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The Honourable Greg Rickford
Minister of State for Science & Technology
Industry Canada
235 Queen St East
Ottawa, Ontario
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February 6, 2014

Dear Minister Rickford,

On behalf of the Institute for Science, Society and Policy (ISSP), I appreciate the opportunity to contribute to your consultations on the Science, Technology and Innovation (ST&I) Strategy. I recognize that this is an important initiative to identify opportunities for recalibrating the Strategy to the state of science and the economy in Canada, today and for coming years.

You will recall that I had provided to you on December 9, 2013 English and French versions of the policy document *Canada's Future as an Innovative Society: A Decalogue of Policy Criteria* which was a collaborative effort led by the ISSP to identify the ten key criteria that are necessary for an effective ST&I policy. I am providing a link to the Decalogue (www.decalogue.ca), and a copy of the English version is also attached for your reference. Now that you have launched an ST&I consultation, I see the value that the Decalogue holds for your current deliberations.

There were extensive consultations in the development of the Decalogue, including a thorough peer review by thought leaders across Canada. Since its publications, science and business leaders have endorsed its ST&I framework of criteria. In addition, the document is circulating widely within government, and some of its authors have been invited to present it to broad ST&I community audiences in Canada. We have also been pleased to give briefings on the Decalogue to officials of Industry Canada who have welcomed it as a constructive contribution to the consultations now taking place. We can note that the Hon. Kelvin Ogilvie has been a vocal supporter of the entire project

from the comprehensive academic review of literature to the final, condensed document we refer to as “Innovation Decalogue.”

It is within that spirit that I am writing to highlight for you the value of the Decalogue in benchmarking your efforts to modernize the existing Canadian ST&I strategy. We have opted specifically to provide policy criteria rather than specific recommendations. You are already besieged with recommendations from various expert panel reports and the current consultation will result in an even longer wish-list.

However, based on the succinct Decalogue, you and your team will rapidly be able to derive practical recommendations by comparing the policy criteria with the *status quo* in Canada. The ISSP is also at your disposal to assist with such a task. It is our belief that this benchmarking will inform the development of a more vibrant Canadian innovation system.

This approach to innovation will broaden the scope of the original Science and Technology Strategy that we have had in place to date, linking it more explicitly to non-technological factors such as the economic environment, commercial strategies, cultural norms and managerial acumen which are critically important to a truly innovative society. It also highlights the value of broad, inclusive performance measurement.

These are just several of the criteria of the Decalogue which I commend to you as you develop your updating of the Strategy. I recognize that your government has seen ST&I initiatives as an investment in the future of Canada. The ISSP is interested in providing constructive assistance as you move forward with the government’s ST&I agenda. I would be pleased to work with you and your officials on this important initiative in the coming months.

Yours sincerely,

A handwritten signature in black ink that reads "Marc Saner". The signature is written in a cursive, slightly slanted style.

Marc Saner
ISSP Director



INSTITUT DE RECHERCHE SUR LA SCIENCE,
LA SOCIÉTÉ ET LA POLITIQUE PUBLIQUE
INSTITUTE FOR SCIENCE, SOCIETY AND POLICY

INNOVATION
DECALOGUE

October 2013

Canada's Future as an Innovative Society

A Decalogue of Policy Criteria

~ Endorsement Edition ~

This document is the highly condensed version
of the Crowdsourcing Edition that remains
available in full at www.decalogue.ca

Please visit that site and add your name to the
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Canadian Innovation Policy: A Decalogue of Criteria

Scope: the policy ...

- ... crosses jurisdictional boundaries**
- ... focuses on innovation, not technology**
- ... does not confuse inputs with outputs**

Knowledge: the policy ...

- ... does not prejudge the practical value of any category of knowledge**
- ... favours “open” over “proprietary” knowledge regimes**
- ... promotes the creation of new knowledge and skills**

Approach: the policy ...

- ... stimulates the transformation of existing industries**
- ... is not contingent upon any specific financial model**
- ... recognizes Canadian realities**

Evaluation: the policy ...

- ... enables measurements that encompass the process of innovation
(not just the inputs and outputs)**

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We are especially grateful to Senator Kelvin Ogilvie for his encouragement, advice and continued support for this project. We thank the Members of Parliament Ted Hsu, H el ene LeBlanc, Geoff Regan, and Kennedy Stewart, as well as Minister Gary Goodyear's Chief of Staff and Director of Policy, for meeting with us in the early stages of this project and helping us shape the document. We also thank Chad Gaffield and his SSHRC colleagues for their enthusiasm and advice.

We also thank the peer reviewers, particularly Alan Bernstein, Paul Clark, Bruce Doern, Robert Fessenden, Janet Halliwell, Adam Holbrook, William Leiss, Jonathan Linton, Susan McDaniel, Peter Nicholson, Kelvin Ogilvie, Peter W.B. Phillips and David Wolfe.

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Introduction

Innovation occurs whenever a new or better way of doing something is employed in ways that create value. It is critical to the health of a modern industrial society. No country can be expected to prosper unless it nurtures the creation and capture of as much value as possible from the ingenuity of its citizens.

This document provides Canada's institutions of governance with a framework to support a coordinated, evidence-based approach to innovation policy development and assessment.

Canada's Innovation Challenge

All over the world, entrepreneurs and other creative minds are gearing up and competing hard to respond to 21st century challenges. Canadians are prominent among them. But whether or not Canadians benefit from their ingenuity is not just a question of talent or investment. It is also a question of organization, cooperation and leverage involving all of the public and private institutions that govern how Canadians live and work. Public policy has always played an important and often decisive role in this regard, whether through legislation and regulation, persuasion and taxation, or procurement and strategic investments in skills and infrastructure.

Recent reports have signalled an urgent need to reassess public policy with respect to stimulating growth, productivity, and employment through innovation. Many point to deficiencies in translating scientific discoveries and new technologies into commercial products. Others counter that the dominance of commercial agendas could threaten the quality and independence of basic science. Still others raise more fundamental concerns about what is included and excluded in discussions of innovation.

The result is that policymakers are confronted with a maze of options on how to proceed. And as governments consider these options, the clock ticks.

We have growing concerns that Canadian public policy is losing its way when it addresses how and when governments can play productive roles in fostering innovation and capturing its benefits. Despite increasing attention to the issue, Canada's governance institutions seem unable to articulate coherent and complementary strategies for how they will stimulate innovation to support the ongoing project of building and sustaining a prosperous Canada.

The Need for a Condensed, Holistic Framework

Most innovation-specific policies focus on just a few industries, mostly in the manufacturing and technology goods sectors. The policy apparatus as a whole remains oriented towards a very narrowly specified group of *inputs*, like R&D, skills or intellectual property, rather than to facilitating *outcomes*, like creating globally competitive industries or enhancing pivotal public infrastructures and services. Many current policies continue to be aimed primarily at upstream activities, such as producing new ideas and transforming

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them into inventions. Others are very narrowly focused on “commercialization” – transforming inventions into products in the marketplace. There is often a lack of effective policy coordination among Federal, Provincial, Territorial and Municipal counterparts.

Innovation is not a linear, unidirectional process. It often creates new engines of growth by displacing existing ones. These are the “gales of creative destruction” of economic theory and of legend. Canadian policy has been keen to emphasize the “creative” side but reluctant to consider the “destructive” side – far less attention has been paid to how we weather these gales. And Canadian policy has seldom recognized that most of the value of innovation is associated with diffusion – that is to say, adoption and adaptation by users and consumers.

In other words, innovation policy ought to respect the full richness and complexity of the innovation system. This requires linking industries, goods, human capital and institutions together in new and often unanticipated ways.

The Concept of the Decalogue

Policymakers are besieged with recommendations. We see no point in burdening them with more. Instead, we condense what is known about innovation and provide a concise, holistic framework for assessing innovation policy as well as developing new options: a tool for innovation policymakers that is grounded in more than half a century of independent investigation by scholars, industry experts and public servants in Canada and around the world.

Drawing on an assessment of evidence spanning over 60 years, we offer a Decalogue of Policy Criteria – ten essential benchmarks for making and assessing policy decisions, such that these decisions stimulate innovation in all of its forms and transfer as many benefits as possible to Canadians.

The Decalogue is grouped into four areas – scope, knowledge, approach and evaluation. Each criterion addresses a critical dimension of innovation where it has been demonstrated that public policy plays a significant role. Each states a synthesis of critically important findings and insights, drawn liberally from a large body of published peer-reviewed studies. A selection of these studies can be found in the appendix.

Research into innovation continues to yield many insights – some complementary, some contradictory, and many controversial. Nevertheless, certain conclusions and patterns have emerged consistently enough over time for us to be confident that they provide a reliable baseline against which current and planned policies can be assessed in terms of their likely impact on encouraging innovation. They also provide a foundation for monitoring and measuring these impacts more comprehensively and rigorously.

All of the criteria are complementary. Some will be more applicable to certain cases than to others, but all apply to some extent in every case. Conformance with one does not preclude conformance with any of the others. In their entirety, the criteria describe the necessary and sufficient features to move Canadian innovation policy to the next level.

A Decalogue of Innovation Policy Criteria

Scope

Criterion 1: The policy crosses jurisdictional boundaries.

Innovation is a multifaceted process of social and economic development. No single policy portfolio is diverse enough to undertake sole or primary responsibility for it. Research policy, governing basic and applied science, has very different dimensions than industry policy, trade policy, health policy or environmental policy, even though all of these and more can play decisive roles in innovation. Leveraging the unique strengths and capacities of policy portfolios and departments and orienting them towards common goals can stimulate innovation.

Criterion 2: The policy focuses on innovation, not technology.

Innovation occurs all the time in every field of human endeavour, in a vast number of forms and contexts. Relatively few innovations involve the creation of genuinely new technology. Many involve only its adoption and adaptation by users. But most innovations have at best indirect origins in technology, if any at all – for example, innovation in organization, location, branding, design, finance, contracts, management, business models, pricing and so forth. Many of Canada's most significant innovations have primarily social origins but yield an extraordinary array of impacts. The efficiency of technological factors is strongly linked with non-technological factors (such as the economic environment, commercial strategies, cultural norms and managerial acumen) and there is no predictable relationship between the amount of technology procured and the success of an enterprise or its propensity to innovate.

Criterion 3: The policy does not confuse inputs with outputs.

Although basic and applied science and industrial R&D can be major inputs to innovation, they are not innovation as such. R&D is essential for the competitiveness of some manufacturing industries – especially producers of technology goods – but there is no guaranteed or necessarily linear relationship between the amount of basic and applied research or industrial R&D performed and the amount of innovation realized. Global investment in industrial R&D is highly concentrated in just a few large companies and in just a few industries. In Canada, fewer than 100 companies perform roughly 50% of all R&D – a proportion that is normal in most national jurisdictions. But R&D is neither a sufficient nor necessary factor in innovation – in official surveys, more firms report making innovations than report doing R&D. It is important to facilitate R&D in sectors that depend upon performing it, but it is also important to facilitate innovation in those that do not. It is even more important to create new possibilities for linking R&D-intensive industries that produce technology with capital-intensive industries that apply it to the creation of new value.

Knowledge

Criterion 4: The policy does not prejudge the practical value of any category of knowledge.

Innovation and knowledge are inextricable. Innovators draw upon and combine knowledge from many sources; their knowledge requirements are fluid and unpredictable. All forms of knowledge are potentially relevant to the innovation process. Different forms of knowledge play different roles in innovation and foster different kinds of innovation (for example, business, social and public sector innovation). Value is created mainly by crossing knowledge boundaries and forging new and unexpected combinations of knowledge. Maintaining maximum diversity and quality in the knowledge pool increases the likelihood that such combinations can occur.

Criterion 5: The policy favours “open” over “proprietary” knowledge regimes.

All innovations bestow temporary knowledge monopolies on innovators – the so-called first-mover advantage. Some forms of knowledge can be protected formally through patents and copyrights, but most knowledge is not and cannot be protected. Formal IP protection through patents and copyrights is not normally a prerequisite for innovation to occur. In most industries, there is no necessary relationship between the propensity to innovate and the propensity to patent or copyright. Both practices can be used just as effectively to inhibit or prevent innovation as to stimulate it. Patenting does provide many useful indicators of innovation performance in industries that are structured around patents and of the evolution of technological trends in many industries. And IP generally has become structural to the basic business models of some industries, like pharmaceuticals or publishing. But it is not a central element of most business models in most industries. All forms of IP rights incur significant costs and the emerging consensus is that except under special circumstances and subject to strict rules, knowledge stimulates more innovation and produces more economic value when it is open than when it is proprietary.

Criterion 6: The policy promotes the creation of new knowledge and skills.

The two indispensable and inseparable functions of the higher education system are to educate the citizenry and to develop the capabilities and skills to produce and apply knowledge. Few forms of public investment, if any, yield higher returns. Higher education institutions often play direct roles in translating ideas and discoveries into practice, but this is not their major role and not their comparative advantage. Direct involvement of these institutions in the exploitation of IP in which they have an equity stake has been productive in only a small number of cases. Generally this is one of the least efficient and highest cost methods of translating knowledge into innovation. The most efficient method is for university and college personnel to contribute directly to promoting and enabling innovation in industry and in the community. The evidence is overwhelming that it is the problem solving abilities of researchers and graduates, honed through basic and applied research, along with advances in basic and applied science, that constitute the outputs that are most valued by industry and that contribute most directly to innovation.

Approach

Criterion 7: The policy stimulates the transformation of existing industries.

Innovation replaces one form of value creation with another, but it does not always replace one industry with another. Innovation often occurs through the transformation of existing industries. Even though trade in commercial services is increasing significantly, natural resources, industrial equipment and manufactured goods (particularly high-value manufactures) are still a major driver of global trade and still decisively shape all of the key economic indicators. And most industrial innovation, and most R&D, occurs within production and supply chains, largely in the form of incremental improvements (in this sense, all industries are knowledge industries). Industrial diversification is not just a matter of replacing non-innovative industries with innovative ones. It is often about the transformation of existing assets and industries through innovation – increasing their value, developing new markets, and generating new, complementary industries.

Criterion 8: The policy is not contingent upon any specific financial model.

Most innovation occurs in response to the needs, opportunities and competitive imperatives that arise in the course of doing business, often without any form of special private financing and usually without public subsidy. Innovation has no fixed financial formula. Financing innovation is not the same as financing start-up companies. Venture Capital is a specific financial model that can be efficient for new companies – especially in industries with relatively short time-to-market horizons – but it is not a universal model and most innovative companies never resort to it. Governments can stimulate innovation in many direct and indirect ways but the critical factors for public investment relate less to the type of investment than to its timing, location and duration. (It should be noted, however, that governments are the single biggest customer for goods and services in any jurisdiction, and public procurement decisions will often prime and stimulate new markets for innovative goods and services more efficiently than subsidies, for example by conferring credibility on a new technology or practice or by creating the production volume needed to reduce costs and prime new markets.)

Criterion 9: The policy recognizes Canadian realities.

One of the most important discoveries about innovation is that history matters. Where you start – your initial advantage in human, natural and industrial assets – plays a huge role in determining the likelihood of where you can go. Like all highly industrialized countries, Canada became so by transforming ‘positional’ endowments – resources, unique skills, geographical location and so forth – into ever higher-value products and services and by increasing the efficiency of how these endowments are exploited. Like all national jurisdictions, the innovation characteristics of Canada tend to be based on how its industry is structured and where specialization has occurred – competitive advantages are created by aligning institutions that can stimulate innovation with the industries that play structural roles in generating growth and employment. There is value in observing the innovation systems of other countries, and Canada has much to learn from them. But it is never wise to simply import innovation policy from another country. Canadian innovation policy must recognize Canadian realities – its unique challenges, endowments and industrial composition as well as political structure and traditions – so that Canada can perform at its very best on the global stage.

Evaluation

Criterion 10: The policy enables measurements that encompass the process of innovation (not just the inputs and outputs).

Measurements of innovation in terms of bringing new or significantly improved products to market, or of finding better ways of getting them there, do not provide an adequate basis for policy decisions. This requires a coherent, measurement-based picture of the whole innovation system, one that incorporates indicators to monitor inputs (like R&D and skills), but also indicators of the activity of innovation itself, on regulation, and of its economic and social impacts. Ultimately, the impacts of innovation are measured in terms of what changes as a result of innovation, like jobs, growth, or solutions to human and environmental problems. What needs to be incorporated into policy-making is knowledge about how innovation leads to these outcomes. Canada has a long history of measuring the activity of innovation and has been a leader in establishing international measurement standards. However, this effort has never been fully integrated with policy development in Canada, meaning that resources have never been sufficient to produce a comprehensive picture of the Canadian innovation system.

Canada: Not an Innovation Laggard

The ten criteria form a complete system of the necessary and sufficient features to move Canadian innovation policy to the next level. We hope that they will facilitate a critical re-evaluation of beliefs that for many reasons have come to dominate the innovation policy debate.

Fostering a more innovative Canada is eminently feasible so long as we take the complexity and richness of the innovation system seriously, evaluate our policies honestly, and move from analysis to implementation effectively.

We should remember Canada's great achievements as an innovative society. Canada became an agricultural superpower out of soil that Captain Palliser concluded would never grow anything. The streets of Quebec gave birth to the Cirque du Soleil, making Canada, of all places, the hub of a global multi-billion dollar circus arts industry. The humble snowmobile gave rise to one of the largest civil aviation and public transport clusters in the world. Canada is one of the world's largest exporters of English and French language media content. It has a thriving biotech sector. It manufactures oil out of sand and seeds.

These and countless other examples illustrate just how successful Canadian innovators can be when they are able to combine their remarkable individual vision, ingenuity and drive with imaginative responses from Canada's governance institutions. And they call on Canada's innovators and governance institutions to continue this proud history, to think creatively and collaboratively about the new challenges facing the nation – the challenges of this century, those that are already here and those that have yet to come.

It is time to stop regarding Canada as an innovation laggard and time to pull together as a nation to ensure coherent efforts across the entire spectrum of innovation policy-making. This Decalogue of Policy Criteria provides the touchstone for such an endeavour.

Appendix: Selected References on Public Policy and Innovation

The literature on innovation is now vast and it reflects a multitude of perspectives, academic disciplines and contexts. The ten criteria were constructed from a review of hundreds of studies. The following is a list of selected references that summarizes the key concepts and empirical evidence pertaining generally to innovation as a phenomenon and specifically to the role of public policy in innovation. All of the investigations represented here are independent and peer-reviewed. Most of the authors represented have made substantial contributions to this field over many years. Others represent significant new generations of scholarship.

The references cover the evolution of innovation as a field of study and body of knowledge over sixty years. Not all of these references agree on every point, nor should they. Understanding innovation is a work in progress. We have avoided associating any of the criteria exclusively with single studies or individual researchers. Criteria have been formulated around conclusions that, on balance, are indicated across a wide spectrum of studies over time.

The references have been selected such that each discusses a critical dimension of innovation in substantive ways that directly affect policy. Each presents important critical perspectives and original arguments. Each has been chosen because it provides expert guidance for exploring specific bodies of knowledge regarding specific innovation issues. A few of the references are conceptual, but most are based on empirical studies of innovation in practice.

Note: About a quarter of the references are authored and or co-authored by Canadians (indicated by an asterisk).

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The Institute for Science, Society and Policy

The Institute for Science, Society and Policy offers a unique, holistic and non-partisan approach to understanding the social implications of science and technology. We're interested in how to use these different perspectives to inform science and technology policy.

Centered at the University of Ottawa, the ISSP carries out research, teaching and public outreach on the relationship between society and science, innovation and technology.

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