Natural Sciences and Engineering Research Council of Canada

Conseil de recherches en sciences naturelles et en génie du Canada

Canada

(http://www.nserc-crsng.gc.ca)

Technology Access Centres – A Discussion Paper

- The Quebec Experience: College Centres for Technology Transfer (http://www.nserc-crsng.gc.ca#quebec)
- Frequently Asked Questions (http://www.nserc-crsng.gc.ca#FAQ)

Summary

Canada's companies, particularly small and medium enterprises (SME), face daunting and new challenges—established markets are shrinking and strong international competitors are emerging. Against this context, many companies are looking for new markets, new products and new approaches for their business processes. Canada's post-secondary research institutions have a wealth of technical capabilities that can assist companies to adjust and adapt products and processes—innovating to compete in new ways. New approaches are needed to connect these advanced capabilities to help Canadian companies innovate.

Technology Access Centres (TAC) are small centres, affiliated with a college or perhaps a university, focused on supporting innovation in an area important to local companies. The core management of the centre (manager, marketer and administrator) will be supported through the Technology Access Centre program, enabling the centre to draw on the technical capabilities (students, researchers, faculty and some equipment access) at their affiliated institution. Technology Access Centres will help companies innovate by providing technical services, including specialized technical analyzes or tests; technology development projects; advice on specific challenges; and linkage (referrals) to other capabilities. The Technology Access Centre approach is built on demonstrated success in Quebec.

Technology Access Centres will typically engage between 10 and 50 people, including core staff, contract staff, and students and faculty, depending on the level of company support. As separate organizations drawing on the capabilities of their host institution, Technology Access Centres are able to meet business imperatives: timely response, security of information and a focus on company problems. The centres will provide some students with valuable experience of company challenges and approaches, and provide faculty with practical experience to enrich their teaching and orient their future research.

A network of 200 Technology Access Centres is proposed. This network will provide local innovation assistance that is essential to helping Canada's small and medium enterprises succeed with new products and new approaches. The budget required for the core funding of these 200 centres is $90 million per year (year 5).

NSERC has identified the need for these centres in its consultations for the Strategy for Partnerships and Innovation. Partnering levels of government and agencies can help define foci for the centres needed in their province or region, and could provide faculty release time and infrastructure.

Introduction[1] (http://www.nserc-crsng.gc.ca#note1)

Success in an innovating economy requires a strong fabric of innovation support. That fabric enables companies to realize value from ideas; in part, drawing on the talent, capabilities and expertise at public post-secondary research institutions (i.e., colleges and universities).

Canada has richly diverse regions and economies, and a consistent reliance on small and medium enterprises (SME). Our economy is strongly dependent on extracting and processing natural resources.

The rise of international competitors supplying natural resources and manufactured goods to markets which Canada previously dominated is a key concern. This challenge is leading an increasing number of companies to seek new markets, products and processes to compete. Innovation through technology is one approach these companies are increasingly pursuing.

Canada ranks second in the world in the proportion of research and development (R&D) funding invested in higher education institutions (particularly universities).[2] (http://www.nserc-crsng.gc.ca#note2) The majority of this funding is from government sources, with a concentration from the federal granting agencies. Correspondingly, Canada's 50-odd universities are highly rated for their contributions to scientific and technical knowledge. Canadian colleges are excellent institutions for training practical graduates and are increasingly interested in conducting applied research with companies. These institutions have outstanding technical capabilities that are of interest to innovating companies. Higher education institutions in Canada and around the world are structured for training graduates with timescales measured in years; they are places where the open exchange of ideas is encouraged, and success for researchers usually required creating new (potentially disruptive) knowledge. Many years typically elapse before some of this knowledge (in combination with other research results) is applied for the benefit of society.

The larger companies in Canada, which conduct the vast majority of private-sector R&D, capitalize on these public sector capabilities—Canada's universities capture among the world's highest percentage of private-sector R&D funding. These companies have the resources and patience to establish relationships with various academic research groups, negotiate collaborative agreements and, more importantly, define and fund long-term, pre-competitive research projects that capitalize on post-secondary strengths. There are perhaps 3,000 companies that currently conduct collaborative R&D with universities and 3,500 that work with Canada's colleges and polytechnics.

The clear majority of the 20,000 companies in Canada that conduct R&D do not directly work with universities and colleges. Most of these companies are small (less than 50 people) and, on average, invest less than $250,000 per year in research and development. These companies generally conduct innovation projects that aim at **incremental** improvements to existing products or processes; are **executed in weeks**, and are **exploited commercially** (rather than published). A significant proportion of these companies conduct research episodically; meaning they are unlikely to have full-time R&D staff (i.e., approximately 50 percent conduct research for one or two years out of every seven years, and only 10 percent conducted R&D on a continuous basis[3] (http://www.nserc-crsng.gc.ca#note3)). The SME's focus on market responsiveness is not aligned with the effort to build long-term research relationships; they don't have money or expertise to negotiate project collaborations and can rarely afford long-term research. Returns on investments from innovation projects are typically expected within 12 to 18 months. The innovation needs of this type of company are not well addressed by university structures and approaches. Addressing the innovation needs of these SMEs represents a significant opportunity to improve the innovation performance of Canada—the technical capabilities and expertise that resides in our post-secondary institutions can be a valuable complement to the capabilities available in the marketplace for an SME.

Innovation is a high risk use of a company's resources, and collaborations to advance an innovation are an even higher-risk investment of time and resources. Companies must trust the organizations they collaborate with—they can more easily establish trust in local organizations that speak the language of the clients and are built to be responsive.

Companies developing a technology or pursuing an innovation need a variety of technical, managerial and financial capabilities during the innovation process. As innovation projects develop, they often reveal new technical requirements. Thus, companies must have fluid access to expertise, resources and capabilities that they lack.

Existing Sources of Private Sector Innovation Support

In a well-developed economic cluster, a wide variety of technical and managerial services are available from companies in the cluster (e.g., from contract development through to specialized personnel support). For clusters that are advancing disruptive ideas for which cash flow or bank financing is not available, local sources of venture financing are essential. Canada's diverse regions often contain nascent clusters that lack sufficient infrastructure, resources or the scope of capabilities to effectively support private sector innovation.

There are a variety of public sources of innovation support for Canadian SMEs. Provincial governments often take a leading role in creating and supporting policies to stimulate their economic regions. Regional Economic Development Agencies (REDA) such as Western Economic Development (WED), and the Atlantic Canada Opportunities Agency (ACOA) are often sources of partial financial support for innovation projects. National Research Council Canada – Industrial Research Assistance Program (NRC/IRAP)[4] (http://www.nserc-crsng.gc.ca#note4) and its Industrial Technology Advisors (ITA) provide advice, referral and financial investments for R&D projects. The Scientific Research and Experimental Development (SR&ED) tax credit programs are a vital financial lifeline for many small research-intensive companies.

Canada's post-secondary research institutions have very interesting technical capabilities that complement the financial and managerial linkages offered by REDAs, SR&ED and IRAP, to local companies. However, the defining characteristics of universities (long training cycles, an information-sharing culture and a knowledge creation drive) limit the ability of those companies to access these specialized and high-value technical capabilities. Canada needs organizations that can draw on post-secondary capabilities, including expertise and other resources, to support the innovation needs of companies. Increasingly, nations are focusing on their research and innovation infrastructure to help their companies compete globally.

The Opportunity for Technology Access Centres

Based on this important gap in innovation support for SMEs, NSERC envisions the creation of a network of Technology Access Centres. Technology Access Centres are small centres with a core staff funded by the Technology Access Centre program; physical facilities associated with, and generally located, on the campus of their parent post-secondary institution; and participation from the students and faculty of the parent institution.

These centres will:

- focus on an area important to companies in their region;
- provide technical services (testing, equipment) to clients, generally by drawing on capabilities at the college or in their own facilities;
- conduct innovation projects with clients involving staff and students from their host institution;
- provide technical and management advice for clients' innovation and technology projects;
- link SMEs with solution providers (referrals);
- operate on a cost-recovery basis;
- be a hub for the support of technology innovation in their region; and
- work as part of a network of similar centres across the country.

The Technology Access Centres will also link to other innovation support capabilities (IRAP, economic development actors, other post-secondary institutions, NRC institutes, and CECRs). Technology Access Centres can be excellent host sites for IRAP Industrial Technology Advisors. While NSERC has a role in realizing Technology Access Centres, other government agencies have essential roles (see A Collaborative Partnership (http://www.nserc-crsng.gc.ca#collab_part) below).

Benefits

Technology Access Centres provide benefits to both the target business sector and the host academic institution(s).

For a region's companies, Technology Access Centres offer:

- a responsive provider for specialized technical services, applied research support and advice;
- a first point of contact for advice and networking on technology issues (particularly effective if the IRAP Industrial Technology Advisor is co-located at the Technology Access Centre); and
- technical capabilities concentrated in the domains important to the region.

Successful experiences with Technology Access Centres will encourage companies to further pursue success through innovation.

Typical benefits to the academic hosts of the Technology Access Centres include:

- access to an excellent training ground for students;
- a practical and convenient tool for faculty and staff researchers to gain insight into business issues;
- a portal for information exchange on the innovation and technology development processes ongoing within companies;
- a central point for SMEs to contact when seeking to access post-secondary capability; and
- a visible presence communicating the importance of the institution as an essential part of the region's innovation system.

Technology Access Centres capitalize on and emphasize the excellent capabilities available in our post-secondary institutions.

Benefits to governments from investing in Technology Access Centres include:

- an effective tool to increase the economic innovation capacity of a region;
- strong leverage from the strong R&D base already created using government funding;
- a highly visible and strongly marketed innovation support presence; and
- the centres building-on and retaining technical competence essential for the economic viability and growth of companies in their regions.

Parameters

A typical Technology Access Centre will have:

- a facility with secure access on a campus of its parent institution;
- core technical capabilities relevant to a key regional economic need (analysis/test equipment);
- a core management staff (manager, marketer, administrator) supported by NSERC);
- employees supported from contracts; and
- students and faculty participating as part-time employees or guest workers.

Technology Access Centres can be an excellent host site for NRC/IRAP ITAs and/or regional economic development agents.

The Technology Access Centre grant will provide up to $350,000 per year (covering core administrative personnel and perhaps one or two technical experts). Other resources required to enable the success of Technology Access Centres includes support for the participation of faculty and staff from the college or university in the centre (faculty release) and funding for infrastructure and equipment where appropriate.

With more than 150 college campuses and fifty universities, at least two hundred centres are likely needed to provide effective access to their capabilities for the 20,000 companies that do R&D in Canada.[5] Two hundred Technology Access Centre grants will require approximately $90 million per year (funds for TAC grants, and related project and scholarship support).[6]

A Collaborative Partnership

Technology Access Centres help their host institutions have a role supporting economic development in their region. The foci for the centres in a province or region can be defined by/with collaborating provincial and federal agencies, and funded on a competitive basis. In addition to NSERC's support for the centres' core administration, some centres will need infrastructure (equipment, renovations and perhaps facilities). The involvement of faculty in these centres will be enhanced if teaching relief is provided (particularly for colleges where research is generally not a mandated element of faculty responsibilities). Canada Foundation for Innovation's regional development agencies can provide equipment support, while provincial agencies can provide teaching relief for faculty.

Governance

Technology Access Centres could be (not-for-profit) corporations owned by a post secondary institution. The board of such a centre would be composed of representatives of the local companies, the host institution and the economic development actors important in the region (REDAs, IRAP and chambers of commerce). The centres provide reports regarding their interactions, outputs and financial activity to their funders each year and are re-evaluated every five years. Alternatively, Technology Access Centres can be specialized departments of colleges with Advisory Boards that represent internal and external stakeholders.

Metrics

The objective of Technology Access Centres is to enhance the ability of companies, particularly SMEs, to solve problems and become more productive and innovative through access to technology, expertise and equipment.

In achieving this objective, Technology Access Centres will realize private sector cash in excess of their operating support from public sources. It is anticipated that the average private sector cash amount per centre will be at least three times the core operating support for centres with at least five years experience. Similarly, by the fifth year, the average centre will have a staff of ten full-time equivalents, including faculty and staff on (partial) release from their institutional responsibilities.

Immediate outcomes that signal that Technology Access Centres are realizing this objective include:

- the number of clients using services of these centres;
- the number of jobs created by companies as a result of successfully using the centres; and
- The return rate of clients.

While the performance expectations for Technology Access Centres will vary with factors that include the private sector focus, the number of years a centre has been active and the regional opportunities, the following measures signal the overall level of impact anticipated from these centres:

Measure	Target
The number of clients using services	55 per centre per year
The number of jobs created by companies	3 per centre per year

It is expected that the performance of a Technology Access Centre will typically take up to five years to realize a significant impact.

(http://www.nserc-crsng.gc.ca)The Quebec Experience: College Centres for Technology Transfer

Quebec has established a network of 41 Centres collégiaux de transfert de technologie (CCTT), with plans for a total of 45. The network was built over 25 years. The Quebec CCTT network is a strong performer in Quebec's system of innovation. A recent evaluation (2008)[7] (http://www.nserc-crsng.gc.ca#note7) provides compelling evidence of their impact. Twenty-eight of the CCTTs participated in the evaluation and their clients were surveyed. The evaluation reports the following:

- The CCTTs earn, on average, $3.30 from companies for every $1.00 of Quebec government support. This leverage on the core support varies between centres and is strongly affected by the strength of the sector and region addressed by the CCTT.
- By the end of their first term, some centres have private sector revenues exceeding 300 percent of the core funding, while others are barely able to match the core funding. The Quebec Government considers the strength of the economic sector addressed by each CCTT, as well as the importance of that CCTT to its region, in deciding whether to renew a CCTT.
- The median number of partners per CCTT is 55; the average is closer to 96.
- The 28 CCTTs employ 340 technicians (representing a skilled workforce supporting SMEs).
- Companies working with CCTTs are significantly more successful with innovation projects than those who are not:
  - process innovations: 79 percent success with CCTTs versus 43 percent without;
  - product innovations: 69 percent success with CCTTs versus 48 percent without;
  - organizational innovations: 85 percent success with CCTTs versus 45 percent without.
- Companies have created more than 240 positions per year based on projects with CCTTs.
- Sixty-eight percent of CCTT clients are SMEs (less than 250 people).
- Clients report high satisfaction with CCTTs on virtually all measures.
- The average CCTT support is $446,000 per year (operations). This funding is provided by two Quebec departments (Education and MDEIE).
- CCTTs are also able to get financing from the provincial and federal governments, and CFI for equipment and infrastructure. This amounts to approximately $0.5 million per CCTT per year for 2006.
- Half of the clients of CCTTs are within a 100 kilometre radius of the CCTT.
- Sixty-two percent of CCTT clients are manufacturers.
- On average, 55 students are trained each year by a CCTT, and three professors (full-time equivalents) participate in applied projects.
- On average, CCTTs have approximately 11 full-time-equivalent technical staff.
- CCTTs are effective in creating projects that link clients with academic expertise.

(http://www.nserc-crsng.gc.ca)Frequently Asked Questions

1. **NRC already has a number of institutes and technology centres across the country. How are Technology Access Centres (TACs) different?**
   The TACs complement the NRC's institutes and technology centres (TACs are smaller scale and more local). Technology Access Centres are owned by a local post-secondary institution and feature strong local participation on their management board. NRC's institutes have core research and development capabilities that compare with other research institutes internationally, and are controlled centrally. They have a national responsibility within their technical/sector domain. A typical institute has at least 50 full-time staff, plus guest workers (researchers) and students.

NRC's four Technology Centres (Hydraulics, Transportation, Aerospace and Composites) have substantial staff complements and strong technical capabilities. Technology Access Centres will have smaller core resources and be more focused on supporting R&D by local SMEs within an area of focus.

2. **The government recently created a number of Centres of Excellence for Commercialization and Research. How are these different?**
   The parameters for the Centres of Excellence for Research and Commercialization funded under this program emphasize technology commercialization. Generally, this means a focus on creating commercially viable products and, perhaps, companies from ideas resulting from academic research (e.g., Green Chemistry Centre). Such ventures are higher-risk/higher-reward propositions than the incremental innovations targeted by Technology Access Centres. Technology Access Centres will focus on addressing their clients' problems by applying the capabilities available to them.

3. **Do these centres compete with consultants and companies provide services in the private sector?**
   No. Technology Access Centres have an important role in referring clients to private sector suppliers of innovation support services. In cases where companies are unable to provide the service required, Technology Access Centres can fill the gap. Technology Access Centres can also involve consultants and service providers as part of technology projects. The Quebec experience with CCTTs shows that the clients of CCTTs lack resources to access commercial services.

4. **Quebec has a large number of CCTTs (College Centres or Technology Transfer). How are these different?**
   These centres are largely modelled on the CCTT system. That system has been successful in building innovation capability in Quebec's numerous and diverse regions. The first CCTTs started in 1985, and there are now 41 CCTTs. In Quebec, for example, there are centres on laser welding (La Pocatiere), and textiles (St. Hyacinthe). A similar model has been implemented in Europe (France has a network of some 200 CRITTs).

5. **Why do we need these centres? Can't universities and colleges meet the same needs?**
   Universities and colleges have structures and policies to effectively train tomorrow's workforce and generate new knowledge. Decades (perhaps centuries) of experience has shown that universities resist changes that would see them stray from this mandate. Most developed countries have support infrastructure for economic innovation available outside of, but associated with, their universities and colleges (e.g., Germany, France).

6. **If I understand correctly, NSERC is only proposing to provide support for approximately three positions at the TAC? Where will funds for infrastructure, maintenance, faculty release and operations come from?**
   TACs are envisaged to be substantially self-supporting from revenues received in working with clients. However, their colleges will be able to apply for CCI's ARD project grants, as well as be able to host students with industrially-oriented scholarships with well defined research/development projects. Collaborating provincial governments can provide faculty release (particularly for college faculty). Equipment and infrastructure funding may be provided by regional agencies, provincial governments or other government agencies (i.e., CFI). This is the experience of the CCTTs in Quebec.

7. **How do the envisaged Technology Access Centre grants differ from the Innovation Enhancement (IE) grants?** (http://www.nserc-crsng.gc.ca/Professors-Professeurs/RPP-PP/CCI-ICC_eng.asp)

The majority of TAC interactions with companies are likely to be technical services (45 percent), followed by applied research projects (40 percent). In contrast, IE grants aim to enable a college to build and demonstrate a significant level of competence in applied research in a field. IE grants ($2.3 million over five years) are focused on supporting project expenses, although up to 20 percent can be used for such things as administrative or marketing support.

8. **Can TACs apply for NSERC's College and Community Innovation program grants?**
   TACs can provide services for projects funded by a CCI grant held by their host college.

9. **Can an institution have more than one affiliated TAC?**
   Yes. Given that Technology Access Centres are focused, it is quite reasonable to have more than one TAC, each with a clear and distinct business focus (e.g., bio-energy and mineral processing).

10. **How many Technology Access Centres are envisaged?**
    Canada has in the order of 150 community colleges, 63 of which are currently eligible to manage NSERC funds. Some of the colleges have multiple campuses. It is reasonable to expect that approximately 200 TACs could significantly increase the ability of SMEs to access the strong post-secondary capabilities in Canada. With a target of 55 clients per year, 200 TACs would assist about 10,000 companies (there are about 20,000 companies that conduct R&D each year. While this discussion paper describes a five-year ramp-up, a more phased approach is also possible.

11. **Why is NSERC leading this?**
    This initiative is in response to an urgent need identified in the development of NSERC's Strategy for Partnerships and Innovation.[8] (http://www.nserc-crsng.gc.ca#note8) The initiative also builds on experience NSERC has gained on the potential for colleges to support economic innovation through the College and Community Innovation program. Others have recently proposed similar initiatives (Polytechnics Canada, Association of Canadian Community Colleges). The participation of other government agencies is important:
    - Provincial and regional agencies to define foci for the needed centres.
    - Provincial governments to provide faculty release.
    - CFI, regional agencies and/or provincial governments to provide infrastructure and equipment funding.
    - NRC/IRAP for locating Industrial Technology Advisors as appropriate.

12. **Does NSERC's involvement mean Technology Access Centres outside the natural sciences and engineering will not be eligible?**
    The general areas of foci for the centres will be defined with partnering government agencies and can take place across the full spectrum of economic activity in Canada. The involvement of sister granting agencies might enable support for Technology Access Centres in an even wider variety of fields. Note that 62 percent of the CCTTs in Quebec are focused on manufacturing areas, and approximately one-third of CCTTs are in resource areas (mining, forestry, fisheries, etc.). This suggests that the natural focus of a significant number of Technology Access Centres will fall within the natural sciences and engineering.

13. **CCTTs have demonstrated a natural fit for the concept with colleges, and it is expected that the clear majority will be hosted at colleges. Are universities really that interested in centres that provide technology services and conduct applied research projects local companies?**
    In short, yes, some may be. Universities have a wide spectrum of activities, from purely fundamental explorations to applied consulting. Universities increasingly are seeing that a significant opportunity lies in longer-term collaborative research. In the regional meetings for the

Strategy for Partnerships and Innovation, faculty noted that companies often come to a university for access to facilities, return for access to expertise and, potentially, return for longer-term collaborations.

14. **Are these centres for technology commercialization (of institution technology)?**
Technology Access Centres are intended to respond to company innovation needs. Other vehicles exist (including Centres of Excellence for Commercialization and Research, and technology incubators) to assist institutions and others intent on commercializing promising technology. TACs can provide technical services to funded companies with technology development activities.

15. **With funds for approximately three staff, how will these centres support the staff needed to serve SMEs?**
Technology Access Centres draw most of the operating funds from revenues received from clients. This supports the broader staff complement.

(http://www.nserc-crsng.gc.ca) [1] Much of the background concepts presented here are drawn from input received from industry, academia and government in the Strategy for Partnerships and Innovation regional meetings (35 meetings involving 400 participants). The Strategy for Partnerships and Innovation can be found at http://nsercpartnerships.ca/_docs/SPI_e.pdf (http://nsercpartnerships.ca/_docs/SPI_e.pdf) .

(http://www.nserc-crsng.gc.ca) [2] Colleges receive approximately 3 percent of NSERC's current budget, while 93 percent flows to universities and university student scholarships and fellowships.

(http://www.nserc-crsng.gc.ca) [3] Personal correspondence with Ron Freedman, Impact Group (Nov. 2009).

(http://www.nserc-crsng.gc.ca) [4] NRC/IRAP = National Research Council of Canada's Industrial Research Assistance Program.

(http://www.nserc-crsng.gc.ca) [5] For the purposes of calibrating the number of centres needed, in fiscal year 2008-09, Quebec had 20.5 percent of NSERC funding and 41 CCTTs. Scaling also suggests that approximately 200 TACs would be appropriate. As another point of reference, the Centres collégiaux de transfert de technologie (CCTT), on average, serve 100 clients per year. A network of 200 TACs would likely be able to serve a majority of the 20,000 R&D-active companies in Canada.

(http://www.nserc-crsng.gc.ca) [6] While the concept has been proven in Quebec, a phased approach would be prudent to implementing the full network across Canada. (http://www.nserc-crsng.gc.ca)

(http://www.nserc-crsng.gc.ca) [7] *Rapport d'évaluation de la performance du dispositif des centres collégiaux des transferts de technologie (CCTT).* Avril 2008 (ISBN électronique 978-2-550-53460-0).

(http://www.nserc-crsng.gc.ca) [8] Natural Sciences and Engineering Research Council of Canada Strategy for Partnerships and Innovation (http://www.nsercpartnerships.ca/_docs/SPI_e.pdf)