

The Myth of the Better Mousetrap

A Review of Canadian Government Programs
for Research, Innovation, and Commercialization

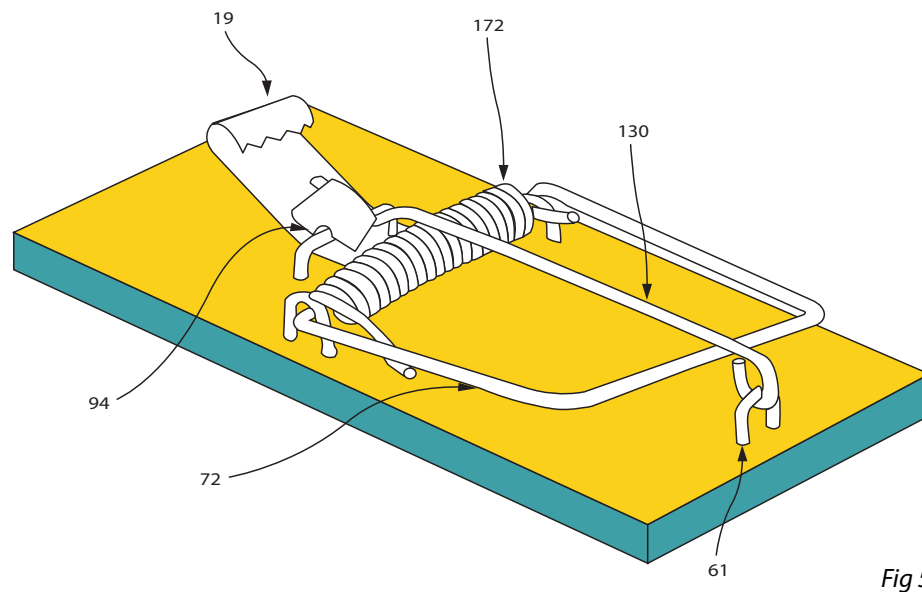


Fig 5

Contents

Summary	3
Introduction	5
Opportunity 1. Focus on Commercialization	9
Opportunity 2. Establish Strategic Objectives	12
Opportunity 3. Focus on Demand Creation	14
Opportunity 4. Improve Program Design Through Rigorous Research and Evaluation	18
Opportunity 5. Eliminate Scientific Research and Experimental Development (SR&ED) Tax Credits	22
Conclusions	24
Appendix A. ISED's 2017-18 Department Results Report	25
Appendix B. ISED's 2019-20 Departmental Plan	26
Appendix C. List of ISED's Programs With Correspondence to Porter's Diamond Model	29
About the Impact Centre	32

Summary

“Without radical changes, we are doomed to continue this slow decline in competitiveness and productivity until it is too late.”

Commonly used productivity and innovation indicators show Canada’s innovation economy declining relative to other countries. Despite large public investments, Canada still trails most of the Organisation for Economic Co-operation and Development (OECD) countries in productivity.

The Canadian government has played a significant role in efforts to reverse this decline. For more than five decades, we have seen the proliferation of new programs at the federal and provincial levels aiming to spur productivity and the growth of an innovation economy—yet without significant improvements in country-level data.

This Impact Brief lays out five opportunities for the federal government to change the nature of its programming to reverse the decline. To arrive at our conclusions, we have reviewed over 25 years of federal government budgets and documents prepared by the key innovation department: Innovation, Science and Economic Development Canada (ISED) and its predecessor, Industry Canada.

Opportunity 1. Focus on Commercialization

Budgetary documents show a continued and strong focus on research and development (R&D). Although innovation is emphasized increasingly, commercialization of research remains neglected. This thinking is analogous to the myth of the better mousetrap, that a better product is all that is needed for commercial success. The first opportunity for the government is to revamp their activities to increase their focus on commercialization and related functions, such as marketing and sales.

Opportunity 2. Establish Strategic Objectives

As the key department in the promotion of innovation for the federal government, ISED’s own strategy plays an instrumental role in advancing Canada’s innovation agenda. Although ISED may have an overarching objective guiding its operations, none of the documentation reviewed pointed to a clear purpose. A significant opportunity is to develop an overarching objective (or set of objectives) for Canada’s central innovation department and turn this into concrete plans whose success can be measured in relation to those objectives.

Opportunity 3. Focus on Demand Creation

Of the challenges that Canada is facing in developing an innovation economy, demand creation is perhaps the most acute. It is likely that we will never have the sufficient local demand to enable our companies to gain experience selling at home before learning how to export. The lack of demand creation programs is a glaring weakness in government programming and one with the greatest potential for positive change and improved results.

Opportunity 4. Improve Program Design Through Rigorous Research and Evaluation

Our innovation-related programs face two key design issues. First, much of the background work done to identify problems in the innovation economy and to inform program design is carried out through opinion-based research that rarely touches on the underlying reasons for the problems at hand. Second, once programs are in place, policy-making and program development tend to set unrealistic targets requiring success rates in excess of what is practical. Innovation programs require more rigorous research during design and more realistic targets during implementation.

Opportunity 5. Eliminate Scientific Research and Experimental Development (SR&ED) Tax Credits

The Canada Revenue Agency (CRA) administers the \$3-billion SR&ED program, which uses a tax incentive to encourage Canadian businesses of all sizes and in all sectors to conduct R&D in Canada. However, the SR&ED filings and surveys currently conducted by the CRA and other federal agencies (e.g. Statistics Canada) do not allow us to capture net benefits beyond expenditures and simple indicators. In the absence of strong evidence, it is time to seriously evaluate whether Canada actually benefits from the SR&ED program. It is our contention that the time for this program has passed, and that the entire program should be phased out and eventually eliminated.

With such a bold and ambitious move, the federal government could free up to \$3 billion a year to focus on demand creation, an area in which Canada has the greatest problem and a large need that is inadequately addressed. It could marry this demand creation to social needs and fund new purchases in areas like health care and clean technology.

In conclusion, if we are to stem the slow erosion of our innovation capabilities, then we must look to opportunities such as those identified above to recast how ISED and other departments (e.g. Finance Canada) provide support to the innovation economy. Without radical changes, we are doomed to continue this slow decline in competitiveness and productivity until it is too late.

Introduction

As a long-standing issue in Canada's discussions on policy, our national "productivity gap" has been spurring analyses, reports, and media articles for decades. About thirty years ago, on January 24, 1979, the Globe and Mail reported on statistics from the now defunct Economic Council of Canada. The statement made on Canada's productivity performance rings true even today:

Canada's productivity performance leaves much to be desired. This country's average annual rate of productivity increase – as expressed by the rate of growth of output per hour in manufacturing – is among the lowest of all industrialized nations.

Exhibit 1 Snapshot of The Globe and Mail Paper Edition (January 24, 1979)

The subject who is truly loyal to the Chief Magistrate will neither advise nor submit to arbitrary measures—JUNIUS.

The Globe and Mail
CANADA'S NATIONAL NEWSPAPER
Proprietor—The Globe and Mail Division of F. P. Publications (Eastern) Limited
444 Front St. W., Toronto M5V 2B5 Telephone 361-5000
The Globe founded 1844 The Mail founded 1872
R. HOWARD WEBSTER, Chairman
A. ROY McGRATH, Publisher
RICHARD J. DOYLE, Editor-in-Chief
CAMERON SMITH, Executive Editor EDWARD MOSLER, Managing Editor
DORIS McNEIL, Assistant Editor OWLAND HOSKIN, Assistant Editor
WEDNESDAY, JANUARY 24, 1979

What's \$37.9-million?

If ever strength was needed in an institution like the Toronto Board of Education it is needed now. It is needed for a variety of reasons, and no one of them at this juncture is more important than the problem presented by tenure (or job security) for teachers at a time when enrollments are dropping sharply, and will go dropping.

The Toronto Board of Education has rejected the traditional pattern of joining other Metro Toronto boards in joint negotiations with the secondary school teachers. Instead of bargaining jointly, the Toronto board has decided to bargain separately with its teachers. It has done this because it wishes to retain a clause which grants teachers tenure. The Metro board wants to drop the tenure clause.

Metro steering committee chairman Gerry Phillips explained, in a letter to Toronto Board chairman Fergus Nelson, "I have no doubt that if this issue (tenure) is not faced head-on at this time it will resurface in the next round of negotiations when actual teachers have been or are about to be declared surplus. The emotional element and the crisis atmosphere which will then exist, coupled with the lack of leadership, will make it difficult for the next

uses to drop as projected and if last year's 2.4 per cent rate of attrition among teachers (those leaving the system voluntarily) continues—and in the present tight job situation the rate is unlikely to increase—the Metro-wide cost of keeping tenure in the agreement over the next five years would be \$64.8-million. The Toronto Board's share would be \$15.5-million.

The Toronto Board is also considering giving tenure to its elementary teachers, who do not now have it. The Metro-wide cost of this would be \$81.8-million, the Toronto cost \$22.4-million.

Metro would have to pay a total of \$149.7-million over the next five years to keep teachers it did not need. Toronto taxpayers would be asked to pay \$37.8-million and, as Mr. Phillips pointed out, if the Toronto Board decides to go it alone, Metro will insist that it pay the extra costs with a levy on its own taxpayers.

Even when trustees are acting in union across Ontario they lack courage. Witness their secret meetings in Toronto this week, of which a trustee opposed to the secrecy said, "If the head of the OTF (Ontario Teachers Federation) had walked into the room, the trustees would have lain down and fanned at the mouth."

The situation is dangerous for the taxpayers, and in the end it must drive the provincial Government to a rational reordering of public control over

the TTC.

Without actually asserting that one interpretation was more accurate than the other, the commission nevertheless felt it was worth going back to the judge for a ruling. Who, after all, could have a better understanding of a report than its author?

Judge Robins obliged by advising the other day that the 160.6 level he had set must be accommodated to the new scale. Otherwise it would "undermine a



The hard part is easier

An unflattering image of the average Canadian's attitude to work is conjured up by the results of a Statistics Canada survey, showing that a typical working adult spends 50 hours a week in leisure activities compared with less than 40 hours a week in the workplace.

As a nation, we are very big on watching television, listening to the radio, reading, viewing or participating in sports, and visiting theatres and concert halls. And what do we have to show for it? Expanding waistlines, contracting productivity levels, and possibly a greater capacity to whine about our declining economic position.

The survey is intended to be no more than a preliminary examination, to serve as the basis for a major study by the Secretary of State, and no doubt it would gain a lot more significance if it could be compared with the proportions of time devoted by other societies to work and leisure pursuits. Still, it does suggest a fair-sized and growing appetite for activity (or inactivity) outside the workplace.

As governments and opposition parties thrash about for the policies they hope will lead us all back to sparkling economic health, the realistic Canadian will bear in mind that he is, to quite a large extent, in the grip of other factors—a major one being the state of the economy of the United States and another the level of technology in the work place. But the readiness of the average Canadian to work for what he considers to be his entitlement is also an essential ingredient of a prosperous mixture.

On that point, J.S. Acheson, president of the Dominion Life Assurance Co. of Waterloo, had this to say at the 1978 annual review: "As individual citizens, we need to realize first that we are not prepared to give up our standard of living, our way of life, and then that we are prepared to pay for it through working harder and/or smarter, through war on waste and through

demand that our corporations and our governments do the same."

In assessing whether we work to a reasonable level of productivity, we are usually aware of documents such as the 1978 annual review of the Economic Council of Canada which, after noting that "over the longer term, productivity growth is the major determinant of the upward trend in per capita income", recalls that "in previous reports, the Council has noted that Canada's productivity performance leaves much to be desired. This country's average annual rate of productivity increase—as expressed by the rate of growth of output per man-hour in manufacturing—is among the lowest of all industrialized nations, though it was slightly higher from 1961 to 1977 than the rate stated in the United States."

Sometimes we focus on the standard of living without giving attention to the quality of life. Suppose it were possible for Canadians to indulge themselves ever more freely in leisure activities without an accompanying fall in productivity or income, would we all be happier?

Probably not, according to research conducted by John Robinson, a communications professor at Cleveland State University. He, too, got into the business of how people spent their leisure time, and he reported: "The pattern is unmistakable: too much free time is a greater burden than too little free time." In other words, the people least satisfied with life were those with the most time to exercise options or choices.

The work ethic, Professor Robinson found, was not dead, but for many the goal of work was leisure—on evenings, weekends, vacations, retirement. His major finding, however, was that the road to happiness is not paved with leisure. It is a pitfall for Canadians to ponder—perhaps during one of those 50 leisure hours per week.

The arbitrator knows best

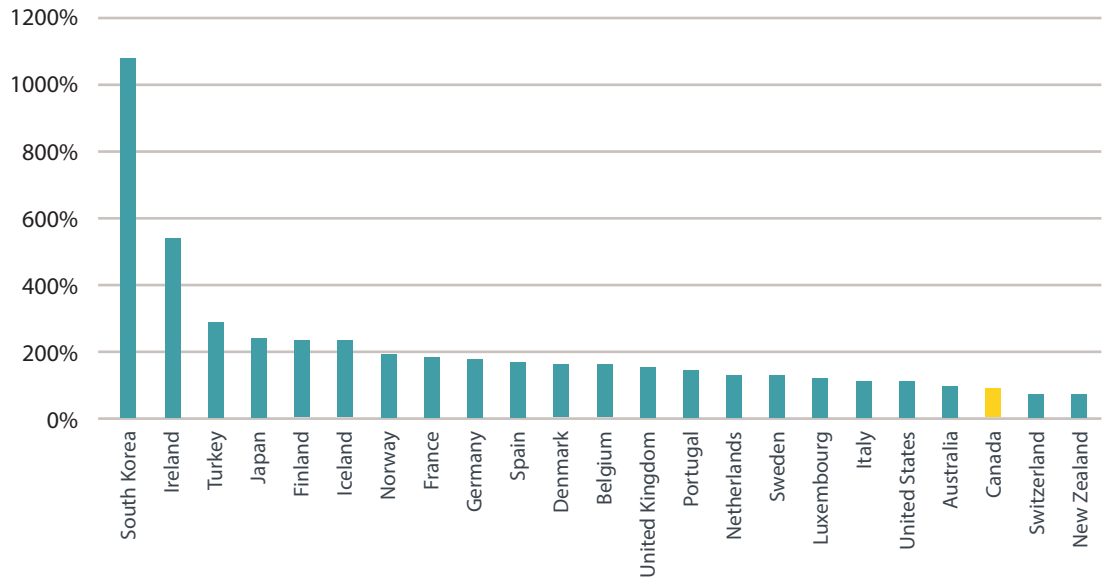
The bill by which the Ontario Legislature sent Toronto Transit Commission's 7,000 striking employees back to work last September awarded the transit workers a 4 per cent interim pay increase, retroactive to the previous July 1, and left it to the arbitrator, Mr. Justice Sydney Robins, to determine the final settlement.

After listening to submissions from both sides in the dispute and weighing the evidence, Judge Robins made his award—a 6.1 per cent wage increase

Heady stuff.

The Organisation for Economic Co-operation and Development (OECD) has been a reliable source of productivity statistics since the early days. Based on their data, Canada's gross domestic product (GDP) per hour worked was US\$27.20 in 1970. By 2018, almost 50 years later, it had grown to US\$49.50, an increase of 82%. While this may seem like an acceptable increase, it pales in international context. Exhibit 2 shows the percentage increase in productivity for 23 of the 35 OECD member countries since 1970: Canada ranks third-last on this metric. Moreover, although Canada was in seventh place in labour productivity in 1970, we fell to 16th place in 2018. (With a drop of nine places since 1970, we are also tied for last place in terms of movement in productivity rankings.)

Exhibit 2
Percentage Increase in Labour Productivity of Selected Countries 1970–2018



Source: OECD

Why is productivity important?

Relative to low-productivity jurisdictions, a highly productive economy produces more goods or services with the same resources, or produces the same level of goods and services with fewer resources. For businesses, increasing productivity increases profits. For workers, it can result in higher wages; and for governments, it translates into higher tax revenue.

Why are we focusing on productivity?

In the classical economic development model, prosperity is derived from selling natural resources. Prosperity is thus limited to the amount of resources available. In a model like this, governments act as owners and distributors of wealth.

In a more modern view of economics, prosperity is created through innovation by firms that create more valuable products and services and thus improve productivity. The government’s role is to create the enabling conditions that allow companies to innovate and create productivity and prosperity. Therefore, the key to success and economic growth in the modern world is through innovation.

What are Canadian governments doing about this?

For more than five decades, we have seen the proliferation of new government programs at the federal and provincial levels aiming to spur productivity and the growth of an innovation economy. These have ranged from direct to indirect incentives that encourage firms to invest in productivity-enhancing tools, research and development (R&D), innovation, and human capital.

Why are we not succeeding?

Despite large public investments, Canada still trails most of the OECD countries in productivity metrics. As a nation, Canada has an underlying structural problem in the economy that is getting in the way of improving productivity. Canada has proportionately fewer large firms than other jurisdictions. This is a significant shortcoming because large firms tend to be more productive than small ones.

Much research has been done on high growth entrepreneurship (HGE) and its impact on the economy. The following findings are detailed in one such study by Henrekson.

- HGE is positively related to per capita income levels.
- HGE is positively correlated with triadic patents per capita
- HGE rates correlate positively with the Global Innovation Index
- As an example, Silicon Valley and Boston have a higher than average share of employment in firms with more than 500 employees.

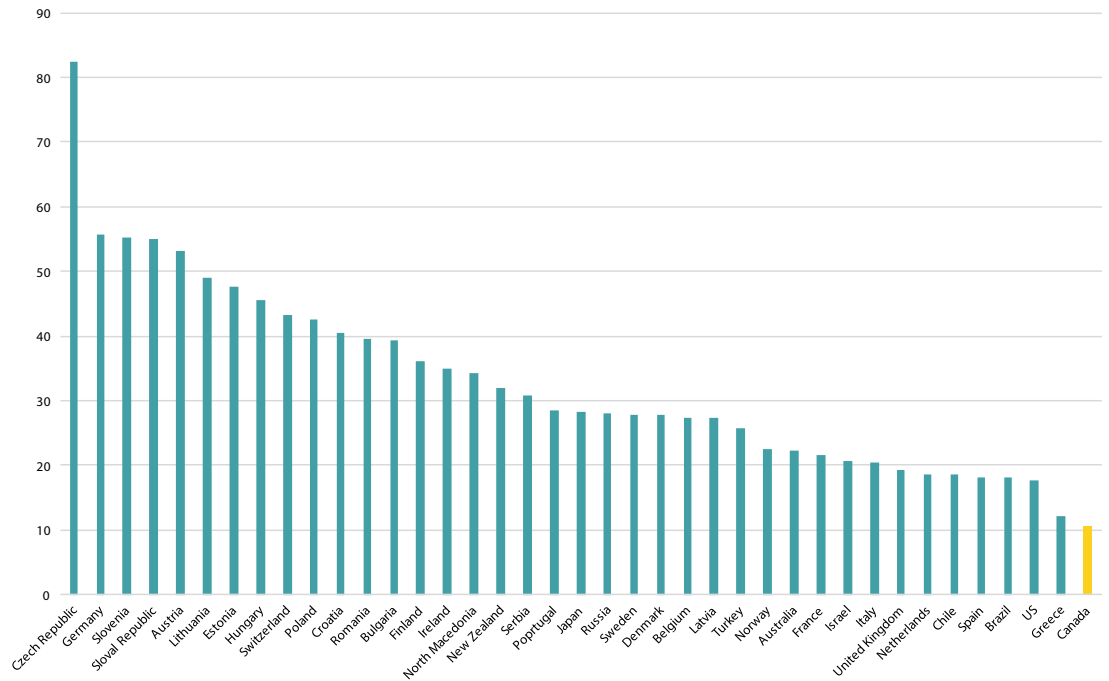
Henrekson, M. and Sanandaji, T., 2014. Small business activity does not measure entrepreneurship. *Proceedings of the National Academy of Sciences*, 111(5), pp.1760-1765.

Exhibit 3 demonstrates just how far Canada lags in the number of companies with over 250 employees. In fact, among countries for which employment data is available from the OECD, Canada ranks last in the production of large companies.

To solve the productivity problem, perhaps we should be asking ourselves how to nurture larger businesses. To date, our research has indicated that at least in the field of technology a series of problems work together to prevent us from growing large tech companies. For example:

1. Canadian firms tend not to focus on large horizontal consumer markets.
2. They raise too little venture capital to fuel growth to world-class levels.
3. They emphasize R&D instead of other critical and growth-promoting business functions (notably marketing and sales).

Exhibit 3
Companies over 250 Employees per 1 Million Population



Source: OECD

The Canadian government has played a significant role in efforts to reverse this decline. However, if the federal government has indeed taken on the responsibility for setting the enabling conditions to nurture innovation, then it would be worthwhile to explore how current government actions could be changed to help develop a more innovative economy. This Impact Brief lays out concrete opportunities for the government to modify its current course.

To arrive at our conclusions, we reviewed over 25 years of federal government budgets and documents prepared by Innovation, Science and Economic Development Canada (ISED) and its predecessor, Industry Canada.

Opportunity 1. Focus on Commercialization

The federal government invests significantly in “innovation” and related activities. ISED has a budget of over \$3 billion this year. In addition, the Scientific Research and Experimental Development (SR&ED) tax incentive program, administered by the Canada Revenue Agency (CRA), is worth just over \$3 billion per year. Together, these two programs constitute a commitment of over \$6 billion per year to boost the innovation economy, representing an investment of \$326 per taxpayer (assuming 18.4 million Canadian taxpayers).

To understand how the federal government interprets the innovation economy, and particularly how that thinking has changed over time, we reviewed all Government of Canada budgets from 1993 to 2019. But, before we jump into the analysis, we first highlight how the government defines the terms that apply to the innovation economy. In particular, three terms were used to express ideas over the entire time span under review; research, innovation, and commercialization. The 2004 budget puts forward more detailed explanations of each:

Research

Creating a knowledge advantage begins with a commitment to research excellence. Not only is leading-edge research a key source of new knowledge and ideas, but it also helps develop the highly qualified personnel that Canada needs. (Government of Canada Budget 2004, p. 133)

Innovation

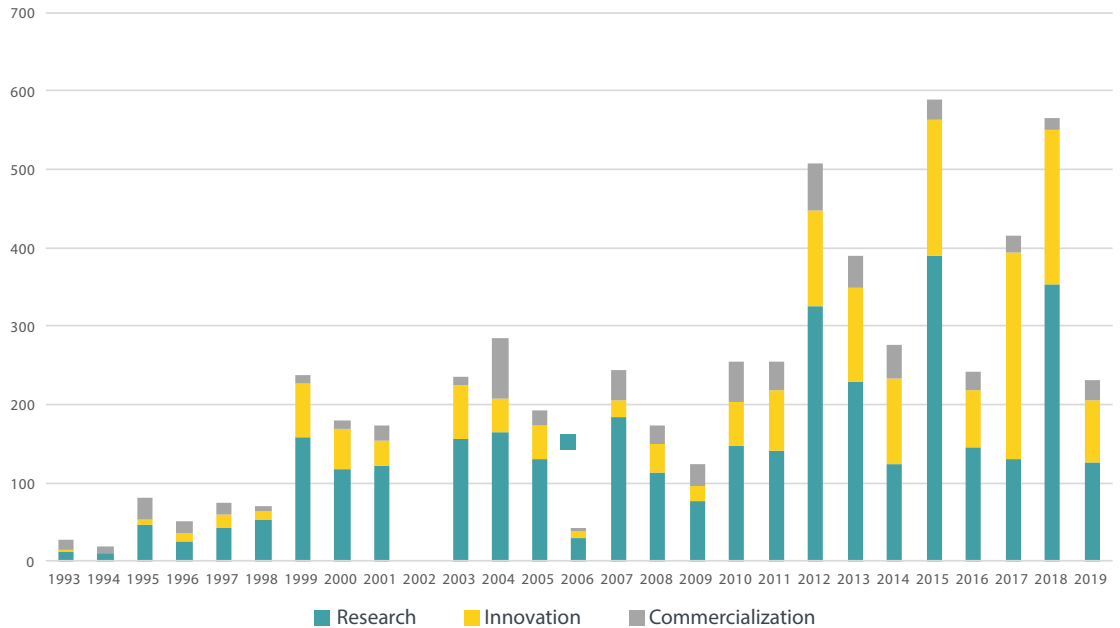
An equally powerful approach is to invest in innovation. Innovation—new ideas—can improve how existing goods and services are produced and allow new goods and services to be introduced. The key ingredients for innovation are research and development, which also require highly skilled individuals and the latest equipment. (Government of Canada Budget 2004, p. 157)

Commercialization

Commercialization is the process through which research discoveries are brought to the marketplace and new ideas or discoveries are developed into new products, services or technologies that are sold around the world. (Government of Canada Budget 2004, p. 133)

If we follow the terms used by the government, the conduct of research results in a new idea, or innovation. The next step entails commercializing that innovation by turning it into a product or service and selling it around the world. With that logic in mind, we can look at how the government has emphasized these activities over time. We conducted word counts in all government budgets between 1993 and 2019. (The budget for 2002 could not be located online.)

Exhibit 4
Word Counts in Government of Canada Budgets 1993–2019



Although research, innovation, and commercialization are mentioned increasingly in budgets (which is not surprising given their importance to the economy), it is difficult to disentangle word counts from the radical increase in the size of the budget documents over the past 25 years. One can see immediately that in many cases “research” is mentioned more often than “innovation” and that they are both mentioned more frequently than “commercialization”. To look at the changes over time, we can compare the relative usage of these terms.

A simple comparison of how many times the term “research” is used relative to “innovation” can help us gauge the importance the government lends to each concept. Over time the ratio has declined, meaning that “innovation” has grown in prominence.

Similarly, the ratio of “innovation” to “commercialization” is on an upward trajectory, suggesting that “commercialization” remains neglected in comparison.

In addition, the relative ratio of the terms “research” to “commercialization” is also increasing, suggesting continued focus on research.

Despite its simplicity, this type of analysis can be very instructive about potential views and assumptions behind programs. The budgetary documents suggest an emphasis on research and innovation, while turning that research and those new ideas into products and services that are then taken to the market are not emphasized to the same extent. If we were to take these as stand-alone documents, the government could be seen as playing a more prominent role in fostering research and innovation rather than the commercialization of that research. This same way of thinking is seen in ISED's 2019–20 Departmental Plan:

Exhibit 5
Word Counts
ISED Departmental Plan 2019–20

Research	72
Innovation	172
Commercialization	19

In contrast to the public sector, the emphasis between research, innovation, and commercialization tends to be reversed in the private sector.

Although marketing and sales are clearly important in getting a technology accepted in the market, the discussion about science and innovation in Canada has paid little attention to this part of the innovation formula. Canada also does not have an indicator that captures business expenditures on M&S while it does have one for R&D. This thinking is analogous to the myth of the better mousetrap, that a better product is all that is needed for commercial success.

The Appendix C lists over 100 programs, with many that are dedicated to science and research or to improving access to personnel and training. There are even programs for providing capital to firms. Yet, there is no program except perhaps the Trade Commissioner Service that deals with M&S. This is truly a great program and of inestimable benefit to Canadian firms wishing to export; but it is the only program that touches on M&S.

M&S is the only business area that is underrepresented from a programming perspective; yet, it is the highest expense area in technology businesses and a significant problem for growing firms. Hence, with a scarcity of initiatives for the development of M&S personnel, this constitutes both a significant challenge and opportunity. ISED is well positioned to develop programs to improve access to qualified M&S personnel, to improve M&S skills, and to promote M&S as a field of employment.

This neglect of M&S may be a key contributor to Canada's laggard innovation performance. We may be soft selling innovation and not backing our inventions with appropriate budgets on M&S that are critical to the wider adoption of products and services. In order for us to become more competitive, Canadian companies must pay more attention to how they market and sell their ideas while policy makers must devise more effective supports that reflect the entire innovation formula—including commercialization and M&S.

Opportunity 2. Establish Strategic Objectives

As the key department in the promotion of innovation for the federal government, ISED's own strategy plays an instrumental role in advancing Canada's innovation agenda. ISED has released departmental plans and results that reveal interesting insights into the fundamental assumptions behind its programming. Appendix A includes a snapshot of ISED's 2017-18 program report (ISED, *2017-18 Department Results Report*, available at http://www.ic.gc.ca/eic/site/017.nsf/eng/h_07615.html). This summary reflects the activities that had been planned under ISED's predecessor under the previous government, Industry Canada.

A look at the report suggests that Industry Canada, when developing its plans was not particularly focused on the holistic development of an innovation-based economy. The summary reveals emphasis on issues such as marketplace competition, foreign investment review, telecommunications spending, and broadband access. It also focused on R&D captured in terms of input and output measures of research (e.g. citation index, numbers of researchers, R&D disbursements to firms). The only substantive indication of any interest in innovation or commercialization was in measuring the percentage of businesses expected to grow their revenue over the next three years.

While not fully implemented yet, the more recent 2019-20 departmental plan represents a substantial improvement in the focus of ISED (ISED, *2019-20 Departmental Plan*, available at http://www.ic.gc.ca/eic/site/017.nsf/eng/h_07622.html). Appendix B includes a snapshot of the renewed focus to be adopted going forward.

There are two major differences in the new plan. First, the current plan has more performance indicators that are results-driven rather than the activity-driven metrics used in the past. Second, while there are still a substantial number of initiatives oriented around research, an increasing number focus on commercialization; only one initiative appears to be centered on innovation.

Clearly, ISED has made some progress at developing plans to foster an innovation economy. Despite improvements, of particular concern is the number of performance indicators for which there are no targets and no measurement of current results. This indicates that programs may have been developed without an understanding of: the extent of the problem to be solved, the objectives to be achieved, or the setting of success measures. This is true for the \$950-million Supercluster Program as well as a number of direct support programs for businesses. Thus, the establishment of strategic objectives presents another key area for further development.

Although ISED may certainly have an overarching objective guiding its operations, none of the documentation reviewed pointed to a clear purpose. Given that fundamental gap, what are the goals of ISED?

- Is it to expand the economy? If so, what is the growth level that we should aspire to? And how can we measure that growth?
- If growth is the objective, then what strategy are we deploying to foster that growth?
- Are we attempting to increase the competitiveness of our country? If so, how?
- Is productivity important, and what level of productivity are we trying to reach?
- How will we drive innovation to improve productivity, competitiveness, and ultimately GDP?

These are examples of fundamental questions that can result in the development of an overarching strategy, and yet, both an overall objective and strategies linked to that objective are missing. Without measurable objectives and strategies, a portfolio of random programs can have individual goals that can be met easily by a government wishing to claim success at economic development. But success in individual objectives does not lead to overall economic success if the program and country levels are not linked tightly, both conceptually and in practice.

A significant opportunity is to develop an overarching objective (or set of objectives) and turn this into concrete plans whose success can be measured in relation to those objectives.

Opportunity 3. Focus on Demand Creation

We can look at the level of individual programs to explore how these might be implemented more effectively. We used Michael Porter's National Diamond framework, which looks at comparative advantage among industrialized nations as a method of determining the focus of government programs (Porter, M.E. *The Competitive Advantage of Nations*, Free Press, New York, 1990). This framework recognizes four pillars for the assessment of a national business environment: (1) factor (input) conditions; (2) firm structure, strategy, and rivalry; (3) related and supporting industries; and (4) demand conditions.

Appendix C lists over 100 programs within ISED; each has been categorized by a pillar as per Porter's framework.¹ The results and key challenges under each pillar are summarized below.

1. Factor (Input) Conditions

A competitive economy needs access to high-quality business inputs such as human resources, capital, physical infrastructure, administrative infrastructure, scientific infrastructure, and natural resources. Most of the programs established by the government fit within this pillar. In total, 82 of the 103 programs listed provided some support to enhance business inputs.

With such a concentration on inputs, it is not surprising that Canada scores well on metrics such as human capital and physical and administrative infrastructure. Canada is also known for "punching above its weight" in research, an expression that is commonly used to describe the country's solid scientific foundation and track record in publications and citations.

In spite of the excellent inputs, there are key issues that must be addressed, including an overarching focus on science, technology, engineering, and math (STEM) careers and R&D to the detriment of other important innovation functions and activities. For example, the description for *People, Skills, and Communities* program in Appendix B suggests that one expected result is a highly skilled Canadian workforce that is equipped for jobs in an innovative and high-growth economy. The performance indicators in this area are:

1. the percentage of professional, science, and technology-related jobs in Canada's economy;
2. the number of STEM graduates in Canada; and
3. the number of Canadians that receive digital and coding skills training and development opportunities through ISED programs.

¹ Our current analysis does not include the almost 50 programs offered through the National Research Council (NRC) and its centres and facilities, the five regional development agencies, or the numerous programs and centres offered through the main research funding agencies: the Canadian Institutes of Health Research (CIHR), the Natural Sciences and Engineering Research Council (NSERC), and the Social Sciences and Humanities Research Council (SSHRC).

The only shortcoming is that all the jobs emphasized relate to R&D. Meanwhile, Canada faces several challenges that necessitate expertise outside the traditional STEM path:

1. Canada's biggest challenge in developing high-growth companies is establishing firms in export markets; and this requires primarily M&S personnel. In fact, a typical successful high-growth company spends twice as much on M&S than on R&D and employs more people in M&S than R&D.
2. Past research carried out by the Impact Centre indicates that the biggest skills gap between US and Canadian firms is in marketing.
3. Canadian labour force statistics show that there are 3.3 times as many sales and service jobs than there are natural and applied science-related jobs (Statistics Canada reports on Labour by Occupation).
4. Despite similar compensation levels between M&S and R&D positions, 92% of employers cite a moderate to extreme skills shortage among M&S employees (2019 Hays Canada Salary Guide).

This focus on STEM is also mirrored in the overwhelming emphasis on R&D across government programming. In Appendix B, the program description for *Science, Technology, Research and Commercialization* includes two areas that specifically deal with R&D. One expected result is that Canadian businesses invest more in R&D. The performance indicators for this are:

1. business expenditure on research and development;
2. percentage of companies engaged in collaborations with higher education institutions; and
3. value of business expenditure on research and development by firms receiving ISED program funding.

A related expected outcome seeks to ensure that Canada has world-leading research capacity. Although this is the section that deals with the commercialization of technology, it has no indicators that pertain to either innovation or commercialization. A section of the plan does focus on creating world-leading superclusters with performance indicators that include:

1. the number of new firms created;
2. the number of anchor firms; and
3. the value of investment leveraged.

However, these three metrics are not the best proxies for commercialization. A more appropriate set would look, for example, at the creation of new products, the entry of firms to new markets, and the growth of those firms over time. Thus, the department is showing again a heavy emphasis on R&D, but little to none on commercialization and related market development.

2. Firm Structure, Strategy, and Rivalry

A country needs rules and incentives that encourage investment and productivity as well as vigorous local competition and an openness to foreign competition.

We identified four programs that belong to this pillar. The largest is the Scientific Research and Experimental Development (SR&ED) tax credit scheme, which although not administered by ISED, falls clearly within the government's innovation mandate and has been included in the analysis. Other programs under this pillar pertain to regulations management and intellectual property (IP) strategy.

3. Related and Supporting Industries

To succeed, companies need to have access to suppliers and supporting industries, ideally operating in an established cluster in geographic proximity.

Until recently, there was scant focus on the development of local ecosystems or clusters to support burgeoning industries. We identified eight ISED programs designed to lend support to specific industries. In particular, ISED's recent launch of the Supercluster Program falls into this category. This recent initiative has added dramatically to the creation of local industry supports. However, with a delay in the release of funds and project horizons of several years, results are still pending.

4. Demand Conditions

Finally, a country needs sophisticated and demanding local customers that they can serve. With our small population, Canada does not have a large enough base to create world-class companies within our own borders.

Currently, there are seven programs in place that address this pillar, with six operating internationally. The international initiatives include those offered by Global Affairs Canada's Trade Commissioner Service and the Business Development Bank of Canada (BDC). The only program attempting to build local demand is Innovative Solutions Canada (ISC), modelled after the well-known Small Business Innovation Research (SBIR) program in the US.

Of the challenges that Canada is facing in developing an innovation economy, demand creation is perhaps the most acute. It is likely that we will never have the local demand to enable our companies to gain experience selling into a competitive local market before learning how to export. This makes company creation far more difficult than perhaps in any major economy, certainly in the G7 and even in the G20.

Missing as well from the list of programs is any focus on improving local competition, or being open to foreign competition. For many years, we have tended to support the idea that Canadian industries need to be protected from foreign competition. As a result, the banking and telecom industries as well as many sectors in entertainment and farming are not subject to competitive pressures from foreign companies. The lack of local competition exacerbates this problem and means that Canadian firms are not well prepared for the level of competition when exporting.

The lack of demand creation programmes is the most glaring weakness in government programming and one with the greatest potential for positive change and improved results. Local demand from Bell Canada enabled Northern Telecom to grow and flourish. Creating demand can assist in the early stages in the establishment of firms that grow to world class size.

Opportunity 4. Improve Program Design Through Rigorous Research and Evaluation

To examine issues in program design, we relied on a number of input and planning documents as well as ISED's annual plan. ISED has made an effort to identify the key issues in the innovation economy, particularly through the creation of initiatives like the Economic Strategy Tables as a model of collaboration between the public and private sectors. These produced some interesting opportunities. However, almost all of the policy formulation included in the reports released through the Economic Strategy Tables (<https://www.ic.gc.ca/eic/site/098.nsf/eng/home>) and the Advisory Council on Economic Growth (<https://www.budget.gc.ca/aceg-ccce/home-accueil-en.html>) was done with opinion-based research.

Opinion-based Research

Much of the background work done to identify problems currently experienced in the innovation economy in Canada is carried out through opinion-based research. This involves asking industry leaders and members what they think the problems facing Canada are. Examples of problems identified are contained in the 2018 report on *The Innovation and Competitiveness Imperative: Seizing Opportunities for Growth*, and particularly the section released by the Health and Biosciences group. This identifies the following challenges (p. 4):

- *Complex regulatory, reimbursement, and procurement processes impede the adoption of innovations*
- *A risk-averse procurement culture prioritizes short-term focus on cost rather than broader considerations of value*
- *Disconnected digital health systems inhibit the collection, connection and analysis of data needed to inform innovation decision making*
- *Skills shortages and lack of access to executive-level talent hinder the sector's competitiveness*
- *Limited access to capital leads many Canadian firms to exit the market through mergers or acquisitions rather than accrue value domestically*

While opinions solicited through surveys and in-depth interviews can substantially enrich a study, good practice usually entails corroborating findings through multiple sources of evidence. In particular, one can examine the last two problems to see the issues that may arise if good research practices are not pursued. When an industry member states that there is a skills shortage, is there really a skills shortage or could that industry member be facing unique challenges recruiting? Certainly, companies that are having a tough time recruiting are unlikely to identify their own recruitment strategies as a problem and are likely to look to the market instead. Companies that have been successful at recruiting are less likely to identify a skills shortage as a central issue. Thus, this "skewing" of specific issues may be identified in a report as a problem, leading to the development of government programs to solve a problem that does not necessarily exist.

When an industry member states that there is a capital shortage, is there really a capital shortage or could that industry member face specific challenges obtaining capital or even have a company or technology that is not attractive to investors? Too many complaints of this sort will lead to the development of government programs to improve capital availability, although research recently conducted by the Impact Centre shows that there is enough capital available in Canada, particularly since there are substantial numbers of foreign firms investing, even at early stages.

Little Research into Underlying Causes of Key Challenges Presented

There have not been any significant attempts to understand the underlying reasons for the issues being identified or the opinions expressed on challenges. As an example of the type of analysis performed by the Economic Strategy Tables, one can turn to the Digital Industries sub-group and their section as part of The Innovation and Competitiveness Imperative: Seizing Opportunities for Growth report. The committee outlined a number of challenges to be overcome (p. 3):

- *Canada lags behind other countries on commercializing innovation;*
- *There's a national scarcity of C-suite talent with experience scaling up businesses;*
- *Skilled STEM talent is severely limited, and competition is fierce and global;*
- *Canadian businesses and governments adopt technology too little and too slowly;*
- *Affordable, reliable, high-speed internet access is not universally available;*
- *Culturally, Canadians don't correctly acknowledge the impact of innovation on their everyday lives.*

Unfortunately, there is no investigation into the underlying causes of these problems. For instance, why does Canada lag behind other countries on commercializing innovation? What statistics show that STEM talent in Canada is severely limited, and why is this the case? Answers to underlying problems are critical if we wish to stop solving symptoms and actually address solutions.

Unrealistic Expectations

Canadian policy-making and program development tend to set unrealistic targets requiring a growth rate significantly in excess of what is currently experienced. A good example of unrealistic plans is embodied in the Supercluster Program. It has been a while since ISED announced the award of \$950 million over 5 years for the creation of a set of superclusters across the country. The program carries heavy expectations (Exhibit 6). Interestingly, while these expectations have been publicly announced, the department plans in Appendix B do not include the anticipated outcomes from this program.

Exhibit 6
ISED Supercluster Initiative
Anticipated Program Impact

	GDP Impact (\$ billions)	Jobs Created
Digital Technology	5.0	13,500
Protein Industries	4.5	4,500
Advanced Manufacturing	13.5	13,500
SCALE.AI	16.5	16,000
Ocean	14.0	3,000
Total	53.5	50,500
Per Year	5.4	5,050

We should note that the total GDP impact is expected over 10 years (i.e. five years after the ISED-funded portion of the project officially concludes). This means that the total GDP increase would be \$5.35 billion per year. Thus, the first issue is to disentangle how much of the GDP impact is coming only from the program versus the wider economy.

Even if we assume that the effect of spending \$950 million over five years (or \$190 million per year) could actually generate a benefit of \$5.35 billion a year (a multiplier of 28 times) right from the beginning of the project, the second issue is jobs created. The math says that the government will create over 50,000 jobs. In actual fact that is 5,050 jobs that last 10 years.

Canada currently has 19 million employed individuals and generates \$1.6 trillion of GDP. That is \$86,000 per employee. And yet the government expects to generate over \$1 million of GDP per person per year with this program. One must question whether this is reasonable.

Our estimates show that it would be more reasonable to expect 1,500-2,000 jobs to be created.

Unfortunately, when one has unrealistic program expectations that are not met, disappointment ensues making it more likely that even good programs will be cancelled for failing to meet expectations.

Other Issues

A review of the program documentation makes other design issues clear, including the following two key challenges:

1. Programs are set up with unrealistically short time horizons and are cancelled before they are able to impact the economy.
2. There is no overall program evaluation, and no consistency in approaches to individual program evaluations, making it difficult to compare program efficacy.

These issues make it clear that innovation programs require more rigorous research during design and more realistic targets during implementation.

Opportunity 5. Eliminate Scientific Research and Experimental Development (SR&ED) Tax Credits

The Canada Revenue Agency (CRA) administers the \$3-billion Scientific Research and Experimental Development (SR&ED) program, which uses a tax incentive to encourage Canadian businesses of all sizes and in all sectors to conduct R&D in Canada.

SR&ED Reporting

Companies report SR&ED expenditures on a data-heavy nine-page form with 10 sections. Without any questions about results that may have been generated from this year's or any prior year's expenses, there is no way for the government to determine whether there is any net benefit to Canada through the development of new products or services, new revenue associated with these credits, any exporting, or effectively any other direct results.

Statistics Canada Surveys

One way the government may find out about the benefit of SR&ED credits is through the Statistics Canada survey entitled *Annual Survey of Research and Development in Canadian Industry*, which collects information on scientific activities of Canadian businesses. This is a 26-page survey on research and development activities. Unfortunately, less than half a page of the survey relates to the results from the R&D undertaken. The rest of the survey is predominantly used to collect data on the extent and nature of R&D expenses. While Statistics Canada may be able to correlate survey information with results from tax returns filed with the CRA, the tax data is not granular enough and will not enable the agency to correlate these expenditures to specific changes in revenue or profits flowing from the R&D.

In terms of results, the Statistics Canada survey only asks five questions requesting yes or no answers as to whether R&D expenditures have led to new or significant improvements to: (1) goods; (2) services; (3) methods of manufacturing or production; (4) logistics, delivery, or distribution methods; or (5) supporting activities.

Just like the SR&ED filings, the collection of regular R&D data by Statistics Canada makes the benefits to Canada also difficult to identify.

Program Review

The 2017 Canadian budget outlined a commitment to perform an evaluation of the SR&ED program. Since we were unable to find a related report online, we asked an ISED representative on the status of that review. The respondent indicated that they were "unaware of a full review taking place by Finance Canada." Certainly, the lacklustre results on our business expenditures on R&D raise questions about the effectiveness of Canada's flagship indirect support program for business innovation. However, without a program review, it is challenging for the government to determine the net benefit to Canada and derive further insights from its programming to date.

Doubling Down in Wrong Areas

By focusing so much of our innovation expenses on these credits, Canada is effectively doubling down in an area where we already have cost leadership. For instance, it is far less expensive to hire a researcher in Canada than in most areas of the United States; and our weaker dollar provides a further advantage—even without the generosity of SR&ED credits. Thus, we take an area in which we already have cost leadership and comparable talent and provide extremely generous incentives without clear outcomes. Meanwhile, we totally ignore areas in which we have less talent and where we face a natural obstacle and higher costs, namely export marketing. Canada has a smaller talent pool from which M&S talent could be drawn. Relative to a comparable US-based company, it is much more expensive for a Canadian company to do business outside of our home region.

By focusing on R&D over M&S, we send a message to Canadian companies that this is a more important activity. It is time to seriously evaluate whether Canada actually benefits from the SR&ED program. It is our contention that the time for this program has passed, and that the entire program should be phased out and eventually eliminated.

Creating Demand

ISED recently created an interesting program entitled Innovative Solutions Canada (ISC), which helps Canadian innovators by funding R&D and prototype testing in real-life settings. The program consists of:

two streams with a combined funding of over \$140 million dedicated to Canadian innovators who want to start, grow, and get to market... Participating federal departments and agencies will issue public challenges designed around a desired outcome rather than a known product or process specification and will be based on each department's mission and mandate. The challenge will be novel where there is currently no solution(s) in the marketplace.

<https://www.ic.gc.ca/eic/site/101.nsf/eng/home>

This is an excellent first step in the right direction, but more is possible. By eliminating the SR&ED tax credit program, the federal government could free up to \$3 billion per year to focus on demand creation, an area in which Canada has the greatest problem and a large need that is inadequately addressed. It could marry this demand creation to social needs and fund new purchases in areas like health care and clean technology. By funding innovative purchases from Canadian companies, the federal government could seed the growth of specific industries, give them the potential to lead the world, and generate benefits, such as improving the health of Canadians and the cleanliness of our environment. In fact, at \$3 billion a year of spending, Canada would be able to support 30 unicorns as the approximate revenue required to become a unicorn is \$100 million a year.

We offer this only as one example of potential changes that could be driven by improving demand creation. Of course, we need a full and detailed study of all of these issues and a willingness to depart from old methods that have clearly not worked. In Canada, we preach innovation, yet infuse very little innovation in programs that are meant to drive the innovation we desire. What we need now is a significant overhaul of our programming that is driven by rigorous research and a willingness to innovate.

Conclusions

The ideas presented here are only five of many potential ideas that could enable the Canadian Economy to reverse its downward slide. We need to begin a new dialogue and a new process to bring forward innovative program ideas that can address this slide. What is essential to start the process is that we come to an agreement that:

1. Canada's position relative to other countries in the development of an innovation based economy is declining.
2. Government programming over the last 25 years may have slowed the decline but has not prevented it and so we should conclude that this programming is not working.
3. We need to find new ways to develop and implement programs that address underlying causes of our challenges, not just symptoms.

Essentially, if we wish to improve productivity and prosperity by building larger firms, if we want to improve our capabilities at innovation, we need to innovate to do so.

Appendix A. ISED's 2017-18 Department Results Report

Program Description	Expected Results	Performance Indicators	Target	Actual	Type of Metric		Program Focus			
					Activity	Result	Research	Innovation	Commercial	Other
Marketplace Frameworks and Regulation	Service standards are met	Average percentage of service standards met	92%	93%		X				X
Marketplace Competition and Investments	Consumers benefit from a competitive marketplace	Dollar value estimate of annual consumer savings from Bureau actions that stop anticompetitive activity	3.99b	2.8b		X				X
	Timely and accurate reviews lead to marketplace certainty	Percentage of mergers and foreign investments reviewed within service standards	85%	86%	X					X
Spectrum, Telecommunications and the Digital Economy	Canada has a growing digital economy	Investment in dollars by telecommunications providers	\$9b	\$11.8b		X				X
		Percentage of population with broadband subscriptions	83%	84%		X				X
Science, Technology and Innovation Capacity	Canada's scientific research excellence is maintained	Canada's Average Relative Citation index	1.35	1.41		X	X			
	Researchers are attracted to Canada, and retained	Total full-time equivalent researchers in Canada per thousand total employment	8.8	9.1	X		X			
Industrial Research and Development Financing	Investment in leading-edge R&D in targeted Canadian industries	Dollar value to date of disbursement to firms for R&D activities			X		X			
		Dollars to date of investment leveraged per dollar of ISED disbursements in R&D projects				X	X			
Small Business Research, Financing and Services	Canadian small and medium sized enterprises grow and become more internationally competitive	The percentage of businesses expecting to grow their total revenues over the next three years	77%	n/a	X				X	
Industrial Competitiveness and Capacity	Canadian industries have the capacity to prepare for and respond to risks and opportunities in domestic and global markets	Canada's ranking among G7 countries for "value chain breadth"	6th	7th		X				X
		Canada's ranking among G7 countries for "firm-level technology absorption"	6th	5th		X				X
Community Economic Development	Targeted businesses and organizations in Northern Ontario create economic growth	Number of Northern Ontario businesses created, expanded or maintained with FedNor assistance	1700	1504		X			X	

Appendix B. ISED's 2019-20 Departmental Plan

Program Description	Expected Results	Performance Indicators	Target	Due By	Actual	Type of Metric		Diamond Model Correspondence			
						Activity	Result	Input Conditions	Firm Structure	Supporting Industries	Demand Conditions
People, Skills and Communities	Canada has a highly skilled workforce that is equipped for jobs in an innovative and high-growth economy	Percentage of professional, science and technology-related jobs in Canada's economy (Note 1)	40%	31-Dec-25	34% (2017)		X	X			
		Number of science, technology, engineering and mathematics graduates in Canada	175,000	31-Dec-25	121,791 (2016)		X	X			
		Number of Canadians that receive digital and coding skills training and development opportunities through ISED programs	500,000	31-Dec-19	281,403	X		X			
	Canadian communities are connected to and use digital infrastructure	Percentage of population with access to ultrafast broadband	80% 1G	31-Dec-20	50%		X	X			
		Percentage of households with an Internet connection (including across underserved individuals, such as low-income)	100%	31-Dec-25			X	X			
	Canada's entrepreneurs represent all segments of Canadian society	Percentage of small and medium-sized enterprises that are majority-owned by women, Indigenous people, youth, visible minorities and persons with disabilities	Women: 25%	31-Dec-25	Women: 15.6%		X	X			
		Number of small and medium-sized enterprises supported by ISED programs, including those that are majority-owned by women, Indigenous people, youth, visible minorities and persons with disabilities	TBD	TBD	NA	X		X			

Program Description	Expected Results	Performance Indicators	Target	Due By	Actual	Type of Metric		Diamond Model Correspondence			
						Activity	Result	Input Conditions	Firm Structure	Supporting Industries	Demand Conditions
Science, Technology, Research and Commercialization	World-leading superclusters are grown in Canada	Number of new firms created (in targeted areas)	TBD	31-Mar-23	NA		X			X	
		Number of anchor firms (in targeted areas)	TBD	31-Mar-23	NA		X			X	
		Value of investments leveraged to develop clusters as a result of ISED program funding (per dollar invested)	\$1.20	31-Mar-23	NA		X	X			
	Canadian businesses invest more in research and development	Business Expenditure in Research and Development (in dollars)	\$30B	31-Dec-25	\$17.6b		X	X			
		Percentage of companies engaged in collaborations with higher education institutions	6%	31-Dec-25	3.20%		X			X	
		Value of Business Expenditure in Research and Development by firms receiving ISED program funding (in dollars)	TBD	TBD	NA		X		X		
	Canada has world leading-research capacity	Canada's rank among Organisation for Economic Co-operation and Development nations on the citation score of science research publication	10th	31-Dec-25	15th (2017)		X	X			
		Number of co-authored publications between federal and non-federal scientists	2,479	31-Dec-20	2,374 (2017)		X	X			
		Value of investments leveraged in science and research infrastructure as a result of ISED program funding (per dollar invested)	\$1.00	31-Mar-20	\$1.50 (Note 6)		X	X			

Program Description	Expected Results	Performance Indicators	Target	Due By	Actual	Type of Metric		Diamond Model Correspondence			
						Activity	Result	Input Conditions	Firm Structure	Supporting Industries	Demand Conditions
Companies, Investment and Growth	Canada becomes a global leader in clean technologies	Value of Canada's exports of clean technologies (in dollars)	\$15.6 billion	31-Dec-25	\$9.0 billion (2017)		X				
		Clean technology employment in Canada (in numbers)	190,000	31-Dec-25	183,265 (2017)		X	X			
		Value of investments leveraged in clean technologies as a result of ISED program funding (per dollar invested)	\$2.00	31-Mar-20	\$2.80		X	X			
	Canadian companies are globally competitive and achieve high growth	Number of high-growth firms	28,000	31-Dec-25	NA		X			X	
		Value of Canada's goods and services exports	\$820 billion	31-Dec-25	\$664 billion (2017)		X			X	
		Revenue growth rate of firms supported by ISED programs	ISED-supported firms grow faster than the national average		31-Mar-20	NA		X		X	
	Canada is a location and destination of choice for investment, growth and	Total Business Investment in Canada	\$260 billion	31-Dec-25	\$216 billion (2017)		X			X	
		Spending by international visitors to Canada (in dollars)	\$25 billion	31-Dec-21	\$21.3 billion (2017)		X				X
		Number of international overnight visitors to Canada	25,973,134	31-Dec-21	20,800,000 (2017)		X				X
		Turn-around times for patent applications filed in Canada, with a request for examination	31.6 months	31-Mar-20	33.6 months		X		X		
	Canadian innovators have simplified access to tools and support	Canada's ranking on the World Bank's Ease of Doing Business Index	10th	31-Dec-25	22nd (2018)		X				X
		Percentage of ISED priority services that meet published service standards	Percentage of ISED priority services that meet published service standards		31-Dec-20	96%		X			X

Appendix C. List of ISED's Programs With Correspondence to Porter's Diamond Model

	Diamond Model Correspondence			
	Input Conditions	Firm Structure	Supporting Industries	Demand Creation
	High-quality business inputs such as human resources, capital, physical infrastructure, administrative infrastructure, scientific infrastructure, and natural resource access	Rules and incentives that encourage investment and productivity as well as vigorous local competition and an openness to foreign competition	Suppliers available and supporting industries, operating for instance in an established cluster to succeed	Sophisticated and demanding local customers
Sophisticated and demanding local customer		X		
A new vision for science	X			
Aboriginal Business and Entrepreneurship Development	X			
Accelerated Growth Service	X			
Accessible Technology Program	X			
Advancing Women Business Leaders	X			
Apprenticeship Training	X			
Atlantic Immigration Pilot	X			
BDC	X			
Business Accelerators and Incubators Performance Measurement	X			
Business Women in International Trade Program	X			
Canada 150 Research Chairs	X			
Canada Research Chairs	X			
Canada Research Coordinating Committee	X			
Canada Small Business Financing Program	X			
Canada Student Loans Program	X			
Canada-China Year of Tourism 2018				X
Canada's Digital Charter	X			
Canada's Regional Development Agencies			X	
Canada's Tourism Vision			X	
Canadian Digital Service	X			
Canadian Foundation for Innovation	X			
Canadian Institute for Advanced Research	X			
Canadian Technology Accelerators	X			
CanCode	X			
Centre for Drug Research and Development			X	
Chief Science Advisor	X			
Clean Energy Fund	X			
Clean Growth Hub	X			
Clean Growth Program	X			
Clean Tech Data Strategy	X			
Communications Research Centre Canada	X			
Community Futures Program	X			
Computers for Schools	X			
Connect to Innovate	X			
Connecting Canadians	X			
Connecting Families	X			

	Diamond Model Correspondence			
	Input Conditions	Firm Structure	Supporting Industries	Demand Creation
	High-quality business inputs such as human resources, capital, physical infrastructure, administrative infrastructure, scientific infrastructure, and natural resource access	Rules and incentives that encourage investment and productivity as well as vigorous local competition and an openness to foreign competition	Suppliers available and supporting industries, operating for instance in an established cluster to succeed	Sophisticated and demanding local customers
Destination Canada				X
Digital Literacy Exchange	X			
Digital Research Infrastructure Strategy		X		
Digital Skills for Youth (DS4Y)	X			
Economic Strategy Tables	X			
EDC – Cleantech				X
Express Entry	X			
Future Skills	X			
Futurpreneur Canada	X			
Genome Canada	X			
Get Connected	X			
Global Skills Strategy	X			
Horizontal Review of Innovation Programs	X			
Horizontal Skills Review	X			
Immigration Levels Plan 2018-2020	X			
Increasing Diversity in Science	X			
Indigenous Peoples and Intellectual Property	X			
Indigenous Tourism			X	
Industrial and Technological Benefits				X
Innovation Canada	X			
Innovation Superclusters Initiative			X	
Innovative Solutions Canada				X
Institute for Quantum Computing			X	
Intellectual Property Legal Clinics Program	X			
Intellectual Property Strategy		X		
Invest in Canada	X			
Investment Canada Act	X			
Labour Market Development Agreements	X			
Let's Talk Science	X			
Low Earth Orbit (LEO) Satellites	X			
Mitacs	X			
National Digital and Data Consultations	X			
National Research Council	X			
Northern Ontario Development Program	X			
NRC - Industrial Research Assistance Program	X			

	Diamond Model Correspondence			
	Input Conditions	Firm Structure	Supporting Industries	Demand Creation
	High-quality business inputs such as human resources, capital, physical infrastructure, administrative infrastructure, scientific infrastructure, and natural resource access	Rules and incentives that encourage investment and productivity as well as vigorous local competition and an openness to foreign competition	Suppliers available and supporting industries, operating for instance in an established cluster to succeed	Sophisticated and demanding local customers
Pan-Canadian Artificial Intelligence Strategy	X			
Pan-Canadian Framework on Clean Growth and Climate Change	X			
Patent Collective Pilot Program			X	
Perimeter Institute for Theoretical Physics	X			
POLAR Knowledge Canada	X			
Post-Secondary Institutions Strategic Investment Fund	X			
Prime Minister Awards	X			
PromoScience Program	X			
Provincial Nominee Program	X			
Regional Economic Growth through Innovation	X			
Regulations Management		X		
Renewing Federal Laboratories	X			
Skills Boost initiative	X			
Skills Development and Training for Indigenous Peoples	X			
Space Strategy for Canada	X			
Start-up Visa Program	X			
Stem Cell Network			X	
Strategic Innovation Fund	X			
Strengthening Indigenous Data and Research Capability	X			
Student Work-Integrated Learning Program	X			
Sustainable Development Technology Canada	X			
Tourism Data Strategy	X			
Trade and Investment				X
Trade Commissioner Service				X
Venture Capital Catalyst Initiative	X			
WE Talk Business initiative	X			
WES Ecosystem Fund	X			
Women Entrepreneurship Knowledge Hub	X			
Women Entrepreneurship Strategy	X			
Workforce Development Agreements	X			
Youth Employment Strategy	X			
	82	4	8	7

ISED

https://www.ic.gc.ca/eic/site/icgc.nsf/eng/h_07654.html

About the Impact Centre

Science to Society

We generate impact through industry projects and partnerships, entrepreneurial companies, training and research.

We bridge the gap between the university and industry to accelerate the development of new or improved products and services based on physical technologies. We work with graduate students and researchers to help them commercialize their discoveries. We provide undergraduate education and training for students at all levels to ease their transition into future careers.

The Impact Centre conducts research on all aspects of innovation, from ideation and commercialization to government policy and broader themes such as the connection between science and international development. We study how companies of all sizes navigate the complex path between a discovery and its market and how their collective innovations add up to create a larger socioeconomic impact.

Our objective is to understand how we can improve our ability to create world-class technology companies, how governments, companies, and academia can identify and adopt best practices in technology commercialization.

Impact Briefs

Read our collection of Impact Briefs: narwhalproject.org

Contributors

Charles Plant
Author
Senior Fellow
cplant@imc.utoronto.ca
416-458-4850
@cplant

Emina Veletanlić
Editor
Manager, Strategic Initiatives
eveletanlic@imc.utoronto.ca
416-978-1457

Harim Ulfig



UNIVERSITY OF
TORONTO

Impact Centre
60 St. George Street, Suite 331
Toronto, Ontario
Canada M5S 1A7

Tel: 416-978-1457
info@imc.utoronto.ca
www.impactcentre.ca