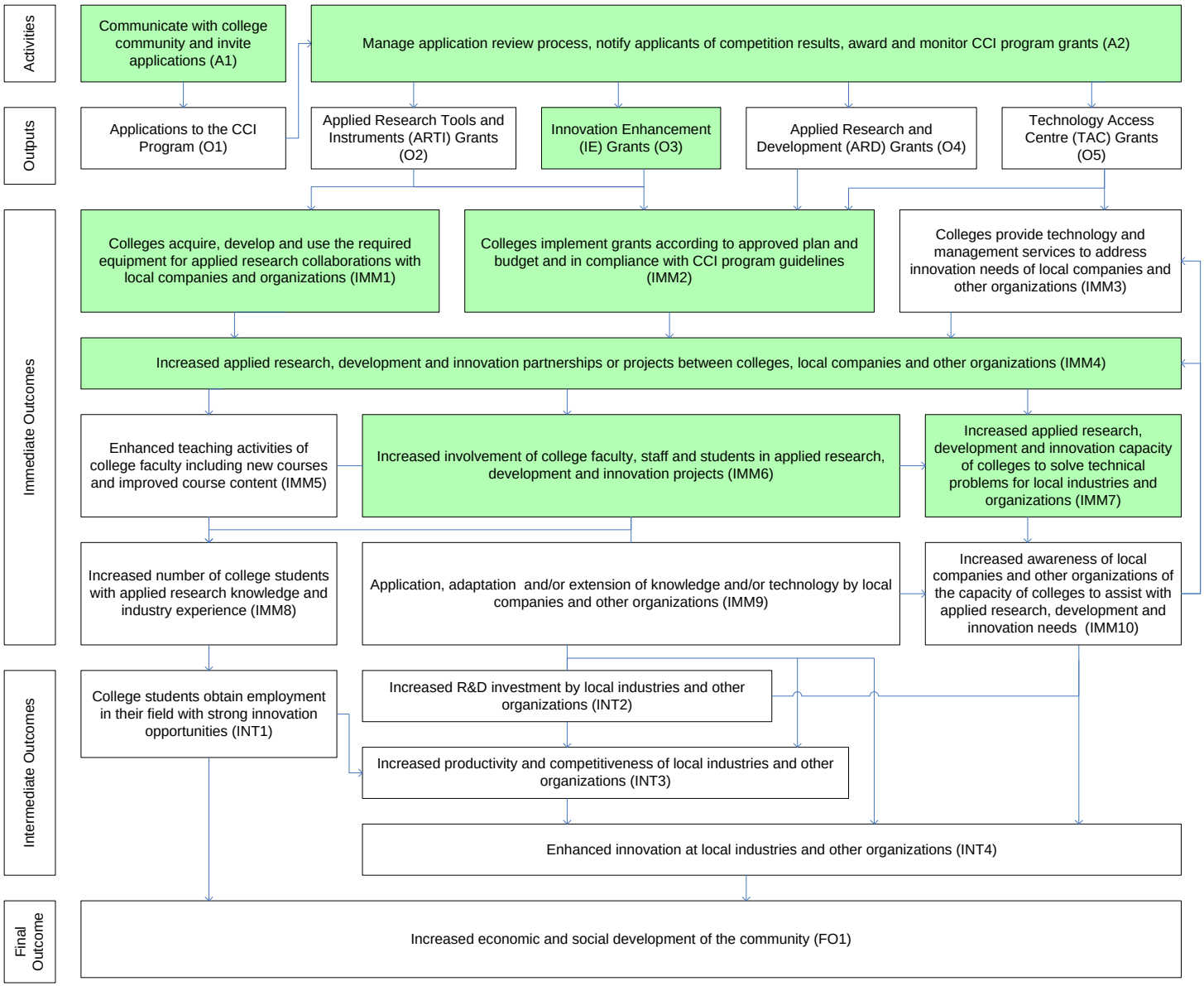
Intermediate outcomes represent the consequences that flow from the immediate outcomes and, for the most part, are expected to occur after the funding period. These outcomes include: increased R&D investment by local industry that contributes to the increased productivity and competitiveness of local industries and other organizations, which in turn results in increased productivity and competitiveness of local industry.

This, along with an increase in employment for college graduates with applied research skills and industry experience; and an enhanced reputation of colleges as applied research and technology transfer partners for local industries and other organizations, contribute to industry's enhanced innovation. The degree to which the CCI program has influence over these outcomes is further removed from that of the immediate outcomes.

Final Outcome

The final outcome represents the broader societal impact that the CCI program contributes to along with other programs and initiatives and environmental factors. It is expected that the CCI program will contribute to the final outcome at the community or regional level; however, the degree to which the program can influence the achievement of longer-term outcomes is further removed than other levels of outcomes. Final outcomes are usually not measurable at the program level due to inherent problems with establishing attribution, but rather at a departmental or even governmental level using aggregate measures. The final outcome for the CCI program is increased economic and social development of the community.

Figure 1.1: College and Community Innovation (CCI) Program Logic Model



1.1.2 Budget

The Treasury Board Secretariat's (TBS) allocation for the CCI program equaled about $80.7 million dollars from 2008-2009 to 2011-2012 (see Table 1.1). The average percentage of operational allocations out of the total budget was 5.1%, with a high of 18.3% during the first year. Extra operational funds were used in the early stages of the program to cover costs associated with start-up activities. Operational allocations in fiscal year 2011-12 include $954,648 for the salaries of the 12 full-time equivalents required to deliver and administer the program. Other operational expenses total $566,541 to cover travel and accommodation costs, communications, information management and increased internal services required for management of the program.

Table 1.1: TBS Allocation for the CCI Program 2008-2009 to 2011-2012

	2008-09	2009-10	2010-2011	2011-2012	Total
Total Program Budget (Grants)	$2,050,750	$14,550,750	$28,033,866	$32,163,777	$76,799,143
Operational Budget Allocation*	$375,000	$375,000	$1,652,116	$1,521,189	$3,923,305
Total	$2,425,750	$14,925,750	$29,685,982	$33,684,966	$80,722,448

* The operational budget allocation excludes funds for the Employee Benefit Plan (EPB). Note that NSERC allocated additional funds for program administration to the program for all years to ensure that operational requirements could be met (see Section 5.0).
Source: NSERC administrative data

1.1.3 The Innovation Enhancement (IE) Grant

The main goal of the IE Grant, under the CCI program, is to increase innovation at the community and/or regional level by enabling Canadian colleges to increase their capacity to work with local companies, particularly SMEs[6]. The IE Grant provides funding support to colleges to help them build and/or reinforce collaborations with local business partners towards the development, adoption and/or commercialization of new technologies in the four Canadian priority areas of research: environmental science and technologies, natural resources and energy, health and related life sciences and technologies, and 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 (S&T) strategy[7]. Ultimately, it is hoped that the reinforcement of colleges' R&D capacity and increased investments in R&D by SMEs will generate positive economic impacts for the community, notably in the form of job creation.

[6] NSERC. (2012). College and Community Innovation Program - Innovation Enhancement Grants. Retrieved July 30, 2012 from: http://www.nserc-crsng.gc.ca/Professors-Professeurs/RPP-PP/CCI-ICC_eng.asp.

[7] NSERC. (2012). Request For Proposals Summative Evaluation Of The College And Community Innovation (CCI) Program - Innovation Enhancement Grant.

Colleges may apply for either the Entry-Level IE Grant, that provides up to $100,000 per year for one to two years, or the Five-Year IE Grant, that awards up to $500,000 per year for years 1 to 3, and four-fifths of the annual base funding in years 4 and 5[8]. Funding decreases in the last two years for Five-Year IE Grants to encourage colleges to maintain existing and build new collaborations with business partners in the long-term and secure cash and in-kind contributions that will help sustain their applied research capacity past the IE Grant[9].

Eligibility Criteria

To be eligible for one or the other stream of the IE Grant, colleges must:

- Offer programs in the natural sciences, engineering, social sciences, humanities and/or health sciences in line with the applied research areas proposed;
- Ensure that faculty members involved in the IE Grants are engaged in research in the natural sciences, engineering, social sciences, humanities and/or health sciences; and
- Provide the space, facilities and services to enable its natural sciences, engineering, social sciences, humanities and/or health sciences faculty members to conduct research;

Only colleges who have never received an IE Grant are eligible to apply for an Entry-Level Grant.

Governance and Corporate Structure

The Deputy Director of the CCI program is accountable for the operation of the program and reports to the Director of Knowledge and Technology Transfer Division for the delivery and results of program. The Director reports to the Vice-President Research Partnerships who reports to the President of NSERC on the delivery and progress of the program. In turn, the President is accountable to NSERC Council for the CCI program. NSERC is accountable for all reporting obligations on this program to Treasury Board and reports to Parliament through the Minister of Industry[10].

CIHR and SSHRC have become increasingly involved in the administration of the program, although the responsibility for managing the program continues to lie with NSERC. Proposals in the social sciences and humanities (SSH) or health areas are submitted to NSERC and reviewed by the CCI Review Committee. If projects without

[8] NSERC. (2012). College and Community Innovation Program - Innovation Enhancement Grants. Retrieved July 30, 2012 from: http://www.nserc-crsng.gc.ca/Professors-Professeurs/RPP-PP/CCI-ICC_eng.asp.

[9] NSERC. (2012). College and Community Innovation Program - Innovation Enhancement Grants. Retrieved July 30, 2012 from: http://www.nserc-crsng.gc.ca/Professors-Professeurs/RPP-PP/CCI-ICC_eng.asp.

[10] NSERC. (2008). Joint Results-based Performance Measurement Strategy for the College and Community Innovation (CCI) Program.

an NSE-component are approved for funding, funds are transferred from NSERC to CIHR or SSHRC which administer these grants.

Program Delivery

Applications are reviewed by the CCI Review Committee, with input from CIHR and SSHRC[11]. The Committee provides comments and advice on each application that is shared with applicants. As part of the 2007 S&T strategy, the federal government created the PSAB to provide advice on the implementation of the Centres of Excellence for Commercialization and Research (CECR), Business-led Networks of Centres of Excellence (BL-NCE) and CCI program to ensure the programs meet the needs of Canadian businesses. For the CCI program, the Private Sector Advisory Board (PSAB) provides advice as appropriate on implementation, delivery and performance measures of the CCI program, and through the CCI Review Committee, which includes at least four PSAB members, provides advice on the selection of IE grants.

Applications are assessed on the basis of their potential to contribute to local or regional innovation, excellence of the proposal, and the need for and use of resources. Funds are transferred directly to colleges whose applications are successful. They are to be used to pay for costs associated with applied research projects and knowledge transfer/outreach activities described in the proposal, including staff and students' salaries. The college can also allocate part of the IE Grant funds to pay for faculty release time to faculty members involved in the projects. Expenditures related to the purchase, installation and development of research equipment and for the operation of applied research facilities are also eligible. However, colleges cannot use grant funding to purchase major equipment, as alternative sources are available for that purpose. Additionally, up to 20% of the budget can be allocated to overhead and administration costs. Aside from these requirements, the IE Grant was designed to be flexible enough to be suitable for colleges with various sizes and characteristics (from small to large, rural or urban, etc.) and to be used for a wide range of activities[12].

Competition Results

As of August 2011, seven competitions have been held for IE Grants. A total of 139 Letters of Intent and 84 Full Applications were received between April 2008 and November 2010 for the Five-Year IE Grant. NSERC approved 47 of these 84 applications, which corresponds to a success rate of 56%. The Entry-Level IE Grants became available in 2009 and there have been four competitions between May 2009 and November 2010. A total of 25 applications were submitted to the CCI program, out of

[11] SSHRC and CIHR act as observers during peer-review committee deliberations for new proposals.

[12] NSERC. (2012). College and Community Innovation Program - Innovation Enhancement Grants. Retrieved July 30, 2012 from: http://www.nserc-crsng.gc.ca/Professors-Professeurs/RPP-PP/CCI-ICC_eng.asp.

which 15 were successful, which corresponds to a success rate of 60%. Table 1.2 below presents the number of Letters of Intent (LOIs), applications and awards per IE Grant type and per year[13].

Table 1.2: Competition Statistics by Year and Type of Grant

Competition	Five-Year IE Grants				Entry-Level Grants		Decision Date
	LOI Deadline Date	# LOIs Received	# Full Applications Received	# Awards	# Applications	# Awards	
1	04/2008	33	13	8	N/A	N/A	11/2008
2	09/2008	14	7	5	N/A	N/A	04/2009
3	12/2008	33	18	9	N/A	N/A	09/2009
4	05/2009	11	11	6	11	6	02/2010
5	11/2009	17	11	6	6	5	08/2010
6	06/2010	13	12	9	5	2	02/2011
7	11/2010	18	12	4	3	2	08/2011

As of today, few applications have been submitted seeking funding for health-related and SSH applied research activities without an NSE-component. None of the health-focused applications have been approved for funding while one entry-level grant has been funded by SSHRC. These data are presented in Table 1.3. Several IE grants funded by NSERC have, however, included a social science or health science component.

Table 1.3: Awards and Expenditures by Year and Type of Grant

Fiscal year	5 Year Grants		Entry-Level Grants			
	NSERC		NSERC		SSHRC	
	# of new awards	Total expenditures ($ 000's)	# of new awards	Total expenditures ($ 000's)	# of new awards	Total expenditures ($ 000's)
2008/09	9	2,051	-	-	-	-
2009/10	19	13,951	6	599	-	-
2010/11	14	18,034	7	1,200	1	95
2011/12	10	22,455	2	702	-	99
Total	***52***	***56,491***	***15***	***2,501***	***1***	***194***

Note: Total expenditures include expenditures both for new and ongoing grants. None of the projects were funded by CIHR during this time period.

[13] NSERC. (2012). Request For Proposals Summative Evaluation Of The College And Community Innovation (CCI) Program - Innovation Enhancement Grant.

1.2 Evaluation Scope and Questions

The first IE Grants awarded in 2008 (with the funds issued at the beginning of 2009) have only been fully operational for 3.5 years. Thus, it is premature to expect significant downstream impacts for IE Grant recipients and their partners. Downstream impacts (such as commercialized products, increased revenues, changes in employment) from applied research projects are often not realized for several years. Given the timing of the evaluation in the program's lifecycle, the evaluation of the CCI program was focused on the first IE grants from the competitions held in 2008 and 2009.

The evaluation questions were designed to cover the IE Grant's immediate outcomes and progress towards achieving intermediate outcomes as well as efficiency, economy and program relevance (see Table 1.4.). Since the need for the program and the federal government's role in delivering the program has not changed since 2007 when the mid-term review of the CCI Pilot program was conducted, the assessment of program relevance focused on the extent to which the CCI program continues to be aligned with federal priorities and agency strategic outcomes. The evaluation framework was developed by NSERC's Evaluation Division in consultation with representatives from senior management associated with the CCI program.

Table 1.4: Evaluation Questions

Issue/Question
Effectiveness: The extent to which the IE Grant is achieving or demonstrating progress towards the intended outcomes
1. To what extent has the IE Grant been effective in increasing industry research and development?
1.a. To what extent has the program facilitated commercially relevant R&D partnerships between colleges, local companies and other local organizations
2. Has the IE Grant increased the capacity of colleges to respond to technical problems of local industry and other organizations?
3. To what extent has there been progress toward the involvement of college faculty, staff and students in applied research, development and innovation?
4. To what extent has involvement in the IE Grant enhanced students' applied learning?
5. To what extent has participation in IE Grant contributed to college students obtaining employment within their field?
6. To what extent has the IE Grant resulted in sustainable applied research capacity at the funded colleges?
7. Has the program generated any unintended impacts?
Design and Delivery: The extent to which the IE Grant is being administered and delivered in the intended manner
8. To what extent have colleges implemented grants as planned? What are the factors in the program's design and delivery that have facilitated or inhibited the achievement of intended outcomes?
Efficiency and Economy: The extent to which the IE Grant utilize resources efficiently in relation to the production of outputs and progress toward expected outcomes
9. To what extent are the most efficient means being used to achieve program outcomes?
Relevance: The extent to which the IE Grant is being administered and delivered in the intended manner
10. To what extent does the IE Grant continue to demonstrate relevance?

2.0 Methods

The evaluation methods were structured to collect information on each of the evaluation questions using a multi-method approach. Where possible, a balance was sought in the use of quantitative and qualitative methods, with qualitative methods providing further description and explanation for the quantitative information. Both primary and secondary data sources were used for the evaluation. In all, five lines of evidence were implemented. The roles and responsibilities for implementing these lines of evidence were split between NSERC evaluation division, The Evidence Network (TEN), and Goss Gilroy Inc. (GGI, herein, also referred to as the consultant) as laid out in Table 2.1.

Table 2.1: Evaluation Methods by Lead Responsibility

NSERC	The Evidence Network	GGI
• File review of the 18-month interim reports from the first and second competitions • Review of documents and administrative data	• Survey of all business partners of funded CCI program grants	• Key informant interviews • Case studies

Each of the lines of evidence is described in further detail in this section. For each, the evaluation questions, approach to implementation and approach to analysis and reporting are discussed.

2.1 File Review

Colleges that receive an IE Grant are required to submit a progress report to NSERC every 18 months. A total of 13 reports, from all 8 colleges from the first competition and all 5 colleges of the second competition, were reviewed as part of the file review. These reports included information on activities and impacts of the funding on the college (including faculty, students and teaching/curriculum) and business partners thus far.

2.2 Review of Documents and Administrative Data

The document review primarily helped answer the evaluation question related to relevance while the administrative data review provided evidence for assessing the efficiency and economy of the program. The administrative data review and document review also provided background information on program participants which help inform the assessment of several other evaluation questions.

2.3 Key Informant Interviews

In all, 10 key informant (KI) interviews were conducted with 21 individuals, including four group interviews and several one-on-one interviews. KI interviews were used to gather in-depth qualitative information, including opinions, perceptions, explanations, examples and factual information that address evaluation questions. First, one interview was conducted with four representatives of CCI program IE Grant management and staff at NSERC. Findings from these key informant interviews were used to provide context around the design and delivery of the program and therefore were not integrated to the evidence from other key informant interviews used to address each of the evaluation questions. Nine interviews were conducted with three types of stakeholders, including: representatives of SSHRC and CIHR (n=3), members of the CCI Review Committee (n=4) and external stakeholders (n=10) including representatives of the Association of Canadian Community Colleges (ACCC), Polytechnics Canada, Réseau Trans-tech and the Canada Foundation for Innovation.

2.4 Survey of Business Partners

NSERC had recently commissioned an external consultant to conduct a web-based survey of the funded colleges' business partners. Some of the survey data was used as a line of evidence in the evaluation. The sample of businesses had been identified by asking the 42 colleges that had been awarded an IE Grant between 2008 and 2010 to provide up-to-date contact information for their partners. However, the sampling approach may have introduced bias since a total of 13 colleges (31%) did not provide partner contact information. As well, the rate of non-response was uneven with more 2008 grantees providing partner contact information (with a non-response rate of 14%) than grantees from 2009 (26% non-response rate) and 2010 (44%). The variation in response rate may be due to the fact that colleges often replace partners in the beginning of the grant. It is also possible that colleges that did provide partner contact information may have chosen only to share contact information for partners from successful projects.

The survey reached 196 individuals associated with 27 colleges, out of which 88 completed the survey for a response rate of 45% (see Table 2.2). Almost all survey respondents (95%) reported they had conducted projects with CCI-supported colleges between 2008 and 2010, while the rest (5%) had their project in 2011.

Table 2.2: Survey Response Rates

	Respondents
Population (27 colleges)	231
Sample	231
Valid sample	196
Responses	88
Response rate	45%
Sample error	±6.4%

Note: The valid sample excludes attrition (e.g., respondents who could not be reached due to outdated contact information).

The characteristics of the respondents were similar to the characteristics of the population in terms of company size. Companies from Quebec were under-represented in that they constituted 27% of the population, but only 17% of the respondents. Companies from Ontario and British Columbia were, on the other hand, slightly over-represented. There were also some variations between the population and the respondent group in terms of industry sector. Companies in the energy sector were slightly over-represented (7% of the population and 16% of the respondents) while others were under-represented: companies in the natural resources sector constituted 21% of the population and 15% of respondents and companies in the materials/manufacturing sector constituted 16% of the population and 9% of respondents.

Survey data presented in the report was not analyzed by demographic variables due to the low number of respondents in the sub-groups.

2.5 Case Studies

A total of eight case studies were conducted with colleges that received an IE Grant as part of the 2008 and 2009 competitions. The purpose of these case studies was to gain a better understanding of processes, challenges, successes, and lessons learned. The case studies were also used to illustrate how performance is being achieved (i.e., to explain the linkage between activities and outcomes) and how performance relates to design and delivery. All eight evaluation questions were covered by this line of evidence.

The case studies drew on information from NSERC and college administrative records and documents, key informant interviews (including group interviews for those case studies conducted on- site). Three case studies were conducted remotely (with interviews via telephone) and five featured site-visits (with in person interviews). The following table provides a summary of each of the case studies.

Table 2.3: Summaries of Case Studies Selected

Organization	Grant Title	Location	Sector	Year of Award
Cégep de l'Abiti-Temiscamingue	Recherche appliquée et support aux PME de l'Abitibi-Témiscamingue et du Nord-du-Québec pour la valorisation de la biomasse	Quebec City, QC and Abitibi-Temiscamingue, QC	Forestry Biomass	2009
Cégep de La Pocatière	Développement de plateformes de soudage laser et soudage hybride laser	La Pocatière, QC	Metallurgy	2009
George Brown College	George Brown College Research Labs	Toronto, ON	Health Promotion, Informatics	2008
Olds College	Biodiesel Production, Alternative Feedstocks, and Commercial Adoption	Olds, AB	Bio-energy	2009
Niagara College	Sustain Niagara: Supporting Innovation in Agricultural Land Management	Welland, ON	Sustainable land management, Agriculture	2008
Emily Carr University of Art & Design	The Emily Carr Centre for Moving Interaction	Vancouver, BC	Media (3-D virtual games, interfaces)	2009
La Cité collégiale	Programme de recherche appliquée et de transfert technologique en biotechnologie en solution au développement socio-économique local et régional	Ottawa, ON	Biotechnology, Natural Health Bioproducts	2009
Cégep de St-Hyacinthe	Développement de vêtements de pompier du futur et application dérivés à d'autres travailleurs	St-Hyacinthe, QC	Textiles (Etudes thermophysiologiques)	2009

2.6 Strengths and Limitations of the Design

While the overall evaluation design benefitted from multiple lines of inquiry, it had two key limitations: limited representativeness of some of the findings and limited consistency in how college performance data was reported.

Representativeness of findings. The evaluation heavily relied on case studies to assess the IE Grants' impact on colleges and partners as they permitted a greater understanding of the impact of the grants. While the methodology was purposefully chosen to allow the evaluation to take context into account when assessing early impacts, the case study findings cannot be generalized to all colleges receiving an IE Grant, as only eight of the thirteen colleges were selected for a case study. To mitigate this, other lines of inquiry were used to help gather additional evidence. The file review provided some complementary performance information from all colleges that were awarded grants in 2008 and 2009. The results from the survey of companies also provided complementary evidence. Also, the survey represents a broad range of firms identified by IE Grant

recipients from all competition years, including those partnering with very recent IE Grant recipients. Thus, the results for surveyed firms may not be evident due to the nascent status of many of these collaborations. While key informant interviews helped augment the evaluation findings further, it is important to remember that these may not represent the views and experiences of the larger populations.

Consistency in reporting of college performance data. Ideally, assessments of the performance of programs include some kind of comparison to a baseline or to similar organizations that did not receive funding. Comparison groups were not used for this evaluation because it would have been extremely difficult and costly to try to identify comparison groups for colleges and partners. Similarly, to collect meaningful baseline data from companies would be very challenging since they would likely consider much of the information required as proprietary information. The grant application form and the 18-month progress reporting template were designed to collect baseline and actual data from colleges (e.g., number of partnerships; extent of faculty, staff and students, employment). The file review noted a lack of consistency in the way data was reported by the colleges. Consequently, detailed comparisons between baseline and actual would likely not have produced reliable findings. Instead, the file review focused on identifying broad trends in the data rather than exact magnitude of the impacts (e.g., how many colleges had experienced increases rather than exactly what the increases had been).

2.7 Presentation of the Report

The evaluation evidence is presented by the evaluation questions. Evidence has been synthesized and specific findings from certain lines of evidence highlighted were appropriate. For qualitative lines of evidence (e.g., case studies, key informant interviews), the following scale is used in the text of the report to indicate the relative weight of the responses for each of the respondent groups.

- **"All/almost all"** – findings reflect the views and opinions of 90% or more of the key informants/respondents commenting on that particular issue;
- **"Most"** – findings reflect the views and opinions of at least 50% but less than 90% of the key informants/respondents commenting on that particular issue;
- **"Some"** – findings reflect the views and opinions of at least 25% but less than 50% of the focus group participants commenting on that particular issue; and
- **"A few"** – findings reflect the views and opinions of at least two respondents but less than 25% of the focus group participants commenting on that particular issue.

3.0 Findings – Effectiveness

3.1 To what extent has the IE Grant Increased Industry R&D?

Summary of Findings:

The evaluation found that the CCI program IE Grant has contributed to increasing business R&D overall. The IE Grant has primarily facilitated commercially relevant R&D partnerships between colleges and SMEs, but also between colleges and larger companies and other organizations. The collaborative opportunities were relevant to companies in that they offered cost-sharing, infrastructure (i.e., space and equipment) and HR capacity. Thus, the IE Grant enabled colleges to connect with new SMEs and changed the intensity and nature of the relationship colleges typically had with SMEs prior to the funding term. Firms were given more opportunities to engage in applied research projects with the college and access faculty, students, and college facilities.

The survey of partners found that some companies had experienced impacts on annual revenues, number of new customers and number of employees as a result of the IE Grant-funded partnerships. Partners were, however, as likely to have experienced impacts as to not have experienced impacts. The case studies did offer over a dozen examples of commercial impacts attributable to the IE grants, including the development of new and improved products and processes and new and improved technologies.

The results for impacts on partners' R&D capacity are mixed as well. Here, survey results indicate that while between one and two- thirds of respondents indicated that the Grant had at least some positive impact on different aspects of their R&D capacity, a sizable proportion indicated that the Grant had either no impact or that the type of impact was not relevant to the collaboration they had engaged in. This contrasts with the more positive picture presented from other evaluation evidence that suggests SMEs have increased their investments in R&D through expenditures and hiring. Most KIs and case study interviewees stated that the IE Grant assisted colleges to address the R&D capacity shortfalls of SMEs. These respondents emphasized that SMEs are typically limited in financial resources and internal capacity to pursue R&D. Thus, the IE Grant is considered to have increased R&D activity and capacity among SMEs.

3.1.1 Has the IE Grant facilitated commercially relevant R&D partnerships?

Development of Partnerships with Businesses

The evaluation found that the IE Grants assisted colleges in strengthening and expanding existing partnerships with companies, as well as fostering the development of new commercially relevant partnerships.

The file review indicates that all colleges had engaged in outreach activities to make companies aware of their capacity to help with applied R&D. Activities included visits to local companies, hosting of events, and distribution of information in brochures or via web sites. Many SMEs also became aware of the colleges' services through word-of-mouth. Case study evidence suggest that local SMEs are much more aware of the R&D capabilities of the colleges and, in many cases, the colleges are now seen as a central point of contact for R&D solutions. It is the opportunity for cost-sharing as well as access to infrastructure, HR capacity, and expertise that make SMEs interested in collaborating according to key informant interviews and case study findings. Existing relationships with college staff and faculty was another important factor.

The approach to selecting partners varied by IE Grant recipient. Some colleges continued to work with existing partners, while others immediately sought to establish new partners. Example of approaches include:

- Approaching existing partners. Rather than develop a research plan and specific objectives for each partner, a single agreement was drawn up which outlined research parameters but did not specify the precise requirements for each partner.
- Following a sequential approach to partnership development. Initially, the college collaborated with existing partners to generate results that could be showcased to a broader audience of potential partners. This led to increased demand for collaborations with the college. The college could, consequently, be more selective about the projects that were pursued.
- Continuing to work with existing partners while seeking new partners through existing college staff and faculty networks, partnerships with industry associations and non-profit research centres, presentations at events frequented by SMEs, and through the college's website.
- Engaging new partners, except for select long-standing partners. Included conducting market assessments and welcoming referrals from national and regional programs that assist SMEs to identifying potential partners.

Case study evidence suggests that although some colleges had pre-existing relationships with businesses for co-op placements and internships, very little collaborative R&D activity was occurring between colleges and businesses prior to the IE Grant. Thus, the

IE Grant changed the relationships in terms of providing firms greater access to faculty, students, and college facilities. Colleges also managed to establish many new partnerships with companies following the grant award. Those funded through the first two competitions had collaborated with an average of 13 companies at the time they submitted the 18-month progress report and slightly less than half (47%) of these partners had been identified at the time the grant was awarded.

In the case of Quebec colleges, the IE Grant was seen as beneficial in advancing and refining existing applied R&D programs. A few stakeholders interviewed for the evaluation observed that there has been a difference in the partnerships between colleges in Quebec and colleges outside of Quebec. These interviewees suggested that in Quebec the total number of partnerships might not have increased as much, but the quality and duration have. This is in contrast to other provinces, where it is believed that the absolute number of partnerships has probably increased.

Organizations that had collaborated with colleges on an IE Grant awarded in 2008-2011[14] were most often located in Quebec (38%), Ontario (37%), Alberta (9%) and British Columbia (8%). Organizations from other provinces and territories represented less than 7% of the total. Most were companies (83%), whereof almost three-quarters (73%) were small, slightly more than one in ten (12%) medium-sized and the rest (15%) large.[15] These companies were most often associated with the natural resources (27%), materials/manufacturing (14%), and information and communications technologies (10%) sectors. It was less common that companies from the energy (1%), life sciences/medical (5%), environment (3%) and other sectors (40%) participated.

Survey findings provide information about the nature of interactions between colleges and partner companies. Survey results indicate that companies used several CCI Program offerings intensively (i.e., respondents reported "moderate" or "high" use). Many survey respondents (57%) have participated in collaborative or jointly sponsored applied research with colleges. Also, about half (51%) accessed college talent and infrastructure. Some respondents (35%) accessed college contract research services and a few (24%) reported having used educational or training services.

Partnership Satisfaction and Challenges

The survey of business partners found that most respondents (86%) were satisfied with their interaction with the college. The findings from the case studies indicated the same, but a few highlighted that it takes time to become familiar with student abilities and how these abilities can be applied to assist the firm or partner. In addition, some college

[14] This included both those identified in the proposal and those that had been identified by colleges as part of the partner survey (n=627).

[15] Note that company size was not known for 32% of the population.

representatives interviewed as part of case studies indicated that one key challenge of collaborating with businesses was making sure the science associated with the project as well as the abilities and limitations of the college to meet the objectives of the project were clearly communicated to business partners and expectations were managed. One college had not clarified their IP agreements up front and were attempting to work out IP issues with at least one of their partners before a product which could be commercialized was fully developed.

Case study evidence suggested that, while most business partners had the technical/conceptual knowledge required to participate in R&D projects, a few business partner representatives were not as accessible to faculty or students as was originally expected. College administrators and faculty at the colleges reported that this is part of the learning curve in developing partnerships and that over the past few years more care has been taken in clearly setting out roles and responsibilities up front.

3.1.2 What have been the impacts of IE Grant-funded partnerships?

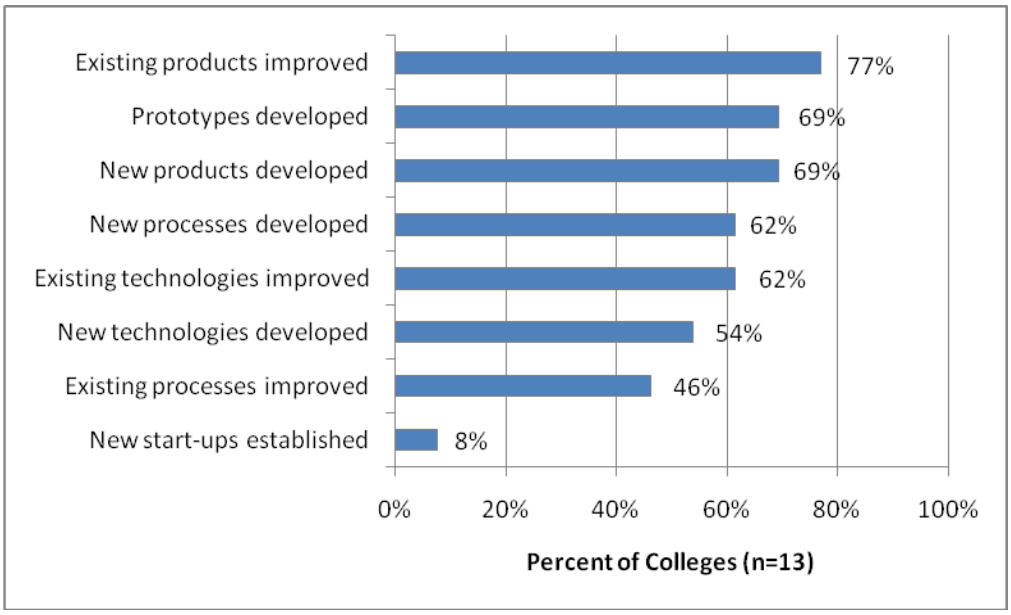
The evaluation looked at two types of impacts on partnering SMEs: firstly, the direct impact of the research results from IE Grant-funded projects, such as new processes and products; secondly, the impacts on the firm's R&D capacity and activities, such as the degree to which the company invests in or conducts R&D. The two types of impacts are discussed below.

Partner application and benefits of research results

Case study findings indicate that all projects under the IE Grant were designed with commercial relevance in mind, including development of products or improved processed with commercial potential. Specific examples are presented throughout this section.

The file review confirms that many colleges have engaged in projects with commercial potential. Figure 3.1 presents the incidence of colleges reporting that a result has been realized in at least one collaborative R&D project undertaken as part of the IE Grant. Over three quarters (77%) of the 13 colleges from the first two funding competitions reported that they had worked with SMEs to improve existing products and another two thirds (69%) had helped SMEs to develop new products and/or new prototypes. Slightly less (62%) reported developing new processes and/or improving existing technologies. Finally, around half of colleges reported developing new technologies (54%) and/or improving existing processes (46%). Only one college reported they had worked with SMEs to establish a new start-up company.

Figure 3.1: Impacts of R&D Projects on Partners (According to Colleges)



Source: NSERC, Draft File Review Report on the Impacts of the CCI Program IE Grants. Includes IE Grant recipients from the first two competitions, n=13.

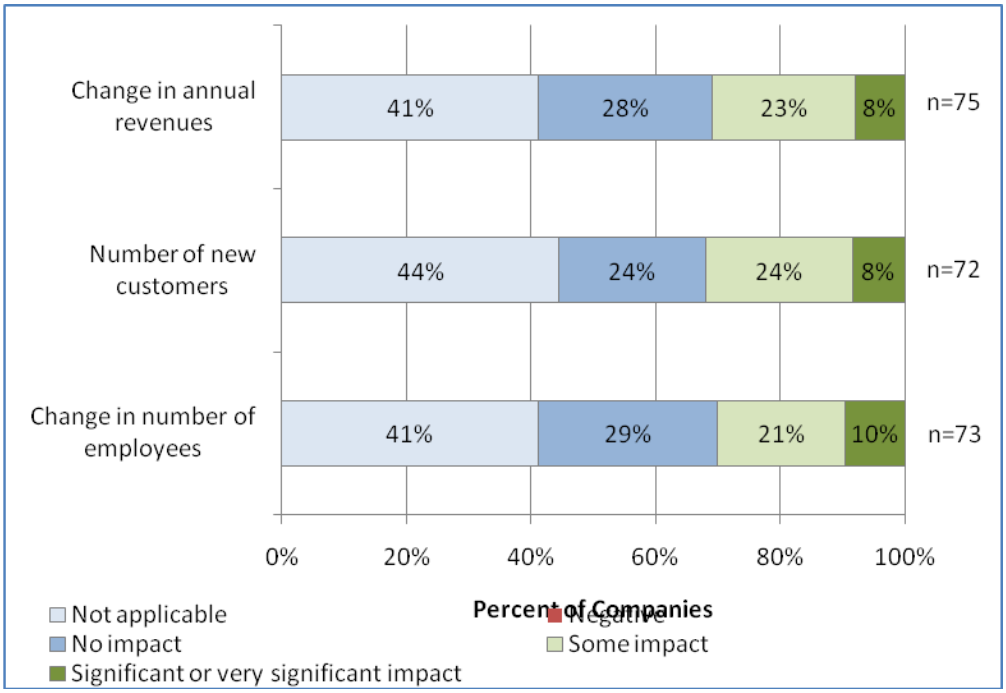
Case studies offer a number of examples of projects that have developed new processes and/or products. For example, in one case the college allowed a company to consider the use of a "fibre" laser technology that was found to be more efficient and less energy-consuming than the other technology being considered at the time. Another college assisted a company in the development of a new technology for tracking infections within a hospital setting. The college first helped with the testing of the technology in their own hospital simulator. Also, the business school at the college got involved and helped with the marketing of the technology. Finally, the college also paved the way for the technology to be tested in a leading Canadian academic hospital. The technology is now being used in four Ontario hospitals with the outcomes and results being marketed to hospitals in the United States. In yet another case, the college evaluated the efficacy of two green roof irrigation systems provided by the company. The results of the tests showed that the irrigation systems significantly increased chances of survival of plants. These systems are now being commercialized by the company.

The partner survey also explored a number of measures that are indicative of commercial impact. According to the partner survey, overall, almost two in five companies (39%) had experienced commercial impact in at least one area (i.e., either on annual revenues, number of new customers, or number of employees). Figure 3.2 shows that almost a third of companies (31%) said that their collaborative R&D project had at least some positive impact on annual revenues, while a slightly smaller proportion (28%) found it had no impact.

Slightly more than four in ten respondents indicated that the question regarding revenues did not apply to them, suggesting that they had not tried to achieve that type of impact as part of the collaboration. The distribution of responses was similar for questions regarding the number of new customers and changes in the number of employees.

Nearly a third (32%) of companies felt there had been a positive change in the number of new customers and less than a quarter (24%) felt there had been no impact. One of the case studies provided an example of how a partnering company to reach new customers. The collaborative research project was able to demonstrate that a 10% biodiesel blend could be used under cold temperatures. This was instrumental in the development of the renewable fuels standards which created a market for renewable fuels that did not previously exist.

Figure 3.2: Impact of R&D Projects on Partners (According to Partners)



Source: The Evidence Network, An Assessment of Canada's Tri-Agency College and Community Innovation Program (CCI). N=76-80.

Another example of project with commercial impact aligned with an improved customer focus was where the college allowed the company to investigate user experience and design opportunities for clean transportation, with particular focus on electric vehicles and associated charging infrastructure. This research highlighted new market opportunities for the company, and contributed to the development of its Electric Vehicle (EV) service offerings, including fleet services and turnkey charging infrastructure projects. The collaboration sparked further design research and development of the company's expertise in delivering turnkey EV charging infrastructure projects that provide effective user experiences, outreach opportunities, and meet the technical and business needs of its clients.

The treatment of intellectual property (IP) varies by college. In most case studies, SMEs hold the IP and project results were/will be used for commercial purposes. However, in one case, the college holds the IP of the results of applied research projects and issues licenses to companies on an occasional basis.

Some projects explored as part of the case studies have already resulted in application of research results and benefits to partners, while others are anticipated to reach similar results in the near future. For example, in one case study the college helped to improve the antibody production process for animal gender selection and further research was conducted on nanoparticles that will be combined to antibodies in animal semen. The tests conducted were successful and the company started to perform in vivo and in vitro inseminations. The company has not yet commercialized the technology as the next steps include starting large-scale production of antibodies in biofermenter and addressing some outstanding marketing-related challenges.

There are a few projects where the research results disproved the commercial potential of the product or application. This was seen as benefiting partners by saving them from investing further in a non-viable concept.

Challenges associated with use of research results

By the very nature of R&D, characterized by experimentation, R&D results are not guaranteed. Therefore it is not surprising that not all research projects under the IE Grant have resulted or will result in commercial benefits or other positive results. One of the case studies illustrated how a project that focused on the anticipated needs of the forestry industry for innovation and recuperation (e.g., in the area of biomass) had limited success. Some business partners that were not doing well financially and needed innovation to succeed in their industry went out of business before the benefits from the improved processes could be realized. Other business partners could not find venture capital to take the concepts developed with the college to market. Also, the college found it difficult to find new business partners to replace those who had to drop out of the project: those potential business partners who were financially well off did not perceive a need to invest in innovation, while those who were struggling could not raise the capital to invest in innovation. Case study evidence indicates that some of these difficulties are likely related to the decline of the forestry sector in the region.

Impact on partners' R&D capacity and activities

Overall, the evaluation found that IE Grants have had a positive impact on business partners' R&D capacity and contributed to further business engagement in R&D activities. Case study respondents emphasized that SMEs typically don't have enough resources to pursue R&D activities. Collaborative R&D projects are appealing to SMEs because they reduce the financial risk they face when they conduct R&D on their own.

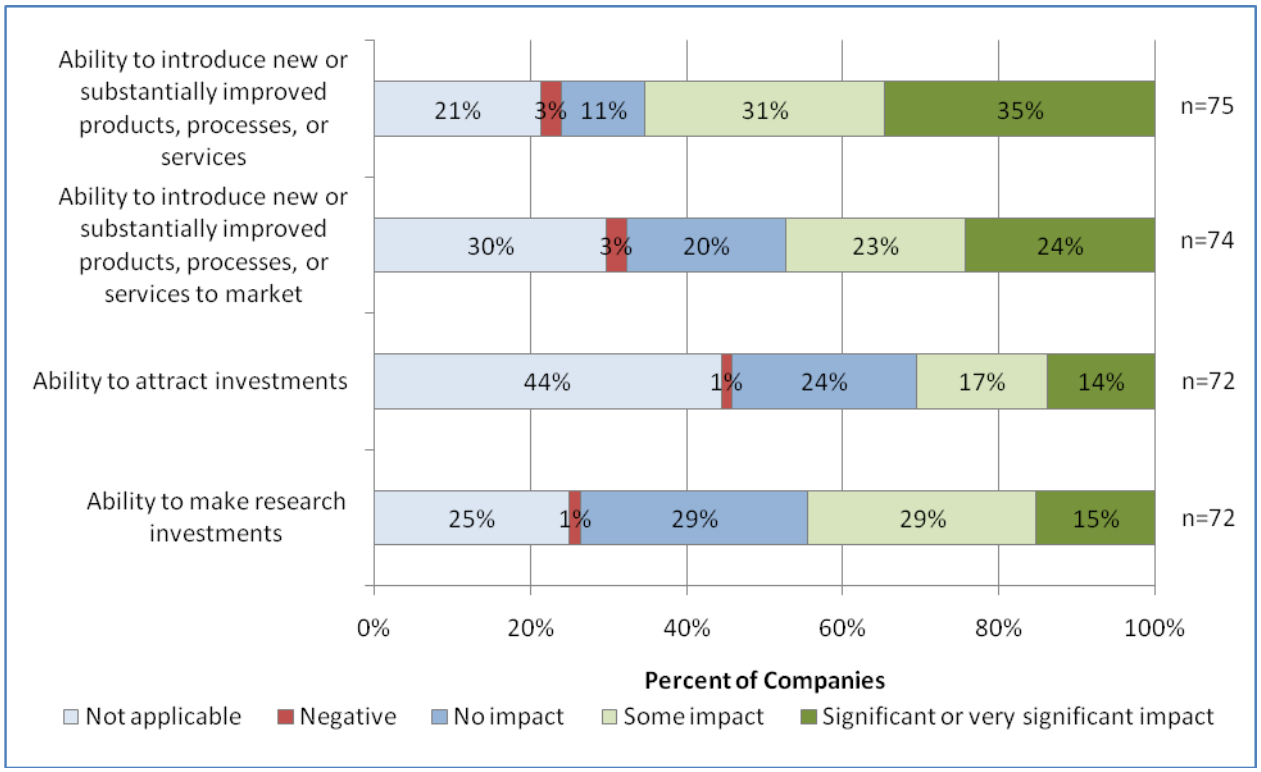
This reduced risk coupled with specific technical capacity of college personnel means that SMEs can undertake more complex and large-scale R&D projects than they would normally. The collaborative nature of R&D projects was also appealing to senior management and allowed firms to convince corporate decision-makers to proceed with time-sensitive R&D projects that would not have been possible without the colleges' R&D capacity.

The evaluation also found that IE Grants are having a positive impact on the importance that firms place on R&D, evidenced by increased personnel time conducting R&D, the hiring of R&D personnel, or the creation of new positions or organizational divisions dedicated to R&D. For example, many SMEs now have ongoing relationships with the colleges and continue to pursue R&D activities. A few firms have also added to their own R&D capacity as a result of collaboration with IE Grant holders by adding a permanent R&D function in their organization or adding new skill sets to their existing R&D division. One case study offers a couple of concrete examples including one partner (a production company) that added a new position in social media R&D, and another partner (a energy R&D company) that added a designer who had graduated from the college to complement their R&D team, which had previously only been comprised of engineers. In addition, the collaboration of a large company with the college helped maintain the R&D capacity in the local plant in the region and ensure that the plant positions itself as a leader in using the technology within the parent company.

The file review findings suggest that more than a third of partners (37%) expected increased investments in R&D and increased capacity for innovation as a result of their participation, but neither the progress reports nor the survey revealed whether or not these expectations had been met. While almost all firms surveyed (96%) reported that they had invested in R&D since their interaction with the college, the investments could not be attributed to their collaboration with the college since the survey did not ask them whether or not the level of investment represented an increase compared to prior to the collaboration. Some partners did, however, report that the IE Grant had at least some positive impact on company's ability to make (44%) and attract (31%) research investments (Figure 3.3). The collaboration with the college also seemed to have a positive impact on companies' R&D in other ways. Almost two thirds of respondents (65%) indicated that the collaboration had at least some positive impact on the company's ability to introduce new or substantially improved products, processes, or services and slightly less than half (47%) indicated the interaction with the college positively impacted the time to market of their products or services. Overall, more than two-thirds (69%) of companies had experienced impacts on at least one aspect of their R&D capacity (i.e., either on their ability to introduce new or substantially improved products, processes or services; their ability to introduce new or substantially improved

products, processes or services to market; their ability to attract investments or their ability to make research investments).

Figure 3.3: Impacts on Partners' R&D Capacity



Source: The Evidence Network, An Assessment of Canada's Tri-Agency College and Community Innovation Program (CCI). n=72-75.

3.2 Has the IE Grant increased the capacity of colleges to respond to technical problems of local industry and other organizations?

Summary of Findings:

The IE Grants have significantly increased the capacity of colleges to respond to the technical problems of local businesses and other organizations. Key areas in which capacity was increased include faculty release time, access to equipment, and development of applied research programs. As well, because of the IE Grant, colleges are better equipped to provide timely, multi-disciplinary, long-term and holistic services to companies. The funding model was reported to have sufficient flexibility to allow the colleges to build capacity in areas in which they had expertise, in a way that best fit the needs of industries in their region.

Most KI and case study interviewees stated that the IE Grant assisted colleges in building capacity to assist SMEs with their applied research needs. Prior to the IE Grant

many colleges did not have capacity to meet applied R&D needs of local SMEs, with the exception of those in Quebec where applied research centres already existed. In most case studies, faculty release time was considered to be a key feature of the IE Grant that was unique to the college system and played a significant role in building IE Grant recipients' capacity. Specifically, by allowing colleges to have an increased number of faculty and staff involved in R&D, they have been able to develop applied research programs. One college representative also stated that the CCI Program IE Grant was the first granting program for colleges designed in a way that funding could be allocated to teaching time release and students' salaries. Some colleges have moved from having very few applied research interactions with industry to having dozens of projects on the go at one time. In many cases facilities were also improved with IE Grant funding to become more relevant to businesses' R&D needs.

The file review also offers evidence that capacity at colleges has increased due to funding via the IE Grant. In particular, teaching release time has increased significantly and the number of faculty and staff involved in applied research projects with SMEs has also increased substantially. In addition six of the eight colleges from the first funding round indicated that faculty and staff have increased contact with industry (this measure was not reported for the second funding round). Additional information about the nature of involvement of faculty and staff is presented below in Section 3.3.

From the perspective of SMEs, the evaluation found that many business partners were impressed with the responsiveness of colleges in developing R&D projects in a timely manner. Companies interviewed as part of case studies used language such as 'agile' and 'nimble' when describing the R&D capacity of the colleges. A few college representatives interviewed for cases studies stated that business partners appreciated the timeliness of R&D projects under the IE Grant, in comparison to their experience in attempting to partner with universities and costly commercial laboratories. The responsiveness of colleges was perceived as critical in advancing products to commercialization in a timely manner. Although most findings related to responsiveness of colleges were favorable, a few business partners commented on the lack of timeliness since college faculty members work at a different pace than businesses (e.g., have to work according to school schedule, instructors have a full teaching load so they can be difficult to reach, take time answering questions, etc.).

The IE grant also made it possible for SMEs to benefit from colleges' multi-disciplinary approach to addressing business needs. While SMEs may come to the college for assistance with an engineering problem, for example, some colleges recognize that other departments within the college can assist with other aspects, such as product development or marketing. This strength was highlighted in a few case studies as well as by a few key informant interviewees. For example, a business partner approached a college with a technical problem related to a heart monitoring vest they were hoping to

have tested, but the college did more than help the partner with the technical problem. The company was also offered assistance from the nursing and fashion departments of the college to improve the usability and wearability of the product.

Case study respondents and a few external KI stakeholders noted that the five-year duration of the grant was critical as it allowed colleges to respond to company needs on an ongoing basis and in a more holistic manner. The long-term funding allowed colleges to make strategic decisions in terms of planning, recruitment, facilities, equipment and projects, within timelines that met business partners' needs. A few stakeholders interviewed corroborated this finding, stating that the IE Grant allows colleges to engage in in-depth collaborative projects that lead to stronger relationships with companies. For example, the IE Grant allows colleges to move beyond traditional relationships of accessing companies for student co-op placements to a point where they can assist in addressing complex applied research problems. In addition, college representatives and other stakeholders noted that some companies come to the college and/or come back to the college to find solutions beyond applied R&D (e.g., business planning, training, etc.):

> It has been a huge transformation-a game changer for us…We are at a point where we are stretched to handle the demand from the local SME community…They [local SMEs] see us as the go-to point for all business solutions…It has spilled over to other parts of the college.
>
> College representative

These long-term relationships are considered to be made possible by the duration of the IE Grant in that interactions do not necessarily have to be framed within the context of a single project or year.

Finally, the file review and the cross-case analysis found that the colleges' capacity to respond to needs of companies also improved through integration of project content into courses. The file review discloses that 8 of the 13 colleges reported they had revised courses as a result of the applied research conducted under the IE Grant. Five colleges reported that new courses have been developed based on results of projects. Some faculty representatives interviewed for case studies noted that this is highly beneficial not only for the college and current and future students, but for the SMEs as well. An example of this benefit would be a situation where the SME's technical problem is built into the curriculum and students work on solutions that are then presented to the SME partner at the end of the semester. At one college, for example, architecture technology students were asked to design a waiting room for "the Family Practice of the Future." Organized into small teams, over 40 students prepared design boards that were presented to the physician and the architecture firm they had hired to design the practice. The faculty member indicated that she subsequently incorporated the learnings from this real-world experience into the curriculum of the course for future deliveries. The process

for integrating research results into course material, and the rate at which this occurs, varies by site. Most IE Grant recipients have scheduled annual curriculum review processes; however a few sites have expedited processes that have been used to rapidly integrate applied research findings into course materials.

3.3 What is the nature of involvement of college faculty and staff in applied research, development and innovation?

Summary of Findings:

Overall, all lines of evidence indicate that the IE Grant allowed most colleges to hire new staff and faculty and to engage existing resources in applied research projects. Varying degrees of involvement of faculty were observed in colleges, from strong engagement of non-faculty research staff to a model where projects are supported almost exclusively by faculty and students. The partner survey suggested that faculty and research staff have time available to interact with business partners on a regular basis, but the extent of the interaction was not always perceived as sufficient by business partners.

Paid faculty and staff release time, enabled by the IE grant, was widely recognized as a key success factor for faculty involvement in R&D projects among case study sites. Barriers for securing faculty release time included culture, collective agreements and resource constraints.

Based on stakeholders' responses and case studies, the use of resources dedicated to administration and management of the IE Grant, such as project managers, appears to be a best practice that allows faculty to focus primarily on the research aspects of projects.

To a large extent, the IE Grant has offered existing faculty new opportunities to conduct applied research that were not possible previously due to limited release time or limited funding.

Faculty involvement in applied R&D

According to all lines of evidence, the involvement of faculty has increased overall as a result of the IE Grant. File review evidence indicates that out of the 13 colleges funded during the first and second competitions, 11 reported increases in the number of faculty involved in applied R&D. This increased participation of faculty in applied research projects is also reflected by the frequency of their interactions with business partners. Indeed, a majority (85%) of the surveyed business partners indicated that college faculty

interacted at least once a month with them during the course of the projects. Still, limited availability of faculty to work on projects was noted as a challenge in all case studies and most key informants. During the school year, colleges have to release faculty from teaching time without impacting class schedules and students, while during summer holidays they have to ensure that projects continue moving forward with limited support from faculty.

The extent to which faculty had been involved in applied research projects did, however, vary by college. A wide range of increases was reported by colleges in their progress reports. The 11 colleges that had experienced increases in the number of faculty involved in applied R&D reported increases ranging from 25% to 2,100% increase (from 1 to 21 faculty involved).[16] Similarly, the cross-case analysis found that, while most colleges involve faculty in projects to conduct or lead the research and to contribute to high-level decision-making, a few colleges allow for less integration of faculty. One possible reason for these variations is that colleges with full-time research staff already available may not experience the same need to involve faculty to the same extent as other colleges. For example, the Centre spécialisé de technologie physique du Québec (CSTPQ) – a College Centres for Technology Transfer[17] (CCTT) in Quebec – rely primarily on a strong team of full-time engineers, scientists and technologists to conduct IE Grant-funded applied research. Another possible explanation is the varying degree to which colleges offer faculty release time from their teaching duties.

Research staff involvement in applied R&D

Colleges also used the IE Grant to engage new research staff to further build or reinforce their research capacity. The increases in the number of research staff engaged ranged from 140% to 1,200%. Findings from the cross-case analysis and key informant interviews indicate that among colleges where faculty is strongly involved in applied research projects, the IE Grant allowed some of them to hire non-teaching staff to support faculty with research and administrative duties, including full-time researchers and project managers. Project managers are generally responsible for planning and scheduling, performance measurement and reporting activities, agreements with partners and external communications, to name a few responsibilities.

16 Increases were reported in various ways in the progress reports. The quality of the data did not allow for a more comprehensive, quantitative analysis of changes in faculty and staff involvement or paid release time.

17 College Centres for Technology Transfer (CCTT) are research centres affiliated with a collegial institution (usually a Cégep), whose mission is to support industry in the innovation process through technical support, technological development and information and training activities. They are governed by a Board although the college with which they are affiliated remains accountable for results achieved. Student and faculty training is part of CCTTs' mandate; however, their primary goal is to carry out applied research activities with small, medium and large enterprises that will contribute to technological and economical development at the provincial level. The CCI Program's Technology Access Centre grants were designed to support colleges outside Quebec in the establishment of research centres using the same structure as those of CCTTs.

The importance of release time

Paid faculty and staff release time was widely recognized as a key success factor for faculty involvement in R&D projects among case study sites. The number of faculty and staff granted release time varied widely between 3 and 13 per college, according to the file review. The case studies found that securing release time can be challenging in practice due to cultural barriers, collective agreements and resource constraints. College representatives from a few colleges described it as a cultural shift that is slowly occurring and is being mitigated through discussions with management and positive word of mouth among faculty:

> Involvement of faculty and staff has been a challenge. However, this is being addressed and NSERC funding has had an impact. Individuals have been engaged in research through NSERC funding and other faculty…have been encouraged to visit the facilities and discuss the work that is being undertaken and have enthusiastically taken advantage of that opportunity.
>
> College representative, File Review

Moreover, a few key informants further stated that this cultural shift is impeded by the fact that job descriptions, as presented in collective agreements, do not include research as part of faculty duties. A few colleges from the case studies were able to overcome such challenges, notably through the continuous support of full-time resources assigned to the projects. At the same time, while colleges awarded an IE Grant have more resources to dedicate to paid release time, these resources are not infinite. The IE grant does, however, make a significant difference to colleges.

Impact of the involvement of faculty and staff

The IE Grants appear to have provided faculty and staff with skills and expertise in applied research. Based on the file review, most colleges indicated that both faculty and staff have benefitted from the IE Grant primarily in terms of increasing their interest in R&D and expanding their skills. Most colleges also reported that faculty and staff had acquired new skills, increased their expertise and increased their knowledge of industry.

3.4 Has involvement in the IE Grant enhanced students' applied learning?

Summary of Findings:

Roughly 10 more students per college receive training opportunities with industry because of the IE grant according to the progress reports. The available evaluation evidence can help explain how the IE Grant is perceived to have enhanced these students' applied learning, but a student survey would be required to verify the magnitude of these impacts.

The case studies and file review suggest that students were offered a wide spectrum of high quality training opportunities by colleges. Students were involved as research assistants, research associates, interns, co-op students, and participants in in-class projects. This experience gave students direct job experience and an understanding of business norms and constraints, and students widely reported that experience received through IE Grant-funded placements was highly valuable.

The effectiveness of the college students' training was strengthened by company-student interaction. Students' participation in applied research with business partners provided them with more opportunities to apply knowledge learned during class in real-world projects with tangible results for companies. They gained first-hand experience working under the time and budget constraints of businesses, and managing business expectations. Students also developed a broad range of soft skills, including project management, problem solving and communication.

Number of students involved in applied learning

Colleges were asked to provide information on the participation of students in applied research projects in the area of their grant proposal both prior to and after receiving the IE Grant. With a few exceptions, colleges that received funding in the first competition reported that prior to the grant an average of 2.5 students per year had been involved in applied R&D projects in the area of the grant. After eighteen months, five of the colleges reported that an average of 12 students per college per year were involved. Here it should be noted that one college did not provide any information and two colleges reported very large numbers (112 and 900 students). In the latter two cases, it appears as though student participation was a requirement of the college and was not initiated as a result of the IE Grant. These cases point to a need for improved reporting of student participation in applied learning activities. However, the findings suggest that roughly 10 more students per college receive training opportunities with industry because of the IE grant.

Quality of training opportunities created

According to all lines of evidence, the IE Grant offered a wide spectrum of high quality training opportunities for college students. Students in most colleges were involved as research assistants, research associates, interns, co-op participants, or participants in in-class projects where they were asked to solve real problems identified by business partners. For example, case studies indicate that students at one college were able to participate in applied research projects as team leads (through graduate internships on research projects in their field), members of cross-disciplinary teams in IE Grant-related sectors and volunteers on awareness-raising campaigns with business partners. A college representative participating in one of the focus groups highlighted some of the benefits with this training:

> [The CCI IE Grant] provides strong research skills. Because [students] work with people involved in industry, this equips them with an understanding of the industrial mindset
>
> Focus group participant, case study

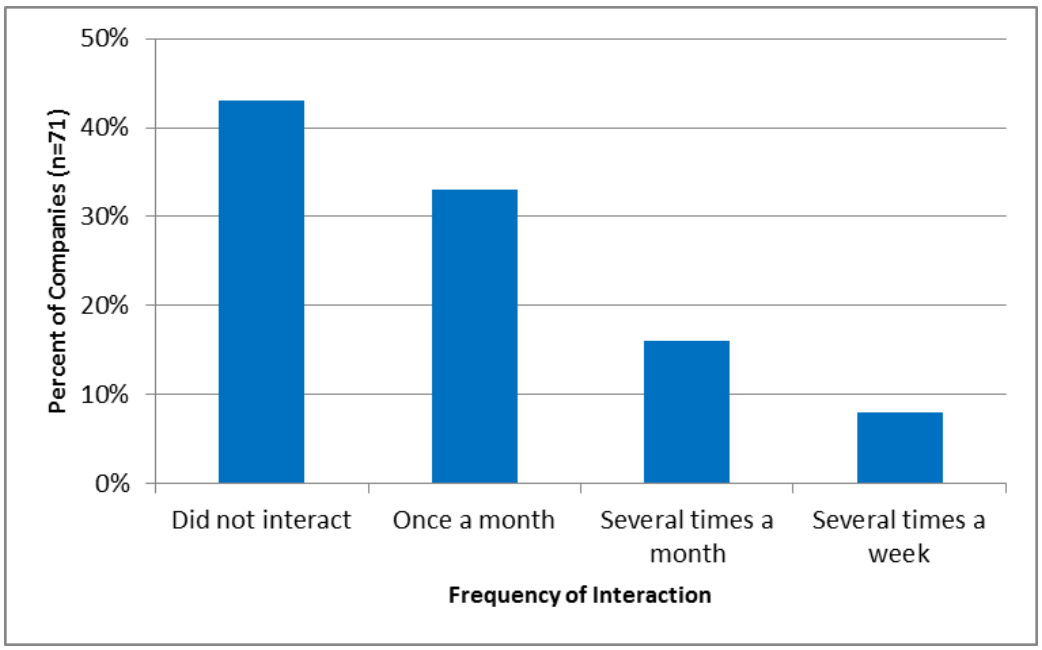
The case studies also indicate that most colleges developed new courses and curricula as a result of the IE Grant, and were integrating research results into the curriculum of existing courses. Students in these colleges improved their technical understanding as well as their skills in research methodologies, project management, and applied research more generally.

Nature and extent of company-student interaction

To a large extent, the effectiveness of training opportunities was bolstered by company-student interaction. As indicated by case studies, close company-student interaction was strongly evident in some colleges. Here, students collaborated with businesses on various aspects of project design, problem solving, testing, product development and presentation of results.

Evidence of company-student interaction is also supported by the survey of client companies involved with the CCI program. When asked to assess their frequency of interaction with colleges, approximately 59% (n=42) of the companies reported interactions with students at least once a month. These findings are indicated in Figure 3.4 below.

Figure 3.4: Partners' Interaction with Students



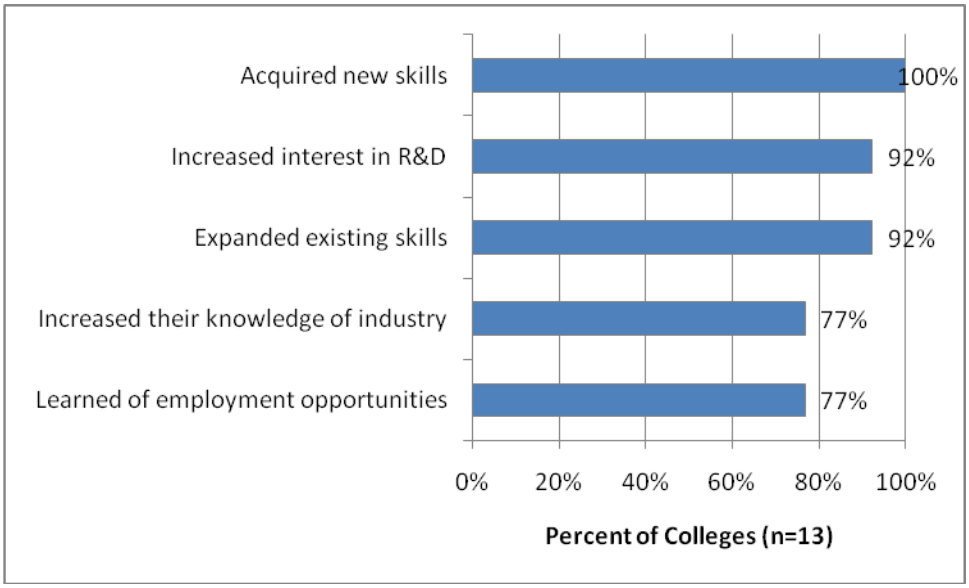
Source: The Evidence Network (2012). An Assessment of Canada's Tri-Agency College and Community Innovation Program (CCI). N=71.

It should also be noted that company-student interaction was limited by a number of factors. According to case studies, these include the physical distance between business partners and the college as well as the fact that companies' visits to students tended to decrease when companies had confidence that the research teams (including students) were likely to meet their needs. In other cases, the nature of the research project did not require students to interact with companies. For example, students working as programmers did not usually need to meet business partners directly in order to perform their duties effectively although they may have interacted via email.

Type of skills and experience gained

According to all lines of evidence, the IE Grant has had an incremental positive impact on students' applied learning. For example, according to the file review, when asked to report on the types of impact that participating in applied R&D projects had on the students involved by selecting from a list of possible impacts, participating colleges most commonly reported that students had acquired new skills (100%) or expanded existing skills (92%), that they had increased their interest in applied R&D (92%,), that they had increased their knowledge of industrial issues and challenges (77%) and that they had learned of employment opportunities (77%) (Figure 3.5).

Figure 3.5: Student Impacts (According to Colleges)



Source: NSERC, Draft File Review Report on the Impacts of the CCI Program IE Grants. Includes IE Grant recipients from the first two competitions, n=13.

As indicated by case studies, the list of research skills acquired by college students included the development and implementation of research plans, the ability to conduct research studies following relevant ethical and safety practices, problem-solving and the organization and execution of knowledge dissemination activities. The experience also gave students first-hand experience with commercialization, increased familiarization with business constraints and direct job experience. According to a college representative, the IE Grant also contributed to broader, cross-cutting professional skills relating to communication and project management.

Case studies also sought to identify what benefits students had experienced as a result of the grant. Students widely reported that the applied experience they received through IE Grant-funded co-op placements and internships was highly valuable. According to most of the case study evidence, students found it stimulating to work on projects designed to have an impact in business-relevant contexts beyond the classroom. One student explained:

> The project helped me to see what I was learning in the classroom meant in the real world… The chance to help an actual company with their problem was very valuable and rewarding.
>
> Student participant, case study

Using their applied research experience, many students were able to learn how to successfully increase production scale for a range of different projects and applications, ranging from food testing to bio-fuel production.

3.5 To what extent has participation in the IE Grant contributed to college students obtaining employment within their field?

Summary of Findings:

While it is difficult to determine precisely to what extent employment outcomes are attributable to the IE Grant, as opposed to other factors (e.g., industry conditions, economic conditions), most of those consulted for the evaluation (through case studies and interviews) indicated that the IE Grant contributed to increased student employability by providing students with highly valuable skills, direct work experience and connections with potential employers. For example, case study evidence found that many students attained a job in their field and that the applied research work funded through the IE Grant added to students' CVs and expanded the breadth of their professional experience.

In addition to assisting students in finding jobs (as described above), just under a third (30%) of CCI partners indicated they hired one or more students as a consequence of their projects with colleges.

It is difficult to make precise assessments of the degree to which employment outcomes are attributable to the IE Grant since there are a wide range of factors that influence student employability. There are, however, indications from multiple lines of evidence (i.e., case studies, key informant interviews, the file review and other reports) that student participation in IE Grants increases student employability.

Students indicated that the applied research work funded through the IE Grant added to their CVs, which in turn provided them with a competitive advantage over students with a more traditional background. At the same time, the IE Grant-funded activities provided students with opportunities to participate in conferences where the results of project work were shown. This gave them an opportunity to interact with businesses, and to reap the benefits from publicizing project results.

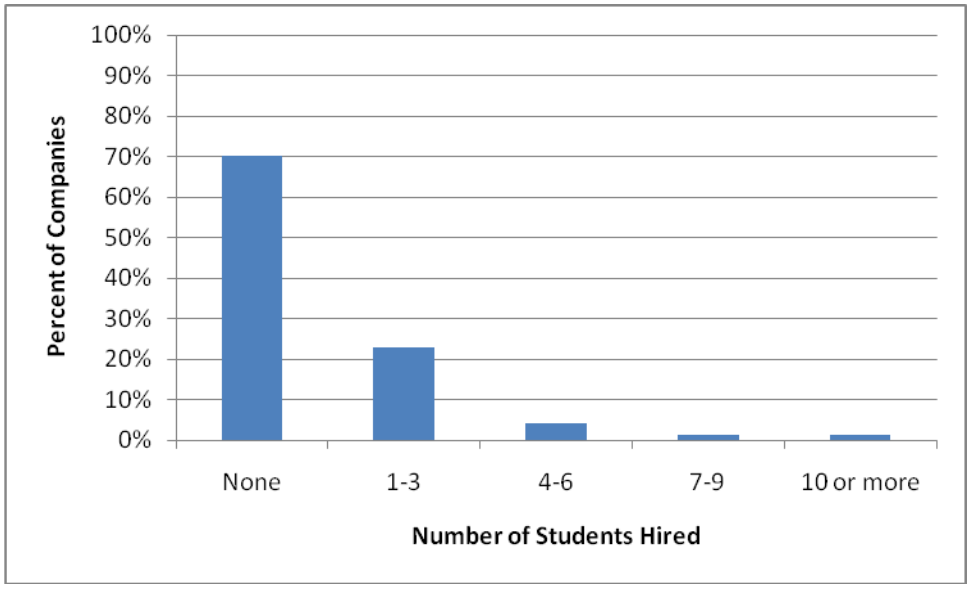
The connections students had established with companies also helped them find jobs. Students interviewed as part of the case studies indicated that co-op placements or internships led to continued employment with the companies with which they completed their placement. In some cases, companies encouraged students to enhance their skill sets by pursuing additional studies at the university level, with the objective of hiring them after graduation. More generally, a program stakeholder revealed that the IE Grant showed business partners that students constituted a group of highly qualified candidates

worth hiring. A company representative also highlighted the benefit of student involvement:

> [The college has] proven to be exceptional partners and our relationship has blossomed into a win/win. We have gained access to students and graduates and we are able to do a trial run with prospective employees.
>
> SME representative, Progress Report

While students were assisted in finding jobs through connections with companies, relevant experience and improved CVs, almost a quarter of partners indicated that they hired one or more students as a consequence of their projects with colleges (Figure 3.6). Most (70%) of the companies indicated that they did not hire any students or graduates as a consequence of their projects with colleges. Less than a quarter (23%) reportedly hired one to three students or graduates. The balance (7%) reported that they hired four or more students.

Figure 3.6: Number of Students Hired by Partners



Note: Text of question reads as follows: "How many students or interns, either full time or part time, has your company hired as a consequence of your project with [college]?" n = 74.
Source: The Evidence Network (2012). An Assessment of Canada's Tri-Agency College and Community Innovation Program (CCI), p. 13.

Case study evidence indicates that many students from one college found employment in their field of expertise after graduation, several students from another college indicated that their co-op or internships led to continued employment with the company they completed their placement with, and many students from a third college were able to secure employment with local companies following their graduation.

In some cases students struggled to find employment post-graduation. Case studies indicate that out of the 10 students involved in an IE Grant-funded project over three years, only one student from one college secured employment in her field. Similarly, no

students out of the 14 involved over three years at another college secured employment. Here, it should be noted that the case studies sought to determine whether the IE Grant provided opportunities in addition to the ones already offered by the school. Further, in some cases, low post-graduation employment rates may be a reflection of the economic conditions in certain sectors rather than the students' skill sets. Finally, faculty members interviewed for the case study reported that students benefitted from their applied research experience in that many were better prepared to pursue additional education at university.

3.6 Is there sustainable applied research capacity at IE Grant recipient colleges?

Summary of Findings:

The evidence is mixed with regards to the degree to which the applied research capacity at colleges is sustainable. The file review and case studies do offer a number of areas where colleges' capacity will be sustained to at least some extent (such as hiring, acquiring equipment, establishing formal mechanisms for contracting and ethics for example, and exploring other avenues to secure funding). However, evidence from interviews with representatives from colleges indicates that most colleges will not be able to sustain their R&D capacity to a level sufficient to meet the needs of SMEs beyond the funding period, without some form of additional support, particularly for college personnel to participate in applied research projects. Moreover, the evaluation found that it is not realistic to expect colleges to rely on contributions from SMEs to sustain their applied research capacity. Some college representatives went further to explain that they do not wish to maintain a strong focus on collaborative R&D without additional funding as this may mean that quality of student training will suffer.

Sustainability of current IE Grant funding

Representatives from five out of the eight colleges that participated in case studies did not think that their R&D capacity would be sustained after the funding period had ended (either capacity would decrease or be lost), without access to some form of access to funding. One of the three colleges that were likely to sustain their capacity had received CCI funding during the pilot phase and the two others were technology transfer centers, each with one multi-national business partner (anchor client).

Among the colleges that reported their R&D capacity would not be sustained overall, some thought that certain areas of their capacity would be partially sustained. These are outlined below:

- ***Some HR capacity to undertake collaborative research***: Because of the IE grant, instructors were released from teaching duties to undertake applied research and, in most cases staff were specifically hired to facilitate research with businesses (e.g., research coordinators, scientists, etc.). Some of these staff resources will still be available for collaborative R&D following the grant as long as enough funding is available to support these positions. (Opportunities for funding are further discussed below.)

  > One college, for example, hired four of its applied-technology program professors and hired three technologists to perform research and manage projects. This allowed the college to build an applied-research capacity that was virtually nonexistent before the IE grant.

- ***Company access to specialized equipment***: Many colleges reported that the specialized equipment purchased to meet the needs of businesses and the knowledge of how to use this specialized equipment will be sustained.

  > For example, new equipment which allowed a college to increase its expertise and thus gain visibility and credibility in the welding industry will likely continue to attract local SMEs to the college.

- ***New or reinforced mechanisms for contracting, research management and ethics reviews***: Colleges reported creating processes for contracting and conducting research in collaboration with businesses where such mechanisms did not previously exist. In a few cases, new research units were created. In cases where such processes existed, experience with new business partners allowed the colleges to refine the contracting mechanisms, work out intellectual property issues, etc.

  > For example, a college established a dedicated office which allows for a focused effort around grant writing and management, application triage and review, as well as project management. This office will be maintained beyond the IE Grant funding period.

Need for ongoing funding

Those colleges that did not think that they could sustain the R&D capacity indicated that some level of ongoing funding by a government organization would be required to ensure that they could fully meet SME demand for collaborative R&D on a continuous basis. For those who had plans in place to maintain capacity, most indicated the funding would be provided by government agencies and only a few indicated that businesses would provide the majority of the funding. The funding sources mentioned included: other NSERC funding (such as CCI ARD grants), FedDev Ontario, provincial governments, and provincial not-for-profit associations (such as Colleges Ontario

Network for Industry Innovation (CONII), the Alberta Association of Colleges and Technical Institutes, and the Ontario Centres of Excellence). The colleges' ability to get this funding to maintain capacity was perceived as a consequence of receiving the original IE grant. These sources of funding (including additional ongoing funds from businesses) were, however, seen by most case study representatives from colleges as insufficient to completely sustain the existing capacity built with the IE Grant. They explained that the IE Grant supports operational costs, something that is not likely to be supported by some of the other sources of funding. Some colleges that participated in case studies reported that continuation of IE Grant funding at a reduced level would likely be sufficient to maintain research programs at or near current capacity.

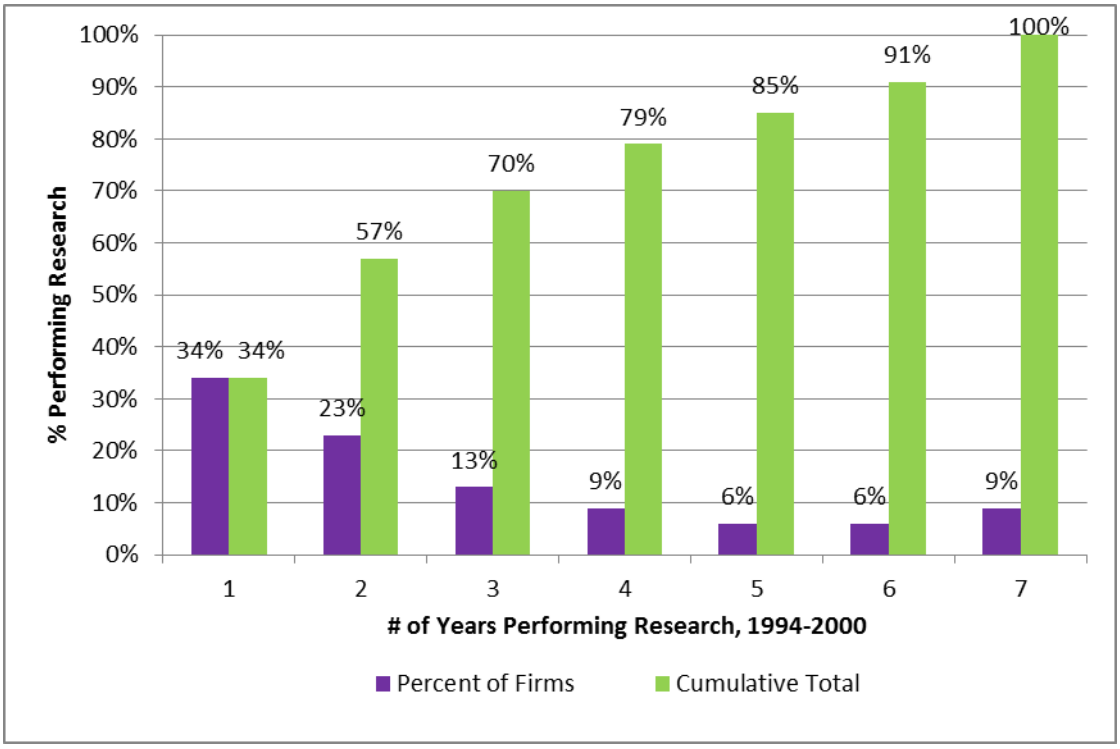
The extent to which colleges are likely to be able to rely on business partners for funding for collaborative R&D projects in the future varied. Cross-case analysis found that the proportion of cash and in-kind contributions from partners varied by industry, size of company, region, and ability to pay, among other reasons, and this is likely an indicator of the ability to leverage funding in the future. For example, one college indicated that they usually do not allow business partners to participate if they cannot pay the amounts or percentage required (usually 25% of the total value of the project, although ability to pay is only one of many criteria that drives the acceptance of the project). Administrative data also suggest that the extent to which colleges can rely on partner contributions varies. Out of partners associated with IE grants awarded between 2008 and 2011, only about half (51%) planned to provide cash and almost three-quarters (73%) in-kind contributions (n=627). Among organizations that planned to provide cash, the average contribution was $58,500 and organizations that planned to provide in-kind contributions offered $89,000 on average.

A few colleges had signed formal agreements with companies and other partners which guaranteed significant amounts of funding for projects beyond the scope of the original IE Grant (including agreements with multi-nationals). Partnering with a multi-national company with an R&D budget seems to be one factor which supports success. For example, three case study colleges work with multi-national companies and have had less difficulty obtaining funding for applied research projects because of these collaborations. In fact, representatives from other colleges indicated they probably could become sustainable if they could pursue funding from other sources, including large business partners. The link between a company's ability to pay and the sustainability of applied research capacity at colleges is further supported by the fact that some of the colleges working solely with SMEs experienced difficulties associated with working with smaller firms. For example two colleges are engaging partners that have limited ability to make cash contributions to R&D projects; the project for one college is leading to benefits for small farmers while the other college is working with the declining forestry sector. Although the sectors require innovation, the fact that they are in decline

means business partners often struggle to come up with their share of the funding. Both of these colleges are also located outside of major urban centres, which could also partially explain some of their struggles (i.e., urban centres have a larger pool of SMEs and more access to large businesses).

A discussion of sustainability also warrants a better understanding of when SMEs make decisions to invest in R&D. Interviews with business partners during case studies revealed that most would undertake a collaborative research project with the college again, but that they did not have any short term anticipated need in this regard. The survey confirms that most (69%) companies plan to undertake a collaborative research project with the college in the future and a third (33%) plan to engage in contract research, but no timeframe was specified. The question of timeframe is important since most SMEs tend to work on one applied research project at a time due to scarcity of resources and limited product offerings resulting in infrequent demand for applied research assistance. This is confirmed by research conducted by The Impact Group which found that, of those Canadian firms that identify themselves as undertaking R&D, the percent that do decreases year over year. Specifically, in a seven year period studied, 34% of firms indicated that they undertook R&D during only one year of the period, 23% undertook R&D in two of the seven years, 13% undertook R&D for three of the seven years, and so on (see Figure 3.7).

Figure 3.7: Persistence of R&D Performers



Source: The Impact Group. The Demographics of Industry Research in Canada 1994-2000. Toronto. January 2005

College representatives interviewed for some case studies indicated they did not plan to become sustainable if this meant becoming a contract research facility. These interviewees pointed to the college's education mandate and emphasized that they would continue to focus their efforts on projects which could benefit the students' learning:

> We do not want to become a contract research facility… Our main goal is teaching. We look for student involvement in everything.
>
> College representative, case study

3.7 Have there been any unintended impacts?

Summary of Findings:

A few unintended impacts emerged from discussions with those who were consulted as part of the evaluation. Most were positive: attraction of new students to the colleges due to possibilities of applied learning experiences; greater range of partnerships including partnerships with multi-nationals which in turn supported sustained R&D capacity at the college; student-led innovation which led to the development of new tools or processes; and improved ability of colleges to attract funding for collaborative R&D as a result of their accomplishments during the IE grant. One negative unintended impact was the high administrative burden that resulted from a high demand for collaborations from companies.

Several unintended impacts were reported by key informants and case study respondents and most of these were positive. For example, the IE Grant was reported to have contributed to attracting new students to the college. Some stakeholder interviewees stated that colleges that advertise project results experienced significant increases in student registrations. They reported that students were attracted by the potential career opportunities that could result from the direct work experience they would obtain while participating in applied research projects.

Different types of partnerships were also established. Specifically, the colleges that established partnerships with large Canadian or multinational firms reported that these partnerships had allowed them to undertake research with sufficient funding while eventually benefitting SMEs through the retention of IP at the college, the transfer of knowledge from the college to the SME and the development of capacity at the college that can then be shared with SMEs. Although this demonstrates the capacity of the colleges to address problems relevant to businesses, one possible drawback of working with larger organizations is that it could limit the ability of the colleges to focus on the needs of SMEs in their region.

Another unexpected positive result relates to student impacts. In two cases, students participating in the projects used the training and access to equipment to innovate and

create new tools or new processes which will ultimately be useful to businesses. Although it was expected that students would assist organizations in innovating, it was unexpected that the students themselves would innovate on their own and create new processes or products which could be commercialized.

Some stakeholders interviewed for the evaluation reported that the success of IE Grant projects has contributed to the success of other initiatives under the CCI program. Specifically, these interviewees explained that the success of one initiative gives credibility to the idea of applied research at the college level. Since one initiative is successful and has demonstrated it can be done, senior management at colleges is more open to additional applied research programming given that some capacity has already been built and senior management has increased confidence that these types of initiatives can succeed.

The only negative unintended impact reported during the evaluation was that the demand for collaborative activities from companies created a burden on colleges. Cross-case analysis and interview evidence suggests that the IE Grant has elevated the profile of applied R&D capacity among IE Grant recipients, and subsequently generated more interest in applied research collaborations where there was little or none in the past. Some of this increased demand is at levels that were not anticipated and in some cases has exceeded available capacity. Although the demand is considered to be largely beneficial as it allows colleges to be more strategic about their project selection, it also poses an unexpected administrative burden on the researchers and their organizations.

4.0 Findings – Design and Delivery

4.1 Have the colleges implemented the grants as planned?

Summary of Findings:

The IE Grants have been generally implemented as planned. CCI Review Committee respondents indicated that high quality proposals are being submitted and assessed against the three selection criteria: potential to contribute to local or regional innovation; excellence of the proposal; and need for, use of, resources. Most colleges experienced at least one partnership that fell through between the application submission and 18-month progress report stage. Some colleges have experienced significant drops in partnerships from what was anticipated at the application phase, although most of these have been able to recover by replacing partners.

Assessment of achievement of outcomes

According to all lines of evidence, in most cases the IE Grant was implemented as planned. Over 70% (n=43) of partners and over 80% (n=8) of colleges reported that projects were implemented as planned. The cross-case analysis also demonstrates that some adjustments to the research plan or to administration and management aspects of the grant were made along the way, as needed.

Most colleges revealed that at least one of their original partners dropped out. Some colleges experienced significant drops in partnerships from what was anticipated at the application phase. In the case studies, some partnerships were cancelled due to major internal changes on the partner side, as experienced by three colleges. Others were cancelled because of financial difficulties (i.e., bankruptcies) of the business partners. These changes did not reportedly impede the success of the IE Grant-funded projects in most cases, but did have some impact at one college.

In interviews, CCI Review Committee members did not note any issues with the implementation of the peer-review process. These interviewees reported that proposals are typically of high quality – successfully meeting the selection criteria such as regional relevance, innovation and involvement of faculty and students.

4.2 What are the factors that have facilitated or inhibited the achievement of intended outcomes?

Summary of Findings:

One of the main findings in terms of design and delivery of the CCI program IE Grant is that there is no one model for success. By the very nature of the flexible approach to implementing the program, this breeds success for most of the colleges holding grants. Two promising practices that did emerge were the assignment of administrative and grant management tasks to dedicated resources to allow faculty members to focus on the applied research projects, and that strong leadership at the college's senior management levels is vital to the successful implementation of faculty release time.

The evaluation did not identify any other factors that had facilitated or inhibited the success of the IE grant. However, there is a perception that requirements for performance monitoring are excessive.

Factors that facilitate success

Interviews with college representatives for most of the case studies indicated that success depended **on the degree of flexibility demonstrated by CCI program management at NSERC**. Generally speaking, a flexible approach is considered to allow the program to remain attuned to the specific needs of colleges. For example, program management allowed the CSTPQ to use its own pay criteria, rather than that of the college, to determine the wage for technologists. This overcame the basic problem of the CSTPQ having a different pay structure than the college. Similarly, flexibility from program management regarding funding allocation allowed another college to hire sufficient resources to rapidly respond to growing demand from businesses in some areas.

Evidence from the case studies suggests that the **assignment of IE Grant-funded project administrative and management tasks to dedicated resources** appears to be a best practice that can help colleges address issues around faculty release time (i.e., by assuring faculty that they will be able to focus their efforts on the applied research project and not administrative duties). This was practiced by four colleges, which use project managers to carry out activities such as performance measurement and reporting, agreements with partners, and external communications. This reduces the administrative burden on faculty involved in applied research.

According to some stakeholder and selection committee interviewees as well as a few college representatives interviewed for case studies, **strong leadership at the colleges' senior management level was vital to get buy-in for increasing faculty release time**.

Examples of how buy-in had been secured according to college managers/administrators included: holding regular and ad-hoc meetings; inviting college senior management to attend open houses with businesses; and encouraging faculty members who have participated in an IE Grant-funded project to share their experiences with their colleagues/managers.

Factors that inhibit success

The evaluation did not find that there are any design factors that limit or inhibit the achievement of outcomes. However, most college representatives and a few business partners interviewed for case studies as well as most stakeholder interviewees indicated that there is **excessive performance monitoring**. The colleges deal with performance reporting requirements in a number of ways, including partnering with outside firms to track metrics or devoting staff resources exclusively to reporting. A few interviewees from the case studies suggested that NSERC should lower the number of mandatory performance indicators in the progress reports. It was suggested that only performance indicators that fall within the area of the proposal should be collected, that the time scope of performance measures be reduced or simplified, and that forms should be tailored to be more relevant to colleges' performance reporting systems. In fact, a review of the progress report template was undertaken in early 2012 and a new template was circulated to colleges. It is not clear whether comments provided for the evaluation were in reference to the original progress report template or the revised template. However, a review of the revised template indicates that the scope of the progress report has not changed significantly and that the progress report for colleges is in fact longer than before. As well, the new template does not include additional guidance regarding expected length or detail for open-ended responses.

Along a similar vein, although not always referenced in the context of the perceived reporting burden, some college representatives interviewed for case studies felt that the 20% allocation for administration and overhead was not sufficient. However, the evaluation did not find any evidence to suggest that this inhibits the achievement of outcomes.

5.0 Findings – Economy and Efficiency

5.1 To what extent are the most efficient means being used to achieve program outcomes?

Summary of Findings:

NSERC's administrative costs for delivering the IE Grant appear to be reasonable considering the life-cycle of the program. The operating ratio was high (19.8 cents for each dollar of grant funds awarded) in fiscal year 2008-09 when the pilot was expanded, below the operating ratio for RPP as a whole for the following two years (4.2 and 5.3 cents) and slightly higher, but identical to RPP's operating ratio, when the CU-I2I and the IRCC components were launched in fiscal year 2011-12 (6.6 cents).

A common measure of the efficiency of grant programs is to assess the ratio of operating expenditures to the total amount of grant funds awarded. This ratio represents the cost of administering a dollar of grant funds awarded. The granting agencies also commonly report operating expenditures as a percentage of total program expenditures. Table 5.1 presents an estimate of the operating expenditures for the CCI program for fiscal years 2008-09 to 2011-12. Administrative costs include both the direct and indirect costs of administering the programs. Direct costs comprise salary and non-salary costs, which are related primarily to the adjudication of the award. Non-salary costs also include a share of the costs relating to corporate representation and general administration for the RPP Directorate. Other direct costs associated with administering the programs, such as post-award management (which is a centralized function carried out by the Finance Division) and indirect costs, such as common administrative services for NSERC (e.g., finance, human resources, communications, regional office outreach and IT) cannot be provided at the program level. These other direct and indirect costs have also been included in the total calculation of costs and were estimated using the ratio of total CCI awards to total NSERC grant funds.

Table 5.1: Estimated Costs for the CCI Program

	2008-09	2009-10	2010-2011	2011-2012	Average
Total administrative costs	*$406,315*	*$610,442*	*$1,491,911*	*$2,077,481*	*$1,146,537*
Total direct costs	$304,030	$413,261	$964,395	$1,438,888	$528,920
Direct salary	$193,000	$193,000	$533,000	$878,000	$336,571
Direct non-salary	$111,030	$220,261	$431,395	$560,888	$192,348
Total indirect costs	$102,285	$197,180	$527,516	$638,593	$366,394
Total grant funds awarded	*$2,050,750*	*$14,550,750*	*$28,033,866*	*$31,620,420*	*$19,063,947*
Operating ratio (¢:$1) (expenditures to grant funds awarded)	**19.8¢**	**4.2¢**	**5.3¢**	**6.6¢**	**6.0¢**
Operating expenditure as a percentage of total program expenditures	**16.5%**	**4.0%**	**5.1%**	**6.2%**	**5.7%**

Note: The IE Grant constituted the whole program budget for fiscal years 2008-09 to 2010-11. Total direct costs include non-salary and salary spending. Salary spending (indirect cost) was estimated using the program's grant funds as a percentage of the directorate's (Council's) grant funds, multiplied by the directorate's total salary expenditures (all non-program directorates' total expenditures. Salary estimates exclude employee benefits (EBP). Indirect costs include common administrative services for NSERC (e.g., finance, human resources and IT).
Source: NSERC administrative data

For fiscal years 2008-09 to 2011-12, NSERC spent 6.0 cents to administer each dollar of CCI grant funds awarded. The operating ratio was similar to the ratio for the Research Partnership programs (RPP) Directorate (5.9 cents) and higher than for NSERC as a whole (4.3 cents) for the same time period.[18] The low total grant funds awarded in fiscal year 2008-09, the program expansion costs (such as updates to program literature, promotion and assessment of institutions' eligibility) and the fact that three rather than two competitions were held that year likely contributed to a high operating ratio (19.8 cents) which significantly affected the four year average. The CCI Program's operating ratio was lower than the operating ratio for RPP as a whole in fiscal years 2008-09 (4.2 cents compared to 5.9 cents for RPP) and 2009-10 (5.3 cents compared to 6.8 cents for RPP). In 2010-11, the operating ratio increased (6.6 cents), possibly due to the costs associated with the launch of the CU-I2I and the IRCC components as well as the growing number of grants for which progress reports needed to be assessed. This year, the operating ratio matched the operating ratio for RPP as a whole.

[18] The delivery of RPP programs is more resource intensive than other NSERC programs. The involvement of companies generally requires more resources for outreach, review of applications, financial administration and monitoring.

6.0 Findings – Relevance

6.1 To what extent does the CCI Program continue to demonstrate relevance?

Summary of Findings:

Since the need for the program and the federal government's role in delivering the program has not changed since 2007, the assessment of program relevance focused on the extent to which the CCI program continues to be aligned with federal priorities and agency strategic outcomes. The evaluation found that the CCI program continues to be consistent with current federal government priorities as well as the strategic outcomes and priorities of NSERC and SSHRC. The program is also aligned with CIHR's strategic outcome, but less so with the agency's Commercialization Strategy from 2005, which is currently being revised.

While all 5-year IE Grants have a focus that falls within the NSE, many of the IE Grants include components that fall within the SSH and health areas. While the CCI program's primary aim is to contribute to economic development by supporting business innovation, there appears to be a desire on the parts of SSHRC and CIHR for greater take-up through awareness-raising on the part of these organizations.

A program demonstrates relevance if it addresses a continuing need, the federal government has a role in delivering it and it is aligned with federal priorities and the strategic outcomes of the agencies delivering it. The need for the CCI program and the federal role in delivering the program was confirmed as part of the mid-term review of the CCI Pilot program in 2007 and the program's context has not changed significantly since then. In fact, the interviews with representatives from colleges and companies reiterated that there is a continued perceived need for the program. College representatives particularly highlighted the need for administrative support for project management and reporting, faculty release time, student involvement as well as for funds for purchasing equipment and supporting outreach.

Since the need for the program and the federal government's role in delivering the program has not changed since 2007, the assessment of program relevance focused on the extent to which the CCI program continues to be aligned with federal priorities and agency strategic outcomes.

Alignment with Government priorities

Based on the success of the CCI Pilot program and the potential of the applied research capacity at colleges to support the knowledge-based economy, the Federal Budget 2007

made the CCI Pilot program permanent and awarded $48M over five years to launch the next round of projects.[19] Since 2007, the CCI Program has formed an integral part of the federal government's science and technology strategy (S&T Strategy) – Mobilizing Science and Technology to Canada's Advantage. The CCI program aligns with and supports the S&T Strategy and its three S&T advantages: the Entrepreneurial Advantage, the Knowledge Advantage, and the People Advantage. The CCI program is specifically identified in Chapter 3.2 of the S&T Strategy as a policy commitment under the Entrepreneurial Advantage.

In Budget 2010, the Government provided an additional $15M/year to double the CCI program to support additional applied R&D projects and strengthen the competitiveness of small and medium-sized businesses through innovation, and enable additional young Canadians to prepare for the jobs of tomorrow.[20]

Budget 2011 provided $3M in 2011-2012 to the CCI program, $5M on a permanent basis in 2012-2013, to establish 30 new Industrial Research Chairs at colleges to assist them in accelerating applied research in fields where there is an important industrial need.[21] Budget 2011 also allocated $12M over five years to NSERC's Idea-to-Innovation (I2I) program to support joint college-university commercialization projects.[22] Budget 2012 announced $15M per year to NSERC's Strategy for Partnerships and Innovation (SPI), of which $1M is planned to fund the CCI program's Technology Access Centre (TAC) grants.[23]

Alignment with Councils' priorities

As per the most recent NSERC Program Activity Architecture, the CCI program is aligned with the Council's third strategic outcome that relates to innovation. Through this strategic outcome, NSERC works towards ensuring that "knowledge and skills in the natural sciences and engineering are transferred to and used productively by the user sector in Canada".[24] NSERC's results under this strategic outcome will contribute to the S&T strategy's objective to generate an "Entrepreneurial Advantage" for Canada, by connecting and applying the "strength of the academic research system to addressing the opportunities and challenges of building prosperity for Canada".[25] In particular, the CCI Program and, thus, the IE Grant are linked to the sub-activity 3.3 "Support Commercialization". This positioning represents the expected results of the CCI program and the IE grants, which emphasizes knowledge transfer and technology

19 Budget 2007, p. 204.
20 Budget 2010, p. 81.
21 Budget 2011, p. 158.
22 Ibid., p. 159.
23 Budget 2012, p. 74.
24 NSERC. (2011). 2011-2012 Report on Plans and Priorities. Retrieved July 30, 2012 from: http://www.tbs-sct.gc.ca/rpp/2011-2012/inst/nse/nse02-eng.asp.
24 Ibid.

transfer through supporting colleges in their applied research capabilities.[26] The CCI program goals also align with CIHR's first Strategic Outcome "A world-class health research enterprise that creates, disseminates and applies new knowledge across all areas of health research" and SSHRC's third Strategic Outcome: "Knowledge Mobilization: Facilitating the use of social sciences and humanities knowledge within and beyond academia."

The CCI program's focus on partnership promotion between businesses and post-secondary educational institutions/researchers as a means of supporting economic growth is a key focus of NSERC's Strategy for Partnership and Innovation (2009) and SSRHC's Knowledge Mobilization Strategy (2009). During an interview with CIHR and SSHRC program delivery representatives, it was discussed that the program is considered to be well aligned with SSHRC's priorities, but not well aligned with those of CIHR. The IE Grant is not seen to fit under CIHR's current Commercialization Strategy which was launched in 2005, although it was mentioned that the CIHR Commercialization Strategy is currently being updated.

When the program was made permanent in 2008, its scope was expanded to consider proposals for applied research in all disciplines; that is, not just those within natural sciences or engineering (NSE), but including disciplines address by the other granting agencies. As expected, to date the vast majority of IE Grants have featured an NSE component, with all 5-year IE Grants and all but one entry-level grant between 2008/09 to 2011/12 including an NSE component and consequently funded by NSERC (see Table 1.3 in Section 1.1). While all 5-year IE Grants have therefore been funded by NSERC, many of the IE Grants include components that fall within the SSH and health areas. Specifically, of the 5-year IE Grants that have been awarded to date, 19% had a social sciences or humanities focus and 18% had a health focus. Three of the case studies explored for this evaluation included non-NSE sectors of focus including GBC (health), la Cité collégiale (health) and ECUAD (SSH).

NSERC staff reiterated that the CCI program's primary aim is to contribute to economic development by supporting business innovation. The fact that almost no CCI program grants had been awarded by SSHRC and CIHR was not perceived as an issue. This view was not entirely shared by the interviewees from CIHR and SSHRC; these interviewees indicated that the CCI program is a missed opportunity for their organizations, although they felt that the most logical steps to take to address the issue is for SSHRC and CIHR to better promote the program with the colleges.

[26] Ibid.

7.0 Conclusions and Recommendations

7.1 Conclusions

7.1.1 Effectiveness

The evaluation found that the CCI program IE Grant is achieving or is on track to achieve its expected immediate and intermediate outcomes. These impacts were assessed primarily through case studies of eight of the 13 colleges funded in the first two competitions, and so are not fully representative of all funded colleges from these two rounds. This evidence was complemented by file review data from all 13 colleges in the first two rounds as well as a survey of business partners from all competition years (resulting in some responses from firms that are still in the early stages of realized impact from their interaction with the college).

In particular, the evaluation found that the IE Grant changed the nature and intensity of relationships colleges typically had with SMEs prior to the funding in terms of providing firms greater access to faculty, students, and college facilities. Most companies were satisfied with their interaction with the college (86%) and they plan to undertake a collaborative research project with the college in the future (69%). Outcomes pertaining to businesses that have been realized include the development of collaborative applied research partnerships with colleges and increased R&D activities. Overall, the survey found that, seven in ten (70%) companies had experienced some type of impact on their business or their R&D capacity in particular. Specifically, almost two in five (39%) had experienced at least some impacts on annual revenues, number of new customers or the number of employees as a result of the IE Grant-funded partnerships. More than two-thirds (69%) of companies had also experienced impacts on at least one aspect of their R&D capacity (i.e., either on their ability to introduce new or substantially improved products, processes or services; their ability to introduce new or substantially improved products, processes or services to market; their ability to attract investments or their ability to make research investments). The case studies, conducted with eight of the 13 colleges funded in the first two funding rounds, provided an even more positive picture of the impact on SMEs. There were many examples of SMEs that have seen commercial impacts attributable to the collaborative R&D partnership, including the development of new products, processes and technologies and/or the improvement of existing products, processes and technologies.

The evaluation also found that the capacity at colleges to meet the needs of SMEs has also been increased as a result of the IE Grant. Key areas in which capacity was increased include faculty release time, access to equipment, and development of applied research programs. Faculty release time, in particular, was identified as a key success

factor leading to increased college capacity, but is one area where challenges remain to counteract the cultural and systemic barriers to this approach. A few colleges have used dedicated resources for administration and management of the IE Grant, such as project managers, that allows faculty to focus primarily on research aspects of projects.

It is unclear if colleges will be able to sustain their R&D capacity after the grant. Generally, the evaluation found that most colleges would need continued government support if they were to maintain their existing capacity and resulting applied research project support for SMEs. Continued reliance on government funding appears appropriate since SMEs are challenged to support applied research capacity at colleges.

While the evaluation did not assess to what extent student impacts have occurred overall, case studies suggest that student impacts have been realized. Most college representatives consulted for the evaluation emphasized that in an educational environment such as the college system, impacts for students are an important area of focus for projects undertaken through the IE Grant. Besides increasing their knowledge, technical skills, soft skills and interest in applied research, students were able to enhance their CVs and improve their access to job opportunities and outreach activities. These impacts were achieved through direct involvement in IE Grant collaborative research projects as research assistants, research associates, interns, co-op students, and participants in in-class projects. The effectiveness of training opportunities was further strengthened by company-student interaction where students' participation in applied projects with business partners provided them with greater opportunities to apply knowledge learned during class in concrete projects with tangible results for businesses. The evaluation found that, on average, 10 more students per college receive training opportunities with industry because of the IE grant. These student-level impacts led to improved student employability. The survey of partners revealed that 30% of respondents had hired one or more students as a result of the IE Grant-funded project. The case studies were also able to provide anecdotal evidence of students being hired in their field which was described by most to be attributable, at least in part, to their involvement with the IE Grant.

7.1.2 Design and Delivery

The evaluation found that the IE Grants have been implemented as planned for the most part. Where deviations have occurred (e.g., in the turnover of SME partners), these have not adversely affected the success of the IE Grant in most cases.

Characteristics of the IE Grant's design and delivery approach that are contributing to the overall success of the program is the flexibility afforded to IE Grant recipients to tailor the implementation of the grant to their own context; there is no one model of success. Two areas that did emerge as promising practices (depending on the context at the implementing college) are the assignment of administrative and grant management

tasks to dedicated resources (thereby freeing up faculty members to focus on the applied research project), and the strong leadership at some college's senior management levels as being vital to the successful implementation of faculty release time.

The evaluation did not reveal any factors that limit or inhibit the achievement of outcomes of the IE Grant. However, there were some concerns on the part of some college representatives and a few business partners regarding the amount of performance monitoring. While the progress reporting template has been recently updated, it does not appear that the amount of reporting has decreased. This suggests that there are still opportunities to improve the consistency of how the information is presented by colleges which may help to decrease the reporting burden.

7.1.3 Efficiency and Economy

With respect to efficiency and economy, the evaluation found that the cost of administering the program is reasonable considering the life-cycle of the program. The average operating ratio over the entire duration of the program was 5.7 cents for each dollar of grant funds awarded. The operating ratio was high (19.8 cents) in fiscal year 2008-09 when the pilot was expanded. The operating ratio was below that of RPP as a whole for the following two years (4.2 and 5.3 cents) and slightly higher, but identical to RPP's operating ratio, when the CU-I2I and the IRCC components were launched in fiscal year 2011-12 (6.6 cents).

7.1.4 Relevance

The evaluation found that the IE Grant continues to be consistent with current federal government priorities as well as the strategic outcomes and priorities of NSERC and SSHRC. The program is also aligned with CIHR's strategic outcome, but less so with the agency's Commercialization Strategy from 2005, which is currently being revised.

While all 5-year IE Grants has a focus that falls within the NSE, many of the IE Grants include components that fall within the SSH and health areas. While the CCI program's primary aim is to contribute to economic development by supporting business innovation, there appears to be a desire on the parts of SSHRC and CIHR for greater take-up through awareness-raising on the part of these organizations.

7.1.5 Availability of Performance Information to Support the Evaluation

The evaluation partly relied on the file review prepared from the 18-month progress reports submitted by the 13 colleges that received funding in the first two competitions. Overall, the file review report did provide valuable information for the evaluation. While there were some limitations to the review, largely as a result of an inability to roll up results across colleges due to inconsistent progress reporting, there was evidence pertaining to most areas of performance explored for the evaluation.

Baseline data is collected through the progress reports and include information such as the number of partnerships, involvement of faculty, staff and students, employment of students, incorporation of applied research project results into curricula prior to the IE Grant. However, due to a lack of consistency in the way data was reported, detailed comparisons between baseline and current data would not have produced reliable findings. Instead, the file review focused on identifying broad trends in the data (e.g., how many colleges had experienced increases rather than exactly what the increases had been). Thus, without the detailed quantitative information the evaluation could still assess how many colleges experienced increases which was enough to speak to incrementally. In the future, if this information becomes available, an evaluation could have summary statements based on quantitative information as well as trend analysis and qualitative evidence.

As well, future evaluations will benefit from additional colleges having submitted progress reports and the availability of 36-month progress report data from some colleges. However, there remains a risk that inconsistent reporting will continue to present a challenge in the analysis and summarization of data.

Finally, future evaluations would also benefit from efforts on the part of NSERC to improve the completeness and accuracy of information on partners (e.g., information on company size and up-to-date contact information to partners) which is currently being collected and entered into the Council's administrative database.

7.2 Recommendations

1. Continue funding the CCI Program IE Grant

The evaluation found that the program has or is on track to increase applied research capacity in businesses, increase college capacity for technical problem solving, and provide high quality training opportunities for students. Moreover, the program is aligned with current government and Council priorities and there is a clear continuing need among SMEs for this type of assistance. It should be noted that the evaluation only focused on one type of grant under the program because it was too early to assess impacts for the other program components.

Because the evaluation found that sustaining the applied research capacity at most colleges requires more than contributions from SMEs, the CCI program should explore the potential need for, and criteria whereby, current IE Grant holders could apply for subsequent IE Grants. Alternatively, the program should ensure that other CCI grants provide funding to help sustain the applied research capacity, especially with respect to support for faculty release time and college personnel to facilitate research with businesses.

2. **Establish a mechanism to encourage the sharing of best/most promising practices and lessons learned among colleges.**

   The evaluation found there are many ways to successfully implement IE Grants. However, there are pockets of expertise in many areas that would be of benefit to be shared, such as governance, SME outreach, the treatment of intellectual property, administrative support/capacity and approaches to reporting. Such a mechanism does not need to be overly complex or costly and could build on current mechanisms NSERC uses to communicate with colleges.

3. **Continue to make improvements to grantee reporting templates and the completeness and accuracy of information on partner organizations.**

   The data collected through the program's current performance measurement strategy did provide valuable information for the evaluation of the CCI program. However, a few areas of improvement were identified over the course of the evaluation. The evaluation advice the program to:

   a. **Review and revise (where necessary) IE Grant progress reporting templates and provide guidance to colleges on CCI program expectations regarding interpretation of indicators and level of detail required.**

      The information currently available in progress report was useful for the purpose of evaluation. However, challenges were encountered in attempting to roll up results due to inconsistency in how questions and indicators were interpreted and different levels of detail. As well, there are opportunities to decrease the amount of detail provided in some progress reports, particularly the amount of narrative and the comprehensive nature of some reports. The program should take steps to ensure that colleges are interpreting written guidance consistently and should seek clarification from colleges on the content of completed reports, where necessary.

   b. **Continue to improve the completeness and accuracy of information on partner organizations in the Council's administrative database.**

      While colleges are required to submit information on new partners to NSERC on an ongoing basis, the Council's administrative database does not include up-to-date information on which partners are or have been collaborating with the colleges. The database mainly includes partners that were listed on the colleges' funding applications. More complete and accurate information would allow NSERC to produce statistics on partners on an ongoing basis. It would also make it possible to pull future survey samples of companies directly from the administrative database which would help ensure that survey findings are representative of the population as a whole.

Improvements could be made to the NSERC partner form to encourage more companies to provide information on the size of their organization. Currently, companies are asked to provide the exact number of employees which they may be hesitant to or might not know. Asking partners to also categorize their company as small (1-99 employees), medium-sized (100-499 employees) or large (500 or more employees) would likely improve the completeness of the data available.

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