

INNOVATION NEXT – A WEST COAST PERSPECTIVE

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Presented to the Public Policy Forum
Conference on Innovation Next
May 27, 2010, Toronto

Almost two years ago, the Business Council of British Columbia launched an ambitious project under the banner of *Outlook 2020*.² The objective was to help shape a realistic vision and agenda for British Columbia's economic future, with a particular focus on the post-Olympic decade. Shortly after the project began, the world economy was rocked by an unprecedented financial crisis that evolved into the first full-scale global recession in six decades. This 'Great Recession' has left a painful legacy of high unemployment, excess industrial capacity, shrunken pools of risk capital, and weakened government finances. While Canada emerged from the turmoil in better shape than many others, no part of the country managed to escape the carnage.

Although the economy is growing again, the 'new normal' will differ from what the province experienced over the previous decade. Among other things, Americans will be less enthusiastic buyers of our products, as US households repair their balance sheets and adjust to an estimated \$10 trillion loss in net worth. Emerging markets, on the other hand, will be responsible for a bigger share of global consumption and trade. In the 'new normal,' growth-oriented businesses, especially those whose balance sheets are weighted toward intangible assets, are likely to find it harder to obtain financing. Another legacy of the recession is that governments in Canada will be grappling with multi-year deficits after posting budget surpluses for several years prior to 2008-09.

The Business Council's *Outlook 2020* project was guided by three fundamental questions:

¹ The views expressed in this paper are the author's and do not necessarily reflect the position of the Business Council of British Columbia.

² More information on *Outlook 2020*, including the papers references in this essay, can be obtained from the Business Council's web site: www.bcbc.com

- 1) What are the most important external and internal trends that will define the economic environment for British Columbia in the next decade?
- 2) How can the province continue to prosper in an increasingly competitive and knowledge-based global economy?
- 3) What steps can be taken to improve upon current policies, institutions, attitudes, and practices to strengthen the foundations for economic success?

At the heart of the project was a series of papers that explore topics relevant to the province's economic future. Most were developed by outside researchers, in some cases in partnership with other organizations. A few were written by Business Council staff. In total, 28 papers were commissioned for *Outlook 2020*, many dealing with the prospects for specific industry sectors deemed important to the province's economic well-being. All of the papers, along with a synthesis report for the project, are posted on the Council's web site (www.bcbc.com)

There are four desired hallmarks of the British Columbia economy that we envisage for 2020:

- 1) It is **open and connected to the world**, in terms of trade and investment, as well as the transportation and communications linkages necessary to support the province's role as a Gateway economy with a sizable tourism sector.
- 2) It is a **successful exporter**, with more enterprises engaged in trade across a spectrum of goods- and service-producing industries.
- 3) It is an **innovation-led economy**, as reflected in the behavior and strategies of firms and institutions in the public and private sectors.
- 4) It is recognized as a **leader in combining smart environmental and energy practices**.

Box 1 lists a number of metrics which the BC Progress Board uses to chart the province's economic performance. Most show where BC ranks within Canada, although for two measures there is also information on its standing relative to all provinces and American states for which data are available. Since 2002 BC Progress Board benchmarking has painted a fairly consistent picture: in a comparative context, British Columbia scores well on health

outcomes, environmental quality, and some aspects of education and human capital; it is a middling performer on indicators of economic well-being, including innovation; and it has a very mixed record on metrics that gauge social condition.

Box 1	
Where BC Ranks	
Real GDP per person	5 th in Canada; 51 st in NA
Employment rate (among 15-64 age group)	4 th in Canada
Productivity	6 th in Canada
Business non-residential investment as % of GDP	5 th in Canada 8 th in Canada
Value of exports per capita	8 th in Canada
University completion (share of 25-54 age group)	2 nd in Canada
R&D spending as % of GDP	5 th in Canada; 37 th in NA

Source: BC Progress Board.

Science, Technology and Innovation

The accelerating pace of scientific and technical change is one of the most significant trends shaping the global economic landscape. This point emerged in many of the papers developed for *Outlook 2020*, including several which examine the competitive dynamics unfolding in specific trade-exposed industry sectors. From health care to manufacturing to environmental remediation, the development and application of new knowledge generated by science and technology is redefining the way business is done. This has profound implications for the ability of countries, regions and even cities to prosper. “Strength and leadership in science, technology and innovation is the price of entry to full participation in the knowledge-based global economy of the 21st century.”³ Advances in these fields are creating new markets for goods and services, blurring distinctions between industries, reshaping business models, and altering patterns of competitive advantage. For example, the development of large-scale non-conventional ‘shale gas’ plays in Western Canada has been enabled by advances in horizontal drilling and ‘fracturing’

³ Science, Technology and Innovation Council, State of the Nation 2008, Ottawa (2009), p. 5.

technologies by oil and gas companies. This has led to a dramatic expansion in British Columbia's estimated natural gas reserves since 2005.

Science and technology are closely linked to innovation in many policy discussions. Innovation involves new or better ways of doing things that have economic value. New ideas and technologies that stay in the lab may increase the stock of human knowledge, but only when they migrate to the commercial world do they produce significant economic benefits. One key conclusion of *Outlook 2020* is that a broadly-based commitment to innovation is necessary to developing products and services for export – and to making British Columbia a leader in smart environmental and energy practices.

From a quantitative perspective, a jurisdiction's innovation performance can be assessed along three dimensions:⁴

- *Inputs*, like research and development activity, investment in advanced technologies and equipment, and the proportion of the workforce consisting of scientists, engineers and technologists.⁵
- *Outputs*, such as the proportion of business sector revenues derived from products/services introduced with the past 3-4 years.
- *Outcomes* – for example, a country or region's market share in technologically sophisticated industry sectors, the speed of diffusion of new technologies across the business sector, the growth of locally-based innovative firms with a global presence, etc.

As the term is used in contemporary academic and policy literature, innovation takes multiple forms – research and development carried out in universities, businesses and institutes; patent activity; the spread of knowledge and new technologies across firms; and the availability of venture and other risk capital to support the formation and growth of innovative businesses.

More broadly, innovation in a business context can be thought of as activities that fall under the following umbrella:⁶

⁴ Expert Panel on Business Innovation, Council of Canadian Academies, Innovation and Business Strategy: Why Canada Falls Short, Summary Report (April 2009), p. 7.

⁵ Some studies identify the proportion of workers with graduate-level degrees as an important aspect of innovation performance.

⁶ Organization for Economic Cooperation and Development, Oslo Manual, 2005.

- Product innovation – developing and bringing to market new/improved products.
- Process innovation – making changes in the way goods/services are produced.
- Direct firm investments in research, development, and the acquisition of capital goods and software that embody advanced knowledge.
- “Soft” innovations at the level of the enterprise – changes in management and organizational practices and functions that lead to improvements in productivity, quality and customer service.

British Columbia has a mixed record on innovation. The BC Progress Board reports that the province ranks 5th in Canada in R&D spending as a share of GDP. Aggregate outlays on R&D edged up from less than 1% of GDP in 1990 to a still very modest 1.4% by 2006. Business investment in R&D is very low, a finding that is likely linked to the province’s industrial structure (weighted heavily toward resource extraction and service industries). Federal and provincial government support for front-end pre-commercial research, particularly in universities and teaching hospitals, has increased over time, but relatively few businesses in BC are involved in R&D. For most BC enterprises, innovation has nothing to do with direct expenditures on research and development. Instead, it means using machinery, equipment, software and other assets that embody advanced technological knowledge; deploying novel marketing strategies; and adopting human resource and other organizational practices that generate gains in productivity, efficiency and market share.

The prevailing ‘small business’ character of the province’s private sector, including the advanced technology sector, contributes to BC’s lackluster innovation record. Contrary to what many believe, the presence of large companies is positively correlated with private sector innovation. Some 90% of worldwide business R&D is performed by companies with more than 250 employees (close to 80% is done by those with 500 or more).⁷ Bigger firms have a greater capacity to finance innovation, to commercialize new ideas, to

⁷ Organization for Economic Cooperation and Development, OECD Industry, Science and Technology Scoreboard (2007).

forge alliances, to hire and develop engineers and scientists, to deploy and extract economic value from new technologies, and to participate in collaborative arrangements with universities and outside experts. Indeed, a pronounced structural weakness of the BC economy is that the province has only 7,000 firms with more than 50 employees, out of a total of 391,000 businesses.⁸ The typical ‘technology’ company has fewer than ten employees, with only a handful of companies in the technology sector employing more than 500. Far from being a source of strength, the paucity of large innovative enterprises is a significant impediment to building globally competitive industry clusters in British Columbia.

Today, companies looking to succeed in global markets are differentiating themselves through innovation: by introducing new products and services that meet customers’ needs, finding different ways of going to market, or achieving advantages in their production or distribution systems. The research done for *Outlook 2020* concludes that too few BC companies compete in this way. The same is true for Canada as a whole.

Most studies categorize Canada as a mid-level innovation nation based on the kinds of measures referenced above. The weakness in Canadian innovation is concentrated in the business sector. Among the provinces, only Ontario and Quebec match the OECD average on business sector R&D intensity. These two provinces also tend to outperform the rest of Canada on business investment in machinery, equipment and advanced technologies.

Innovation and Creativity

Innovation is not limited to science, nor does it always entail research and development or visible advances in technology (albeit such advances are crucial to much innovation). As the Council of Canadian Academies’ Expert Panel of Innovation noted in its landmark 2009 report, “Innovation...is the manifestation of creativity, the uniquely human capacity to transform the imagined into the real.” Innovation matters to society, “because it is the means by which problems are solved and new opportunities are created.”⁹

⁸ BC Stats, Small Business Profile, 2009. Note that of 391,000 firms, 216,00 are categorized as self-employed without paid help.

⁹ Expert Panel on Business Innovation, Summary Report, op. cit., p. 3.

Understood this way, innovation shades into the concept of ‘creativity’ that has captured the attention of many analysts.

Creativity is the production of new ideas that are fit for a particular economic or business purpose. From the perspective of the macro-economy, the challenge is less to spur the growth of ‘creative industries’ than it is to stimulate all industries to be more creative (and innovative). *Outlook 2020* found that British Columbia is a fertile environment for the formation and growth of ‘creative industries;’ the province also boasts a substantial ‘creative class.’ In 2008, the ‘creative sector’ consisted of a collection of sub-industries which together represent almost 3% of the province’s GDP and directly supported 85,000 jobs.¹⁰

The application of creativity through design is having an impact on many industries, including some in traditional sectors. Historically, BC’s economy has been driven by resource-based industries that have made little use of industrial design; instead, innovation in resource sectors has mainly focused on process improvements to reduce unit costs and finding ways to access new supplies. That is now changing. Industrial design is becoming an important component of innovation and commercialization, “because it can be a source of competitive advantage in the marketplace where most competitors have the same technology.”¹¹ The province has made visible progress in bolstering its position in industrial design. It has established the Emily Carr University of Art and Design, which has well-regarded programs at both the undergraduate and graduate levels. More recently, BC has formed a Wood Innovation and Design Centre affiliated with the University of Northern British Columbia to nurture and capture design opportunities in the forest sector.

Business Ambition

One commonly overlooked factor that is crucial to innovation-fueled economic growth at the local/regional level is business ambition. Are local companies dedicated to innovation and market expansion, and willing to take

¹⁰ Pricewaterhouse Coopers, “Opportunity BC 2020: Creative Sector,” report prepared for the Business Council of British Columbia (2009). Available at: www.bcbc.com. The report identifies the following sub-industries as components of the broad creative sector: film and television production; sound recording; performing arts and heritage institutions; design; new media (including video games, software and internet-based entertainment; advertising; radio and television broadcasting; and print publishing.

¹¹ Premier’s Technology Council, 12th Report, 2009, p. 57.

the necessary risks? Absent this, no region is likely to enjoy innovation-based economic growth, or to witness the emergence of a critical mass of significant, global-scale businesses built around innovation.

The extent of business ambition, and the nature of the competitive strategies chosen by firms and entrepreneurs, are not matters that governments directly control; ultimately, they depend on the goals and skills of managers and entrepreneurs. But some aspects of public policy may serve – even inadvertently – to dampen business ambition. One example is Canada’s business tax structure, in which much lower tax rates are imposed on ‘small business’ income. In British Columbia, the government plans to adopt a zero income tax rate for small business income by 2012, versus a rate of 10% for income earned by mid-sized and larger firms.¹² Ontario’s employers’ health tax exempts the first \$400,000 of payroll from the levy. At the national level and in most provinces, tax support for private sector research and development is also linked to firm size: the smaller the better. All of these features of the tax system encourage businesses to remain small and create disincentives for those that aspire to grow.

Financing Innovation

Many analysts point to difficulties in financing knowledge-based firms as a factor slowing innovation in Canada. There is some evidence to support this view. Unlike many other businesses, small- and mid-sized innovative firms typically depend on equity rather than debt to finance growth (this reflects the inherent risk of innovation and the fact that such firms lack tangible assets to use as collateral for borrowing). However, the sources of equity finance for innovators are limited in Canada.¹³ This problem is linked to and exacerbated by the fragmented and excessively tax-driven character of the Canadian Venture Capital sector as it has evolved over time.¹⁴ Recent changes in federal tax policy may help to attract more American VC funding into Canada, increasing the pool of growth capital for innovative companies and strengthening the quality of the VC industry as a whole.

¹² In 2010, the provincial small business tax rate is 2.5%, versus 10.5% for other businesses.

¹³ S. Wang, “Financing Innovative Small- and Medium-Sized Enterprises in Canada,” Industry Canada, Small Business and Tourism Branch, Working Paper (October 2009).

¹⁴ Douglas Cumming, Financing Entrepreneurs: Better Canadian Policy for Venture Capital, C.D. Howe Institute Commentary (April 2007).

Some scholars have started to worry that the ‘Great Recession’ of 2008-09 and its extended after-effects may retard economic dynamism in mature economies like Canada, in part by making it harder for growth-oriented firms to pursue innovative business strategies. In a recent paper, Nobel Laureate Edmund Phelps frets that as the systemic crisis in financial markets slowly resolves, it will severely limit access to capital and – important for innovation – the quality of capital for many businesses.¹⁵ He anticipates lasting damage to the environment for ‘big’ innovation in particular. Even before the ‘Great Recession’, the resources available to fund private sector innovation were dwindling, with Venture Capital investment in the US tumbling from \$100 billion in 2000 to \$23 billion in 2005 and \$17 billion last year. A similar pattern is evident in Canada.

The American banking and shadow banking systems display a diminished interest in and ability to supply capital to innovative firms; and the public capital markets, according to Phelps, are not much better. He recommends the establishment of state-sponsored banks with an explicit mandate to lend to and invest in innovative business projects, especially those of a longer-term nature in fields such as life sciences, bio-technology and clean energy. It is striking that this *dirigiste* recommendation comes from the pen of a well-respected market-oriented economist who has long championed the benefits of Schumpeterian creative destruction.

Advancing Innovation in British Columbia

According to an *Outlook 2020* paper written by the British Columbia Innovation Council, “a rich and interconnected support infrastructure for entrepreneurs is key to the success of an entrepreneurial cluster in any jurisdiction.”¹⁶ The entrepreneurship infrastructure needed to support innovation can be thought of as the systems, networks, venues and actors that support entrepreneurial success, increase local economic development, and reduce the risk of starting a company for entrepreneurs. It includes the local IT infrastructure, education programs for entrepreneurs, networks of mentors

¹⁵ Edmund Phelps, “The Slump, the Recovery and the ‘New Normal,’” Centre on Capitalism and Society, Columbia University, May 2010 (<http://www.capitalism.columbia.edu>). A summary version of this paper was published in the January 2010 issue of *Harvard Business Review*.

¹⁶ BC Innovation Council, “BC Entrepreneur Infrastructure Requirements to 2020,” report prepared for the Business Council of British Columbia (2010). Available at: www.bcbc.com.

and advisers, lab space, incubator parts, angel investors, venture capitalist and professional expertise for business services (accountants, lawyers and so on).

A healthy innovation entrepreneurship infrastructure provides product development and commercialization tools to receptive entrepreneurs. Skills, experience and connections are passed to the entrepreneur by the systems, networks, venues and actors that make up the entrepreneurship infrastructure. The vehicles for this knowledge transfer include coaching, mentoring, training/professional development and introductions - all things are inherently local in their provision.

Commercialization is predominantly a private sector phenomenon. As the BC Innovation Council points out, however, the responsibility for developing a robust ecosystem that fosters innovation and commercialization does not rest solely with the private sector. “In key technology jurisdictions around the world governments are taking an increasingly interventionist role and collaborating with the private sector. These private-public partnerships are helping to fund new and existing business and technology accelerators and their clients as a way of [speeding]... the commercialization of technology and the cultivation of a healthy stable of new and sustainable technology companies.”¹⁷

In some cases, the public sector can serve as an important source of early or lead demand to accelerate commercialization. For example, with government entities controlling the bulk of health care funding in Canada, the development and testing of innovative healthcare products and services is an area where the public sector could leverage its control over demand to create opportunities for domestic companies to commercialize innovative products and services. There are similar opportunities in green technologies, ICT, logistics, and education.

Local market access, including to markets where public sector institutions possess strong buying power, allows local companies to gain an important early ‘track record’ which is often a critical hurdle in achieving export success. More generally, the ability of BC (and other Canadian) firms to develop and export sophisticated goods and services is enhanced if the domestic marketplace features demanding buyers who put a high value on innovative

¹⁷ Ibid.

products and services and leading-edge technology solutions. Unfortunately, this does not describe many key public sector markets in Canada, including those in the health care sector.

British Columbia is well-positioned to further leverage its significant public investments in R&D by devoting more resources and attention to commercialization and to stimulating user-driven innovation. A strong entrepreneurship infrastructure, including a robust ‘acceleration ecosystem,’ can increase the birth and success rates of innovative firms and ultimately help to strengthen and diversify the economy. The BC government is already a large contributor to the province’s entrepreneurship infrastructure through its funding of industry organizations, the BC Regional Science and Technology Network, universities, specialized incubators like Genome BC, and business competitions like New Ventures BC. Indeed, in recent years, governments across Canada have taken steps to encourage commercialization. Federal and BC government support provided to the Centre for Drug Research and Discovery (CDRD) at the University of British Columbia is an excellent example: CDRD’s mandate is to commercialize new life sciences products and technologies developed by small and medium-sized innovators. Further investments in acceleration ecosystem programs could help to address BC’s short- and long-term commercialization challenges.

Finally, investment in machinery and equipment (M&E) and in information and communications technologies (ICT) is another crucial requirement for developing a more innovation-based economy. It is important to understand that the vast majority of companies do not and never will invest in research and development. For these firms, the acquisition and deployment of new technologies, equipment, machinery and business processes is the primary means by which they move closer to the innovation frontier. Research demonstrates close links between ICT investment and economic growth.¹⁸ This is an area where British Columbia falls below the Canadian average and substantially underperforms the leading American and European jurisdictions. The province’s decision to harmonize its sales tax with the federal Goods and Services Tax will stimulate investment in M&E and other productive assets by sharply reducing the marginal effective tax rate on new

¹⁸ See Aled ab Iorwerth, “Machines and the Economics of Growth,” Department of Finance Working Paper (March 2005); Dale Jorgenson, ed., *Economic Growth in Canada in the Information Age* (Ottawa: Industry Canada, December 2004); Andrew Sharpe, Someshwar Rao and Jeremy Smith, “An Analysis of the Labour Productivity Growth Slowdown in Canada Since 2000,” *International Productivity Monitor* (Spring 2005).

capital investment.¹⁹ Boosting investment in M&E, including ICTs, is essential to raising productivity and becoming an increasingly innovation-driven economy.

In the post-Olympic decade, BC would benefit from a multi-pronged research and innovation strategy that sets goals for improvement and seeks to optimize the substantial public resources already dedicated to innovation and commercialization. In this connection, it is critical that the province coordinate with the federal government – including leveraging Ottawa’s funding of post-secondary research and industrial development. Provincial dollars allocated to innovation will deliver greater results if they are linked to federal priorities.

Apart from the points made above, *Outlook 2020* identified a number of additional ideas that could improve BC’s performance on innovation and commercialization:

- Within the procurement budgets of the Health Authorities, a modest amount of funding could be earmarked to support market access for BC-based suppliers of innovative health products and technologies who currently find it difficult or impossible to sell locally.
- The province could explore the merits of a tax exemption for commercialization, similar to that recently adopted by Ontario. Ontario has legislated a ten-year income tax holiday for companies formed in the province to commercialize intellectual property developed by qualifying Canadian universities, colleges or research institutes. The revenue cost to the treasury from such a program is expected to be small.
- To accelerate the commercialization of new ideas and technologies, the province could establish a program of Commercialization Fellowships, under which it would contribute a portion of the salary for post-doctoral and other graduates of science, engineering, technology and health-related programs, to work for up to two years with innovative BC companies.
- Given low private sector outlays on R&D, public agencies take on greater importance as sources of innovation, particularly in sectors such

¹⁹ Jack Mintz, British Columbia’s Harmonized Sales Tax: A Giant Leap in the Province’s Competitiveness, University of Calgary, School of Public Policy, SPP Briefing Papers, Volume 3, Issue 4, March 2010.

as energy, health care and agriculture where government and Crown agencies are major players. In the energy sector, BC Hydro and its subsidiary Powertech Labs are significant players in the innovation ecosystem, with the capacity to commercialize new products and services that drive energy efficiency. There may be other sectors where public agencies can play a similar role.