Study on the new Capstone Research Funding Organization

Submission to the Standing Committee on Science and Research

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POLYTECHNICSCANADA

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About

Polytechnics Canada is the voice of leading research-intensive, publicly supported polytechnics and institutes of technology. We advocate for federal action in areas where polytechnics provide solutions for a more innovative, productive and globally competitive country. Polytechnics Canada members play a critical role in addressing some of the country's greatest challenges. Through their facilities and networks, our members provide meaningful solutions to industry problems and accelerate knowledge transfer.

Cover photo courtesy of the Northern Alberta Institute of Technology (NAIT) and the institution's applied research of restoring peatland ecosystems impacted by oil and gas extraction.

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Context

Though Canada makes considerable investments in academic research, its struggle with productivity is well documented. Knowledge mobilization remains a significant challenge. It is no longer good enough to invest ever-increasing amounts in theoretical, investigator-led research without a corresponding investment focused on the translation of discoveries into market-ready solutions.

The capstone research funding organization has the potential to address this shortcoming. An agency responsible for multi-disciplinary, impact-driven and challenge-focused research should ideally identify where Canadian innovations can address real-world challenges. By drawing together players across the research ecosystem, it can do something the Tri-Councils have largely failed to accomplish: the translation of research into products and services with a focus on commercialization, working prototypes and production-ready solutions in areas of critical importance to Canada's productivity.

To achieve this level of ambition, the capstone organization must differ from the existing research funding agencies. Using the same blueprint, following the same path or listening to the same voices will result in more of the same. Pragmatic solutions to pressing national challenges – the adoption of technology, addressing housing shortages and supporting an aging population – requires an independent body with a clear mandate to review recent and current research in order to draw together the players best positioned to activate results and boost productivity.

As the Standing Committee on Science and Research considers recommendations for a new capstone organization, Polytechnics Canada sees tremendous value in the creation of an organization focused on connecting academic research to the innovation supply chain.

The Polytechnic Advantage

In its August 2024 report, Polytechnics Canada demonstrated the substantial return on investment of applied research – between $8.09 and $18.49 for every input dollar. By derisking R&D for businesses, polytechnics make innovation more accessible. Projects respond directly to industry-defined challenges, with partners retaining intellectual property from these collaborations, enabling them to commercialize products freely and without being hostage to shared IP.

These impactful research partnerships result in business growth, create jobs and attract follow-on investment from the private sector. Over the past three years, polytechnics have attracted matching funds for every dollar invested by the federal government. Polytechnics excel at challenge-driven collaborations by operating at the speed of business with partners looking to solve real challenges and commercialize the results.

Priorities

We recommend the new capstone research organization take a mission-driven approach to thorny national and international challenges, with the flexibility to address others as they arise. Such an approach requires full appreciation of capacity in every corner of Canada's research ecosystem.

Recognizing an established bias for investigator-led research of the type undertaken by traditional universities – where 97.1 per cent of all Canadian government investment in academic research currently flows – we feel it necessary to explicitly ask that an examination of ecosystem strengths include polytechnic and college capacity. Canada is currently underutilizing the sector's expertise when it comes to undertaking research informed by partners including businesses, non-profits, governments and other public players. For example, discovery research related to artificial intelligence requires implementation pathways for main street businesses and organizations in every corner of the country. Strategic engagement and program design dialogue should seek to overcome this bias.

Industry engagement in research collaborations should be an important goal of the new capstone research organization, driving input from those positioned to inform the problem statement and implement solutions. To support industry involvement, we recommend systems support efficient decision timeframes to ensure the new organization operates at the speed of business.

Key Recommendations:

- Identify priorities and focus for the new capstone research organization
- Assess capacity and expertise to address those priorities across the research ecosystem
- Encourage and support inter-disciplinary partnerships, including with industry partners who are positioned to test and implement research findings

Structure

Unlike traditional research investments that assume discovery research will trickle into the market, we recommend that the new organization activate research expertise from the entire community – business, non-profits, Indigenous communities, polytechnics and colleges – to work collaboratively in a challenge-driven environment. By requiring a diversity of contributors, such a model would encourage stronger participation and draw on the strengths of those best positioned to drive commercialization.

Giving coherence to the domain-driven research supported by the Tri-Council agencies and driving mission-driven, interdisciplinary research will require insights from and the expertise of contributors outside of today's research structure. We recommend that the governance structure be informed by a clear ambition to drive collaboration among experts across disciplines, ideally with a primary focus on creating economic and social impact.

This approach requires a diversity of contributors with knowledge of the current strengths in our domain-driven system but suggests that other voices will play a critical role. The advisory board should include representatives of business, non-profits, Indigenous communities, polytechnics and colleges to

ensure a greater breadth of expertise inform the capstone research organization. To ensure these voices are adequately heard in program design, we recommend the President come from industry rather than the research community.

The new capstone research organization must have a budget that enables it to undertake mission-driven research separate from the Tri-Council agencies. This will ensure the new organization can encourage and support new models and approaches to research, better addressing the pragmatic challenges Canada faces.

Systems and processes must also enable funding to flow at the speed of business to further encourage broad participation. Lengthy review processes make it difficult for partners from outside the research community to commit. One approach might be to identify critical challenges for the research community to solve, encourage and support the development of expert networks, then fund those with the highest potential for impact. This approach ensures business partners and projects can come online without additional delay.

Key Recommendations:

- Ensure the organization's Advisory Board is made up of representatives of business, non-profits, Indigenous communities, polytechnics and colleges
- Organization leadership should come from industry, where a challenge-driven mindset will encourage and enable new approaches
- Provide the organization with a standalone budget to support mission-driven network development and projects, preferably one that enables industry engagement

Future Ambitions

We believe polytechnics are underutilized and under-resourced partners in translating academic research into economic impact. As the new capstone research organization addresses national challenges, it is essential for its future mandate to consider mechanisms for more evenly distributing research support funding. This would ensure that all players in the academic research ecosystem have the necessary resources to build and sustain infrastructure aimed at solving national challenges.

As this new organization is established, it will also be critical to consider how existing and longstanding eligibility requirements support the status quo and make it difficult for new actors to participate.

Barriers include:

- Lack of faculty-release provisions
- Relatively few programs/grants that enable polytechnic/college leadership
- Application processes geared to individual PIs rather than Research Offices
- Adjudication criteria that favour research-intensive CVs
- Decision timeframes that discourage industry involvement

A comprehensive future review of federal research funding programs is crucial to identify opportunities where polytechnics and colleges can contribute to national priorities and industry needs. Polytechnics excel in applied research that directly addresses practical challenges and fosters innovation in key sectors such as advanced manufacturing, clean technology and healthcare. Evaluating existing programs through this lens can unlock new avenues for collaboration and ensure that funding opportunities are accessible and tailored to their strengths.

Key Recommendations:

- Dismantle existing barriers to the full activation of applied institutions within Canada's research programming as a way to better translate research to economic and social impact

Conclusion

Though Canada's research spectrum encompasses everything from discovery research to pragmatic applied supports for business partners, funding structures haven't evolved to include new approaches and new players. An uneven playing field and poor understanding of ecosystem strengths make it difficult to connect researchers and research expertise across disciplines, institutions and across the country.

There are opportunities to better map and exploit Canada's rich research ecosystem and areas of expertise across the post-secondary sector. This stands to enable collaboration beyond established local/regional relationships on topics of intense or emerging national interest, such as climate change and housing, particularly as these priorities require a breadth of expertise, space, equipment and technology. We consider this an important role for the new capstone research organization.

We encourage an examination of networked research models and best practices in Canada and abroad for exemplars of challenge- or expertise-driven collaborations. These approaches should inform the new capstone research organization's primary purpose, driving greater impact on challenges of national and international importance.

CASE STUDY:	Reading Assistance Software
Principal Investigator:	Asma Paracha, PhD
Project Partner:	Quillsoft

Seneca POLYTECHNIC

Project Profile

This project enhanced the WordQ software application developed by Quillsoft. The company is a joint venture of its founder and Holland Bloorview Kids' Rehabilitation Hospital. The software assists individuals with reading and writing impairments. These impairments are often a result of conditions such as dyslexia or ADHD. The software uses predictive capacity to assist with writing and text-to-speech to assist with reading comprehension. The product is available on several platforms, including Windows, iOS and Chrome browsers. The partnership with Quillsoft is ongoing.

Funding

The project was co-funded by the company and NSERC. The company covered 50 per cent of the project's costs.

Student Engagement

Throughout the project, it generally employed one full-time or two part-time students from the computer science or software development programs. Four students who worked on the project were subsequently hired by the company on a full-time basis. The company uses its co-op and applied research collaborations to recruit qualified employees.

This collaboration empowered Quillsoft to hire additional staff. Seneca Polytechnic graduates were identified as having the high-level practical skills necessary for these roles.

Intellectual Property

Quillsoft has opted to protect its intellectual property through trade secrets rather than patenting.

Social Benefits

The company's product increases the capability of persons who have challenges with reading or writing, including persons with physical disabilities or recent immigrants with limited English language skills. As such, the product has broad social benefits. The software is widely used in schools throughout North America.

Export Potential

Quillsoft has operations worldwide.

CASE STUDY:	Bovine Pathogen Genomics
Principal Investigators:	Abhinaya Venkatesan, PhD Paul Adams, PhD
Project Partner:	WestGen

KPU KWANTLEN POLYTECHNIC UNIVERSITY

Project Profile

This research involved the development of a qPCR (quantitative real-time polymerase chain reaction) test for bacterial diseases in dairy cattle, specifically *Mycoplasma bovis* and *Salmonella Dublin*. The goal of this project was to produce tests for these pathogens that are better, faster and cheaper using qPCR test methods, a diagnostic technology which proved valuable during the COVID pandemic because it is low cost, easy to use and rapidly returns results.

WestGen, a beef and dairy industry group of companies focused on genetics and reproduction, articulated the need for better tests for these diseases. A research plan to produce targeted diagnostic tests was developed in collaboration with the Applied Genomics Centre at KPU. Funding was first received in 2019. Since that time, KPU has worked closely with WestGen and their industry partners (e.g. farmers, veterinarians).

The genome analysis and test development were undertaken at KPU, however, this work was accompanied by considerable field work on dairy farms. As well, while production of the tests was the primary goal of the research, an important byproduct of this project has been the development of improved disease management and testing practices in the industry. The qPCR tests for the *Mycoplasma bovis* and *Salmonella Dublin* pathogens are now in the initial stages of commercialization.

Funding

The project is co-funded by the WestGen Endowment Fund and NSERC.

Student Engagement

One or more students have been involved with this project every year, both in the lab and in the field. As much of the fieldwork has been with the end-user farming community, this experience has been particularly valuable for enabling students to connect scientific research with the needs of industry and understand how solutions will be implemented. Involvement in the Bovine Pathogen Genomics project led two of the students to pursue graduate studies.

Company Benefits

An important partner benefit of this project was the ability to focus on a tangible industry-identified issue. Dairy farmers who provided their farms for testing are already experiencing direct and immediate economic impacts due to the improved ability to detect pathogens and then deploy effective disease management strategies which improve animal health outcomes and reduce economic loss. Commercialization of these tests will expand these benefits to the rest of the Canadian dairy industry. Beyond these benefits, reducing the likelihood and impact of these pathogens also serves to decrease the potential harm to export markets for affected animals and/or their products.

Social Benefits

Keeping cattle healthy and disease-free is extremely important to the public, so effective testing for harmful pathogens is essential. Food safety, biosecurity and improved management of animal health are important social benefits of this project.