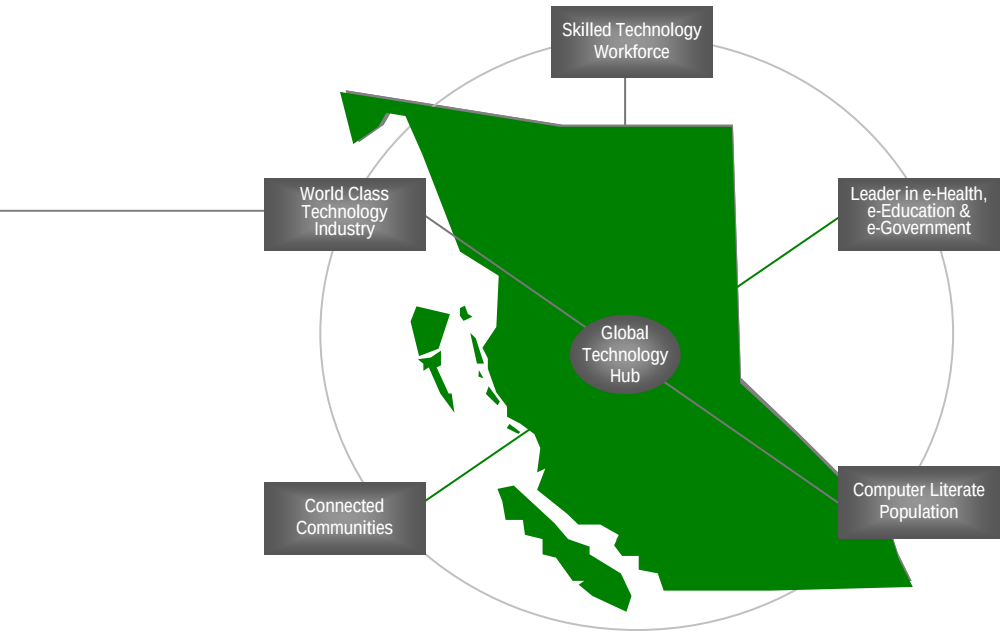
PREMIER'S TECHNOLOGY COUNCIL

10TH REPORT

SUPPLEMENT

Innovation and Commercialisation



We believe that with strong cooperation between the provincial government and private enterprise, British Columbia will be one of the world's top ten technology centres

Every effort has been made to consider all information obtained and to be as accurate and consistent as possible in our use and analysis of all research materials. However, errors or omissions may have occurred. Please notify the Premier's Technology Council of any significant inaccuracies by e-mail at:

Premiers.TechnologyCouncil@gov.bc.ca

Premier's Technology Council
730-999 Canada Place
Vancouver, British Columbia V6C 3E1
http://www.gov.bc.ca/prem/popt/technology_council/

Table of Contents

1 EXECUTIVE SUMMARY 1

2 INTRODUCTION 3

3 RESEARCH 7

3.1 RESEARCH INVESTMENT 7
3.1.1 Gross investment on R&D 7
3.1.2 Business enterprise sector expenditure on R&D 13
3.1.3 Research efficiency - Commercialization 19
3.2 RESEARCH IN PUBLIC SECTOR 20
3.2.1 Government research / innovation strategy 20
3.2.2 Universities 23
3.2.3 University Industry Liaison Offices 38
3.2.4 Clusters 39
3.3 RECOMMENDATIONS 41
3.3.1 Ministry restructuring 41
3.3.2 Research investment 41
3.3.3 One university to top 20 42
3.3.4 Develop a faculty recruitment plan 42
3.3.5 Develop a graduate student strategy 43
3.3.6 UILOs 43

4 TALENT 45

4.1 INTRODUCTION 45
4.2 BRITISH COLUMBIA'S ADVANTAGES 47
4.3 CURRENT CHALLENGES IN ATTRACTING TALENT 49
4.3.1 Decision barriers 49
4.3.2 Immigration 54
4.4 STRATEGIES TO ATTRACT TALENT 59
4.4.1 Measures in other jurisdictions 59
4.4.2 Expatriates 59
4.5 RECOMMENDATIONS 61
4.5.1 Talent and the new ministry 61
4.5.2 No tax for employees on company stock (or stock options) 61
4.5.3 Housing 62
4.5.4 Deemed disposition 62
4.5.5 Immigration 63
4.5.6 Recruitment plan for talent 64

5 CAPITAL 65

5.1 CURRENT STATE OF THE CAPITAL MARKET 65
5.1.1 Founders, Friends, Family 66
5.1.2 Government Programs 69
5.1.3 Angel Investment 73
5.2 VENTURE CAPITAL 74
5.3 FUNDING GAPS 78
5.4 RECOMMENDATIONS 80
5.4.1 Barrier to large scale foreign investors 80
5.4.2 Proof-of-concept funding 81
5.4.3 Encouraging angel investment in BC 82

6 BC INNOVATION COUNCIL (BCIC) 83

6.1 INTRODUCTION 83
6.2 CHALLENGES BCIC COULD HELP TO ADDRESS 84
6.2.1 Talent gap and talent development 84
6.2.2 Entrepreneurial advice and mentoring 88
6.3 RECOMMENDATIONS 90
6.3.1 Improve research efficiency 90
6.3.2 Facilitate talent development 90

7 CONCLUSION 92

8 COMMERCIALISATION PROJECT BACKGROUND 93

APPENDIX A. LIST OF ROUNDTABLE PARTICIPANTS AND CONSULTATIONS 95

Note to the Supplement

During the preparation of its tenth report the Premier's Technology Council conducted extensive research in the areas of innovation and commercialisation. The quantity of the material gathered was such that it could not all be included in the final report. Consequently the PTC has prepared this supplement which more completely relates the data gathered. This does not change or restructure the recommendations submitted in the tenth report but instead provides more of the background that contributed to their development.

This page has been left blank intentionally.

1 Executive Summary

Knowledge based industries represent over 5% of GDP in BC and are growing quickly. While BC has some very successful companies in a number of key technology clusters, none of them are large and few of our biggest companies are headquartered in BC. If the technology industry in BC is to reach its full potential some critical issues will need to be addressed.

The knowledge economy is driven by three critical elements - research, talent and capital. Investment in research is, apart from talent, the most important driver of the knowledge economy. BC currently invests, through public and private means, about 1.45% of GDP in research. Top technology jurisdictions such as California and Massachusetts invest closer to 4.5% of GDP. BC needs to move towards the goal of investing 4.5% of GDP in research and 65% or more of that investment should come from private industry compared to the 40% which private industry currently invests. In order to ensure that this investment is efficient the government should develop a plan to focus the spending and it should revise the policies and procedures of the University Industry Liaison Offices. A significant strategic initiative should be made to invest in one of BC's universities with the goal of moving it into the top twenty in the world. World renowned universities are foundation elements for thriving technology centers and serve as powerful talent and research magnets. Finally, this increased research investment should be delivered according to a long term strategic plan for the technology economy of BC. A restructuring of the current Ministry of Advanced Education to place the education mandate in the Ministry of Education would leave the newly named Ministry of Research and Talent dedicated to the task of developing this critical component of BC's economy.

- Create a Ministry of Research and Talent dedicated to research and talent;
- Increase research investment to 4.5% of GDP from private and public sources;
- Ensure efficiency of research investment through strategic planning and streamlining of commercialisation practices; and
- Improve one of the BC universities to top twenty in the world.

Talent - in particular scientists, researchers and top technology business executives – is the most important resource in the knowledge economy. We need to reorient ourselves around the talent challenge. Our economic success in the future will depend on our ability to retain and attract these Highly Qualified Personnel (HQP). The government should put programs in place to retain our graduates, to recruit HQP including expatriates and to streamline the current immigration processes. Most importantly, BC needs to create a strong incentive for talented knowledge workers to live and work in

BC and for corporations to grow their businesses here. The elimination of tax on company stock would provide such an incentive.

- Proposed Ministry of Research and Talent to focus on talent retention and recruitment of researchers, grad students, and expatriates;
- Eliminate tax on company stock to create incentives to attract and retain talent and to keep businesses growing in BC; and
- Streamline the immigration processes for permanent residency and temporary foreign workers.

Capital is the third critical element of the knowledge economy. Our capital markets are growing, but remain immature relative to the top technology centers in the world. We have a strong angel community and a growing venture capital community but the total volume of capital available in BC does not support the development of companies in capital intensive sectors such as life sciences and clean technology, which often require hundreds of millions of dollars before their products reach the market. In order to fully fund these opportunities it is critical that the BC government work with the federal government to revise the US tax treaty to allow Limited Liability Corporation investors from the US to fund ideas in Canada more easily. Equally important is funding to move more ideas out of the lab and into the proof of concept stage where they can then be supported by angels and VCs. This development of prototypes and proof of concepts is supported by multiple levels of government in the US but no such support exists in Canada.

- Amend the tax treaty to allow US LLCs to invest in Canada; and
- Develop a series of proof of concept funds to move more ideas out of the labs. The Discovery Foundation could provide the capital.

Finally, there needs to be an agent for change in BC which can take on the long term work of growing the knowledge economy. The government ministry will do its part by creating the right environment for the tech economy to flourish. The various industry associations will also play a critical role in advocating for their sectors but there also exists the need for an interested but unbiased third party to provide ongoing direction and development. The BC Innovation Council is the agency best positioned to serve this need and we recommend that the BCIC take on some of the important tasks necessary for the growth of the industry. Ninety-five percent of the technology businesses in the province have less than ten employees. These businesses would benefit greatly from the advice and mentorship that could be provided by a network of virtual board members coordinated by the BCIC. The Council should take a proactive role in providing talent development and encouraging our educational institutions to develop programming for technology sales, technology product management, world class recruiting practices and virtual company management.

2 Introduction

"As for the future, your task is not to foresee it, but to enable it."
- Antoine de Saint-Exupéry, *The Wisdom of the Sands* (1948)

In today's world, particularly in countries like Canada with its modern economy and open trade practices, product and process innovation is the primary source of GDP growth. This does not mean only in the knowledge-based industries. The need to apply innovation and technology cuts across all sectors, including key sectors in BC such as mining, forestry, construction and retail. It is hard to imagine an industry that will not be transformed by technology. If our mainstream industries are not innovative, they will struggle to remain competitive in the global marketplace.

In mining, for example, Goldcorp[1], a Canadian mining concern, had a 55,000 acre site at Red Lake. Over the course of several years the firm invested over $10 million exploring the claim to little effect. Rob McEwen, the CEO, decided Goldcorp needed to change the rules of the exploration game if it was going to be successful in finding gold on the property. Their solution was to tap into the innovation of thousands of talented researchers in labs around the world. They posted the geological data from Red Lake on the internet and offered a prize of $500,000 for whoever could find extractable gold. Over 1400 qualified participants offered analysis from fields like advanced physics, intelligent systems and applied mathematics. Goldcorp found the gold and Red Lake is now considered the richest gold mine in the world. [2] [3] [4]

In retail, Netflix[5] has revolutionised the way people rent movies - by bringing the movies directly to them. After launching its subscription service in 1999, Netflix reached one million subscribers faster than industry giant AOL and now has over 6.7 million subscribers. Realising that accurate recommendations for movies are critical for customer satisfaction and commercial success; Netflix has offered a one million dollar prize to the system that improves the accuracy of their recommendations by 10%[6].

In the construction industry, BuildDirect, a BC company, has revolutionised the distribution of building materials. By approaching the manufacturers directly, they have cut the costs that accrue through the manufacturer's marketing and shipping efforts. Through volume buys, innovative logistics software, and on-line purchasing, BuildDirect has become the single-most cost efficient distribution channel. BuildDirect's model allows them to deliver product directly from the manufacturer to the homebuilder for less than half the traditional cost by eliminating the standard tiers of distribution. Founded in 1999, BuildDirect now does business in over 60 countries. [7]

Although innovation and technology will play a role in allowing our traditional

industries to grow and remain competitive, it is in the high tech industry where the greatest economic opportunities lie. British Columbia's high technology sector has undergone significant growth in the last decade. It has consistently grown at a faster rate than the overall economy and is likely to emerge as an even more important segment of the provincial economy in the years to come.[8]

In 2005, high technology industries generated about 5.1% of British Columbia's GDP, which is roughly similar to industries such as public administration and construction. The room for growth is clear, however, when we look south of the border. High technology industries generated just over 9% of GDP in the United States and in technology heavy states like California it accounted for just over 12% of the state's GDP[9]. Much of the rest of GDP growth in all countries will come from real breakthrough's in science. According to an OECD study, there is a long-term trend towards a knowledge-based economy where science, technology and innovation are the key factors contributing to economic growth.[10]

Governments have traditionally invested in the type of infrastructure that supports the economy of the day. In the middle ages this meant building castles and hiring armies to pillage neighbours and extort taxes from the peasants. In Canada during the late 1880s and early 1900s, infrastructure involved canals and railways. Canadian governments borrowed millions for canal purposes in the 1840s alone. Early in the twentieth century, highways were the major investment, garnering the bulk of government infrastructure spending. In the 1960s it was airports, with federal spending totalling about $500 million during the decade. [11] [12]

Today, a commensurate investment needs to be made in the knowledge economy with the recognition that people and knowledge are the natural resources driving our future. Broadband and education facilities are part of the knowledge economy's 'hard' infrastructure. The BC government's commitment to broadband development is ongoing, and in the 2007 provincial budget, over 20% of the $5.2 billion in capital investment was for schools and post-secondary education[13]. It is in the area of research investment where BC lags behind.

People are critical to the knowledge economy. Talent is the natural resource of the future and talented people are in demand the world over. Some investments by government, like the Canada Research Chair Program for example, have already had a great effect. We have a firm foundation in BC with a strong creative class and the kind of tolerant environment that attracts it. Talent is mobile, however, and we need to make it attractive for talented people to stay here.

Take Stewart Butterfield, for example, a classics scholar from the University of Victoria, who completed his master's degree at Cambridge. Stewart returned to Vancouver after completing his degree in England, and in collaboration with a lead developer in New

York, he and his wife, Caterina Fake, launched a photo-sharing site in February of 2004. Called Flickr[14], by 2006, the site had over 100 million photos and was sold to Yahoo for an estimated $25 to $30 million[15]. Stewart and his wife are the type of talented individuals we need to grow our knowledge economy. Unfortunately, Stewart and Caterina were persuaded by Yahoo to move to California.

A more hopeful example is New Horizon Interactive, which in March of 2005 set out to create an online world for kids where they could safely play games, have fun and interact. As parents and Internet specialists, New Horizon's owners wanted to develop a place they'd be comfortable letting their own kids visit. Based out of Kelowna, they launched Club Penguin[16] in 2005. The CEO, Lane Merrifield, was originally from Lethbridge and moved to Kelowna via California. Through the talents of the principle individuals, and while building the business entirely in Kelowna, Club Penguin quickly garnered an audience of more than four million active viewers. Club Penguin was sold to Disney in August of 2007 for $350 million[17]. The principals and the company will continue to be based in Kelowna.

British Columbia is not the only jurisdiction that has benefited from recruiting talented, creative entrepreneurs from other parts of the world. The Silicon Valley is probably the best example of a talent magnet for star international talent. Google was founded by an American (Larry Page) and a Russian (Sergey Brin) who met at Stanford University.[18]. Ebay was founded by a Frenchman (Pierre Omidyar)[19]. Yahoo was founded by a Taiwanese native (Jerry Yang) with a Canadian as founding CEO (Jeffrey Mallett)[20]. Linux was founded by a Finn (Linus Torvalds)[21], Sun Microsystems by an Indian (Vinod Khosla)[22], and Hotmail by an Indian (Sabeer Bhatia)[23]. In fact, Business Week reported that for engineering and technology companies, "…half of those founded in Silicon Valley from 1995 to 2005, had a foreign-born chief executive or lead technologist as a founder." [24] Talent is clearly the key, and it goes where the action is. We need to keep our own talent and attract it from elsewhere.

One of the key factors in attracting talent to every top technology region is the presence of a world class city. Great cities are clearly, as Bill Gates claims, IQ magnets. Vancouver is already recognised as a world class city and this is having a positive effect. For example, Microsoft chose Vancouver[25] as one of its ten global research centers because of its current tech base, diversity, and immigration policies that are more open than in the US. As well, the city has large Asian, Indian and Eastern populations, which is critical for technology companies in the US, where the share of awarded degrees in science and engineering are declining, but remain high in Asia and Europe.[26]

So where does BC stand in terms of growing its technology industry? We have a good economic foundation built on our resource industries. This is being added to by some technology clusters that demonstrate real potential including digital media, life sciences, wireless, IT and clean technology. More importantly, we have some of the key elements

needed for the knowledge economy including strong universities, positive immigration policies, and a tolerant and diverse population.

In spite of these tremendous assets, however, our knowledge economy infrastructure remains immature. There are a number of areas in which British Columbia needs to improve if the province is to take full advantage of its assets. We need to understand why our tech community remains quite small, without any companies of size, and why most of our biggest companies are not headquartered in BC.

That is the focus of this paper. The PTC will make recommendations on how BC can improve on its underdeveloped capital markets, boost investment on research, deepen the talent pool of scientists and business leaders and become more efficient at commercialising research. We need to develop a strategy and invest in the knowledge economy if we want to be a top tech region in the world. The knowledge based economy is all about people and research. We need to orient ourselves around these two important resources. This is not only necessary for us to succeed as a top tech region in the world, but is necessary for all of our industries to succeed in the global marketplace.

3 Research

Our interviews, roundtables and the subsequent related research have made it abundantly clear that investment in research and development is the most important direct driver of innovation and commercialisation. Furthermore, it is predicted that the majority of GDP growth in almost all sectors of the economy will come from innovation in products, processes and services. Investment in research not only helps to develop the technology industry but in fact it helps to develop all industries in BC.

3.1 Research investment

The Economist Intelligence Unit identified the most important direct drivers in innovation as:[27]

- R&D as a percentage of GDP;
- Quality of the local research infrastructure;
- Education of the workforce;
- Technical skills of the workforce;
- Quality of IT and communications infrastructure; and
- Broadband penetration.

Apart from talent, the single most important direct driver of innovation and commercialisation is R&D investment as a percentage of GDP. The importance of research is also illustrated in work done by the US Bureau of Economic Analysis which found that if R&D were treated as an investment instead of an expenditure, then the R&D investment and the income flows arising from accumulated R&D capital would account for about 4.5% of real GDP growth in 1959-2002. The percentage would be even higher for the latter part of that period at 6.5% for 1995-2002. Businesses' investment in commercial and all other types of buildings would account for just over 2% of the growth in 1959-2002.[28]

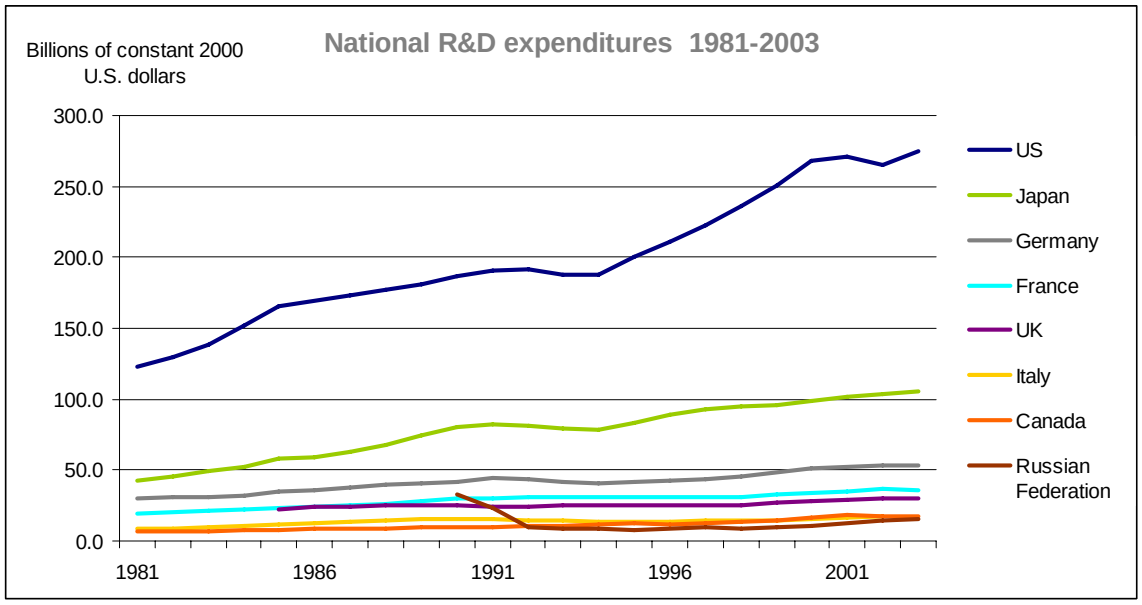
3.1.1 GROSS INVESTMENT ON R&D

Gross investment in R&D is one of the important measures where British Columbia trails many jurisdictions. Indeed Canada itself does not score well. We are ranked lower than the US, Japan, Germany, France and the UK (Figure 1)[29]. The R&D as a percentage of GDP is also low, ranking fifth among selected OECD countries (Figure 2) [30] and also ranks behind Finland, and Switzerland (Figure 3)[31].

BC has made great strides in the past ten years in increasing government support for research, including aggressively pursuing federal CFI funding, and developing the BC

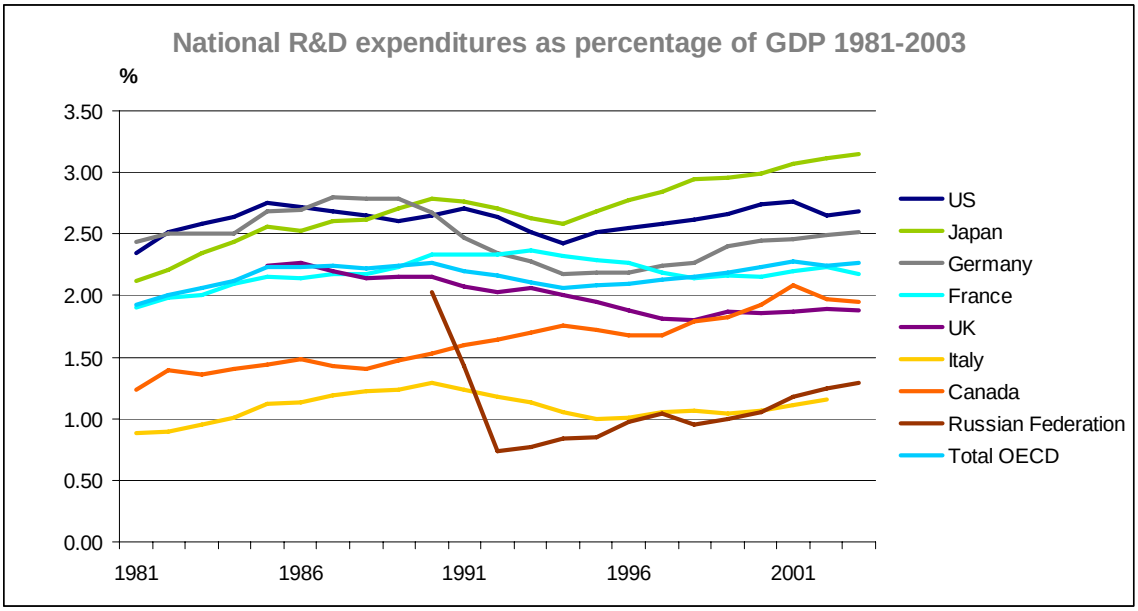
Knowledge Development Fund. However, in this critical area, BC with its 1.45% (2004) still trails the major technology centers of the world by a considerable margin. BC ranked 39th out of 61 jurisdictions in 2003 based on R&D investment as a percentage of GDP, and our ranking was lower than the key western states (Figure 4).[32] The discrepancy is even starker if we compare BC with the three key technology states of Washington, California and Massachusetts. BC is investing less than half of any of them on R&D as a percentage of GDP (Figure 5).[33] Among our key Canadian competitors BC is fourth after Quebec, Ontario and Alberta in total government expenditure on R&D (Figure 6).[34]

Figure 1. R&D expenditures among selected OECD countries 1981-2003



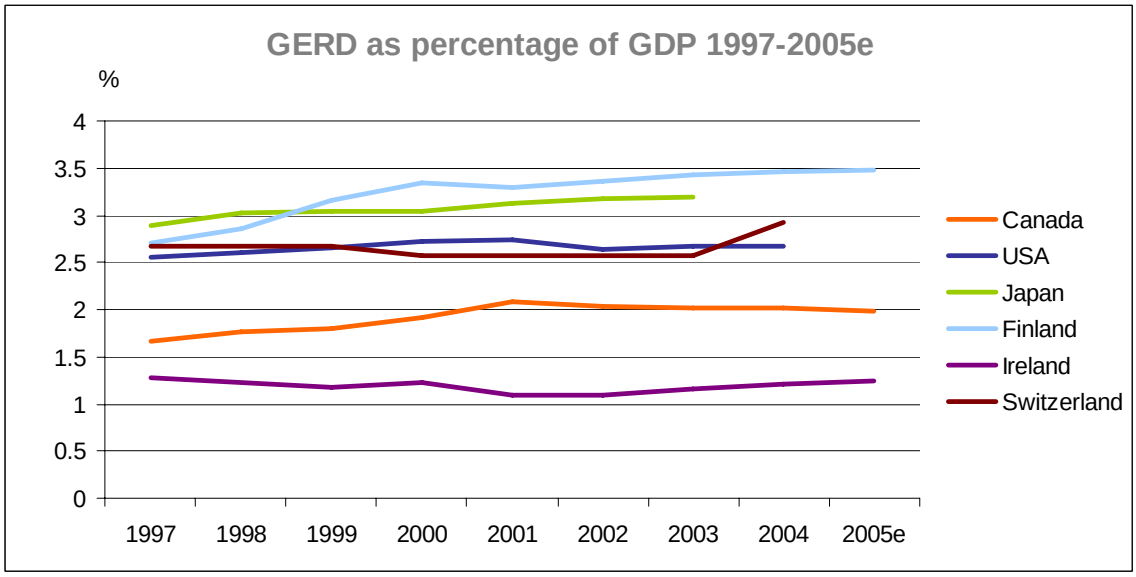
Source: National Science Foundation

Figure 2. R&D expenditures as % of GDP among selected OECD countries in 1981-2003



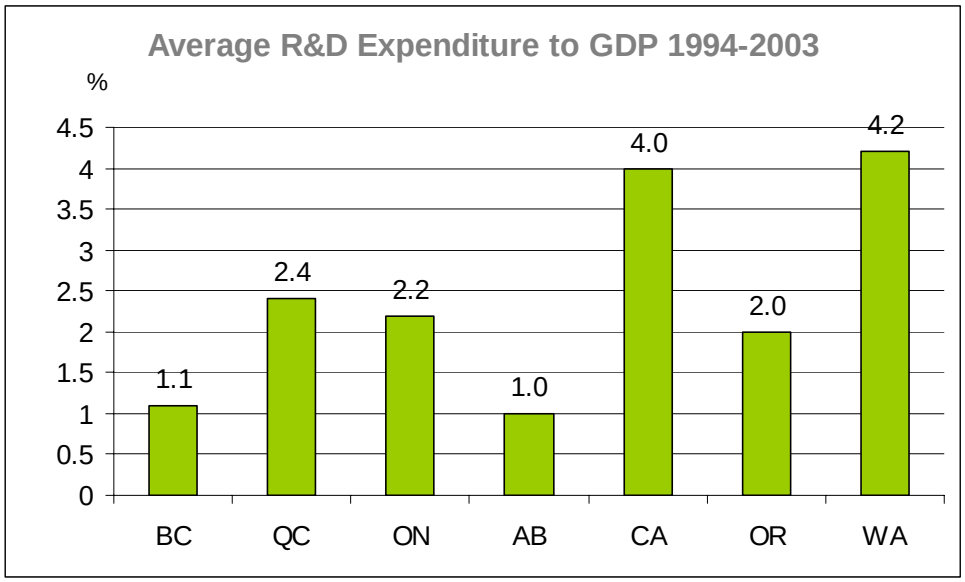
Source: National Science Foundation

Figure 3. GERD as % of GDP in selected jurisdictions in 1997-2005e



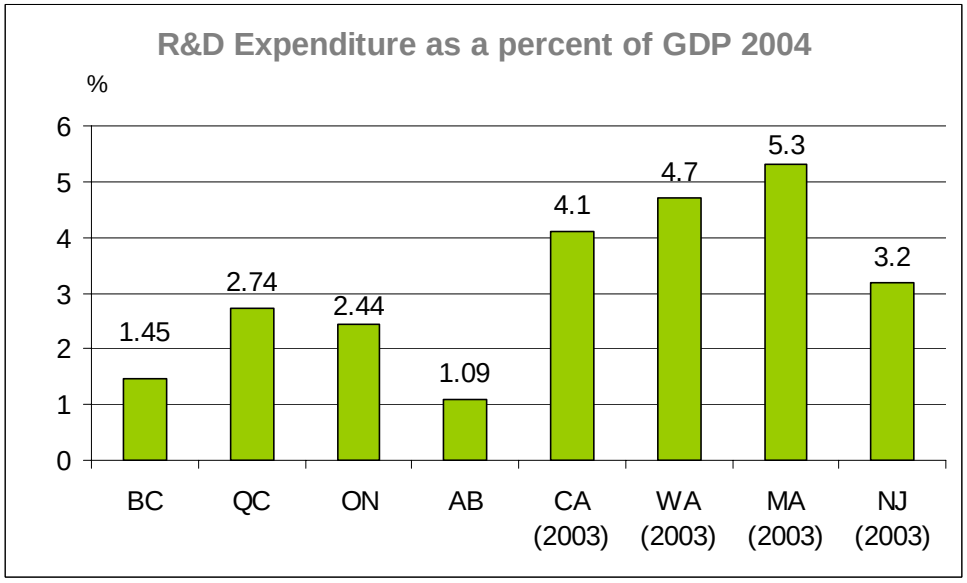
Source: Eurostats and Statistics Canada

Figure 4. Average R&D expenditure as % of GDP in selected jurisdictions in 1994-2003



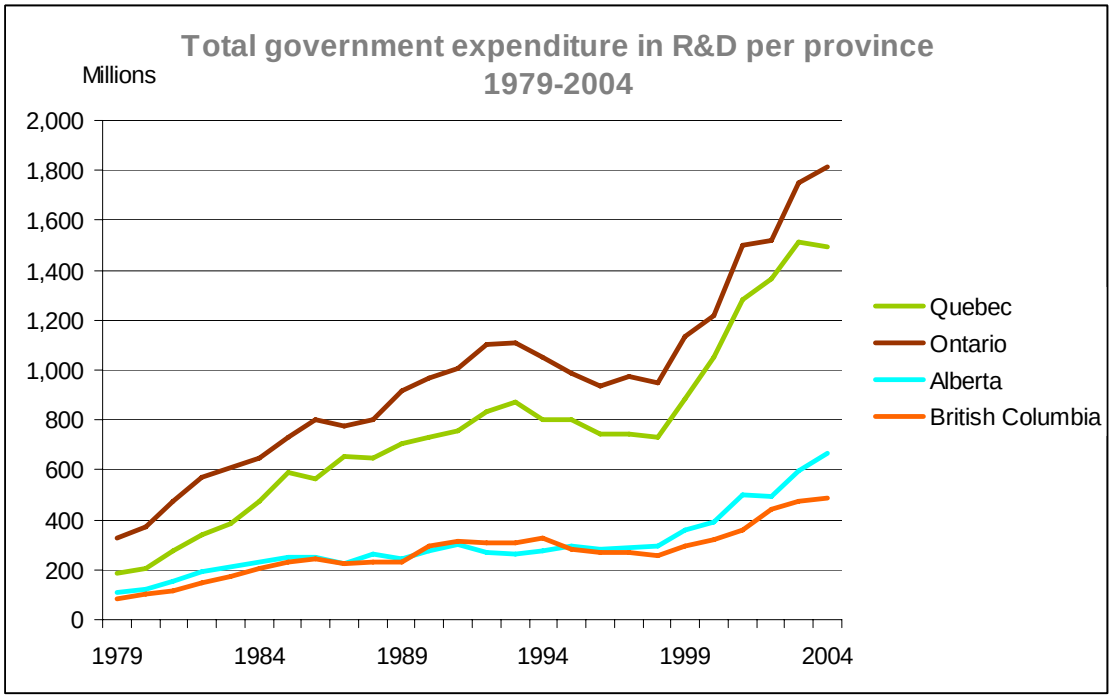
Source: BC Progress Board (2006)

Figure 5. R&D expenditure as % of GDP in selected jurisdictions in 2004



Source: BC Progress Board (2007)

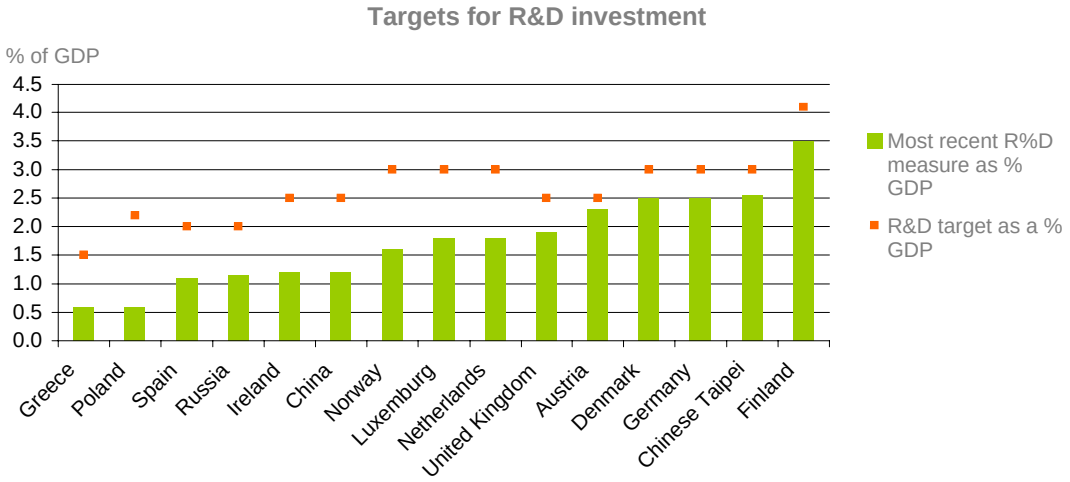
Figure 6. Total government expenditure in R&D per province



Source: Statistics Canada

Many OECD countries have developed a national science and innovation strategy with targets for R&D investment as percentages of GDP. Of the 15 countries that have targets, most are over 2.5%, and the highest is over 4%.[35] The most recent measures and targets per country are presented in Figure 7. [36]

Figure 7. Targets for R&D spending as a percentage of GDP



Source: OECD (2006), "OECD Science, Technology and Industry Outlook", p.5

These gross numbers, although illustrative of the challenge are in part a function of a historically resource dependent economy. It is important to recognise that British Columbia has recently made some significant investments in research. Research related spending measures of the provincial government over the past few years include:

- the Centre for Drug Research and Development (CDRD);
- the BC Knowledge Development Fund (BCKDF);
- the Leading Edge Endowment Fund (LEEF);
- Genome BC;
- Michael Smith Foundation for Health Research;
- Forest Science Program;
- Investments in fuel cells and hydrogen technology;
- World Centre for Digital Media;
- Natural Resources and Applied Science Research Endowment; and
- WINLAB BC.

These are all intelligent, targeted investments that indicate a keen awareness of the importance of spending in these areas. This investment needs to be greater, however, for BC to become a world leader as a research and innovation economy.

Quick facts – The CFI and the BCKDF

The Canada Foundation for Innovation

The Canada Foundation for Innovation (CFI) is an independent corporation created by the Government of Canada to fund research infrastructure. Its mandate is to strengthen the capacity of Canadian universities, colleges, research hospitals, and non-profit research institutions to carry out world-class research and technology development.

Since 1997 the CFI has been entrusted with $3.75 billion by the Government of Canada. CFI funds up to 40% of a project's infrastructure costs. Institutions and their funding partners from the public, private, and voluntary sectors will provide rest of the costs.
www.innovation.ca

BC Knowledge Development Fund

The British Columbia Knowledge Development Fund provides funding for research infrastructure at post-secondary institutions. This fund provides 40% toward the cost of a research project and is typically matched with federal funding through the Canada Foundation for Innovation.

The British Columbia Knowledge Development Fund (BCKDF) permits public post-secondary institutions, teaching hospitals and affiliated non-profit research agencies to invest in research infrastructure.

As the objectives of the fund focus on creating and enhancing research infrastructure within the province, proposals should reflect the manner in which they will contribute to building or enhancing an institution's long-term capacity for leading-edge research, provincial economic development and job creation.
www.aved.gov.bc.ca/research/bckdf/

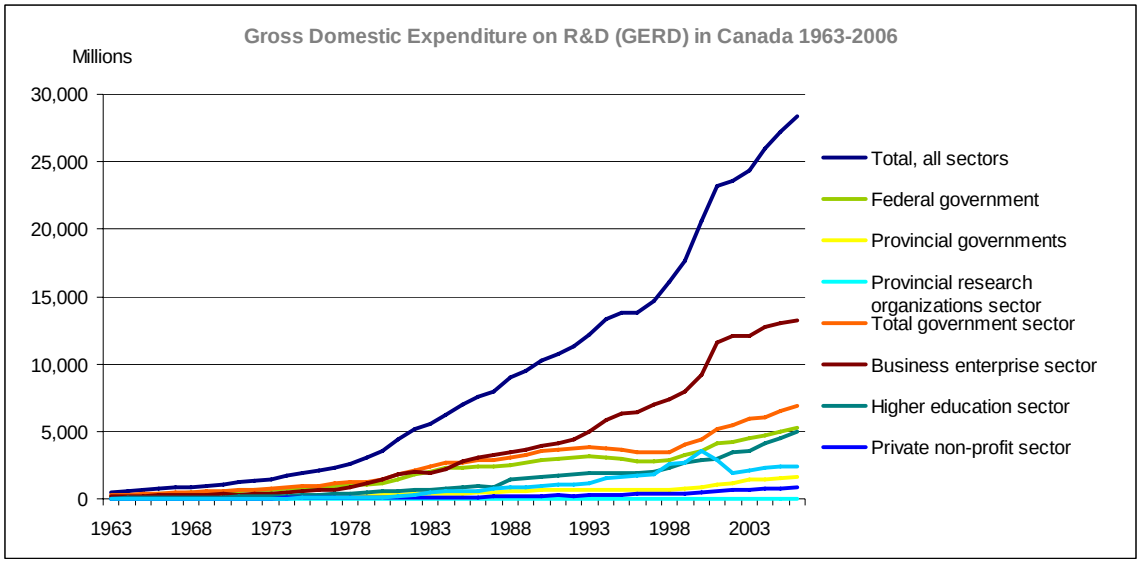
3.1.2 BUSINESS ENTERPRISE SECTOR EXPENDITURE ON R&D

World class economic performance requires investment in research and development of 4 to 5% of GDP. Government alone cannot generate that kind of R&D investment. Industry must play a role. The absence of any large tech companies or other large company headquarters located in BC is a significant disadvantage the province needs to overcome. A solid foundation of support for industry-based investment exists in the federal and provincial Scientific Research and Experimental Development (SR&ED) tax credit program, but a long-term strategic plan which includes the engagement of public, private and foreign parties will likely be necessary to achieve on-going investment in the range of 4 to 5% of GDP.

On a percentage basis, private expenditure on research in BC is also low. This is changing, however, and as our economy diversifies BC must increase the level of private research spending because business investment in R&D (BERD) has a more definitive impact on the economy than government R&D. According to the OECD a 0.1% increase in BERD intensity raises per capita output by 1.2%. The impact of the government funded R&D is not found to be as good.[37]

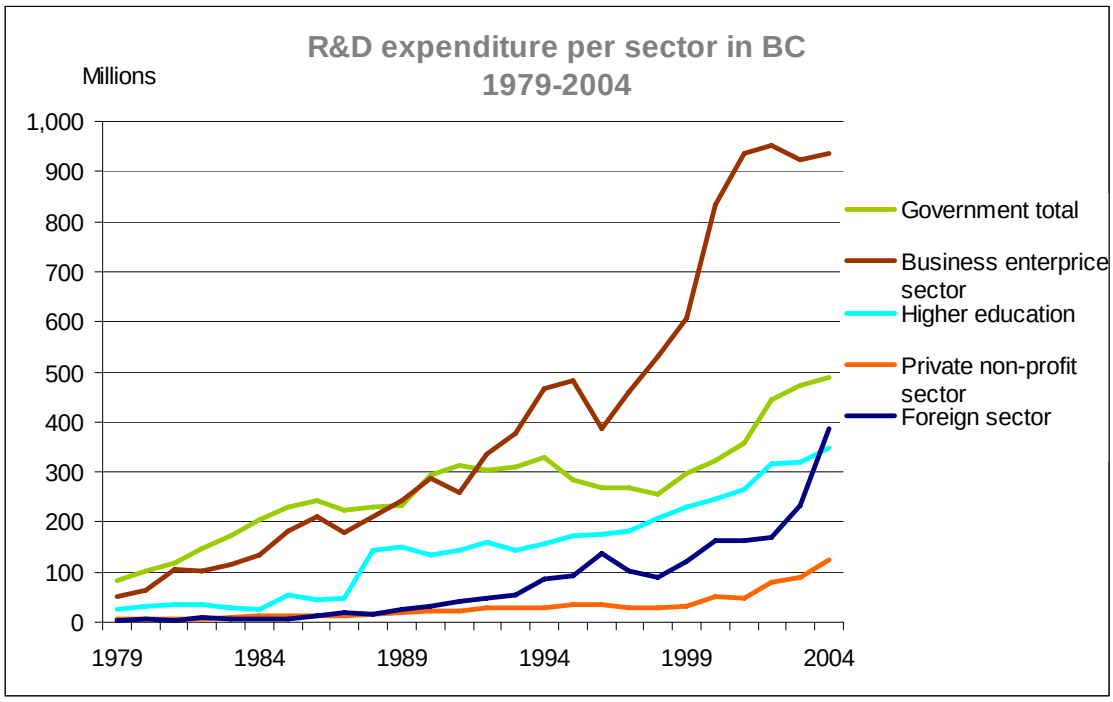
In Canada as a whole BERD has been greater than government's investment since 1985.[38] This has been so in the US since 1981[39], but BC lagged behind, not reaching that level until 1992 (Figures 8 and 9). And BC continues to lag, BERD, on average, represents about 70% of R&D in the OECD and at about 60% in Canada.[40] In BC however, R&D expenditures by domestic business enterprises only represents about 41% (2004) of the total R&D spending.[41] We also lag behind the key North American jurisdictions in per capital industrial R&D expenditure (Figure 10) [42] [43] [44].

Figure 8. R&D Expenditure by sector in Canada in 1963-2006



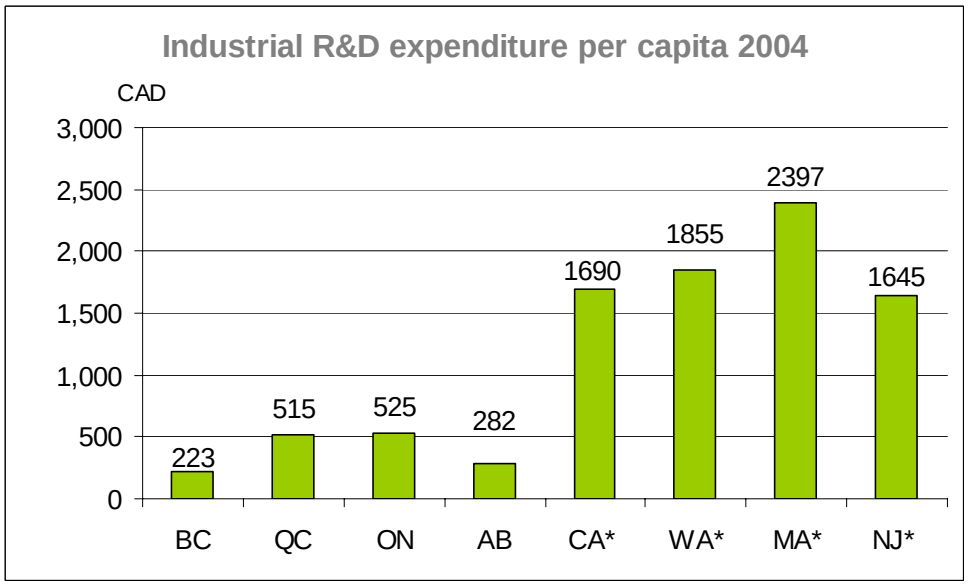
Source: Statistics Canada

Figure 9. R&D Expenditure by sector in BC in 1963-2006



Source: Statistics Canada

Figure 10. Industrial R&D expenditure per capita in 2004



** Exchange rate 1.3015 (2004 average)*
Source: Statistics Canada, National Science Foundation and Bank of Canada

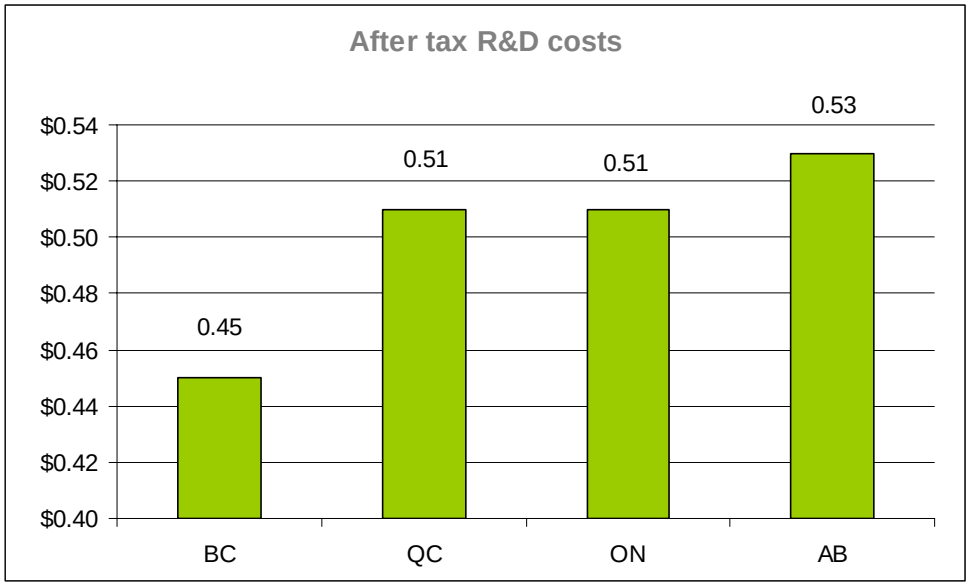
Research

One way to encourage private sector research is through tax credits. There are currently two R&D tax credits available for companies in BC.[45]

1. The Federal Government's Scientific Research and Experimental Development (SR&ED). Tax credits of up to 35% research and development expenses.
2. The Provincial Scientific Research and Experimental Development Tax Credit, which offers an additional 10% tax credit to qualifying corporations for their research and development expenses.

Introducing R&D tax credits has had a significant impact on industry investment in R&D. The R&D tax credit program in Germany increased industry investment by $1.30 to $1.40 for every $1.00 provided in R&D tax credits. In Israel, industry investment increased by $1.41 for every $1.00 in tax credits provided. In Canada, 73% of the respondents to a SR&ED survey conducted more R&D as a result of the program and 58% indicated that their profitability increased. In BC, approximately 1,400 companies claim the SR&ED annually. Figure 11 presents after-tax costs of R&D in BC compared to other jurisdictions in Canada. [46]

Figure 11. After-tax costs of R&D



Source: Ference Weicker & Company (2005), "Promoting research and innovation in British Columbia". Report Prepared for BC Ministry of Advanced Education, p.A-10

Quick facts – How Canadian R&D tax incentives area ahead of those in US

Ference Weicker & Company (2005) report suggests that R&D tax incentives area ahead of those in US in several ways[47]:

- Capital R&D expenditures are eligible for 100% immediate deduction in Canada whereas such expenditures are capitalised and depreciated in the US over a period of time.
- All direct and indirect current and capital expenditures are eligible for tax credit in Canada whereas in the US, only certain types of expenditures are eligible.
- R&D activities eligible for tax credit are more broadly defined in Canada compared to the US.
- In Canada, R&D tax credits are based on all eligible expenses whereas in the US, credits are based on incremental eligible expenses to a maximum of 50% of total eligible expenses.
- R&D tax credits are available in Canada indefinitely whereas in the US, they are subject to periodic sunset dates with no guarantee for extension.

Ference Weicker & Company (2005), "Promoting research and innovation in British Columbia". Report Prepared for BC Ministry of Advanced Education

Although the SR&ED system is strong and having an impact there are a few concerns. The first is that the recent extension of SR&ED, only extends it until September 1, 2014 .[48] Other jurisdictions like Quebec do not have a sunset date for their program.[49] Quebec's SR&ED system also includes and R&D wage tax benefit. Consultations revealed that it is possible for a company to receive 37.5% back on each salary of a person working over 90% of the time in production. This table compares SR&ED in BC with that in Quebec and Ontario.

Table 1. SR&ED comparison in selected jurisdictions

Jurisdiction		For R&D expenditures incurred		Rate	Refundable
		After	Before		
BC		Aug. 31/1999	Sep. 1/2014	10%	**Yes**
Ontario	Innovation tax credit	Tax years ending May 4/1999 [1]	n/a	10% [3]	**Yes**
	Business research institute tax credit	May 6/1997	n/a	20% [2]	
Quebec	R&D wage tax credit	April 21/2005	n/a	17.5% or 37.5% [3]	**Yes**
	University, public research centre and research consortium tax credit	June 12/2003	n/a	35% [4]	
	Tax credit on dues and fees paid to a research consortium	June 12/2003	n/a	35%	
	Private partnership tax credit [7]	March 23/2006	n/a	35%	
	Precompetitive Tax credit [5]	June 12/2003	March 24/2006	35%	
Alberta		**No provincial R&D tax incentives**			

Source: PWC

[1]Ontario corporations qualify for the refundable credit on eligible expenditures incurred up to the expenditure limit, which is generally $2 million and must be shared by associated corporations. The expenditure limit is reduced when:

- the previous year's taxable capital of the worldwide associated group is between $25 million and $50 million; or
- the previous year's taxable income of the worldwide associated group is between $400,000* and $600,000*.

100% of current expenditures and 40% of capital expenditures are eligible for the credit.
The OITC was originally available to Canadian-controlled private corporations effective for taxation years ending after December 31, 1994. For taxation years ending after May 4, 1999, the credit is extended to all public and private corporations and is no longer limited to the amount eligible for the federal 35% R&D tax credit.
[2] Ontario's credit is calculated as 20% of qualifying payments (up to $20 million annually on an associated basis) to Ontario eligible research institutes.
[3] Quebec Canadian-controlled corporations with less than $50 million ($25 million before December 5, 2006) in assets, on an associated basis, may claim the 37.5% rate on up to $2 million of R&D wages, on an associated basis. For those with assets between $50 million and $75 million ($25 million and $50 million before December 5, 2006), the 37.5% rate is gradually reduced to 17.5%. The rate increased from 35% to 37.5% on R&D expenditures incurred after April 21, 2005. The rate is 17.5% for all other taxpayers. For expenditures incurred before June 13, 2003, the 35% rate was 40% and the 17.5% was 20%. 50% of payments

to unrelated subcontractors are eligible for the credit. All thresholds are in respect of the previous year, on a worldwide associated basis.
[4] Quebec's 35% (40% before June 12, 2003) credit is available on 80% of payments to certain eligible entities (e.g., universities and public research centres).
[5] The Quebec tax credit for private partnerships replaced the pre-competitive research tax credit.

3.1.3 RESEARCH EFFICIENCY - COMMERCIALIZATION

Investing in research is critical, investing efficiently should be our goal. Research spending in industry is assumed to be efficient; if it isn't, the market will decide and the company will struggle. Public sector research investment public sector is more difficult to manage given the absence of market forces. Research investment is efficient when it produces new products, processes or services. How is this measured and how are we doing?

The Economist Intelligence Unit did a study of innovation efficiency in April 2007 and analysed national innovation inputs including R&D, research infrastructure, workforce education and technical skills, IT and communications infrastructure, and broadband penetration. It then compared these inputs with a nation's innovation outputs, or performance.[50] Canada proved to be inefficient in capitalising on its research investments with an input ranking of 9 and a performance ranking of 13. [51]

Small countries like Switzerland, Sweden and Finland outperformed on the innovation index. They have clusters of world-class companies in research-intensive sectors and very high standards of education, particularly in science and mathematics. Israel also outperforms many larger countries, because of its well-educated immigrants.[52]

Table 2. Innovation index 2002-2006

Country	Patents per m	Innovation performance index	Rank	Direct inputs index	Rank	Innovation environment index	Rank
Japan	1213.103	10.00	1	9.50	11	6.88	23
Switzerland	501.797	9.71	2	9.88	4	8.50	5
USA	350.495	9.48	3	9.88	4	8.53	3
Sweden	334.625	9.45	4	9.94	2	8.24	10
Finland	321.717	9.43	5	10.00	1	8.48	6
Germany	300.296	9.38	6	9.56	7	7.95	14
Denmark	259.764	9.29	7	9.94	2	8.61	1
Taiwan	253.973	9.28	8	9.06	14	7.68	16
Netherlands	198.294	9.12	9	9.63	6	8.37	8
Israel	192.058	9.10	10	9.56	7	6.85	24
Canada	127.846	8.84	13	9.50	9	8.20	12

Source: Economist Intelligence Unit (2007), "Innovation: Transforming the way business creates includes a global ranking of countries, White paper", p. 28

3.2 Research in public sector

There are a number of ways in which a government can influence or enable improved research. One is through strong strategic planning to ensure that government dollars are properly directed. Governments can also support a strong university research system, and promote an efficient process for converting the research into products and services. Finally government can work to encourage and support the development of strong clusters that build on domestic strengths.

3.2.1 GOVERNMENT RESEARCH / INNOVATION STRATEGY

It became clear through our consultation that British Columbia needs not only to invest more in research but it needs to be more strategic in its research allocations. BC has certain strengths and stakeholders believe that its resources are spread too thinly. BC needs to focus its research dollars so they have greater impact. This requires careful strategic planning.

Governments have also realised this. The federal government has an innovation strategy, but it is not limited to the technology sector.[53] It also recently published a Science and Technology Strategy (Spring 2007).[54] The BC government has also recently published its Research & Innovation (R&I) strategy and is now working on a ten year plan for implementation of that strategy. Provincially, this is a strong first step but other jurisdictions who have achieved great success through innovation and technology have dedicated more resources.

Geoff Plant, in his *Campus 2020* report to the provincial government in 2007, recognised the importance of focusing the public research investment in key areas and key institutions. He not only recommended a clear delineation between teaching-intensive universities and research-intensive universities, but also recommended that government should[55] :

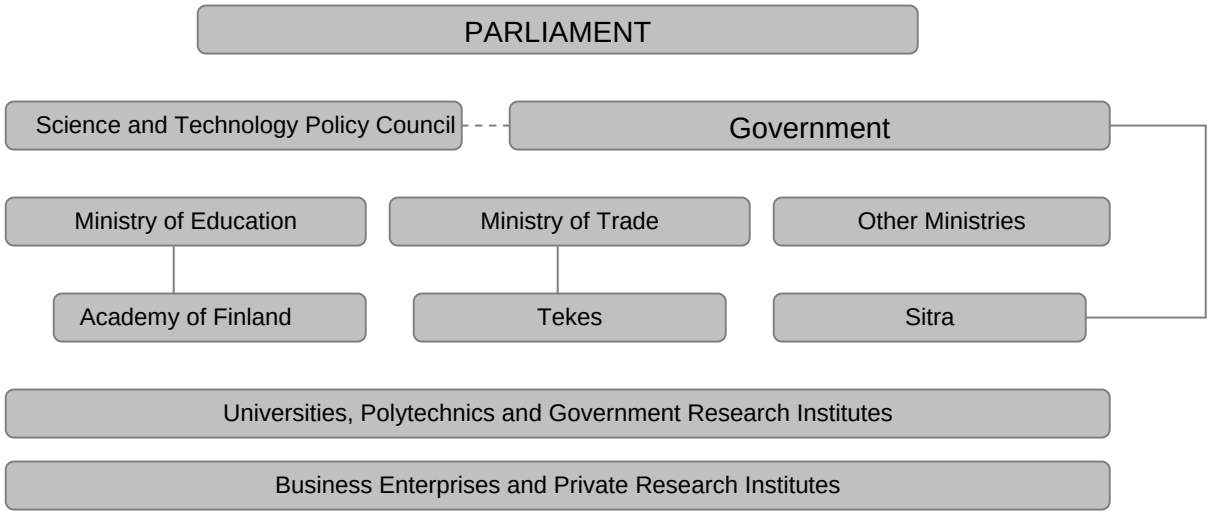
> 45. Implement a "Georgia Strait" research cluster initiative by ensuring that at least 95% of all provincial research funding is awarded to UBC, SFU and UVic.

The three case studies below represent successful innovation jurisdictions. We have chosen Finland and Ireland because they are international examples that are roughly analogous to British Columbia in population size. We chose Ontario because it is a strong Canadian jurisdiction that is currently pursuing aggressive innovation policies. In each case the jurisdictions are following a policy that centralises the allocation and distribution of research funding and ensures the distribution meets the strategic need.

Finland

In Finland the strategy is conducted by the Science and Technology Policy Council which is chaired by the Prime Minister. The key however is that much of funding is then directed through Tekes, which reports to the Ministry of Trade and Industry and is the funding agency for Technology and Innovation. With a budget of 448 million euros in 2005, Tekes received more government funding than all of the Universities combined. This body then ensures that the R&D expenditure and funding supports the strategy as laid out by the Science and Technology Policy Council. The government plans to maintain its spending on R&D at 30% of the total, which will expand their spending from 1.6 billion euros in 2005 to 2.1 billion (4.1% of GDP) in 2011. [56]

Figure 12. National Innovation System of Finland

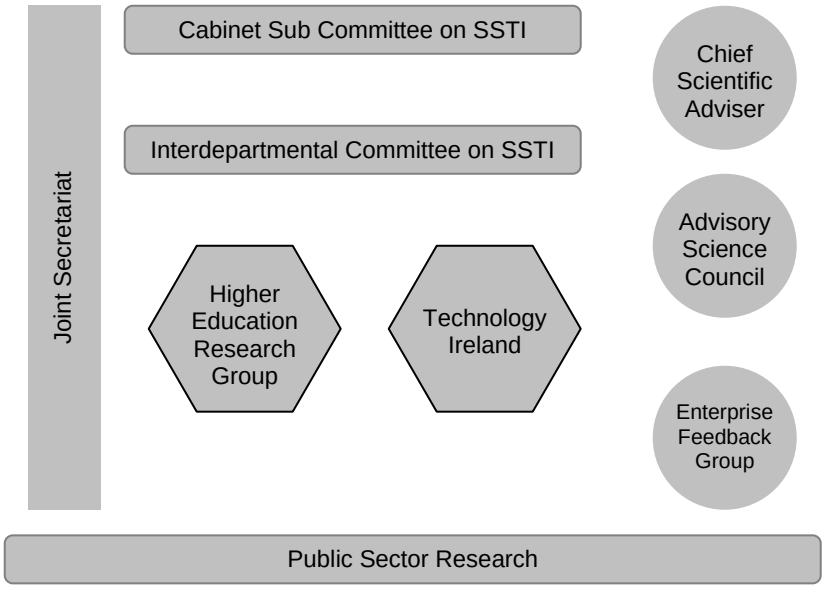


Source: Science and Technology Policy Council of Finland

Ireland

In Ireland the primary policy body is Office of Science and Technology (OST) which obtains advice from different stakeholders through the Advisory Council for Science, Technology and Innovation. OST is responsible for the science and technology budget. It provides advice to government through an Inter-departmental Committee on Science, Technology and Innovation. The key departments involved in funding are Education and Science; Enterprise, Trade and Employment; and Agriculture and Food. They work together through a cabinet committee that administers the Strategy for Science, Technology and Innovation (SSTI). They plan to invest nearly $2 billion Euros between 2005 and 2013.[57] [58] [59]

Figure 13. National Innovation System of Ireland

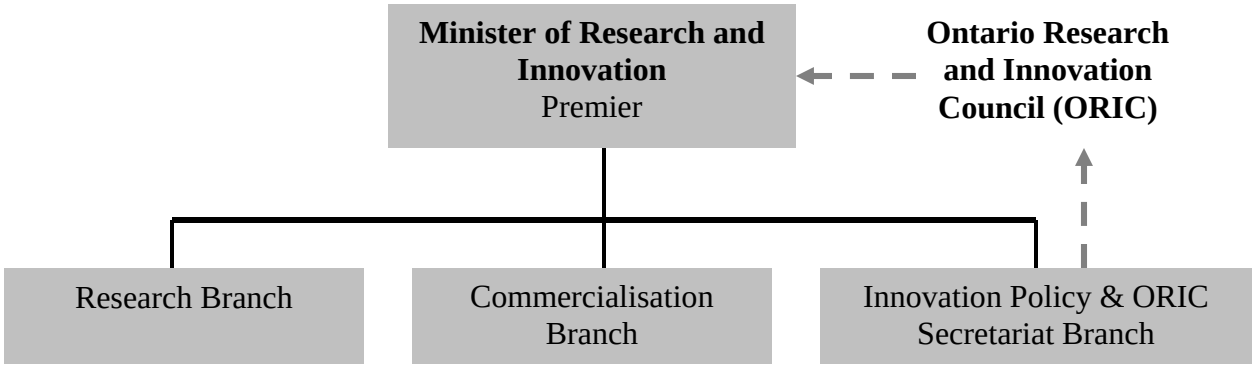


Source: Ireland Ministry of Enterprise, Trade and Employment

Ontario

When the new government came to power in Ontario they found that investments in innovation were spread over numerous Ministries with different agendas. The result was a lack of vision and strategy. To address this, they formed a Ministry of Research and Innovation (MRI), with the Premier as the Minister responsible. To help the Premier with his decision making there is an Ontario Research and Innovation Council which reports directly to him. This Ministry has separate branches focussed on Research, Commercialisation and Innovation Policy. The government is investing nearly $1.7 billion during the five year period ending in 2009-2010 on research and innovation initiatives.[60]

Figure 14. Structure of the Ministry of Innovation and Research



Source: Ontario Ministry of Research and Innovation

3.2.2 UNIVERSITIES

Universities play a crucial role in any jurisdiction with a strong innovation climate. Not only are they the progenitors of most primary research but they are the training grounds for the HQP that an innovation economy needs. A strong university needs good faculty, focused and efficient research capabilities with strong mechanisms for transferring technology to industry, and a cadre of graduate students that support the primary research and act as the primary carriers of Intellectual Property (IP). Investment in post-secondary education (amount and quality) increases a jurisdiction's growth and its ability to adapt and use new technologies and innovation practices. There is a link between workers with university education and innovative companies, as well as a link between investment in masters and doctoral students and product and process innovations.[61]

A. University Ranking

That is why the PTC believes British Columbia needs a University that is truly world class. This is by no means meant to disparage the current system which is very strong, but if we are to strive for the next stage and become a truly global power in the technology world then we need one of our Universities to take another step forward. The key technology hubs of Massachusetts , California, and Washington all have at least one and sometimes two top ranked Universities.

The Shanghai Jiao Tong University has completed an academic ranking of the top 100 Universities in the world. Newsweek also prepares world university rankings and both of these place the University of British Columbia, BC's highest ranking University in the 30s. The University of Toronto is the only Canadian University with better rankings.

(Table 3). The PTC believes BC should strive to boost UBC's ranking. An enhanced reputation would enable UBC to attract higher profile 'star' faculty, which in turn attracts better students and more research dollars from around the globe. [62] [63]

Table 3: Global universities ranking: top 20 and Canadian universities

Shanghai Ranking			Institution	Country	Province Canada	Newsweek Ranking
World	Regional	National				
1	1	1	Harvard University	USA		1
2	1	1	University of Cambridge	UK		6
3	2	2	Stanford University	USA		2
4	3	3	University of California at Berkeley	USA		5
5	4	4	Massachusetts Institute Technology	USA		7
6	5	5	California Institute of Technology	USA		4
7	6	6	Columbia University	USA		10
8	7	7	Princeton University	USA		15
9	8	8	University of Chicago	USA		20
10	2	2	University of Oxford	UK		8
11	9	9	Yale University	USA		3
12	10	10	Cornell University	USA		19
24	19	1	University of Toronto	Canada	ON	18
37	**30**	**2**	**University of British Columbia**	**Canada**	**BC**	**31**
67	45	3	McGill University	Canada	QB	42
101-152	58-77	5	University of Alberta	Canada	AB	55
153-202	78-100	6-8	University of Calgary	Canada	AB	not ranked
203-300	**101-140**	**9-17**	**University of Victoria**	**Canada**	**BC**	**not ranked**
301-400	**141-165**	**18-19**	**Simon Fraser University**	**Canada**	**BC**	**not ranked**

Source: Shanghai Jiao Tong University "Academic Ranking of World Universities: Top 100" (2007), Newsweek: "The Complete List: The Top 100 Global Universities" (2006)

B. University Faculty

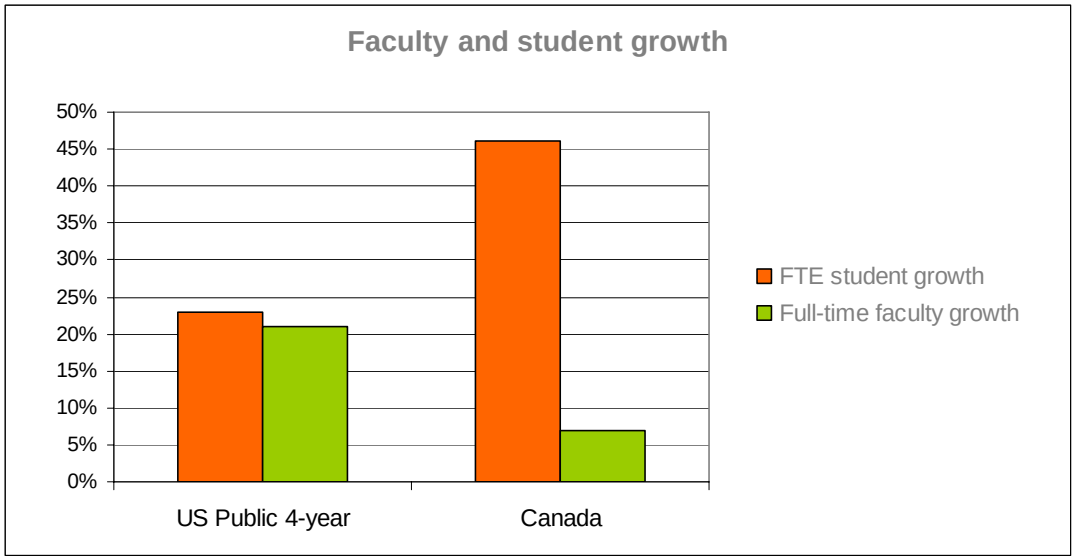
The best way to move ideas from the lab to industry is by investing in the people who make the discoveries. The researchers, the professors and the graduate students who are intimately familiar with the material are the best carriers of the new IP. In BC, we need to attract the very best faculty and graduate students, and we need to keep them working in BC. Further, we need to make it easy for them to move between academia and industry. It is axiomatic that the quality of a university revolves around its faculty. Without good faculty with the time and resources to do the job properly, our universities will not retain their current quality, let alone improve their international ranking. Furthermore, the quality research and innovation we are striving for will not occur.

Faculty/Student Ratios

The province recently made a laudable commitment to increase the number of graduate students in BC by 2,500.[64] One concern however, is that the universities might not have sufficient resources to absorb the increase in graduate level seats. The full-time student to full-time professor ratio has increased in Canada in last twenty years. In 1987 the ratio for Canada was 14.0 while in 1997 it was 16.9. For BC the ratio was 12.7 and 16.1 respectively.[65] In contrast to the US, the full-time faculty growth in Canada has not matched the increase in enrolment (Figure 15). Since 1987 the number of students has doubled while the number of faculty has increased only by 7%.[66] Data from Canada Statistics shows that the number of full-time university educators in 2002-2003 had decreased by about 3% from ten years earlier.[67] The full-time enrolment increased 12% during that time. The decrease in the overall number of full-time educators was the result of a 6% decrease among full professors and 8% among associate professors. There was a 7% increase among other ranks of educators that include entry-level assistant professors, lecturers and instructors.

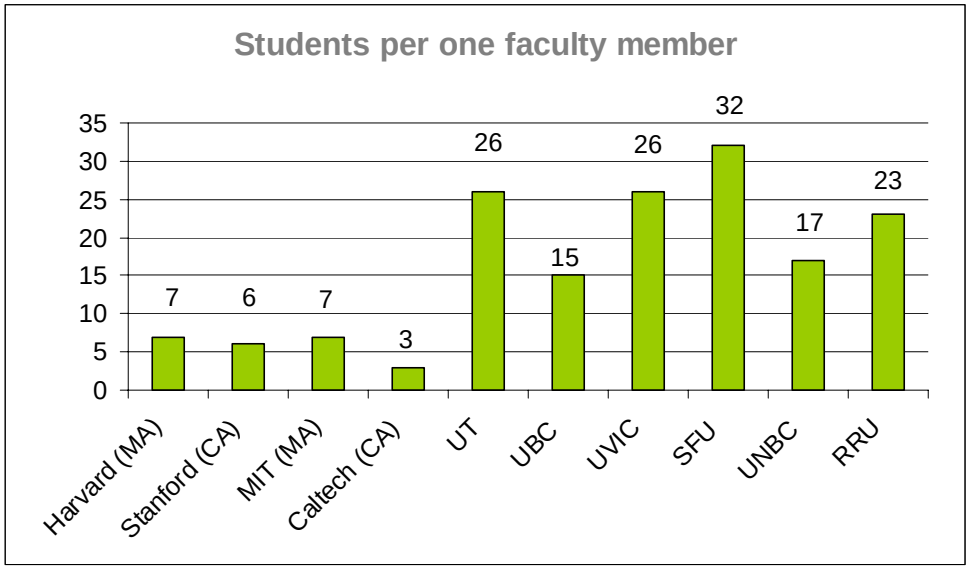
BC's universities have a student faculty ratio which is higher than the world's leaders (Figure 16).[68] The difference is even more pronounced at a university department level. The top universities such as Harvard and Stanford have ratios as small as 4:1 in certain disciplines. The 4:1 ratio exists for example in the Graduate School of Arts and Science (all graduate students) and the School of Engineering and Applied Science (Master's students) at Harvard, and the School of Humanities and Sciences (all graduate students) at Stanford.[69] [70] [71]

Figure 15: Faculty and student growth in Canada and the U.S.



Source: AUCC (2006),"Backgrounder: Why Higher Education and University Research Matter: Facts and Figures", p.4

Figure 16. Student (undergraduate) to faculty ratio in selected universities



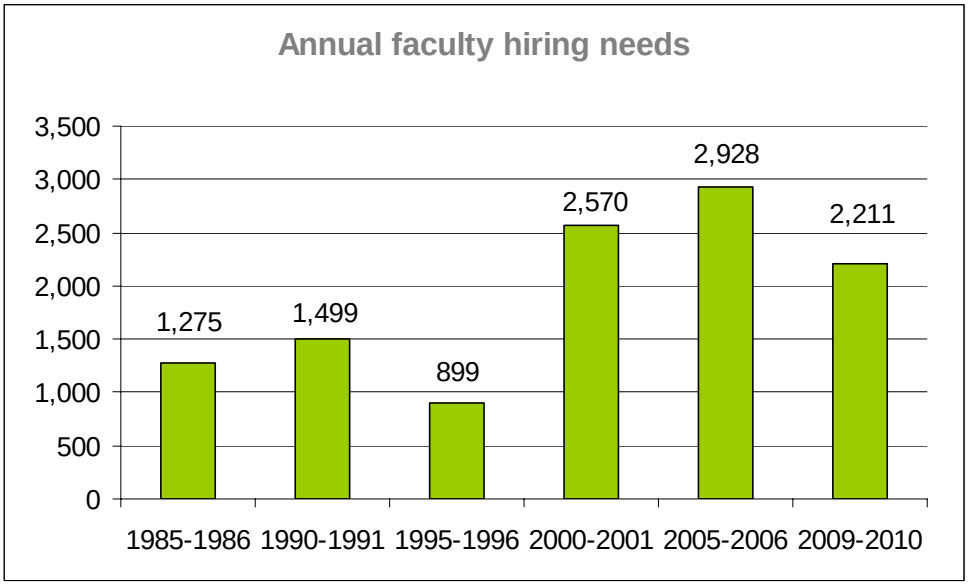
Source: www.petersons.com, the page was last updated on August, 2007

Retirement

This issue is compounded by our aging faculty. Currently the average university professor in Canada is 49 years old, generally older than their colleagues in other OECD countries.[72] It is suggested that by 2011 universities in Canada will face 20-30% increase in demand for university enrolment. They will also need to replace about 20,000 faculty members and hire another 20,000 to respond to the quality and growth demand.[73] The required annual amount of hiring is presented in the Figure 9. The current amount of full-time faculty was 40,000 in 2005.[74] [75]

From 1992-1993 to 2002-2003 British Columbia, Prince Edward Island, and Alberta were the only provinces that saw an increase in the number of full-time university educators. By 2018 almost 50% of the current 3,532 faculty members of BC universities (2003/04) have reached the probable retirement age of 65.[76]

Figure 17: Annual faculty hiring needs 1985-2010



Source: AUCC (2000), "Research", March, Volume 4, No 1. p.4.

Faculty Interaction with Industry

Faculty, along with the graduate students, are some of the primary IP carriers in academia. Participants at the PTC roundtables on innovation and commercialization indicated that the opportunities to capitalise on research and its resulting IP could be enhanced if there was greater flow of the faculty between academia and industry. University practices and policies in other jurisdictions support faculty members as they engage in private sector activities where it is considered valuable. For example, professors having their own start-ups or consulting for companies increases the idea flow between academia and industry. Some of the most successful technology companies in BC were founded by faculty members from UBC. In fact UBC alone has spun off over 120 companies since 1984 which generate over $1.5 billion in revenue and have over 2000 employees.[77] Government and the Universities should seek ways to encourage this kind of interaction.

Attracting faculty

It is clear that government must seek different ways to attract faculty to our Universities. Other institutions around the globe face similar challenges. The competition presented by the universities and research institutions in the US, for example, is significant. A full professor in the US earns at least 20% more than their counterparts in Canada. US institutions can also offer better research facilities and funding. In certain fields like medicine and biotechnology, the Canadian government's allocation of research money lags far behind its US counterpart.[78]

BC will be challenged to compete with that kind of financial might, although there are models that BC can examine to develop a strategy for gaining the best people possible. The federal government, for example, helps to attract research talent through the highly successful Canada Research Chair Program.

Quick facts – Canada Research Chair Program

The Canada Research Chair (CRC) program was created in 2000 and it is funded by the federal government with annual support of $300 million. Its goal is to attract both the most accomplished research talent in their respected fields. Every participating institution (currently 70) receives an allocation of chairs based on the proportion of research grant funding they have received from the three federal granting agencies. The nominees are evaluated by a three member expert panel.

Total number of Canada Research Chairs: 1,806
Number recruited from outside of Canada: 545 (30%)
Expatriates: 246
International recruits: 299
Number recruited from USA (expatriate and international): 347

There are two types of Canada Research Chairs
Tier 1 Chairs - Tenable for seven years and renewable, these are for outstanding researchers acknowledged as world leaders in their fields. For each Tier 1 Chair, the university receives $200,000 annually for seven years.

Tier 2 Chairs - Tenable for five years and renewable once, these are for exceptional emerging researchers, acknowledged as having the potential to lead in their field. For each Tier 2 Chair, the university receives $100,000 annually for five years.
www.chairs.gc.ca/web/about/index_e.asp

BC also has a program called the Leading Edge Endowment Fund (LEEF).[79] LEEF's objectives include but are not limited to attracting world-class researchers to BC and promoting economic growth and job creation. Based on a cost-sharing partnership with the private sector, it intends to establish twenty permanent Leadership Research Chairs at public, post-secondary institutions across the province in the areas of medical, social, environmental and technological research. The Fund will also establish nine Regional Innovation Chairs to create opportunities in communities through B.C.'s colleges, university-colleges and institutes. [80]

Each Leadership Research Chair will receive a total endowment of up to $4.5 million. Each Regional innovation chair will receive $2.5 million. The endowments are cost-shared on a half and half basis by government and the private sector.[81]

Finland also has some aggressive measures. The Finland Distinguished Professor Programme (FiDiPro)[82] is a joint program of Tekes and the Academy of Finland to attract world-class researchers. It recruits foreign researchers or Finnish professor-level researchers who permanently work abroad. They work at Finnish universities and research institutes for two to five years conducting research together with Finnish researchers and research groups. The recruitment targets are internationally highly merited and have strong experience in researcher training. Launched in 2005, the first round brought 24 professors to Finland and a second round of the program is planned for this year. [83]

In addition to this direct investment in top-level researchers, Finland is developing a research career system. It has dedicated 50 million euros from 2007 to 2011 to a four stage career model. This highlights the need for long-term investment in different stages of a research career.[84]

Nearer to home, Ontario is also pushing to attract faculty and researchers. Its innovation strategy includes dedicating $527 million to a new Ontario Research Fund to provide infrastructure and support, 40 annual fellowships for post-doctoral students, and a $51 million Early Researcher Awards program.[85]

C. Graduate Students

Graduate students play an important role in innovation and commercialisation. Within universities, they support research projects.[86] Perhaps more importantly from a commercialisation perspective, they are IP carriers transferring ideas from universities to industry. Graduate students are also the key source of High Quality Personnel (HQP) for our growing technology industries. In 2001 over half of the HQP in Canada were people with a master's or doctorate degree.[87] A significant amount of the 50% HQP increase in Canada between 1991-2001 came from master's level. The roundtables highlighted the importance of increasing the graduate student seats in BC's institutions to accommodate the future needs of the province's growing technology sector and the overall knowledge-based economy.

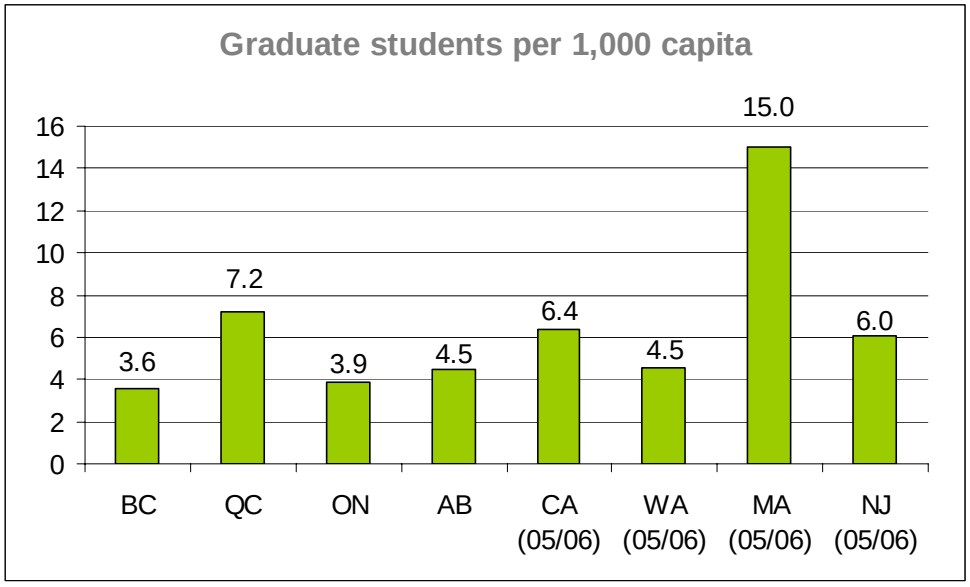
Graduate student ratios

For the measure of graduate students per capita, BC once again lags behind the key US jurisdictions. Our numbers are slightly more than half of California's and less than a quarter those in Massachusetts. BC also lags behind Alberta, Ontario, Quebec and the Canadian average in Master's and PhD's part-time and full-time graduate enrolment per capita in 2004.[88] It should be noted that other jurisdictions have announced plans to increase the number of graduate seats. Alberta has committed to add 15,000 spaces for undergraduates and graduate students by 2008.[89] Ontario is committed to open 14,000 new graduate seats by 2009/2010.[90] The Ministry of Advanced Education has announced

plans to address this through the creation of 2,500 new graduate seats by 2010.[91] The Ministry is to be commended for this step which will make a significant difference increasing the ratio to 4:16. Again looking to Plant's Campus 2020 report we note this will not put BC into a leadership position by 2015[92] and he recommends:

> 41. Building on the recent commitment to create 2,500 new graduate student spaces by 2010, develop a plan to implement the BC Access and Excellence Strategy target of the highest per capita enrolment of graduate students in Canada by 2015.

Figure 18. Graduate student per capita ratio in 2004, selected North American jurisdictions



Source: Statistics Canada, The National Center for Education Statistics (NCES), U.S. Department of Education

Support for graduate students

One of the challenges created by generating more graduate student spaces is ensuring that we have high quality students to fill them. One solution is to offer more support to the graduate students in BC. A comparison of graduate tuitions and opportunity costs is presented in Figure 6. Support could be provided in the form of scholarships, bursaries and funding programs.

In general, the government assistance to graduate students mainly comes from the federal government while provincial government's role is to provide the core operating and infrastructure support that universities require to offer quality graduate programs. BC does offer some programs of support directly to the student and the provincial government has recently launched StudentAid BC. It houses under one umbrella the various BC student support programs, including loans, interest relief, loan forgiveness, bursary programs and scholarships. However, most direct support for graduate students still comes from the federal government through scholarship, fellowship and research support programs operated by the research granting agencies and government departments.[93]

Other jurisdictions offer scholarships to graduate students. For example, the Ontario Graduate Scholarship Program provides about 2,000 scholarships annually of $10,000 to $15,000.[94] Until recently, British Columbia had only one scholarship available for graduate students, the Queen Elizabeth II British Columbia Centennial Scholarship. Three scholarships were awarded each year: one major scholarship with a total value of $60,000 and two minor scholarships of $5,000 each. In spring 2007 however, the provincial government announced $10 million in new graduate scholarship support over the next four years.[95] This is an excellent first step, vastly increasing the scholarship resources available to BC graduate students. It still, however, leaves us behind other jurisdictions in both totals and per capita support. The Campus 2020 report notes this and recommends[96]:

> 43. Establish an expanded program of graduate student financial aid to ensure no qualified applicant for graduate studies is denied access on the basis of financial circumstances.

Quick facts –Alberta's Affordability Framework and graduate awards

In 2006 Alberta launched an Affordability Framework to will make post-secondary education more affordable for students. Key actions in framework include:[97]

- more financial support for part-time students;
- no longer requiring students to make payments on their student loans while on parental leave or completing an internship or residency program;
- lifetime student loan limits extended for students returning to post-secondary studies who have repaid their previous student loans;
- expanded eligibility for the Rutherford Scholarships;
- expansion of programs that encourage Albertans to pursue post-secondary studies; and
- continuation of the rural incentive bursary beyond 2008/09

The Alberta government provides more scholarship funding than any other province in the country. In 2005/06, a total of $46 million was provided through 50 different scholarship programs[98] to different education levels. In 2007 Alberta will provide a record $57 million in overall scholarship funding that will support more than 33,000 students[99]. In June 2007 province announced another boost to its scholarship programs. A new $227 million investment in the Alberta Heritage Scholarship Fund will translate to additional scholarship spending of about $10 million in 2008-09[100].

The current graduate awards of Alberta are: [101]

- Sir James Lougheed Award of Distinction - 15 awards valued at $15,000 for master's and $20,000 for doctoral level study;
- Ralph Steinhauer Award of Distinction - 15 awards valued at $15,000 for study at the master's level, and $20,000 for doctoral level study;
- Alberta Ukrainian Centennial Commemorative Scholarship - two awards, up to approximately $20,000;
- Arts Scholarship - Graduate Level - five awards, $5,000 each ;
- Queen Elizabeth II Graduate Scholarship - one award for every 30 full-time eligible graduate students valued at up to $9,300 for study at the master's level and up to $10,500 for the doctoral level;
- Alberta Award for the Study of Canadian Human Rights and Multiculturalism - one award of $10,000;
- Graduate Student Scholarship - 1,000 scholarships of $2,000 each; and
- iCORE Scholarships - approximately 150 awards for a total of $2 million.

Tables 4 and 5 show the support in leading Canadian universities and top business school's for their students. Difficulty in comparing BC's universities to others arises because scholarship data is not readily available and some universities do not even disclose it.

Table 4. Scholarships provided by top 5 Canadian, and BC universities[102]

National Rank	Institution		No. of scholarship sources	Min No. of scholarships awarded	Scholarship Awarded yearly ($1,000)	
				[1]	Min(=<)	Max(=>) [2]
1	University of Toronto	ON	37	1648	$2,567	$7,901
2	University of British Columbia*	BC	47	93	$590	$592
3	McGill University*	QB	58	59	$481	$650
4	McMaster University*	ON	9	10	$59	$69
5	University of Alberta*	AB	117	334	$1,357	$1,521
9-17	University of Victoria*	BC	49	691	$1,256	$1,329
18-19	Simon Fraser University*	BC	30	129	$839	$883
n/a	University of Northern BC	BC	63	274	$1,780	$1,813

Columns [1] and [2] were based on the assumption that each source, who's number of scholarships awarded varies, provided only one scholarship.

Source: MacLean's, 12th Annual Issue: Guide to Canadian Universities (2007), p.192

Table 5. Scholarships awarded in 2006 by top 6 universities (Business Schools)

Rank	Business School at	2006 Financial Aid ($ 1,000)
1	Harvard University	2,000[103]
2	University of Cambridge	information is confidential
3	Stanford University	5,200[104]
4	University of California - Berkeley	3,074[105]
5	Massachusetts Institute of Technology	3,379[106]
6	California Institute of Technology	24,854*[107]

* *Endowment for programs, activities, and scholarships*

Source: Indicated in the table

Quick facts –Financial aid given by government in Finland

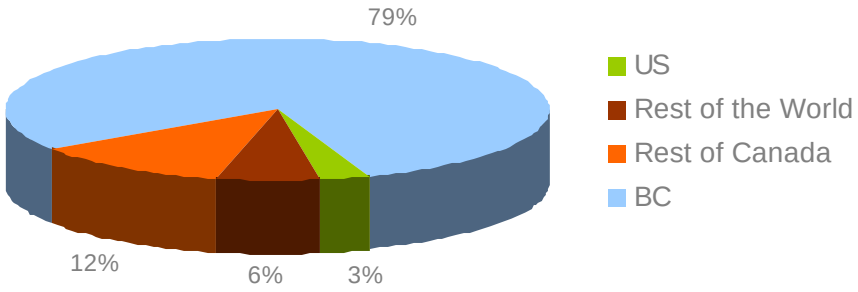
The Finnish government provides three forms of financial aid to students in secondary and higher education: study grants, housing supplements and government guarantees for student loans. To be eligible a student must be full-time, make satisfactory academic progress, and be in need of financial assistance. The study grant and housing supplement are government-financed benefits with monthly payments to the student. The study grant is subject to tax. If a student garners a government loan guarantee, they can apply for a student loan. Students are eligible for up to 70 months of financial aid.

A student in a university usually gets 259 euros/month (study grant), 80% of their rent but only up to 201 euros/month (housing supplement) and 300 euros/month (study loan). Thus the total amount is about 760 euros/month (about 1140 CAD/month). Other income of the student or their spouse or partners affects the financial aid. The student can earn 500 euros/month for every month they receive aid and 1,515 euros/month for aid-free months. Only the student loan has to be repaid after graduation. It should be noted that secondary or higher education degrees in Finland don't have any tuition except MBA programs
www.kela.fi.

Keeping BC's student graduates in the province

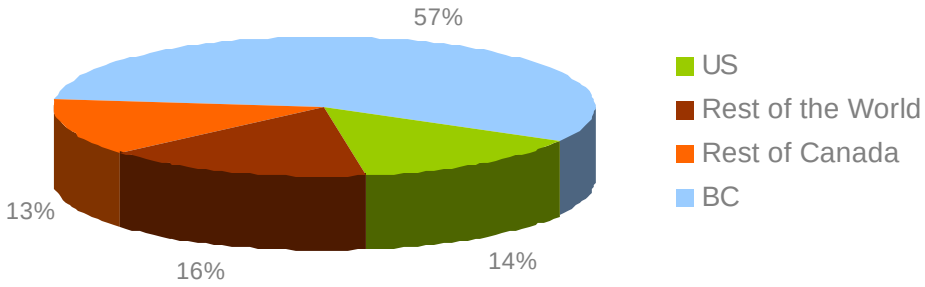
BC also needs to encourage or ensure graduate students remain in BC after their graduation. One study indicated that UBC graduates tend to leave at almost exactly the national average.[108] Given that British Columbia has an appealing lifestyle, we believe we could do a better job of keeping those students here. PhDs in particular are hard to keep and leave the province at a far higher rate than either bachelor's or master's graduates. For example, in 1995 UBC had 967 master's graduates. 30 (3%) moved to US, 59 (6%) to the rest of the world, and estimated 114 (12%) moved to other parts of Canada. For the 262 UBC Ph.D. graduates, the numbers were 37 (14%), 42 (16%), and estimated 35 (13%) respectively. Thus in 1995, about 30 % of UBC's Ph.D. graduates left Canada, versus only less than 10 % of UBC's master's graduates.[109] Figures 18 and 19 show the distribution of the UBC 1995 graduates. Figure 20 indicates the main reasons for leaving. [110] [111]

Figure 19. Location of UBC class 1995 graduates, masters



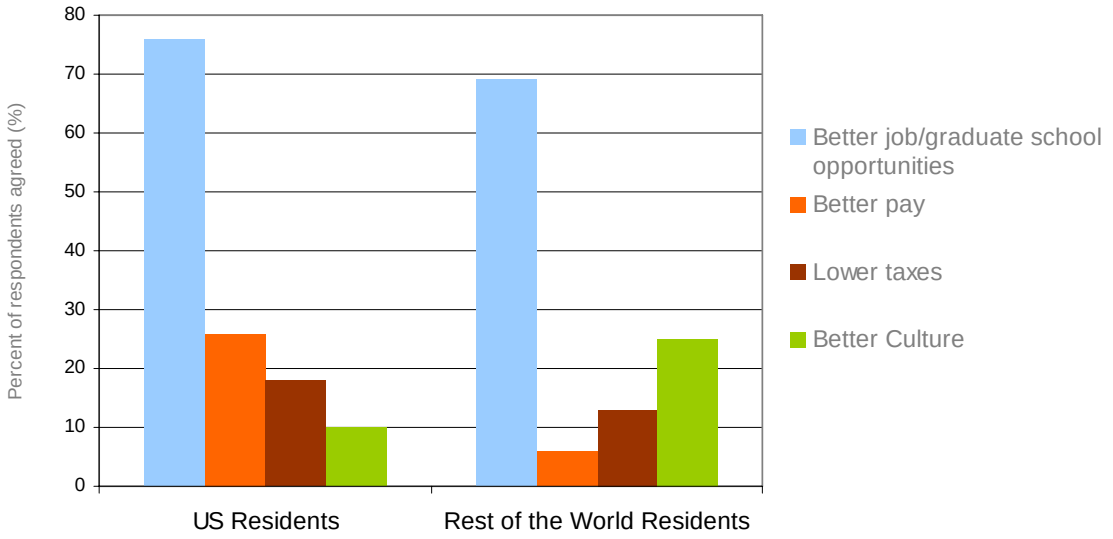
Source: Helliwell, J. and Helliwell, D, Tracking UBC Graduates Trends and Explanations, Table 4.1, and Helliwell, J. and Helliwell, D.,Where Are They Now? Migration Patterns for Graduates of the University of British Columbia", p.34

Figure 20. Location of UBC class 1995 graduates, Ph.D



Source: Helliwell, J. and Helliwell, D, Tracking UBC Graduates Trends and Explanations, Table 4.1, and Helliwell, J. and Helliwell, D.,Where Are They Now? Migration Patterns for Graduates of the University of British Columbia", p.34

Figure 21: Reasons for UBC graduates to move out to US and the rest of the world



Source: Helliwell, J. and Helliwell, D (2000), "Where Are They Now? Migration Patterns for Graduates of the University of British Columbia", p.34

Internships and Co-ops

Increasing the number of co-op and internship programs will improve development of critical talent. Co-ops and internships not only prepare students to enter the workforce but also increase the probability that they will remain here after graduation.

It is particularly important to provide more internship and co-op opportunities for graduate students both locally and internationally. Internship positions related to marketing, sales and product management will develop talent needed in commercialisation. Increasing opportunities for internships in the US is also considered important. At the PTC roundtables, the University of Waterloo was cited as successful in getting internships in the U.S. for nanotechnology students. The Nanotechnology Engineering program has one full-time staff member dedicated to searching job-opportunities for students in the program. In BC there are currently two successful models, WestLink's TCIP and MITACS. In June 2007 the Provincial government announced a new $10 million for graduate student internship program.[112] This tripled the size of MITACS over the next four years. The funding was leveraged by another $5 million from industry partners. B.C.'s Graduate Research Internship Program, ACCELERATE BC, allows graduate students in public post-secondary institutions to conduct applied research in partnership with industries and other organizations whose business is relevant to their studies.

Quick facts - WestLink TCIP

WestLink Innovation Network Ltd is an organisation that connects its members with industry experts to accelerate the rate of successful commercialisation of scientific inventions. The members are publicly funded research and educational organisations including western Canadian universities, colleges, research and technical institutions (total of 30 full members). The organisation offers programs and services in following areas: networking and communication, building technology commercialisation skills and awareness, technology bundling and commercialisation facilitation, and contract services.

One of the main programs is the WestLink Technology Commercialisation Internship Program (TCIP). The internship consists of three 8-month work placements through which the interns develop expertise in technology commercialisation. The placements, arranged by WestLink, are in three different areas: 1) Technology Commercialisation in a Research Institution (University, College, Hospital or Government), 2)Commercialisation /New Venture in a High Technology Company, and 3) Finance in a Venture Capital or Commercial Financing Firm. The program starts once a year and the candidates need to have a post-secondary education in science and/or business and/or related work experience. ***www.westlink.ca***

Quick facts - MITACS

MITACS (Mathematics of Information Technology and Complex Systems) initiates and fosters linkages among industrial, governmental, and not-for-profit organisations that require mathematical technologies to deal with problems of strategic importance to Canada. It connects 305 scientists, 611 students, and 169 partner organisations working on 32 ongoing projects involving 48 Canadian universities. Overview:

- Internship projects are 4 months in duration and a student can have a maximum of two internships per degree.
- The intern is a graduate student or post-doctoral fellow at a Canadian university.
- The intern, academic supervisor and partner supervisor will meet at the initiation of the internship to agree on the research plan.
- Each internship project receives $15,000 in direct funding with the partner organisation and MITACS each providing $7,500 of this amount. These funds are limited to supporting the direct costs of research as directed by NSERC and the NCE Program rules.
- The internship will be awarded as a grant to the academic supervisor.
- The intern will receive a stipend from the academic supervisor using the internship grant.
- MITACS recommends that the intern receive approximately $10,000 per 4-month internship.

www.mitacsinternships.ca/internship

3.2.3 UNIVERSITY INDUSTRY LIAISON OFFICES

The primary interface between academia and business are the University Industry Liaison Offices (UILOs). They are common (e.g. 300 in the American and 117 in British universities) and are proven to accelerate the flow of ideas from universities to industry. However, studies reveal that many technology transfer offices are not profitable. On average, universities get US$10,000 income from a successful disclosure that is patented and marketed by the university. This is usually less than the cost of administrating the project. [113]

BC's UILOs have traditionally performed well. For example UBC's UILO with close to 40 technology transfer officers spent about $3.82 million and $4.28 million in 2005 and 2006 respectively[114] while collecting about $16 million from technology licensing each year.[115] [116] However, many of those participating in PTC roundtable process believed BC's UILOs could be improved.

To better understand the UILO processes, the Ministry of Advanced Education and BCIC commissioned a strategic review of the university-industry collaboration and knowledge transfer system in BC. The study was conducted by Global Connect and the results were released in the spring of 2007. The following are the key recommendations in the report:[117]

1. Create a regional collaborative network based at BCIC that would work as a broker facilitating engagement of different elements and individuals within the innovation system;
2. Expand university-industry collaborative activities and develop an entrepreneurial culture within BC's educational institutions;
3. Improve access to risk capital through "fund-of-funds" and a mechanism to deliver seed funding to promising commercial opportunities; and
4. Government should actively encourage integration and collaboration through policies and the funding of targeted programs

The study makes six specific recommendations related to the BC's UILOs. First, it suggests the creation of industry brokers within multiple levels in the universities to provide needed support for industry-university interaction. They should be empowered to direct corporate affiliate programs, facilitate industry sponsored research and philanthropic gifts, and develop new arrangements with industry. Second, increasing the number of entrepreneurs-in-residence within the university was seen critical for providing sufficient expertise to the faculty in commercialisation efforts. Third, the report recommends establishing department level corporate affiliate programs. These programs would offer new points of entry for companies and improve the opportunities for cooperation. Fourth, UILOs should consider having fixed valuation and model

agreements for certain licensing arrangements. This would ensure that the IP does not leave the university too early and would improve the licensing process to all parties through decreased time, money, and effort. Fifth, a collaborative review for simplifying UILO policies is recommended for removing bureaucracy barriers for commercialisation. Finally, student involvement with industry should be increased by expanding and further supporting the existing programs. [118]

TAP program [119]

The University of Ottawa, recognising the importance of getting ideas from the lab and into the market, has initiated its new Intellectual Property – Transfer Acceleration Pilot (IP-TAP) Program. Initially working with the Faculty of Engineering in 2007, inventors may decide to patent their invention through the pilot program rather than by using the traditional technology transfer approach. The University of Ottawa will then offer a royalty-free, non-exclusive license for up to three years to any local small medium enterprise (SME) that provides a business plan for commercializing the IP. When the license is issued, the researcher who originated the IP will receive from the University a research grant of $15,000 per year for the three years of the license.

3.2.4 CLUSTERS

A key goal of any jurisdiction developing an innovation economy is to build a cluster, small wonder given the results of a recent survey by the Economist Intelligence Unit. It defined a cluster as a group of firms that have a powerful academic institution at the centre and perhaps a national laboratory in the neighbourhood. The survey found that 56% of those who were connected to a high tech cluster like the Silicon Valley felt they performed better than their peers compared to 36% outside a cluster.[120]

One way to encourage cluster development is to build centres of excellence. They allow a critical mass of research and businesses and thus ideas to develop. Centres of excellence that capitalise on BC's existing strengths can be a draw for researchers and high-end companies. This is of particular interest in rural regions, where centres of excellence that make use of BC's resource industries can be used to generate research and technology in regions outside the lower mainland.

Many of the leading jurisdictions have centers of excellence programs in place. Finland has had a National Strategy for Centers of Excellence in Research since 1997. It currently has 39 Centers of Excellence and is planning to fund 23 centres in the national centre of excellence programme in 2006-2011 and another 18 for the years 2008-2013.[121] According to the programme's definition, a centre of excellence is a research unit or researcher training unit which is comprised or one or more high-level research teams that are at or near the cutting edge of research in their field globally. They will share a common set of objectives and work under the same management. The Finnish government funds the

Centers mainly through Academy of Finland which provides about 20% of the funding. [122] The remainder of the funding comes from the hosting organisations, business enterprises and foundations[123]. The government funding will total approximately 130 million euros for the period of 2007-2011.[124]

Ontario's program, the Ontario Centers of Excellence (OCE) Initiative, supports research projects in province's universities, colleges and research hospitals. OCE has established five Centers: [125]

- Centre of Excellence for Communications and Information Technology - Invests to foster innovation in communications and IT;
- Centre of Excellence for Earth and Environmental Technologies - Invests to drive commercially viable outcomes contributing to clean air, water, land, and smart infrastructures.;
- Centre of Excellence for Energy - Invests to foster innovation in energy markets, systems and technologies;
- Centre of Excellence for Materials and Manufacturing - Invests in research partnerships that increase competitiveness and productivity; and
- Centre of Excellence for Photonics - Supports the creation of new photonics knowledge and technology.

OCE has been operating at some level since 1987 but officially formed as the "pre-eminent research-to-commercialization vehicle" in Ontario in 2004. It has had an important role in innovation commercialisation and increasing the mobility of the researchers or the IP carriers in the province. It has spun-off total of 73 companies and issued 61 new technology licences. In 2005/06, it helped about 836 people to move into positions outside their academic institutions. This is over 20% of the total of 3772 researchers funded in 2005/06. [126] [127]

BC has also made significant investments in such centres in recent years. Both the Centre for Drug Research and Development and the Centre for Digital Media will reap benefits down the road as centres of learning and innovation. Agencies around the province are moving to expand upon this development by capitalising on the federal government's Centres of Excellence in Commercialisation and Research (CECR) program. The CECR program has allocated a total of $165 million for the 2008 Competition.[128] This translates to about $15 million per center over five years. BC should continue to work on developing centres of excellence.

3.3 Recommendations

3.3.1 MINISTRY RESTRUCTURING

The PTC believes that to properly focus resources on the attraction and development of talent, and to focus our research funding more strategically, that British Columbia should create a ministry of research and talent. The Ministry would include research and innovation policy and resources from the Ministry of Advanced Education. The learning and instructional mandate of the Ministry of Advanced Education could be merged with the Ministry of Education to create a Ministry of Learning. In creating the larger Ministry of Learning, however, the government must take note of past experience and ensure that the advanced education aspects of such a Ministry are not overwhelmed by the size and mandate of the current Ministry of Education.

Also, as *Campus 2020*[129] noted, it is critical that this new body be able to focus resources. If the new Ministry attempts to be all things to all people it will spread our research investment too thinly and become ineffective. The new Ministry of Research and Talent would have a dual mandate to:

- develop and execute on long term strategy for Research and Innovation with focused and efficient research investment; and
- develop and execute on a long term strategy to attract and retain the top talent in the world.

10.32: That government restructure to create a Ministry of Research and Talent, and a Ministry of Learning.

3.3.2 RESEARCH INVESTMENT

It has become abundantly clear that R&D investment as a percentage of GDP is one of the most important drivers of an innovation economy. The strongest innovation economies all have R&D expenditures that range between 4% and 6% of GDP. In 2004, BC's research investment was up from the more traditional 1per cent to a stronger 1.45% but this is still not enough. We clearly need to spend more if we want a true innovation economy, and if we want to be a world class innovation economy, we have to undertake R&D investment levels that account for more than 4% of GDP.

This kind of increase cannot be accomplished by government alone. In fact, a much larger portion of the increase must come from the private sector. In 2004, private investment in R&D only represented 41% of the total. This is much lower than the Canadian average of 60%. To achieve greater levels will require not just government

funds but careful planning and programming to encourage greater private investment in R&D.

The new Ministry should ensure that its long term strategic plan includes addressing the disparity between private and public investment. Potential solutions include programs that encourage more matching dollars from industry, extension and expansion of the existing SR&ED program, and providing tax relief for funding University research.

10.33: That the government's long term strategic plan for Research and Innovation include interim goals to increase gross investment in R&D toward the world class benchmark of 4.5% of GDP, increase private investment in R&D to 65% of that total, and move toward these targets with aggressive but realistic time frames.

As already noted in the PTC's 5th Report, R&D tax credits are an important source of capital for R&D in early stages of technology businesses.[130] In Canada, 73% of the respondents to a SR&ED survey confirmed more R&D as a result of the program, and 58% indicated that their profitability increased.[131] Fourteen hundred companies claim success with BC's SR&ED program as well. Although the SR&ED system is strong, it expires on September 1, 2014.[132] Other jurisdictions like Quebec do not have a sunset date for their program.[133]

10.34: That the provincial government extend the British Columbia SR&ED tax credit program beyond its current expiration date (September 1, 2014) and make it an ongoing program with periodic reviews.

3.3.3 ONE UNIVERSITY TO TOP 20

The province should set a long term goal for one of its universities to achieve a top 20 world university ranking. An institution with international credentials would attract and retain the most talented people in the world, create high- quality graduate students and all of the benefits that accrue from having them contribute to our economy, and help meet the provincial goal of making British Columbia one of the world's top technology centres.

10.35: That government set a long-term goal for a British Columbia university to achieve a top 20 world university ranking.

3.3.4 DEVELOP A FACULTY RECRUITMENT PLAN

One of the biggest challenges facing British Columbia's post secondary institutions is attracting and retaining faculty. This is exacerbated by the large number of aging professors. By 2018, almost 50% of BC's current 3,532 faculty members (2003/04) will have reached the probable retirement age of 65.[134] Currently, we have a professor to

graduate student ration of 16:1 up from 12:1 in 1987, as compared to ratios as low as 7:1 or 6:1 at Harvard and Stanford universities.

While this is a challenge, it also represents a tremendous opportunity. One of the first tasks of the new ministry should be to develop a strategy that assists the universities in recruiting the best faculty in the world. BC can start by capitalising and building on the good work of the Canada Research Chair program and the Leading Edge Endowment Fund.

Such an effort would support the goal of creating a top twenty university, attract better graduate students to study with the high-profile faculty, and help form the development clusters that will drive an innovation economy.

10.36: That the provincial government develop a faculty recruitment plan in concert with the BCIC.

3.3.5 DEVELOP A GRADUATE STUDENT STRATEGY

Graduate students are the most important product of the university system. We need to develop exceptional students and we need to retain them in BC. There are a number of tools available to the provincial government that might be incorporated into a provincial strategy. They include:

- offering all foreign graduate students permanent residency through the Provincial Nominee Program, without the requirement of a job offer;
- repayable graduate student support or loan that could be forgivable at 20% per year should the graduate student stay in British Columbia; and
- extending provincial support for graduate internship programs.

Work BC is currently planning a marketing strategy aimed at international graduate students. This is commendable, but we believe the marketing should be supplemented with some targeted recruitment strategies for key areas.

10.37: The government should develop a graduate student strategy to attract, teach and retain the best possible students.

3.3.6 UILOS

One of the concerns expressed by stakeholders regarding UILOs is that the process is too complicated. This is, in part, due to the mandate of UILOs to protect IP and the interests of the University. This challenge was also identified by Global Connect who noted that University-based researchers, investors and industry representatives believe the process is too complicated. Another issue identified by stakeholders is that UILO processes are further complicated by different university regulatory procedures.

BC's universities need to make it easier for industry to conduct business with them. They should standardise the process with a limited number of standard agreements to choose from. The UILOs would also need to recognise that life sciences research and investment is significantly different from other forms of research, and the policies need to be developed accordingly.

Finally, the new system would have to measure how much technology is being transferred out of the University and how much money is being accrued through licensing. This would allow the process to be iterative. Universities could experiment with new processes and models to determine which is the most effective.

To manage such a cross-university process, there needs to be an independent body to manage, advise and measure. Industry should be included to ensure the process does the most efficient job of transferring technology to our economy. The goal is to create a more business-like and business-friendly model.

10.38: That the government and the universities should restructure and simplify the UILO process.

10.39: That government appoint a group of independent advisors led by BCIC to work with the UILOs to develop new policies and procedures.

4 Talent

4.1 Introduction

"We no longer think of immigration as a gatekeeping function but as a talent attraction function necessary for economic growth."[135]

- *Peter Hodgson, New Zealand's Minister for Research Science and Technology.*

Through its interviews, roundtable consultations and research, one definitive finding of the PTC is that the technology industry's most important resource is its people. In time, the ideas that people and companies develop become commodities, but top talent is a renewable resource that continues to perform. In today's modern economy, companies put a premium on talent (brainpower) as a competitive advantage. Accenture estimates that intangible assets now account for 70% of a company's value in the S&P 500 compared to 20% in 1980.[136]

The key question becomes...what kind of people, or talent, do we want to attract to and retain in British Columbia? The PTC believes our focus should be on two areas. The first is researchers and their students, also called Highly Qualified Personnel (HQP), who are the creators and carriers of Intellectual Property (IP). Investment in post-secondary education (amount and quality) increases a jurisdiction's growth and its ability to adapt and use new technologies and innovation practices. There is a link between workers with university education and innovative companies, as well as between investment in masters and doctoral students and product and process innovations.[137]

The second focus should be on top technology business talent like entrepreneurs, CEOs, and vice-presidents of sales and product management. The majority of our consultations indicated that these are the positions that local companies struggle most to fill and that the success of most technology companies rides disproportionately on the experience of these individuals. This is also the case on a worldwide basis. Demand for senior (experienced) talent is on the rise. In the United States, it is estimated that America's 500 leading companies will lose half of their senior managers in the next five years.[138] In China, two in three companies are having difficulties filling senior positions.[139] Also, as noted earlier, Business Week found that a full 50% of companies in Silicon Valley are founded by an immigrant.[140]

A PricewaterhouseCoopers' survey of 140 emerging companies and the 12 largest software companies in Canada shows that:

- 70% of the founders are still the CEOs of their emerging companies[141];
- 94% of emerging CEOs surveyed view growing revenues with quality customers as their most challenging issue in the next two years[142];
- 78% noted the difficulty of attracting a marketing and/or sales team[143];
- 100% of larger companies think that growing the revenues with quality customers is an issue; and
- 91% identify attracting and retaining a marketing and/or sales team as another key issue they will have to face in the next two years[144].

Like other jurisdictions, British Columbia must train and attract talent in order to continue its growth as an innovative technology centre. A report done by the Conference Board of Canada suggests that there are three primary sources for HQP[145]:

- The existing labour force, who can upgrade their skills and knowledge;
- New graduates entering the labour force; and
- Highly-qualified immigrants who bring skills and expertise.

Even though Canada's labour force has a high global ranking in educational attainment[146], the nation will find it a challenge to maintain and increase the number of Highly Qualified Personnel in the future.[147] This is due to demographic trends such as a declining birth rate and an aging population that will reduce the number of workers relative to the overall population[148]. It is suggested that by 2011 the outflow of retirees will surpass the inflow of young workers, and by 2016 almost 30% of the workforce will be on the verge of retirement.[149]

This makes immigration a key tool for BC. The competition, however, is fierce. Top talent is mobile and is heavily recruited by the best universities, research institutions, and companies in the world. Foreign born engineers, for example, make up nearly one quarter (24%) of the US National Academy of Science. Foreign born scientists account for more than half (56%) of the 'classic' papers in the physical sciences.[150] German universities now offer free international degree programs, taught in English, to attract students from Britain, America and around the world.[151]

Governments, as well, are offering extra incentives to attract top talent by relaxing immigration policies. France, for example, has introduced a "scientist visa". Australia has implemented a streamlined system of temporary long-stay business visas, and the United Kingdom created the Highly Skilled Migrant Programme.[152] Immigration policies are increasingly viewed as a recruitment tool.

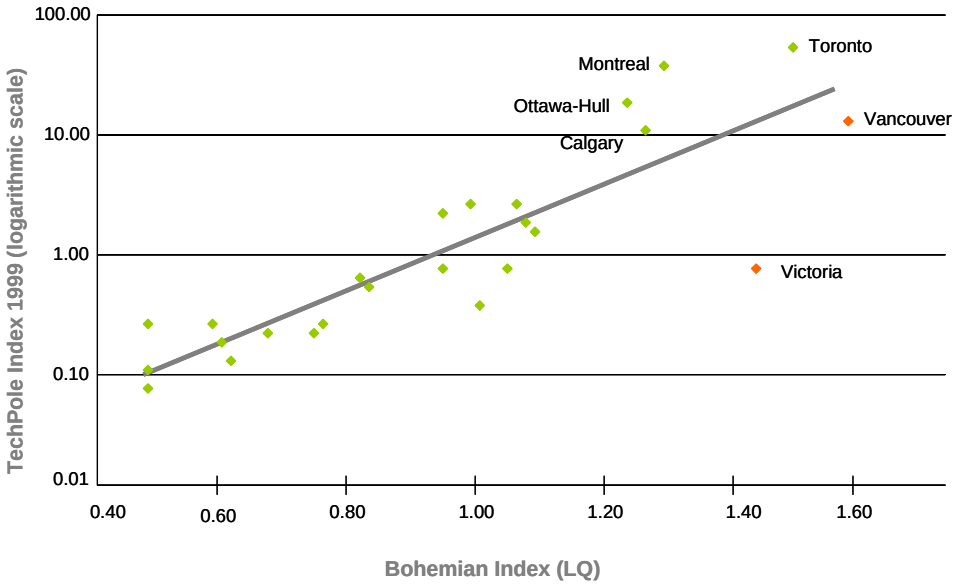
4.2 British Columbia's advantages

British Columbia really is one of the best places in the world to live. We have a strong education system, universal health care, relatively low rates of serious crime and poverty, and very low levels of unemployment. International rankings reflect this.[153]

It is more than our natural assets that will attract HQP. HQP who significantly contribute to knowledge-intensive production and innovation are attracted by certain regional characteristics. A Global Creative-Class Index is used to measure the existence of this creative class within a region. This creativity has been linked with the amount of innovation and economic growth in the region. Canada was recently ranked 8th in the Global Creative-Class Index.[154] Vancouver was the top city in and seventh in the world.

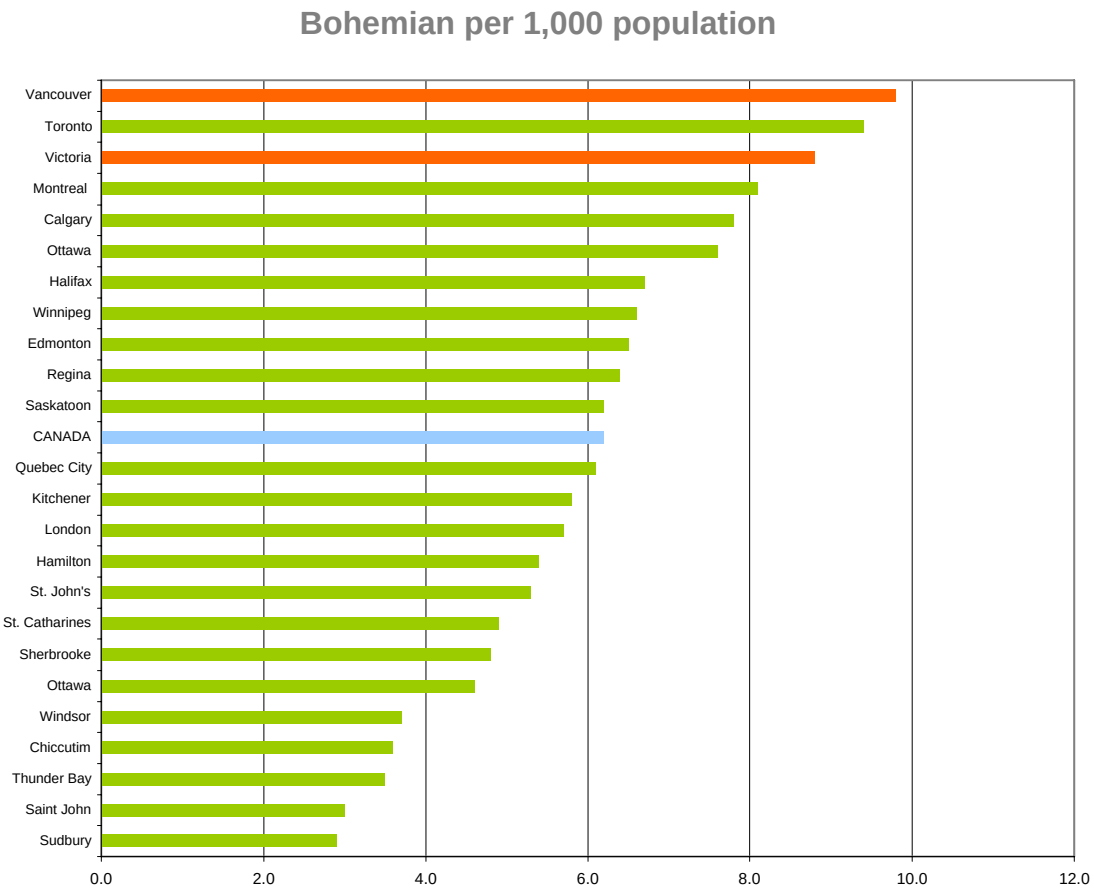
The creative class is attracted by quality of life and regional diversity, and are also found in regions with a high incidence of 'bohemian' professions (such as artists, writers, producers, designers, painters etc). Vancouver and Victoria are ranked first and third in Canada respectively on this measure.[155] A study conducted by behalf of Ontario Ministry of Enterprise, Opportunity and Innovation demonstrates a link between bohemian occupations and technology based economic growth.[156] We have a rich culture, not only in terms of the arts but also in terms of the diversity we can offer and that is already acting as a magnet for BC.

Figure 22. Tech-Pole Index by Bohemian Index for Canadian city-regions



Source: Gentler, M. et al. (2002) "Competing on Creativity – Placing Ontario's cities in North American Context", p.14

Figure 23. Bohemians in Canadian city-regions



Source: Gentler, M. et al. (2002) "Competing on Creativity – Placing Ontario's cities in North American Context", p.7

Microsoft chose to locate one of their ten global research centers in BC largely because of our diverse and tolerant population, the existence of a large pool of talented researchers, and our progressive immigration policies. British Columbia needs to build on these natural advantages to continue its growth as a technology centre.

4.3 Current challenges in attracting talent

Before we can build on our natural advantages in attracting talent to British Columbia, we must understand what barriers already exist. Throughout its interviews and research, the PTC identified two key areas of concern. The first area involves making the decision to move and the second involves the immigration process itself.

4.3.1 DECISION BARRIERS

A. Disposable income and taxation

The average real personal disposable income (PDI) increased by 2.5% in BC in 2005. The growth was the strongest since 2000 and it was due to a multiyear economic upswing in BC. The continuing tax reductions in BC also play a huge role in the increase in PDI. Government is to be commended for the measures it has taken.

BC still lags behind the Canadian average however (Figure 23).[157] The gap is even more pronounced when compared to the United States. One major local technology company estimated that senior level management migrating from the United States faced a reduction of 13-14% on disposable income.

British Columbia has effectively used tax reductions to boost its economy in the past. The BC Progress Board uses the top marginal income tax rate to compare tax rates among jurisdictions. The rate is a combined federal-provincial income tax rate levied on the highest income bracket. It is one of the critical factors in a jurisdiction's ability to attract HQP since high marginal tax rates tend to discourage additional work effort and lessen the growth of real GDP. Among the provinces in Canada, BC has the second lowest top marginal personal income tax rate for employment income and interest income (43.70%), the second lowest rate for capital gains (21.85%) and the fourth lowest for dividend income (31.58%). Alberta has the lowest top marginal personal income rate for all three sources of income. These are employment and interest income 39.00%, capital gains 19.50% and dividends 24.08%.[158]

This was based on 2006 figures and in 2007 the BC government introduced new tax relief to build on previous reductions in income tax in 2001 and 2005.

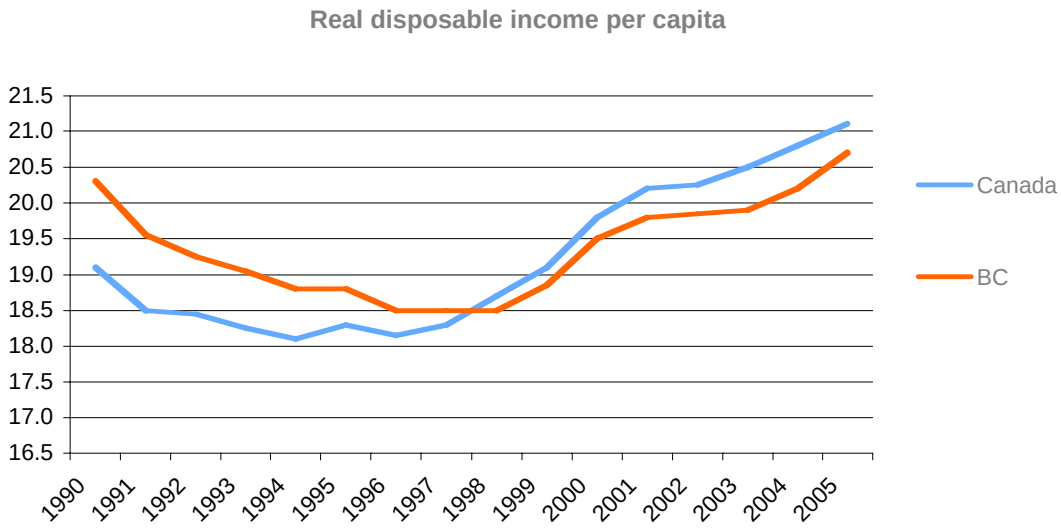
Table 6. 2007 income tax cuts

Taxable Income	B.C. tax before 2001 tax cuts	B.C. tax after 2007 tax cuts	Reduction in B.C. tax	Per cent change in B.C. tax
$15,000	$56	$0	$56	-100%
$20,000	$823	$256	$567	-69%
$30,000	$1,606	$1,023	$583	-36%
$40,000	$2,585	$1,679	$906	-35%
$50,000	$3,760	$2,484	$1,276	-34%
$60,000	$4,950	$3,299	$1,651	-33%
$70,000	$6,197	$4,142	$2,055	-33%
$80,000	$7,888	$5,210	$2,678	-34%
$100,000	$11,669	$7,766	$3,903	-33%
$120,000	$15,609	$10,706	$4,903	-31%
$150,000	$21,519	$15,116	$6,403	-30%

Source: Government of British Columbia (2007), "Budget 2007"

In spite of the measures taken by the BC government, taxation still remains a contributor to the perceived income gap between BC and some major US jurisdictions. Our personal tax rates are becoming competitive compared to the major technology jurisdictions in the US, particularly at the low and mid-income levels, however, the large number of possible income tax deductions, the addition of other non-income taxes, and the high cost of housing without mortgage interest deduction, leads to a much lower level of disposable income in BC.

Figure 24. Real disposable income per capita in BC and Canada



Source: Finlayson, J. and Peacock, K. (2006), "BC Economic Snapshot", Vol5, No3, p. 1.

BC has to address this. The difference in disposable income whether perceived or real not only prevents people from moving here but also plays a role in companies' decisions to relocate. If companies cannot attract the people they want then they must investigate other options. BC needs to consider measures that demonstrate a clear advantage to relocating here.

Another area for improvement in taxation is the treatment of assets when an individual ceases to be a resident in Canada. Becoming a resident in Canada does not result in any immediate Canadian tax consequences to the immigrant. However, taxation of assets upon leaving Canada creates a barrier for HQP to move to Canada in the first place, especially when some of the assets are left in the country of origin. These assets, regardless of their location in the world, will also be subject to deemed disposition in Canada. The deemed disposition tax is imposed on all residents of Canada when they cease to be resident a here. The reality is that some executives come to Canada for a period of years, but are much more likely to cease being a resident of Canada than are most Canadian citizens. This represents a significant barrier to skilled senior executives, especially those with significant foreign investment and property holdings. In certain sectors with medium to long product development cycles it is important that the skilled senior executive remains with the company for the duration of the cycle. Currently, an immigrant may earn income on assets held in a foreign trust established prior to immigration for up to five years from the date of immigration without that income being subject to tax in Canada. This may change however, as a result of proposed non-resident trust rules. Regardless, a five year timeline may be insufficient in many cases. Deemed disposition taxation policies create a far more restrictive timeline that erects a barrier to recruiting skilled senior executives to BC. [159] [160] [161] [162]

B. Housing

The cost of housing in British Columbia has a significant impact on disposable income, and the ability to attract talent. British Columbia is a desirable place to live, and the property values, when compared to competing jurisdictions, reflect this.[163] The price of housing is further complicated by certain tax structures, which compare unfavourably with those in the United States.

For the last three years, net in-migration to BC has averaged more than 41,000 people a year. Some 35,000 of those are entries from other countries, while approximately 6000 move here from the rest of Canada. Combined with higher incomes, this has created increased demand for housing that has been reflected in rising home prices.[164] Table 7 presents the sales activity and average prices of residential property in BC and Greater Vancouver from 1996-2005. [165] [166]

Table 7. Residential properties sold and averages prices in BC 1996-2005

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Residential properties sold										
BC	72,182	68,182	52,910	58,084	53,454	68,105	82,725	93,126	96,316	106,290
GVRD	28,555	26,946	19,612	22,944	21,216	28,176	34,909	39,022	37,934	42,222
Average price $										
BC	218,687	220,512	212,046	215,283	216,989	220,952	238,758	259,835	288,967	332,137
GVRD	288,268	287,094	278,659	281,163	287,973	284,806	301,473	329,447	373,875	425,745

Source: BC Stats (2006)

Property transfer tax[167]

BC companies trying to lure new residents to Canada also report that the Property Transfer Tax contributes to the challenge presented by expensive housing. This tax is charged on a home purchase. The amount due depends on the fair market value of the property that is transferred. If the fair market value is $200,000 or less, the tax is 1% of the fair market value. If the fair market value is greater than $200,000, the tax is 1% of the fair market value up to $200,000, plus 2% on the portion of the fair market value that is greater than $200,000.

US mortgage interest deductions[168]

This property transfer tax issue becomes all the starker when compared with the mortgage interest deductions available in the United States. Any interest a person pays on a loan secured by one's home (main home or a second home) to buy the home, a second mortgage, a line of credit, or a home equity loan is deductible from income tax. In most cases, a person will be able to deduct all of the home mortgage interest. Some conditions apply based on the date of the mortgage, the amount of the mortgage, and use of its proceeds.

Current Domestic Government Actions

Both the federal and provincial governments have recognised the importance of housing and are taking steps to address the situation. In the 2006 federal budget, the government provided a one-time payment of $800 million to increase the supply of affordable housing. This was paid to a third-party trust, the Affordable Housing Trust, which will support investments to enlarge supply of affordable housing. This funding will be distributed among provinces and territories on a per capita basis over the next three years.[169]

The 2007 Provincial Budget also contained significant measures to address housing. Although they primarily focus on low income and homeless issues there are some measures which can be related to talent. They include the increase in the threshold for the First Time Home Buyers' Program and the raising of the threshold for the phasing out of the Home Owner Grant. The province also announced a $250 million Housing Endowment Fund. This will be invested and generate an estimated $10 million annually. These earnings will be available to support innovative housing proposals to

focus on new ways to meet the diverse needs of individuals and families not being fully served by existing programs and services.

Creative Solutions

The housing challenge is felt the most acutely by researchers, professors, scientists and mid-level business managers. These people, critical to the growth of our technology industry, are usually locked out of the market in Vancouver and are increasingly challenged in cities like Victoria and Kelowna. To determine ways to make it easier for these kinds of people to purchase a home, the provincial government will need to investigate creative solutions used elsewhere.

Universities in the United States, particularly for institutions where property values are very high, have a number of programs that address housing cost issues. Housing Assistance at universities can be divided into six major categories (1) income supplements (2) subsidized rental assistance (3) co-ownership with shared equity (4) shared appreciation mortgage (5) low-interest mortgage, and (6) indexed pricing.[170] One of the more interesting programs is at Princeton, which has a Tenancy in Common Program for tenured faculty whereby the university co-buys one-third of the house, up to $375,000. Rent is imputed for tax purposes on this portion. There is a pro-rata share of appreciation paid to the university at payoff which is not deductible as interest. Stanford's Mortgage Assistance Program (MAP) also has a shared equity structure.[171] [172] The University will lend money to the faculty member, at a very low rate, and the loan is not due until the property is sold or the borrower ceases to be eligible. The University benefits from a possible appreciation of the property – taking a proportion of the appreciation based on what fraction of the value is represented by the loan. These are the kinds of solutions that British Columbia needs to consider to attract talent to the province.

C. The size of the technology community

Another challenge in attracting people to BC is the relatively small size of the technology community. A bigger hub attracts more people. Silicon Valley, for example, is large enough to provide plenty of opportunities, should someone decide to leave a position. In BC, there are only 37 large technology companies that have more than 200 employees, and 34 with more than 100 but less than 200 employees.[173] We need more and larger companies.

Efforts to attract larger companies have not proven effective, often because other jurisdictions are prepared to offer much larger subsidies. This is not a course of action that the PTC recommends. Instead, strategies need to focus on growing companies in BC rather than attracting them from elsewhere. Favourable conditions will do more to attract larger operations than any specific, targeted measure.

4.3.2 IMMIGRATION

As noted earlier, many jurisdictions are now looking at immigration as an economic development tool and hoping for the removal of regulatory barriers. Thus, it is particularly troublesome that one of the issues raised most often, both in our roundtable consultations and in our interview process, was the regulatory barrier to immigration. Jurisdictions found the process for bringing in a Temporary Foreign Worker (TFW) challenging and the process to achieve Permanent Resident status often opaque and unreasonably lengthy.

A. Work BC

The Work BC initiative was launched in April 2007.[174] [175] Its objective is to provide an innovative new labour market strategy to ensure the Province's success in meeting key economic priorities. Included in the initiative is an action plan that lays out how government, working with business and industry, will address skills shortages for the next five years and respond to longer-term labour market challenges. The action plan recognises B.C.'s proximity to Asia, and addresses each of the following five strategic areas:

- keep the workforce we have;
- develop the skills of the existing workforce;
- increase Aboriginal participation and labour market success;
- find and attract more workers to B.C.; and
- address regional skills shortages.

The initiative has expanded the Provincial Nominee Program to speed up the immigration process and continues to seek Off-Campus Work Permits for international post secondary students. The aim is to increase provincial involvement in temporary foreign worker approvals, and in a number of other immigration processes.

The Premier's Technology Council commends the government for recognising the serious nature of this issue and for taking steps to address it. The PTC believes, however, that in addition to addressing these regulatory barriers, government can undertake some specific measures that will provide more concrete, 'marketable' benefits to talent.

B. Federal and Provincial Immigration Programs

One of the challenges in dealing with immigration issues is the complicated nature of the relationship between the provincial and federal governments. Because they hold joint responsibility on immigration issues there are programs at each level that can be drawn upon. In general the federal government programs related to HQP are twofold.

They have permanent residency through skilled worker and investor initiatives,[176] and are responsible for the Temporary Foreign Worker program. They are also developing a new Canadian Experience Class. This would allow an immigrant to have temporary status for study and work, after which they could apply for residency.

At the provincial level there is the Provincial Nominee Program (PNP). Under this program the province can nominate immigrants for permanent residency in Canada should they meet certain criteria as per agreement with the federal government. Those nominated through the PNP immediately qualify for a work permit as a Temporary Foreign Worker until their residency status is confirmed. Currently, the agreement with the federal government stipulates that those nominated under the PNP provide some economic benefit to the country.

Table 8. Programs in the federal and BC level

	Federal	BC provincial
Work permit	Temporary Foreign Worker program, TFW	
Permanent Residency	Skilled Worker class	PNP Strategic Occupations • Skilled Workers • Designated Health Professionals • International Graduates
	Investors, Entrepreneurs and Self-employed immigration class	PNP Business Category • Business Skills • Regional Business • Projects

Source: CIC and BC Ministry of Economic Development

C. Temporary Foreign Workers

In order for a prospective employee to get a work permit as a TFW in Canada, an employer needs to acquire a Labour Market Opinion (LMO) from Human Resources and Skills Development Canada (HRSDC). Acquiring the LMO - a letter from HRSDC to the employer stating that if a foreign worker fills a particular position, it will not negatively impact the labour market in Canada - is a serious challenge. The vast majority of applicants for a temporary work permit require a LMO.

While the goal of HRSDC is to provide a LMO within 10 to 15 days, interviews with prospective employers indicated the process currently takes 16-18 weeks or more to complete.[177] The work permit acquired through a LMO is also 'closed' - specific to one employer and not transferable to another. There are some exemptions, and occasionally 'blanket' LMOs are given to certain occupations but these are often too restrictive. [178]

Other countries that require LMOs often follow different processes. In the United States, [179] [180] [181] for example, the system is based on automatic approval and auditing.

Applications are automatically approved once the employers have sworn that the processes have been followed and the information is correct. The government then does spot audits to ensure companies are following appropriate regulations. Under New Zealand`s Temporary Foreign Worker program, certain licensed companies can automatically qualify TFWs provided they meet certain criteria. [182] [183] [184]

The Premier's Technology Council believes the Provincial Government should investigate these as potential opportunities. A combination of the two aforementioned ideas, for example, would grant licensed companies an automatic LMO which would then be subject to a spot audit. Federally, some of these process changes could be implemented without legislative oversight. Work BC should encourage the federal government to consider this during its negotiations on TFW issues. BC might even consider negotiating its own TFW program based on the US model described above.

Quick facts – US

When applying for a temporary work visas for employees in the US the employer must file a labour condition application ("LCA") with Department of Labor ("DOL"). This is done online and the DOL's technology will automatically evaluate the information entered to ensure it meets some minimum requirements. The online application system will determine, usually within minutes, if the submitted LCA is certified or denied based on information that was entered, and relying on the Employer's attestations. This applies to an employer seeking to employ a foreign worker temporarily in a specialty occupation (the H-1B program).

Specialty occupations require theoretical and practical application of a body of highly specialised knowledge along with at least a bachelor's degree or its equivalent. Examples include architecture, engineering, mathematics, physical sciences, medicine and health, education, and business specialties. The H-2B program, which applies to non-specialty occupations, non-agricultural workers, and which is smaller than the H-1B program, does not have the same attestation system.

The one drawback on the H- programs is that they have quotas which are often used up by the time the quota year arrives. This has more to do with the annual numbers Congress approves, rather than any real deficiency with the immigration system. [185] [186] [187]

Quick facts – New Zealand

New Zealand employers can also apply to Immigration New Zealand ("INZ") to gain accreditation to offer employment to overseas workers. Once accredited, an employer can offer employment to non-New Zealand citizens or residents without having to prove each time they want to employ someone that there are no suitably qualified New Zealanders available, or readily able to be trained, to do the work.

Approved employers are granted accreditation for 12 months and this can be renewed on an annual basis. Offers of employment made by accredited employers need to meet INZ requirements, and prospective foreign employees also need to meet a range of requirements. In addition to requirements for good health and good character the prospective employee needs to:

- be under 56 years;
- have a genuine offer of employment from an accredited employer, for employment that is:
    - full-time;
    - for at least two years;
    - with an annual base salary of at least NZ$50,000;
    - in the employer's main business activity; and
    - where they are directly responsible for the employee's output.

The prospective employee will also need to show that they are either fully or provisionally registered – if their occupation requires occupational registration in New Zealand. To become an accredited employer a business must prove that they currently meet, and will continue to meet, all New Zealand employment and immigration laws. INZ will look to see that the employer:

- pays employees at least minimum, or industry standard, wages;
- offers at least the minimum required by law for holiday and special leave;
- meets other requirements of New Zealand law that protect the safety and health or workers;
- only employs people who are lawfully allowed to work in New Zealand;
- is in a sound financial position;
- has good human resource policies and practices; and
- has a commitment to training and employing New Zealanders.

In determining whether an employer can be accredited INZ will assess such as factors as:

- how long the business has been a going concern;
- the employer's relationship with their Industry Training Organisation;
- whether they're a member of the Equal Employment Opportunities Employers Group;
- whether they're IOS (International Organisation for Standardisation) certified; and
- how long they intend holding accreditation and how this relates to any visas or permits held by their employees.

If INZ receives information that may lead to it declining an employer's application, it gives the employer the opportunity to comment before making a decision. [188] [189] [190]

D. Permanent Residency

There are two HQP-relevant options for acquiring permanent residency in Canada. The system supporting the federal option, the Skilled Worker Class, is so oversubscribed that it takes years for an immigrant to attain residency status. Currently half of the applications are finalised in an average of 51 months. This varies depending where the application was processed. Half of the applications from European countries, for example, are finalised in 33 months as opposed to 62 months and 64 months for visa offices in Africa and the Middle East, and the Asia Pacific region respectively.[191] This leaves the Provincial Nominee Program (PNP) as the only real recruitment option. There are three classes of PNP that are related to the technology sector: skilled workers, international graduates, and a business category.[192] Fortunately, the PNP has been very effective for companies and immigrants who choose to use it. Interviews and consultations indicate that the PNP staff is extremely helpful and the program itself is flexible and timely. Some of the companies interviewed thought so highly of the program that they indicated they would consider paying more for the service should it be expanded.

The PTC is pleased to note that Work BC is already seeking ways to expand the PNP and believes there is plenty of opportunity for expansion. Currently the provincial government requires a job offer for an immigrant to qualify for the PNP under the strategic occupations category. This is a provincial requirement. Under the present PNP agreement with the federal government, only PNP- nominated immigrants are required to demonstrate some economic benefit.

E. Options for Grad students

One of the ways to encourage HQP in Canada is to retain those foreign students who are already here. These students are a great repository of Canadian trained talent and are clearly identified as desirable IP carriers. There are three options for them to either work while studying or shortly after their studies[193]: the Off-Campus Work Permit Program, the Post-Graduation Work Permit Program and permanent residency through the federal program or the Provincial Nominee Program. The PNP currently requires that graduate students have a job offer. The PTC believes that if all graduate students were automatically eligible for the PNP program without a job offer it would serve as an excellent recruitment tool and facilitate the retention of a high percentage of these graduate students.

F. Spouses and Families

In most circumstances the spouses of most Temporary Foreign Workers are eligible for open work permits.[194] This means that spousal work permits are not usually a barrier to

attracting a TFW. Unfortunately, the same can not be said for spouses of Canadian citizens. Should a Canadian citizen return to work in Canada, bringing a foreign spouse, that spouse may have to wait up to 9 months before receiving a work permit.[195] This often serves as a significant barrier to any company wishing to repatriate a Canadian skilled worker.

A similar barrier exists for TFW. If the offspring of a TFW comes to Canada with their parent and wishes to attend university they must do so as a foreign rather than a domestic student. This leads to significantly higher tuition rates. For example, foreign students pay more than four times the domestic tuition at UBC and over three times at SFU. [196] [197] The strength of our university system, and its low cost in comparison to many American universities can act as a significant draw for Temporary Foreign Workers, but only if their children qualify as domestic students.

4.4 Strategies to attract talent

4.4.1 MEASURES IN OTHER JURISDICTIONS

The governments of Ontario and Quebec have both provided incentives to attract technology workers. Quebec introduced a five-year personal income tax holiday for HQP in the following specialities: foreign researchers specialising in pure or applied science, management or financing of innovation activities, foreign commercialisation, and transfer of leading technology.[198] The Ontario Research Employee Stock Option (ORESO) Credit provides a personal income tax reduction for the disposition of stock options granted to employees by research and development companies, and for capital gains arising from the sale of shares acquired through exercising eligible stock options.[199]

Quebec has also worked creatively and proactively with companies for large-scale hiring and job creation initiatives. For example, large subsidies were provided to attract Ubisoft, a major video game developer. The PTC notes this kind of company-specific subsidy, not as a recommendation but as an example of the kind of competition we are facing in BC.

4.4.2 EXPATRIATES

One human resource strategy is to focus on the Canadian Diaspora as a source of potential talent. Many of the top students from our universities leave Canada when they graduate. Microsoft hires more graduates from the University of Waterloo than any other university in the world.[200] BC should encourage expatriate HQP and sales, marketing & product professionals to return to BC. They will have been trained at some of the best companies in the world, and are more likely than foreign nationals to stay in

Canada if they return. About 2.7 million Canadians (over 8% of Canada's population) are currently working abroad.[201]

Table 9: Distribution of Canadian Diaspora as of 2001

Country	Distribution (%)	Estimated number (1,000)
USA	44	1,210
Asia	24	644
Europe	18	499
Rest	14	380
TOTAL	**100**	**2,733**

Source: Kenny Zhang, "Recognizing the Canadian Diaspora", Canada Asia Commentary, Number 42, March 2006.

Other jurisdictions around the world have also noted émigrés as a source of HQP. In an effort to attract the 20 million Indians living abroad, and to make it easier for émigrés (with a total annual income of 35% of India's GDP) to invest in their home country, India has introduced a special visa for "people of Indian origin." China has introduced incentives such as bigger apartments, access to the best schools, chauffer-driven cars, and elaborate titles. [202]

There are at least two potential expatriate target groups. The first is Canadians in their mid-30's who are starting a family or putting children through school, and who want their offspring to be raised in Canada. The second is Canadians who are closer to retirement age and looking for opportunities to return home, or who may want to be closer to elderly parents.

4.5 Recommendations

4.5.1 TALENT AND THE NEW MINISTRY

One of the key recommendations in this report is for the government to create a Ministry for the promotion of innovation and research. Because talent is the most critical aspect of both innovation and research, this new Ministry should also assume responsibility for developing and attracting the kind of people who will drive an innovation economy.

The Ministry should build on the efforts of Work BC by partnering with other key agencies such as BCIC and recruitment firms to develop a series of recruitment tools through the use of taxation, immigration, and housing options and should assist with opportunities for spouses and children of immigrants and be authorised to work closely with the private sector. This new Ministry must also be prepared to develop targeted communications and look beyond the traditional immigration exercise to the global recruitment initiative.

10.40: The Ministry of Research and Talent should focus on strategies to attract and retain the top talent in the world.

4.5.2 NO TAX FOR EMPLOYEES ON COMPANY STOCK (OR STOCK OPTIONS)

The provincial government has a history of using income tax reduction as an economic spur. The PTC believes that, on a purely income tax basis, it will be difficult to compete with key jurisdictions in the United States especially states like Washington which have no state tax. The provincial government instead needs to provide a more targeted initiative that will provide one clear 'win', such as the elimination of income tax on employee-owned company stock, in order to create the incentive for HQP to immigrate to British Columbia and for entrepreneurs to build their businesses here.

This tax incentive will serve as a method for attracting more companies here, growing more companies here, and keeping more companies here as it allows companies to be more frugal by using stock as an incentive. Although this tactic could be used in all sectors, it is particularly critical for most technology companies where the number one line item expense is salaries.

Most importantly however is that such a tax reduction will serve as a strong recruitment tool for important technology talent. In light of this, the Premier's Technology Council would like to restate the recommendation 5.3 from its fifth report.

10.41: That the provincial government develop and implement an employee equity participation incentive to attract technology companies, senior management, key employees and head offices to British Columbia. The incentive should eliminate the provincial tax payable on the exercise or disposition of stock from the employee's company.

10.42: That BCIC lead the innovation associations in other key provinces to advocate to the federal government for the elimination of federal tax payable on the exercise or disposition of stock from the employee's company.

4.5.3 HOUSING

Housing has already been noted as a challenge and this is particularly key for researchers, academics, middle management, and key developers. BC and Canada have both recognised housing as a critical aspect of immigration and continue to develop measures that address it. However, aside from broad measures like allowing mortgage interest tax deductions, there are few existing models for addressing housing issues at this level.

One potential source of solutions is to be found in the university system. A number of universities in the United States have introduced successful programs, including some where they serve as an equity partner and jointly purchase a home with new faculty. This helps them to overcome the high cost of housing which is a significant obstacle in certain communities. The Premier's Technology Council believes similar programs can be initiated in BC.

10.43: That government continue to develop programs that address housing issues. Government could begin investigating University housing models, implement them within our own University system and expand programs based upon their success.

4.5.4 DEEMED DISPOSITION

Another challenge the PTC has identified is the regulatory regime surrounding the deemed disposition of assets. Even though there are legal ways to avoid paying this tax, it still represents a significant regulatory barrier. Given that in some industries, a company needs a Temporary Foreign Worker for two consecutive three-year temporary work visa periods, a five year deadline for the assets to be deemed as disposed of is problematic. Extending the term from five to seven years would alleviate this problem.

10.44: That the provincial government work with the federal government to change the deadline for deemed disposition of assets from five years to seven years.

4.5.5 IMMIGRATION

The PTC has noted the effectiveness of the provincial government's PNP program. The program's success is a testament to the government's ability to manage immigration issues effectively. The PTC also commends the Work BC initiative. As it goes forward, we believe the provincial government should consider the following recommendations as ways of improving opportunities both for the talent who wish to move to British Columbia, and for the companies trying to recruit them. It is important to note, however, that should these measures increase the volume of work and pressure on those who administer the PNP program, the province should ensure take steps to ensure it is adequately resourced.

10.45: That the provincial government streamline immigration to BC by:

- **using the PNP program to grant immediate permanent residency for graduates of BC universities' Master's and PhD programs, with no requirement of existing job offer;**
- **amending the PNP program to allow the designation of approved employers in the technology sector with such designation allowing for automatic qualification for the program (The system should be subject to audit);**
- **working with the federal government to pilot a BCTFW program that allows designation of approved employers in technology areas so that their prospective employees can obtain immediate temporary work visas (The system should be subject to audit);**
- **negotiating with the federal government the provision of immediate work permits to the foreign spouses of returning Canadian citizens; and**
- **allowing children of temporary foreign workers to qualify as domestic rather than international students at our universities.**

4.5.6 RECRUITMENT PLAN FOR TALENT

Early in this discussion on talent, the PTC identified two critical types of talent we need to target to improve the innovation economy in British Columbia. The first group was researchers and their graduate students, and the second was senior executives and entrepreneurs. In the research section of this paper, the PTC identified the need for strategies to attract both graduate students and senior faculty.

The PTC believes the richest potential source of talent in the senior business category is the Canadian Diaspora. Many expatriates consider returning to Canada either when they have children of their own, or when their own parents begin to age. When targeting Canadians in respected universities abroad, subsidised trips for recruiting and social events in BC could be arranged. Senior talent could be attracted by inviting them to BC, perhaps to speak at events. Once here, they would learn about the province and network with people. Industry associations could play an active role in such an initiative.

10.46: That the new Ministry develop a recruitment plan for expatriate Canadians which could potentially be executed through the BCIC.

5 Capital

Throughout the PTC's interview and consultation process, technology entrepreneurs and companies in BC continued to recognise limited access to capital as one of the key inhibitors to starting and growing technology businesses here in BC. Although our technology industry is reasonably strong, it is also quite young. There are not many old technology companies and not many big ones. Only 43 (December 2006) large technology companies in BC have revenue over $25 million.[203]. This is however, 11 more than in 2002.[204] According to BCTech, only 37 technology companies have more than 200 employees.[205] This small-scale business environment is due in part to an immature funding environment that limits innovation and technology development. We need to consider where government can best help the industry grow.

5.1 Current state of the capital market

Throughout our consultation process, interviewees regularly referred to 'Silicon Valley' as an example of a mature capital market resulting in a vibrant technology industry. In comparison, BC does not have as much money readily available at any stage of the life cycle. Furthermore, comparisons with the Silicon Valley revealed that companies in BC get less help from funders in mentorship, access to partners, recruitment and strategic advice. Finally, it is apparent that when BC companies do find funding, they find it in smaller amounts. This is because of the conservative nature of our investors. As one roundtable attendee stated, "The Valley makes bigger bets, and swings for more home runs." The BC community is more risk averse.

To understand how to address this disparity in investment, the PTC has examined the current investment cycle in the BC technology industry and tried to determine who the key funders are throughout the funding cycle. By comparing these funders with similar sources in other jurisdictions it is possible to determine where the gaps are and how to address them. In the long run we cannot have a purely government solution and it is not government's function to pick the winners. We do, however, need to determine if there are ways for government to help the capital markets mature in BC.

Key stages of development in the technology environment are:

- Pre-seed – A developing business entity that has not yet established commercial operations and needs financing for research and product development. A pre-seed is usually an entrepreneur or researcher with an idea. The line between the pre-seed stage and basic research often gets blurred.

- Seed/start-up – This is a business in the earliest phase of established operations and needs capital for product development, initial marketing and other goals.
- Early Stage – This is a company, usually in business for less than three years, which now has a product in testing or pilot production. In some cases, the product may be commercially available. It may or may not be generating revenues and needs financing to achieve full commercial production and sales.
- Later stage – The product at this stage is in production and commercially available. The company has significant revenue growth but may or may not be showing a profit. It needs capital to expand productive capacity, marketing and sales.

Within these different stages, companies and entrepreneurs can attempt to access capital from different sources. The four types of key investors are FFF (Founders, Friends, Family), Angels, Private Equity/VC and the government.[206]

- Founders, Friends, Family (FFF) – This sector is exactly as it appears. Entrepreneurs seek resources from friends and family and usually supplement this with their own savings or investments.
- Angel Investor – An 'angel' is a high net worth individual, active in venture financing and typically participating at an early stage of growth. They often play an active mentorship role and take shares or equity in the company.
- Private Equity – The key players in the private equity industry vary based on the particular fund structures and sources of capital supply. In the United States, private equity is dominated by Private Independent Funds, while Canadian Activity is diversified across several major groups. These include corporate funds, institutional investors, retail funds (established with the benefit of government tax credits to individuals), private independent funds and foreign investors. Venture capital is a specialised form of private equity invested by recognised venture capital funds. They invest money obtained from other investors, especially institutional investors such as pension funds.[207]
- Government - Federal government programs include the Natural Sciences and Engineering Research Council of Canada (NSERC), the National Research Council-Industrial Research Assistance Program (NRC-IRAP), and sector specific Sustainable Development Technology Canada (SDTC). The provincial government sponsors a number of tax credit programs.

Within each stage these different kinds of investors or funders can play different roles.

5.1.1 FOUNDERS, FRIENDS, FAMILY

The lighthearted sounding term of 'Founders, Friends, and Family' (FFF) belies the importance of this investment category, particularly at the earliest stages. At this stage the product or service is only the germ of an idea and funding is needed to facilitate

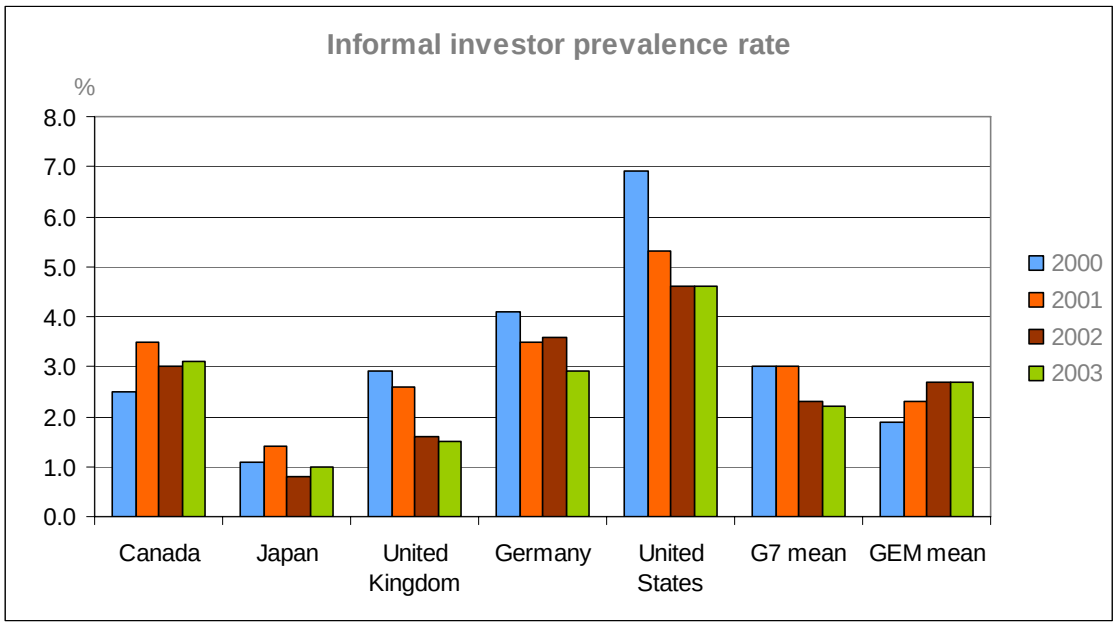
commercialisation of new product concepts, often from laboratories, research centres or entrepreneurs. As a result a private investor needs to have a certain amount of faith in the entrepreneur as an individual or at the very least a clear and personal understanding of their concept. Institutions and more professional venture capital investors prefer a more stable investment opportunity. This leaves the entrepreneur, or developer to seek either government grants, funding from friends or they must use existing assets to boost their product to the next stage.

FFF is often called 'informal investment', and many sources also include angel investors in this category as well. The PTC has decided to treat them separately because of an added dimension angels bring to a later phase of the investment cycle and the particularly critical role they play in British Columbia. As stated the FFF category is usually a very personal investment. As a result its actual impact is very difficult to track. How many people accept a check from a parent or sibling with a promise to repay them? Having said that, there is some data available and it shows that FFF is critical to the earliest, pre-seed stages of business development.

The Global Entrepreneurship Monitor (GEM) estimated that, in the countries it studied, over 85% of private equity invested in a new business is informal investment. On average the founders themselves provide some 66% of the startup financing. While fewer than 0.01% of nascent entrepreneurs launch their new ventures with formal capital or business angel investments. The GEM also estimates that, in GEM nations, approximately 1.35% of GDP is financing from informal investors. When the entrepreneurs themselves are included this number increases to 3.6%. Within Canada this rate is somewhat lower, with less than 1% of our GDP being driven by informal investment.[208]

On a different GEM measure of informal investment, however, Canada scores reasonably well. They determined in 2003 that across all of the GEM countries some 2.7% of adults had invested in someone else's business during the previous three years. For Canada, the rate was higher, usually over 3.0%. This does represent one challenge however. Although the score is better than most G7 nations is still significantly lower than that of our key competitor, the United States, which has almost 50% more informal investors per capita.[209] [210]

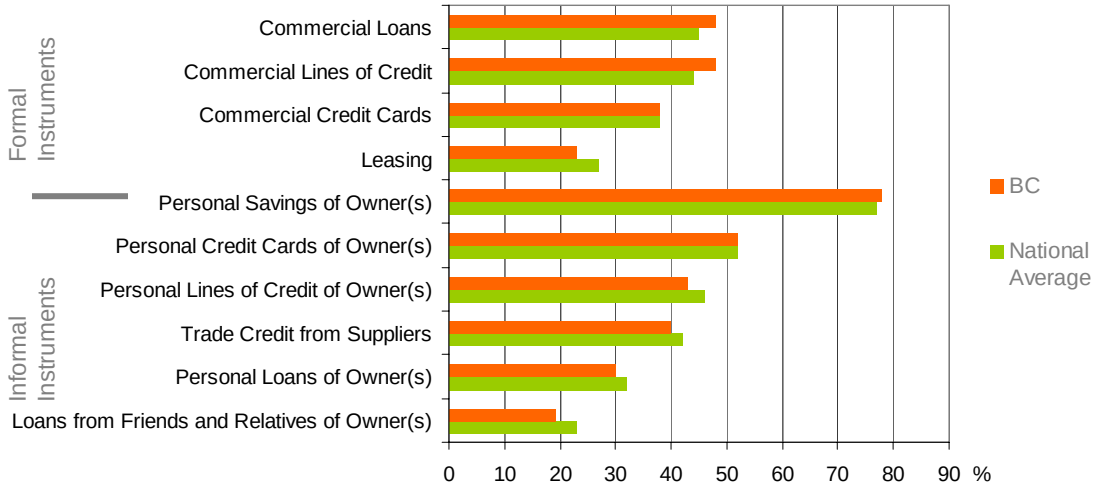
Figure 25. Informal investor prevalence rate by country, 2000-2003



Source: Global Entrepreneurship Monitor (GEM), Canadian National Report 2003, p.29

Within British Columbia it is difficult to obtain raw numbers about the total levels of informal investment in such early stages. However, a recent Government of Canada study on Small and Medium-sized Enterprises (SME) in BC does contain some data about what proportion of their financing is coming from informal sources. They determined that of the BC firms that seek equity financing, some 20 percent approached friends and family and 13% sought angel financing. This is lower than in other provinces. Across Canada, 23% of firms approached friends or family, 22% sought out angels. What the table below makes clear however, is that the vast bulk of start up financing comes from the personal assets of the entrepreneurs themselves.[211]

Figure 26. Sources of financing used during start-up



Source: Government of Canada (2007), "SME Financing data initiative – Small and Medium-sized Enterprises in British Columbia" p. 9

5.1.2 GOVERNMENT PROGRAMS

Government programs in Canada do fund research. Compared to the United States however, our governments do not fund a great deal of commercialisation.

A. Federal Government Programs in BC

In early stages, the line is often blurred between pure research and the beginning of idea commercialisation. The majority of critical government funding for this stage is in the form of research grants. The most important of these programs are federal and include the National Science and Engineering Research Council (NSERC), the National Research Council's Industrial Research Assistance Program (NRC-IRAP), Technology Partnerships Canada (TPC) and sector specific Sustainable Development Technology Canada (SDTC). The province has programs that help to match this funding.

The impact of these programs in BC was studied in a 2005 report on research and innovation in BC prepared by Ferrence Weicker and Company for the Ministry of Advanced Education.[212] They determined that:

- National Science and Engineering Research Council (NSERC) is the major funder of research at educational institutions in Canada. Operating on a competition basis, NSERC has provided from $60 million to $80 million in funding annually to BC, including funding for basic university research through discovery grants, for project research through partnerships among universities, governments and the private

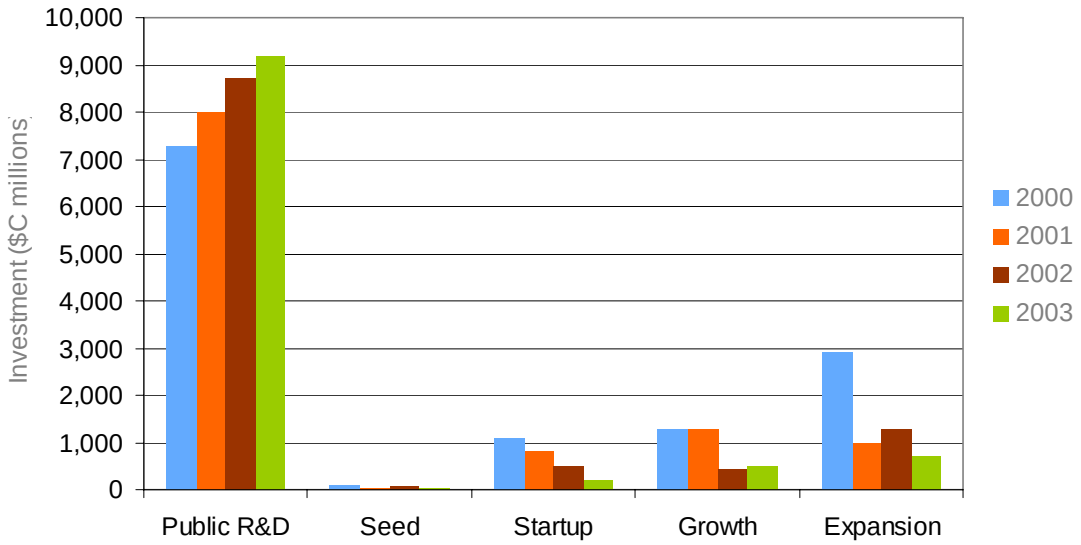
sector, and for advanced training of highly qualified people. BC commonly receives 13% to 15% of the funding awarded by NSERC annually. Basic research is funded 100% while other arrangements are made for applied research and projects with industry partners.

- Industrial Research Assistance Program (IRAP), delivered by NRC, funds small-scale industrial research, market assessments for technology products, delivers an internship program and helps companies to acquire foreign technology. In 2002-03, IRAP distributed about $12 million in funding to clients in BC (representing about 16% of the national total).
- Technology Partnerships Canada (TPC) is a special operating agency of Industry Canada with a mandate to provide funding support for strategic R&D and demonstration projects that will produce economic, social and environmental benefits to Canada. In 2002, TPC provided $32 million in grants for research and development activities in BC (which represented about 11% of the R&D funding it provided in Canada).

The fourth program, SDTC, is a more sector specific program. It is a not-for-profit foundation that finances and supports the development and demonstration of clean technologies which provide solutions to issues of climate change, clean air, water quality and soil, and which deliver economic, environmental and health benefits to Canadians. To do so, the Foundation draws from an investment fund of $550 million. To date, SDTC has completed ten funding rounds and allocated a total of $279 million to 124 projects. That amount has been leveraged with an additional $670 million in funding from other project partners for a total project value of $949 million. Funding for BC has totalled $52 million since 1992.[213]

While these programs have been extremely successful, the Prime Minister's Advisory Council on Science and Technology has found that only a small portion of Government investment has been made available for scientific research at new, for-profit businesses, especially at the seed stage. The majority of investment goes towards scientific research at universities, hospitals, and other centers as well as to profitable companies that can take advantage of investment tax credits. The result is a serious gap in financing for the commercialisation of new businesses dependent upon investment in scientific research.[214]

Figure 27. Canadian Investments in Publicly Funded R&D* and in Venture Capital



* Public Funded R&D includes both Provincial and Federal Government R&D Expenditures as well as the expenditures made by Universities in R&D.

Source: Report on the March 17-18, 2004 Roundtable on Seed/Pre-Seed Stage Venture Capital Financing and on Commercialisation Skills Sponsored by the Prime Minister's Advisory Council on Science and Technology (ACST) p. 40

B. BC government financing support

There are a number of ways in which the Government of British Columbia encourages investment in companies. Some, like the SR&ED program highlighted in the research section of this paper encourage investment obliquely. There are other programs that encourage more direct investment through tax credits.

There are at least four ways the Government of BC encourages investment in companies[215]:

1. The Government of BC's Equity Capital Program (ECP) provides BC investors with a 30% refundable tax credit. The investment can be made directly or through a holding company, called a Venture Capital Corporation (VCC);
2. Community Venture Capital Program (CVCP) tax credit program;
3. New Media Program (NMVCP) tax credit program; and
4. Employee Share Ownership Plan (EIA).

The Equity Capital Program (ECP) has been the most successful. As of September 2007, the programs have raised over $750 million in equity, invested in over a thousand businesses and created over 22,000 jobs.[216] The average investment has been $697,953 for each business. The budget for the programs is $25 million. Thus, currently the programs can raise up to $83 million per year. The budget for ECP is $17 million. The annual investment cap for individual investors is $200,000, which translates into a tax credit of $60,000. Interviews with the program administrators indicate that the most popular model is the program that allows small businesses to raise capital directly from investors without Venture Capital Corporations (VCCs).[217]

C. United States Government Programs

In the US, a number of programs exist which are in place for the express purpose of aiding the commercialisation of research. These programs include the Small Business Innovation Research - SBIR[218], the Small Business Technology Transfer - STTR[219], and the Small Business Investment Company (SBIC) program.[220]

SBIR is a highly competitive award system which provides qualified small business concerns with opportunities to propose innovative ideas that meet the specific research and development needs of the Federal Government. Depending upon the program phase, the grants can range between $100,000 and $750,000. [221]

STTR is a very similar program that awards a specific percentage of Federal research and development funding for award to small businesses in partnership with non-profit research institutions to move ideas from the laboratory to the marketplace, to foster high-tech economic development, and to address the technological needs of the Federal Government. Exactly how much money is distributed is difficult to determine but the California technology community once again had a very strong showing, receiving more SBIR awards (6,756) from 2000 to 2005 than any other state.[222]

The SBIC supplements the flow of private equity capital and long term loan funds which are administered by the Investment Division, U.S. Small Business Administration (SBA). In 2005, its financings benefited over 2200 companies to the tune of $2.9 billion. Almost $1 billion went to companies less than two years old. The program is a tremendous success and has provided some 64% of all seed financing dollars. [223] [224]

Compared to high-performing jurisdictions like the US, we do not provide adequate funding to get ideas out of the lab. Funding at this stage is critical to bridge the gap between the idea and the prototype or proof of concept, which will then engage an angel or other seed investor. If we want to be truly efficient in our research investment we need to get more ideas off the lab bench.

5.1.3 ANGEL INVESTMENT

Angel investment begins to become prominent once a company transitions from a pre-seed stage to a start up stage. This means it has progressed from having an idea to embarking on an actual operation and often has a working prototype or one in development. This is when the angels begin to gain enough confidence to invest in the company.

The key difference between an angel investor and a venture capitalist is that they are using their own money. This is what leads to the more hands on approach to mentoring a new entrepreneur that angel investors are known for. One of the challenges to studying the impact of Angel investment on an economy is the lack of good data. What studies have been done are all prefaced with a note that relatively little is known about angel finance in any jurisdiction. However, these studies also all seem to support what the PTC heard through its consultation process. Angel investors who bring their expertise and experience along with their money are critical to a developing company.

Those who have studied angel networks in Canada have found that they are very informally structured. This not only makes it difficult to quantify data but it also makes it difficult to link potential investors with businesses. In spite of that it is estimated that angel investors are currently investing over $3 billion in Canadian small business each year. This is much greater than the value of venture capital invested in Canada each year which is estimated at under $1.8 billion.[225]

According to a key study commissioned by Leading Edge BC, 60% to 80% of early stage, arm's length equity financing in BC is provided by angels.[226] For 2003 and the first eleven months of 2004, the amount of angel investment captured by BCSC filings was approximately $107.6 million. As the study assumes that about 30% of angel investment is captured in BCSC filings, the estimated total is nearer $355 million. The study concluded that angel investment is much more important - perhaps twice as important - as formal venture capital for early stage venture finance.[227] These conclusions are supported by a different study which determined that in 2003, the VC community funded fewer than 10 companies, while angel investors funded an estimated 40 registered companies through BC's ECP's Eligible Business Corporation (EBC) program alone, and likely many more. [228] [229]

The strength of the angel investment in British Columbia is comparable to that of the US. In 2005 angels invested about 23.1 billion in the US.[230] This represented about 49,500 deals, mostly at the early stage.[231] This is only slightly more than the $22 billion invested by formal venture capital, usually at later stages. As noted earlier, angels in BC are proportionally more important. Possible reasons for this could be the BC angel tax credit, which California, for example, does not have, and the lack of latter stage capital which is much stronger in the United States.

Angels in the United States are also becoming quite organized. There are a number of angel organisations in the Silicon Valley that work together to assess and fund opportunities. They are also co-investing with venture capitalists and other angel investment groups. In 2006 the three most active angel investor organisations in the Silicon Valley / Bay Area were the Keiretsu Forum Silicon Valley, the Band of Angels, and the Angel's Forum. They invested US$51.23 million, US$8 million and US$5.5 million respectively. This totals approximately US$65 million for 62 deals. These three organisations have invested a total of about US$280 million in the area since they were established.[232]

US agencies are also starting to recognise the importance of angel investors. The National Science Foundation (NSF) is one of the eleven federal agencies who are eligible to participate in the SBIR program. It has begun a unique initiative where companies that receive Phase I and II awards can apply for up to $50,000 or $500,000 respectively in additional matching grant funds for any angel or venture capital that the company is able to raise. The match is typically about fifty cents to the dollar. The company can use the NSF matching funds only for research; there are no conditions on how they spend the third party funds as long it is related to the Phase I and II grants.[233]

Although angel investment represents a fairly high proportion of our early to mid stage investment when compared with the US this is more a function of the weaker VC market than of a greater strength in angel investment. What is clear however is that across the US angel investment is strong and growing as government agencies work to encourage it.

5.2 Venture Capital

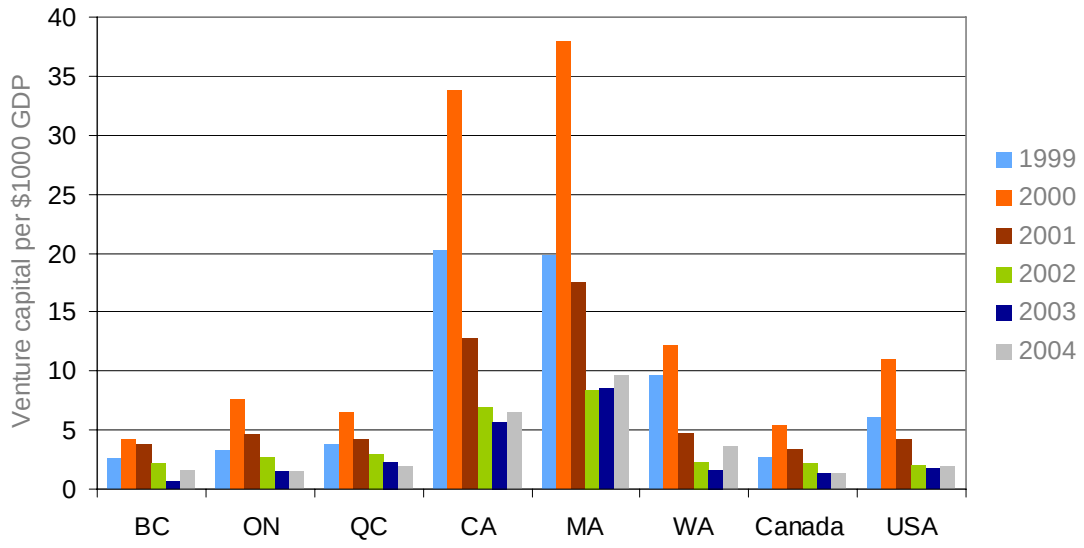
Venture capital (VC) plays a role in the mid and late stages of a company's funding cycle in BC and a limited role in the early stages. Some of the data indicates that VC in BC performs acceptably. When compared with truly strong tech economies like California or Massachusetts, however, or even with some other Canadian jurisdictions, it lags behind.

A study of VC by Industry Canada[234] has determined that VC activity in BC has increased since the lows of 2003. In the first three quarters of 2006, investments in B.C. totalled nearly $260 million, more than the total investments for all of 2005. Despite these signs of healthy activity, there are some reports of difficulties in securing VC funding in B.C., particularly for new and early-stage firms. In its 2006 Advocacy initiatives, the B.C. Technology Industry Association[235] points out that the lack of

available VC funding and the shortages of investment opportunities in B.C. are hindering the growth of B.C. businesses.

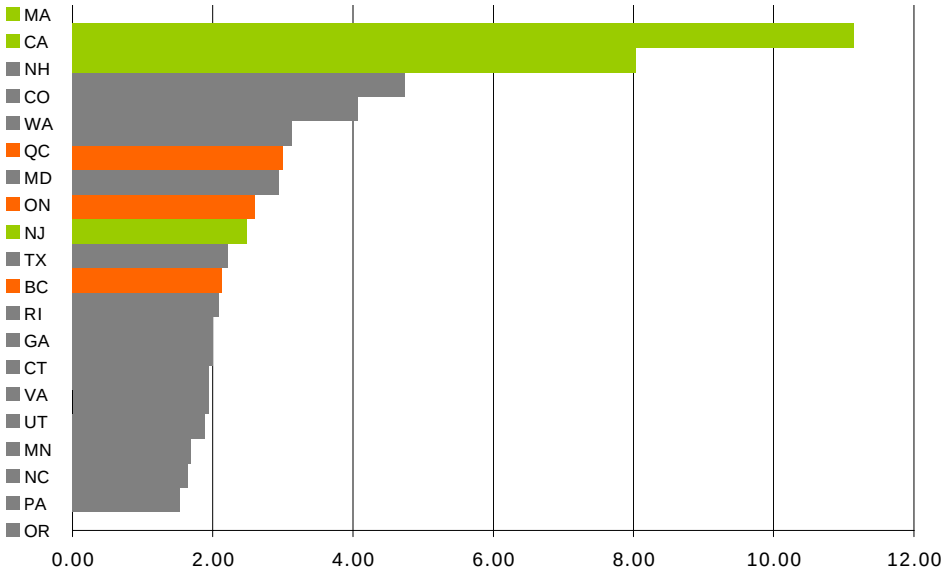
This concern is born out by comparing VC activity in BC with other jurisdictions. VC investment in British Columbia, measured per thousand GDP, demonstrates how it could be stronger. Although we rank in 11th place among the top 20 North American VC investment jurisdictions, this is still behind Quebec and Ontario. BC also trails the US average and is well behind California, Washington and Massachusetts. [236]

Figure 28. Venture capital investment rate 1999-2004 in selected jurisdictions



Source: Brander, J. et al. (2005), "The Equity Capital Program in British Columbia", commissioned by Leading Edge BC. p.18

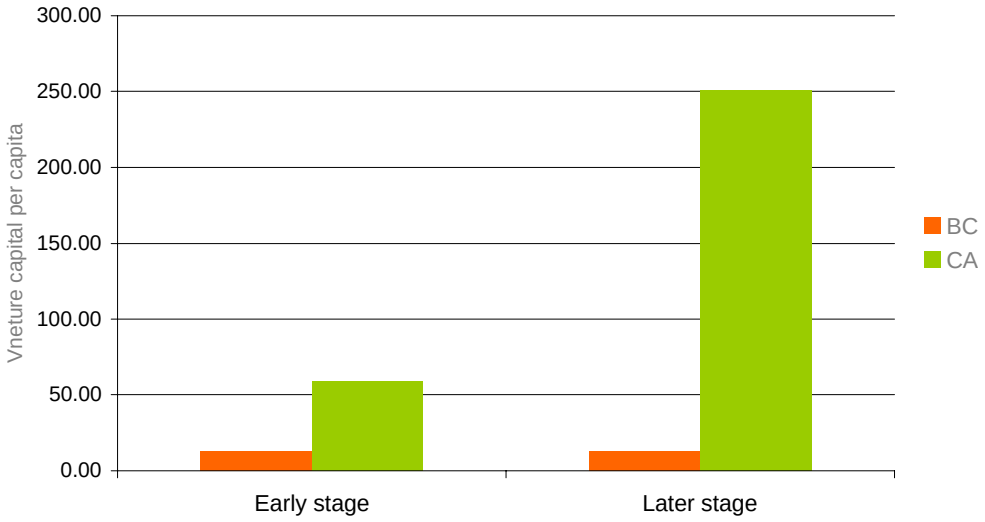
Figure 29. Top 20 North American VC investment jurisdictions, 4 year average (2001-2004) venture capital per $1,000 GDP



Source: Brander, J. et al. (2005), "The Equity Capital Program in British Columbia", commissioned by Leading Edge BC. p.23

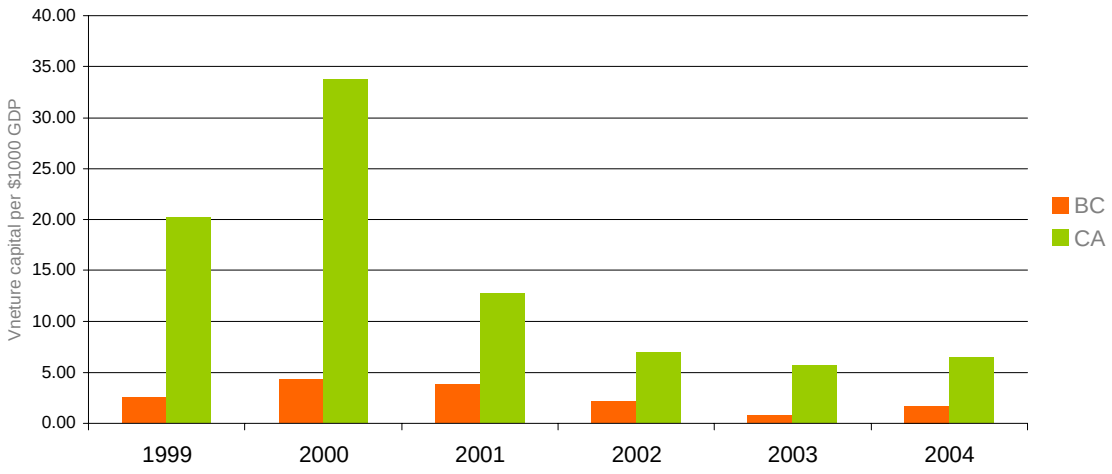
California and Massachusetts are well developed jurisdictions for venture capital where market imperfections are at a minimum. Accordingly, the values for these regions are probably close to the maximum level of venture capital penetration that can be achieved under the most favourable circumstances.[237] This comparison makes it clear that there is a vast gap in VC funding between BC and California. If BC is going to create more companies and become an important global centre for technology development, then the VC gap must be addressed.

Figure 30. Venture capital (all industries) per capita (2003)



Source: Ference Weicker & Company (2005), "Promoting research and innovation in British Columbia". Report Prepared for BC Ministry of Advanced Education, p. A-13-14.

Figure 30. Venture capital per $1,000 GDP in BC and CA (all stages) 1999-2004

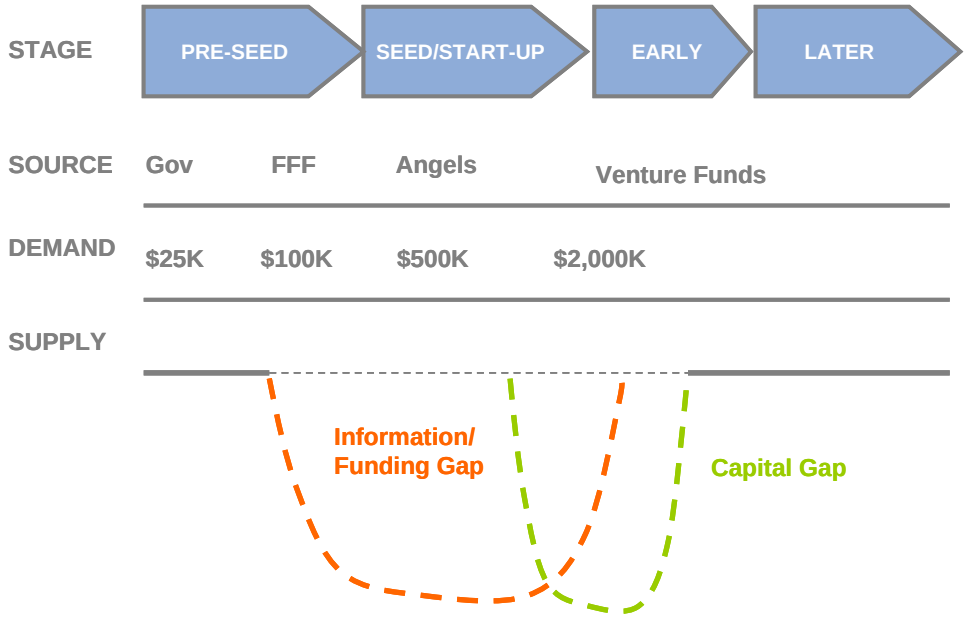


Source: Brander, J. et al. (2005), "The Equity Capital Program in British Columbia", commissioned by Leading Edge BC. p.18

5.3 Funding gaps

At a national level there are two funding gaps identified in the commercialisation of innovations.[238] These are presented in the Figure 32.

Figure 32. Funding gaps in a national level.



Source; NAO, Solving the Precommercialization Gap in Canada - Submitted to Industry Canada's Expert Panel on Commercialization, August 2005

The concern for financing was also raised in the survey done by Industry Canada among 1,500 individuals in universities, governments, private sector and in the Council's member Academies. Among 16 specific components of commercialisation of science and technology (S&T), respondents gave a relatively low rating to Canada's financial support infrastructure. Fewer than 30% of survey respondents cited venture capital providers as a strongly advantageous element of Canada's infrastructure. This was among the lowest ratings of any element in the entire survey. Respondents in BC gave the worst ranking to all the financing related components (the last four rows in the Table 9). [239] [240]

Table 9. Support for commercialisation / translation of S&T.

Infrastructure	Total	Univ	Bus	Gov	BC	AB	ON	QC
IRAP	76	71	82	82	80	84	76	66
SR&ED	73	66	84	78	74	72	74	78
NCE	73	73	69	79	76	71	75	72
Genome Canada	68	65	65	74	75	67	66	71
Fed supp for tech bus	56	48	64	59	61	52	52	61
Prov supp for tech bus	51	48	57	52	48	48	51	60
Univ tech transfer	48	51	46	45	61	46	46	50
IDRC	48	47	42	46	48	36	52	46
SDTC	47	46	47	45	44	46	46	56
Prov Resh. Councils	47	49	48	44	40	50	42	65
Export Dev Corp	39	31	48	43	38	40	38	43
S&T counselors	39	28	46	45	44	39	35	41
Bus Dev Bank	31	26	36	35	22	30	27	43
Venture Capital	29	26	30	28	22	33	28	31
Cdn Commercial Corp	25	18	33	27	17	27	26	32
Commercial banks	16	14	16	16	10	11	15	18

Source: Industry Canada for Government of Canada (2006), "The State of Science & Technology in Canada", p.18.

5.4 Recommendations

5.4.1 BARRIER TO LARGE SCALE FOREIGN INVESTORS

In its 8th report, the PTC highlighted the lack of recognition of Limited Liability Corporation (LLC) under the Canada/US Income Tax Convention (the "treaty"). This is still a significant barrier to investments from the US and the importance of the issue cannot be overstated. This is particularly important for funding in the development of Life Sciences. The amount of money required to bring a new molecule to market is astronomical, often $500 million to $1 billion. The VC community in BC ($247 million in 2004) is not large enough for projects of this scope so the funds must come from foreign capital pools.

In the United States, most pension and institutional funds pool their capital into a single fund under an LLC that is registered as a tax exempt entity under the US tax law. As a flow-through vehicle, an LLC is not required to file a tax return, and incomes of the LLC are taxed in the hands of its shareholders. The Canada Customs and Revenue Agency, however, has taken a position that LLCs are not recognised under the treaty and are therefore subject to Canadian income tax. A tax return may be required even if there is no tax payable. This rule becomes a "deal breaker" for most LLCs, since a majority of their corporate articles prohibit them from investing in funds if tax returns are to be filed. [241]

A way around this barrier is for LLCs to invest through an offshore holding company, but this process is complex and costly. Considering the significant size of US pension funds and their investment in venture capital, the impact of this red tape on high-tech firms is significant. Worse still, because that investment is unavailable here in Canada, many Canadian companies are forced to move south of the border in order to receive financing from US institutions. [242]

In the Canadian federal budget of 2007, the federal government announced that they were going to address this issue. It stated:

> "Representatives of Canada and the United States have agreed in principle to update our tax treaty. The revised treaty will create a more competitive lending market in Canada and lower barriers to the flow of capital between our countries. This will include a complete exemption from withholding tax in respect of cross-border interest payments between the two countries as well as the extension of treaty benefits to limited liability companies commonly used by U.S. venture capital firms. When the revised treaty comes into force, the

> Government also proposes eliminating Canadian withholding tax on interest paid to all arm's-length non-residents, further expanding funding opportunities for investment." [243]

This has yet to come to fruition, however, and the PTC believes the provincial government should continue to aggressively pursue this issue. It remains as the most serious equity financing issue facing BC companies today.

10.47: That BCIC lead innovation associations in the other key provinces to press for implementation of the changes to the tax treaty.

5.4.2 PROOF-OF-CONCEPT FUNDING

Lack of funding in the commercialisation cycle is particularly significant at the pre-seed stage. During this stage, when the entrepreneurs are still trying to build confidence in their concept or idea, they need funding to develop prototypes and proofs of concept. Because of the funding gap at this level, there are currently more ideas in our research labs that can be commercialised, than there is money to develop them. Providing more funding at this stage will build a bigger pipeline of promising technology companies.

In comparison with the United States, the key reason for the funding gap at this stage is the lack of government funding following the primary research stage. The formal Venture Capital Community does not tend to participate at this stage. Angels will occasionally get involved, but would prefer to see a working prototype or proof of concept. This is why there is such a heavy reliance on Friends, Founders and Family.

The PTC believes there is a role for government to play. An initial pool of capital could be created with $10 million from the Discovery Foundation with matching funds from government. Additional matching funds would be provided by a partner and the fund would be tailored to that partner's needs. Universities, for example, may want to develop funds specific to their university. They could raise capital from their endowments or their alumni and partners. All applications for funding would then be reviewed by an independent group of industry advisors and funds would be awarded in amounts of $50,000 to $250,000. The money would be converted to equity in the case of successful ventures, and returned to the investment fund.

10.48: That government work with the Discovery Foundation to form a set of proof-of-concept funds with a few select partners.

5.4.3 ENCOURAGING ANGEL INVESTMENT IN BC

Angel investors are prepared to step in sooner than formal Venture Capital to provide early stage funding and advice that can be invaluable to a new company. This is crucial because it allows more companies to become stable enough to attract venture capital. Other jurisdictions realise this and are taking steps to encourage greater angel investment. The new National Science Foundation program under the US SBIR is just one example.

In BC, with its smaller and less adventurous VC community, angels are arguably even more important.

The Equity Capital Program has played a strong role in encouraging more angel investment in BC. Currently the program reaches its limits fairly early in the year, indicating there is extra demand. These limits should be increased.

10.49: That the provincial government raise the annual investment cap and double the size of the Equity Capital Program to provide the opportunity for more angels to get involved with more money.

6 BC Innovation Council (BCIC)

This report envisions an expanded role for the BC Innovation Council. It is important to note that Greg Kerfoot, the Chair of the PTC's Innovation and Commercialisation Task Force which compiled this report, is also a member of the Board of BCIC. To acknowledge the twin responsibilities and ensure the recommendations are considered in their proper context, the PTC has created this separate section on BCIC.

6.1 Introduction

Throughout this report, the PTC makes repeated references to the BC Innovation Council (BCIC), which is a Crown Agency of the Province of British Columbia, with a mission to create the conditions for top-tier innovation and commercialisation within the province in partnership with government, industry and academia. Its stated strategy is to build on BC's established strengths and recognised abilities.[244]

Since it was formed, by combining the Advanced Systems Institute with the BC Science Council , it has taken time to begin fulfilling the mandate and realising its full potential. The Premier's Technology Council believes that under its newly appointed CEO and new Board, BCIC can be a powerful force for advancing innovation and commercialisation in BC. In particular, the PTC recognises some specific issues that BCIC is best suited to address. These are:

- the need for a facilitator to the technology industry;
- the need for new training and academic programs; and
- the need for entrepreneurial advice and training.

The Ministry of Advanced Education recently commissioned a study of commercialisation in BC by Global Connect. Global Connect identified BCIC as critical, stating, "BCIC would act as an honest, neutral broker to facilitate the active engagement of entrepreneurs, researchers, technology companies, capital providers, service providers, and government agencies to build a community that assists in the mobilisation of knowledge and the formation and growth of technology-based business opportunities throughout the province."[245] In other words, Global Connect also believes BCIC is the independent agency best suited to identify gaps, provide programming where necessary, and facilitate collaboration amongst all members of the technology community.

6.2 Challenges BCIC could help to address

6.2.1 TALENT GAP AND TALENT DEVELOPMENT

The PTC consultations indicated that there was a need for training programs in a number of fairly specific areas, namely technology sales and product management, world class recruiting, virtual company management, and multidisciplinary programs.

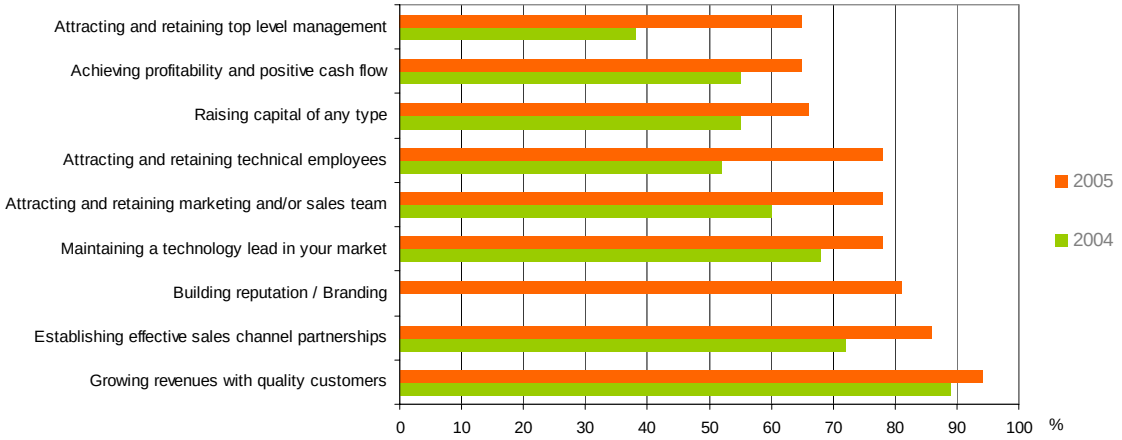
Some of the gaps identified, technology sales and product management in particular, stem in part from lack of head offices in BC. Large companies on the leading edge in their respective industries contribute significant resources to train their talent pool. General Electric, for example, is known as a producer of top talent. Goldman Sachs set up a Goldman Sachs University to develop internal talent and encourage its senior partners to put in more effort.[246] McKinsey created a People Committee and boosted its training budget to $100 million.[247] The talent these companies build is also a significant source for new companies. Sun Microsystems was built by the managers from Hewlett Packard. Without this kind of large corporation, there is a void and BCIC is the organisation best suited to identify these gaps and determine how to fill them.

A. Tech sales

As the PTC identified in its 8th report, one of the challenges technology companies face as they try to commercialise their product is the insufficient pool of marketing and sales talent, especially at a senior level. Most companies do not have formalised product management until they are relatively large and successful. Many companies also struggle through multiple VPs of sales and multiple sales models, before finally developing a winning sales strategy. Often these two problems, or even one in isolation, can be fatal for an early stage technology firm.[248]

More marketing and sales courses need to be offered, not just within academia, but also within industry. Business programs should refocus their marketing curriculum towards marketing practices used in the technology sector and SMEs.

Figure 33. Most challenging issues over the next 2 years – Emerging companies



Source: PricewaterhouseCoopers, "Connecting Vision to Reality 2006. Report on Emerging Canadian Software Companies: The CEO Perspective", p. 79.

Figure 34. Most Challenging Issues over the Next 2 Years – Large Companies

Source: PricewaterhouseCoopers, "Connecting Vision to Reality 2006. Report on Emerging Canadian Software Companies: The CEO Perspective", p. 81.

B. Tech product management

Another challenging area previously identified by the PTC is product management, often overlooked by technology companies until it is too late. New technology companies regularly make it through multiple rounds of funding without ever undertaking a real product management exercise. [249] The net result is a product that does not interest the consumer.

There is a deficiency of product management courses in academia. Adding such courses to both business and engineering curricula is critical to improving commercialisation. Industry needs access to short courses in product management. The Product Development and Management Association's (PDMA) short programs, or something similar, could be brought to BC. BCIC and local colleges should work with the PDMA to develop programs suitable for BC.

Quick facts - Product Development and Management Association (PDMA)

The Product Development and Management Association (PDMA) is a global advocate for product development and management professionals. Its mission is to improve the effectiveness of individuals and organisations in product development and management. It provides resources and opportunities for professional development, information, networking, collaboration and promotion of new product development and management.

PDMA provides a Body of Knowledge in the area of product development and management. The purpose is to organise, distil and provide access to the evolving core knowledge needed and used by product development and management professionals and organisations. It includes generally accepted definitions and summaries of important concepts, tools, methodologies and processes. It gives reference information around key topic areas and linkages to the latest writings and presentations on the topic of new product development.

PDMA members are from a variety of disciplines (practitioners, service providers, academics and students) and industries. It currently has over 3,500 members. It also provides New Product Development Professional (NPDP) Certification.
www.pdma.org/about/

C. World class recruiting

People are critical in the knowledge economy. As the struggle to attract Highly Qualified Personnel worsens in the face of increasing global competition, BC needs to compete with other jurisdictions. In the talent section, we laid out a number of things that government can do, but the corporate community also has a critical role to play. It needs to practice better recruitment practices in order to compete for staff. The roundtables indicated a strong need to create an understanding of and develop the skills associated with world class recruiting practices in the private sector. This is a role BCIC can play.

D. Virtual company management - particularly important outside 'Vancouver'

Many regions of BC have small but successful technology companies, but their success is limited by their inability to attract talent to a smaller community. The creation of a 'virtual company' would allow the regionally-based small entrepreneur to access the appropriate skilled people. A virtual company, using computer and telecommunications technologies, would be able to extend its capabilities by working routinely with employees or contractors located throughout the country or the world. Using e-mail, faxes, instant messaging, data and videoconferencing, it implies a high degree of telecommuting as well as using remote facilities. [250]

The skills and practices needed to build a company in this fashion are different from those needed to build a company in which all the participants are proximate. BCIC needs to help identify these skills and develop the training required.

E. Multidisciplinary business, engineering and science programs

Integration of business education in the science and engineering curriculum at undergraduate, graduate and postgraduate levels would ensure that those who develop the technology have a better of understanding of the rigours of launching a commercial product. Business courses could be added to the programs, internships placed in businesses, or combined PhD and MBA programs created. On the industry side, developing the marketing and business skills of a company's employees would improve the communication in the product development process and enhance business plan development for new products.

F. Joint graduate programs

In order to generate new and more marketable ideas, there needs to be more cross collaboration among academic disciplines. This would not only generate innovative ideas but would increase the number of HQP and provide them with a broader knowledge base. In particular universities could offer joint graduate programs in science and engineering. Programs could be created among universities both locally and globally to capture complementary expertise through collaboration. Examples of these kinds of programs are UBC's and SFU's Bioinformatics training program, and the UBC/UNBC Environmental Engineering Program.

Quick facts – Joint program in Environmental Engineering UBC&UNBC

The four and a half-year BASc degree program is offered by UNBC in Environmental Science and UBC in Engineering.

In the first two years at UNBC the programs offers foundation in mathematics, biology, chemistry, and environmental science. In the third and fourth years at UBC the curriculum includes engineering fundamentals, analysis and design, primarily through courses in Civil Engineering and Chemical and Biological Engineering. Final term at UNBC focuses on practical environmental engineering design problems.

In the program, students will learn:

- Fundamental science underlying engineering and the environment;
- Function, process and interactions of the major environmental systems: air, land, water, and living;
- Fundamental concepts of heat, mass transport, fluid dynamics and process of water and dispersion of pollutants in surface water and groundwater;
- Industrial pollution prevention/control;
- Design of waste water and air pollution control technologies;
- Common industrial process design;
- Hands-on training in wastewater analysis and treatment; and
- Geo-environmental and mining environmental engineering.

Program requirements are:

- UNBC degree requirements: 85 credit hours;
- UNBC elective credits: 6 credit hours;
- UBC degree requirements: 59 credit hours;
- UBC technical elective credits: 9 credit hours;
- UBC design elective credits: 3 credit hours; and
- Total credits for degree: 162 credit hours

www.enve.ubc.ca/about%20the%20program/about%20program.html

6.2.2 ENTREPRENEURIAL ADVICE AND MENTORING

Another critical role for BCIC is to encourage and develop advice and mentoring programs. Mentoring is critical. PricewaterhouseCoopers' survey of 140 emerging companies and the 12 largest software companies in Canada shows that approximately 70% of the founders are still the CEOs of their emerging companies.[251] The majority of emerging companies have revenues between $1 and 10 million with an average employee pool of 44 people.[252] These CEOs develop professionally through coaching from their peers, investors and board members, followed by reading publications and periodicals.[253] Less than 20% of emerging CEOs are looking to their C-suite to assist them in building the skills they need to be effective.[254]

One successful CEO level mentoring program is ACETECH[255] which has hundreds of members and has been running for 15 years. It provides an integrated learning and relationship-building environment to enable CEOs to develop personally and professionally by learning from their peers and experienced mentors. It connects CEOs in technology fields through Annual Symposia, CEO Roundtables, Growth Strategy Program, and CEO Speaker Series.

Another successful mentoring program in BC is MentorLinx,[256] a program set up to mentor regionally-based companies. Generally, these CEOs (mentees) have already utilised the resources available to them in the region and now require expertise and wisdom not locally available. Their companies have been in operation for a period of time, are at revenue or near revenue stage, and have a "growth orientation." They want additional insight to help them achieve that growth. Mentors are volunteers from all parts of the province, with wisdom and business experience they are willing to share. They have hands-on CEO level experience, usually in technology companies, and at least two to three years' more experience than the mentees.[257] The pilot of MentorLinx has been successful enough to permit expansion.

To encourage the development of local HQP, the amount, extent and reach of mentoring should be increased. Mentoring opportunities should be improved at different levels in the organisation, not only the CEO level. Moreover, mentoring across company borders and industries could be improved. The expertise of ex-CEOs could be used in mentoring SMEs throughout the province.

The Global Connect report clearly indicates that there is more to do here though. The report specifically recommends two other pilot programs for BCIC: [258]

- Meet the Researcher / Meet the Entrepreneur event series: These hour and a half-long events, conceptually similar to the IdeaLinx programs offered by the regional science and technology councils, allow researchers and entrepreneurs to present their current research efforts or general business concepts to a small audience of interested community members (10 to 30 individuals).

- Financial Forum and Springboard-type screening programs - These programs provide an opportunity for entrepreneurs to pitch their companies in front of an audience of other entrepreneurs, investors, researchers, and service providers. Financial Forum events are similar to the presentations made by companies at the various BC angel network meetings, but presented to a larger, more public audience.

6.3 Recommendations

6.3.1 IMPROVE RESEARCH EFFICIENCY

Within the Research section of this report, the PTC identified the need to commercialise research more efficiently. We believe BCIC's role should be twofold: it can facilitate the UILO review as recommended in the research section of this paper; and it can also implement the province wide Entrepreneur-in-Residence Program.

10.50: That BCIC facilitate the UILO review.

BCIC is well connected to industry and has extensive access within the university structure. This gives BCIC the tools to attract the most effective people to participate in an Entrepreneur-in-Residence (EIR) program. They would have access to many ideas and would have the resources to help make these ideas commercially viable.

10.51: That BCIC implement a province-wide Entrepreneur-in-Residence program.

Global Connect recommends Financial Forum and Springboard-type screening programs. One model the PTC would like to recommend is a 'virtual board' to act in a mentoring capacity. BCIC could compile a group of industry luminaries who would act as a virtual board for developing companies. Companies from throughout the province would submit their company and business plan for virtual board review. This would help fill both the VC gap and the mentoring gap.

10.52: That BCIC develop a virtual board to support and advise start-up companies in BC.

6.3.2 FACILITATE TALENT DEVELOPMENT

One of the key sources of talent already identified by the PTC in this report is expatriate Canadians. BCIC, with its industry, government and academic connections, can play a key role in tracking and cultivating talent. It can provide ex-pats with contacts in the community and keep them abreast of the best opportunities. BCIC and the proposed new Ministry could partner on this initiative.

10.53: That BCIC partner with the proposed new Ministry to develop a repatriation program.

The PTC has identified a number of key areas where specific training programs are needed. BCIC can either assist in the development of these programs or play an active role in their delivery.

10.54: That BCIC encourage development of technology sales and product management training programs in universities.

10.55: That BCIC encourage development of multidisciplinary programs in universities.

10.56: That BCIC help develop and deliver training programs in world class recruiting and virtual company management.

10.57: That BCIC assist in the expansion of existing mentor programs and in the development and delivery of further mentoring programs.

7 Conclusion

The PTC has determined that British Columbia has a strong, but relatively immature technology sector. Given the relatively small research investment, the province has created many companies and a number of marketable ideas. The PTC also found, however, that BC does not produce many large companies, and that given the right conditions, it has tremendous potential for future growth. The technology sector is optimistic, but if it is to become a true global force and a driver of a knowledge economy, then it will need more investment, more people, and a larger pool of capital.

Smart and focused investment needs to be made in the area of research, both private and public, and needs to be dedicated to strategic areas according to a specific plan, with closer ties to industry to facilitate the commercialisation of this research.

We also need more talented people. The government of BC has recognised this and is working to address the issue. To compete globally for talent, we need to build a plan that not only markets our existing advantages but also creates some specific benefits that government, and the companies that locate here, can use as tools to recruit actively and aggressively.

Finally, if our companies are to get more ideas to market, then we need to address some specific funding gaps. In particular, researchers and entrepreneurs need pre-seed capital to transfer more ideas from the lab bench into the proof-of-concept stage. The sectors that require large, long-term investment beyond the capacity of our local venture capital community need unfettered access to foreign capital.

8 Commercialisation project background

A jurisdiction's capabilities in innovation and commercialisation are fundamental to maintaining its competitiveness and standard of living. Highly innovative jurisdictions produce better quality goods and services, and create higher income jobs. The whole economy, including traditional resource-based industry, needs innovation and commercialisation to stay competitive in the marketplace.[259]

According to World Economic Forum's Global Competitiveness Report 2006-2007, Canada belongs to the group of 31 innovation-driven economies. For countries in this economic category to remain competitive they must do more than just increase productivity through incremental improvements and adoption of existing technologies. Instead, they must design and develop cutting-edge processes, products and services. This requires an environment supported by both public and private sectors that is favourable to innovation and commercialisation. Two key measures for this group of countries are business sophistication and innovation. Canada ranked 18th after countries such as Germany, Japan, Switzerland, Austria, Sweden and USA in business sophistication and 13th in innovation. In 2005, Canada's overall competitive position in the world dropped to 16th from the 13th place. [260]

Due to increased competition based on innovation, jurisdictions around the world are looking to improve their innovation/commercialisation processes. PTC uses the widest possible context to define innovation/commercialisation. It covers the overall framework of technology development, transfer and adoption. The process is presented in the Figure 35.[261]

Figure 35. Innovation/commercialisation process.

Source: Sustainable Development Technology Canada, www.sdtc.ca/en/about/innovation_chain.htm

Project Overview

PTC's Innovation and Commercialisation project

PTC's Commercialisation Task Force chaired by Greg Kerfoot is researching ways to improve innovation and commercialisation in BC. It initiated its evaluation processes evaluation in spring 2005 through a series of 45 consultative interviews with local stakeholders involved in different phases of the innovation process. Stakeholders included private sector, academia, UILOs, government, and the financial community. These interviews identified issues that inhibit the growth of innovation or hinder effective commercialisation processes in BC. Results from the consultations were used to define discussion topics for the commercialisation roundtables.

The roundtables were arranged in the fall 2006 to discuss solutions for the following key issues:

1. Attracting senior management executives;
2. Enhancing sales and product management capabilities;
3. Expanding the number of highly qualified personnel (HQP);
4. Strengthening linkages between academia and industry;
5. Strengthening science and technology governance; and
6. Improving the availability of early and later stage funding.

Each of the roundtables had 60-80 participants and provided a forum for senior stakeholders in the province to discuss possible solutions and recommendations for the provincial government. The potential solutions were then further researched and refined by the task force.

Appendix A. List of Roundtable Participants and Consultations

Greg Aasen, Chief Strategy Officer
PMC-Sierra

Lori Ackerman, Executive Director
Sci-Tech North

Diane Akelaitis, Partner
PricewaterhouseCoopers

Scott Anderson, Client Executive
Microsoft Canada Co.

Don Avison, President
The University Presidents' Council of BC

Max Blouw, Vice President Research
UNBC

Jeremy Boyd, Senior Manager
BC Ministry of Economic Development

Jim Brookes, COO
MITACS

Lynda Brown, President
New Media BC

Dennis Bruchet, Manager
Western Economic Diversification Canada

Jim Charlton, Senior Vice President
Growthworks Capital Ltd.

Bruce Clayman, President & CEO
Great Northern Way Campus

Colleen Collins-Dodd, Program Chair
SFU Business

Greg Conner, VP Human Resources
EDS Advanced Solutions

Rob Cruickshank, President
BCTIA

Dan Cvitanovich, Board Chair
Mid-Island Science, Technology & Innovation Council

Bruce Deacon, Manager
Ministry of Advanced Education

Rolf Dekleer, VP Investments
Growthworks Capital Corp.

David Dolphin, CEO
BC Innovation Council

Bruce Drake, Executive Director
Industry Canada

Karimah Es Sabar, Executive Director
BC Biotech

Tim Ewanchuk, Senior Policy Analyst
Ministry of Advanced Education

Kevin Falk, CTO and COO
Vivonet

Philippe Favreau, General Manager
KODAK

Participants and Consultations

Don Ference, President
Ference Weicker & Company

Mark Grambart, CEO
Contech Electronics

Steve Grundy, Acting Vice President
Royal Roads University

Dan Gunn, Executive Director
Vancouver Island Advanced Technology Centre

Arvind Gupta, Scientific Director
MITACS

David Hall, CCO
Angiotech Pharmaceuticals

Susan Harmer, Sr. Director
Business Objects

Soren Harbel, VP Innovation Development
BCIC

Peter Haubrich, Executive Director
Okanagan Research & Innovation Centre

Kathryn Hayashi, CFO
Centre for Drug Research and Development

Michael R Hayden, Director
Centre for Molecular Medicine and Therapeutics

Colin Heartwell, Director
Canadian Manufacturers and Exporters

John Hepburn, Vice President Research
UBC

Brent Holliday, Partner
Greenstone Venture Partners

Greg Horowitt, Director
Global Connect

Dawn House, PhD Candidate
UBC

Lauren Hunter, Vice President
UBC Graduate Student Society

Christine Slanz Ignas, Executive Director
Northwest Science and Innovation Society

Sandy Innes, Vice President
TELUS

Brenda Irwin, Director
Business Development Bank

Evaleen Jaager Roy, VP
Electronic Arts Inc

Marlene Jan, Principal
Think Relocation Consulting

Barry Jinks, President & CEO
Colligo Networks, Inc.

Victor Jones, President
Cast Ventures Corporation

Kerry Jothen, CEO
Human Capital Strategies

Richard Juren, Director of Engineering
MacDonald, Dettwiler and Associates Ltd.

Richard Keeler, Associate Vice President
Research
University of Victoria

Tony Knowles, President & CEO
BCIT

Chris Laird, Vice President
Ventures West Management Inc.

Meika Lalonde, Corporate Counsel
Business Objects

Patrick Lauzon, Manager
Merck Frosst Canada Ltd.

Ann Levi-Lloyd, President & CEO
JALANN Enterprises Inc.

Participants and Consultations

Julia Levy, Executive Chairman
QLT Inc.

Angus Livingstone, Managing Director
UBC UILO

John Lorenz, Manager
Industry Canada

Marco Marra, Director
BC Cancer Agency

Colin Macrae, Director
Electronic Arts Inc

Charles Mah, Director
Business Objects

John McEwen, Co-CEO
Discovery Capital

Christopher M. McHardy, Associate
McCarthy Tétrault

David McIntyre, VP
Ventures West Management Inc.

Stuart McLaughlin, President
Grouse Mountain Resorts

Bill McQuarrie, Executive Director
Interior Science Innovation Council

Ian Mellor, Director
Ministry of Economic Development

Bert Miles, Chair
Investment Agriculture Foundation of BC

Michael Miller, Dean of Engineering
University of Victoria

Benton Mischuk, Manager
Ministry of Economic Development

Sean Mullins
Electronic Arts Inc.

Reg Nordman, Managing Partner
Rocket Builders

Lorene A. Novakowski, Partner
Fasken Martineau

Amy Ogawa, Manager
Pfizer Canada Inc.

Pekka Parnanen, Director
FinNode

Patrick Payne, Director
Wireless Industry Partnership

Charles Perrin, Special Advisor
Service Canada

Earl G. Phillips, Partner
McCarthy Tétrault

Mario Pinto, Vice President Research
SFU

S Poon, Program Manager
Ministry of Economic Development

Don Prior, Managing Partner
The Caldwell Partners International

Moura Quayle, Deputy Minister
Ministry of Advanced Education

Irfhan Rajani, President & CEO
Apparent Networks

Jim Reichert, Vice President
BCIT

Glenn Rousseau, Executive Director
BC BioProducts Association

Allison Rutherford, Executive Director
BCTIA

Christopher Ryan, Executive Director
National Research Council

Participants and Consultations

Kelvin Saldern, Executive Director
Kootenay Association for Science and Technology

Bruce Sampson, Vice President
BC Hydro

Bijan Sanii, President & CEO
Inetco

John Savage, President
Interior Science Innovation Council

Bruce Schmidt, Corporate Secretary
Genome BC

Glen Scobie, Manager
Ministry of Economic Development

Alan Shotter, Director
TRIUMF

Greg Smith, Director
Business Development Bank

Stephen Smith, Project Director
Flintbox

Ken Spencer, Co-founder and former CEO
Creo Products

Roy Spooner, Executive Director
Innovation Resource Centre

Paul Swinwood, President
Software Human Resource Council

Carolyn Tatton, Executive Director
Mid-Island Science, Technology & Innovation Council

Todd Tessier, Director
Ministry of Economic Development

John Thompson, Vice President
Teck Cominco Limited

Kirsten Tisdale, Senior Client Partner
Korn/Ferry International

Stephen Toope, President and Vice-Chancellor
UBC

Jean Trask, Associate Director
SFU UILO

Stuart Turnbull, Client Executive
TELUS

Shauna Turner, Director
BC Biotech

Serge Vanasse, Vice President
Modelsoft Consulting Corporation

Tim Walzak, President & CEO
UVic Innovation & Development Corporation

Matthew Watson, CEO
BCIC

Justin Webb, VP Olympic Services
Bell Canada

Lorne Whitehead, Provost and VP Academic
UBC

Alan Winter, President and CEO
Genome BC

Jenny Yang, Director
Business Development Bank

REFERENCES

[1] Goldcorp Inc. www.goldcorp.com/
[2] Goldcorp Inc. www.goldcorp.com/
[3] Gooderham, M. (April 24, 2007), "Golden challenge unearths new ideas". Globe and Mail,www.theglobeandmail.com/servlet/story/RTGAM.20070424.wgtrinnoprizeside24/BNStory/GlobeTQ/home
[4] Taylor, W. and Labarre, P. (2006), "Mavericks at Work: Why the Most Original Minds in Business Win", p.66-68.
[5] Netflix, www.netflix.com/MediaCenter?id=1015
[6] Hafner, K. (October 2, 2006), "And if You Liked the Movie, a Netflix Contest May Reward You Handsomely", The New York Times, www.nytimes.com/2006/10/02/technology/02netflix.html?ex=1188360000&en=9e1d871be35c6b46&ei=5070
[7] BuiltDirect.com, www.builddirect.com/
[8] BC STATS and Ministry of Economic Development (April 2007), "High Technology Sector, 2006 Edition", p. 2-5.
[9] BC STATS and Ministry of Economic Development (April 2007), "High Technology Sector, 2006 Edition", p. 35-36.
[10] OECD (2005), "Science, Technology and Industry Scoreboard 2005", www.oecd.org/dataoecd/59/52/35465901.pdf, p.8.
[11] Harchaoui, T. and Tarkhani, F. (2003),"Public infrastructure in Canada: Where do we stand?", Statistics Canada, p.308
[12] Financing Infrastructure in Developing Countries, Lessons from the Railway Age, B. Eichengree, The World Bank, 1994
[13] BC government Budget 2007. http://www.bcbudget.gov.bc.ca/
[14] Flickr, www.flickr.com/about/
[15] Schonfeld, E. (December 1, 2005), "The Flickrization of Yahoo!", CNNMoney.com
[16] Club Penguin, www.clubpenguin.com/company/about.html
[17] Stueck, W. (August 2007), "Club Penguin founders strike it rich, Disney pays Kelowna entrepreneurs $350-million for virtual penguin world", Globe and Mail, www.theglobeandmail.com/servlet/story/RTGAM.20070802.wpenguin02/BNStory/Technology/home
[18] Business Week (June 7, 2007), "Immigration: Google makes its case".
[19] Business Week (June 7, 2007), "Immigration: Google makes its case".
[20] Business Week (June 7, 2007), "Immigration: Google makes its case".
[21] Wikipedia, http://en.wikipedia.org/wiki/Linux
[22] Business Week (June 7, 2007), "Immigration: Google makes its case".
[23] Wikipedia, http://en.wikipedia.org/wiki/Sabeer_Bhatia
[24] Wadhwa, V. (August 31, 2007), "Who Needs the Ivies?", Business Week, www.businessweek.com/technology/content/aug2007/tc20070830_254262.htm?chan=search
[25] CBC News, (July 5, 2007), "Microsoft announces Vancouver development centre", www.cbc.ca/technology/story/2007/07/05/microsoft-vancouver.html
[26] OECD (2006), "OECD Science, Technology and Industry Outlook", p.7-8
[27] Economist Intelligence Unit (2007), "Innovation: Transforming the way business creates includes a global ranking of countries, White paper", sponsored by Cisco Systems, p.9
[28] Bureau of Economic Analysis BEA (Dec 2006), "BEA's 2006 Research and Development Satellite Account". p. 15.
[29] National Science Foundation. Table 14.
[30] National Science Foundation. Table 14.
[31] Eurostats and Statistics Canada
[32] BC Progress Board (2006), "Sixth Annual BC Progress Board Benchmarking Report". p.79-85
[33] BC Progress Board (2007), " Interim Benchmarking Report", p.18
[34] Statistics Canada
[35] OECD (2006), "OECD Science, Technology and Industry Outlook", p.5
[36] OECD (2006), "OECD Science, Technology and Industry Outlook", p.5

[37] BC Progress Board (2007), " Interim Benchmarking Report", p.18-19
[38] Statistics Canada. Table 358-0001.
[39] Bureau of Economic Analysis BEA (Dec 2006), "BEA's 2006 Research and Development Satellite Account". p. 15.
[40] BC Progress Board (2007), p.18
[41] Statistics Canada
[42] Statistics Canada
[43] National Science Foundation NSF 06-314
[44] Bank of Canada Exchange Rate Look-Up
[45] Ference Weicker & Company (2005), "Promoting research and innovation in British Columbia". Report Prepared for BC Ministry of Advanced Education, p.23.
[46] Ference Weicker & Company (2005), "Promoting research and innovation in British Columbia". Report Prepared for BC Ministry of Advanced Education, p.19-20..
[47] Ference Weicker & Company (2005), "Promoting research and innovation in British Columbia". Report Prepared for BC Ministry of Advanced Education, p.A-10.
[48] BC Ministry of Small Business and Revenue, (2007), "Bulletin CIT 007-SR", www.sbr.gov.bc.ca/itb/Bulletins/cit_007-sr.pdf
[49] PWC, "SR&ED Tax Clips: 2007 Provincial and territorial R&D tax credits", Accessed August 23, 2007, www.pwc.com/extweb/pwcpublications.nsf/docid/67140D8F4D56992B852572FF006916FC
[50] Economist Intelligence Unit (2007), "Innovation: Transforming the way business creates includes a global ranking of countries, White paper", sponsored by Cisco Systems, p. 10
[51] Economist Intelligence Unit (2007), "Innovation: Transforming the way business creates includes a global ranking of countries, White paper", sponsored by Cisco Systems, p. 28
[52] Economist Intelligence Unit (2007), "Innovation: Transforming the way business creates includes a global ranking of countries, White paper", sponsored by Cisco Systems, p. 12
[53] Government of Canada (2002), "Canada's Innovation Strategy" http://innovation.gc.ca/gol/innovation/site.nsf/en/in04113.html.
[54] Government of Canada (2007)," Mobilizing Science and Technology to Canada's Advantage", www.publications.gc.ca.
[55] Ministry of Advanced Education, "Campus 2020 final report", 2007. p. 81.
[56] Science and Technology Policy Council of Finland (2006), "Science, Technology and Innovation", www.minedu.fi/OPM/Tiede/tiede-_ja_teknologianeuvosto/julkaisut/?lang=en
[57] OECD, "National Science Systems", www.oecd.org/document/24/0,3343,en_2649_37417_34291480_1_1_1_37417,00.html
[58] ERAWATCH, Accessed August 7th, 2007, http://cordis.europa.eu/erawatch/index.cfm
[59] Ireland Ministry of Enterprise, Trade and Employment (2006), "Strategy for Science, Technology and Innovation, 2006-2013", p.13
[60] Ontario Ministry of Research and Innovation,"About us", www.mri.gov.on.ca/english/about/MRIStory.asp
[61] BC Progress Board, "Boosting incomes, confronting demographic change: BC's productivity imperative", April 10, 2006, p.17-18.
[62] Shanghai Jiao Tong University, "Academic Ranking of World Universities: Top 100" (2007), Accessed 08.08.2007, http://ed.sjtu.edu.cn/rank/2007/ARWU2007_Top100.htm.
[63] Newsweek, "The Complete List: The Top 100 Global Universities", Accessed 08.07.2007, www.msnbc.msn.com/id/14321230/site/newsweek.
[64] Ministry of Advanced Education, "Campus 2020 final report", 2007. p. 22.
[65] CAFA: Confederation of Alberta Faculty Associations, "Student:Faculty Ratios in Universities - a report card on university education in Alberta", 2001, www.ualberta.ca/~cafa/CAFARCratioU.pdf.
[66] AUCC, (2006) "Backgrounder: Why Higher Education and University Research Matter: Facts and Figures", www.aucc.ca/_pdf/english/reports/2006/facts_figures_02_23_e.pdf.
[67] Statistics Canada, "Education indicators 2005", http://dsp-psd.pwgsc.gc.ca/Collection/Statcan/81-582-X/81-582-XIE2006001.pdf.
[68] Peterson's, www.petersons.com, the page was last updated on August, 2007
[69] Harvard University, "Harvard University Fact Book 2007".

http://vpf-web.harvard.edu/budget/factbook/current_facts/2007OnlineFactbook.pdf
[70] Harvard School of Engineering and Applied Science, About Us, www.seas.harvard.edu/aboutus/today/index.html.
[71] Stanford University, "Stanford Facts 2007", www.stanford.edu/home/stanford/facts/index.html.
[72] AUCC (2000), "RESEARCH", March, Volume 4, No 1.
[73] AUCC, (2006), "Quick facts", www.aucc.ca/publications/auccpubs/research/trends/summary_e.html.
[74] AUCC, (2006), "Quick facts", www.aucc.ca/publications/auccpubs/research/trends/summary_e.html.
[75] AUCC (2000), "RESEARCH", March, Volume 4, No 1.
[76] The Universities Presidents' Council of British Columbia, "Facts & Figures", accessed September 4, 2007, www.tupc.bc.ca/facts_figures/
[77] Ministry of Advanced Education, "Campus 2020 final report", 2007. p. 78.
[78] The Laurier institution, "Renewal and Retention: Attracting and Keeping Faculty and Senior Administrators at British Columbian Universities", June 2000.
[79] Leading Edge Endowment Fund, Accessed 08.09.2007, http://www.leefbc.ca/
[80] Leading Edge Endowment Fund, Accessed 08.09.2007, http://www.leefbc.ca/
[81] Leading Edge Endowment Fund, Accessed 08.09.2007, http://www.leefbc.ca/
[82] Finland Distinguished Professor Programme (FiDiPro), www.fidipro.fi/
[83] Finland Distinguished Professor Programme (FiDiPro), www.fidipro.fi/
[84] Science and Technology Council: http://www.minedu.fi/OPM/Tiede/tiede-_ja_teknologianeuvosto/julkaisut/?lang=en
[85] Ministry of Research and Innovation, www.mri.gov.on.ca/english/about/MRIStory.asp
[86] AUCC, (2006)" University Research Talent", Rev 10-2006, www.aucc.ca.
[87] The Conference Board of Canada, "Exploring Canada's Innovation Character – Benchmarking Against Global Best", Report June 2004, p.18-19.
[88] Statistics Canada, The National Center for Education Statistics (NCES), U.S. Department of Education.
[89] Government of Alberta, "2006 Budget, Post-Secondary system to grow by over 7000 spaces", www.advancededucation.gov.ab.ca/news/2006/March/nr-psgrowth.asp
[90] Government of Ontario, "News Release, McQuinty government expanding post-graduate education by 12,000 spaces", www.premier.gov.on.ca/news/Product.asp?ProductID=777
[91] Ministry of Advanced Education, "Campus 2020 final report", 2007. p. 22.
[92] Ministry of Advanced Education, "Campus 2020 final report", 2007. p. 76.
[93] AUCC, (2006)" University Research Talent", Rev 10-2006, www.aucc.ca.
[94] Ontario Ministry of Training, Colleges and Universities, Ontario Graduate Scholarship program, Accessed august 28, 2007, http://osap.gov.on.ca/eng/not_secure/OGS.htm
[95] Ministry of Advanced Education (2007, " BC Research and Innovation Strategy".
[96] Ministry of Advanced Education, "Campus 2020 final report", 2007. p. 77.
[97] Alberta Advanced Education and Technology (November 3, 2006), "News Release, Government invests $136 million to make post-secondary studies more affordable", www.gov.ab.ca/acn/200611/20752AF380FD7-A1B3-5835-A101C769E46D7365.html
[98] Alberta Advanced Education and Technology (November 22, 2005), "News Release, Alberta Centennial Scholarship continues longstanding tradition of helping student Edmonton..."
[99] Alberta Advanced Education and Technology (June 26, 2007), "News Release, Alberta banks on future students with 35 per cent boost to scholarship fund", www.gov.ab.ca/acn/200706/21723692CE8EC-94FF-60A8-6AE7324E72E7AD69.html
[100] Alberta Advanced Education and Technology (June 26, 2007), "News Release, Alberta banks on future students with 35 per cent boost to scholarship fund", www.gov.ab.ca/acn/200706/21723692CE8EC-94FF-60A8-6AE7324E72E7AD69.html
[101] Alberta Advanced Education and Technology (November 22, 2005), "News Release, Alberta Centennial Scholarship continues longstanding tradition of helping student Edmonton..."
[102] MacLean's, 12th Annual Issue: Guide to Canadian Universities (2007), p.192.
[103]Harvard University, "Annual report (2006)", Accessed 08.10.07, www.hbs.edu/about/annualreport/pdf/fullfinancials.pdf
[104] Solle A., Financial Aid Advisor, Graduate School Of Business, Stanford University

[105] Business Week, "Undergrad Rankings 2007", Accessed 08.10.07, http://www.businessweek.com/bschools/07/undergrad/profiles/haas1.htm
[106] Business Week, "Undergrad Rankings 2007", Accessed 08.10.07, http://www.businessweek.com/bschools/07/undergrad/profiles/haas1.htm
[107] California Institute of Technology (2206), "Financial Report (2005–2006)", p. 10, http://pr.caltech.edu/annual_report/annual_report_archive/fr_05_06.pdf
[108] Helliwell, J. and Helliwell, D. (2000), "Where Are They Now?Migration Patterns for Graduates of the University of British Columbia", p.28, Accessed 08.07.2007, www2.arts.ubc.ca/cresp/grads.pdf
[109] Helliwell, J. and Helliwell, D., "Tracking UBC Graduates Trends and Explanations", Table 4.1, Accessed 08.16.2007, www.isuma.net/v01n01/helliwel/helliwel_e.shtml.
[110] Helliwell, J. and Helliwell, D., "Tracking UBC Graduates Trends and Explanations", Table 4.1, Accessed 08.16.2007, www.isuma.net/v01n01/helliwel/helliwel_e.shtml.
[111] Helliwell, J. and Helliwell, D. (2000), "Where Are They Now?Migration Patterns for Graduates of the University of British Columbia", p.28, Accessed 08.07.2007, www2.arts.ubc.ca/cresp/grads.pdf
[112] Ministry of Advanced Education (June 5, 2007), "News Release, $10m Triples Graduate Student Internship Program".
[113] Economist Intelligence Unit (2007), "Innovation: Transforming the way business creates includes a global ranking of countries, White paper", p. 26
[114] UILO, UBC, Annual report (2005/06), p.16, http://www.uilo.ubc.ca/pdf/UILO_AR_2006.pdf
[115] Ministry of Advanced Education and BCIC (2007), "Integrating and Enhancing the BC Knowledge Transfer System, Final Report" by Global Connect, p.44
[116] UILO, UBC, Annual report (2005/06), p.16, http://www.uilo.ubc.ca/pdf/UILO_AR_2006.pdf
[117] Ministry of Advanced Education and BCIC (2007), "Integrating and Enhancing the BC Knowledge Transfer System, Final Report" by Global Connect.
[118] A Ministry of Advanced Education and BCIC (2007), "Integrating and Enhancing the BC Knowledge Transfer System, Final Report" by Global Connect.
[119] University of Ottawa, (June 5, 2007), "News release, Researchers from uOttawa get help to rapidly commercialize their research" http://www.research.uottawa.ca/news-details-research_78.html
[120] Economist Intelligence Unit (2007), "Innovation: Transforming the way business creates includes a global ranking of countries, White paper", sponsored by Cisco Systems, p. 4, 26
[121] Academy of Finland, Accessed August 23, 2007. www.aka.fi
[122] Academy of Finland, Accessed August 23, 2007. www.aka.fi
[123] Academy of Finland, Accessed August 23, 2007. www.aka.fi
[124] Science and Technology Policy Council of Finland (2006), "Science, Technology and Innovation", www.minedu.fi/OPM/Tiede/tiede-_ja_teknologianeuvosto/julkaisut/?lang=en
[125] Ontario Centres of Excellence, "About Us", Accessed August 23, 2007, www.oce-ontario.org/Pages/About.aspx
[126] Ontario Centres of Excellence, "About Us", Accessed August 23, 2007, www.oce-ontario.org/Pages/About.aspx
[127] Ontario Centres of Excellence, (2007), "Annual Report 2005-2006", www.oce-ontario.org/documents/Annual%20Report%202005_2006.pdf, p.1
[128] Networks of Centers of Excellence, Accessed August 23, 2007, www.nce.gc.ca/comp/CECR/cecr_e.htm.
[129] Ministry of Advanced Education, "Campus 2020 final report", 2007. p. 11, 13-14.
[130] PTC, (2004), "5th Report"
[131] Ference Weicker & Company (2005), "Promoting research and innovation in British Columbia". Report Prepared for BC Ministry of Advanced Education, p.19-20.
[132] BC Ministry of Small Business and Revenue, (2007), "Bulletin CIT 007-SR", www.sbr.gov.bc.ca/itb/Bulletins/cit_007-sr.pdf
[133] PWC, "SR&ED Tax Clips: 2007 Provincial and territorial R&D tax credits", Accessed August 23, 2007, www.pwc.com/extweb/pwcpublications.nsf/docid/67140D8F4D56992B852572FF006916FC
[134] The Universities Presidents' Council of British Columbia, "Facts & Figures", accessed September 4, 2007, www.tupc.bc.ca/facts_figures/

[135] Florida, R. (2005), "The Flight of the Creative Class: The New Global Competition for Talent", Collins, p. 8
[136]The Economist (October 7th 2006), "The Battle for Brainpower", p. 4.
[137] BC Progress Board, "Boosting incomes, confronting demographic change: BC's productivity imperative", April 10, 2006, p.17-18.
[138] The Economist (October 7th 2006), "The Search for Talent", p. 11.
[139] The Economist (October 7th 2006), "The World is Our Oyster", p. 12.
[140] Wadhwa, V. (August 31, 2007), "Who Needs the Ivies?", Business Week, www.businessweek.com/technology/content/aug2007/tc20070830_254262.htm?chan=search
[141] PricewaterhouseCoopers, (2006) "Connecting Vision to Reality 2006. Report on Emerging Canadian Software Companies: The CEO Perspective", p. 13.
[142] PricewaterhouseCoopers (2006) "Connecting Vision to Reality 2006. Report on Emerging Canadian Software Companies: The CEO Perspective", p. 79.
[143] PricewaterhouseCoopers (2006) "Connecting Vision to Reality 2006. Report on Emerging Canadian Software Companies: The CEO Perspective", p. 79.
[144] PricewaterhouseCoopers (2006) "Connecting Vision to Reality 2006. Report on Emerging Canadian Software Companies: The CEO Perspective", p. 81.
[145] The Conference Board of Canada, "Exploring Canada's Innovation Character – Benchmarking Against Global Best", Report June 2004, p.17.
[146] Educational attainment is the percentage of labour force that has achieved college or university graduation
[147] The Conference Board of Canada, "Exploring Canada's Innovation Character – Benchmarking Against Global Best", Report June 2004, p.17.
[148] Ibid.
[149] BC Progress Board, "Boosting incomes, confronting demographic change: BC's productivity imperative", April 10, 2006, p.9.
[150] Florida, R. (2005), "The Flight of the Creative Class: The New Global Competition for Talent", Collins, p. 101
[151] Florida, R. (2005), "The Flight of the Creative Class: The New Global Competition for Talent", Collins, p. 148
[152] The Economist (October 7th 2006), "Opening the Doors", p. 12 and "The Impact of Labour Migration on Developed and Developing Countries", Queen's Leaders Forum.
[153] Economist.com, (Aug 22, 2007), "Where the grass is greener", http://economist.com/markets/rankings/PrinterFriendly.cfm?story_id=8908454
[154] Richard Florida, (2004)."America's Looming Creativity Crisis", Harvard Business Review, October 2004, p.124-126.
[155] Gentler, M. et al. (2002) "Competing on Creativity – Placing Ontario's cities in North American Context", Ontario Ministry of Enterprise, Opportunity and Innovation, and Institute for Competitiveness and Prosperity, p.1-9.
[156] Gentler, M. et al. (2002) "Competing on Creativity – Placing Ontario's cities in North American Context", Ontario Ministry of Enterprise, Opportunity and Innovation, and Institute for Competitiveness and Prosperity, p.1-9.
[157] Finlayson, J. and Peacock, K. (2006), "BC Economic Snapshot:, Vol5, No 3, p. 1.
[158] BC Progress Board, (2006), " 6th annual BC Progress Board benchmarking report". http://www.bcprogressboard.com/index.php, p.61.
[159] Discussion with Michael Chew, Ministry of Economic Development, Economic Immigration Branch, November 23, 2006.
[160] Canada Revenue Agency (2007), "T3 Trust Guide 2006", www.cra-arc.gc.ca/E/pub/tg/t4013/t4013-06e.pdf
[161] Canada Revenue Agency (2007), "Newcomers to Canada 2006", www.cra-arc.gc.ca/E/pub/tg/t4055/t4055-e.html.
[162] Consultation with Darrell Wickstrom, Partner, Fasken Martineau
[163] Government of British Columbia (2007), "Budget 2007"
[164] Government of British Columbia (2007), "Budget 2007"
[165] BC Stats (2006),"Multiple Listings Statistics", www.bcstats.gov.bc.ca/data/dd/handout/mls.pdf

[166] Government of British Columbia (2007), "Budget 2007"
[167] Ministry of Small Business and Revenue, Property Taxation Branch, www.sbr.gov.bc.ca/Rpt/property_owner_information.htm
[168] Internal Revenue Service, Publication 936, Home Mortgage Interest Deduction. http://www.irs.gov/publications/p936/index.html
[169] Federal Government (2006), 'The Budget Plan 2006', www.fin.gc.ca/budget06/bp/bpc3ce.htm.
[170] Stanford University, Provost Committee on Faculty Housing, Accessed August 20, 2007 http://facultysenate.stanford.edu/archive/1999_2000/reports/106332/106419.html
[171] Stanford University, Faculty Staff Housing, Accessed August 20, 2007, www.stanford.edu/dept/fsh/homebuyers/
[172] Stanford University, Provost Committee on Faculty Housing, Accessed August 20, 2007 http://facultysenate.stanford.edu/archive/1999_2000/reports/106332/106419.html
[173] T-Net ranking 2007. www.bctechnology.com/frameset_tnet100.html
[174] Ministry of Economic Development (April, 2007), "BC launches labour strategy to meet skills shortages".
[175] Work BC, www.workbc.ca/WorkBC
[176] Citizenship and Immigration Canada. Accessed August 21, 2007. www.cic.gc.ca/english/immigrate/index.asp
[177] Discussion with Michael Chew, Ministry of Economic Development, Economic Immigration Branch, August 28, 2007.
[178] Working Temporarily In Canada, http://www.cic.gc.ca/english/work/index.html
[179] US Department of Labour, Accessed August 29, 2007, www.foreignlaborcert.doleta.gov/h-1b.cfm
[180] US Department of Labour, Accessed August 29, 2007, www.foreignlaborcert.doleta.gov/faqsanswers.cfm#h1b1
[181] Consultation with Christopher M. McHardy, McCarthy Tétrault LLP
[182] Immigration New Zealand, Accessed August 29, 2007, www.immigration.govt.nz/community/stream/employ/
[183] Immigration New Zealand, Accessed August 29, 2007, www.immigration.govt.nz/community/stream/employ/employmentprocesses/employingworktoresidenceworkers/whatisrequired/accreditedemployer/
[184] Consultation with Christopher M. McHardy, McCarthy Tétrault LLP
[185] US Department of Labour, Accessed August 29, 2007, www.foreignlaborcert.doleta.gov/h-1b.cfm
[186] US Department of Labour, Accessed August 29, 2007, www.foreignlaborcert.doleta.gov/faqsanswers.cfm#h1b1
[187] Consultation with Christopher M. McHardy, McCarthy Tétrault LLP
[188] Immigration New Zealand, Accessed August 29, 2007, www.immigration.govt.nz/community/stream/employ/
[189] Immigration New Zealand, Accessed August 29, 2007, www.immigration.govt.nz/community/stream/employ/employmentprocesses/employingworktoresidenceworkers/whatisrequired/accreditedemployer/
[190] Consultation with Christopher M. McHardy, McCarthy Tétrault LLP
[191] Citizenship and Immigration Canada web-site, Accessed 08/22/2007, updated on 08.20.2007, http://www.cic.gc.ca/english/information/times/international/02a-skilled-fed.asp.
[192] Ministry of Economic development, Accessed August 28, 2007, www.ecdev.gov.bc.ca/ProgramsAndServices/PNP/index.htm
[193] Citizenship and Immigration Canada. Accessed August 21, 2007. www.cic.gc.ca/english/study/work-postgrad-who.asp
[194] Citizenship and Immigration Canada. Accessed August 21, 2007. www.cic.gc.ca/english/information/faq/work/work-faq08.asp
[195] Citizenship and Immigration Canada web-site, Table: In-Canada Application Processing Times, Accessed 08/22/2007, http://www.cic.gc.ca/english/information/times/canada/process-in.asp.
[196] UBC, "Table: Tuition by Program", Accessed 08.23.2007, https://you.ubc.ca/ubc/vancouver/adding.ezc
[197] SFU, Accessed 08.23.2007, http://students.sfu.ca/fees/undergradfees.html#Anchor-Tuition-47857
[198] BC Biotech, "Promoting Growth of the Biotechnology Industry in British Columbia", p. 27.
[199] Ibid., p. 25.

[200] CTV.ca (Oct. 14 2005), " Bill Gates draws a crowd at Waterloo university", www.ctv.ca/servlet/ArticleNews/story/CTVNews/20051013/billgates_waterloo_20051013/20051013?hub=Canada
[201] Kenny Zhang, "Recognizing the Canadian Diaspora", Canada Asia Commentary, Number 41, March 2006.
[202] The Economist (October 7, 2006), "Opening the Doors", p. 13.
[203] BCTech Magazine(02007), "BC's Technology Guide 2007".
[204] T-Net ranking 2007. www.bctechnology.com/frameset_tnet100.html
[205] T-Net ranking 2007. /www.bctechnology.com/frameset_tnet100.html
[206] Thompson / Macdonald & Associates, www.canadavc.com/info.aspx?page=glossary#s
[207] Brander J., et al (2005), "The Equity Capital Program in British Columbia", commissioned by Leading Edge BC. p.13
[208] Global Entrepreneurship Monitor (GEM), Global Report 2005 p.49-52
[209] Global Entrepreneurship Monitor (GEM), Canadian National Report 2003, p.27-29
[210] Global Entrepreneurship Monitor (GEM), Global Report 2005 p.49-52
[211] Government of Canada (2007), "SME Financing data initiative – Small and Medium-sized Enterprises in British Columbia" p. 9.
[212] Ference Weicker & Company (2005), "promoting Research and Innovation in British Columbia", report prepared for BC Ministry of Advanced Education.
[213] Sustainable Development Technology Canada, "Portfolio and leveraged funding per province", http://www.sdtc.ca/en/results/portfolio/leveraged_financing.htm
[214] Report on the March 17-18, 2004 Roundtable on Seed/Pre-Seed Stage Venture Capital Financing and on Commercialisation Skills Sponsored by the Prime Minister's Advisory Council on Science and Technology (ACST) p. 39-49
[215] Ministry of Economic Development, "Equity Capital Programs", Accessed June 20, 2007, cse.gov.bc.ca/ProgramsAndServices/BusinessServices/Investment_Capital/Venture_Capital_Programs/ECP.htm
[216] Consultation with Todd Tessier and Lina Doung, Ministry of Economic Development, September 17, 2007.
[217] Discussion with Todd Tessier, Ministry of Economic Development, June 20, 2007.
[218] SBIR, www.sba.gov/aboutsba/sbaprograms/sbir/sbirstir/sbir_sbir_description.html
[219] STTR, www.sba.gov/aboutsba/sbaprograms/sbir/sbirstir/SBIR_STTR_DESCRIPTION.html
[220] SBIC, /www.sba.gov/aboutsba/sbaprograms/inv/index.html
[221] SBIR, /www.sba.gov/aboutsba/sbaprograms/sbir/sbirstir/sbir_sbir_description.html
[222] National Science Foundation, http://www.nsf.gov/statistics/
[223] SBIC, www.sba.gov/aboutsba/sbaprograms/inv/index.html
[224] Report on the March 17-18, 2004 Roundtable on Seed/Pre-Seed Stage Venture Capital Financing and on Commercialisation Skills Sponsored by the Prime Minister's Advisory Council on Science and Technology (ACST) p. 46-49)
[225] Ference Weicker & Company (2005), "Promoting research and innovation in British Columbia". Report Prepared for BC Ministry of Advanced Education, p. 30.
[226] Brander, J. et al. (2005)," Equity Capital Program in B", commissioned by The Leading Edge BC p. 28-31
[227] Ference Weicker & Company (2005), "Promoting research and innovation in British Columbia". Report Prepared for BC Ministry of Advanced Education, p. 30).
[228] NAO, (2004), " Innovation and Productivity Tax Credit (IPTC), p.1-6)
[229] Brander, J. et al. (2005)," Equity Capital Program in B", commissioned by The Leading Edge BC p. 28-31
[230] Angel Capital Association and Angel Capital Education Foundation (2006), "State of Angel Groups: A Report on ACA and ACEF", www.angelcapitaleducation.org/dir_resources/news_detail.aspx?id=135
[231] Angel Capital Association and Angel Capital Education Foundation (2006), "State of Angel Groups: A Report on ACA and ACEF", www.angelcapitaleducation.org/dir_resources/news_detail.aspx?id=135
[232] Silicon Valley / San Jose Business Journal (2007), "Most active Angel Investors in Silicon Valley/Bay area",

www.bizjournals.com/bookoflists/sanjose/list_index_html/?sid=a52b0d46222003396c97e6929929beae&site=
[233] Angel Capital Education Foundation, "Ask an Angel: SBIR and STTR Grants Provide More than Capital", www.angelcapitaleducation.org/dir_resources/news_detail.aspx?id=120
[234] Government of Canada (2007), "SME Financing data initiative – Small and Medium-sized Enterprises in British Columbia"
[235] BCTIA, (2006), "2006 Advocacy Initiatives", www.bctia.org/files/PDF/BCTIA_Advocacy_Initiatives_Document_Mar_2006_Final.pdf, p.11.
[236] Brander J., et al (2005), "The Equity Capital Program in British Columbia", commissioned by Leading Edge BC. p.18
[237] Brander, J. et al. (2005)," Equity Capital Program in B", commissioned by The Leading Edge BC p. 18
[238] Carty, A. National Science Advisor to the Prime Minister (2005), "Building a World Class Innovation and Commercialization System in Canada", presentations, Expert Panel on Commercialization, June 29, 2005.
[239] Industry Canada for Government of Canada (2006), "The State of Science & Technology in Canada", p.18.
[240] Industry Canada for Government of Canada (2006), "The State of Science & Technology in Canada", http://www.scienceadvice.ca/documents/Summary%20and%20Main%20Findings.pdf. p.18.
[241] PTC 8th Report p.21
[242] PTC 8th Report p.21
[243] Government of Canada (2007), "Federal Budget 2007", www.budget.gc.ca/2007/themes/bkcmae.html
[244] BC Innovation Council, www.bcinnovationcouncil.com/index.php
[245] Ministry of Advanced Education and BCIC (2007), "Integrating and Enhancing the BC Knowledge Transfer System, Final Report" by Global Connect, p.2.
[246] "Everybody's Doing It", The Economist, October 7th 2006, p. 5.
[247] Ibid., p. 5.
[248] PTC (2006), 'The 8th Report", p. 26-31.
[249] PTC (2006), 'The 8th Report", p. 26-31.
[250] PC Magazine, www.pcmag.com
[251] PricewaterhouseCoopers, (2006) "Connecting Vision to Reality 2006. Report on Emerging Canadian Software Companies: The CEO Perspective", p. 13.
[252] Ibid., p. 3.
[253] Ibid., p. 6.
[254] Ibid., p. 6.
[255] ACETECH, www.acetech.org
[256] BC Regional Science & Technology Network (BCRSTN), "Mentorlinx Orientation Package" by Dawn Miller & Associates, www.dmateam.com/pdf/ACT-BC_Orientation%20_August2005_V.3.pdf
[257] Ference Weicker & Company (2003),"Promoting Innovation and Commercialization in Rural BC (PIC) Report"
[258] Ministry of Advanced Education and BCIC (2007), "Integrating and Enhancing the BC Knowledge Transfer System, Final Report" by Global Connect, p.22-26.
[259] PTC, 8th Report, 2006.
[260] World Economic Forum (2006), "Global Competitiveness report 2006-2007", /www.weforum.org/en/initiatives/gcp/Global%20Competitiveness%20Report/index.htm. p.11.
[261] PTC, 8th Report, 2006.