

# **Evaluation of the NRC Industrial Research Assistance Program (NRC-IRAP)**

## ***Final Report***

**Prepared for:**  
National Research Council

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# Executive Summary

## Purpose and Methodology

Established in 1962, the National Research Council (NRC) Industrial Research Assistance Program (NRC-IRAP) provides a range of both technical and business-oriented advisory services along with potential financial support to growth-oriented Canadian small- and medium-sized enterprises (SMEs) at all stages of the innovation process. NRC-IRAP helps SMEs build their innovation capacity, understand technology issues and opportunities and provides linkages to various experts.

An evaluation of NRC-IRAP was undertaken in 2011 to update NRC senior executives and managers in terms of ongoing program performance in light of the additional demands placed on the Program in recent years. The evaluation will also provide information as part of the renewal of the Program's Terms and Conditions, slated for March 2013. The work undertaken as part of the evaluation covers the period from May 2007 to April 2012 and addresses the core issues of relevance and performance, as per the Treasury Board Policy on Evaluation (2009). Because of its high materiality and visibility, the Program was assessed as posing a high evaluation risk and therefore required an in-depth methodological approach, which included primary and secondary data from qualitative and quantitative sources. The following methods were used in the evaluation:

- Literature and document review
- Key informant interviews
- Focus groups
- Survey of Industrial Technology Advisors
- Survey of firms;
- Survey of organizations;
- Study of advisory services
- Qualitative network analysis; and,
- Partial cost-benefit analysis

## Profile of NRC-IRAP

The mandate of NRC-IRAP is to stimulate wealth creation for Canada through technological innovation, while its mission is to stimulate innovation in SMEs in Canada. It proposes to accomplish this through two strategic objectives, which are to: 1) provide support to SMEs in Canada in the development and commercialization of technologies; and 2) collaborate in initiatives within regional and national organizations that support the development and commercialization of technologies by SMEs.

Over the evaluation period, the Program has received close to \$1 billion. Financial allocations for NRC-IRAP have averaged around \$130 million to \$137 million per year in 2007-08, 2008-2009 and 2011-2012. The notable exceptions are in 2009-2010 and 2010-2011 (approximately \$279 million per year), when an additional \$200 million were provided to NRC-IRAP under Canada's Economic Action Plan, including graduates from business schools.

To support the achievement of its objectives, NRC-IRAP offers three main services: advice,

funding and networking and linkages.

### ***Advisory Services***

Industrial Technology Advisors (ITAs) located across Canada help SMEs identify and address their technical, research, information, and business needs by assisting them with planning, identifying challenges and selecting solutions at each stage of the R&D development process and the innovation cycle.

### ***Financial Support***

NRC-IRAP offers financial assistance through core funding, as well as temporary funding targeted to specific purposes. Project funding is available to firms and organizations that meet eligibility criteria. Over the evaluation period, firms and organizations received project funding from the core NRC-IRAP grants and contributions budget, as well as from special temporary budgets created as part of Canada's Economic Action Plan and other federal government initiatives. Financial support is also provided to firms for projects involving the temporary recruitment of graduates under the Youth Employment Strategy.

### ***Networking and Linkages***

Through the course of their work, ITAs typically develop linkages with industry sectors, government organizations and community economic development groups in order to provide holistic innovation services to firms. By building these networks and linkages, ITAs focus on bringing the most appropriate expertise to their clients. These inter-organizational working relationships may also lead to more formal linkages, including contribution agreements with organizations, to provide local SMEs with networking services and business support.

## **Program Reach**

An important component of any program's success is the extent to which it has reached its intended clients. In the case of NRC-IRAP, the targeted clients are SMEs engaged in R&D activity in Canada and organizations that have the potential to offer business and/or technical support services to SMEs. Between 2006-07 and 2010-11, NRC-IRAP provided financial support to close to 5,000 firms and over 300 organizations. The stimulus funding provided through the Economic Action Plan enabled the Program to extend its reach in 2009-10 and 2010-11. Overall, the trend observed in the previous evaluation appears to be holding: Program reach appears to be contracting over time, despite the additional stimulus funding, in favour of larger project sizes.

## **Program Performance – Achievement of Expected Results**

Overall, the program activities and outputs are linked to the achievement of expected client outcomes. The evaluation found that the majority of NRC-IRAP clients have increased their innovation capacity (e.g., skills, knowledge, and personnel) through the guidance of the ITAs, the financial support provided by the Program, or the services provided by the funded organizations. All three program components appear to complement one another in pursuit of client success. The evaluation also found that NRC-IRAP has been successful in assisting recipient SMEs to use their increased innovation capacity to generate greater productivity and

revenues through the development of new products, processes and technologies. In terms of broader outcomes, the Program can be credited with significant extrapolated labour force outcomes, including direct employment impacts (in the 6,900 to 10,700 range overall per year on average, of which approximately 80% are R&D positions) and associated wage/salary impacts.

### **Program Performance – Efficiency and Economy**

The evaluation examined the extent to which the resources allocated to the Program are being utilized in an economical manner in producing outputs and progressing towards expected outcomes. The evaluation found that the demand for the Program far exceeds the supply of available resources, even when the additional funding provided through the Economic Action Plan is taken into account. The stimulus funding did, however, increase the number of projects funded by the Program over the two years of the temporary allocation; in addition, the stimulus funding elevated the profile of NRC-IRAP in many regions and led to the development of streamlined administrative processes for low-risk projects. However, the temporary increase in funding resulted in a decrease in the availability of ITAs to provide advice and linkages to their clients.

The overall economic benefits of NRC-IRAP outweigh its costs. The cost-to-benefit ratio of the Program was identified as 1:11.36, and is consistent with the results of previous studies. Furthermore, the partial cost-benefit analysis conducted as part of the evaluation found that estimated annual profits (\$440 million) and SME wages, salaries, and overhead (\$1.1 billion) that subsequently result from NRC-IRAP projects far outweigh the Program's annual expenditures of approximately \$130 million.

The evaluation identified a number of areas worthy of further consideration and potential improvement that may positively influence the Program's future efficiency and economy. Specific recommendations were made to this effect in the evaluation report.

### **Program Relevance – Continued Need for the Program**

The evaluation found that there is a continuing need for the Program. The issue of market failure associated with the production of scientific knowledge by private sector firms is well-documented in the literature and supports the rationale of NRC-IRAP. Furthermore, R&D subsidies are on the rise in developed nations to support industrial innovation in an attempt to increase national competitiveness and economic achievement. The evaluation found that in the case of NRC-IRAP, 47% of clients felt that in the absence of project funding provided by the Program, their projects would not have proceeded at all.

### **Program Relevance – Alignment with Government Priorities**

The evaluation found that NRC-IRAP is aligned with current federal government priorities regarding R&D and innovation. The science and technology policy of the federal government, *Mobilizing Science and Technology to Canada's Advantage* (2007), clearly identifies NRC-

IRAP as one of the key mechanisms through which it will achieve the policy objectives outlined in its “Entrepreneurial Advantage” suite. This is reflected through the recent use of the Program as a stimulus funding instrument as well as the increased contribution and operational resources announced in Budget 2012. NRC-IRAP also continues to be aligned with NRC strategy and priorities, and constitutes one of its four business lines.

## **Program Relevance – Federal Roles and Responsibilities**

The role of government in providing R&D subsidies to SMEs is also well-established; the government is perceived to be an impartial, objective, and credible player that can provide support to SMEs without the conflict of direct financial gain. In this way, the government helps companies “de-risk” technology development since many companies do not have the resources to innovate and survive in their markets. The role of government in providing technical and business-related advice to SMEs was also examined given the importance of this program component, which is often considered unique to NRC-IRAP. The review of literature showed that the lack of technical and business-related knowledge and skills is a key obstacle to the growth of SMEs, and that the government can play a role in addressing this need.

NRC-IRAP, with a specific mandate for assisting SME innovation, is uniquely positioned to provide its services through its ITA workforce. While there are policy alternatives to providing direct R&D subsidies, the complementary nature of the Program with the tax credit policy alternative suggests that the NRC-IRAP model is appropriate. In terms of program alternatives in Canada, NRC-IRAP is a unique program offering and is complementary to other programs targeting similar client firms.

## **Recommendations and Management Response**

The evaluation found overall that NRC-IRAP is relevant and effective. To support continued program improvement, six recommendations are presented below, along with the NRC-IRAP management response and proposed actions.

Recommendation 1: Increase the involvement of ITAs in the selection of the firms to be served by NRC-IRAP funded activities undertaken by organizations and implement measures of control that involve direct communication between NRC-IRAP and these firms, especially in cases where individual services are provided.

- **Management Response:** Accepted. NRC-IRAP will facilitate the involvement of ITAs in the referral of firms and to provide follow up services if needed. Directions will be provided to ITAs and the Field Manual will be modified as required.

Recommendation 2: When grants and contributions funding increases occur, allocations for associated O&M requirements should also be considered to support efficient and timely program delivery.

- Management Response: Accepted. Develop a costing model for incremental programming and request appropriate levels of O&M funds whenever additional Gs&Cs are allocated or new programs are integrated into or delivered by NRC-IRAP.

Recommendation 3: Opportunities should be made available for SME clients to voice concerns about their ITA; recourse mechanisms should be communicated to all clients to ensure increased awareness.

- Management Response: Accepted. Since the completion of the Evaluation , NRC-IRAP has implemented mechanisms through which clients can provide feedback:
  - a. Post-Project Assessment includes 1) questions about client satisfaction and 2) option for clients to discuss concerns with NRC-IRAP management.
  - b. Service Standards, available on the NRC-IRAP website, state the level of performance clients can expect from NRC-IRAP.
  - c. The Feedback and Complaints Procedures have been reviewed and a manual is being developed for employees.

Recommendation 4: Contribution Agreements for funded organizations must clearly articulate the projected outputs and outcomes of funded activities and introduce monitoring and reporting requirements for each project. ITAs should receive training in developing CAs or CAs need to be written by trained staff. In addition, the field manual for contributions to organizations should be utilized systematically to guide the consistent development of CAs.

- Management Response: Accepted.
  - a. NRC-IRAP guidelines allow capture of relevant outputs and outcomes. However, to address this recommendation, NRC-IRAP will enhance the Field Manual instructions to better articulate outputs and outcomes in the contribution agreements.
  - b. Staff directly involved in developing CtO will receive appropriate training.

Recommendation 5: NRC-IRAP should examine the implications that the recent reorganization has already had and will have in the future on NRC Institutes (now referred to as portfolios) and determine if additional mechanisms are required to foster synergies and reduce barriers to collaboration between SMEs and portfolio these areas of NRC.

- Management Response: Accepted. The new RTO structure and mandate of NRC encourage improved cooperation and collaboration between NRC-IRAP and R&D portfolios.
  - a. NRC-IRAP will take active part in the design of new programs at the request of Portfolios' management.
  - b. NRC-IRAP is currently renewing its Sector Teams as part of its Strategic and



Operational Plan with an objective to better interface with the NRC portfolios.

- c. NRC-IRAP is developing an International Framework aligned with the NRC's International Strategy.

Recommendation 6: NRC-IRAP should continue to develop its nationally coordinated approach to performance measurement to ensure that it can demonstrate the value-added of all Program components. This approach should be based on a comprehensive performance measurement strategy and logic model. In addition, the approach should:

- Monitor the appropriateness of its performance measurement tools for funded firms;
  - Include a performance measurement system for its funded organizations; and,
  - Enable ITAs to track advisory services provided to SMEs.
- 
- Management Response: Accepted.
    - a. The Performance Measurement Strategy (PMS) will include a logic model.
    - b. There will be a review of NRC-IRAP's performance measurement tools (i.e. Post-Project Assessment, Impact Assessment and Status of Firm) in order to provide management with essential data and information while minimizing the administrative burden placed on clients.
    - c. NRC-IRAP will review metrics for funded organizations to implement essential performance measures.
    - d. NRC-IRAP will improve tracking mechanisms for advisory services provided to funded and unfunded clients.

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# List of Acronyms

AERI	Alberta Energy Research Institute
BDC	Business Development Bank of Canada
CA	Contribution agreement
CAF	Community Adjustment Fund
CBA	Cost-benefit analysis
CEAP	Canada Economic Action Plan
CFO	Community Futures Development Organization
CHTD	Canadian HIV Technology Development
CHVI	Canadian HIV Vaccine Initiative
CICP	Canadian Innovation Commercialization Program
CRM	Client relationship management
DTAPP	Digital Technology Adoption Pilot Program
EAP	Economic Action Plan
EBP	Employee Benefit Program
FTEs	Full time equivalents
GGI	Goss Gilroy Inc.
HR	Human resource
HRSDC	Human Resources and Skills Development Canada
IA	Impact assessment
IC	Industry Canada
ICSO	Industry Canada Southern Ontario
ICT	Information and communication technologies
IRAP	Industrial Research Assistance Program
ITA	Industrial Technology Advisor
NPV	Net present value
NRC	National Research Council
NRC-BRI	NRC Biotechnology Research Institute
NRC-CISTI	NRC Canada Institute for Scientific and Technical Information
NRC-IAR	NRC Institute for Aerospace Research
NRC-IIT	NRC Institute for Information Technology
NRC-IMI	NRC Industrial Materials Institute
NRC-IRC	NRC Institute for Research in Construction
OECD	Organization for Economic Development and Cooperation
OFR	Online Final Report
PPA	Post Project Assessment

R&D	Research and development
RBAF	Risk Based Audit Framework
RMAF	Results Based Management and Accountability Framework
ROI	Return on investment
RTO	Research and technology organization
SMEs	Small- and medium-sized enterprises
SoF	Status of the Firm
SR&ED	Scientific Research and Experimental Development
TBS	Treasury Board Secretariat
TPC	Technology Partnerships Canada
Ts&Cs	Terms and conditions
YEP	Youth Employment Program

# 1.0 Introduction

Established in 1962, the National Research Council (NRC) Industrial Research Assistance Program (NRC-IRAP) provides a range of both technical and business-oriented advisory services along with potential financial support to growth-oriented Canadian small- and medium-sized enterprises (SMEs) at all stages of the innovation process. NRC-IRAP helps SMEs build their innovation capacity, understand technology issues and opportunities and provides linkages to the best expertise in Canada.

An evaluation was undertaken to update NRC senior executives and managers in terms of ongoing Program performance in light of the additional demands placed on the Program in recent years and to provide information as part of the renewal of the Program's Terms and Conditions, slated for March 2013. Based on the evaluation's objectives and issue areas consistent with the Treasury Board Policy on Evaluation (2009), eight specific evaluation questions were developed. The evaluation, which covers the period from May 2007 to April 2012, sought to address the issues identified in Table 1.1.

**Table 1.1: Evaluation Questions**

Issues	Questions
<b>ISSUE AREA: RELEVANCE</b>	
Continued Need	R1. Is there a justifiable need to support SME innovation in Canada, through financial and/or advisory support?
Alignment with government priorities	R2. To what extent is NRC-IRAP consistent with current government priorities?
Alignment with federal roles and responsibilities	R3. Is NRC-IRAP consistent with federal roles and responsibilities (including its alignment with NRC and its strategy)?
<b>ISSUE AREA: PERFORMANCE (EFFECTIVENESS, EFFICIENCY, ECONOMY)</b>	
Achievement of Expected Outcomes	P1. To what extent has the Program been successful in reaching its intended clients?
	P2. To what extent have intended outcomes been achieved as a result of the Program?
	P3. To what extent has NRC-IRAP facilitated the development of linkages in the business community?
Demonstration of efficiency and economy	P4. To what extent are the resources allocated to the Program being utilized in an economical manner in producing outputs and progressing towards expected outcomes?
	P5. To what extent does the Program demonstrate efficiency in the production of outputs to reach expected outcomes?

Source: Planning Report, Evaluation of NRC-IRAP (May 2011)

The evaluation was led by the NRC Office of Audit and Evaluation with the assistance of GGI. Because of its high materiality and visibility, the Program was assessed as posing a high evaluation risk and therefore required an in-depth methodological approach, which included primary and secondary data from qualitative and quantitative sources. These methods, implemented between October 2011 and February 2012, included:

- Key informant interviews (primary data);
- Focus groups with firms (primary data);
- Survey of firms (primary data);
- Survey of organizations (primary data);
- Survey of Industrial Technical Advisors (primary data);
- Partial cost-benefit analysis (primary and secondary data).
- Study of advisory services (both primary and secondary data);
- Qualitative network analysis (both primary and secondary data);
- Internal and external document review (secondary data); and,
- Review of administrative and performance data (secondary data).

All of the methods implemented for the evaluation as well as their limitations are outlined in greater detail in Appendix A.

This report is organized into eight sections. The report begins with a description of the Program (Section 2.0), which includes its mandate/objectives, delivery approach and resources. The Program's reach is then presented in Section 3.0. The main evaluation findings are presented in Sections 4.0 through 7.0 and are summarized in Section 8.0. Appendix A presents additional details regarding the methodology and Appendix B provides a crosswalk between the evaluation questions and each of the methods. A selected bibliography is presented as Appendix C.

For qualitative lines of evidence (e.g., focus groups, 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 focus group participants commenting on that particular issue;
- **“Large majority”** – findings reflect the views and opinions of at least 75% but less than 90% of the focus group participants commenting on that particular issue;
- **“Majority/most”** – findings reflect the views and opinions of at least 50% but less than 75% of the focus group participants 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.

## 2.0 Program Profile

### 2.1 Mandate, Mission and Program Activities

The mandate of NRC-IRAP is to stimulate wealth creation for Canada through technological innovation and its mission is to stimulate innovation in SMEs in Canada. It proposes to accomplish this through two strategic objectives, which are to: 1) provide support to SMEs in Canada in the development and commercialization of technologies; and 2) collaborate in initiatives within regional and national organizations that support the development and commercialization of technologies by SMEs<sup>1</sup>.

To support the achievement of its objectives, NRC-IRAP offers three main services: advice, funding and networking and linkages. Each of these services is described in greater detail below.

#### 2.1.1 Advice

Industrial Technology Advisors (ITAs) located across Canada help SMEs identify and address their technical, research, information, and business needs by assisting them with planning, identifying challenges and selecting solutions at each stage of the R&D development process and the innovation cycle. ITAs engage in strategic questioning, provide expert interpretation and judgment, foster collaboration between experts, instigate the need for competitive intelligence, and assist clients in developing a technology management plan.

#### 2.1.2 Financial Support

NRC-IRAP offers financial assistance through core funding, as well as temporary funding targeted to specific purposes. NRC-IRAP financial services are detailed below:

***NRC-IRAP Core Funding:*** NRC-IRAP's continuing contributions budget is primarily directed toward innovating firms with a smaller portion directed toward organizations that provided needed services to those SMEs. It includes:

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<sup>1</sup> Retrieved on April 30th, 2012 from: <http://www.nrc-cnrc.gc.ca/eng/irap/about/index.html>



- a. Contributions to Firms: NRC-IRAP provides non-repayable contributions to SMEs in Canada, on a cost-shared basis, for the research, development, adaptation and/or adoption of innovative or technology-driven new or improved products, services or processes in Canada.
- b. Contributions to Organizations: NRC-IRAP provides financial assistance to non-commercial organizations to either help them build their capacity to support SMEs (such as an industry association) or to provide complementary innovation support programs to SMEs.

***NRC-IRAP Temporary Funding:*** NRC-IRAP also occasionally receives temporary funding that is targeted to a specific purpose for which NRC-IRAP can deliver within its existing Terms and Conditions of Contributions. Specific funds provided to NRC-IRAP budget over the last five years include the following:

- a. NRC-IRAP-TPC: This program, delivered on behalf of Industry Canada's Technology Partnerships Canada, provided SMEs in Canada with repayable financial assistance for projects at the pre-commercialization stage. TPC was sunset in 2006. As of April 2009, there were no further projects in the payment phase. NRC-IRAP received operating funding from Industry Canada (IC) to administer and manage the repayments up until 2011-12. As of 2012-13, TPC repayments will be managed by IC.
- b. NRC-IRAP Youth Employment Program (IRAP-YEP): NRC-IRAP's Youth Employment Program provides firms with support to hire college and university graduates who are unemployed or underemployed. Firms benefit by putting to use graduates' expertise in science, technology and business, which in turn increases their entrepreneurial awareness. NRC-IRAP delivers this youth initiative on behalf of Human Resources and Skills Development Canada (HRSDC).
- c. Canada's 2009 Economic Action Plan initiative for SMEs: As part of its temporary economic stimulus package, the federal Budget 2009 provided \$200M to NRC-IRAP over two years, starting in 2009-2010, to enable the temporary expansion of the Program.
- d. Community Adjustment Fund (CAF): In the context of Canada's Economic Action Plan and Budget 2009, a two-year fund was created to provide economic support to communities severely affected by the economic downturn, to be administered by various regional development agencies. NRC-IRAP partnered with Industry Canada to deliver this stimulus funding in Southern Ontario (17.5M plus operational funding) on behalf of a new regional development agency (later to become FedDev) that had not yet been created at the time. In

- 2010-11, NRC-IRAP received additional funding (\$26M plus operational funding) to deliver the FedDev CAF initiative.
- e. Additional Southern Ontario Development Agency funding: Along similar lines as the CAF, NRC-IRAP received temporary additional funding (\$27.5M plus operational funds) to be delivered in Southern Ontario for 2009-10, in anticipation of the upcoming creation of a new regional development agency for the area. In 2010-11, NRC-IRAP received additional funding (\$16.2M plus operational funds) to deliver the southern Ontario development agency funding.
  - f. Support to NRC Technology Clusters: In 2007-08 NRC-IRAP received three-year funding from NRC in support of activities with firms and organizations related to NRC Cluster Initiatives. The Cluster Initiatives were renewed for two years starting in 2010-11 and once again included funding to NRC-IRAP towards support of the clusters.
  - g. Canadian HIV Technology Development (CHTD): In 2010-11, NRC-IRAP received approval to deliver the Canadian HIV Technology Development component of the Canadian HIV Vaccine Initiative (CHVI) for five years. The CHVI is primarily focused on accelerating the development of a safe and effective HIV vaccine by building on Canada's scientific excellence.
  - h. Canadian Innovation Commercialization Program (CICP): Announced in Budget 2010, this program aims to bolster innovation in Canada's business sector by helping companies to bridge the pre-commercialization gap for their innovative programs and services. NRC-IRAP will be involved in this program by reviewing proposals on behalf of Public Works and Government Services Canada (as seen in the financial table, only operating dollars have been allocated to this program).

### **2.1.3 Networking and Linkages**

Through the course of their work, ITAs typically develop linkages with industry sectors, government organizations and community economic development groups in order to provide holistic innovation services to firms. By building these networks and linkages, ITAs focus on bringing the most appropriate expertise to their clients. These inter-organizational working relationships may also lead to more formal linkages, including contribution agreements with organizations, to provide local SMEs with networking services and business support.

## 2.2 Expected Results

The results chain developed as part of the Integrated RMAF-RBAF for NRC-IRAP (2009) provides some guidance on the key immediate and intermediate outcomes targeted by the Program. These outcomes include, but are not limited, to:

**Table 2.1: Select Program Outcomes**

Immediate Outcomes	Intermediate Outcomes
Increased SME technical and business competencies	New/improved product/service/process
Increased SME management, marketing and finance capability and capacity	Client growth (jobs, sales, market share and profitability) in key sectors
Jobs created/maintained	

Source: Evaluation Planning Report

## 2.3 Governance and Clients

At the start of the evaluation period, the Director General of NRC-IRAP reported to NRC's Vice-President of Technology and Industry Support, and had overall managerial accountability for the Program. Following a reorganization at NRC in 2011-12, the Director General is now considered the head of the NRC-IRAP Division and sits on the NRC Senior Executive Committee. The Director General is supported by five regional Executive Directors and a national office Executive Director. Together they form the Senior Leadership Team which makes Program-wide decisions.

NRC-IRAP's primary clients can be described as Canadian firms (incorporated, for-profit commercial entities), SMEs with under 500 employees, with the potential to innovate. Organizations desiring to enhance their technological and business capabilities in order to support SMEs are also eligible for support and may be considered clients, although the contributions made to these organizations should support firms and strengthen their innovation capacity.

## 2.4 Program Resources

Over a span of five years (2006-2011), the Program has received close to \$1 billion. Financial allocations for NRC-IRAP have averaged around \$130 million to \$137 million per year in 2007-08, 2008-2009 and 2011-2012. The notable exceptions are in

2009-2010 and 2010-2011 (approximately \$279 million per year), when an additional \$200 million were provided to NRC-IRAP under Canada's Economic Action Plan. As discussed previously, this contribution was meant to enable NRC-IRAP to expand its initiatives for small and medium-sized businesses. Of the additional \$200 million, \$170 million were earmarked to double the Program's contributions to firms, and \$30 million were used to help companies hire approximately 800 new post-secondary graduates, including graduates from business schools. Table 2.2 provides detailed information on the financial resources of the Program.

At the start of the evaluation period (May 2011), the Program employed 397 full-time equivalents (FTEs), including 30 managers/directors, 236 ITAs and Innovation Network Advisors, 6 Technical Business Analysts (TBAs) and Business Analysts (BAs), 15 Research Council Officers, 39 Regional Contribution Agreement Officers and 71 administrative support employees.

**Table 2.2: NRC-IRAP Resources 2007/08 to 2011/12<sup>2</sup>**

	2007-08	2008-09	2009-10	2010-11	2011-12	Total (5 years)
<b>NRC-IRAP Core Funding</b>						
Contributions to youth employment	\$4 986 130	\$4 817 241	\$5 261 862	\$8 624 000	\$5 558 018	\$29 247 251
NRC-IRAP contributions to organizations	\$11 960 831	\$11 016 359	\$10 732 164	\$11 363 910	\$10 969 318	\$56 042 582
NRC-IRAP contributions to firms	\$69 113 629	\$70 658 886	\$74 155 313	\$72 581 386	\$72 662 105	\$359 171 319
<b>TOTAL NRC-IRAP grants and contributions</b>	<b>\$86 060 590</b>	<b>\$86 492 486</b>	<b>\$90 149 339</b>	<b>\$92 569 296</b>	<b>\$89 189 441</b>	<b>\$444 461 152</b>
Youth employment program operating expenditures	\$373 000	\$373 000	\$373 000	\$373 000	\$373 000	\$1 865 000
NRC-IRAP contributions to firms and organizations personnel	\$32 135 575	\$32 965 749	\$37 723 691	\$35 375 273	\$38 914 205	\$177 114 493
NRC-IRAP contributions to firms and organizations operating and maintenance	\$8 769 367	\$10 746 110	\$7 930 456	\$8 872 093	\$7 357 656	\$43 675 682
<b>TOTAL NRC-IRAP operating expenditures</b>	<b>\$41 277 942</b>	<b>\$44 084 859</b>	<b>\$46 027 147</b>	<b>\$44 620 366</b>	<b>\$46 644 861</b>	<b>\$222 655 175</b>
<b>TOTAL NRC-IRAP</b>	<b>\$127 338 532</b>	<b>\$130 577 345</b>	<b>\$136 176 486</b>	<b>\$137 189 662</b>	<b>\$135 834 302</b>	<b>\$667 116 327</b>
<b>Canada Economic Action Plan (CEAP)</b>						
CEAP contributions to youth employment	\$0	\$0	\$9 567 145	\$19 423 162	\$0	\$28 990 307
CEAP contributions to firms	\$0	\$0	\$83 082 745	\$78 637 615	\$0	\$161 720 360
CEAP contributions to firms in support of innovation and commercialization	\$0	\$0	\$5 000 000	\$0	\$0	\$5 000 000
<b>TOTAL CAEP</b>	<b>\$0</b>	<b>\$0</b>	<b>\$97 649 890</b>	<b>\$98 060 777</b>	<b>\$0</b>	<b>\$195 710 667</b>
<b>Community Adjustment Fund (CAF)</b>						
CAF contributions to firms	\$0	\$0	\$12 703 345	\$23 812 817	\$0	\$36 516 162
CAF contributions to organizations	\$0	\$0	\$3 225 862	\$2 359 450	\$0	\$5 585 312
<i>Sub-total CAF grants and contributions</i>	<i>\$0</i>	<i>\$0</i>	<i>\$15 929 207</i>	<i>\$26 172 267</i>	<i>\$0</i>	<i>\$42 101 474</i>
CAF personnel	\$0	\$0	\$488 000	\$872 400	\$0	\$1 360 400
CAF operating and maintenance	\$0	\$0	\$339 334	\$264 580	\$0	\$603 914
<i>Sub-total CAF operating expenditures</i>	<i>\$0</i>	<i>\$0</i>	<i>\$827 334</i>	<i>\$1 136 980</i>	<i>\$0</i>	<i>\$1 964 314</i>
<b>TOTAL CAF</b>	<b>\$0</b>	<b>\$0</b>	<b>\$16 756 541</b>	<b>\$27 309 247</b>	<b>\$0</b>	<b>\$44 065 788</b>
<b>Additional Southern Ontario Funding (ICSO)</b>						
ICSO contributions to firms	\$0	\$0	\$24 641 089	\$13 204 778	\$0	\$37 845 867
ICSO contributions to organizations	\$0	\$0	\$2 667 870	\$2 832 051	\$0	\$5 499 921
<i>Sub-total ICSO grants and contributions</i>	<i>\$0</i>	<i>\$0</i>	<i>\$27 308 959</i>	<i>\$16 036 829</i>	<i>\$0</i>	<i>\$43 345 788</i>
ICSO personnel	\$0	\$0	\$661 667	\$318 333	\$0	\$980 000
ICSO operating and maintenance	\$0	\$0	\$524 000	\$353 437	\$0	\$877 437
<i>Sub-total ICSO operating expenditures</i>	<i>\$0</i>	<i>\$0</i>	<i>\$1 185 667</i>	<i>\$671 770</i>	<i>\$0</i>	<i>\$1 857 437</i>
<b>TOTAL ICSO</b>	<b>\$0</b>	<b>\$0</b>	<b>\$28 494 626</b>	<b>\$16 708 599</b>	<b>\$0</b>	<b>\$45 203 225</b>
<b>Canadian Innovation Commercialization Program (CICP)</b>						
CICP grants and contributions	\$0	\$0	\$0	\$0	\$0	\$0
CICP operating expenditures (operating and maintenance)	\$0	\$0	\$0	\$100 000	\$501 204	\$601 204
<b>TOTAL CICP</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$100 000</b>	<b>\$501 204</b>	<b>\$601 204</b>
<b>Canadian HIV Technology Development Canadian HIV Vaccine Initiative (CHTD CHVI)</b>						
CHTD CHVI grants and contributions	\$0	\$0	\$0	\$0	\$1 164 620	\$1 164 620
CHTD CHVI operating expenditures (operating and maintenance)	\$0	\$0	\$0	\$0	\$105 000	\$105 000
<b>TOTAL CHTD CHVI</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$1 269 620</b>	<b>\$1 269 620</b>
<b>TOTAL NRC-IRAP Expenditures</b>	<b>\$127 338 532</b>	<b>\$130 577 345</b>	<b>\$279 077 542</b>	<b>\$279 368 285</b>	<b>\$137 605 126</b>	<b>\$953 966 830</b>

Source: NRC-IRAP administrative data

Notes: 2011-12 figures are the actual as of May 8<sup>th</sup> 2012; Employee Benefit Program (EBP) at 20% is not included in operating expenditures.

<sup>2</sup> The table does not include expenditures made in 2011-12 for the Digital Technology Adoption Pilot Program (DTAPP) because this component will be evaluated separately in 2012-13 as per Treasury Board requirements.

## 3.0 Program Reach

An important component of any program's success is the extent to which it has reached its intended clients. In the case of NRC-IRAP, the targeted clients are SMEs engaged in R&D activity in Canada and organizations that have the potential to offer business and/or technical support services to SMEs.

This section of the evaluation reports on the extent to which NRC-IRAP has successfully reached its intended client community by describing the number of funded firms and organizations reached between 2006-07 and 2010-11<sup>3</sup> as well as the characteristics of funded firms and organizations. Given that organizations are a mechanism by which the Program attempts to increase its reach to SMEs, the ability of funded organizations to reach SMEs is also discussed in this section. Despite the fact that some of the NRC-IRAP clients receive advisory services only, the evaluation was unable to describe reach for this subset of clients due to the unavailability of reliable program data for clients receiving no project funding.

### Key Findings:

- While NRC-IRAP was able to increase its reach to firms with additional funding provided in 2009-10 and 2010, Program reach to discrete firms appears to have contracted over the evaluation time period.
- NRC-IRAP supported approximately 300 funded organizations during the timeframe explored for the evaluation and was able to fund 42 discrete organizations in Ontario in 2009-10 and 2010-11 as a result of CAF and ICSO funding<sup>4</sup>.
- By funding organizations, NRC-IRAP is able to increase its reach to the SME community, particularly to those that are early start-ups or entrepreneurs and not ready for NRC-IRAP funding.

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<sup>3</sup> While the current evaluation addresses fiscal years 2007-08 to 2011-12, SONAR / SIGMA data from 2006-07 to 2010-11 was used for two reasons: 1) data for 2011-12 were not complete at the time of analysis (i.e., the fiscal year had not ended); and 2) data from 2006-07 were included to provide a longer time period for trend analyses

<sup>4</sup> Project funding for both firms and organizations is discussed more thoroughly in section 4.0.

### 3.1 Reach to Funded Firms

Between 2006-07 and 2010-11, NRC-IRAP provided financial support to close to 5,000 discrete<sup>5</sup> firms, representing approximately 12% of the estimated eligible 43,000 SMEs in Canada (Doyletech, 2009). Most of these firms were from Ontario and Quebec (58%) and could have received support for either a research and development (R&D) project or a youth employment project, in which financial support is provided for the hiring of a graduate as an intern (see Table 3.1).

**Table 3.1: Number of Discrete Funded Firms Per Year Between 2006-07 and 2010-11 by Region**

Fiscal Year	Atlantic	Ontario	Pacific	Quebec	West	All regions
2006-07	134	323	183	264	145	1049
2007-08	90	283	174	254	123	924
2008-09	55	77	80	138	65	415
2009-10	208	764	211	287	239	1709
2010-11	65	419	171	128	111	894
All years	552	1866	819	1071	683	4,991

Source: NRC-IRAP administrative and performance data

As mentioned in the Program Profile section, in 2009-10 and 2010-11 NRC-IRAP received additional funding to support firms and / or organizations. This included funding through the Canadian Economic Action Plan (CEAP), Industry Canada Southern Ontario (ICSO) fund and the Community Adjustment Fund (CAF). As a result of this funding, NRC-IRAP increased its reach to firms; in 2009-10 and 2010-11, 2,017 discrete firms were supported that had not been previously supported by the Program between 2006-07 and 2008-09. This represents approximately 40% of the total number of firms supported over the five year period.

Further evidence of enhanced Program reach due to the additional funding is demonstrated by the finding that only one quarter of firms with a project supported by ongoing NRC-IRAP funds also had a project funded by CEAP, CAF or ICSO over the five year period. Thus, for the most part, firms not previously funded by NRC-IRAP were afforded the opportunity for Program support.

Increased reach, however, does not necessarily mean that the demand for the Program has been met. While the majority of the ITAs surveyed as part of the evaluation felt that, in a typical year, more than 75% of the firms that submitted project proposals

<sup>5</sup> The use of the term “discrete” refers to clients that have not received NRC-IRAP funding previously within the five-year timespan of the evaluation. For the purposes of this evaluation, these firms are considered new clients, even though some may have received funding and/or advice before 2006-07. Administrative data provided by the Program did not include discrete firm information previous to 2006.

were funded, in 2009-10 (the second year of stimulus funding) ITAs felt that a larger proportion of firms than usual were unsuccessful in accessing NRC-IRAP funds despite the additional capital. While this may be due to an increased need by Canadian SMEs in a weaker Canadian economy, it could also be the result of the increased visibility of NRC-IRAP following the CEAP announcements made by the federal government.

Finally, in describing NRC-IRAP's reach, the repeat use of the Program by its clients must be considered. Program performance data reveal that almost two thirds of clients (63.5%) received support for only one project between 2006-07 and 2010-11. While these findings suggest that the Program seeks opportunities to expand its reach to discrete firms, it is possible that some of these clients have accessed financial support in years prior to 2006-07. For those firms that have received financial support for more than one project, findings from the literature indicate that while the receipt of a subsidy increases the probability that a firm will make subsequent requests for subsidies, there is no evidence to suggest that subsidizing the same firm repeatedly leads to lower effectiveness of the funding (Aschhoff, 2009; Herrera and Bravo-Ibarra, 2010). As such, despite influencing the Program's reach to discrete firms, repeat usage has likely not affected the degree to which the Program has achieved its outcomes.

## 3.2 Funded Firm Profile

Using available performance data, a portrait of a typical NRC-IRAP funded firm was developed for illustrative purposes. The characteristics that were analyzed included firm size, age and sector.

In general, firms were approximately seven<sup>6</sup> years old (mean = 11) and had nine employees (mean = 29) when they signed their first agreement with NRC-IRAP between 2006-07 and 2010-11. Although this provides a general picture of a client, some variability can be observed among clients, as indicated by the differences between the mean and median age and size. This speaks to the flexibility afforded to the Program to reach SMEs with any number of employees (up to 500) and of any age so long as they require financial support for R&D and innovation-related activities. **When compared to the size and age of firms described in the previous evaluation of the Program in 2007, it appears that NRC-IRAP clients have not changed.**

NRC-IRAP was found to have supported firms in all industrial sectors over the

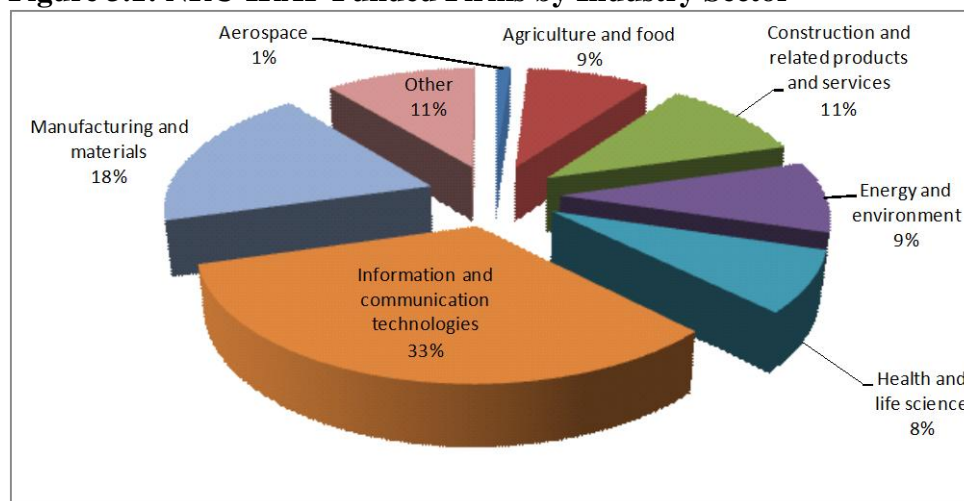
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<sup>6</sup> Unless otherwise indicated, measures of central tendency reported refer to the median.



evaluation period. The largest proportion of funded firms was from the information and communication technologies sector (ICT) and the manufacturing and materials sector (see Figure 3.1).

**Figure 3.1: NRC-IRAP Funded Firms by Industry Sector**



Source: NRC-IRAP administrative and performance data

### 3.3 Reach to Funded Organizations

Between 2006-07 and 2010-11, NRC-IRAP provided financial support to approximately 300 funded organizations, the majority of which were located in Ontario and Quebec. NRC-IRAP was able to fund 42 discrete organizations in Ontario in 2009-10 and 2010-11 as a result of CAF and ICSO funding<sup>7</sup> (see Table 3.2).

**Table 3.2: Number of Discrete Funded Organizations Per Year Between 2006-07 and 2010-11 by Region**

Fiscal Year	Atlantic	Ontario	Pacific	Quebec	West	All regions
2006-07	35	15	24	47	13	134
2007-08	8	5	15	4	14	46
2008-09	5	2	2	10	2	21
2009-10	3	35	7	4	10	59
2010-11	8	18	4	5	7	42
All years	59	75	52	70	46	302

Source: NRC-IRAP administrative and performance data

The Program's apparent decreasing reach over time to discrete organizations can be

<sup>7</sup> CEAP was not targeted to support funded organizations.

explained by the provision of increasingly large financial contributions per project, the increased use of multi-year agreements, more agreements being signed with umbrella organizations who then work through their member organizations to deliver services to NRC-IRAP clients, and hence fewer projects (see section 4.0 for more details). Additionally, Program performance data indicate that 60% of organizations have had more than one funded project between 2006-07 and 2010-11.

### **3.4 SMEs Reached by Funded Organizations**

Providing funding to organizations that support SMEs is a key component of the NRC-IRAP strategy and enables the Program to further increase its reach to firms. Because of this, it is important to consider the number of firms served by funded organizations as part of an analysis of Program reach. The evaluation revealed that neither NRC-IRAP nor the funded organizations systematically track the number of firms served by funded organizations. Although fragments of information were available in the sample of Final Reports consulted as part of the evaluation<sup>8</sup>, this information could not be generalized to the whole population of firms served by funded organizations during the evaluation period. Nonetheless, data collected through a survey of funded organizations revealed that a median of 39 firms are reached by each organization. It also seems as though the number of firms reached varied by type of service provided. For example, as could be expected, organizations that held conferences reached a larger number of firms when compared to those that provided individualized technical services to individual firms.

In addition to quantifying the number of firms reached, the evaluation identified the types of clients served by NRC-IRAP funded organizations. Case studies conducted as part of the evaluation<sup>9</sup> revealed that funded organization clients are different than NRC-IRAP funded clients in that they are generally early stage companies or entrepreneurs with a business idea. Often, these companies face technical or business-related problems that can be resolved through a straight-forward intervention, or have simply not yet reached the level of maturity required to receive NRC-IRAP funding. However, in some instances, the services of funded organizations were used by ITAs to address issues faced by their funded clients.

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<sup>8</sup> A review of the mechanism through which the Program supports SMEs via funded organizations is outlined in the Working Paper for the Qualitative Network Analysis.

<sup>9</sup> Nine case studies were conducted as part of the Qualitative Network Analysis. Each features a funded organization and its clients.

### 3.5 Funded Organization Profile

The evaluation developed a portrait of a typical NRC-IRAP funded organization based on survey results. While these results helped paint a general portrait of funded organizations, the Program does not systematically collect sufficiently detailed information on its organizations and this limits the extent to which a comprehensive description can be provided. Survey results demonstrate that nearly one quarter (25.4%) of the organizations that responded to the survey self-identified as an industrial/professional association. This was followed by private sector companies, technology centres and universities, each represented by 9.9% of survey respondents. Although this information provides valuable indications of the general type of organizations funded by the Program, the fact that approximately one third of the survey participants selected the category “*Other*” reduced the evaluation team’s ability to fully describe the nature of funded organizations. The data collected by NRC-IRAP through various mechanisms are examined in subsequent sections of this report, which provides options and recommendations specific to the Program component focused on contributions to organizations.

## 4.0 Achievement of Expected Results

This section describes the extent of the impacts of NRC-IRAP in the areas of innovation capacity, innovation outputs, and the impacts of innovation in economic and social terms. The achievement of expected outcomes relies heavily on the availability and quality of Program outputs; therefore, this section starts with an overview of these and links them to specific immediate and intermediate Program outcomes.

### Key Findings:

- Between 2006-07 and 2010-11, NRC-IRAP funded approximately 8,000 individual projects, with 70% of these funded as R&D projects and 30% funded as youth employment projects.
- The majority of NRC-IRAP clients have increased their innovation capacity through the guidance of the ITAs, the financial support provided by the Program, or the services provided by funded organizations. All three Program components complement one another in pursuit of the clients' success.
- Program-supported services offered by organizations were found to have the greatest impact when an ITA was closely involved in selection the organization's SME clients.
- NRC-IRAP has leveraged and increased R&D investments and created jobs (especially R&D positions). Smaller and younger firms were particularly more likely to see a positive impact on their complement of R&D employees.
- NRC-IRAP has also been successful in assisting recipient SMEs to use their increased innovation capacity (e.g., skills, knowledge, and personnel) to increase their firm's productivity and to enable them to move new products and technologies closer to commercialization.
- Although the Program has enabled its clients to generate significant revenues, client firms must also invest time and resources to access NRC-IRAP funding and advice.
- In terms of broader outcomes, the Program can be credited with significant extrapolated annual labour force outcomes, including direct employment impacts (in the 6,900 to 10,200 range overall, of which approximately 80% are R&D positions) and associated wage/salary impacts.
- NRC-IRAP more than pays for itself from a purely government fiscal framework perspective as the Program costs are recuperated through personal income tax revenues.
- The social benefits of only a small number of NRC-IRAP funded firms yielded significant numbers of lives saved (in the order of approximately 15,000).

## 4.1 Program Activities and Outputs

In order to better understand the outcomes of NRC-IRAP, it is necessary to first review and assess the activities of the Program as well as its outputs. The findings provided below highlight key components of the contributions to firms and contributions to organizations as well as the advisory services and networking/linkages provided by both funded organizations and ITAs. These activities and outputs will also be considered in the assessment of the Program's efficiency and economy, presented in section 5.0.

### 4.1.1 Contributions to Firms

NRC-IRAP's direct, and arguably most tangible output, is the funding provided to firms. This represents the culmination of a number of Program activities, including ITA guidance to the proposing firm, the budgetary allocation processes, and the review and approval process. Project selection, in this respect, has great bearing on the Program's eventual achievement of outcomes, as discussed in the literature pertaining to R&D subsidy programs (Aschhoff, 2009; Benavente, Crespi and Maffioli, 2007; and Feldman and Kelley, 2006).

This section provides an overview of the funded firm projects that NRC-IRAP has supported between 2006-07 and 2010-11.

Amongst the 5,000 unique firms supported by NRC-IRAP between 2006-07 and 2010-11, approximately 8,000 individual projects were funded. Of the 8,000 projects, 70% were R&D projects and 30% were youth employment projects. The following section outlines the key characteristics of each project type (i.e., R&D versus youth), including source of funding, the dollar value of NRC-IRAP contributions, and project duration.

#### *R&D Projects*

**Number of Funded Projects** – Over the course of the evaluation period, NRC-IRAP supported close to 6,000 R&D projects that were funded by either ongoing Program funds or by CEAP, CAF and/or ICSO in 2009-10 and 2010-11.<sup>10</sup> Table 4.1 provides a detailed breakdown of the number of projects funded through various mechanisms over the evaluation period.

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<sup>10</sup> CAF and ICSO funds were available only for Ontario, while CEAP was accessible for all regions. CEAP, CAF and ICSO made it possible for the Program to support an increased number of R&D projects across all regions.

**Table 4.1: Number of Unique R&D Projects by Year and Region<sup>11</sup>**

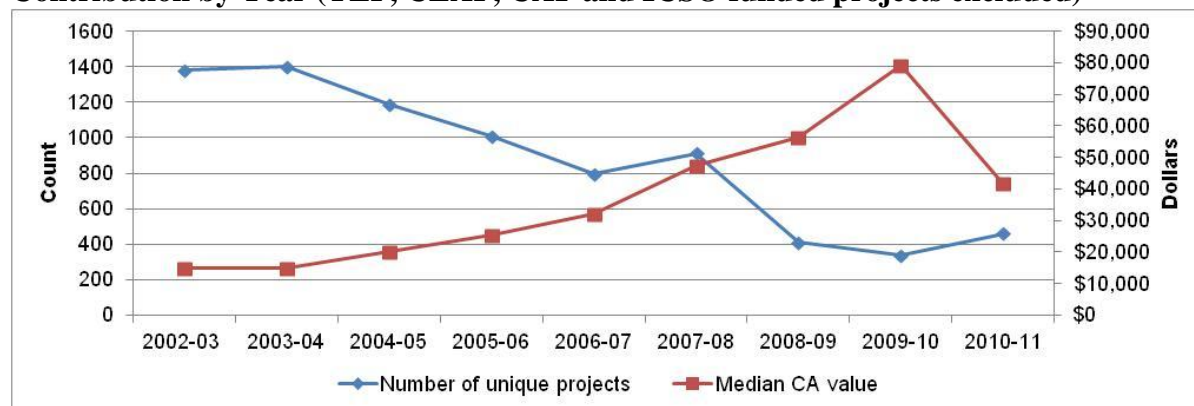
Fiscal Year	Funding Source	Atlantic	Ontario	Pacific	Quebec	West	All regions
2006-07	NRC-IRAP core	115	233	152	177	120	797
2007-08	NRC-IRAP core	105	271	189	212	136	913
2008-09	NRC-IRAP core	61	77	99	110	62	409
2009-10	NRC-IRAP core	36	123	42	62	75	338
	CEAP, CAF and / or ICSO	282	984	251	251	251	2,019
2010-11	NRC-IRAP core	91	73	146	42	109	461
	CEAP, CAF and / or ICSO	6	689	96	12	44	847
All years	NRC-IRAP Core, CEAP, CAF and ICSO	696	2,450	975	866	797	5,784

Source: NRC-IRAP administrative and performance data

**Value of NRC-IRAP Contribution to Funded Projects** – The average contribution to a project between 2006-07 and 2010-11 was \$81K, with a median contribution of \$45K. While the median provides a much more realistic portrayal, the difference between the mean and median underscores the variability in the Program’s contribution to projects. There appears to be an increasing trend in NRC-IRAP’s median contribution to projects. This coincides with a decreasing trend in the number of funded projects that was highlighted earlier and suggests that the Program is funding fewer projects at higher levels. This trend appears to be a continuation of that observed in the previous evaluation of NRC-IRAP as is depicted in Figure 4.1, which includes data from the 2007 evaluation and the current evaluation. The dip in median CA value after 2009-10 could be attributed to the introduction of the Accelerated Project Review process whereby projects under \$50K were deemed to be lower risk, subject to a different level of due diligence thereby speeding up project approval. In this environment, there is an incentive for ITAs and firms to design projects that are below the \$50K threshold.

<sup>11</sup> The count of unique projects includes only those that started and ended between 2006-07 and 2010-11. Projects are accounted for in the first year they were funded.

**Figure 4.1: Number of Unique Funded Firm Projects and NRC-IRAP's Median Contribution by Year (YEP, CEAP, CAF and ICSO funded projects excluded)**



Source: NRC-IRAP administrative and performance data

**Duration of Funded Projects** – On average, the NRC-IRAP funded projects lasted 10 months. This finding, which is similar to that of the previous evaluation, suggests that the duration of a funded project has not changed.

### *Youth Employment Projects*

**Number of Funded Projects** – Between 2006-07 and 2010-11, NRC-IRAP provided financial support to 1,557 projects using its ongoing funding base. Funding from CEAP in 2009-10 and 2010-11 made it possible for the Program to support an additional 800 projects.<sup>12</sup> As a result of the funded YEP projects over the evaluation period, approximately 2,400 graduates received an internship to gain work experience in a Canadian SME between 2006-07 and 2010-11.

Despite employing graduates through youth internship projects, the evaluation found that over half of firms reported having difficulty in finding a qualified graduate between 2007-08 and 2010-11<sup>13</sup>, with the absence of appropriate skills in graduates largely cited by firms as a barrier. Some firms noted that the YEP eligibility criteria that requires students to be between the ages of 15 and 30 also posed some difficulty, given that some students are starting a second career and can be over the age of 30 at graduation, making them ineligible for a YEP internship.

**Value of NRC-IRAP Contribution to Youth Employment Projects** – The average and median NRC-IRAP contribution to a youth employment project was approximately \$15K between 2006-07 and 2008-09. In the latter two years of the evaluation period, it increased to approximately \$30K. This coincides with

<sup>12</sup> CAF and ICSO were not targeted to support YEP projects.

<sup>13</sup> The time period identified here refers to the years in which a survey of YEP recipients (firms and graduates) was conducted by NRC-IRAP.

modifications to the Terms and Conditions of YEP, which increased the maximum contribution that could be given by NRC-IRAP to a youth employment project from \$15K to \$30K. Youth employment projects lasted on average 9.5 months.

#### 4.1.2 Contributions to Organizations

Funded organizations are used by NRC-IRAP to reach out and diversify services available to SMEs. An overview of the funded organization projects is first provided, followed by a description of the services offered by funded organizations with NRC-IRAP's financial contribution.

##### *Funded Organization Projects*

Between 2006-07 and 2010-11, NRC-IRAP supported 722 unique funded organization projects. Projects were funded by ongoing NRC-IRAP funds, or in the case of Ontario in 2009-10 and 2010-11, CAF and/or ICSO funds. In total, CAF and ICSO funding supported an additional 78 new projects in Ontario. The Atlantic region supported the largest number of unique projects. Table 4.2 presents the number of funded organization projects by region on an annual basis<sup>14</sup> (see Table 4.2).

**Table 4.2: Number of Funded Organization Projects by Year and Region<sup>15</sup>**

Fiscal Year	Atlantic	Ontario	Pacific	Quebec	West	All regions
2006-07	35	15	24	47	13	134
2007-08	40	16	37	42	29	164
2008-09	38	15	25	38	27	143
2009-10	40	49	26	19	33	167
2010-11	41	47	22	18	29	157

Source: NRC-IRAP administrative and performance data

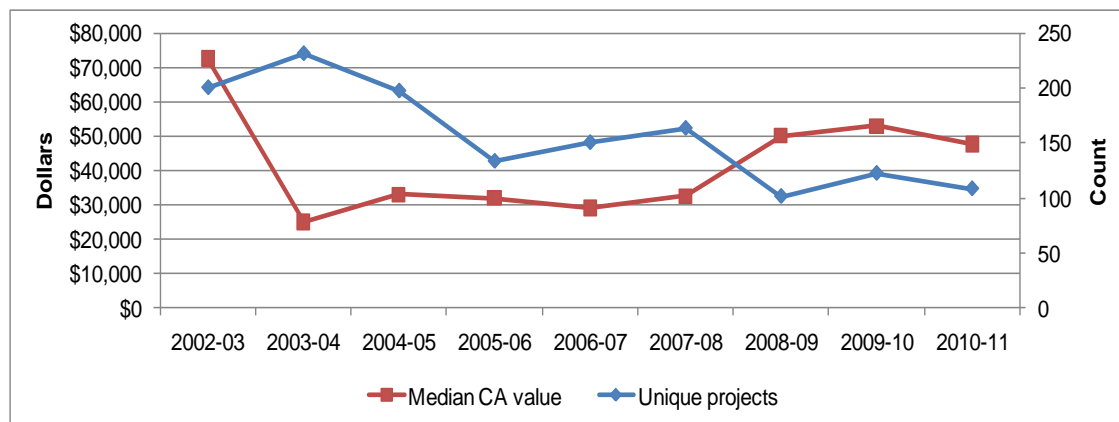
On average, NRC-IRAP provided \$87K in support to funded organization projects. However, due to the wide variability between funding amounts, the median of \$44K represents a more realistic portrayal. Contributions appeared to increase somewhat over the course of the evaluation, coinciding with a decreasing number of projects. Funding projects at higher amounts limited the number of new projects that could be funded (see Figure 4.2).

<sup>14</sup> These projects may carry forward between fiscal years, so the table columns cannot be summed.

<sup>15</sup> The count of actively funded projects includes only those that started and ended between 2006-07 and 2010-11.



**Figure 4.2: Number of Unique Funded Organization Projects and NRC-IRAP's Median Contribution by Year (CAF and ICSO projects excluded)**



Source: NRC-IRAP administrative and performance data

### ***Funded Organization Services***

The services provided to SMEs by funded organizations include business advice, technical advice, and linkages<sup>16</sup>. Each type of service was found to contribute to the achievement of various outcomes. The key outputs produced by the funded organizations include business advice, business plans, marketing plans, training, market information, technical advice, conferences, networking platforms, and others. Most respondents to the survey of organizations identified their most common outputs as business and technical advice (52.1% and 50.7% respectively), followed closely by referrals and linkages (49.3%).

### **4.1.3 Advisory Services**

Besides funding firm and organization projects, ITAs provide advisory services to their clients. The Study of Advisory Services conducted as part of the evaluation identified similar types of services as those delivered by funded organizations. While developing linkages is a sub-component of advisory services, it requires a different skill set and is defined by different criteria than advice. Each of these is examined in further detail below.

**Advice.** ITAs provide firms with business advice or technical advice. Where business advice relates to building the entrepreneur's capacity, technical advice relates more specifically to technical problem-solving. Program performance data indicate that more than half of funded firms reported receiving one type or another of advisory

<sup>16</sup> The services provided to SMEs by funded organizations were identified through the survey of organizations and qualitative network analysis.

services (see Table 4.3). This finding is consistent with those from the survey of ITAs, in which ITAs reported providing technical and/or business advice to approximately three-quarters of NRC-IRAP clients in a typical year.

**Table 4.3: Types of Advisory Services Reported by Funded Firms**

Advisory services category	Type of service	Proportion of firms reported receiving the service (%)
Business advice	Project development	90
	Advice on business strategy and internal capabilities (business assistance)	64
	Advice on firm financial practices and possible investors (financial assistance)	50
Technical advice	Technical advice (technical assistance)	51
Developing linkages	Referrals and linkages	61

Source: NRC-IRAP administrative and performance data (2007-08 to 2010-11)

A number of focus group recipients explained how business advice provided was crucial. It was explained how some ITAs, for example, could provide advice on how to help SMEs prepare their products for market. Technical advice is also appreciated by some SMEs: one highly successful SME in the health sector described how their ITA explained the regulatory requirements necessary to obtaining government approval to move through various research phases. The same ITA also helped them explore other applications for their innovation which led them to develop other products.

**Linkages.** As part of the suite of advisory services, ITAs also facilitate the development of linkages. Across most lines of evidence, ITAs are considered by a large majority of stakeholders as the main entry point for NRC-IRAP clients to develop networks and linkages in the business community. The majority of NRC-IRAP staff, SMEs and funded organizations interviewed also indicated that NRC-IRAP has contributed significantly to the development of linkages between IRAP-supported SMEs and various stakeholders within the business community. Types of linkages were found to vary, with the linkage/referral to consultant(s) / subcontractor, industry association(s) or firm(s)/organization(s) being the most common, as reported through NRC-IRAP performance data.

In order to facilitate the development of linkages, ITAs have their own external networks and an internal network of ITAs to draw upon. One component of the internal network of ITAs is a set of sector teams, established by NRC-IRAP in 2007 to bring together ITAs from each region to support the overall Canadian SME community within various industrial sectors. While the evaluation found that sector

teams have contributed to the development of networks and business linkages for firms, the sector team approach has not yet been fully exploited by NRC-IRAP. This appears to be mainly due to funding restrictions. Going forward, limited resources from which to foster internal networks may impact the extent to which ITAs are able to successfully establish appropriate linkages for their clients.

The following example, drawn from the Study of Advisory Services, underscores the importance of networks and the development of business linkages. In one province, a working arrangement was initiated by an ITA with another federal department and a provincial ministry. This arrangement focused on reducing the effort required on the part of SMEs to obtain funding support, such as submitting one proposal to all three organizations and meeting with all three funders at the same time. This also enabled clients to leverage multiple sources of funding and expertise (e.g., NRC-CISTI, other ITAs) within a single project, which stretched R&D dollars much further.

## **4.2 Immediate Outcomes**

This section reports on the immediate outcomes observed in the evaluation resulting from contributions to firms, the provision of advisory services by ITAs and the services provided by funded organizations.

### **4.2.1 Increased Technical and Business Capacity**

NRC-IRAP directly supports the increased capacity of firms to innovate by supporting the development of the firms' technical and business skills and knowledge. A majority of respondents to the survey of funded firms agree that NRC-IRAP helped increase their firm's general business skills and knowledge (70%) and increased their firm's scientific and technical knowledge (82% agreed). Along the same lines, the performance data indicate that clients reported enhanced technical knowledge/ capabilities (90%); enhanced ability to conduct R&D (62%); and enhanced business knowledge/capabilities (68%) as a result of their NRC-IRAP funded project. These findings are corroborated by ITAs surveyed, who felt that the funding and advice that they provided increased their clients' business skills and knowledge to a large extent; similar findings were also identified in the Study of Advisory Services, where both funding and advice provided by ITAs were linked directly to increased technical and business skills and knowledge.

The services provided by funded organizations were also found to have increased the technical and business skills and knowledge of SME clients. However, the extent to

which these outcomes occurred appeared to be linked to the ITA's involvement in the selection of the funded organization clients. Impacts were greatest when the ITA was closely involved in selecting the firms to receive services from funded organizations; impacts were more difficult to identify, or specific issues were raised by firms related to the quality of the services provided by funded organizations, when ITAs were not as closely involved. This was particularly true for cases in which individual services were provided by the funded organization. Several case study participants expressed their frustration with the quality of the services provided by the funded organization. Even though other informants representing NRC-IRAP or the funded organizations insisted on the fact that controls are in place to ensure that funded organizations provide high-quality services to SMEs on behalf of NRC-IRAP, these controls could not be identified readily and vary between regions and ITAs.

**Recommendation 1:** Increase the involvement of ITAs in the selection of the firms to be served by NRC-IRAP funded activities undertaken by organizations and implement measures of control that involve direct communication between NRC-IRAP and these firms, especially in cases where individual services are provided.

The YEP component of the Program was found to contribute to the development of graduates' skills and knowledge. The performance data indicate that the top skills reported by YEP participants<sup>17</sup> were computer skills, communication skills, confidence, time management skills and decision making skills. This would suggest that the YEP internship provides an avenue by which graduates can foster their practical ("soft") skills necessary to function efficiently and effectively in the workplace. Program data also indicate that almost all graduates supported by a YEP project between 2007-08 and 2010-11 reported that the work they performed was somewhat or entirely related to their career objectives (98%) and their field of study (97%).

#### 4.2.2 Creation or Maintenance of Jobs

NRC-IRAP also contributes to the direct creation or maintenance of jobs by its funded clients. According to the survey of firms, 85% of NRC-IRAP clients agreed that the Program created or maintained jobs in the firm. In most cases, these jobs were dedicated to research and development (67% agreed). These findings are supported by the results of the survey of ITAs, where both funding and advice were found to have increased the number of employees in the firm. The performance data

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<sup>17</sup> YEP interns were surveyed by NRC-IRAP during the evaluation period (YEP participants from 2007-08 to 2010-11)

also point in this direction; it was found that the average increase of employees in funded clients supported in 2009-10 and 2010-11 was approximately 16%.

The survey of firms also indicates that smaller and younger firms are more likely to state that NRC-IRAP enabled them to increase their number of R&D employees. This is consistent with at least two sources from the literature (Aschhoff, 2009; Benavente, Crespi, and Maffioli, 2007), that suggest that smaller firms experience the most significant impacts of publicly-funded R&D projects, because they are often the most affected by financial pressures. The longer-term economic and fiscal impacts of job maintenance and creation are discussed at greater length in Section 4.4.

The YEP component, as could be expected, is also strongly associated to the creation of jobs. According to Program performance data, the majority (71%) of graduates supported by a YEP project between 2007-08 and 2010-11 were employed by their firm following their internship.

## **4.3 Intermediate Outcomes**

The intermediate outcomes identified in this section were found to have occurred as a result of the NRC-IRAP funding, advice, and linkages and the clients' efforts in reaction to these. Although they tend to occur over a slightly longer timeframe than the immediate outcomes, some may occur sooner rather than later, depending on the specific context and situation.

### **4.3.1 Increased R&D and Development of New Products or Processes**

NRC-IRAP contributions to firms have enabled clients to increase their own research and development expenditures (84% of respondents to the survey of firms agreed). In fact, survey data suggest that the contributions made by NRC-IRAP were more than matched by clients as the SMEs mobilized internal resources in a ratio of \$3.75 for each NRC-IRAP dollar. Recipients also managed to locate resources from outside sources. Again, external resources were obtained at a ratio \$3.5 for each NRC-IRAP dollar. Section 4.4 provides more detailed financial information on the additional R&D activities conducted in terms of R&D staff.

It is unknown to what extent these dollars were actually leveraged as a result of the projects funded by NRC-IRAP; however, there is some evidence showing that the NRC-IRAP contributions did in fact enable firms to leverage resources from other

sources. For example, several SMEs interviewed as part of the Qualitative Network Analysis reported that the mentoring, coaching and training services offered by the funded organizations resulted in increased access to private and public sources of funding. For example, the involvement of a client firm in a trade mission to the UK, which was sponsored by a funded organization, led to a \$1 million investment from a British company. Linkages made by ITAs, in particular, were found to have enabled SMEs to participate in roundtable discussion with experts in their industries, meet with potential investors, and obtain work from other companies outside of their region, all of which could result in increased investments from external sources. These comments were echoed by focus group respondents, who explained that NRC-IRAP financial and advisory services play a role in the ability of firms to access angel and venture capital investments, as well as other sources of public funding. As highlighted by one client, NRC-IRAP assistance was a show of support for the company. In another case, a firm reported raising an additional \$4M in external investments following NRC-IRAP advice and funding. Focus group respondents, however, felt that NRC-IRAP contributions constitute only one source of funding and advice and, that for larger/more complex products, other sources of support may be required.

The increased capacity of client firms to innovate, as identified in the previous section, has also led to an increased development of knowledge and innovations. For many clients, this translated in protected IP: 30% said that NRC-IRAP helped them develop trademarks, copyrights or confidentiality/royalty agreements with users of the firm's innovation (30%).

Intellectual property is linked, in many cases, to the development of new products and processes. While 70% of NRC-IRAP clients agreed that the Program helped increase their firm's overall productivity, 86% of survey respondents agreed that the Program has enabled them to create new and improved products, technology or services. These findings are corroborated through the analysis of performance data, which points to the development of at least one new product or service as a result of approximately 80% of funded projects in 2009-10 and 2010-11. Along the same lines, the performance data also indicate that the Program has enabled 83% of its clients to develop new processes. This is a significant impact in terms of an individual firm's sustainability and growth.

Focus group participants and the Study of Advisory Services provided multiple examples of new products or processes supported by NRC-IRAP, including the following:

- An SME received support from NRC-IRAP to maintain R&D staff and to work on promising software applications. The software, which is now commercialized, helps educational institutions have online access to software applications at lower cost. More than 30,000 institutions have allowed their users (e.g., students) to have access to specialized software at a lower cost as a result of the application supported in part by NRC-IRAP.
- Another SME used NRC-IRAP funds to hire an industrial designer to work on a project that consisted of incorporating various electrical components into a single box. This box (or booth) acts as a relay and interface between the power/IT grid and homes. It is typically installed directly on the ground near its intended users. This product was successfully developed and marketed.
- Advice and information provided to an SME allowed the organization to develop an innovative baby bib with a patented mess-catching pocket fabricated out of a non-toxic and eco-friendly plastic material. The product was launched successfully and is now generating revenues for the firm.
- An SME received support to develop a treatment for cardiovascular conditions such as angina and atrial arrhythmias. NRC-IRAP funds were used to purchase automated equipment and to hire young researchers with PhDs. Organization representatives said that NRC-IRAP played a role in the development of the treatment, which is now at the pre-clinical stage of development.

### **4.3.2 Commercialization**

The survey of firms indicates that increased innovation capacity leads to, in most cases, actual commercialization and concrete economic benefits. According to findings, the majority of NRC-IRAP clients agreed that the Program increased their firm's capability of production or service provision (69%) and/or helped commercialize a product or technology (69%). Along the same lines, two-thirds (66%) of NRC-IRAP clients also agreed that the Program helped to increase their firm's domestic market share, while 59% said that it helped increase the firm's international market share. One-third of respondents linked the NRC-IRAP support to the creation of new spin-off companies. The actual economic impacts of these commercial successes are indicated in the following subsection.

## 4.4 Long-Term Economic and Social Impacts

NRC-IRAP is expected to contribute to the development of innovative approaches, processes and products in Canadian SMEs. The corollary of this would be various economic and social benefits for the Canadian economy and Canadians in general. This subsection assesses the economic impacts of NRC-IRAP based on findings stemming from the survey of firms.<sup>18</sup> It should be noted that data from this section were also used to examine Program efficiency through a partial cost-benefit analysis (CBA).

### 4.4.1 Firm-level Impacts

Longer-term economic impacts were calculated at the client level. These include revenues and profits, contrasted against the cost of compliance to NRC-IRAP and Government of Canada requirements.

#### *Revenues and Profits in the Last Fiscal Year Attributable to NRC-IRAP*

The survey of firms asked SMEs what revenues were generated as a result of NRC-IRAP funding. From these responses, profit margins based on known industry averages by Statistics Canada's industry classification codes (NAICS) were extrapolated.<sup>19</sup>

According to survey results, the revenues attributable to NRC-IRAP in the latest fiscal year are conservatively estimated at \$1,788.3 million and optimistically estimated at \$2,868.5 million<sup>20</sup>. The midpoint adjusted extrapolated estimate is **\$2,328.4 million in revenues**. Profits were estimated by using industry average profit margins applied to the net present value of revenues attributable to NRC-IRAP. Annual profits are estimated in the range of **\$440 million** (up to \$530 million in the higher range scenario). Similar results are achieved when YEP and /or TPC are included in the calculation (see the right-hand column of Table 4.4).

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<sup>18</sup> The evaluation team conducted further calculations to extrapolate the survey results to the population of NRC-IRAP clients. The following subsections present the results of the impact analyses.

<sup>19</sup> Based on Statistics Canada, CANSIM Matrix 180-0003, Financial and taxation statistics for enterprises, by North American Industry Classification System (NAICS), (last updated February 1, 2012).

<sup>20</sup> At a 95% level of confidence. Extrapolated revenues in the last fiscal year generated from and attributed to NRC-IRAP supported were determined as the percentage of revenues attributable to NRC-IRAP based on the attribution given for 2006-2010 where respondents had revenues for that period. Where revenues just began in the latest fiscal year the average of previously attributed revenues among earlier responders of 44.3% was utilized.



**Table 4.4: Extrapolated Net Present Value of Attributable Profits for Projects Supported by NRC-IRAP (\$ Millions)**

Estimate\Support	NRC-IRAP Only	One or more program components (NRC-IRAP, TPC, YEP)
<b>Profits in 2016</b>		
Conservative estimate	318.2	329.9
Midpoint	405.3	416.5
Optimistic estimate	492.4	503.1
<b>Average Annual Future Profits</b>		
Conservative estimate	348.7	343.2
Midpoint	440.9	433.6
Optimistic estimate	531.1	524.2

Source: Calculations based on NRC-IRAP Evaluation Survey of Clients

### ***Cost of Doing Business with NRC-IRAP***

In order to better contextualize and balance the findings related to firm revenues, the evaluation identified the administrative costs of dealing with NRC-IRAP on the part of the SMEs. The survey sought information about the costs of doing business with NRC-IRAP since 2006 in terms of both time to meet with and to report to NRC-IRAP as well as the financial resources needed to meet the Program's administrative requirements. In this case, results have been amalgamated by converting hours to person years by industry and using the industry data on incremental wages, salaries and overhead, covered earlier, to establish the costs of the time. Bearing in mind that these costs cover a five-year period, they are significant. The results on the costs of doing business with NRC-IRAP are shown in Table 4.5.

However, it should be mentioned that part of this time is likely to be associated with tasks that are otherwise beneficial to the firm, including the preparation of business plans. In this sense, these costs should not be strictly interpreted as the cost of dealing with NRC-IRAP.

**Table 4.5: Extrapolated Recipient Costs of Doing Business with NRC-IRAP**

	<b>Person hours (total)</b>	<b>Person hours (per firm)</b>	<b>Total Cost of doing business (time and overhead)</b>	<b>Average costs per firm</b>
Personnel time and costs	1,251,104	501		
Monetized Time low estimate (with lower estimate salary)			\$66,733,871	\$26,715
Monetized Time midpoint estimate (with mid estimate salary)			\$89,266,147	\$35,732
Monetized Time high estimate (with higher estimate of salary)			\$111,798,424	\$44,749
Total Cost low estimate (salary and overhead)			\$104,104,839	\$41,675
Total Costs midpoint (salary and overhead)			\$126,859,344	\$50,780
Total Costs high estimate (salary and overhead)			\$149,613,850	\$59,885

Source: Survey of Firms

Note: Low estimate of remuneration was \$53.34 per hour and the high estimate \$89.36 per hour, so the hours were monetized as the product of the hours times either bound.

#### 4.4.2 Direct Labour Force Impacts

The survey covered incremental impacts on full-time employment and on part-time employment stemming from NRC-IRAP support. Survey recipients were asked the number of part-time and full-time jobs that were created or maintained as a result of the NRC-IRAP supported project. Although general rates of increased employment are reported in an earlier section pertaining to the Program's immediate outcomes, the evaluation team identified the overall incremental employment attributable to the Program. This information is summarized here.

***Total Direct Incremental Employment.*** The combined direct employment impacts for the latest year are presented in Table 4.6. As shown, 6,933 to 10,195 FTE positions were maintained or created as a result of NRC-IRAP contributions.

***Extrapolation of Direct Incremental Research Employees.*** The evaluation also assessed the impact of the Program for a subset of employees, the R&D staff of the SMEs. Impacts on this employment group are also summarized in Table 4.6 where both maintained and new full-time jobs and part-time jobs (converted to FTEs) are shown. The midpoint is estimated at approximately 6,683 FTEs per year on average, which indicates that about 75% of the jobs maintained or created overall are in the area of research (i.e., out of the 8,564 FTEs estimated above).

**Table 4.6: Extrapolated Employment Impacts (FTEs) per Year, on Average**

	Conservative	Midpoint	Optimistic
Extrapolated Direct Employment Impacts (FTEs) Extrapolated	6,933	8,564	10,195
Extrapolated Direct R&D FTE Impacts (FTEs)	5,458	6,683	7,908
Wages, Salaries and Overhead Extrapolated (in Millions\$)	650.4	1,126.6	1,602.7

Source: Calculations based on survey of firms

***Wages and Salaries of all Incremental Employment.*** The survey also asked respondents to provide wages and salaries and related overheads as a percentage of costs<sup>21</sup>. The evaluation team determined incremental wages and salaries with the optimistic and conservative estimates as shown in Table 4.6. The midpoint estimate is valued at \$1.126 million as indicated above.

Findings from focus groups and key informant interviews confirm that this impact was significant for some firms. In some cases, NRC-IRAP funding allowed them to keep their R&D staff and survive during difficult economic times: “Without [NRC-] IRAP, we wouldn't be here...we wouldn't have made payroll.” Interview respondents also confirmed that a number of larger SMEs also managed to keep their R&D staff and invest in research during the recession.

#### 4.4.4 Fiscal Impacts

The impacts of NRC-IRAP can also be extended to fiscal revenues to government, considering the above impacts in terms of profits and salaries. Because the majority of the recipients are and remain SMEs, the analysis utilized the corporate tax rate of 20% on profits. A single ratio was used to assess personal income tax impacts (a 30% tax rate on those amounts remaining after deducting \$10,000 per incremental FTE). The resulting increase in fiscal capacity is noted in Table 4.7. The combined impacts increase government revenues from income taxes by about \$353 million per year (\$318 million in personal income tax and \$35 million in corporate tax) for the midpoint.<sup>22</sup>

<sup>21</sup> Costs have been estimated as revenues less estimated profits where industry averages have been used to assess profit margins.

<sup>22</sup> Applying a common corporate tax rate to profits is a standard approach to assess fiscal benefit to the government. While SMEs qualify for many deductions that may in fact render their tax payable nil, these deductions can be considered a public good and thus equivalent to tax revenue for the crown.

**Table 4.7: Extrapolated Fiscal Impacts per Year (\$M)**

Derived from Incremental Incomes in;	Conservative	Midpoint	Optimistic
Personal Income Taxes Extrapolated	178.8	317.9	457.1
Corporate Income Taxes Extrapolated	27.6	35.4	43.2

Source: Calculations based on survey of firms

Total NRC-IRAP expenditures on its combined granting programs including TPC and YEP (but not including the stimulus funding for 2009-10 and 2010-11) ranged from \$127.3 million in 2007-08 to \$137.2 million in 2010-2011. The stimulus funding package allocated to NRC-IRAP added a further \$97.6 million and \$98.0 million respectively to expenditures. Thus for the year 2010-11, the conservative estimate of combined extrapolated income taxes generated exceeds the programming costs, the midpoint doubles them, and the optimistic estimate nearly triples NRC-IRAP costs. Even with the stimulus funding included, the midpoint exceeds the income tax revenues generated via NRC-IRAP contributions.

#### 4.4.5 Social Benefits

The survey of firms and Program performance provide evidence to suggest that NRC-IRAP support has contributed to social benefits. Program performance data indicate that fifty percent (50%) of firms with funded projects in 2009-10 and 2010-11 reported that their funded project has contributed to an environmental, health, safety and security for Canadians and/or sustainable development benefits. Given that a limited period of time had elapsed between project completion and performance measurement, these findings provide promising, early evidence to suggest that NRC-IRAP funded projects can contribute significantly to improving the environment, health, safety and security of Canadians.

Along the same lines, the survey of firms found that 39% of clients report that their innovation contributes to improving the environment or reducing negative environmental impacts, and 32% said that their innovation will improve the health of Canadians. The survey required these clients to identify the type of health benefits, including number of lives saved, that were generated as a result of the funded project. According to these results, survey respondents from 13 firms in six different industries identified that their innovation and service from NRC-IRAP support resulted in saving 14,970 Canadian lives. With one exception, the users of project products and procedures had normal life expectancy after treatment. In one additional case, another approximately 55,000 lives were saved who still had shorter than

normal life expectancies either due to the state of medicine or because they were elderly when treated.

## 5.0 Efficiency and Economy

This section of the evaluation looked at the extent to which the resources allocated to the Program are being utilized in an economical manner in producing outputs and progressing towards expected outcomes.

### Key Findings:

- The demand for the Program far exceeds the supply of available resources. This situation has continued to exist despite the temporary funding provided through the Economic Action Plan.
- Timing at which funding is delivered within the fiscal year was determined to impact project success. However, firms that did receive project funding were satisfied with the timeliness of ITA advice and timeliness of payment.
- The overall economic benefits of NRC-IRAP outweigh its costs. For example, NRC-IRAP performance data indicate that most projects result in a positive Return on Investment (ROI) with a cost-to-benefit ratio of 11.36. Furthermore, the partial cost-benefit analysis found that estimated annual profits (\$440M) and SME wages, salaries, and overhead (\$1.1B) that subsequently result from NRC-IRAP projects far outweigh the Program's annual expenditures of approximately \$130 million.
- The impact of the EAP stimulus funding had mixed results. Overall, an increased number of projects were funded, although this resulted in a reduction in advisory services, which may have had an impact on individual project performance. The profile of NRC-IRAP was elevated in many regions, and increased project funding demonstrated that there was a significant unmet demand for the Program. The EAP also led to the development of a streamlined due diligence processes for lower risk projects. However, the EAP was not sufficiently resourced to meet the receptor capacity of the SME community.
- Client satisfaction with Program delivery is high overall. However, there is a risk to the effectiveness of the Program when the synergy between the ITA and the potential client SME is not well aligned. Moreover, clients consulted for the evaluation were not aware of any recourse mechanism for this situation.
- NRC-IRAP demonstrates a high degree of efficiency in the production of outputs. Although the evaluation found that the role of the ITA contributes directly to Program efficiency, the ITAs could function more efficiently if the administrative responsibilities associated with the ITA role were reduced.
- There are some weaknesses in organization contribution agreements. In particular, they are typically vague in articulating the expectations of the outputs and outcomes of the agreement and the reporting requirements.
- Another notable area in which efficiency could be improved is through greater access to NRC Institutes<sup>23</sup>.

<sup>23</sup> At the time of the evaluation, NRC was still organized according to the previous Institute structure. These findings would also be true of the newly-created portfolios.

- Despite advances made to the Program’s performance measurement system for funded firms, the current evaluation found limited performance measurement data for funded organizations and an absence of performance data for firms that received advisory services only.

## 5.1 Program Inputs

This sub-section examines whether inputs were made available as needed to ensure timely completion of activities. Two major issues emerged from the examination of the evidence. First, the demand for the Program outweighs the availability of project funding. Second, the mechanism through which project funds are allocated can create significant delays for innovating firms and can have an impact on the achievement of intended outcomes.

Overall, the evaluation found that the Program is not able to meet the demand of SMEs for innovation funding. This was also the case during the two-year period when NRC-IRAP delivered additional stimulus funding. These findings were identified as part of key informant interviews as well as focus groups and were corroborated through the survey of ITAs, where the lack of funding was identified as the primary reason for which firms and organizations did not receive project funding in all five years of the evaluation period (even though the stimulus package did increase the Program’s reach by funding a greater number of projects than usual). The fact that operational funds were generally not provided along with the additional stimulus funding<sup>24</sup> also had a considerable effect on the Program’s ability to provide advice to its clients; this effect is further explored in a separate section of the report.

In addition to the direct resources allocated to the Program, the evaluation also considered the extent to which the Program is able to provide these resources to firms in a timely manner. Most focus group respondents and some key informant respondents emphasized that the impact of timely provision of R&D support is quite significant in terms of achieving commercialization prior to domestic and international competitors. Some focus group respondents added that R&D opportunities that arise at the wrong point in the government fiscal year are not supported and must wait until the following fiscal year to receive funding - at which point competitors may have already advanced with a similar innovation.

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<sup>24</sup> Please consult the Program resources table in the Profile section for more details.

## 5.2 Benefits and Costs of NRC-IRAP

The partial CBA that was completed for this evaluation found that annual profits attributable to NRC-IRAP for the last fiscal year are estimated at about \$440 million (see section 4.4), in addition to about \$1.1 billion in salaries (see Table 5.1). This is prior to including other social benefits, such as lives saved, that range in the billions of dollars according to the Value of Human life estimated in the partial CBA. These benefits significantly exceed the average annual expenditures of NRC-IRAP in the \$127-\$138 million range. Taking the upper amount of Program expenditures of \$138 million and the estimated benefits (including salaries/overheads and profits), **the ratio of costs to benefits is 1:11.36**. If the conservative amount of Program expenditures of \$127 million is considered, the ratio is 1:12.06. These findings are consistent with those of the previous evaluation of NRC-IRAP, conducted in 2007; because a different methodology was employed in each evaluation, the ratio of costs to benefit is thought to be particularly robust over the last 9 years.

While the benefits were calculated to remove the impacts of projects that would have proceeded without NRC-IRAP support (in order to not inflate the relative impact of the Program), the reader should bear in mind that NRC-IRAP's project support is only one of the contributing factors to the achievement of these impacts. There are other inputs that contributed to the impact (including other funders and internal firm resources). However, it can be said with a significant degree of confidence that most of the impact would not have occurred without NRC.

**Table 5.1: Performance of NRC-IRAP Recipients**

Benefits	Estimated Benefits (midpoint scenario)
Revenues attributed to NRC-IRAP funding during last fiscal year	\$2,328.4 M
Net present value (NPV) of Attributable profits to NRC-IRAP (2012)	\$440.9 M
NPV of Attributable profits to Three Funding programs (NRC-IRAP, YEP, TPC) 2012	\$433.6 M
Incremental FTE Employment	8,564
Incremental FTE R&D Employment	6,683
Increased Annual Wages, Salaries, and Overheads	\$1,126.6 M
Incremental Corporate and Personal Income Tax Revenues	\$361 M

Source: Calculations based on survey of firms

Additional data suggest that the benefits may differ by size of project. For example, NRC-IRAP performance data suggest that the return on investment (ROI) is higher on smaller contributions, when compared to larger contributions (for funded projects that



started and ended between 2009-10 and 2010-11). Even though the ROI figures were positive, the ROI appears to be the greatest for projects with total funding amounts between \$25K and \$50K and lowest for projects with total funding amounts greater than \$200K. These findings suggest that the Program achieves greatest efficiency of its investment with projects involving smaller total funding amounts. These results should be interpreted with caution, however, based on the short timeframe for which performance data pertaining to ROI were available. When looking at a compressed timeframe, it can be expected that small projects would generate returns sooner. Notably, SMEs have an inverse opinion on the subject of project value. For example, many focus group participants stated that the NRC should fund larger projects and not distribute resources too broadly.

## **5.3 Impact of Economic Action Plan Stimulus Funding on Program Delivery**

The stimulus funding delivered by NRC-IRAP in 2009-10 and 2010-11 was found to significantly increase the Program's reach to firms, as demonstrated in earlier sections of this report. Overall, the impacts reported by recipients of stimulus funding are positive, and reflect the ability of the Program to deliver on additional requirements when needed. However, the stimulus funding did have an effect on the delivery of various Program components; this is examined in more detail here.

Although the EAP had a positive impact on Program reach, the evaluation found that some factors associated with the EAP negatively impacted Program delivery. Internal informants noted that, because the stimulus funding did not include operational budgets for the most part, the delivery of advisory services was reduced in favor of administering funds and managing financial contributions. This was a concern as a net decrease in advisory services was occurring at a time when the number and value of projects was increasing. For example, the level of total available advisory support for 1709 firms supported in 2009-10 was similar to the support available for 415 funded firms in 2008-09. These findings are illustrated through the survey of ITAs, where respondents reported that they spent an excessive amount of time providing project support and completing administrative tasks last year (15% and 10% respectively). They felt that they should be spending more time on every other activity, particularly providing advice (ideally 7% more time than they spent last year). These findings suggest that ITAs feel that delivering the stimulus funding negatively affected their ability to deliver the overall Program. This is further supported by ITA survey findings that state, although more firms received funding support during the EAP,

there was a significant reduction in the ITAs capacity to provide strategic and tactical information, technical advice, and business advice across all clients. The performance data also support this general finding: in 2009-10 and 2010-11, the proportion of firms reporting that they did not receive advisory services increased somewhat (by approximately 5%) compared to earlier years.

Evidence from the key informant interviews identifies other effects of the stimulus funding on the overall delivery of the Program. For instance, informants specified that ITAs felt overstretched and work with sector teams slowed down. However, as mentioned previously, the profile of NRC-IRAP was elevated in many regions, and increased project funding demonstrated that there was a huge demand for the Program. One of the positive effects of the stimulus funding was the adoption by NRC-IRAP of a streamlined due diligence processes for projects that were a) determined to be low risk, and b) less than \$50K, which has continued after the end of stimulus funding and supports increased efficiency.

**Recommendation 2:** When grants and contributions funding increases occur, allocations for associated O&M requirements should also be considered to support efficient and timely program delivery.

## 5.4 Economy and Efficiency of Outputs and Outcomes

### 5.4.1 Efficient Production of Outputs

This sub-section assessed whether outputs were produced of a quality and quantity acceptable to support the achievement of expected results. Generally, evaluation findings suggested that outputs were produced in a timely manner to support the achievement of expected outcomes, although some limitations were identified in producing timely outputs. Several examples are provided here to highlight the economical and efficient use of resources in delivering the Program.

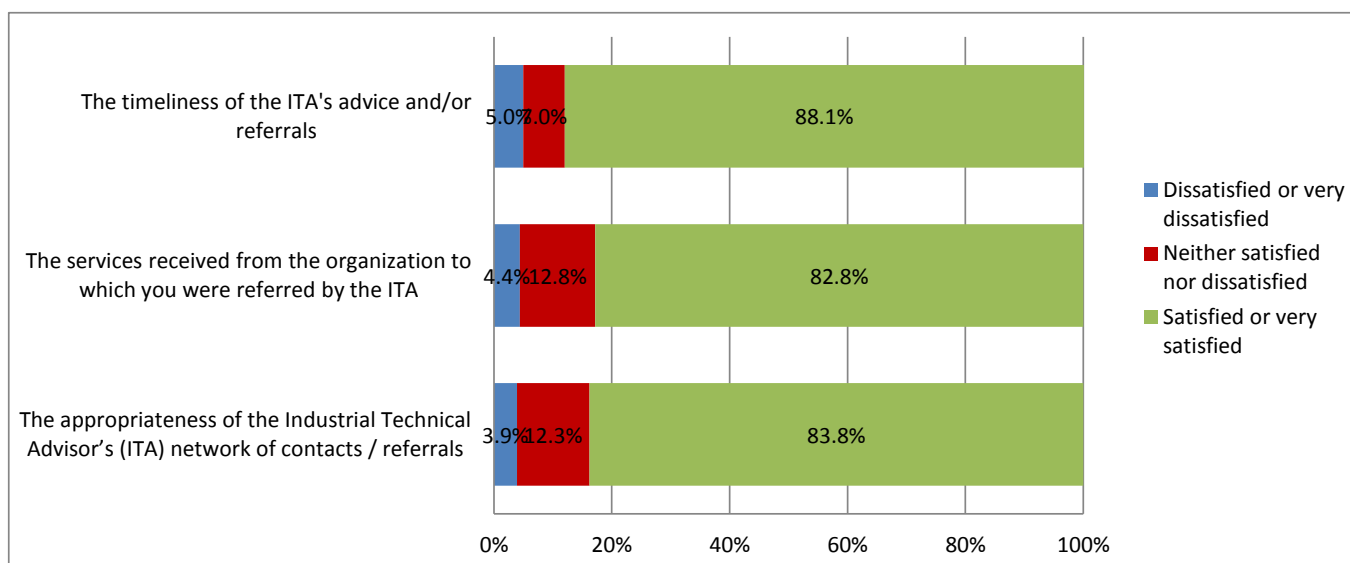
#### *Client Satisfaction with Program Outputs*

Overall, clients of NRC-IRAP are satisfied with the Program's delivery processes. According to the survey findings, 78% of the SMEs are satisfied with the timeliness

of the funding decision, and 87% of the SMEs are satisfied with the timeliness of payments. Along the same lines, the survey of organizations found that client satisfaction with various aspects of NRC-IRAP service was quite high, most notably, responsiveness of NRC personnel at 94%; timeliness of payments to the organization at 91% and the timeliness of the funding decision at 80%.

In terms of the specific role of the ITAs and the advice and linkages that they provide, the survey of firms found that most clients were satisfied or very satisfied with their ITAs' network of contacts and referrals they offered (83%). A majority of firms were also satisfied or very satisfied with the timeliness of their ITA's advice and/or referrals (88%), as well as the services they received from organizations to which their ITA referred them (83%). Figure 5.1 summarizes findings from the survey of firms in regards to the ITAs' role in facilitating networking and linkages for their clients.

**Figure 5.1: Satisfaction with ITAs' networking/linkages efforts**



Source: Survey of Firms, n=327

Even though clients were generally satisfied with the outputs produced by the Program, some critical issues were raised by key stakeholders that require some attention. For example, some SME focus group participants believed that the timing of NRC-IRAP funding needs to be accelerated so they can better plan for their company's future. Also, some ITAs stated that single year funding agreements are prone to lapsing and NRC-IRAP must manage the associated cash flow. This affects the amount of time ITAs are required to focus on administrative tasks toward the end of the fiscal year.

Although the role of the ITA is seen as positive and satisfactory in most cases, it also presents an element of risk to the Program. The flexibility provided to ITAs in responding to individual SME needs is a cornerstone of NRC-IRAP and closely linked to its achievement of significant outcomes and impacts. However, this flexibility is also manifested in the field by an inconsistency in the quality of services provided and poses a significant risk to the Program. For example, key informants and focus group participants stated that some ITAs seemed to take a far more active role in providing advice and linking SMEs to networks than others. The extent and quality of networking possibilities depends on the ability and engagement of the ITA, as a few respondents have noted mismatches in linking them to certain NRC Institutes, as well as a lack of linkages to other SMEs and national/international contacts.

In some cases, identified through case studies and focus groups, clients felt that the allocation of ITAs based on geographic region (i.e., through postal codes) could be problematic. For example, some clients felt that the ITA assigned to them did not have the requisite technical knowledge to help them identify concrete solutions, or simply did not seem interested in their firm or proposed project. In other cases, personality conflicts between an ITA and clients made it difficult for the clients to pursue a relationship with NRC-IRAP, resulting in lost projects and clients. This is an issue that can be encountered in any type of direct service program and in itself, does not constitute a major barrier to results achievement, given the high overall rate of satisfaction. What may be riskier for the Program is the perception held by clients that they have no recourse in the case of a disagreement with their ITA. Although this is not necessarily the case (for example, clients could communicate with other ITAs or a regional office director), evaluation participants did not appear to be aware of any straight-forward mechanisms for addressing problematic issues with Program staff.

**Recommendation 3:** Opportunities should be made available for SME clients to voice concerns about their ITA; recourse mechanisms should be communicated to all clients to ensure increased awareness.

### ***Issues Affecting the Efficient Production of Program Outputs***

Some of the problems noted by stakeholders in terms of Program delivery can be explained in part by the increased accountability responsibilities faced by ITAs and how these may reduce the time available to advise clients. The ITA survey asked respondents to identify the most significant change to the delivery of NRC-IRAP in the last five years and describe how this may have impacted their work. As could be

expected, a large number of respondents focused on recent changes to the administrative and accountability requirements of the Program and the burden that these requirements have placed on both ITAs and clients. The ITA survey respondents felt that the increased burden is a result of more administrative tasks, coupled with a decrease in administrative support available to ITAs.

An oft-cited example was that at the end of the fiscal year (particularly from January to March), the administrative load of ITAs increases because projects are being completed and new projects are being considered – both of which involve administrative requirements for ITAs. Some respondents felt that certain administrative tasks could be allocated to Regional Contribution Agreement Officers. NRC-IRAP has recently undertaken a review of its business processes. It is expected that this review will identify areas in which administrative requirements for ITAs can be moved to other NRC-IRAP regional personnel.

In the case of funded organizations, the evaluation found that the Contribution Agreements that outline the terms of funded projects provide limited or vague information about expected project outputs and outcomes such as the number of clients served, the SME needs addressed by the services provided, and the projected impacts on client firms. For example, many CAs indicated that the expected outcome of the agreement was to “*increase the innovation capacity of SMEs*” or “*accelerate the growth of innovative firms*” with no additional information. Second, the final reports were found to vary significantly in terms of format and content. While some reports provided valuable performance information about reach, satisfaction and impacts, others included a brief description of the activities delivered and a brief list of clients served. In other words, the format and information included in the final report is left to the discretion of the ITA and/or the funded organization and is not linked to an overall program measurement strategy.

**Recommendation 4:** Contribution Agreements for funded organizations must clearly articulate the projected outputs and outcomes of funded activities and introduce monitoring and reporting requirements for each project. ITAs should receive training in developing CAs or CAs need to be written by trained staff. In addition, the field manual for contributions to organizations should be utilized systematically to guide the consistent development of CAs.

### ***Steps Taken to Improve Efficiency***

The evaluation found that NRC-IRAP continues to look at improving efficiency. For example, to improve Program efficiency and to increase consistency in Program delivery across regions, NRC-IRAP introduced field manuals for ITAs, which provide guidelines on the development of CAs with firms and organizations. Overall, more than half of ITA respondents reported that they use the field manuals for firms frequently (55%); it is interesting to note, however, that more than half of respondents have never seen the field manual for organizations (52%), even though 70% of ITAs work with funded organizations. Perceptions of the usefulness of the manuals were mixed.

Other changes that have improved efficiency that were noted by some key informants include the introduction of draft Standard Operating Procedures, streamlined due diligence processes for lower risk projects (i.e., Accelerated Project Review process), and reduction of expenses such as meal reimbursements (that have disproportionate administrative costs in claims). NRC-IRAP is also undertaking a business process review to streamline administrative processes.

### ***Anecdotal Evidence of Economical and Efficient Program Delivery***

Examples of economical Program delivery can be derived from the ITAs delivery of advisory services. The case studies conducted as part of the Study of Advisory Services demonstrated that many ITAs had been proactive in identifying opportunities to improve the economy of the services they deliver. For example, the case studies show that ITAs often deliver frequently-requested services in a group setting when feasible. In one case, an ITA set up a series of workshops to help firms through the ISO registration process for medical devices. In another case, an ITA brought together a group of firms to identify research needs and potential collaborative projects for a particular geographic area and industrial sector. This not only enabled the ITA to interact with a group of firms as opposed to meeting with each one individually, it also made possible linking firms together for future collaborations.

Additionally, the internal ITA network can be highlighted as an economical use of NRC-IRAP resources. Having the ability to draw on other ITAs' expertise reduces the duplication of skills required between Program personnel. It also reduces the breadth of knowledge each ITA requires, allowing them instead to focus on their specific area of expertise.

Examples of Program efficiency can be found in the quality of advisory services provided by ITAs as well as strategies employed by ITAs in their work for maximizing efficiency. The advisory services reviewed as part of the case studies conducted in the Study of Advisory Services were thought to have been of very high quality by the clients who received them. Not only were the ITAs able to identify what the firms' needs were, but the advice they provided was valid and reliable and, in many cases, allowed the firms to make immediate improvements to their technical or business approaches.

#### **5.4.2 Use of NRC Institutes and other NRC Services by NRC-IRAP**

The evaluation found the use of NRC Institutes and other NRC services by NRC-IRAP beneficiaries to be modest. The most common interaction with NRC Institutes occurred among sector team members; for example, the sector team annual reports highlight instances in which members of sector teams visited NRC laboratories to exchange information with research officers. This allowed sector team members to increase their knowledge of NRC capacity and expertise as well as to be more aware of opportunities for linkages with SMEs. In 2008-2009, sector team members made approximately 42 visits to NRC Institutes. As result of these interactions, 60 SME referrals were made to NRC Institutes and 71 others to organizations in Canada and abroad. SME interaction with NRC Institutes facilitated the development of relationships and the identification of future projects. However, these referrals by sector team members did not appear to result in a high level of project activity between SMEs and institutes.

In addition to sector team involvement in referrals, ITAs were also involved in independently referring clients to NRC Institutes. For example, 80% of respondents to the ITA survey stated that they have made use of at least one NRC Institute or technology centre in the past year.

The most common reason for accessing other NRC Institutes are to expand NRC-IRAP networks (34%), followed by provision of services (including both fee-for-services and collaborative research) to NRC-IRAP clients (23%). This relationship is facilitated by the organizational location of NRC-IRAP within NRC and may not be found as frequently in an arrangement where the funding agency is not co-located with a research institution.

The NRC Institutes accessed most frequently by ITAs were:

- NRC Canada Institute for Scientific and Technical Information (NRC-CISTI, 99 ITAs, 59% of respondents for this question),
- NRC Industrial Materials Institute (NRC-IMI, 53, 32%),
- NRC Institute for Research in Construction (NRC-IRC, 46, 28%),
- NRC Institute for Information Technology (NRC-IIT, 37, 22%),
- NRC Biotechnology Research Institute (NRC-BRI, 34, 21%), and
- NRC Institute for Aerospace Research (NRC-IAR, 29, 18%).

These findings are corroborated by the survey of firms, where respondents reported working with NRC Institutes to develop their innovation and carry out their research projects. Survey results suggest that firms worked across a broad range of institutes, as respondents accessed service from twenty of twenty-four NRC, with the largest percentage (10%) reporting working with the NRC Canada Institute for Scientific and Technical Information (NRC-CISTI).

NRC-CISTI, Canada's national science library, is a resource available for use by both NRC employees, as well as external organizations. ITAs may use the services of NRC-CISTI to further develop their own knowledge base or to support an individual client. NRC-CISTI services may be used to support projects at various stages on the innovation chain, from the idea and concept stages through to market research. As such, it is not surprising that more ITAs accessed NRC-CISTI last year than any research institute. In the past year, 41 ITAs (24%) have made use of NRC-CISTI services to support client proposal assessments and NRC-CISTI has provided paid services to clients of 44 ITAs (26%).

Despite the introductions made by ITAs to a number of different NRC Institutes, SMEs report a relatively lower level of contact with these. The Program performance data indicate that 13% of funded firms with projects that ended between April 30th 2008 and March 31st 2011 reported that their ITA linked or referred them to an NRC Institute. The majority of key informants indicated that there has been some level of engagement between NRC-IRAP and NRC Institutes, but that it is generally uneven.

Some of the barriers cited by key informants to working with NRC Institutes include the nature of Institute research projects (i.e. longer-term projects versus shorter-term ones that SMEs require), administrative delays in contracting resources in NRC Institutes, perception of conflict of interest of NRC-IRAP clients working with NRC Institutes (e.g. perception by NRC Institutes that NRC-IRAP funds should not flow



back to NRC), monetary constraints for firms paying for NRC Institute services, constraints for NRC Institutes providing free services to SMEs, differing objectives in supporting SMEs or research, and others. Many respondents to the ITA survey also stated that personnel from the NRC Institutes are not always receptive to working with SMEs, and that, in some cases, it is difficult to engage with NRC Institutes because the ITAs themselves do not have a solid understanding of the research conducted at all Institutes, or the Institute services which could be available to their clients.

**Recommendation 5:** NRC-IRAP should examine the implications that the recent reorganization has already had and will have in the future on NRC Institutes (now referred to as portfolios) and determine if additional mechanisms are required to foster synergies and reduce barriers to collaboration between SMEs and these areas of NRC.

## 5.5 Availability and Use of Program Performance Measurement

In order to ensure efficient Program delivery, ongoing performance monitoring is necessary to allow Program management to make informed decisions and take appropriate, timely action. Historically, much of NRC-IRAP's performance measurement data came from information in its Client Relationship Management System (CRM), SONAR. SONAR largely provided descriptive information on funded firms and to a lesser extent, funded organizations (e.g., project duration and firm age and size as well as firm/organization sector). As a result of challenges experienced in the previous evaluation of NRC-IRAP with SONAR data quality and limited outcome-level information, it was recommended that the Program implement a nationally-coordinated approach to the collection, analysis and reporting of performance information in support of Program management. This section of the evaluation report speaks to the degree to which NRC-IRAP implemented a performance measurement system for all Program components, including its contributions to funded firms and funded organizations as well as the provision of advisory services.

### 5.5.1 Measurement of Funded Firm Performance

Stemming from the recommendation made in the 2007 NRC-IRAP Impact Evaluation, NRC-IRAP launched the Online Final Report (OFR) to measure the early

outcomes of its services on funded firms in 2008. The OFR was an interim reporting tool while the Program worked to develop a suite of three complementary performance measurement tools designed to provide information on short, medium and longer term impacts for funded firms. Work on these tools resulted in the development of:

- the Status of the Firm (SoF), administered on an annual basis beginning just prior to the project start date and continuing through for five years following project completion;
- the Post Project Assessment (PPA), administered at the end of the project, prior to the payment of the final claim (replacing the OFR); and,
- the Impact Assessment (IA), administered at the end of the project, as well as annually for five years following the completion of the project.

The development of these performance measurement tools involved consultations with various Program stakeholders as well as NRC's evaluation function to ensure that they would yield mutually beneficial data. The evaluation team provided advice to NRC-IRAP on the content to ensure that it would meet not only the needs of Program management but also the needs of evaluation and of other central agency reporting requirements. To this end, central Program documents such as the Terms and Conditions (Ts & Cs) and the Results Based Management and Accountability Framework (RMAF) were consulted to ensure that key Program outcomes were measured with the tools. This was necessary given that the Program did not have a clearly articulated logic model or performance measurement strategy. The absence of such documents was also noted during the planning phase of the current evaluation.

In support of the current evaluation, NRC-IRAP provided the evaluation team with data from SONAR, the OFR as well as the SoF and the IA. While the new suite of tools had not been launched prior to the beginning of the evaluation, NRC-IRAP asked firms with projects between 2009 and 2011 to provide retrospective data to support the evaluation. Even though only two years' worth of data were available, it was never expected that the SoF and IA would yield sufficient data to cover the current evaluation time period. The PPA was not launched retrospectively given that those firms had completed the OFR, which contained similar content as the PPA, its replacement.<sup>25</sup>

Overall, even though the data provided through the performance measurement tools

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<sup>25</sup> While some of the questions were modified in the PPA from those originally included the OFR, the overall content of these tools was of a similar nature.

were of sufficient quality for use in the evaluation, significant challenges were experienced with missing data from certain SONAR fields (e.g., firm age and firm size). In addition to this, NRC-IRAP was unable to deliver on a number of data requests in a timely fashion or not all: the provision of SONAR data was delayed and data requests for qualitative OFR data went unmet, both due to limited human resource (HR) capacity in the National Office to extract data from the performance measurement systems. This not only posed a challenge for the evaluation, but also represents a risk for the Program. It is important that the Program not only collect performance measurement data but that it uses performance information to manage its activities. This is critical to a results-management perspective and if left unchecked, will affect the Program's ability to monitor its outputs and outcomes and hinder its ability to make evidence-based decisions in the future.

### **5.5.2 Measurement of Funded Organization Performance**

In order to measure the impact of its contributions to funded organizations, NRC-IRAP requires that funded organizations complete a Final Report, describing project outcomes at the end of the project. As mentioned earlier, the Program has limited guidelines on the structure of the Final Reports, affording organizations the flexibility to include what they wish in their report. As part of the Qualitative Network Analysis conducted in the evaluation, a sample of Final Reports ( $n = 9$ ) were reviewed, which revealed strong limitations in the Program's ability to collect, analyze and report on the activities, reach and impacts of its financial assistance to funded organizations. The format and content of the final reports were found to vary significantly, often not addressing reach or achievement of outcomes. Moreover, the extent to which ITAs followed up with organizations at the end of the project was largely dependent on the individual; in some cases, limited interaction occurred between the ITA and the firms that accessed services delivered by the funded organization. This finding, in conjunction with the finding that NRC-IRAP tends to establish long-term engagements with organizations by renewing the contribution agreement without direct follow-up with the companies served, is indicative of another performance-related risk to the Program. In order to ensure that funds are re-invested in performing organizations and to demonstrate the value-added of funded organizations, an enhanced performance measurement approach is necessary. This would include not only a standardized reporting structure but also a standardized process for use across all regions.

### 5.5.3 Measurement of Advisory Services and their Outcomes

Although NRC-IRAP assesses the impacts of advisory services on funded firms as part of the SoF, PPA and the IA, it does not collect information on the provision of advice or the outcomes of the advice on firms that received advisory services only (i.e., non-funded firms). Recently, NRC-IRAP has been under pressure to demonstrate the value of its advisory services, and will likely be increasingly called upon to do so in the future. Demonstrating the value of advisory services will entail measuring not only the outcomes of the services on the firm, but also the ITA's delivery of the service, including the intensity with which they are delivered (i.e., ITA time required to deliver).

As part of the Study of Advisory Services conducted in this evaluation, a standardized list of activities and impacts was developed for the Program to use as a starting point to measure ITA activities and associated impacts. In refining and implementing a performance measurement system for the Program's advisory services, consultation with ITAs on the feasibility of the approach will be an important step. Given the high degree of administrative responsibilities that ITAs reported (e.g., due diligence of claims, reporting requirements, data entry into SONAR, checking payroll information of clients, and tracking time utilization), any approach to performance measurement will need to balance an ideal state with the practical reality faced by field staff. The working paper produced as a result of the Study of Advisory Services provides options for further measurement as well as examples of some of the tools that could be developed for performance measurement purposes.

**Recommendation 6:** NRC-IRAP should continue to develop its nationally coordinated approach to performance measurement to ensure that it can demonstrate the value-added of all Program components. This approach should be based on a comprehensive performance measurement strategy and logic model. In addition, the approach should:

- Monitor the appropriateness of its performance measurement tools for funded firms;
- Include a performance measurement system for its funded organizations; and,
- Enable ITAs to track advisory services provided to SMEs.

## 6.0 Relevance

This section of the report addresses three different dimensions of the relevance issue: 1) the extent to which NRC-IRAP is responding to a demonstrable need, 2) the extent to which NRC-IRAP is aligned with government priorities and NRC's new strategy, and 3) the extent to which the Program is coherent with federal roles and responsibilities.

### Key Findings:

- There is a continuing need for the Program. In fact, the evaluation found that there is a significant role to be played in providing financial and advisory support to SMEs and that this role is, for the most part, best suited to government.
- NRC-IRAP is aligned with current federal government priorities regarding R&D and innovation. This is reflected by the recent use of the Program as a stimulus funding instrument as well as the increased contribution and operational resources announced in Budget 2012. NRC-IRAP constitutes one of the business lines of the new NRC strategy.
- NRC-IRAP, with a specific mandate for assisting SME innovation, is uniquely positioned to provide its services through its ITA workforce. While there are policy alternatives to providing direct R&D subsidies, the complementary nature of the Program with the tax credit policy alternative suggests that the NRC-IRAP model is appropriate. In terms of program alternatives in Canada, NRC-IRAP is a unique program offering and is complementary to other programs targeting similar clients firms.

## 6.1 Continued Need for the Program

### 6.1.1 Market Failure and Need for Financial Assistance

Scientific knowledge has long been considered a public good. Knowledge, once produced, cannot entirely be appropriated by its producer and leaks to other organizations. This increases the social returns of R&D but reduces its private returns (Aschhoff, 2009; Hussinger, 2008). Because of this, a purely market-driven system would lead to an under-investment of firms in innovation, relative to what may be socially desirable, and, at the same time, would limit the ability of SMEs to exploit their full growth potential (Meuleman and De Maesoneire, 2008). Public R&D funding, therefore, serves to overcome the market failures that lead the private sector, and especially young firms, to under-invest in innovation (Benavente, Crespi & Maffioli, 2007; Stam and Wennberg, 2009; Tanayama, 2007; Wolff & Reinthaler, 2008).

Currently, R&D subsidies are the second largest and fastest growing form of industrial aid in developed countries (Tanayama, 2007). In fact, these investments are generally on the rise given the fact that competitiveness and economic achievement are highly dependent on industrial innovation (Herrera and Bravo-Ibarra, 2010). According to Kleer (2008), “R&D subsidies are an important tool to support technology policy in OECD countries. In 2005 roughly one third of funds for R&D were provided by the government (EU 27: 34.7%, US: 30.4%, source: IW 2008)” (p. 2). Other programs in the OECD that compare to NRC-IRAP include the Centre for the Development of Industrial Technology (Spain), VINNOVA (Sweden), OSEO (France), Small Business Innovation Research Program (United States), and NL Agency (The Netherlands).

These perspectives, found in the literature, were supported by the majority of interviewees consulted for the evaluation. More specifically, key informants from both within NRC and outside the organization felt that the government has a significant role to play in providing financial support to companies. The government is perceived to be an impartial, objective and credible player that can provide support without the conflict of direct financial gain. The government’s role is seen by most interviewees to be helping companies “de-risk” technology development since many companies do not have the resources to innovate and survive in their markets. Moreover, key informants indicated that funding support is vital to meet the innovation needs of SMEs because investors are risk averse, introducing new products is expensive, and getting into new markets constitutes a significant barrier for small companies.

### **6.1.2 Need for Advisory Services**

The role of government in providing technical and business-related advice to SMEs was also examined given the importance of this Program component, which is often considered unique to NRC-IRAP. The review of literature showed that the lack of technical and business-related knowledge and skills is a key obstacle to the growth of SMEs and that the government can play a role in addressing this need.

Lambrecht and Pirnay (2005) identify the most common reasons for which firms seek external advice. Although their study is limited to the use of external private consultants, these reasons likely apply to government support:

- Organizational improvement;
- Diagnosis of the enterprise;

- Capacity to solve autonomously future problems;
- Capacity to discover the real needs of the company;
- Availability of an external sounding board;
- Management knowledge;
- Technical competencies;
- Quality of goods and/or services;
- Use of time; and,
- Solving urgent problems.

Although the literature did not clearly establish whether government is best positioned than the private sector to provide advisory services, it was found that there is a role for government in providing such services. In fact, in its evaluation of the UK program Business Link, the University of Warwick, Aston Business School and Kingston University (2007) argue that market failure in terms of the demand for business advice and institutional failure on the supply side (i.e., the absence of advisory services offered by the private sector) require government intervention rather than private external consulting. It has to be noted that advisory services can also take the form of referrals and networking advice where the advice provider puts the entrepreneur in touch with members of their own network, who can offer further assistance when needed.

### **6.1.3 Needs of Canadian SMEs**

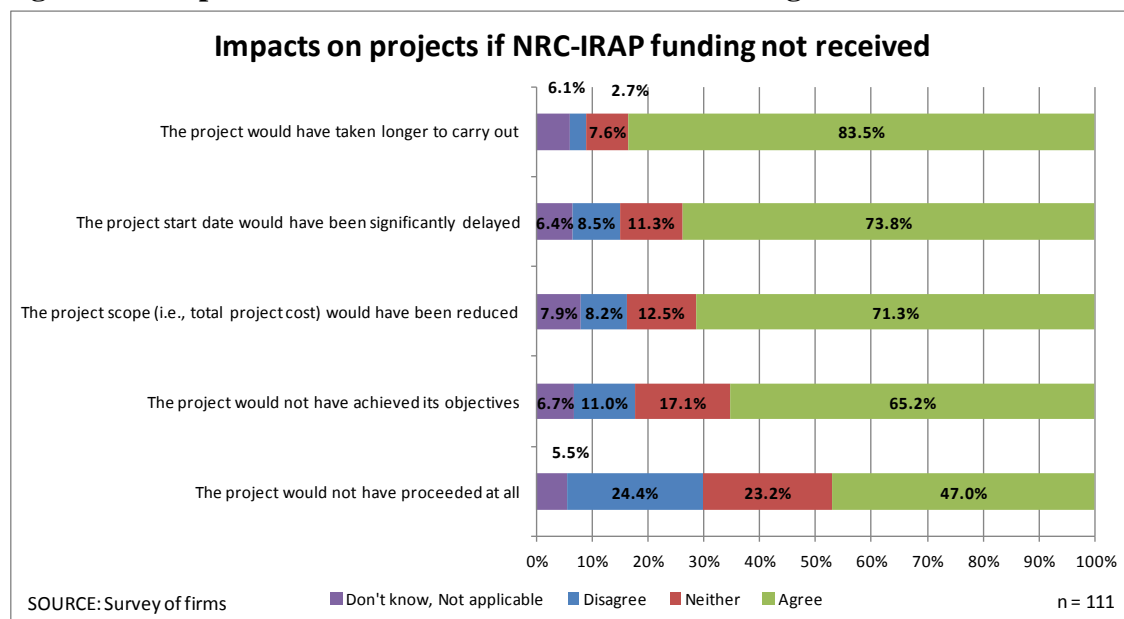
Overall, the evaluation found strong evidence to suggest that NRC-IRAP is responding to two demonstrable needs; the need for financial assistance and the need for advisory services. In fact, most SME key informants indicated that they have found it a challenge to engage in innovation activities due to limited financial resources. Respondents felt particularly strongly that SMEs require innovation support, particularly financial support for product development and for leveraging other sources of capital.

The majority of key informants across of respondent types interviewed also felt that the government has a significant role to play in providing business advice to companies and emphasized the impartial nature of their involvement as being a key strength. Some evaluation participants of all types also indicated that it is important to obtain feedback on business planning and development, funding proposals, and ways to obtain technical expertise. Most respondents, including both internal and external key informants, also mentioned that advisory support provides links to networks, facilitates relationships with other firms and organizations, increases the chances for

potential collaboration, and supports firms in obtaining necessary expertise and human resources. It was also said to help firms understand markets, develop appropriate business plans and strategies, develop proposals, find potential investors, and help formulate better R&D projects as well. Many evaluation participants (including interviewees and focus group participants) reported that there is a need for NRC-IRAP assistance throughout the lifecycle of a firm, although the general consensus was that NRC-IRAP has the greatest impact on young firms or firms exploring a new innovation.

The results from the survey of firms also provided empirical evidence of the limited resources of SMEs and how NRC-IRAP has an impact on the behaviors of its clients in terms of their R&D investments and activities. More specifically, the survey focused on what would have happened in the absence of NRC-IRAP funding (see Figure 6.1).

**Figure 6.1: Impacts in the Absence of NRC-IRAP Funding**



Source: NRC-IRAP Evaluation Survey of Clients

The evidence presented in Figure 6.1 illustrates how the NRC-IRAP contributions to firms play a role in stimulating private sector investments in innovation projects. It hints at the fact that firms tend to increase the scope of their R&D projects as a result of the funding, and that this can enable them to better achieve their objectives. More importantly, the survey findings reveal that close to half of the supported firms would not have conducted their project in the absence of NRC-IRAP funding. This strongly supports the fact that the Program is addressing the market failure pertaining to the



limited access of firms to resources for R&D projects.

## **6.2 Alignment with Government Priorities**

### **6.2.1 Alignment with Government Priorities**

The science and technology policy of the federal government, *Mobilizing Science and Technology to Canada's Advantage* (2007), clearly identifies NRC-IRAP as one of the key mechanisms through which it will achieve the policy objectives outlined in its "Entrepreneurial Advantage" suite, although the policy also outlines a need for greater cooperation and alignment between the various programs that focus on improving the innovation outcomes of the Canadian private sector. More recently, a progress update on the S&T Policy (2009) outlines the continued relevance of programs such as NRC-IRAP by highlighting efforts made to encourage private sector investment in R&D during the economic crisis. It notes in particular the additional funding provided to NRC-IRAP in budget 2009 as part of the Economic Action Plan, as well as the Youth Employment Program, which also benefitted from additional funding in 2009-10 and 2010-11.

In the Federal Budget 2012, the Government of Canada announced its commitment to a new approach to supporting innovation in Canada. Among the various policy tools and programs announced in support of this new approach, the government expressed its support to NRC-IRAP by increasing the Program's budget by \$110 million per year. This new approach echoes the concerns, conclusions and recommendations raised by the Expert Panel (2011) following the Review of Federal Support to Research and Development. The panel was mandated by the current government to review the strategy of the federal government in support of innovation in Canada.

The importance of this Program to the government is also reflected in the fact that NRC-IRAP is frequently used as a mechanism for the federal government to deliver other programs in support of SME innovation in the country. Recent examples of investments in support of SMEs delivered through NRC-IRAP include Digital Technology Adoption Pilot Program (DTAPP), YEP and CHTD.

### **6.2.2 Alignment with NRC Strategy**

Over the last years, NRC undertook a review of its strategy and program support with the objective of increasing its support to the growth of Canadian SMEs and therefore

contributing to wealth creation in Canada. The evaluation examined the extent to which NRC-IRAP is aligned with the objectives and orientation of the new NRC Strategy.

The evaluation found that few changes will be made to the Program as part of the new strategy and that NRC-IRAP will be one of the four business lines offered by NRC to its clients. In other words, the fundamental nature of NRC-IRAP was not affected by the strategy orientation and structural changes of the organization. Overall, it is felt that NRC-IRAP continues to align with the objectives of NRC, and that in fact, the priorities of NRC-IRAP may better converge with those of NRC in the future.

## **6.3 Federal Roles & Responsibilities**

### **6.3.1 NRC as Delivery Agent**

The need for government intervention in the provision of R&D subsidies and advice is outlined in a previous section; given this need, it is particularly important to examine the extent to which NRC should play a role in delivering an industrial research assistance program. For example, despite the mandate of NRC-IRAP to assist SMEs engaged in innovation, other government departments of various levels appear to industry users to provide similar services as NRC-IRAP (organizations such as regional development agencies, Business Development Bank, for example). The Program has stated that those other organizations have broader mandates and larger budgets, and that they may provide potential industry clients with a different scope and value of some services. NRC-IRAP further emphasizes that such other programs do not have its ITA delivery workforce, which differentiates it from the rest of the pack, but that it also enables NRC-IRAP to collaborate with these other programs (NRC-IRAP Business Plan 2009-2012).

The design of NRC-IRAP has long been heralded as its key strength. The delivery staff (ITAs), its regional structure, and its mandate to help firms situated at any point in the innovation chain clearly differentiate it from other programs. The positioning of NRC-IRAP within a broader Research and Technology Organization (RTO) also provides efficient and effective access to research capability and support, as demonstrated previously.

### **6.3.2 Federal R&D Policies and Programs**

Given the important role of national governments in stimulating R&D for long-term economic growth, it is critical to better understand the types of R&D support policies that may be put in place before undertaking a deeper analysis of NRC-IRAP as one such mechanism. Ghosh (2007) identifies three types of R&D policies in Canada: first, direct subsidies to R&D activities (such as NRC-IRAP); second, subsidies to the users of R&D capital; and third, trade liberalization to promote international R&D spillovers. Bérubé and Mohnen (2007), for their part, distinguish instead between tax credits and direct subsidies, where tax incentives are provided to encourage the broadest range of firms to conduct R&D. Direct support is provided to specific firms for promising R&D projects, and they contend that their effects can be better measured than those from fiscal indirect support.

#### ***Program Design Alternative – Indirect Subsidies***

The Scientific Research and Experimental Development (SR&ED) program is typically touted as an alternative to NRC-IRAP; it is not considered here as a true alternative, because it represents a different policy mechanism that is usually thought of as complementary to the services offered by NRC-IRAP. By design, the SR&ED program privileges SMEs who are further along the innovation continuum and who may have more innovation capacity in general, since it provides funds once the R&D has been conducted by the firm. The program's budget is vastly larger than that of NRC-IRAP (compare \$3 billion with \$70 million for NRC-IRAP) and also supports a much larger number and size of projects (Doyletech Corporation, 2009).

#### ***Program Delivery Alternative – Other Direct Subsidies***

A recent market analysis commissioned by NRC-IRAP identifies a number of provincial and federal programs meant to support innovation through assistance to firms (Doyletech Corporation, 2009). At the provincial level, there appear to be several programs that provide either technological or financial assistance to SMEs (such as Nova Scotia's InNOVAcorp, Investissement Québec and Alberta Energy Research Institute (AERI)'s Industry Research Program & Innovation Assistance Program). However, few provide assistance in both areas, and none were found to provide the same level of advisory services as those provided by NRC-IRAP. In addition to this, most of the provincial programs were found to be competition-based and/or sector-specific, which reduces their accessibility to all SMEs in a given region. In the case of federal programs, very few were actually found to compare directly

with NRC-IRAP and rather can be considered complementary. In most cases, these other federal programs (such as Communications Research Centre's Technology Transfer Office and Industry Canada's Strategic Aerospace and Defence Initiative) focus on very specific sectors of the economy, or target certain levels of the innovation chain.

Another complementary approach to NRC-IRAP, both in terms of its delivery model and positioning within Canadian industry, may be found in the Business Development Bank of Canada (BDC). The BDC plays an important role in stimulating the supply of venture capital available to emerging technology companies. It provides early-stage venture capital through direct investments in firms and by helping to capitalize funds managed by venture capital partners (Government of Canada, 2007). However, its venture capital operations tend to invest in firms further along the innovation continuum as well as "high growth" potential technology-based businesses in specific sectors. The consulting services offered by BDC address both innovation and commercialization issues; however, these are offered separately from the financing services and at a cost to the SME (Doyletech Corporation, 2009).

Other than the above, the only other federally-funded programs that share some of the characteristics of NRC-IRAP are the Community Futures Development Organizations (CFOs), funded through the regional economic development agencies. These have advisors in the field working with companies, even though these include both SMEs and larger firms, and are exclusively situated in rural jurisdictions.

While a large majority of internal and external key informants to the evaluation were able to identify other programs that offer similar services as NRC-IRAP, most felt that the Program is unique in its geographic coverage, focus on SMEs, and provision of both financial and advisory support. Moreover, while most representatives of firms who participated in the interviews and focus groups were familiar with other sources of support, they all indicated that the other sources of support are complementary to NRC-IRAP and do not duplicate it.

## 7.0 Summary

Overall, the evaluation found that NRC-IRAP is achieving its expected outcomes in an efficient manner. There is strong evidence that the Program's reach to SMEs and organizations is broad and that NRC-IRAP is funding (among others) those SMEs that are best positioned to generate a positive return on investment (identified to be those that are smaller and younger). Impacts on firms and to the economy more broadly are significant and are illustrative of NRC-IRAP's achievement of mid-term and longer-term outcomes. The evaluation also found that the Program continues to be relevant and is responding to an acute need among the SME community for innovation assistance.

The evaluation makes six recommendations, most of which are focused on efficiency, such as improving funded organization CAs and reporting requirements, exploring synergies with NRC Institutes, and ensuring that when grants and contributions funding increases occur allocations for associated O&M requirements should also be considered for increased funding.

Some recommendations are focused on assisting the Program to improve the achievement of its outcomes. For example, ITAs should be more involved in the selection of and assistance to clients of NRC-IRAP funded services offered by funded organizations and SMEs should be made aware of a mechanism to voice concerns about their ITA.

Finally, the evaluation acknowledges recent advancements in the development of performance measurement tools but makes suggestions for additional improvements.

## 8.0 Management Response

Recommendation	Status	Planned Action(s)	Expected date of Completion (M/D/Y)	Measure(s) of Achievement
1. Increase the involvement of ITAs in the selection of the firms to be served by NRC-IRAP funded activities undertaken by organizations and implement measures of control that involve direct communication between NRC-IRAP and these firms, especially in cases where individual services are provided.	Accepted	IRAP will facilitate the involvement of ITAs in the referral of firms and to provide follow up services if needed. Directions will be provided to ITAs and the Field Manual will be modified as required.	03/31/2013	Directions provided to ITAs to get involved, whenever feasible, in the selection of Organizations' clients. Field Manual updated as required.
2. When grants and contributions funding increases occur, allocations for associated O&M requirements should also be considered to support efficient and timely program delivery.	Accepted	Develop a costing model for incremental programming and request appropriate levels of O&M funds whenever additional Gs&Cs are allocated or new programs are integrated into or delivered by NRC- IRAP.	03/31/2013	Funds for O&M are requested whenever additional G&Cs are allocated. Costing model for incremental programming is developed.
3. Opportunities should be made available for SME clients to voice concerns about their ITA; recourse mechanisms should be communicated to all clients to ensure increased awareness.	Accepted	<p>Since the completion of the Evaluation , NRC-IRAP has implemented mechanisms through which clients can provide feedback:</p> <ul style="list-style-type: none"> <li>• Post-Project Assessment includes 1) questions about client satisfaction and 2) option for clients to discuss concerns with NRC-IRAP management.</li> <li>• Service Standards, available on the NRC-IRAP website, state the level of performance clients can expect from NRC-IRAP.</li> <li>• The Feedback and Complaints Procedures have been reviewed and a manual is being developed</li> </ul>	03/31/2013	<p>Feedback and Complaints Procedures manual developed and disseminated to NRC-IRAP management and staff.</p> <p>Communication products developed and disseminated to all NRC-IRAP staff and clients on the feedback mechanisms available.</p>

		for employees.		Client complaints or feedback are recorded and a follow-up is directed by NRC-IRAP management.
4. Contribution Agreements for funded organizations must clearly articulate the projected outputs and outcomes of funded activities and introduce monitoring and reporting requirements for each project. ITAs should receive training in developing CAs or CAs need to be written by trained staff. In addition, the field manual for contributions to organizations should be utilized systematically to guide the consistent development of CAs.	Accepted	<ul style="list-style-type: none"> <li>NRC-IRAP guidelines allow capture of relevant outputs and outcomes. However, to address this recommendation, NRC-IRAP will enhance the Field Manual instructions to better articulate outputs and outcomes in the contribution agreements.</li> <li>Staff directly involved in developing CtO will receive appropriate training.</li> </ul>	03/31/2013	Contribution Agreements for organizations will better outline expected outputs, outcomes and reporting requirements.
5. NRC-IRAP should examine the implications that the recent reorganization has already had and will have in the future on NRC Institutes (now referred to as portfolios) and determine if additional mechanisms are required to foster synergies and reduce barriers to collaboration between SMEs and these areas of NRC.	Accepted	<p>The new RTO structure and mandate of NRC encourage improved cooperation and collaboration between NRC-IRAP and R&amp;D portfolios.</p> <ul style="list-style-type: none"> <li>NRC-IRAP will take active part in the design of new programs at the request of Portfolios' management.</li> <li>NRC-IRAP is currently renewing its Sector Teams as part of its Strategic and Operational Plan with an objective to better interface with the NRC portfolios.</li> <li>NRC-IRAP is developing an International Framework aligned with the NRC's International Strategy.</li> </ul>	Ongoing	<p>NRC-IRAP contribute to the design of new programs upon request.</p> <p>Sector Teams initiative facilitates interaction between ITAs and NRC portfolios.</p> <p>IRO participation on NRC-IRAP's International Network Team (INT).</p> <p>Supported engagement of Canada's SMEs in EUREKA.</p>

<p>6. NRC-IRAP should continue to develop its nationally coordinated approach to performance measurement to ensure that it can demonstrate the value-added of all Program components. This approach should be based on a comprehensive performance measurement strategy and logic model. In addition, the approach should:</p> <ul style="list-style-type: none"> <li>• Monitor the appropriateness of its performance measurement tools for funded firms;</li> <li>• Include a performance measurement system for its funded organizations; and,</li> <li>• Enable ITAs to track advisory services provided to SMEs.</li> </ul>	Accepted	The Performance Measurement Strategy (PMS) will include a logic model.	03/31/2013	A PMS has been developed in consultation with key stakeholders (SOP, TB) and implemented.
		There will be a review of NRC-IRAP's performance measurement tools (i.e. Post-Project Assessment, Impact Assessment and Status of Firm) in order to provide management with essential data and information while minimizing the administrative burden placed on clients.	03/31/2013	NRC-IRAP tools have been streamlined and use a time-sensitive data collection approach to enhance effectiveness while improving the client experience
		i.NRC-IRAP will review metrics for funded organizations to implement essential performance measures.	03/31/2013	Essential performance measures for funded organizations have been implemented.
		ii. NRC-IRAP will improve tracking mechanisms for advisory services provided to funded and unfunded clients.	FY 2017-18	ITAs track their advisory services more effectively by using improved SONAR capability.



## Appendix A: Methodology

The evaluation of the NRC Industrial Research Assistance Program (NRC-IRAP) was conducted to assess the value for money of the Program (i.e., relevance and performance) between FY 2007-08 and 2011-12, inclusive. The evaluation was intended to update NRC senior executives and managers in terms of ongoing Program performance in light of the additional demands placed on the Program in recent years; and, to support the renewal of the Program's Terms and Conditions in March 2013. The evaluation was carried out in accordance with NRC's approved evaluation plan and Treasury Board Secretariat (TBS) policies. The last evaluation of NRC-IRAP took place in 2007. Wherever possible, longitudinal analyses including data from the previous evaluation were conducted to maximize the usefulness of the evaluation findings.

The selection of methods was based upon the most efficient means of addressing the evaluation issues in a rigorous way, while taking into account cost, time and resource constraints, as well as other considerations, such as evaluation scope, evaluation budget and minimizing response burden. The evaluation approach and level of effort was commensurate with the Program risk, which was assessed as high during an assessment conducted as part of the planning phase. As such, a summative evaluation was conducted using a comparative research design.<sup>26</sup> Specific calibration exercises were undertaken within each of the core issues to ensure that sufficient data would be gathered for the core issues with a higher risk index, and to reduce the level of effort for the core issues with a lower risk index. In the latter case, secondary data were identified to support reduced primary data.

In order to maximize the possibility of generating useful, valid and relevant evaluation findings, mixed methods were used for this evaluation, allowing for triangulation (i.e., convergence of results across lines of evidence) and complementarity (i.e., developing better understanding by exploring different facets of a complex issue). Both qualitative and quantitative methods were used as appropriate.

This evaluation was conducted using a hybrid evaluation team; while the overall evaluation methodology was developed by the NRC Office of Audit and Evaluation, a portion of the evaluation was conducted by external consultants, who also had the

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<sup>26</sup> A comparative design was used for the most part; however, in some cases, descriptive methods were used where comparators were not available and could not be developed.

responsibility of drafting the evaluation report. The methods conducted by the internal evaluation team included:

- Internal and external document review (secondary data);
- Survey of Industrial Technical Advisors (primary data);
- Review of administrative and performance data (secondary data);
- Advisory services study (both primary and secondary data); and,
- Qualitative network analysis (both primary and secondary data).

The methods conducted by the external consultant included:

- Key informant interviews (primary data);
- Focus groups with firms (primary data);
- Survey of firms (primary data);
- Survey of organizations (primary data); and,
- Partial cost-benefit analysis (primary and secondary data).

A discussion of the approach used for each of these methods as well as their limitations and mitigation strategies is provided in the following paragraphs. A more in-depth description of the methodology employed for each of these is included in the working papers produced as part of the evaluation.<sup>27</sup>

### ***Internal and external document review***

Internal and external documents were reviewed, synthesized and integrated into the evaluation to provide context and history, and contributed to the analysis of relevance and performance. The review of internal documents included strategic and business plans, performance reports, presentations, previous evaluation studies, other internal studies and reports and audit reports. The review of external documents included those produced by other government departments and central agencies, published journal articles and economic working papers.

The key limitation inherent in any document or literature review is the large amount of time required to gain a deep understanding of the issues at hand. Given that a significant amount of research has been conducted on the public subsidization of R&D, the evaluation team did not have the time or resources to conduct a thorough literature review. In order to mitigate any potential limitations, the review focused on

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<sup>27</sup> Working papers are internal documents meant to capture the details associated with the execution and results of each of the evaluation methods.

documents published since 2006, which not only represent the most recent thinking on many of the issues at hand, but also typically summarize previous knowledge gained through older studies and documents. This mitigation strategy has not affected the extent to which rigorous conclusions could be drawn from the evidence.

### ***Survey of Industrial Technology Advisors (ITAs)***

A web-based survey was administered to all NRC-IRAP Industrial Technology Advisors (ITAs) across Canada (229 staff in total). The survey instrument was based on the tool used in the previous evaluation of NRC-IRAP and key questions were integrated into the current instrument wherever appropriate to facilitate longitudinal analyses. The draft instrument was reviewed by NRC-IRAP National Office staff as well as a select number of ITAs. While the survey may have benefited from additional piloting and refining, due to anticipated changes in Program staffing, the evaluation team had to design, pilot test and administer the survey instrument sooner than had been planned and in a very compressed timeframe. This was done to avoid surveying staff soon after significant staffing reductions which may have influenced the results of the survey. To mitigate this limitation, survey findings were triangulated with data from the key informant interviews (which included ITAs) as well as the survey of firms (which requested similar information such as the immediate and intermediate outcomes of the Program). With 181 respondents completing at least one question of the survey, the response rate was 79% overall, with similar average response rates for each question.

### ***Review of administrative and performance data***

Financial and human resources information was reviewed and analyzed to provide context to the findings obtained through other lines of evidence. The evaluation also reviewed Program performance data from various sources to contribute to the assessment of the Program's achievement of outcomes. Key data sources used in this review included:

- Client and project data from NRC-IRAP's Client Relationship Management System (CRM), SONAR;
- Data on Program outcomes collected on funded firms from the Online Final Report (OFR), Status of the Firm (SoF), the Post Project Assessment (PPA) and the Impact Assessment (IA) instruments;
- Final Reports produced by funded organizations; and,
- Data on the outcomes of the youth employment program (YEP) collected from

firms and graduates supported by youth employment projects (approximately 65% of YEP graduates responded to a survey conducted by NRC-IRAP from 2006-07 to 2010-11).

The evaluation team faced several limitations with the Program's performance data. Certain fields in SONAR, such project start and end date, date of incorporation and number of employees, contained missing data. While the NRC-IRAP Field Manual requires ITAs to enter firm and project characteristics into SONAR at the onset of a project, this did not always appear to occur.

In addition to limitations with SONAR, data from the SoF, the PPA and the IA were not available for the full evaluation period. The issues related to the performance measurement tools are identified in the body of the evaluation report, along with a recommendation for improvement. The presence of only two years' worth of data and the limited response rate restricts the representativeness of findings from the SoF and IA. Out of those firms supported between 2006-07 and 2010-11, the representativeness of the IA was calculated to be approximately 16% and the SoF 39%. The risk of limited generalizability, was however, mitigated by triangulating findings with those from other lines of evidence such as the survey of firms and the survey of ITAs.

It is also worthwhile to highlight that only a limited amount of time had passed between project completion and time of measurement using the SoF and the IA (i.e., one to two years). Given that impacts may not have had time to fully materialize for all funded firms, findings from the SoF and the IA data are best viewed as lower-end estimates of Program impacts.

Finally, challenges were experienced with the Final Reports completed by funded organizations. The format and content of the final reports were found to vary significantly, often not addressing funded organization reach to small-and-medium-sized enterprises (SMEs) or achievement of outcomes. The conduct of case studies on funded organizations as part of the qualitative network analysis mitigated these challenges, facilitating the evaluation's team assessment of financial assistance provided to funded organizations.

### ***Study of Advisory Services***

A special study was conducted to identify the extent to which clients benefit from the advisory services provided by ITAs and to provide the Program with information for

the future measurement of its advisory services. The study included the development and validation of an advisory services model and an impact assessment.

**Development of an advisory services model:** The development of an advisory services model for NRC-IRAP was the first component of the study. This included reviewing the work done by the NRC-IRAP National Office on identifying and defining advisory services, conducting a literature review and consulting with five ITAs from various regions and with varying tenures at NRC-IRAP. As a result of finding very little relevant academic literature on advisory services provided to firms, specifically in public organizations, the study included a larger conceptualization and validation component than originally expected.

**Validation of the advisory services model:** The next step in the study involved the validation of the advisory services model. This involved a review of SONAR data on advisory services to determine whether the service categories used by NRC-IRAP in SONAR were largely aligned with those in the model of advisory services.

**Impact analysis:** Six case studies were conducted to illustrate the impacts of advisory services. Potential cases were identified through consultations with ITAs and the review of SONAR data. Five criteria guided the selection of cases and included: NRC-IRAP region; type of advisory service; impact of advisory service; project funding status (i.e., funded versus non-funded); and stage of firm development. Each case study included semi-structured interviews with the lead ITA, the firm (or firms) receiving the advisory service and other stakeholders involved in the case. Relevant information from SONAR was also reviewed as part of case development.

As with any case study, the depth of knowledge gained is traded against breadth of knowledge across multiple cases. The evaluation team recognizes that further research is needed to understand the advisory services provided by ITAs and the impacts of these services on a larger sample of firms. The current study, however, was a necessary first step to conceptualize the activities and the impacts of advisory services, from which further measurement can occur. Despite this limitation, the fact that findings from the advisory services study converge with findings from other lines of evidence, suggests that the results are generalizable.

### ***Qualitative Network Analysis***

A qualitative network analysis was conducted to assess the activities and outcomes of NRC-IRAP's financial contribution to organizations. The qualitative network

analysis included a review of funded organization contributions, a cross-case analysis of in-depth case studies and the development of a service model for contributions to funded organizations.

**Review of contribution agreements:** A sample of 100 Contribution Agreements (CAs) with 100 different organizations was reviewed, representing 33% of the total number of individual organizations funded between 2006-07 and 2010-11. NRC-IRAP was responsible for selecting the CAs to be reviewed based on certain criteria provided by the evaluation team in an effort to have a fairly representative sample. The Program was asked to choose CAs that were reflective of the typical organizations and activities funded in each region and that reflected the diversity of funded projects with regard to the value of the CA and fiscal year.

**Cross-case analysis:** Nine case studies were conducted to gain in-depth knowledge on funded organization activities, reach, and impact on client SMEs. Cases were selected based on the value of the agreement, the types of services provided (technical, business-related, etc.), and the funded organization's geographic location. The individual case studies involved semi-structured interviews with the ITA or Innovation Network Advisors responsible for the administration of the CA, a representative of the funded organization and, when possible, a minimum of two interviews with SME clients that benefited from the services delivered by the funded organization. The results of the individual case studies were then analyzed to develop a set of cross-case findings.

**Development of a service model for contributions to funded organizations:** Findings from the review of CAs and the cross-case analysis were integrated to develop a service model for contributions to funded organizations. The service model provides a framework for understanding the activities of funded organizations and their expected outcomes.

The main limitation of the qualitative network analysis centers on the representativeness and generalizability of the service model for funded organizations that was developed. There is the possibility that certain types of funded organizations, and their associated activities and expected outcomes were not captured in the organizations reviewed as part of the Qualitative Network Analysis. Given that NRC-IRAP provided the sample of funded organizations for inclusion in the study, the evaluation team felt comfortable with its representativeness. Moreover, the convergence of findings from other lines of evidence suggests that the service model is representative.

### ***Key informant interviews***

Conducting interviews with key informants is an essential element of an evaluation methodology. The information gathered through the qualitative, semi-structured interview process was based on personal experiences, opinions and expert knowledge. This information plays an important role in contextualizing performance data and other statistics. In all, 43 key informant interviews were conducted with NRC management and staff, as well as other stakeholders (see Table A.1).

Most of the interviewees located in the National Capital Region were interviewed in person. In other cases, interviews were conducted by phone. Interviews were conducted in the preferred official language of the interviewee. Interviews lasted between 45 and 60 minutes, depending on the interview approach (phone or in-person) and the interviewee type. The development of the key informant interview guides was informed from the preliminary interviews, preliminary administrative data/document review, and feedback from a methodology workshop held at the outset of the evaluation. Interview guides were used to ensure that the same issues were addressed by all relevant interviewees.

**Table A.1. Summary of Key Informants Interviewed**

<b>Key Informant Type</b>	<b>Completed</b>
<b><i>Internal Program Personnel and Stakeholders</i></b>	<b>29</b>
NRC Senior Executive	1
NRC-IRAP Senior Leadership and Management	14
NRC-IRAP staff	7
Other NRC representatives	7
<b><i>External Stakeholders and Beneficiaries</i></b>	<b>14</b>
Regional Development Agencies	3
NRC-IRAP-funded organizations	3
Firms receiving NRC-IRAP funding and/or advisory support	7
Other external experts	1
<b>Total</b>	<b>43</b>

The original intention in the evaluation work plan was to interview 60 respondents, of which only 43 were completed in the final count. This was due to the unavailability of certain respondents, or the unwillingness of some respondents to participate in the evaluation. This was more an issue with respect to external stakeholders than internal, particularly those who are not directly involved with NRC-IRAP (e.g. private sector experts or agencies). To the extent possible, the evaluation team ensured the representativeness of the sample, and identified outliers in responses for particular groupings when they emerged.

### ***Focus groups with firms***

Focus groups were implemented in order to gather rich qualitative information from clients to complement the other lines of evidence for the evaluation. In total, six focus groups were conducted in six cities: Kitchener/Waterloo (n=6 participants, total), Montreal (n=4 participants, total), Ottawa (n=6 participants, total), Saskatoon (n=7 participants, total), St. John's (n=7 participants, total) and Vancouver (n=7 participants, total). These cities were selected based on the likely concentration of NRC-IRAP clients and variations in industrial activity.

Participants were selected based on various criteria, including: sector; type of support; amount of support; gender; year of funding; whether they received stimulus funding; and whether they accessed the Youth Employment Program (YEP). While all attempts were made to achieve a cross-section of participant characteristics, this was not entirely possible due to the limited number of NRC-IRAP clients in some jurisdictions available to attend the focus group on the specified date and time. An honorarium was not paid to focus group participants. Focus groups were conducted by three experienced facilitators using the focus group moderator's guide and lasted on average two hours.

The main limitation of the focus groups is the ability to generalize the findings. Considering the small sample sizes for each group, focus group findings may not represent the views and experiences of the larger population of NRC-IRAP clients and are thus difficult to generalize. This limitation was exacerbated since it was not possible to select participants solely based on a cross-section of a priori criteria, but instead the method was adapted to include all those within the general criteria who were contacted and who were available and interested. For example, if recruitment was low for one criterion, other criteria were over-subscribed to achieve a reasonable group size. The use of a multi-method evaluation, however, mitigates the limited generalizability of focus group findings.

### ***Survey of firms***

A web-based survey was administered to a sample of former and current NRC-IRAP client firms to gauge the reach and performance of NRC-IRAP, as well as to collect some economic impact data. The firms that were surveyed had previously been supported by NRC-IRAP between 2004 and 2007. The survey questionnaire was pretested with approximately 20 firms in English and French. Based on the results of the pretest, the questionnaire was adjusted with minor changes. The survey of firms



was conducted in both English and French by a firm sub-contracted by GGI. In addition to the original invitation email, three reminder emails were sent and a minimum of three reminder telephone calls were placed to those firms who had not responded after several attempts to contact them. In all, 442 firms (out of 2,003 contacted) responded to the survey. Considering email bounce backs and firms that were not able to respond during the timeframe (as identified through email messages and/or feedback during telephone reminders), the response rate was 22%.

The main limitation of this method stems from the limited response rate which affects the representativeness of the data. However, considering the respondent group (i.e., SMEs), this response rate is deemed acceptable and is consistent with the response rate in the previous evaluation. As such, survey findings were deemed valid.

### ***Survey of organizations***

A web-based survey was administered to former and current NRC-IRAP client organizations to gauge the reach and performance of NRC-IRAP, as well as to collect some broader outcome data. The survey questionnaire was pretested with 40 organizations in English and French. Based on the results of the pretest, the questionnaire was adjusted with minor changes. The survey of organizations was conducted in both English and French by a firm sub-contracted by GGI. In addition to the original invitation email, two reminder emails were sent and three reminder telephone calls were placed to those organizations who had not responded after several attempts to contact them. In all, 71 organizations (out of 275 contacted) responded to the survey, representing a survey response rate of 25.8%.

The main limitation of this method is the limited response rate which affects the representativeness and generalizability of the data. The use of mixed methods and the presence of corroborating evidence from other lines of evidence such as the qualitative network analysis helped to mitigate this limitation.

### ***Partial cost-benefit analysis***

An analysis of the Program's economy and efficiency was conducted using partial cost-benefit analysis. To achieve this, the evaluation team used evidence from the survey of firms conducted as part of this evaluation, as well as information from NRC-IRAP's CRM, SONAR and SIGMA, the financial database.

The first limitation of the analysis stems from the limitations of the survey of firms.

As alluded to previously, the representativeness of the survey data may be limited with a response rate of only 22%. However, this limitation was overcome by developing various scenarios, including a low/conservative scenario strictly based on responses from the 390 firms and another based on various weighing procedures to obtain a higher level impact assessment, more representative of the NRC-IRAP client base.

The second major limitation is related to attribution. In the absence of a comparison group, it is a major challenge for the evaluation to assess the net impacts of the Program. This limitation was overcome by using a proxy indicator in the survey indicating the extent to which these results would have been achieved in the absence of NRC-IRAP. This allowed the evaluation team to provide a more accurate picture of the net impacts.

## Appendix B: Evaluation Matrix

**Table A1: Evaluation Matrix by Data Source**

Evaluation Issues and Questions	Lit & doc review	Review of performance data	Survey of ITAs	KI interviews	Survey of firms	Focus groups with firms	Survey of organizations	Advisory services study	Qualitative network analysis	Partial Cost-benefit Analysis
<b>RELEVANCE – Continued Need for the Program</b>										
1_1. Is there a justifiable need to support SME innovation in Canada, through financial and/or advisory support?	✓	✓		✓	✓	✓	✓	✓		
<b>RELEVANCE – Alignment with Government Priorities</b>										
2_1. To what extent is NRC-IRAP consistent with current government priorities?	✓	✓		✓						
<b>RELEVANCE – Alignment with Federal Roles and Responsibilities</b>										
3_1. Is NRC-IRAP consistent with federal roles and responsibilities?	✓	✓	✓	✓		✓	✓	✓	✓	
<b>PERFORMANCE: Achievement of Expected Outcomes</b>										
4_1. To what extent has the Program been successful in reaching its intended clients?	✓	✓	✓	✓	✓	✓	✓	✓		
4_2. To what extent have intended outcomes been achieved as a result of the Program?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
4_3. To what extent has NRC-IRAP facilitated the development of linkages in the business community?	✓	✓		✓	✓	✓	✓		✓	
<b>PERFORMANCE: Demonstration of Efficiency and Economy</b>										
5_1. To what extent are the resources allocated to the Program being utilized in an economical manner in producing outputs and progressing towards expected outcomes?	✓	✓	✓	✓	✓		✓	✓		✓
5_2. To what extent does the Program demonstrate efficiency in the production of outputs to reach expected outcomes?	✓	✓	✓	✓	✓		✓	✓	✓	

## Appendix C: Selected Bibliography

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