



PREMIER'S TECHNOLOGY COUNCIL

12th REPORT
April 2009

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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/

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Foreword

The Premier's Technology Council (PTC) was created in August 2001 to provide advice to the Premier on technology-related issues. The Honourable Gordon Campbell is Chair of the Council, a position shared with the Co-Chair, Greg Peet, formerly Chairman, President and CEO of ALI Technologies (acquired by McKesson Corp in 2002). The Council is fortunate to draw its membership from 20 other leaders of BC's technology industry and from senior levels of the academic sector.

This is the PTC's 12th report, the 5th of the government's current mandate. Given that the PTC is nearing its second term of service to the Premier, its members deemed it appropriate to examine the status of our knowledge-based society in British Columbia. The objective of the report is to review the progress that has been made towards creating a knowledge-based society, the impact of PTC recommendations and to determine what themes are important in the future to ensure BC's continued prosperity.

The PTC put a great deal of effort into learning about the impact of its recommendations on government operations. To prepare for this, the PTC conducted extensive consultations with a number of different government departments. We would like to acknowledge and thank those public servants who continue to assist the PTC in its endeavours and who work hard to implement a vision of a knowledge-based society.

We would like to express our thanks to all the members of the Premier's Technology Council who volunteered their time and energy, and to the Premier for his continued interest and support.

Sincerely,

Eric Jordan and Cheryl Slusarchuk

Co-Presidents, Premier's Technology Council

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Executive Summary

The Premier's Technology Council (PTC) is an independent body that advises the Premier on all technology matters in BC. The primary purpose of this report is to investigate BC's progress as a knowledge-based society since 2001, and to consider how technology can help BC over the next decade. To that end, the PTC examines how technology has been brought to life in BC and how it impacts on the three pillars of a knowledge-based society. These pillars are infrastructure, government services and the knowledge-based economy.

Infrastructure for a Knowledge-Based Society

Initiating the development of infrastructure that supports our society is a key role for government. For today's knowledge-based society broadband development, particularly to support education and research, is a critical part of that infrastructure. The provincial government has made significant progress in making BC one of North America's most connected jurisdictions.

CONNECTING BRITISH COLUMBIA

- Through forming Network BC and implementing a series of connecting communities initiatives, including the Connecting Communities Agreement, 362 of 366 identified communities have received points of presence and 324 of 366 have last mile services in place. Some 92% of the province now has access to a broadband connection.
- To help bridge the digital divide for First Nations, the provincial government has recently announced over \$30 million for broadband connectivity and capacity building.
- Funding from the Community Networking Infrastructure Grant Program helped 57 communities to deliver last mile services. The newer \$5.2 million Connecting Citizens Grant Program will continue that work to help Internet service providers and community networks purchase the equipment necessary to extend last mile services.
- A survey by the Canadian Internet Project indicates that BC has the highest rate of high speed connectivity in the country.

CONNECTING GOVERNMENT

- The broader government network called SPAN/BC is one of the largest private networks in North America. Although it covers all of government, its largest and most critical components are health and education. The entire system requires regular reinvestment and upgrading to ensure effectiveness.
- BCNET connects our research universities and research institutions. It is 10,000 times faster than the commercial Internet and the provincial government is continuing its expansion. Its bandwidth, speed, and flexibility are critical to collaborative research in the modern world
- PLNet is a secure high speed network that connects BC's public schools and post secondary institutions. It is undergoing continuous upgrades. It provides each school with Internet access, secure data transfer capability, and equity in service delivery around the province.
- Government is implementing the e-Health Network Gateway to securely connect the diverse Health Authority information systems.
- Government has created the Private Physicians Network (PPN) which allows secure access from home or office.

Government Services for a Knowledge-Based Society

Technology offers the opportunity for governments to improve existing service and add new services. It will also help government to address the challenge arising from the aging demographic and the pending skills shortage.

CITIZEN CENTRED SERVICES

- To deliver integrated services government technology must allow for data sharing between departments and responsible sharing of that information must be encouraged.
- Government has instituted an annual review process for all IM/IT strategic project expenditures to ensure they meet the standards required to achieve the integration and alignment of government systems.
- Integrated service delivery is also being encouraged through Service BC. The quality of the service is excellent with an overall customer satisfaction rate of 92%.

EXECUTIVE SUMMARY

GOVERNMENT 2.0

- Government 2.0 is applying online tools and techniques for collaborative idea generation to the development of government services and policy.
- The infrastructure being developed to deliver citizen centred services will greatly aid this new initiative.
- The BC government is undertaking some Government 2.0 initiatives internally through the use of Spark, an online space for collaboration within the BC Government Service with over 3,000 users.

E-LEARNING SERVICES

- The provincial government has changed legislation so students can use technology to individualise their education programs and to provide equitable access to education for students with restricted options.
- BC is also using technology to provide e-exam opportunities for students.
- Because of these new opportunities nearly 50,000 students were taking online courses and more than 25,000 e-exams were administered in 2007/08.
- BCeSIS is a common student information system that allows administrators, counsellors and teachers to store, analyse, and share information about students. It is expected to be implemented province wide by 2010.

E-HEALTH SERVICES

- Technology can enhance quality and control costs in the health care sector by delivering the right information at the right time to the right people.
- Government now has a pilot site for 1,000 physicians to use an Electronic Medical Record which can integrate with the Electronic Health Record in such a way that doctors can continue to protect patient confidentiality.

The Knowledge-Based Economy

Over the past eight years, the technology industry has grown in BC. Its contribution to GDP has increased by 64%; its revenues have increased by 58% and employment by 20%. This growth is helping to diversify BC's economy, making it less dependent upon the volatile commodities sector. Equally important is that the fundamentals that have driven growth over the past decade remain, in spite of the economic crisis. Hence the measures that government has taken to capitalise on those fundamentals leave the technology sector well placed to rebound.

The six areas where government has worked to encourage an innovation economy include: ensuring BC has people with the right skills, supporting industry development through addressing taxation and regulatory barriers, investing in research and development, encouraging clean energy and green technology, concentrating on both traditional and new sectors, and building export markets, particularly in the Asia Pacific.

PEOPLE: EDUCATION AND IMMIGRATION

- BC has the world's 9th ranked education system, and one of the world's top 35 universities. Its tuition fees are the 4th lowest in Canada and 30% lower than those in the US. To supplement this, the provincial government has provided \$1.44 billion in financial assistance since 2001.
- The provincial government's Provincial Nominee Program (PNP) provides a simple and expedient process for bringing skilled immigrants to BC. The technology industry in particular has benefited from this program with about over 2,700 nominations, almost 40% of the total.
- BC needs to attract more experienced executives, particularly with sales and marketing, and product management experience.

BUSINESS ENVIRONMENT: TAXATION AND REGULATORY REFORM

- Since 2001, BC has eliminated 163,000 regulations (43%) and reduced corporate income tax by 33%. Corporate tax reductions planned for the next three years will give BC a combined federal-provincial rate of 25%, among the lowest corporate income tax rates of the world's major industrialized economies.
- Since 2001, the BC government has introduced over 100 tax cuts for British Columbians creating the lowest personal income taxes in Canada at every level for those earning up to \$116,000.
- Some aspects of Venture Capital investment in BC have been very strong. Particularly notable have been the government's VCC programs, strong angel investment, and the new BC Renaissance Fund. Unfortunately, the venture capital situation is worsening on a Canada wide basis and the challenge is exacerbated by the current financial crisis.

EXECUTIVE SUMMARY

RESEARCH AND COMMERCIALISATION

- BC has increased investment in research by 100% since 2001, a total of over \$1.5 billion. BC is looking to capitalise on this investment by creating stronger links between industry and academia through internship programs, and by adopting a Research and Innovation strategy.
- To further increase the effectiveness and volume of R&D investment, BC needs to encourage an increase in business investment in R&D, which currently only represents about 40% (2006) of the total.
- Industrial Design can play a key role in commercialisation in BC, particularly to increase the competitive differentiation of BC products and in the transformation of our traditional resource industries. The new Wood Innovation and Design Centre at UNBC is a good first step on this front.

ENERGY AND THE ENVIRONMENT

- BC's current sources of electrical power are clean and inexpensive as some 90% of existing generation infrastructure consists of hydroelectric dams. Government continues to encourage other clean energy sources by investing \$600,000 bioenergy research, providing \$25 million to establish and enhance BC's Bioenergy Network and creating the new \$25 million Innovative Clean Energy Fund.
- BC's environmental industry sector employs about 18,000 people and generates \$2.3 billion in revenue. This growing industry is supported by strong research capabilities including a total of 21 Canada Research Chairs in Clean Tech, 4 NSERC Research Chairs and over 20 research facilities creating a total of 2,800 grad students per year.
- Government leadership on such issues as climate change policy helps position BC to take advantage of the explosion in global demand for green technologies. The global market for environmental products and services is projected to double from US\$1,370 billion per year at present to US\$2,740 billion by 2020.

TRADITIONAL AND EMERGING STRENGTHS

- BC's traditional strength in the forest industry means that wood and paper production together accounted for 41% of the total value of our manufacturing shipments. Canada is the world's largest exporter of forest products and this industry is beginning to reinvest R&D. Canada's forest sector research institute, FPInnovations, has two of its four locations in BC and an annual budget of approximately \$85 million.
- BC's emerging technology sectors include ICT, New Media and Life Sciences. Together they have over 7,000 companies, approximately \$12 billion in revenues, and employ over 63,000 people. Government has helped support these sectors through investment in research, research facilities, and graduate schools.

EXPORTS: ASIA, THE PACIFIC AND OTHER TRADING OPPORTUNITIES

- BC is situated between three of the world's four largest economies and the Asian economies are expanding rapidly. BC can not only serve as a conduit for trade between these jurisdictions, but can market its own products into all of them. BC is working to take advantage of this opportunity through the Asia Pacific Initiative. The budget of February 2008 committed \$40 million to strengthen BC's trade, investment and cultural links with Asian countries.
- The province has entered into a number of agreements to remove barriers to nearby markets. These measures include the Trade, Investment and Labour Mobility Agreement (TILMA) with Alberta, Pacific Coast Collaborative and Western Climate Initiative (WCI). TILMA alone has the potential to add \$4.8 billion to real GDP and create 78,000 new jobs in BC.

Conclusion

Over the past eight years British Columbia has taken positive steps forward on the three pillars of creating electronic infrastructure, using technology to improve government services and in supporting the shift to a knowledge-based economy. In each case, efforts must continue to ensure BC remains competitive and to ensure the citizens of BC can continue to garner the benefits of living in a knowledge-based society.

Introduction

British Columbia has grown as a knowledge-based society over the past eight years. This has created a number of social and economic benefits including job creation, export growth, GDP growth, and government efficiency. The Premier's Technology Council (PTC) believes that this growth is largely attributable to government efforts to bring technology to life in BC. The PTC believes that there are three pillars of a knowledge-based society, infrastructure, government services and the knowledge-based economy. Important progress has been made on all of these pillars and work must continue to keep moving BC forward.

Infrastructure is the first pillar. For a knowledge-based society, that infrastructure includes communications. Government initiatives for broadband Internet connectivity have vastly improved access throughout BC. Access compares favourably both in comparison to the year 2000, but also in comparison to other jurisdictions. This is demonstrated both through increased usage data and the number of communities with access. The use of new learning technologies has also greatly increased in classrooms around BC.

The second of pillar is the transformation of government services. Population dynamics are changing in a way that will significantly impact government operations. Technology creates opportunities to not just improve, but to transform the way government serves the citizen. BC is beginning to take advantage of these opportunities. Studies show that government initiatives to promote citizen centred services using technology have improved service in BC compared to other jurisdictions. BC has also made progress in e-health initiatives and is now looking to 'Government 2.0' as a way to further improve the quality of service.

“The PTC believes that there are three pillars of a knowledge-based society, infrastructure, government services and the knowledge-based economy.”

The third pillar is the promotion and development of a knowledge-based economy. The technology industry in BC has grown both in absolute terms and in terms of GDP contribution over the past eight years. This has much to do with the efforts of industry itself but government has played a role. It has taken broad industry action in the key areas of attraction and retention of people, creating a positive business environment, and improving both the quantity and effectiveness of R&D. These activities have helped industry grow. Government has also undertaken more specific initiatives to capitalise on natural advantages that arise from our access to clean energy and our place on the Pacific Rim, as well as of the emerging clusters in the technology sector.

Infrastructure for a Knowledge-Based Society

One of the most important roles for government is to enable or provide the infrastructure that supports our society. In past centuries this meant canals, ports, and roads. Over time this grew to include sewer and water systems, airports, electricity grids, transit infrastructure and most recently, communications technology. A critical aspect of 'hard' infrastructure for today's knowledge-based society is the development of the connectivity that will ensure access at home and ensure our government services, particularly health and education, have modern delivery channels.

“The global competitiveness ranking of the World Economic Forum uses the amount of broadband Internet subscribers as an indicator for technological readiness and thus the competitiveness of a country.”

Connectivity creates the kind of communications network that allows a society to create, diffuse and use knowledge and is the backbone for economic growth, and social and cultural development.^{1,2,3}

The OECD has warned that without investing in broadband or appropriate communications connectivity countries could miss significant opportunities.⁴ It increases productivity, innovation, and competitiveness and increases knowledge diffusion. In fact, the global competitiveness ranking of the World Economic Forum uses the amount of broadband Internet subscribers as an indicator for technological readiness and thus the competitiveness of a country.⁵ And this is not going away. OECD further estimates that “with growing use, new content and applications requiring broadband capabilities, broadband is likely to take on increasing socio-economic importance in the future.”⁶

Case: “Building” the Interior Economy



One of the most important areas of focus for the Premier’s Technology Council over the past eight years has been the delivery and expansion of broadband Internet throughout British Columbia. That, of course, begs the question: what does it mean for a small community? Does it provide better access to social networking? Does it enhance

educational opportunities? These are indeed important benefits but a crucial piece of the puzzle when looking for the benefits of the broadband is determining the economic impact. In this day and age, the business world moves at the speed of the Internet and connectivity is helping BC to keep up.

A great example is the case of Hamill Creek Timber Homes. Based near the small community of Meadow Creek, north of Kaslo in the Kooteneys, Hamill Creek makes houses. They are not what you might first imagine when thinking of a wooden home. For some the term ‘timber home’ conjures up the idea of ‘quaint’ or perhaps ‘rustic’. This is not the case with Hamill Creek. They create beautiful pieces of architecture that feature BC’s most abundant resource.

Meadow Creek got its broadband connection through the Connecting Communities Agreement and Hamill Creek Timber Homes took advantage of it, first gaining access to broadband in 2007. For them there were immediate tangible benefits. At the simplest level the broadband allows them to save on phone bills because email is so much more efficient. It also provides them better control of their website, and that too is less expensive as they can maintain and update it themselves.

If you look deeper however, broadband Internet is far more important than the nickels dimes from a phone bill. It allows Hamill Creek to bid on and execute larger scale projects through the ability to access FTP sites, where much of the information on many of the larger jobs is posted. In other words it has allowed them to continue to compete in this changing global market.

For Hamill Creek access to the speed and reliability of broadband means improvements throughout their business model. They use the Internet for communication with clients and suppliers, for sending and receiving design files, for sourcing supplies and for advertising. As a company they simply believe that they are better informed with quick and easy access to a world of information. And as they now use the Internet as their primary marketing tool it not only helps the business run better, it helps them expand it too.

Connecting British Columbia

The provincial government recognised early in this century this rising importance of broadband connectivity. They knew that for BC:

- it provides better access to government services, such as e-health and e-learning;
- it is an essential business tool for the private sector; and
- it provides the access to information and knowledge diffusion that are critical for innovation and competitiveness.

PTC Recommendation 6.1 The PTC recommends that government:

- Keep up the momentum to extend broadband to the remaining communities as quickly as possible.
- Work with communities to identify last mile solutions.

Network BC is a dedicated project office within the Ministry of Labour and Citizens' Services. It works with BC communities, the private sector and all levels of government, including First Nations, to facilitate and encourage broadband connections to all BC communities. Created following a recommendation from the PTC in 2003, its initial task was to deliver or expand broadband to 366 priority communities, 119 of which had no connection whatsoever. The first step, the Connecting Communities Agreement with TELUS, had the key goal of establishing a connection in these 119 communities.

This focus on broadband is bearing fruit. Some 92% of the province now has access to a broadband connection, making BC one of the most connected jurisdictions in North America. This compares favourably with 82% that had broadband connectivity when the PTC first examined this issue in 2001. The Connecting Communities Agreement project has been completed. All 119 communities have a broadband connection and according to Network BC's latest data, 362 of 366 communities have a broadband point of presence. As of March 2009, 324 have gone beyond the point of presence and have last mile broadband connectivity.

“92% of the province now has access to a broadband connection, making BC one of the most connected jurisdictions in North America.”

External analysis confirms BC's progress. A survey conducted by the Canadian Internet Project in 2007 indicated that BC is doing well compared to the rest of Canada. Survey respondents from BC had the highest rate of high speed connectivity in the country, at 88%. BC had 82% Internet penetration behind only Alberta at 83% but ahead of Ontario at 81%. This is an 8% increase since the previous survey conducted in 2004, at which time BC also trailed Ontario in Internet penetration.⁷

In spite of this progress, the province recognises that the job is not yet finished and is to be commended for continuing to dedicate resources to this effort. In September of 2008 it announced the \$5.2 million Connecting Citizens Grant Program to address last mile issues. Of the remaining 8% of the population that still lack a connection, many are in remote communities with average populations of 200. Some of these are First Nation communities, and recently announced funding will help address a large portion of this.

PTC Recommendation 11.2 *That government continue to address the broadband challenges for British Columbia by:*

- establishing a plan to address broadband related hindrances to economic development in BC;
- continuing to use its own telecommunications procurement as a lever for supporting regional delivery through local ISPs and make this solution part of a broader package that supports local ISPs in the delivery of these services; and
- continuing investment to assist First Nations in broadband delivery and related capacity building.

In November 2008 government announced \$22.5 million in funding to help connect First Nations communities and then supplemented that with a further \$8.3 million for First Nations Connectivity in February of 2009. TELUS is also continuing its own investment, announcing a \$500 million broadband capital expenditure plan in March of 2009. The Premier's Technology Council will continue to support the government and advise it on addressing this important connectivity issue.

“In November 2008 government announced \$22.5 million in funding to help connect First Nations communities and then supplemented that with a further \$8.3 million in February of 2009.”

Case: Building Community in the Yekooche Learning Centre



Since its sixth report, released in the summer of 2004, the Premier's Technology Council has stressed the importance of bridging the digital divide for First Nations. But for the PTC, bridging that divide is not just delivering the equipment but also building the capacity within the communities to use it. Many of these communities are very small and lack the expertise and knowledge needed to bring the full benefit of the technology to that community. But if the capacity building efforts are done well, with the needs of the community in mind, then the technology can mean so much more than a mere link to other places.

Yekooche is the perfect example. It is a small community of 120 people situated at the northwest end of Stuart Lake and in the middle of the village is the Learning Centre. The centre is partnership between Royal Roads University and Yekooche. It is operated by Yekooche Youth with

financial support from the provincial government. It began as a six-seat lab to assist the members of the community as they learned the different ways this technology could enhance their lives. It was viewed as a key to enabling band members to stay in the community while they learned; insuring community vision, and cultural values were maintained.

The centre has greatly exceeded expectations. Over a period of 30 months, the resources of the Learning Centre have grown to thirteen computers, including one MAC for video and audio recording, and a Carrier language archive. Additionally, they have an outfitted music lab and prosumer-level video equipment. Learning programs include EBus, which provides grade 8-12 and Adult Dogwood completion, IC3 Technical; and a host of other programs including music, graphics, newsletters and administration. Utilization of the Learning Centre was initially around five members a day, but has grown to a peak of over thirty members a day who come to utilize the resources, services and support that the Learning Centre provides.

The Learning Centre means so much more. Community members were involved from the outset, so it is their centre, not something an outsider dumped in the middle of their community. Because it was built with their vision, their values, and their own sweat and effort, it brings far more than just the technology to their community. The Learning Centre has become a central gathering place.

There is a lunch program where all are encouraged to contribute to the cooking, feasting and cleaning. There is mentorship between participants, sharing skills and knowledge; most important are the stories, traditional knowledge and skills shared between Elders and youth. There are also networking opportunities with members sharing information, including exchanges with different First Nations, First Nations Organisations and other external parties about upcoming opportunities or potential partnerships.

When you ask the members of the community what they use the centre for, the most common thread is education. Some speak of completing grade 8 or grade 12, others talk of technical skills, and some speak of music or of learning from traditional family archives. That is what the centre was built for and if that was all it did, then it would be a success. But if you tilt the question and ask the community what the Learning Centre does and then you discover what the Centre really represents. It makes a better place to live they say, and brings our people and our families together.

So the Centre is a success but it is not just about technology. Technology is a tool and alone would not provide the vision, sharing, mentoring and capacity building opportunities that the Learning Centre has provided. Along with access to the technology and learning, the Centre provides a place of gathering, and a place to share excitement in projects that are created. It provides a place to go to be encouraged and acknowledged where new visions are inspired and the community shares in individual success. So while this Learning Centre does provide them with an important link to the broader world, it is also building deeper links to their roots at home.



Connecting Government

Government requires the appropriate technology infrastructure in order to deliver services effectively. The more coordinated that infrastructure is, the more effective it is in assisting in the delivery of government services.

In British Columbia that coordinated network is a massive enterprise called the Shared Provincial Access Network/British Columbia (SPAN/BC). It is one of the largest private networks in North America. It contains over 100,000 network devices, constitutes a strategic investment and is a critical component of government operations. It includes more than just the 30,000 government employees. It supports 600,000 school children, teachers and college students. It encompasses over 300 urban, rural and First Nations communities. It incorporates hospitals, pharmacies, health authorities and crown corporations. This represents one of the most critical aspects of government infrastructure and it requires ongoing investment to ensure it remains an effective tool for modern technology-based program delivery. The two largest and most critical components of that system are education and health.

*“SPAN/BC is one of the largest private networks
in North America and contains over
100,000 network devices.”*

Case: How Government Secures Data

In its 8th report the Premier's Technology Council made a variety of recommendations in regards to improving the security of government information systems. When it made those recommendations it expected to reap certain rewards – increased security of data, greater confidence of the public, and the ability to use more data safely within the government systems. The reward the PTC didn't expect was a very tangible prize for innovation and yet that is just what the resulting Intrusion Prevention System Project (IPSP) earned, garnering a silver medal at the Canadian Innovation Productivity Awards.

Protecting government data is no mean feat. The Shared Provincial Access Network/British Columbia (SPAN/BC) is one of the largest private networks in North America. It contains over 100,000 network devices, constitutes a strategic investment and is a critical component of government operations. It includes more than just the 30,000 government employees. It supports 600,000 school children, teachers and college students. It encompasses over 300 rural and First Nations communities. It incorporates hospitals, pharmacies, health authorities and crown corporations.

"We knew there were many ways our system could bring better services to BC Citizens," explains Dave Nikolejsin, the provincial government's Chief Information Officer, "but we also knew that for us to have any success in that area people have to believe their information is safe."

So government completely rethought the way their security system worked. The IPS leapfrogs traditional network security controls such as router filtering and firewalls. The IPS uses new technology allowing it to compare incoming traffic to all the known bad traffic signatures. This is a tremendous technical accomplishment given that it is making 100's of millions of comparisons every second. So the IPS sensors block the malicious traffic before it comes into SPAN/BC. This methodology required supporting processes to be developed across the system to maintain, monitor and tune the sensors.

The net result is a system that is vastly more effective and efficient. When investigating suspicious traffic, the data is available in real time instead of the 24 hours it used to take. Even more important is that the new system is ubiquitous and transparent throughout government. It has no exceptions so every computer on the SPAN/BC network has the same protection, whether the computer belongs to a Ministry, a school or a hospital, they are all protected. A major infection can cost upwards of half a million dollars in time and equipment, so this new prevention is saving the government tons on a cure.

"It saves time and saves money," asserts Mr. Nikolejsin, "but most importantly it makes our data – BC citizen's data - safer. Throughout 2007, the IPS was blocking 2.5 million attempted intrusions per day."

It is rare that a system can be introduced that is faster, cheaper, and better. It's no wonder that this project was an award winning one.

CONNECTIVITY IN EDUCATION

A goal area for government investment is to ensure that our education system has excellent infrastructure that provides the best tools to our teachers, to our students, and to our professors. This true for K-12 education but is also important for post secondary education and its associated research.

Ideally, technology infrastructure should:

- provide a platform for research collaboration in universities;
- support and enhance the delivery of education services;
- provide options for students to receive educational services that meet learning styles and access requirements; and
- enhance opportunities for teachers to participate in professional development.

For a province like BC with its challenging geographic diversity, it is also important that the technology infrastructure provide equity in the delivery of service.

Advanced education and research require a great deal of collaboration. As the data and information become more complex and integrated it is important to provide bandwidth, speed, data-transport capabilities and flexibility beyond what the commercial Internet can provide. In other words, research and education projects need high-bandwidth networks. British Columbia is well positioned in this area through BCNET. It is 10,000 times faster than the commercial Internet and highly customisable.

“PLNet is a secure, high speed network that connects all of BC’s public schools and colleges.”

It connects our research universities and key research institutions with regional, national and international research and education networks. They can share terabytes of data across the province or around the world.

Such an advanced system needs continuous upgrading to ensure it remains a leading system. Government recognised this when it invested in the BCNET 2010 project, launched in 2005 with \$3.15 million in capital funding from the Ministry of Advanced Education. This extended the Optical Regional Advanced Network (ORAN) to higher education institutions in Kelowna, Kamloops and Surrey. ORAN, already connecting our other key institutions, is dedicated optical fibre that can transmit massive quantities of data and connect scientific equipment, instruments, sensors and databases.

At the K-12 and post secondary institution level in BC the key piece of infrastructure is the Provincial Learning Network (PLNet). PLNet is a secure, high speed network that connects all of BC’s public schools and colleges with each other in a centrally managed wide area network. It enables districts and schools to communicate and exchange information. It also provides each school with Internet access, and secure data transfer capability.

Like BCNet, PLNet needs to be regularly upgraded in order to fulfill its purpose. The PTC recognised this in its 6th report, recommending that its capacity be increased to meet expanding needs. The Ministry has now completed its ninth major upgrade project, which included 141 schools and post secondary institutes. The tenth upgrade project, PLNet 2010 will be deployed

soon, including another 170 sites as the government continues to ensure our education system has a strong technology backbone. All upgrades have been and continue to be funded through pricing efficiencies and contract negotiation to maximize bandwidth availability within the existing envelope. BC must continue to push forward on PLNet to ensure our education system can provide BC students with the tools they need to compete.

PTC Recommendation 6.3 *The PTC supports the PLNet initiative and recommends that its installation and capacity review continue to receive top priority to ensure it has the ability to meet ever-expanding needs.*

CONNECTIVITY IN HEALTH

In order to properly use technology and information systems to improve our health care system the government needed to focus on a handful of key objectives. Some of these were identified in the PTC 7th report. Government had to create an infrastructure powerful enough to allow collaboration between the diverse systems of the Ministry of Health Services (MHS) and the Health Authorities. It also had to create a system that was secure enough that doctor patient confidentiality would not be compromised. In other words, it had to allow for doctors to decide what information is appropriate to share with the broader system. Although some of this could be addressed through program design, a key component is the infrastructure itself.

To address this, the MHS and the Health Authorities are developing a comprehensive Health Sector IM/IT plan for 2009/10 which will highlight the opportunities for standardization. This will improve information flow. Further facilitating this flow is the creation of the eHealth Network Gateway (eNG). This is the inter-health authority network that will securely connect the Health Authorities on a high bandwidth, quality-of-service, IP-enabled network. Other eHealth domains and stakeholders will be supported through the Health Extranet using firewall, intrusion prevention and detection technologies. Creation of the eNG is currently under way.

To supplement the eNG, government has contracted for the development of a Private Physician Network (PPN). This is a private and reliable network for physicians to access patient information in their own files from office or from home.

Government Services for a Knowledge-Based Society

As technology develops and new technology infrastructure begins to spread, it provides governments with a whole new avenue to deliver and improve the range of services it provides. This could include using technology to enhance the delivery of education, health, social services and economic development.

There is an added challenge however. Technology must not only provide new services and new delivery models. It must play a key role in addressing a significant demographic shift within government. The impact of the aging population and the worldwide competition for talent was discussed in the PTC 10th report.

“Technology will play a key role in addressing a significant demographic shift within government.”

The BC Public Service currently employs approximately 30,000 people. In its most recent corporate HR plan the government estimates that, because of the labour shortage being created by the aging population, the public service will be 30% smaller by 2015. Equally important is that by 2016, the number of employees leaving the BC Public Service could be as much as four times higher than the number of new hires. Dealing with this challenge will require a significant shift in the way that government delivers services without compromising quality.⁸

Citizen Centred Services

In the past, government program delivery has been the responsibility of each discrete Ministry. The focus has traditionally been on each individual program and how best to deliver it. The advent of modern information management technology allows for a new model, commonly referred to as Citizen Centred Services. It requires government to focus on the citizen rather than the program. In its 9th report the PTC envisioned a citizen centred services system that would allow the “front office”, where government meets the citizen, to integrate seamlessly with the more complex “back office” where programs are developed and managed. By ensuring those who actively deliver the services can access the information they need, public services could be rendered more accessible, easier to deal with, and more responsive.

Although technology is the enabler, it is only a part of the solution. It will only provide the means to communicate for the purposes of sharing information. The new technological infrastructure needs to be tied to an implementation plan that ensures those who design and deliver services focus on the overall needs of the citizen instead of just the effective delivery of one program.

A key to success is information sharing. Responsible sharing of information enhances the services that the BC government can provide and generates significant benefit for citizens. It allows government and its service providers to accurately ascertain the needs of the citizen and then meet those needs rapidly and efficiently. It quickly informs citizens of those government services in which they are most likely to be interested.

PTC Recommendation 9.1 *Ministries should be directed to share data collaboratively with programs outside their own Ministry and actively seek such opportunities in order to deliver seamless coordinated services to the citizens.*

Sharing information to deliver citizen centred services required two key shifts within government. One was a commitment to invest in technology across the government enterprise that allows this sharing of information. The second was a government⁹ wide commitment to actually use the information to deliver citizen centred services. In other words, government must commit to collaborative, integrated service delivery. Only then can the citizen fully benefit from the improved service delivery that government can provide through technology.

Government is meeting both of these challenges. An annual review process has been established for all IM/IT strategic project expenditures across government in partnership with the capital planning secretariat. This review and endorsement of prioritized projects will not only ensure they meet the necessary standards but will help achieve the integration and alignment of government systems.

The shift in culture required to deliver Citizen Centred Service is also taking place. This is best demonstrated by looking at the success of Service BC. Service BC is the front office of government and serves as a source for services and information. It delivers hundreds of programs and services to residents, business, and visitors online, in person and over the phone. It is the locus of integrated service delivery in BC, where the commitment to share information for more seamless services is tested through daily interaction with the citizen.

“Responsible sharing of information enhances the services that the BC government can provide and generates significant benefit for citizens.”

According to the Institute for Citizen Centred Service (ICCS), that service is working. ICCS conducted a survey of Service BC clients and benchmarked the results against other organisations. The survey included questions on accuracy and completeness of information, courtesy, and accessibility. Service BC scored over 4.5 out of 5 in every category. This also ranked them in the top ten in all categories. Perhaps most impressive was an overall customer satisfaction rate of 92%, ranking third out of the 66 organisations in the benchmarking group.⁹

Government 2.0

The Internet has had a revolutionary impact on our society and the way we do things. This is in part because it has given us access to such vast amounts of information. More importantly it has become a tool of the people. Users quickly realised they could use the Internet to express their ideas, solicit input and collaborate.

As the Internet became more interactive, it stepped beyond being a repository for information and became a tool for online collaboration and content generation. This new drive to collaborate and interact led to the development of things like blogs, wikis and discussion boards. Through these tools a collaborative discussion to generate an idea can now involve thousands of people. This kind of distributed idea generation, often termed Wikinomics, is exceptionally powerful because “no one is as smart as every one.”¹⁰

This phenomenon is called Web 2.0 and applying these tools and techniques for collaborative, online generation of ideas to government is called Government 2.0. There are many potential applications for government for as Kevin Kelly pointed out: “A network is a possibility factory.”¹¹ Government consultation need no longer be limited by the size of a board room or limited to the leaders of organisations. It will allow all citizens to have a more directive voice into their government, into the generation of policy and into the delivery of programs.

“Wikinomics is exceptionally powerful because no one is as smart as every one.”

Government should proceed cautiously though. The very nature of collaborative online systems automatically brings the most interesting ideas to the forefront because they garner the most discussion. However, simply opening up every decision to discussion is no way to proceed. There must be both control and leadership for a broad discussion to be fruitful so the ideas are generated with focus. “Without some element of governance from the top, bottom-up control will freeze when options are many. Without some element of leadership, the many at the bottom will be paralyzed with choices.”¹²

The infrastructure being developed to deliver citizen centred services will play a role in embarking on Government 2.0 in an effective manner. Depending upon the topic, government can choose to consult within the public service, or to specific groups of public, or to the broad public at large.

The BC government is already undertaking some Government 2.0 initiatives. Spark is an online space for collaboration within the BC Public Service. It was created internally as a discussion forum with the belief that every employee has the capacity and the responsibility to bring forward new ideas. The ideas can then be built upon and refined using the input from others. And although not every idea is a good idea, every idea deserves to be heard.¹³ Although Spark is quite a new system, as of mid March 2009 it had over 3,000 users and had generated over 500 ideas.

E-Learning Services

As discussed previously, PLNet provides the technology backbone for our education system. However, to take even greater advantage of the benefits that technology can provide to our students, the government made changes to the School Act in 2006. With this legislation British Columbia committed itself to using technology to provide equitable access to education and provide choice for students who have restricted options, like those in rural communities. In the end however, it is not just about rural students. It enhances all BC students' educational opportunities.

“Government can now make services available to all students in BC, regardless of their location...”

Because of this legislation and PLNet, government can now make services available to all students in BC, regardless of their location, the size of their school, or the number of courses that can be offered in any single school. In fact, the vast majority of students using on-line services are enrolled in their local school and are augmenting local services. Services usually available in only the largest schools are available everywhere through LearnNow BC.

LearnNow BC is an important component of the policy shift allowed by this change in legislation. This is a single point of entry to information about distributed learning in British Columbia. It is a website operated by the Virtual School Society that contains both distributed learning course details and information about student services available online. It is a one-stop website which provides access to choices and services for students across the province.

PTC Recommendation 6.5 The PTC recommends that the Ministry of Education:

- Continue research in e-learning for K-12 to include funding for school districts to use IP video and other telecommunications technology delivery systems.
- Conduct education programs for teachers to provide them with the skills necessary to utilise e-learning technology.
- Promote the use of technology in school districts.
- Continue to work with other provinces to research, evaluate and test, and cost-share in the implementation of e-learning strategies in the provinces K-12 system.

Through LearnNow BC, British Columbia's students also have a free, province-wide tutoring service. On-line tutoring now supports 21 secondary courses with fully automated mini-lessons and assessments, on-line video lessons and live one-to-one peer tutoring. In the year ended June 30, 2007, an average of 4,900 referrals to the on-line service were made each month. This rose to 9,600 per month in the year that ended June 30, 2008.

The resulting changes in BC's educational landscape have been dramatic. The number of students taking courses and programs on-line has risen from just over 16,000 before the legislation was introduced to almost 50,000 in the 2007/2008 school year. The rapid growth is continuing this school year.

PTC Recommendation 10.3 *That the Ministry of Education continue to use LearnNowBC as a central repository for electronic learning programming in order to ensure interoperability, quality, and effective use of resources.*

The resulting flexibility has enriched education for many students. For instance, a group of secondary students in the Sunshine Coast took a semester to learn movie making using local experts working in conjunction with their teacher. To create time within the school day, participants in the project used on-line courses to get ahead.

PTC Recommendation 9.4 *That the provincial government consider dedicating the time and resources needed to expand the limited e-examination system with a long term goal of e-examinations as the norm.*

Providing electronic exams is another way the government can use technology to provide more options to BC students. Such e-exams increase access to the benefit of those in special circumstances. This includes students participating in virtual and offshore schools or those who have special needs. But the advantages are not limited to these students. Greater access allows all students to learn at their own pace and take the exams when they feel prepared. In response to PTC recommendations on this matter, the Ministry now offers graduation exams electronically seven times per year. As a result, the number of e-exams administered increased more than tenfold from just over 2,000 in 2005-2006 to 25,000 in 2007-2008. This is clearly an option students enjoy having and the Ministry should continue to expand the e-exam program.

“The number of e-exams administered increased more than tenfold from just over 2,000 to 25,000.”

Giving students the capability of enrolling in neighbourhood schools, as well as through e-learning opportunities, requires good management of student information. The BC enterprise Student Information System (BCeSIS) is a shared student system that is being used by public schools, independent schools and First Nations schools throughout British Columbia. Each student in BCeSIS has only one integrated student record that can be accessed, with appropriate controls, by many teachers and administrators. First highlighted in the PTC 8th report, BCeSIS is being expanded throughout the province. This shared model will reduce costs and the administrative burden and free up resources to be dedicated elsewhere. All school districts have voluntarily signed up to implement BCeSIS and they are working to an end date in 2010.

E-Learning also plays a role at the post secondary level. The Distributed Medical Education Program was launched by the UBC Faculty of Medicine in partnership with the Government of British Columbia, the University of Northern British Columbia and the University of Victoria. After the province constructed new facilities in Victoria and Prince George, UBC used state of the art technology to deliver the education program in those facilities. The program encourages the physicians to remain the communities in which they were trained. Because of the program's success, it is being expanded and will include a new facility being constructed at the UBC Okanagan campus in Kelowna.

*“The number of students taking
courses and programs on-line
has risen from just over 16,000 to
almost 50,000.”*

Case: How Technology Makes Learning Fun



Technology as a tool can improve education by bringing the world to the classroom. The PTC has been consistent in recommending steps in this area. We have supported PLNet, as the backbone for delivery to all regions of the province, we have supported putting technology tools into the classroom, and we have supported providing teachers the proper training on how to use the technology once its there.

What it can do for a grade 6-7 class in a school like Silverthorne Elementary in Houston BC is

extraordinary. By linking the broadband from PLNet with Smartboard technology in the classroom and then training a teacher to use the technology you can really enhance the classroom.

Mark Fehr, the Principal of the school explains. "Being a little more isolated, living in the north, we feel out of touch with some things, but technology can bring the world right into our classroom. When the kids interact with it they are going to be a lot better equipped."

"It brings the learning alive," agrees Erin Short, one of the school's teachers. "I have access to so many resources out there."

But both Erin Short and Mark Fehr notice something else about the Smartboard. Because it makes the learning fun the kids seem more focussed.

"It really helps to grab their attention and keep their attention and get them excited about whatever it is we are learning," says Erin. "The students see movement and the projection and it means a lot more to them than seeing a picture in a text book."

Mark has also noticed the difference. "When the kids are interacting with the technology they seem a lot more focussed and pay a lot more attention."

This kind of learning is only going grow in BC. Over 150 Smartboards are already in use and ERAC, the purchasing agency for school districts recently negotiated a new deal for bulk purchasing of Smartboards and other electronic learning resources.

E-Health Services

Technology in the health care sector can help to enhance quality and control costs. As the PTC noted in its 7th report, the most important role for technology is ensuring that the healthcare system can deliver the right information at the right time to the right people to support personal health, healthcare decision-making, and health care system sustainability.¹⁴

In that report the PTC recommended the development of an individual Health Record that the patient can access and manage, that is private and confidential, and that is interoperable across the health system. This includes Regional Health Authorities, health care professionals and others authorised within the system. Such an undertaking is fraught with challenges. In addition to creating the technology backbone to support it (the eNG discussed earlier), government had to:

- find a way to integrate the Electronic Health Record (EHR) with the doctor’s Electronic Medical Record (EMR) in such a way that doctors could continue to protect patient confidentiality; and
- develop a governance structure to manage the development of the electronic health system.

The provincial government through the Ministry of Health Services (MHS) has tackled these challenges. The BC eHealth Strategic Framework was published in November 2005, and includes the empowerment of patients to help manage their own health and interact with the health care system electronically.

Then in 2006, the BC Medical Association (BCMA) and the province negotiated a new agreement covering physicians in British Columbia. As part of this negotiation, the parties agreed to work collaboratively to coordinate, facilitate and support information technology planning and implementation for physicians within the eHealth Strategic Framework. The net result is that the first of the EMR pilot sites involving some 1,000 physicians has started up, and physician practices are being connected via the PPN to access patient information in their EMR from office or home.

“Technology in the health care sector can deliver the right information at the right time to the right people.”

To govern the transition to greater use of technology infrastructure, the MHS is leading development of an eHealth Governance Structure that includes broad management and stakeholder membership. Included in the process are an eHealth Strategy Council, an eHealth Deployment Task Group, a Clinical Integration Working Group and the Health CIO Council.

What this all means is better, more efficient health care. It will provide better access to services like Telehealth. In fact, specific Telehealth network requirements have been provided to both the eNG design team and the First Nations Network design team. The First Nations Network will be connected to the Health Authority eNG to enable Telehealth service delivery. Within the First Nations Network, the goal is to enable up to 51 communities to receive Telehealth services.

The Knowledge-Based Economy

British Columbia, like much of the world, is facing difficult economic times. However, BC is well positioned to weather the storm and the technology sector can play a key role in the recovery. This sector has grown over the past decade and the fundamental factors that have driven that growth remain. Furthermore, the measures that government has taken to capitalise on those fundamentals have helped position the technology industry to capitalise on the recovery.

A Profile of Growth Since 2001

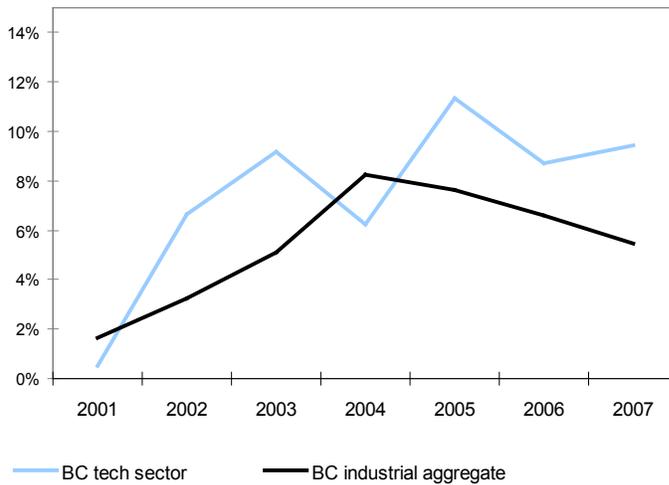
Over the past eight years, the technology industry has been a growing contributor to BC's economy. It has increased in size and significance and it is playing a key role economic diversification.

Table 1. Contribution to BC economy by technology sector and other selected sectors in 2007 ^{15 16}

	GDP contribution (\$ million)	% of GDP	Employment	% of total	Exports (\$ million)
Agriculture	1,062	<1%	36,200	2%	441
Forestry & logging	2,961	2%	24,300	1%	394
Fishing, hunting & trapping	130	<1%	2,900	<1%	199
Mining and oil & gas extraction	4,474	3%	20,000	<1%	7,084
Resource based total (primary)	8,627	6%	83,400	4%	8,118
Construction	8,996	6%	196,900	9%	N/A
Wholesale and retail trade	17,962	12%	365,100	16%	N/A
Accommodation, food services	4,572	3%	172,700	8%	N/A
High technology	10,335	6%	81,100	4%	877

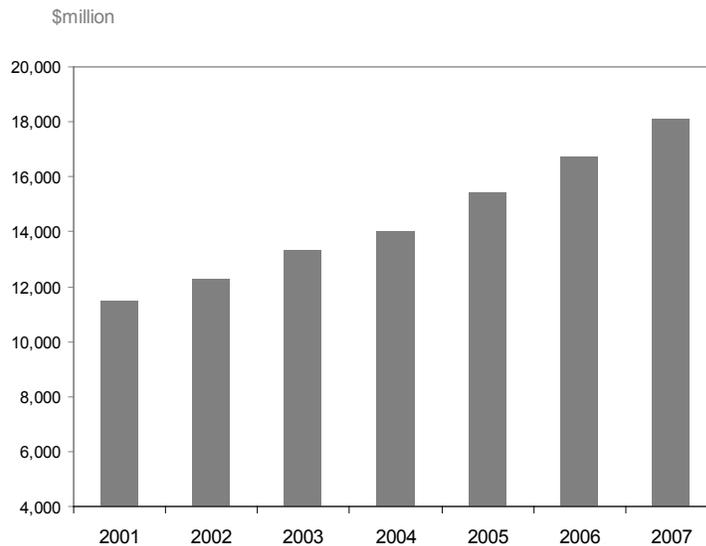
This growth is reflected by the numbers. The technology sector's contribution to GDP has increased by 64% since 2001 raising it to 6% of BC's total GDP which is more than construction or the primary resource industries.¹⁷ Overall revenues are now at \$18.1 billion, an increase of 58% since 2001. Employment figures are also strong. In 2007, the technology sector employed just over 81,000, an increase of some 20% since 2000. This represents a growth rate that is higher than the industry average. As important as the growth rate in these jobs is the quality of them. The wages for these jobs are higher than in many other sectors.¹⁸

Figure 1. Tech sector contribution to GDP growth versus industrial aggregate¹⁹



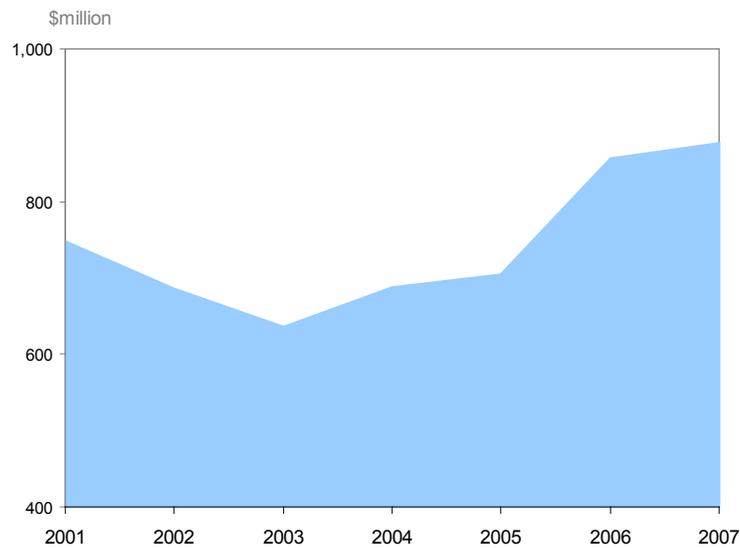
Because our technology industry is still quite immature, it represents an opportunity for continued growth. This is particularly true in regards to exports. In 2001, exports were a healthy \$748 million in goods and \$1.5 billion in services and have grown by almost 20% (goods) and 75% (services) since 2001.²⁰

Figure 2. Tech sector revenues 2001-2007²¹



The economic showing of the technology sector is even more impressive in the context of the collapse of the technology bubble in 2002. The growth numbers, particularly exports, are even stronger if compared to the low of 2003. They have grown by nearly 40% since that time. However, they still represent only 2.8% of BC's exports.²² As this industrial sector matures and grows, so will its contribution to BC's exports.

Figure 3. Tech sector exports 2001-2007²³



Our resource industries have always been so strong that the growth of the technology sector has gone almost unnoticed in some quarters. Yet the expansion is an important factor in the diversification of the economy away from dependence on the resource base. Although in terms of exports, resource products are still the leader, technology is now becoming more significant in terms of overall contribution to GDP. The sector now accounts for a larger portion of GDP than either of the extraction sectors and has even surpassed the construction sector. The technology sector is helping BC to build a more diversified economy that will be less prone to the boom and bust commodity cycle.²⁴

“The technology sector’s contribution to GDP has increased by 64% since 2001.”

Economic Crisis

The year 2008 will forever be remembered for the global economic crisis. Although this is no longer news we need to understand of it this means for BC. Only then can we understand its impact on the technology industries and how the technology sector can be one of the levers to speed BC's recovery.

The year was one of record volatility which built to the financial crisis that surfaced in September.²⁵ Oil prices swung wildly and commodity prices fell. The financial industries underwent an abrupt and fierce restructuring. Lehman Brothers collapsed in mid September and global financial institutions fell like dominoes.²⁶ The stock markets reacted negatively and between early September and the end of the year the Dow Jones Industrial Average lost almost 3,000 points or about 25% of its value.^{27 28} One of the early casualties was the Canadian dollar which dropped 18% versus the US dollar between the end of September and October 24.²⁹

“The U.S. economy contracted at a 6.2% annualized rate in the last quarter of 2008.”

As 2008 drew to a close, a number of developed countries were either in recession or close to it. This below trend growth is anticipated at least through 2009, regardless of the stimulus packages being engineered around the globe.³⁰

The U.S., by far BC's largest export market, was hit first and hit hard. The U.S. economy contracted at a 6.2% annualized rate in the last quarter of 2008 as consumer spending declined at the fastest rate in 28 years.^{31 32} The US lost 2.6 million jobs in 2008 (worst since 1945) and is expected to shed roughly 1.1 million jobs in 2009.^{33 34 35} The housing market declined abruptly as US housing starts fell by almost 30% in the first nine months of 2008.³⁶

Other economies are not immune. A number of Asia Pacific economies have slowed sharply, and some are close to recessionary conditions. Real GDP growth in the region is expected to average around 4.5% per year over the short term, down from a growth rate of 6% in 2007. Most Asian equity markets suffered record losses of well over 30% in 2008. In Europe the outlook is also bleak with GDP growth already stalled in the United Kingdom, Germany and France.³⁷

“The province of BC is reasonably well positioned to ride out this storm.”

Canada is also afflicted. The Conference Board of Canada estimates that the real GDP growth in Canada will be limited to 1.5% in 2009 (down from 2.7% estimated in the summer).³⁸ Employment is also impacted as, according to Statistics Canada, an astonishing 129,000 full-time jobs were cut in Canada in January of 2009.³⁹

The province of BC is reasonably well positioned to ride out this storm. The Canadian banks are widely recognised as the most stable in the world at the moment. BC's Triple-A credit ratings from both Standard and Poor's and Moody's Investor Service speaks to the strength of our economy and sound fiscal management. However, our largest markets are all facing challenges and there are bound to be serious consequences. BC's economy began to suffer towards the end of last year and BC lost a record 35,100 jobs in January of 2009.⁴⁰

In the 2009 provincial budget the government projected that BC's economy will contract by 0.9% in the coming year but is expected to recover and grow by 2.4% in 2010. The expected growth in 2010 is to be fuelled by the recovery in the US, particularly as the demand for housing returns.⁴¹

ECONOMIC CRISIS AND THE TECHNOLOGY SECTOR

The crisis creates some specific challenges for the technology industry. In spite of the sector's strength there are three key challenges that BC must acknowledge.

- **Limited Access to Capital** – Banks are not lending in sufficient quantities to stimulate the economy. In the United States, new loans to large companies for the quarter ending November 2008 slumped 37% compared to the preceding quarter.⁴² While Canada's banks are stronger than the American banks, it is still challenging to get money. Some 63% of executives said they were having difficulty securing credit in the latter part of 2008 compared to 44% in the fall.⁴³ This capital crunch has spilled over into the VC market. US Venture capitalists invested \$28.3 billion in 3,808 deals in 2008, marking the first yearly decline of total investments since 2003.⁴⁴
- **Reduction in Demand for Technology** – In a financial crisis, industry has fewer resources to invest in technology upgrades. This became apparent last fall when many companies, started to experience decreasing orders. As a result, several of the technology industry's biggest names have issued downward forecasts. Cisco Systems warned that sales in the fourth quarter of 2008 could drop 10%. Intel believes sales for the third quarter of that year could plummet as much as 19% and Sun's shares have lost more than 80% of their value over the course of 2008.^{45 46}

A January poll of some 150 high technology executives by the Canadian Advanced Technology Alliance (CATA) found that almost three-quarters (73%) believed there would be either a decline in sales or that their companies would be "badly wounded".⁴⁷

- **Reduction in Government Revenues** – The provincial government has suffered a decline in revenue as a result of the financial crisis. The surplus forecast for 2008-2009 is now down to only \$50 million from previous estimates of \$800 million. In 2009-2010 and 2010-2011, BC is expected to run deficits of \$495 and \$245 million respectively before returning to surplus budgets in subsequent years. Government has responded quickly with a ten point plan to mitigate the impact of the economic decline on British Columbians. The plan includes \$14 billion in infrastructure spending and an additional \$485 million in tax relief and support for businesses, families and individuals over the next three years. More specific to technology, the budget includes infrastructure funding in the form of a \$1.7 billion investment in post-secondary education facilities, \$5 million over three years for the Connecting Citizen's Grant program to encourage delivery of 'Last Mile' broadband connectivity and \$8 million over three years to complete the BC portion of the hydrogen highway. In addition to these infrastructure investments the government is planning other spending to encourage the innovation economy in these troubled times. It has budgeted \$15 million to support health research at the Michael Smith Foundation, is investing \$16 million over three years to remove barriers to BC's immigrant workforce and extended the ICE fund for another three years at \$25 million annually.⁴⁸

In spite of this crisis, BC has taken specific steps that will help the technology sector to play a key role in our economic recovery. The PTC sees six areas where government has worked to encourage an innovation economy. The reasons for taking action in these areas have not changed with the economic collapse. These steps include:

- ensuring BC has skilled talent;
- supporting industry development through addressing taxation and regulatory barriers, and increasing access to capital;
- investing in research and development;
- encouraging clean energy and technology;
- encouraging both traditional and new sectors; and
- building export markets, particularly in the Asia Pacific.

These strengths were built with advice from the Premier’s Technology Council and continued action on PTC recommendations will help the province use the platform that has been built over the past decade to launch our innovation economy into the next decade.

People: Education and Immigration

One of the most critical areas to examine is how BC can train, attract and keep people as we go forward in an increasingly demanding global environment. It is often a mantra of companies, governments, and indeed the whole society, that ‘we are only as good as our people’. The government has worked hard to put BC at the forefront in some key areas.

AFFORDABLE, HIGH QUALITY UNIVERSITIES

Universities are a critical contributor to an innovation economy, not just because a university is the cradle of innovation, but because it creates the actual innovators – the High Qualified Personnel (HQP) that drive a knowledge-based, innovation economy. The link is clear. A multi-country study found that increasing the national average educational attainment level by one year, increased aggregate productivity by 5%. In addition a 1% increase in numeracy and literacy skills leads to a 1.5% permanent increase in GDP.⁴⁹

PTC Recommendation 1.1 Double the number of computer science and electrical engineering graduates from British Columbia post-secondary institutions.

That is why BC's strong university system is such an asset. According to a Global Competitiveness Ranking (2008) by World Economic Forum, Canada's educational system gets excellent marks for quality (ranked 9th in the world).⁵⁰ The Shanghai Jiao Tong University publishes an annual academic ranking of the top research universities in the world.⁵¹ UBC is in the top 35 in this ranking and in another global ranking by Times Higher Education (UK) UBC was 12th Social Sciences education.⁵² Although, it is particularly positive to have one university that has garnered such international recognition, UBC is not alone. UVIC and SFU are both in the top 300 of the Shanghai ranking and SFU ranks 64th in the Times study. In business education both UBC and SFU have the prestigious Advance Collegiate Schools of Business (AACSB) accreditation. The province continues to add to our assets, having created seven new universities since 2001, including five in 2008.

Of equal importance to the quality of BC's university system is its affordability. According to the OECD students in Canada pay about 30 % less per academic year (US\$3,464) than those in the US (US\$5,027).⁵³ Tuition fees are the fifth lowest in Canada, and fee increases have been limited to two per cent for the past three years.⁵⁴

Affordability measures should also account for other supports including government grants, loan remission programs and tax reductions. The measure of net price, developed by the Education Policy Institute, takes into account tax measures by governments and once tax credits are taken into account, average net tuition is less than \$2,000 in British Columbia.⁵⁵

The BC government has built on this strength. It has provided \$1.44 billion in student financial assistance since 2001. Student Aid BC funding has increased year over year by approximately \$6 million and last year alone the government forgave or reduced \$77 million in loans for 24,000 students. As a result, a full half of BC students graduate without debt, and 90% of those who have borrowed are making their payments on time.⁵⁶

Such measures will ensure that BC's strong university system will remain a key contributor to its innovation economy in years to come.

“According to a Global Competitiveness Ranking (2008) by World Economic Forum, Canada’s educational system gets excellent marks for quality (ranked 9th in the world).”

Case: The Centre for Digital Media



Finding the right people is critical to any successful economy. When the PTC looked at our world-leading digital media sector they knew that for it to remain a world leader BC would need to cultivate the right kind of people. That is why they recommended that the province fund the formation of the Centre for Digital Media at the Great Northern Way Campus. It has been operating for less than two years and already its Masters of Digital Media (MDM) Program is turning out top notch people and turning heads around the world.

Tarrnie Williams, the CEO of local video game company Relic Entertainment explains what the program means to his company. "Having this program located here reinforces Vancouver's position as one of the world's key digital media centres. So the best talent, whether just starting out, or with years of experience, will be attracted to the area. This then contributes to Relic's ability to attract the best talent worldwide."

Tarrnie also makes clear that it's about more than just people, it's about the ideas those people bring with them. "The video game industry is an industry of rapid change, and to successfully compete in that climate, we need a continual flow of new ideas and new approaches. As video games continue to evolve, their creation requires an ever-widening range of skills, and having people trained locally in digital media at a Master's level gives us an increased opportunity to take advantage of these new and evolving ideas and the people who create them."

For students and businesses alike the approach the program takes is exciting. The students work together in teams to address real world challenges brought to them by industry. The projects run the gamut from virtual transit information terminals, to interactive museums, to mobile telephone applications. For the students this interaction with industry is a bonus.

“The biggest benefit of the program is the chance to study with executives currently working in the industry,” states Mark Freeman, one of the graduate students. “This has provided insights that I’m sure I’ll find extremely valuable upon graduation, whether I’m joining a company or launching my own start-up.”

Mark Freeman and Tarrnie Williams also agree on something else. The fact that the students come from differing backgrounds is an important part of the MDM program. Tarrnie believes it contributes to the generation of new ideas. “The program allows students to come from a very diverse set of backgrounds – something that I find very exciting,” he said.

For Freeman it just adds to the spice of the program, “The best part is the chance to collaborate with talented people from diverse professional and academic backgrounds - and to play video games for “homework,” he adds with a grin.

But is the formula actually working? Is this program keeping BC at the forefront of innovation in this sector? Telefonica the Spanish telecommunications giant thinks so. Their Second Annual Research Fair was held in November 2008 and had more than 60 submissions from their research centres based around the world. Yet it was a team of MDM students who walked away with the big prize for “Best New Business Opportunity”. That sounds like success already and the MDM has really only just begun.

SCIENCE AND MATH IN K-12

Although university completion is the most relevant indicator of a country's ability to produce innovative talent, studies show that the choice of discipline matters to outcomes as well. Mathematics and scientific disciplines in particular drive the bulk of innovation for a knowledge economy.⁵⁷ That is why, in spite of the quality of our university system, we need to increase the number of graduates holding advanced degrees in math and science to remain competitive into the future.⁵⁸

At 18.4%, the proportion of graduates with math, sciences or engineering background in Canada is among the lowest in the 17 benchmarked countries and is decreasing.⁵⁹ In BC the share of science degrees (math, computer science, physical and life sciences) is lower still at less than 15% of total undergraduate degrees awarded and engineering degrees (architecture, engineering and related technology) was 5%.⁶⁰ This does not compare favourably with countries like Germany, Finland and UK where approximately 30% of the educated population have a degree in these fields.⁶¹ More importantly our Asian competitors and trading partners are creating graduates in math and science at an astonishing rate. India, for example, has a domestic talent pool of 14 million recent graduates.⁶²

“We must encourage more students to take science and math courses at the secondary level.”

The root of this challenge is not at the university level but at the secondary school level where students first begin to make education and career decisions. International testing shows that up to a certain level Canadian students score exceptionally well in math and science. The OECD Programme for International Student Assessment (PISA) assesses national performance levels for students at age of 15 in science and math literacy. It ranks Canada third in science and seventh in math.⁶³ Unfortunately, at a more senior level Canada does relatively poorly on the percentage of secondary school students who score above 600 on standardised testing.⁶⁴

This is not because Canada and BC have poor education in math and science. It is because not enough students choose to take these courses. In the 2007-2008 school year fewer than 26,000 BC students took grade 12 math, which is less than 40% of the total. Biology 12 and Chemistry 12 had even lower participation rates of 34% and 23% respectively while only 15% of the students in grade 12 took Physics 12. The BC system builds a strong base for math and science early and has quality institutions at the post secondary level. We must encourage more students to take science and math courses at the secondary level so they will go on to the science and engineering courses that are a strength of our system and one of the bases of an innovation economy.⁶⁵

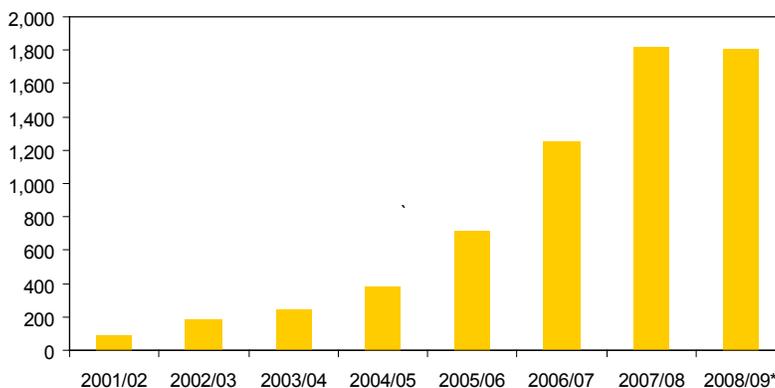
BRINGING TALENT TO BC

Another of BC’s strengths is its ability to welcome the talent it attracts. BC has the reputation of a beautiful place to live with a growing tech industry, and competitive tax rates. BC is already highly multicultural, with more than one quarter of British Columbians and more than a third of the citizens of Vancouver being born outside the country. BC’s proximity to the US is also a selling point for US companies looking to place research centres or for a foreign company looking to situate near one of the largest markets in the world.

“With nearly 2,800 nominations the technology sector has been a particular beneficiary of the PNP program.”

The provincial government has added to these natural advantages through the Provincial Nominee Program (PNP). It provides a simple and expedient process for bringing skilled immigrants to BC. 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. The technology sector has been a particular beneficiary of the program. It has made nearly 2,800 nominations, over 40% of the total.⁶⁶

Figure 4. BC PNP Total Nominations in the Strategic Occupations Category⁶⁷



*April 1, 2008 - December 31, 2008

PTC Recommendation 2.45 Focus its marketing strategy to attract highly skilled workers or those individuals that may be predisposed to move to Canada such as expatriate Canadian and British Columbia technology workers and members of communities that are already represented in British Columbia.

Table 2. BC PNP Nominations in Technology-Related Occupations⁶⁸

Occupations	Total
Telecommunication Carrier Managers	7
Managers in Engineering, Architecture, Science & IS	106
Managers in Health Care	8
Prof and Tech Occupations in Natural & Applied Sciences	1,405
Prof and Tech & Skilled Occupations in Health	1,088
Occupations in Motion Pictures, Broadcasting	8
Graphic Designers & Illustrators and Technicians	101
Technical Sales Specialists	49
Supervisors, Resource sector and manufacturing	2
Total	2,774

This simple process is even more advantageous when compared with the process in the United States. Specific quotas are fairly quickly reached. The challenge is compounded by stringent security regulations and long timelines for approval.^{69 70} This prevents foreign students who graduate in the US from saying there and hinders companies who are trying to bring in HQP. Bill Gates clarified the problem during a United States Senate testimony in 2007 and even noted our opportunity stating “countries like Canada and Australia have been beneficiaries of our system discouraging these people with both the limits and the long waits and what the process feels like as they go through the security checks.”⁷¹

“The ability to employ talent from other parts of the world was among the key reasons Microsoft brought an R&D centre to BC.”

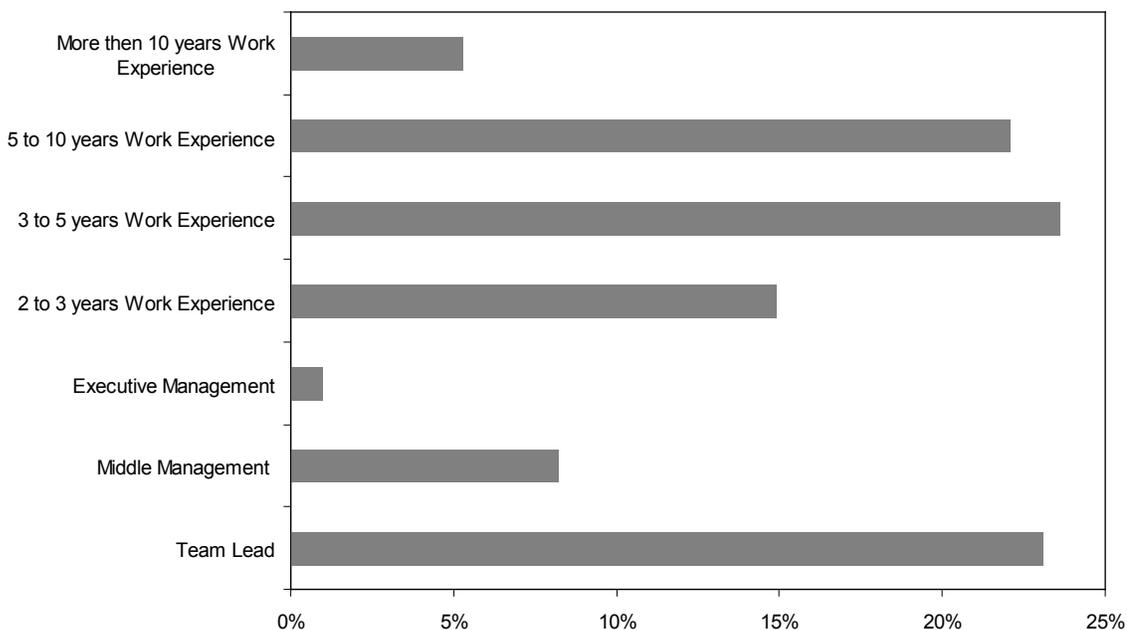
This was later borne out by action in 2007. The ability to employ talent from other parts of the world was among the key reasons Microsoft brought an R&D centre that employs more than 300 software engineers to BC in 2007.⁷²

LACK OF EXPERIENCED EXECUTIVES

Even with this progress, BC needs continued focus on the lack of experienced executives, particularly with sales, marketing, and product management experience. The lack of scale and small number anchor companies in BC’s technology sector both contribute to this problem as it means there are few companies that can train executives. Furthermore, the small size of the sector makes it hard to attract them since there are not enough options should someone decide to leave a position or look for another opportunity. According the BCTIA’s TechTalent BC survey, management positions represent almost a quarter of the difficult positions to fill. Furthermore, companies are looking for extensive work experience in these areas (Figure 5).⁷³ Attracting this kind of talent should remain a key priority of the provincial government.

“Management positions represent almost a quarter of the difficult positions to fill.”

Figure 5. Hiring needs in BC technology sector⁷⁴



Business Environment: Taxation and Regulatory Reduction

The BC government has made a series of conscious policy decisions to encourage business investment in BC. These include regulatory measures as well as taxation measures.

POSITIVE ENVIRONMENT FOR BUSINESSES

BC has a strong general business environment in part because of our national stability. In the WEF's Global Competitiveness Ranking for 2008, Canada ranked 15th in the world for the institutions pillar (legal ownership rights, absence of red tape, transparency, trustworthiness, good governance).⁷⁵ The nation also tied for first in a survey by Transparency International to determine the least corrupt countries.⁷⁶

Within Canada, BC is considered a good place to conduct business. Six BC cities are in the top 40 places to do business in Canada according to the Canadian Business Online 2008 ranking⁷⁷ and according to the Canadian Federation of Independent Business, three BC cities are in the top 10 cities for entrepreneurs.⁷⁸

The provincial government has worked hard to create and maintain this environment. BC has eliminated 163,000 regulations since 2001 to support small business growth. This represents a reduction of 43%. BC has also taken significant strides with regards to corporate taxation. Since 2001, the general corporate income tax rate has been reduced by 33% and is now on par with the lowest corporate tax rates in the country. In fact, corporate tax reductions planned for the next three years will give BC a combined federal-provincial rate of 25%, among the lowest corporate income tax rates of the world's major industrialized economies. When this is combined with other measures like training tax credits and venture capital tax credits, BC becomes a very attractive place to conduct business. Compared with west coast of the United States, BC now offers a 20% savings in annual corporate operating costs.^{79 80}

“Compared with west coast of the United States, BC now offers a 20% savings in annual corporate operating costs.”

By removing cost and regulatory barriers on such a broad scale, BC makes it easy for companies to prosper here.

COMPETITIVE PERSONAL INCOME TAX STRUCTURE

Personal taxation is also an important component of the business environment. Low taxation rates make it easier to attract personnel, particularly highly trained personnel. As we noted in the people section, the worldwide competition for talent is fierce and one of the key decision making criteria for these people is the income tax rate. The BC government has long realised that and has taken action to allow our technology industries to compete for talent.

Since 2001, the BC Government has introduced over 100 tax cuts for British Columbians and we now have the lowest personal income taxes in Canada at every level for those earning up to \$116,000. The latest of these measures was announced in the Economic Plan in October, 2008. There will be a 5% personal income tax reduction retroactive to January 1, 2008 that will put an additional \$144 million in the pockets of British Columbians.^{81 82}

Table 3 shows the impact of these changes by comparing BC taxes payable using rates in effect prior to the changes in 2001 and after the rates are cut for 2009.

Table 3. BC personal income taxes⁸³

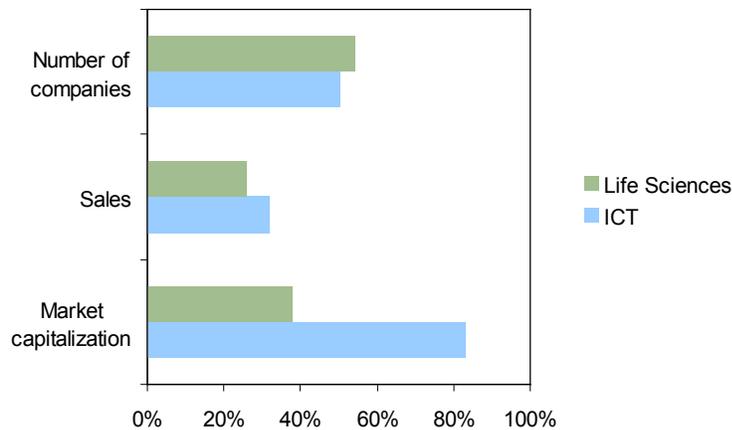
Taxable Income	BC tax before 2001 tax cuts	BC tax after 2009 tax cuts	Reduction in BC tax	Percentage change in BC tax
\$15,000	\$419	\$0	\$419	-100%
\$20,000	\$810	\$205	\$605	-75%
\$30,000	\$1,594	\$960	\$634	-40%
\$40,000	\$2,553	\$1,564	\$989	-39%
\$50,000	\$3,721	\$2,321	\$1,400	-38%
\$60,000	\$4,911	\$3,091	\$1,820	-37%
\$70,000	\$6,101	\$3,861	\$2,240	-37%
\$80,000	\$7,769	\$4,910	\$2,859	-37%
\$100,000	\$11,525	\$7,418	\$4,107	-36%
\$120,000	\$15,465	\$10,358	\$5,107	-33%
\$150,000	\$21,375	\$14,768	\$6,607	-31%

“The BC Government has introduced over 100 tax cuts for British Columbians and we now have the lowest personal income taxes in Canada at every level for those earning up to \$116,000.”

ACCESS TO CAPITAL

Venture Capital is one of the most critical components of a technology based economy. A full 50% of ICT companies in the Top 1000 Canadian Publicly Traded Companies received venture capital investment as emerging private companies. Venture capital backed companies represent 32% of total sales and 83% of total market capitalisation within this category (Figure 6). Venture capital-backed technology companies generate close to 150,000 jobs in Canada (1.3% of all private sector employees) and 1% (\$14.5 billion) of Canadian GDP.⁸⁴

Figure 6. Share of venture capital-backed companies among technology companies present in the top 1000 Canadian publicly traded companies ⁸⁵



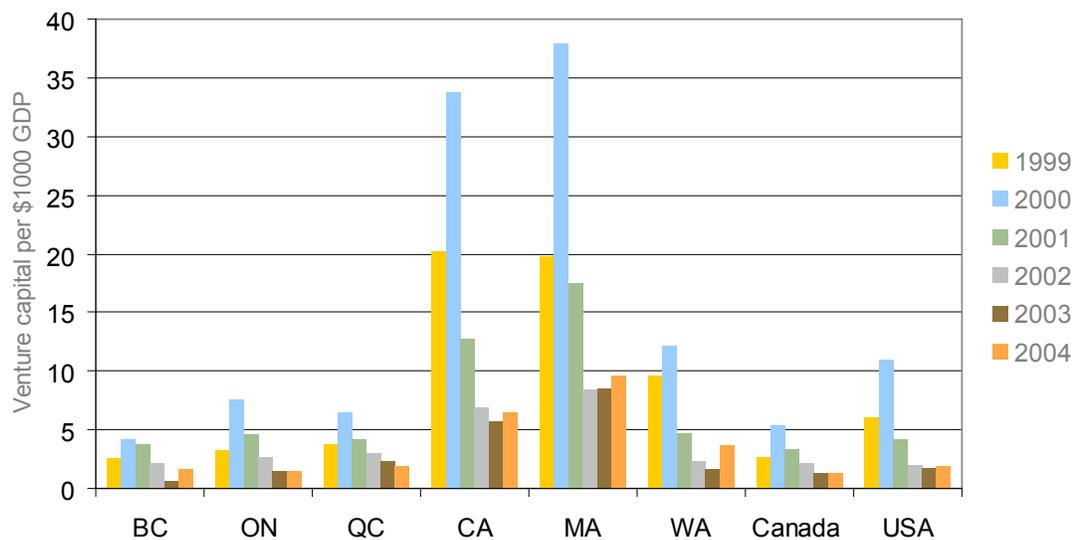
Some aspects of venture capital investment in BC have been very strong. The province now captures 19% of all the venture capital invested in Canada which is an increase from previous years. It attracted \$259 million in venture capital investment but that does not include the \$66 million invested under the *Small Business Venture Capital Act* primarily by angel investors.⁸⁶ Furthermore, overall venture investment in BC from U.S. investors remains at 44%, which is well above the national average of 30% and demonstrates foreign investor confidence in our technologies.

PTC Recommendation 6.12 *The PTC recommends that government expand the tax credits under the SBVC Act.*

In total, the programs operating under the *Small Business Venture Capital Act* raised approx \$91 million for investment in early stage companies - a record amount which includes \$17 million dedicated to Clean Technology companies. In spite of this success however, venture capital investment in BC still trails Quebec and Ontario and is well behind the leading tech centers like California, Washington and Massachusetts.^{87 88}

Unfortunately the venture capital situation is worsening on a Canada-wide basis. The Canadian industry has always been smaller than the US industry and the gap is widening. Between 2003 and 2008 the investment pace in Canada has only been 60% of that in the US. The challenge is that the industry has not been able to garner consistent enough returns to attract institutional and foreign investors and the funds are now shrinking. The decline of Canadian funds had been compensated for by increased American investment but with the financial crisis that has been abruptly corrected. The turmoil in the financial markets has combined with the steady decline of Canadian investment funds to make the year ending 2008 a challenging period for the venture capital community in Canada and BC.⁸⁹

Figure 7. Venture capital investment rate 1999-2004 in selected jurisdictions⁹⁰



In 2008, venture capital investment in Canada declined from \$2.1 billion invested in 2007 to \$1.3 billion in 2008. Venture capital investment from U.S. investors declined by 55% from \$845 million in 2007 to \$371 million in 2008. The most marked decreases came to the provinces of Ontario and Quebec which witnessed investment declines of 40% and 46% respectively. British Columbia has not been immune to this recent downward trend. The \$259 million in investment cited earlier actually represents a decline of 18%. Canada-wide, many burgeoning technology companies could cease operations due to lack of cash.^{91 92}

To address this challenge and add to the depth of the venture capital community in BC, the province established the BC Renaissance Capital Fund (BCRCF) as a crown corporation in 2008. The BCRCF was initiated with \$90 million earmarked for investment in top-tier fund managers from both the United States and Canada. Criteria used to select these managers included their ability to

source and finance investment opportunities from BC and develop them into anchor technology companies. Other provinces have adopted a similar model including Alberta, Ontario and Quebec since the BCRCF was introduced.

Arch Ventures, Kearny Venture Partners and Vantage Point Venture Partners have finalized their capital commitments with the BCRCF and have begun evaluating and making investments in BC. In 2008, Vantage Point and Foursome Capital from the UK invested \$12.5 million in Ostara Environmental Technologies Inc. This company using technology developed at UBC for extracting phosphate from waste water is now exporting systems to the United States including the city of Portland, Oregon. The investment was the 4th largest financing in Canada by value last year according to Thomson Reuters.⁹³

Presently in 2009 the BCRCF has tendered another request for manager qualifications (RFQ) valued at \$55 million for investment in up to 3 fund managers. Venture fund managers working with the information technology and clean technology sectors are the focus of this current RFQ. The process is expected to be completed by the end of June.

“Other provinces have since adopted models similar to the BCRCF including Alberta, Ontario and Quebec.”

Case: The Ripple Effect of Capital Investment

One of the largest challenges faced by growing technology companies is access to venture capital. Government has a number of venture capital programs to help companies bridge this gap and grow. The PTC has long supported them because of their effectiveness at growing companies, growing our economy and creating jobs. And when one company strikes big success it is like throwing a rock into a pool of water. The ripples just grow and grow as that economic success spills over to the rest of the province.

ALI is one example of such a company. Founded in the mid 1980s by Peter Keefe, Dr. Don McIntosh, Chris Hanna, Peter van Bodegom and Len Grenier, their original concept was to build a light scanner to detect breast cancer. Unfortunately, the original idea failed after a couple of years. However, during the course of developing the light scanner, they stumbled upon the idea to use microcomputers and software to replace the use of film in the radiology department of a hospital. The images were captured as they were scanned in the examination room, automatically stored and sent to the radiologist who could then send a report the referring physician. The whole process was simpler and faster and allowed the radiologist and the technologists to spend more time with the patient.

Their first angel was Milton Wong who invested about \$5 million over the first few years. He helped Chris, Peter and Len get off the ground, but ALI was going to be up against the industry giants who already filled that space – GE, Philips, Siemens, AGFA and Kodak. Small companies like theirs would have real trouble facing the big boys without more substantial investment dollars, and expertise on how to grow the company.

That is where the government venture capital programs stepped in. In the early 1990s they came along to boost the company further. Discovery Capital (a BC provincial Venture Capital company) invested about \$750,000 in ALI and then another key investor came aboard in 1992 using the BC Venture Capital program.

But investors like this bring more than just money to the table. They bring business know-how. It was Discovery Capital that eventually connected the company with Greg Peet who joined as CEO in 1993. Under his leadership the company really took off. Between 1993 and 1997, ALI grew from a modest 11 employees, to more than 50 employees. By 1997, ALI was emerging as a recognised healthcare software leader with 70% of the ultrasound image archive market. Leveraging this position, ALI went after the radiology image market and went on to become one of the three market-share leaders in North America. It was eventually acquired by McKesson in 2002 for more than half a billion dollars in cash.

Many mistakenly believe this is where the venture capital story ends - a company sells and the investment and the jobs are lost. That is rarely the case. ALI stayed and grew here in BC and is now called McKesson Medical Imaging. At the time of acquisition there were 185 people at ALI with revenues of approximately \$45 million. Now there are nearly 1,000 people working here in BC and generating over \$350 million in revenues.

But the story goes beyond that. Not just the company stayed in BC, that half a billion in cash did too and the ripple effect is still being felt. Those investors and company founders who profited from the sale didn't just disappear into the woodwork. They remain here in BC and have continued to invest – and they regularly use the provincial VCC program to do it.

“Yaletown Venture Partners has taken advantage of a couple of opportunities that I am an early investor in, Cogent Health Solutions and Genologics Life Sciences Software,” says Peter van Bodegom. “I used the VCC program in both cases.”

In addition to those two companies, Greg Peet became an active angel investor and independent company director in the BC technology companies including:

- Blast Radius - a digital media software and services acquired by WPP in 2007;
- Contigo - mobile asset tracking security systems;
- TIR System - a solid state lighting company acquired by Philips Electronics in 2007;
- Vigil Health - patient monitoring and nurse support systems for the aged; and
- Cogent Health – a disease management software for cancer survivors.

Each of these had key capital investment driven by the government venture capital programs and each had involvement in one way or another of the key players from ALI.

That is the ripple effect and those Venture Capital programs still exist today and still bring wealth and jobs to BC.

Research and Commercialisation

IMPROVING R&D COMMERCIALISATION

As stated earlier, British Columbia has a strong university system. This is not only important because it creates people, but because Research and Development is another critical driver of an innovation economy. The BC government understands this. It has increased investment in research by 100% since 2001, a total of over \$1.5 billion.^{94 95} There is an opportunity to boost the return on that investment by strengthening the linkages between academia where the much of the research takes place and industry where it can be commercialised.

According to the Conference Board of Canada one substantially new and commercially successful product or process innovation is generated for every 3,000 ideas.⁹⁶ Association of University Technology Managers (AUTM) data reveals that the progressive yield along the innovation supply chain is approximately 50% at each successive stage of the process. With a starting number of one invention for every \$2 million, the number of patents filed is about 50% of the number of inventions, the number of patents issued is about 50% of that and the number of proofs of concept and prototypes developed (product opportunities) is about 50% of that.^{97 98} That means there is approximately one product opportunity generated from every 8 inventions.

“The BC government has increased investment in research by 100% since 2001.”

By assessing the total number of product opportunities – or commercially relevant innovations - available through this process, one can determine the innovative capacity of a jurisdiction. The key figure is that private R&D is 15 times more effective in developing innovative capacity. Hence, it is no surprise that the return on investment improves significantly when the research projects are partnered with industry. For example, in Finland the commercial yield of public private research partnerships organised through Tekes, the national technology agency, was twenty times better than pure university research.^{99 100}

PTC Recommendation 1.2 Establish 20 British Columbia Research Chairs in the fields of medical, social, environmental, and technological research.

There a number of ways to improve linkages between industry and academia in order to better capitalise on the opportunity presented by our investment in research. These include partnering research so industry and academia work more closely together and promoting the movement of people between the university sector and industry. To facilitate the later, other jurisdictions have practices and policies that support faculty members as they engage in private sector activities, like starting their own business. Some of the most successful technology companies in BC were founded by faculty members.

It is not just faculty, but graduate students that need to be encouraged to engage with industry. Co-ops and internships not only prepare students to enter the workforce but enable them to contribute more quickly. In BC there are currently two successful models, WestLink's TCIP and MITACS. Because MITACS in particular has been improving linkages to garner a better return on research investment, the provincial government announced an added \$10 million for a graduate student internship program in June 2007. This will triple the size of MITACS over the next four years.¹⁰¹

Another way for jurisdictions, particularly smaller jurisdictions, to make research funding more effective is through focussed strategies. Finland, Switzerland, Sweden, and Israel are all jurisdictions that centralise the allocation and distribution of research funding to meet a strategic need.

Noting the success of such jurisdictions the province created a Research and Innovation strategy that focuses on certain key sectors including: life sciences, technology, clean technology, and natural resources. The BC government is now working on a ten year plan for implementation of that strategy. Provincially, this is a strong first step, but other jurisdictions have achieved great success through a more focused strategy and more dedicated resources.

“The provincial government announced an added \$10 million for a graduate student internship program in June 2007.”

Case: How Investment Creates Jobs

BC's Venture Capital programs continue to help BC's technology industry grow. Genologics is an excellent example of how this works.

Genologics was a spinoff from the University of Victoria. Established in 2002, it is headquartered in Victoria. Genologics is a leader in the complex field of bio informatics – sitting at the intersection of information technology and life sciences. Medical research and treatment today requires handling ever increasing volumes of information from a vast array of locations and systems. It requires making the clinical information from the patient make sense in the context of the research information from the realms of discovery. Genologics products handle this complex and incredibly important exchange of information.

A small company of only eight people when it first accessed the Venture Capital (VCC) program in 2003, Genologics' earliest angel investors included founders of ALI Technologies and Dr. Don Rix the founder of MDS Metro Labs. These initial backers were joined by more angels from the BC technology community introduced to Genologics by Yaletown Venture Partners. All of these angels, further utilizing the VCC programme, invested alongside Yaletown in an initial \$6.6 million venture capital financing in early 2005.

Since first accessing the VCC program, Genologics has leveraged over \$17 million in venture capital funding. This includes an investment syndication partnership that Yaletown helped to forge with a leading Seattle venture fund, OVP Venture Partners. Genologics has grown dramatically as a result. It now employs 72 people, an increase of 900% in just six years, and is recognised as a leader its field.

Michael Ball, CEO of Genologics explains why the government venture capital programs are critical to the success of a company like his.

"The financial piece is absolutely critical and the key value is that it allows speed and simplicity in raising money," explained Mr. Ball. "The investors get a much better return on their money and we simply would not have raised the money we did without that program."

And as we saw in the McKesson story, successful investors often reinvest in the next generation of BC technology companies. Steve Hnatiuk a founder of Yaletown Venture Partners, is a key player for Genologics. Yaletown's first fund has seven of its ten investments in BC. Six of those have attracted angel investors from the BC technology community. "BC's technology industry angels are great partners in building successful companies" Hnatiuk points out. "The VCC programme encourages increased angel investment and has been enormously valuable in the launching promising new companies in BC."

For job creation in BC this program is a winner. "This is a critical program," said Ball, "and must continue to operate to grow new business to a stage where major venture capitalists will step in the door."

INCREASING BUSINESS INVESTMENT IN R&D

A key challenge inherent to trying to grow a technology sector and create an innovation economy is finding ways to increase spending on R&D. The steps highlighted above show that government is moving to make technology and innovation an ever more important part of our economy. Private non-profits investment in R&D in BC has also increased, by 140% since 2001.¹⁰² The increase in foreign investment is an even more impressive 250% over that time period. However, the greatest opportunity to improve innovation in BC's economy is to even further increase the quantity of investment in R&D, particularly by businesses.

BC, with a Gross Expenditure on R&D (GERD) of only 1.45% of GDP (2005), trails the major technology centers of the world. The discrepancy is most notable in comparison to the three key technology states of Washington, California and Massachusetts. (Figure 8)^{103 104 105 106 107} It must be noted that those three jurisdictions benefit from a number of Fortune 500 anchor companies as well as US military expenditures, all of which boost R&D. Many OECD countries have targets in their national science and innovation strategy 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%.¹⁰⁸

“In spite of the other R&D increases discussed earlier, BERD in BC has only increased by 11% since 2001.”

However, more than government it is business that needs to recognise the importance of increasing R&D. Business Expenditure R&D (BERD) is critical because it 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%.^{109 110} Thus its unfortunate that in spite of the other R&D increases discussed earlier, BERD in BC has only increased by 11% since 2001.¹¹¹

Figure 8. Gross domestic expenditures on R&D as % of GDP by jurisdiction in 2005^{112 113 114 115 116}

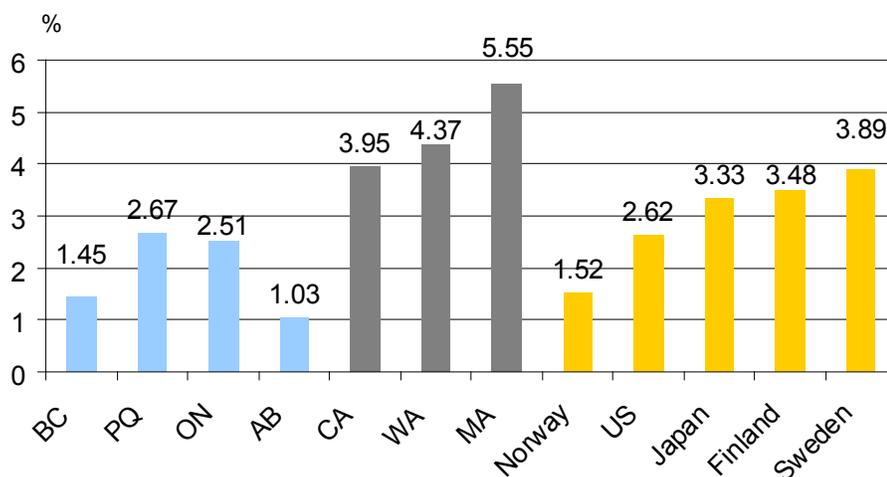
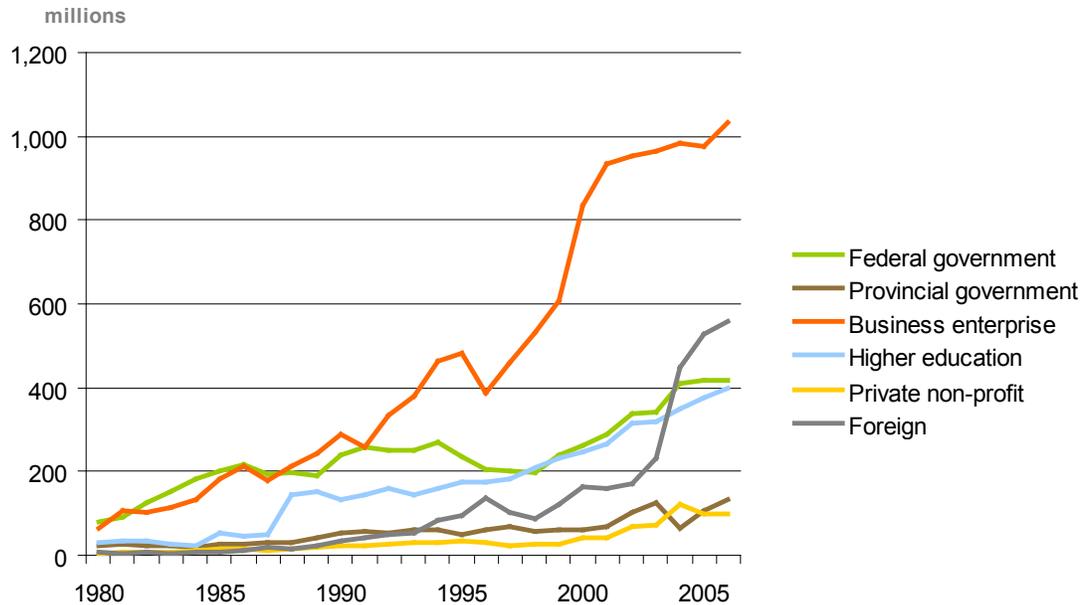


Figure 9. R&D Expenditure by sector in BC in 1980–2006 ¹¹⁷



BC lags behind the key North American jurisdictions in per capita BERD. In BC business expenditure (excluding foreign investment) only represents about 40% (2006) of the Gross Expenditure on R&D (GERD) in BC ¹¹⁸ (Figure 9). In leading innovation economies, BERD represents over 65% of GERD. The leading jurisdictions with over 65% ratio include Finland, Switzerland and Japan. ^{119 120 121 122} If British Columbia were to find a way to increase the business investment to 65% of the GERD total without increasing government expenditures on R&D at all, it would boost the GERD to nearly 2.5% of GDP and render that GERD far more commercially effective. That is a real opportunity for BC.

INDUSTRIAL DESIGN

One key component of innovation and commercialisation is Industrial Design (ID) because it can be a source of competitive advantage in the marketplace where most competitors have the same technology.¹²³ Not only companies but also jurisdictions benefit from promoting use of ID and BC should focus some efforts in this area.

A number of studies indicate that companies benefit from using ID. Through improving usability, ergonomics, aesthetics, sustainability and overall quality, ID creates more competitive products and services, improves customer experience and strengthens the brand. The benefits of design are not limited to creating an improved product. ID contributes to increased sales, improved margins, and higher stock performance.^{124 125 126} For example based on US SEC filings for “effective design” companies; the EBITDA (Earnings before interest, taxes, depreciation, and amortisation) to Net Sales was on average 75% higher than the industry average.¹²⁷ Furthermore, the UK Design Index has outperformed key stock market indices (FTSE 100 and FTSE All-Share) by about 200% in the past decade.¹²⁸ As a result, many global companies have made design an integral part of their core strategy. These include Apple, Philips, Google, DeWalt, Nokia, P&G, Xerox, Sony and others.

“ID creates more competitive products and services, improves customer experience and strengthens the brand.”

It is just as important to promote ID at a jurisdictional level. ID is a critical component of competitive products and business processes. This is particularly true in the development of the technology sectors that drive growth for the economy. Furthermore, increased use of ID increases exports and employment.^{129 130} In Denmark companies that use design export an average of 34% of their income while their counterparts export only 18%.¹³¹ Design focussed companies in the UK will make ten hires per year on average that are attributable to the use of design.¹³² Consequently, it is no surprise that countries with higher use of design rank higher in the Global Competitiveness Report by the World Economic Forum.^{133 134} Countries with national design polices or programs include the United Kingdom, Denmark, Finland, Sweden, Norway, Germany, New Zealand, Australia, South Korea, Japan, Taiwan, China and India. At the moment the United States and European Union are both building design policies to help the recovery from the recession, stimulate the creation of new jobs, and to address social and environmental challenges.^{135 136}

PTC Recommendation 11.7 *That the provincial government develop a plan for the promotion and development of Industrial Design as a key component of BC’s innovation economy and consider the first step of providing \$4.5 million to fund an Industrial Design Chair for the Emily Carr University of Art and Design.*

Traditionally BC's economy has been driven by the resource based industries with little use of ID. However, PTC believes that BC has some key assets to build on. One has been the Emily Carr University of Art and Design with undergraduate and graduate design programs. BC also hosts a Design Research Canada network at SFU, which links design researchers to industry. The BC Industrial Design Association (BCID) with increasing membership can also be considered a strength. We also have several local success stories where companies using ID in their product development have gained significant benefits.

“The new Wood Innovation and Design Centre affiliated with UNBC in Prince George will help to capture design opportunities for the forest sector.”

There are two particular opportunities for industrial design to play a role in BC's industries. The first of these is in the development of clean technologies and their associated products. Design decisions made in product development affect the entire value chain and environmental footprint of a product during its life cycle. It is estimated that 70% to 90% of any given product's footprint can be addressed at the design stage.¹³⁷ The second opportunity is in the transformation of our traditional resource based industries. While mining and forestry remain critical components of BC's economy they are facing challenging times. They must develop new products and practices and design is one of the tools for achieving this.¹³⁸ The new Wood Innovation and Design Centre affiliated with UNBC in Prince George which was announced in the 2009 budget will help to capture these opportunities.¹³⁹ It will reinforce the work already done by FPIInnovations, Canada's Wood Products Research Institute to increase the use of design in the forest sector in order to create new value-added products.

Since the PTC published The ID Advantage in 2008 the local community has undertaken a number of initiatives to move forward on industrial design. The BC Innovation Council (BCIC) has led a working group of key stakeholders to put an action plan in place. BCIC has used the BC RSTNs to communicate benefits of design in the regions, and has championed the inclusion of design as one of the criteria in the New Ventures BC competition. Emily Carr University is also taking steps. It has doubled the number of graduating Industrial Designers, hired new faculty members, increased multidisciplinary in the design curriculum, and expanded the lab space for design by 50%. Their Research and Industry Office has been successful in building private sector partnerships in health care, sustainable resources and clean tech sectors.

Energy and the Environment

One of the most fundamental shifts in the global economies over the next few decades will be around consumption. There will be an increasing demand for clean energy and for ways to generate products and services in an environmentally sustainable way. Recognising this, the provincial government has embarked upon key policy initiatives that build innovation around our natural advantages and the fast changing global market.

ABUNDANT, SECURE, CLEAN, AFFORDABLE POWER

BC's potential for clean power and the infrastructure that is already in place to take advantage of that potential are important assets. In BC, about 90% of total electricity generation is clean or renewable, placing the Province's standard among the top jurisdictions in the world.¹⁴⁰ Furthermore, this system has provided BC with relatively low energy prices when compared across North America (Table 4). This inexpensive electricity serves as a real boon to industry growth.

Table 4. BC hydro residential rates among the lowest in North America¹⁴¹

Utility*	Avg. Residential Price April 2007 c/kWh
Manitoba Hydro	6.4
Hydro Quebec	6.7
BC Hydro	6.7**
Fortis BC	8.0
Puget Sound Energy (WA)	7.63
Newfoundland Power	10.3
Ontario Power Generation***	11.5
Nova Scotia Power	11.8
EPCOR (Alberta)	11.6
Pacific Gas & Electric California)	20.3

* Based on 1,000 kWh monthly consumption. Source 2007 Comparison of Electricity Prices in Major North American Cities, Hydro Quebec

** Includes 2% Rate Rider (April 2007), 0.5% (2008) and daily fixed charge

*** Toronto Hydro Rate

The vast majority of BC's power comes from BC Hydro's 30 hydroelectric facilities. As BC has set a target to be energy self sufficient by 2016 with all new projects having a target of net zero greenhouse gas emissions, it is looking to supplement this hydro with other clean power resources. For example, the province is already a leader in bioenergy production, with over half of Canada's biomass electricity production capacity.¹⁴²

"The province is a leader in bioenergy production, with over half of Canada's biomass electricity production capacity."

However, there is more to this opportunity than increasing power generation. It is about investing in the development of clean technologies and generating jobs and economic growth. During 2008, government invested \$600,000 in bioenergy research, in studying technology, in infrastructure, and in biomass supply. It is also providing \$25 million to establish and enhance BC's Bioenergy Network. This is in addition to investments in wind, solar, tidal and hydrogen power. The \$25 million Innovative Clean Energy Fund was initially announced in the 2007 Energy Plan and was then extended for a further three years at \$25 million per year in the 2009 budget.¹⁴³ It will encourage the development of clean energy and energy-efficient technologies in the electricity, alternative energy, and transportation sectors.

"The \$25 million Innovative Clean Energy Fund will encourage the development of clean energy and energy-efficient technologies."

Case: Growing a Clean Sector with the ICE Fund



One of the reasons the PTC supported the creation of the Innovative Clean Energy (ICE) Fund was to help companies to invest in BC developed clean energy alternatives. This in turn would demonstrate commercial viability and in the long term help BC to grow its clean energy industry. That is exactly what happened for Nexterra Energy Corporation and the Kruger Products tissue paper mill in New Westminster.

Nexterra is a leading developer and supplier of advanced biomass gasification solutions. It converts biomass into a clean burning 'syngas'. This can be used instead of natural gas and other fossil fuels to generate heat, steam or power for institutional and industrial customers. With a head office in Vancouver and a development centre in Kamloops, Nexterra employs 45 people and is already a BC success story in the clean energy field. It has sold gasification systems to Tolko Industries in Kamloops, the University of South Carolina, Dockside Green in Victoria, and to the US Department of Energy's Oak Ridge National Laboratory in Tennessee.

Nexterra had developed a new process, a 'direct fire' application that fires clean-burning syngas directly into an existing boiler. However, applying any new technology, regardless of how promising it is, represents a risk. That risk is an obstacle to a commercial buyer. Nexterra needed to show potential buyers the technology will work in the real world and that it's better than the traditional alternatives. But it needed a first buyer to take in order to demonstrate the commercial viability of the new technology.

That is where the ICE fund came in. Support from the ICE fund was instrumental for Nexterra as it convinced Kruger to accept the risk and purchase this new application. This becomes a win for both companies. The installation of Nexterra's gasification system at Kruger mill will result economic and environmental savings. Kruger could save millions per year, primarily from displacing higher cost natural gas with lower cost syngas. It will also reduce green house gases by as much as 22,000 tonnes per year. This is the equivalent to removing nearly 5,500 cars off the road. These benefits were noted by Frank van Biesen, Kruger's VP of Technology.

"Our New Westminster mill is situated in an urban area, so we needed the cleanest technology available, and in a challenging economic climate, we also needed the most cost-competitive," said Mr. van Biesen. "Nexterra's biomass gasification system addresses both challenges, significantly reducing both greenhouse gas emissions and energy costs."

Obviously, Nexterra also benefits, but not just from the sale of one system. Successful completion and commissioning of the project will provide further proof of the technology. This positions Nexterra to provide a unique and very cost effective gasification solution for boilers, not only in the pulp and paper industry, but also in many other industrial and institutional sectors. As North America and the world come out of the current recession, the market for this application could be in the hundreds of millions of dollars.

CRITICAL MASS IN THE CLEAN TECHNOLOGY SECTOR

The strength of BC’s clean electricity development is one of the reasons that clean tech is emerging as an important contributor to BC’s economy, and that BC is emerging as one of the leading jurisdictions in clean energy and technology in North America. BC has approximately 90 companies in the advanced energy sector that generated \$750 million in revenue and employed 3,000 people. For the environmental industry as a whole there were 1,350 companies, employing approximately 18,000 people and generating \$2.3 billion in revenue (2004).^{144 145} Many of the companies are leaders in their respective fields and the annual Deloitte Green 15 leaders ranking in Canada had 7 companies from BC in 2008.¹⁴⁶

“BC has approximately 90 companies in the advanced energy sector that generated \$750 million in revenue.”

Support for the growing clean technology sector in BC includes strong research capabilities featuring Nobel Prize winners and top notch research facilities. BC has a total of 21 Canada Research Chairs in Clean Tech, four NSERC Research Chairs and over twenty research facilities creating a total of 2,800 grad students per year in science and technology fields.¹⁴⁷ BC is also the birthplace of the “Ecological Footprint” concept and has two NGOs that are among the leaders in their field, David Suzuki Foundation and Globe Foundation.

In addition to the ICE Fund and Bioenergy Network discussed earlier, government has also supported the clean technology industry with a \$94.5 million endowment (\$90 million endowment and \$4.5 million first-year startup costs) to create the Pacific Institute for Climate Solutions that brings together universities, government and the private sector to facilitate cutting-edge solutions.¹⁴⁸

PTC Recommendation 10.26 *That government finalise and support the bio-energy strategy to enable BC to reach its renewable energy targets and its bio-energy leadership potential as soon as possible.*

THE GLOBAL GROWTH OF CLEAN TECHNOLOGY SECTOR

The provincial strength in the area of clean technology is important because the industry is on the verge of strong growth. Internationally, consumers are demanding cleaner and greener products and practices, and corporations are increasingly proactive in reducing their footprint and cleaning their operations. The global market for environmental products and services is projected to double from US\$1,370 billion per year at present to US\$2,740 billion by 2020.¹⁴⁹ Governments are being both demanding and supportive of green technologies. A recent Deutsche Bank’s report found 250 new regulations supporting renewable energy and climate change mitigation across the world as well as more than \$200 billion in global stimulus packages for “green” initiatives.¹⁵⁰

Being on the leading edge of a growing industry can allow a jurisdiction to attract investment, increase exports and create jobs. Venture capital investment in North American clean tech start-

up companies has grown 50% annually and with \$4.1 billion in 2008 it bypassed biotechnology as the second largest sector for VC investment in the US.¹⁵¹ As to exports, in 2006 the export volume for environmental goods from Germany totalled nearly €60 billion.¹⁵² The Danish wind industry has a 40 % market share of the global market (2006) bringing 27 billion kroner to Danish economy.¹⁵³

“The global market for environmental products and services is projected to double to US\$2,740 billion by 2020.”

Developing the emerging clean tech industry in Washington and Oregon states is estimated to result in 41,000-63,000 new jobs by 2025.¹⁵⁴

Government leadership is a key to attracting and growing the companies that will take advantage of this growth. Public policy commitments in areas like carbon pollution fees, green buildings, and public transportation investment contribute to creating an attractive environment for businesses, stimulating technology innovation and economic development. Clean technology businesses will invest here because they know they are supported not only by investment and research initiatives, but also by a responsible public policy regime that helps create a fair and stable market for green options.

Recognising the importance of such leadership the BC Government has taken significant action that positions BC well to capitalise on this growing new industry.^{155 156} It has clearly shown its commitment through legally binding goals for Green House Gases (GHG) reduction (33% by 2020 and 80% by 2050 from 2007 levels), clearly stated energy conservation goals, and strengthening the green building code. A particularly important initiative is the province’s revenue neutral carbon tax. It recognises the inherent costs of using carbon based energy sources, rendering cleaner alternatives more affordable.

Another strong indicator that the BC government is committed to clean technologies, and is recognised elsewhere as being committed is its involvement in the Western Climate Initiative and the cap and trade system. BC was recently elected as Canadian Co-Chair and serves as the Canadian Liaison for the WCI. Also, BC was nominated and elected to Chair of the International Carbon Action Partnership, an international organisation established to contribute to the development of a well-functioning global cap and trade carbon market. Leadership in this international arena makes it easier for BC to meet its GHG reduction commitment and lowers compliance costs for BC emitters by providing access to a larger, more liquid market.

The government is supplementing local demand through its own actions. BC Hydro energy calls are encouraging clean power (although the amount of green power required in the most recent call was reduced as a result of the global economic crisis), government is investing \$1.6 billion in new clean technology buses, and is working to install 100,000 solar roofs by 2020.¹⁵⁷

The government's plan to position BC as a green technology powerhouse is even more critical in light of the economic crisis. It is one sector which will benefit significantly because of a variety of stimulus packages around the world that are specific responses to the crisis.

Traditional and Emerging Strengths

STRONG RESOURCE INDUSTRIES

BC has historically been highly dependent on resource-based industries, which include agriculture, forestry, mining, oil and gas extraction, and fishing. Now although BC's economy is more mature and less resource dependent, these industries are still strong and a critical contributor to our economy. Wood and paper production together accounted for 41% of the total value of BC's manufacturing shipments in 2005¹⁵⁸

There is potential for this resource sector to create, and spin off new technologies. An excellent example is the case of the Finnish forest industry. Globally, Finland has only 0.5% of the forest resources and yet has three of the top ten pulp and paper companies, one of the top three papermaking machinery companies, the largest producer of papermaking chemicals, and the world's leading forestry consulting firm.^{159 160}

Finland came to this strength through crisis. The collapse of the Soviet Union also meant the collapse of most of the market for Finnish forest products. To survive it had to focus on higher value and that required increased investment in R&D. Today, the forest cluster R&D expenditure is estimated to total €400-500 million annually. This massive influx of R&D investment has now borne fruit and most of the paper and pulp mills in the world are counting on Finnish equipment, capital or expertise.^{161 162}

Therein lays the opportunity for BC. Canada is still the world's largest exporter of forest products and it is time to reinvest in R&D. Currently forestry and logging companies (excluding manufacturing) spend only \$20 million per year on R&D (2006),^{163 164} yet there are already some positive first steps to increasing that. In 2007 Canada's three forest sector research institutes—respectively focusing on forests, wood products, and pulp and paper—merged to create FPInnovations. It has two of its four locations in BC with annual budget of around \$85 million.¹⁶⁵ As well BC has some of the best forest scientists in the world.

There are exciting new areas of research where BC can capitalise through investing in R&D to reinvigorate its most important industry. Areas which can offer significant opportunities over time include bioenergy, nanotechnology, biorefining, and building products and systems.¹⁶⁶

THE EMERGING TECHNOLOGY SECTORS

BC's technology sector is growing but as an emerging sector, it is still relatively small in global terms. BC's healthy business climate generates the development of a lot of smaller technology companies but there is a real shortage of larger anchor companies. Fewer than ten technology companies are on the list of BC's top 100 companies in 2008;¹⁶⁷ only 17 technology companies headquartered in BC have revenue over \$50 million;¹⁶⁸ and fewer than 40 technology companies can boast more than 200 employees.¹⁶⁹

Table 5. Tech establishment in 2007 ¹⁷⁰

Number of establishments, by number of employees							
Industry	50 plus	20 to 49	10 to 19	5 to 9	1 to 4	None	Total
Manufacturing Industries	77	88	94	161	357	545	1,322
Service Industries	271	443	613	991	5,478	15,088	22,884
Motion picture production & post production	19	21	36	74	674	2,299	3,123
Telecommunications	25	32	29	52	137	305	580
Engineering services	46	129	149	233	1,214	2,651	4,422
Computer and related services	117	158	233	346	2,195	6,257	9,306
Other services	64	103	166	286	1,258	3,576	5,453
Total for sector	348	531	707	1,152	5,835	15,633	24,206
Total for all Industries	6,819	12,113	19,808	33,655	94,857	225,415	392,667

In spite of a profile that is weighted too heavily to smaller companies, there are some sectors of real note. In addition to the clean technology sector mentioned earlier, other key sectors include ICT, New Media, and Life Sciences.

INFORMATION AND COMMUNICATION TECHNOLOGIES (ICT)

The Information and Communication Technologies sector (ICT) in British Columbia is the largest of these emerging sectors. There are approximately 6,000 companies active in the sector. They exist across the province generating revenues of approximately \$9 billion and employing about 46,000 people. This sector includes all of the domestic communications services as well as some of the larger software companies, making it particularly strong in the areas of ICT services, ICT manufacturing and telecommunications services.¹⁷¹

BC has been strong in software development since the 1980s. It has produced a wide variety of applications that have attracted international investment. Major multinational firms including Microsoft, IBM, SAP, and Yahoo have purchased companies in BC and continue to operate and grow them here. This is in part because of our experienced and established talent base.

NEW MEDIA

BC is among the world's top performing New Media clusters. It has one of the largest videogame development centres per capita in the world and the third largest film and television industry in North America. The sector has about 1,000 companies, employs 15,000 people and generates some \$2 billion in revenue annually. The strength of the sector is also demonstrated by its ability to attract local and global investments. For example in 2005 it raised at least \$40 million in thirteen deals.¹⁷²

“BC has one of the largest videogame development centres per capita in the world and the third largest film and television industry in North America.”

BC's sector is also recognised worldwide. For 2009 it has been able to attract the annual IxDA (International Interaction Design Association) Interaction 09 conference and Computer Graphics International 2009 conference. Even more impressively, in 2011 the SIGGRAPH (Special Interest Group on Graphics and Interactive Techniques) annual conference by ACM SIGGRAPH will be held in Vancouver. This is the first time it is being held outside the US since its inception in 1974.^{173 174}

The sector is supported by strong research capabilities and important facilities. It has three Canada Research Chairs and research centres including the World Centre for Digital Media (WCDM) at the Great Northern Way campus, Intersections Digital Studios at Emily Carr Institute, the SFU School of Interactive Art and Technology and the UBC Media and Graphics Interdisciplinary Centre.

Government has played an important role in creating this critical mass, not only in the taxation measures discussed earlier, which are critical for an industry so dependent upon talent but in other ways as well. It has a number of tax credit programs and made a particularly important investment in the \$40 million WCDM that is now a hub for industry and academia collaboration and graduate student education in New Media Management.

PTC Recommendation 8.19 *That government support and invest in the development of the Master of Digital Media program and the World Centre for Digital Media located at the Great Northern Way Campus.*

LIFE SCIENCES

The Life Sciences sector is another of BC’s technology clusters. The sector consists primarily of Biopharmaceuticals, Medical Devices, Bioproducts, and Bioinformatics. It has approximately 180 companies, 2,700 employees and \$800 million in revenues.¹⁷⁵

“The Life Sciences sector has approximately 180 companies, 2,700 employees and \$800 million in revenues.”

Life Sciences is a difficult sector to grow because it is capital intensive and dependent upon long research cycles. Research is BC’s strong point as some significant companies have spun off from our institutions. BC boasts more than 60 Research

Chairs in related fields and key research centres include the BC Centre for Disease Control, the BC Cancer Agency and the Michael Smith Genome Science Centre. The Centre for Drug Research and Development is one of the more recent additions to Life Sciences research in BC and received a grant of \$25 million from the provincial government in 2007.¹⁷⁶

Exports: Asia, the Pacific and other Trading Opportunities

British Columbia is a small, open jurisdiction that will continue to rely on trade for prosperity. As an innovation economy the province must constantly seek to increase and open markets. The government is fully aware of this and has positioned BC to take advantage of both traditional and emerging partners.

CULTURAL TIES TO INDIA AND CHINA

The economic growth in the Asia Pacific region, and in Asia in particular, has been exceptional. This area now includes three of the world’s four largest economies. Their predicted growth creates opportunities for British Columbia, both in exporting to these markets and in using technology to improve BC’s strength as a gateway between Asia and North America.

Table 6. World’s largest economies in 2007 and 2020^{177 178}

	GDP 2007 (billions)	Rank (2007)	Projected GDP 2020 (billions)	Rank (2020)
U.S.	13,800	1	28,800	2
China	7,100	2	29,600	1
Japan	4,300	3	6,800	4
India	3,100	4	13,400	3

Aside from the obvious advantage of geography, BC also has strong cultural ties to Asia-Pacific. This is evident through trade, tourism, and immigration.

The Asia Pacific is our second largest export market and consumes \$8.5 billion per year of BC goods. China and Hong Kong represent BC's second-largest trading partner, accounting for 5.5% of BC exports. More importantly, exports to mainland China have increased more than 97% since 2002 and the bilateral trade with China is now more than \$10 billion (2006). India is also important and is now the tenth largest export market for BC products.^{179 180}

“Immigrants arriving in BC from the Asia Pacific now represent approximately 70% of the total.”

Further evidence of the cultural ties between BC and Asia can be found in the tourism figures. Visitors from Asia Pacific now make up over 50% of all overseas visitors to BC. More than half of the overnight visitor revenue from overseas (\$1,789 million) came from Asia Pacific visitors (2005) and \$170 million from China and Hong Kong. Total overnight visitor volume from overseas was 1,688,000 and again over half from Asia Pacific (880,000). 144,000 visitors came to BC from Hong Kong and China in 2005.¹⁸¹

The other key indicator of our growing association with Asia is immigration. Of the one million immigrants in BC, the vast majority had traditionally come here from the UK, closely followed by China, India and Hong Kong. However, the number of immigrants arriving in BC from the Asia Pacific region grew 20% between 2002 and 2006 and now immigration from the Asia Pacific region represents approximately 70% of the total. The result is that BC has well-established Asian communities. Some 20% of BC's population is of Asian descent and 600,000 BC residents claim Chinese, Korean, Japanese, or another Asian language as their mother tongue.^{182 183 184}

BC AS A GATEWAY BETWEEN ASIA AND AMERICA

BC is already a gateway between Asia and the US as can be seen from the trade, exports, cargo, investment and travel data. The US accounts for approximately 60% of BC's exports while Japan, China and Korea account for another 23%. Being a gateway presents a twofold opportunity to BC: large and diverse markets for our own goods and the opportunity inherent to being the gateway itself.¹⁸⁵

BC's favourable geography means that a great deal of cargo travels through BC to those regions. It has close proximity to the US and is the shortest land-sea-air route between Asia and North America. BC has efficient road and rail connections to major markets across North America. The Port of Vancouver has a particularly strong advantage in that it is served by three major intercontinental railways. This is not matched by any U.S. port. The key advantage for the Port of Prince Rupert is that it provides the shortest (three days) direct route from Asia to the consumer markets of the U.S. central and eastern consumer markets.

As a result some 95% of the container traffic and 55% of the bulk export cargoes moving through major BC ports are Asia Pacific related while some 60% of the cargo travelling through Vancouver

International Airport is Asia Pacific related. In total, the value of Asia Pacific related container trade going through BC ports was \$45 billion in 2004.¹⁸⁶

BC companies have traditionally focused on the US market because of its size and proximity. This opportunity has been enhanced by NAFTA. Since that agreement came into effect BC exports to the U.S. have grown by 178%. BC's growth in Asian markets however has not been as strong.¹⁸⁷

Real opportunities exist to expand trade. BC can export to both markets and act as a conduit between the two. Developing Asian trade and investment can be used to reinforce the province's all important U.S. markets. Asia also represents a massive market of its own, and one that is growing.

The provincial government has recognised this opportunity and is trying to capitalise on it through the Asia Pacific Initiative. It is estimated that the Asia Pacific Initiative could increase BC trade within the region from \$29 billion (2005) to \$106 billion in 2020.¹⁸⁸

“95% of the container traffic and 55% of the bulk export cargoes moving through major BC ports are Asia Pacific related.”

The other opportunity is the gateway itself. BC could use technology to enhance the strength of the gateway and at the same time develop technology that improves transportation and supply chain infrastructure.¹⁸⁹ BC has world-class transportation and communications systems already and because of a projected three-fold increase in container port traffic by 2020 and a 68% increase in Vancouver International Airport traffic there will be a need to develop technologies to address the logistics challenges created by such large increases.¹⁹⁰

BC is continuing to invest in this Asia Pacific opportunity. The budget of February 2008 committed \$40 million to strengthen BC's trade, investment and cultural links with Asian countries. With the goal that “British Columbia is recognised internationally as North America's capital for Asia Pacific commerce and culture,” the Asia-Pacific Initiative identifies five priority areas. The Asia Pacific initiative has the potential to drive B.C.'s economic prosperity for decades with over \$70 billion in additional annual trade and 255,000 new jobs in BC by 2020 and 500,000 for all of Canada. A key component of the Asia Pacific Strategy is to develop collaborative technological research and development.^{191 192}

“The Asia Pacific initiative has the potential to drive B.C.'s economic prosperity for decades with over \$70 billion in additional annual trade and 255,000 new jobs in BC by 2020.”

ENLARGE “HOME” MARKET FOR BC TECHNOLOGIES THROUGH COLLABORATION

Although markets in Asia and the Pacific represent an emerging opportunity, BC must not neglect its near neighbours and other traditional trading partners. It must constantly seek new ways to work with them. Understanding this, the province has entered into a number of agreements to remove barriers to nearby markets. These measures include the Trade, Investment and Labour Mobility Agreement (TILMA) with Alberta, agreements with Washington, Oregon and California, Pacific Coast Collaborative and Western Climate Initiative (WCI) with several North American jurisdictions.

TILMA is Canada’s most comprehensive internal trade agreement and creates a market of 7.7 million people.¹⁹³ The Pacific Coast Collaborative is a partnership between BC and the states of Alaska, Washington, Oregon and California. It recognises common interests and establishes a framework for leadership and collaboration. Such agreements allow us to set common standards and so create larger markets for environmental products. The Western Climate Initiative (WCI) is another cross-jurisdictional initiative, focussed on climate change.

“TILMA has the potential to add \$4.8 billion to real GDP and create 78,000 new jobs in B.C. alone.”

The impact of such initiatives is significant. TILMA, according to a recent report by the Conference Board of Canada, could narrow the Canada-U.S. productivity gap by lowering non-tariff trade barriers, and make Canada more competitive. According to the Board, the B.C. and Alberta agreement has the potential to add \$4.8 billion to real GDP and create 78,000 new jobs in B.C. alone.¹⁹⁴

Conclusion

The Premier's Technology Council believes the provincial government has a clear idea of what the future looks like. On the three pillars of infrastructure, government services and the economy the PTC has examined the role technology plays in a knowledge-based society and economy.

The infrastructure of a knowledge economy is not just roads, and bridges, but broadband. A society like ours is built on innovation driven by knowledge and collaboration. Furthermore the technology based services our citizens expect will ride not on the iron rails of the past, but on the glass rails of the future. Knowing this, the government has embarked on initiatives that deliver broadband around the province and ensure our education system is equipped to use it.

Faced with the challenges of changing demographics and the opportunities presented by new technology, the government has moved decisively to use one to address the other. Its citizen centred services initiative and its move to take advantage of government 2.0 will help improve all government services. The progress made in the specific cases of e-health and e-learning demonstrate how government can use technology to improve service.

The province has also worked to create a knowledge-based economy by focussing on key fundamentals. It is important to note that those fundamental remain largely unchanged, in spite of the economic crisis. BC must continue to focus on these key areas to ensure we can reap the full benefit of strong leadership to date.

The two largest opportunities for the future are created by combining certain natural advantages with important global drivers. Addressed earlier, these involve matching our clean energy and green technology resources with the growing global demand for greener products and processes and using our Pacific Rim location to take advantage of the burgeoning growth in Asia. When this crisis is over, the growth in Asia will continue and the demand for clean technologies will grow. So BC must continue to push its Asia Pacific and gateway initiatives and continue to foster the clean technology industries.

BC needs to continue the process of growing our technology industry to diversify our economy. As our young sector matures the government will have a role to play. It needs to address those key issues that it is already working on. These are issues where the PTC supports and agrees with government efforts. It must find ways to attract HQP, particularly senior talent. It must continue refining plans to improve commercialisation of R&D, and it must continue other policy initiatives that make British Columbia a favoured place for business.

About the PTC

The Premier's Technology Council (PTC) was formed by Premier Gordon Campbell in August 2001. It is comprised of up to 25 members from the private sector and academia. The Honourable Gordon Campbell is Chair of the council, a position shared with the Co-Chair, Greg Peet, formerly Chairman, President and CEO of ALI Technologies (acquired by McKesson Corp in 2002). The mandate of the council is to provide advice to the Premier on all technology-related issues facing British Columbia and its citizens.

Areas of scope include growing the technology industries in BC, how government can use technology to better deliver services, and how to encourage and support the use of technology by citizens and BC's other industries. The PTC makes broad based policy recommendations that are objective focused. It does not make recommendations in regards to the implementation methods of specific initiatives.

The council has published 12 reports making a total of 198 recommendations. The vast majority of these recommendations are either implemented or in process. The council continues to publish its reports on a semi-annual basis, with the aim of bringing technology to life in BC to attract talent and investment and support economic growth and job creation.

Although the PTC is an independent advisory body, it makes its recommendation development process as inclusive as possible. The council identifies an issue or area of improvement related to the PTC's mandate and a PTC task force is formed to develop recommendations and conduct background research.

The task force defines the issue and engages in a consultation process. The consultation usually includes both one-on-one consultative interviews and larger roundtables involving local stakeholders and subject matter experts. Since its inception the PTC has consulted more than 1,800 people in this way. The roundtables provide a forum for senior stakeholders to discuss possible solutions and recommendations for the provincial government. Stakeholders usually include private sector, academia, NGOs, government, and the financial community. The potential solutions are then further researched and refined by the task force before recommendations are submitted to the full council for debate prior to publication.

In addition to formal reports and recommendations PTC also provides advice informally and works with the government and industry to further encourage the use of technology in BC.

Appendix A.

Summary of Recommendations

This is a list of recommendations made by the PTC in all preceding reports. They are numbered in the order in which they appear in the original report.

11th Report

Clean Technology

11.1: That the provincial government address the regulatory challenges to the development of clean technology by:

- directing the Regulatory Reform Office to collaborate with the Climate Action Secretariat and work across ministries to identify, prioritise and address regulatory barriers that affect the use and application of current and emerging technologies in addressing environmental issues, and
- directing the Pacific Institute for Climate Solutions, through its collaboration between UNBC, UVIC, SFU and UBC, to map current and emerging technologies and recommend to the Regulatory Reform Office how regulation and government policy planning should anticipate and accommodate the opportunities that they present.

Regional Innovation

11.2: That government continue to address the broadband challenges for British Columbia by:

- establishing a plan to address broadband related hindrances to economic development in BC;
- continuing to use its own telecommunications procurement as a lever for supporting regional delivery through local ISPs and make this solution part of a broader package that supports local ISPs in the delivery of these services; and
- continuing investment to assist First Nations in broadband delivery and related capacity building.

11.3: That government create a stable funding structure for non-government economic development bodies that:

- are regionally collaborative;
- are locally driven by business leaders;
- have significant industry input; and
- have strict data driven criteria for decision making.

11.4: That the Ministry of Advanced Education support regional research development and deployment in the regions in collaboration with the BC Innovation Council and post-secondary institutions.

11.5: The PTC recommends there be a budget allocation to fund program flexibility in order to establish short term and emerging technology training programs as required by industry.

11.6: The PTC recommends that additional tax credits be allocated to the Small Business Venture Capital Act's (SBVCA) Community Venture Capital Program in the form of increased regional allocations and that the Investment Capital Branch implement policy to encourage greater distribution to smaller communities.

Industrial Design

11.7: That the provincial government develop a plan for the promotion and development of Industrial Design as a key component of BC's innovation economy and consider the first step of providing \$4.5 million to fund an Industrial Design Chair for the Emily Carr University of Art and Design.

10th Report

Learning and Technology

10.1 That a government task force, which includes the Virtual School Society, BC Campus, and the Ministries of Education and Advanced Education, develop a long-term vision for technology and education by the end of March 2008.

10.2 That the Ministry develop Key Performance Indicators to measure the success of programs that encompass learning technology and use those KPI to ensure quality.

10.3 That the Ministry of Education continue to use LearnNowBC as a central repository for electronic learning programming in order to ensure interoperability, quality, and effective use of resources.

10.4 That the Ministry of Education work with the Boards of Education to create a realistic plan for expanding the one-to-one computer programs around the province and to determine the costs.

10.5 That the Ministry of Education develop an independent certification program that rewards teachers for expanding their professional qualifications to include technology-supported learning.

10.6 That the Government use the implementation challenges facing BCeSIS as a proxy for determining infrastructure barriers, and move to address them.

10.7 That government develop a single window for learning for government-supported e-learning services.

10.8 That the Ministry of Education work with a school district to pilot a 'school of the future' that combines the elements of a modern learning environment.

Clean Technology

10.9 That government continue to pursue its goal of self-sufficiency by 2016.

10.10 That BC set a target to become an annual net exporter of clean energy by 2020.

10.11 That government direct BCUC to consider the broader goals of government in its monitoring

role, in particular the objectives of the Energy Plan. Examples of specific measures that need to be considered are:

- **Investment in infrastructure**, including smart grid technologies, to allow access to more supplies and enable system efficiencies;
- **Stimulation of conservation initiatives** through such measures as public awareness/education and pricing structures including time based pricing; and
- **New tariff structures** that encourage the development of a range of renewable energy supplies.

10.12 That government direct BC Hydro to advance its investigation of Site C and provide large-scale clean energy generation to meet growing demand for energy and capacity and to provide dependable power.

10.13 That government direct BCUC to consider government policies for conservation and renewable energy when reviewing the long-term strategic plans of the utilities to invest in a 'smart grid' digital power infrastructure.

10.14 That government and appropriate utilities embark on public awareness campaigns that explain the importance and value of conservation and renewable energy initiatives.

10.15 That BC Hydro invest in an infrastructure that allows BC to become a leading jurisdiction in the application of DSM technologies and that BC Hydro implement rate and regulatory structures that take full advantage of these DSM technologies.

10.16 That government continue to advance the Green Cities Project and the Green Building Code, through the mandating of green targets and promoting the use of green technologies.

10.17 That as part of a demonstration project, 100 government vehicles be PHEVs, either through conversion of existing fleet or purchase of new vehicles.

10.18 That the government continue to work with industry and the federal government to develop the guidelines and regulations to achieve British Columbia's biodiesel targets.

10.19 That government support a 'Hydrogen Highway Rally' to California for 2009.

APPENDIX A: SUMMARY OF RECOMMENDATIONS

10.20 That BC investigate other incentives to promote the use of green vehicles.

10.21 That government support the development of appropriate feed-in tariffs that decline over time to assist the commercialisation of emerging, renewable energy sources and their associated technologies.

10.22 That BC Hydro and BCTC identify areas rich in renewable energy potential in the near term for transmission system investment.

10.23 That the cost of building transmission lines including the transmission interconnect to new power sources be factored into the price of electricity.

10.24 That BC Hydro assess the current energy storage capacity and the needs for the future, determine the best options to meet those future needs (in particular the Site C dam), and initiate the development of those capacity options.

10.25 That government adequately resource the approval mechanisms for developing renewable energy projects, including an expediter dedicated to clean energy.

10.26 That government finalise and support the bio-energy strategy to enable BC to reach its renewable energy targets and its bio-energy leadership potential as soon as possible.

10.27 That government continue to support demonstration projects that make BC a clean technology showcase.

10.28 BC should leverage federal programs to create research chairs and develop centres of excellence around existing strengths in clean technology.

10.29 BC should have a coordinated approach to applications for federal funding for clean technology.

10.30 That BCTC and BC Hydro's abilities to contribute to the deployment of pre-commercial technologies be recognised and these organisations be provided with an effective R&D budget.

10.31 That government support the transformation of Powertech Labs into a Centre of Excellence for Smart Grid Technology.

Innovation and Commercialisation

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

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 percent of GDP, increase private investment in R&D to 65 percent of that total, and move toward these targets with aggressive but realistic time frames.

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.

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

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

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

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.

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

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.

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.

APPENDIX A: SUMMARY OF RECOMMENDATIONS

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.

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.

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

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

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

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.

10.50 That BCIC facilitate the UILO review.

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

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

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

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.

9th Report

Citizen Centred Services

In order to implement the technological integration required to achieve the five great goals the PTC believes that:

9.1 Ministries should be directed to share data collaboratively with programs outside their own Ministry and actively seek such opportunities in order to deliver seamless coordinated services to the citizens.

9.2 The role of the Chief Information Officer (CIO) should be enhanced with the authority to set standards, architecture and policy for IT purchases and development across government, and to monitor compliance with those standards. Precedent for this model is in the Office of the Comptroller General. Furthermore, for this CIO to assist the government in achieving its goals it should:

- a. be adequately resourced to complete the integration of government systems.
- b. be given responsibility for managing privacy considerations on a government wide basis. A Chief Privacy Officer (CPO) should be established in the CIO offices to set guidelines and procedures that protect privacy without unnecessarily hindering data sharing.

9.3 Government should focus on some important key projects to generate early success and grow confidence both with the citizens of BC and within the public service.

e-Learning - Assessment

9.4 That the provincial government consider dedicating the time and resources needed to expand the limited e-examination system with a long term goal of e-examinations as the norm.

9.5 That the provincial government consider developing a 'teach the teachers' program on e-examinations.

WINLAB

9.6 That the government support and invest in the WINLAB project.

8th Report

Digital Divide

8.1 That the government commit further funds to addressing "last mile" issues inherent to the Digital Divide. The funds would add value by preparing communities for the arrival of broadband and by equipping them to benefit from its introduction.

First Nations

8.2 That the Joint Task Force be constituted as soon as possible and tasked to develop and resource an action plan to bring broadband to First Nations communities in BC.

8.3 That the Premier and government Ministers continue to support the Transformative Change

Accord, urge their federal counterparts to support the connection of broadband to First Nations communities in British Columbia, and enter into a partnership with British Columbia and First Nations in this province to accomplish this task.

Identity Management and Security

8.4 That government define an architecture and an implementation/delivery strategy for service integration and information sharing that spans the public service; that recognises the diversity and mandates of the organisations that participate in delivering public service; and that recognises the complexities of the service integration and information sharing.

APPENDIX A: SUMMARY OF RECOMMENDATIONS

8.5 That government ensure a budget and process exist to accommodate the major investments in corporate government infrastructure needed to provide identity management, privacy and security capabilities.

8.6 That government expand its notion of identity management to include the broader public sector (i.e., important registries such as client registries, master patient indexes, health care provider registries, student registries, and social service provider registries). The strategy identified in 8.4 also needs to address how the registries will be cooperatively managed (for example, which one will be the authoritative source).

8.7 That government ensure public sector investment in better information security technologies is done in a way that provides open connectivity for all users that arrive at any public facility or location. This is especially important as organisations look to extend their current wired networks with wireless capabilities.

8.8 That government approach federally sponsored initiatives in an organised fashion. For example, the Ministry of Health and the health authorities are working cooperatively to secure funding from Canada Health Infoway. This will ensure that BC does not build infrastructure to support health solutions in stand-alone silos that increase costs and complexities in integrating these sources into the government's electronic service delivery environment.

8.9 That government pursue these issues and recommendations through stakeholders across the broader public and private sector by utilising a model similar to the NetWork BC project, with the aim of optimising the amount of investment required and increasing the quality of the result for the entire public sector.

Privacy

8.10 That government revisit the responsibility structure for privacy management and ensure the authority is appropriately delegated and that there are sufficient resources available for the development, implementation and monitoring of policies and procedures.

8.11 That government clearly communicate to the public how it manages privacy and educate public

service employees on privacy management in an electronic environment.

8.12 That government ensure all ministries deliver on their legislative requirement to conduct privacy impact assessments. These privacy impact assessments must be conducted at the onset of new e-government initiatives and be reviewed periodically to ensure that the privacy considerations have been addressed in the design and continue to be addressed successfully in production.

8.13 That government periodically review privacy and program legislation to ensure that it anticipates technological advances and is not rendered obsolete by them.

8.14 That government ensure a secure electronic infrastructure to protect privacy.

Technology and Education

8.15 That government ensure the investment in the BCeSIS system to finalise its installation and provide as rapid implementation as possible.

Capital and Investment

8.16 That the provincial government expand the SR&ED program to provide the provincial refundable tax credit to all companies in BC.

8.17 That the provincial government work with the federal government to remove any administrative and fiscal constraints that hinder foreign capital investment into BC's companies and venture capital pools.

8.18 That the provincial government work with the federal government to recognise tax-exempt corporations under the Canada/US Income Tax Convention to encourage foreign capital investment into BC, and Canada in general.

Power Technology

8.19 That the government support and implement the initiatives outlined by the Alternative Energy and Power Technology Task Force.

New Media

8.20 That government support and invest in the development of the Master of Digital Media program and the World Centre for Digital Media located at the Great Northern Way Campus.

7th Report

DIGITAL DIVIDE

7.1 That the provincial government work with the federal government to create a Joint Task Force with the expertise, authority and resources to provide broadband and related services to First Nations communities in British Columbia wherever reasonably possible. The Task Force must also have First Nations representation.

E-HEALTH

7.2 Define a provincial strategy and architecture for the Electronic Health Record and commit to its implementation. The PTC recommends that the provincial government:

- Give the highest priority to establishing architecture for the Electronic Health Record, giving consideration to the best industry practice using Internet technology. A defined EHR solution that aggregates existing information in the healthcare system will determine the appropriate standards and interface to ensure that the evolution of systems are properly directed.
- Ensure that the EHR strategy incorporates features to empower patients to better manage their own health and to interact with the health care system electronically.

7.3 Create a business model and data exchange standard to integrate the EHR with private practice physicians' internal Electronic Medical Records (EMR). To do this, the Council recommends:

- That a task force be established to determine a single business model and data exchange standard that will allow electronic information exchange with private practice physicians and their internal EMR while respecting patient privacy rights. Priority should be given to the electronic delivery of information to private practice physicians (for example, to improve chronic disease management), and the collection of private practice physician information should be deferred until a definitive plan is determined.
- That this strategy and business model incorporate a method to encourage private practice physicians to acquire broadband network connections for their offices, principally via demand for the "content"

made available from the health authorities EHR.

7.4 Establish preferred standards for the regional implementation of clinical systems and give priority to optimising clinical workflow on an enterprise basis across regions, as distinct from workflow bounded at each facility. To do this the Council recommends:

- That the eHSC and its working committees establish a policy for the preferred architecture for the deployment of clinical systems, as a basis for making future investments and joint procurement purposes.
- That the health authorities give priority to adopting the preferred architecture and undertake projects to optimise workflow within the next three years.

7.5 Continue infrastructure investment. The PTC recommends that the provincial government:

- Complete broadband network services to acute care facilities, expand the network to all government-managed care facilities, and consider a network platform that connects service provider groups within the health authorities.
- Invest to execute on the strategy for a client registry with the ability to uniquely identify each client. This will provide a critical resource for the establishment of the Electronic Health Record. Furthermore, collaboration managed through the eHSC should establish operational methods to add new persons to the client registry and to manage identity records efficiently. The client registry should be considered as a resource for the potential integration of client identity for other social services.
- Continue to invest in the execution of its implementation plan for the provider registry, in consultation with the College of Physicians.
- Invest in the continuing development of a detailed architecture and operational plan built on the common "active directory" security access standard. This would be used to develop a comprehensive system access standard that will be inter-operable (single sign-on) across regional systems. It would also meet national security and privacy standards. Preference should be given to the harmonisation of regulations with the standards primarily adopted by major software systems.

APPENDIX A: SUMMARY OF RECOMMENDATIONS

7.6 Continue to develop telehealth initiatives. The PTC recommends that:

- The relevant agencies move expeditiously to expand fee codes to cover all billing categories, except where there is a specific medical reason where they should not apply.
- Under the guidance of the eHSC, there be continuing evaluation of opportunities to implement specific telehealth services that achieve positive clinical and economic outcomes.

7.7 Governance and management. The PTC recommends that the leadership of health authorities and Ministry of Health Services collectively:

- Place priority on collaboration to achieve significant progress in the development of the e-health system.
- Ensure that development of the e-health architecture is within the context of best industry practice, and also establish a process of independent evaluation of the effectiveness of all e-health technology deployed.
- Invest in resources to effectively lead the process of change management of a system required to successfully implement technology that will automate the delivery of healthcare in the province.

IT PROCUREMENT

7.8 That the provincial government continue its procurement reform initiative in cooperation with industry to ensure the most effective process possible. It should consider the issues and the suggested solutions identified at the procurement symposium and further examine those that did not receive due attention.

CAPITAL AND INVESTMENT

7.9 The PTC recommends that government continue its existing programs under the *SBVC Act* and work with federal government to secure federal funding for the program.

HUMAN RESOURCES

7.10 That the provincial government work with industry to develop an accurate inventory of the province's current and projected technology sector skills and then execute on strategies designed to close critical skills gaps that impair growth of designated technology clusters.

7.11 That the provincial government work with industry to develop immigration policy recommendations to the federal government targeted at attracting the senior management required to grow BC's technology sector.

7.12 That the provincial government work with industry and the federal government to define modifications to the *Income Tax Act* that would improve industry's ability to attract top senior talent to BC's technology sector.

POWER TECHNOLOGY

7.13 The PTC recommends that the government pursue the strategies outlined in the report (*A Vision for Growing a World-Class Power Technology Cluster in a Smart, Sustainable British Columbia*) to advance the power technology industry and secure BC's position as a world leader.

NEW MEDIA

7.14 That the government work with industry to extend the DAVE tax credit to include the new media sector.

7.15 That the government establish a world class, graduate-level program in digital entertainment technology.

6th Report

DIGITAL DIVIDE

6.1 The PTC recommends that government:

- Keep up the momentum to extend broadband to the remaining communities as quickly as possible.
- Work with communities to identify last mile solutions.

INDUSTRY DEVELOPMENT

6.2 The PTC recommends that government:

- Recognise and support the important role that regional technology councils play in fostering innovation and small business development within their region.
- Support the formation of a regional technology council in the Northwest.
- Provide incentives to encourage growth and development of technology companies in the regions.
- Market the technology innovations and opportunities for the province as a whole through Leading Edge British Columbia.

E-LEARNING

6.3 The PTC supports the PLNet initiative and recommends that its installation and capacity review continue to receive top priority to ensure it has the ability to meet ever-expanding needs.

6.4 The PTC recommends that government, through the Ministry of Education, in cooperation with industry and the school districts, support the goals and financing needs of BCEd Online, and that the Ministry continue to monitor and promote the expansion of its activities to all school districts in the province.

6.5 The PTC recommends that the Ministry of Education:

- Continue research in e-learning for K-12 to include funding for school districts to use IP video and other telecommunications technology delivery systems.
- Conduct education programs for teachers to provide them with the skills necessary to utilise e-learning technology.
- Promote the use of technology in school districts.
- Continue to work with other provinces to research, evaluate and test, and cost-share in the

implementation of e-learning strategies in the provinces K-12 system.

6.6 The PTC recommends that the Ministry of Education investigate providing a capability to encourage and assist students to enter high-tech careers. The Australian Skills Hub distance learning program, located on the web at www.itskillshub.com.au, is a good example of a resource that has been very successful.

6.7 The PTC recommends that government, through the Ministry of Advanced Education, continue to encourage and support the BCcampus initiative as the leading organisation to promote e-learning concepts at the post-secondary education level.

6.8 The PTC recommends that government, through NetWork BC, in cooperation with other ministries, lead a process whereby a comprehensive and focused team (possibly federal/provincial) work with First Nations to address digital divide issues and government services such as e-learning and e-health.

6.9 The PTC recommends that the government work with BC universities, both the federal and provincial governments and large and small business to promote the establishment of an R&D facility to advance the e-learning industry in BC.

E-HEALTH

6.10 The PTC recommends that government support the adoption of a fee code structure that allows health care providers to bill for e-health procedures.

6.11 The PTC recommends that the government establish a governance structure dedicated to the development and implementation of the EHR. Its structure and accountabilities would involve the following:

- A pre-determined term (24-36 months, for example) be set, and clear, reasonable success criteria developed.
- A team leader who is a member of the ministry executive reporting to the deputy minister.
- Positioning so that it is acceptable to the entire community (the health ministries, health authorities and practitioners).

- A direct link between the success of the team and the success of the EHR implementation.
- A funding model utilising resources from other bodies such as Canada Health Infoway. The model must allow for central decision making on the common or province-wide EHR infrastructure but also provide continued funding for specific health authority equipment and software.
- An advisory group with members from the ministry, health authorities and practitioners to guide development activities.

CAPITAL AND INVESTMENT

6.12 The PTC recommends that government expand the tax credits under the *SBVC Act*. Further, government should change appropriate regulations so that the tax credits exist as a total allocation over multiple years and unused credits can be transferred between programs.

HUMAN RESOURCES

6.13 The PTC recommends that government, through Leading Edge British Columbia, undertake special marketing initiatives to assist in recruiting talent for high-tech companies throughout the province.

ALTERNATIVE ENERGY: FUEL CELL

6.14 The PTC recommends that government build on the record of success and work with the energy technology sector to complete the “Hydrogen Highway™” prior to the 2010 Olympics and to further develop the sector.

5th Report

CAPITAL AND INVESTMENT

5.1 That the provincial government extend the British Columbia SR&ED tax credit program beyond its current expiration date (September 1, 2004) and make it an ongoing program with periodic reviews.

5.2 That the provincial government initiate an advocacy program with the federal government to:

- Review and modify the rules within the SR&ED program that restrict tax credits to companies having investment from public companies and/or non-residents. This would ensure that firms that have obtained capital from legitimate sources are not being excluded from other important and appropriate financing sources.
- Review and modify restrictions in the program, mandated at a federal level, with respect to differences in the treatment of public (20% tax benefit carry forward) and private (35% tax credit carry forward) companies.

5.3 That the provincial government develop and implement an equity participation incentive to attract technology companies, senior management, key employees and head offices to British Columbia. The incentive must lower and/or eliminate the

provincial tax payable on the exercise or disposition of stock options. The incentive would be applicable to:

- All employees who are residents of BC at the end of the calendar year and file for a BC tax return,
- All forms of equity compensation such as stock options and restricted stock, and
- The gain in value between the fair market value on the date of grant and the price on disposition.

The incentive would provide a tax credit equal to 50% of the provincial tax payable if the option is held for greater than 1 year but less than 2 years and a tax credit equal to the provincial tax payable if the option is held for more than 2 years.

5.4 That the provincial government work with the federal government to explore the issue of double taxation by nations whose citizens are working in Canada and ensure that all parties honour both the intention and letter of the appropriate treaties, and that the federal government, when acting upon new tax treaties, pay particular attention to double taxation clauses.

5.5 That the provincial government work with the federal government to extend the loss carry-forward

APPENDIX A: SUMMARY OF RECOMMENDATIONS

provision from the existing 7 year period to 20 years (the newly enacted US limit).

5.6 That a thorough review of all regulations and taxation involved with foreign pension and investment fund investment in venture capital and entrepreneurial growth business be undertaken by the province in cooperation with the federal government.

5.7 That the provincial government undertake a study to investigate the under-investment of pension funds and other investment portfolios in venture capital, determine the key drivers (particularly educational and training) that would enhance such investment, and work with the venture capital industry and appropriate industry associations to encourage and/or secure further investments by such portfolios in venture capital funds within the province.

5.8 That the provincial government remove the individual annual limit in the provincial *Income Tax Act* for angel investors in eligible small businesses under the *Small Business Venture Capital Act*.

5.9 That the provincial government develop programs to focus on attracting and/or building 2 to 3 new, venture capital funds per year, staffed with experienced venture capital players, in British Columbia. The new funds would be required to:

- Be associated with a top tier world class venture capital player that is establishing a new fund in BC,
- Be a new fund primarily directed at investment in BC which counts among the principals in the new fund individuals with extensive venture capital experience.

Any new funds must:

- Establish their funds locally: a BC office and general partners in BC,
- Target its investments in BC companies, and
- Raise private capital before accessing the BC programs.

5.10 That immediate steps be taken to identify an appropriate and targeted campaign for creating greater awareness of British Columbia as a high technology jurisdiction and to make clear the entrepreneurial opportunity that lies within it. The campaign should be designed to be undertaken with existing provincial high technology and biotech players so that it benefits both the companies and the region.

5.11 That the provincial government work with the venture capital industry, successful high technology and biotech businesses, and appropriate trade associations to host small group meetings in the key investment centres of New York, London, Boston, Frankfurt and San Francisco.

5.12 That the provincial government work with industry and the financial and academic communities to invite the management teams of the top 20 global venture capital and private equity funds to visit the province on fact-finding tours. This should be executed within the year, in an effort to build momentum in the venture community.

5.13 That the provincial government work with the universities and institutes to ensure that British Columbia is receiving its fair share of federal funding for innovation, as well as any available industry funding. In addition, the PTC recommends the province work with industry and the academic sector to ensure that BC-based companies, or those having significant satellite plants in the province, are actively investing in innovation in the province.

HUMAN CAPITAL FOR AN INNOVATION ECONOMY

5.14 That the provincial government work with industry to develop a means to raise awareness of the opportunities available in an information-based economy and assist citizens to enter technology-related careers.

5.15 That the Ministry of Education continue to develop its K-12 e-learning strategy through the BC Ed Online initiative to ensure that consistent, province-wide standards and content are developed and maintained.

5.16 That the provincial government fully implement the BCcampus initiative.

5.17 That the provincial government revise the definition of a “high technology professional” to provide:

- Enhanced clarity for employees and employers to minimise disputes and costly resolution processes.
- Greater clarity as to what occupational activities are included as opposed to defining specific occupational titles that limit interpretation.
- Inclusion of all occupational activities related to the full product and service life cycle, including sales and marketing.

- Clear inclusion of other high technology sectors such as new media, alternative energy (fuel cells), and

biotechnology. The definition should also leave room to include new technologies as they emerge.

4th Report

THE PTC PRIORITY RECOMMENDATIONS

4.1 Continue to work to implement all previous PTC recommendations with priority consideration of the following by government in the coming year:

- a. **Broadband**
Provide broadband services to all British Columbia communities. Work with the federal government to accomplish this in the next three years.
- b. **Government Operations - Telehealth**
Make telehealth a top priority and continue work to adopt and implement common health information technology infrastructure and standards, and establish an e-Health Task Force.
- c. **Industry Development**
 - 1) **Venture Capital -**
Work to pass the PTC's previously recommended amendments to the *Small Business Venture Capital Act (SBVC Act)*.
 - 2) **Promoting British Columbia -**
Develop a provincial marketing strategy and take every opportunity possible to promote the province. This includes:
 - a) Marketing and promotion missions led by the Premier
 - b) A marketing and promotion plan developed from government analyses of the five key emerging industry sectors in British Columbia – information technology, life sciences, new media, alternative energy and wireless. The plan would provide for a sustained marketing effort of the province's technology industry and business climate. Among other things, it would include:

- i. Developing and executing a branding strategy and marketing plan for the British Columbia technology community.
- ii. Creating an inward-bound information centre for prospective corporate recruits to the province.

ALTERNATIVE ENERGY

4.2 Combine the strengths of the provincial and federal governments, industry and academia to develop and implement an aggressive British Columbia Fuel Cell Strategy that parallels and builds on a similar National Fuel Cells Strategy. Activities in the provincial strategy should include:

- a) Enhanced support for research and development carried out by the private sector and in public institutions (in collaboration with industry).
- b) Support for market focused demonstration projects in both public and private sector applications. This should include real life situations that validate product reliability and output, "ruggedize" the product, provide quality assurance data, and help manufacturers make the necessary alterations to earn commercial success.
- c) The British Columbia government becoming an early adopter of fuel cell products. Government departments and crown corporations being real customers raises the profile and supports the development of markets.
- d) Accelerate the development of harmonised codes and standards. Government and industry collaboration is necessary to remove regulatory obstacles to the introduction of fuel cell products and systems.
- e) Incentives that support and reward growth and investment such as:

- 1) Encourage the early adoption of fuel cell and related products and systems by providing fiscally neutral tax based incentives, such as the income tax payback approaches used in Michigan.
- 2) Consider programs having an initial cost but longer term substantial savings to the treasury.
- f) Development of infrastructure which includes building upon investments already made by BC Hydro and others.
- g) Ensure the availability of a highly skilled, well-trained workforce. This involves conducting

industry and government collaboration with secondary and post-secondary institutions to define and implement appropriate education and training at all levels in the post-secondary system.

REWARDING INNOVATORS IN THE PUBLIC SERVICE

4.3 Accelerate and reinforce desirable change in the public sector by adopting the Premier’s Awards in all the proposed categories (leadership, service excellence, innovation and partnership), especially the innovation category.

3rd Report

IT PROCUREMENT

3.1 Examine the scope of its current procurement reform initiative to ensure it adequately addresses the unique nature of IT procurement and permits adoption of a benefits-driven procurement model based, above all, on the business objectives rather than the technology requirements of government.

3.2 Identify a senior government official to drive both a strategy and implementation process around IT procurement reform. This official will also be responsible for fostering development and adoption of new IT procurement tools and models; facilitating government-wide and industry education; and championing support throughout government.

3.3 Create a joint government and industry task group to address the wide range of issues associated with IT procurement reform, with particular attention to the prioritized list of issues and proposed solutions emanating from the Procurement Symposium as well as the larger list of tactical and strategic issues identified by the PTC during its consultative process.

3.4 Continue the momentum. Hold a follow-up IT procurement symposium within 120 days. The joint industry / government event should include a progress report from government outlining its response to the set of recommendations contained within this report, as well as future plans, deliverables, and timelines.

E-HEALTH

3.5. Establish an e-Health Task Force composed

of both government representatives and health care professionals to address the recommendations arising from the e-Health Roundtable. In addition, the mandate of the e-Health Task Force would include:

- coordinating and leveraging current e-health initiatives, including clinical and educational telehealth projects;
- the implementation of an Electronic Health Record (EHR), in conjunction with other levels of government and across ministries. This standard EHR would be adopted by all Health Authorities, institutions and businesses providing health care services in the province;
- address the licensure, liability and billing issues and the resulting changes required to existing policy or legislation to enable health care givers to participate in telehealth; and
- conduct a community consultation
- process to identify specific telehealth applications that will address critical needs in each community.

VENTURE CAPITAL

1.6. To meet the acute need for seed and early stage venture capital within the province, the PTC strongly recommends that the proposed amendments to the *SBVC Act* be passed by the legislature prior to the beginning of 2003. Failure to do so will discourage and inhibit the facilitation of more early stage capital within British Columbia, and will put us further behind other jurisdictions.

2nd Report

UTILIZING SPAN/BC NETWORKS

2.1 Upgrade and extend SPAN/BC so it is capable of delivering advanced broadband network infrastructure to the communities of British Columbia.

2.5 Find ways to open up SPAN/BC to allow communities to take advantage of the government's broadband infrastructure in those communities where the private sector is unlikely to provide high speed Internet access to citizens and businesses.

PRIVATE SERVICE PROVIDERS' NETWORKS

2.4 Investigate all potential levers including – but not limited to – aggregating public demand, so that it can prompt service providers to extend and update their current telecommunications network infrastructure.

2.6 Reform procurement policy to allow for flexible, creative and competitive procurement models that will stimulate the private sector to upgrade and expand their broadband network infrastructure, as well as encourage the entry of local service providers, such as community-based networks, into the marketplace. To this end, two or three communities should be identified as pilot sites for further detailed planning, and implementation.

2.7 Conduct a Request for Information that solicits vendor and community stakeholder reaction to these recommendations, and taps into the innovative and creative potential for public-private partnerships that exists in the marketplace.

BROADBAND - DEMAND AGGREGATION

2.2 Aggregate total public sector demand (including core government, health authorities, schools, etc) where feasible to upgrade and expand SPAN/BC so that it will be capable of providing next-generation broadband infrastructure to the communities of British Columbia.

2.3 Investigate fully the economics as well as the potential benefits or obstacles inherent in aggregating public sector demand.

PUBLIC ACCESS AVAILABILITY

2.8 Make sure that there is public access to the Internet in every community in British Columbia.

2.11 Develop a complete map-based inventory of all public access sites by community to determine if the levels of public access and location of sites are appropriate for the size and demographics of the population.

2.14 Work with the First Nations of British Columbia and the federal government to bring information technology, including public Internet access, to remote First Nations communities in British Columbia.

2.15 Determine if the province's 58 sCAT locations and if existing PLNet facilities could be used by the public to access the Internet.

Public Access Sustainability

2.9 Work closely with the federal government to coordinate the allocation of scarce public dollars for public access.

2.10 Find ways to sustain existing public access sites in the province and meet the growing public demand by increasing, where necessary (based on demographics and usage patterns), the number of sites, the number of public access terminals, the available bandwidth, and the hours of operation.

2.13 Increase staffing levels at public access sites through programs like Youth@BC, through partnering with Industry Canada's CAP Youth program, or through use of the Labour Force Development Agreement with the federal government to train unemployed individuals to work at access sites

IMPROVE AWARENESS ON PUBLIC ACCESS

2.12 Improve awareness and visibility of public access.

PROVINCE-WIDE HEALTH IT STANDARD

2.16 Continue meetings between the executive of the new Health Authorities and the Ministry of Health Services and Ministry of Health Planning to discuss province-wide health information and information technology standards that will apply to

APPENDIX A: SUMMARY OF RECOMMENDATIONS

all six Health Authorities as they move to restructure and consolidate.

2.17 Ensure each of the Health Authorities appoints a person to be responsible for information management and technology with the task of implementing the appropriate standards in collaboration with the Ministry of Health Services and the other health authorities.

2.26 Extend its standards beyond just ministries to its agencies and other government service providers.

Ensure that the designated chief information and technology officers of each authority work with the Ministry of Health Services and Ministry of Health Planning and other appropriate ministries to establish integrated technology standards province-wide. At a minimum these information and technology officers should:

2.18 Establish a consolidated provincial strategy for Health Information Management and Information Technology (IM/IT).

2.19 Adopt and implement common health information technology infrastructure and standards.

2.20 Evaluate and seize opportunities for moving towards shared services where practical and cost-effective.

2.22 Identify policy changes needed to support the electronic delivery and management of health services.

2.23 Recognise information technology development as a strategic investment.

E-HEALTH AND TELEHEALTH STRATEGY

Ensure that the designated chief information and technology officers of each authority work with the Ministry of Health Services and Ministry of Health Planning and other appropriate ministries to establish integrated technology standards province-wide. At a minimum these information and technology officers should:

2.21 Develop a provincial strategy to facilitate Telehealth and electronic health record initiatives in consultation with medical and continuing education units of the colleges and universities.

2.24 Facilitate the advancement of key e-health and Electronic Health Record initiatives.

2.25 Establish a British Columbia e-Health Think

Tank composed of e-health visionaries, not senior IT staff, who will examine the applications side of e-health, since it will be compelling applications that drive down costs and improve the delivery of health services to the remote and rural regions of the province.

IT PROCUREMENT

2.39 The provincial government should expedite its efforts to rewrite its Policy and Legislative Framework around Procurement Reform so as to result in more streamlined, flexible, and cost-effective processes for both government and the British Columbia supplier community, ensuring fair and open procurement throughout the province. The government should also develop procurement policies and educational programs for both ministries and the supplier community which will provide British Columbia-based technology companies with the tools and skills required to compete more effectively for government contracts.

VENTURE CAPITAL - CHANGES TO SBVC ACT

Accelerating 'Early Stage' Technology Investment

The provincial government should proceed promptly with the following streamlining amendments to the *SBVC Act* to address the need for early stage capital investment in technology companies:

2.27 Expand the tax credit budget legislated under the *SBVC Act* from \$50 million to \$100 million annually.

2.28 Introduce an investment model under the *SBVC Act* that does not require the registration of a separate VCC to facilitate investment and tax credits under the programs in order to allow direct investment, cut red tape and reduce program registration costs.

2.29 Increase the total amount of capital one business may receive under the program (beyond the current \$3 million) to better reflect the capital needs of many early stage technology companies.

2.30 Increase the employee threshold limit for a small business from 75 to at least 150.

2.31 Allow approval for common investment regimen, such as multi-tranche investments over multiple years based on attainment of established milestones.

Leveling the Playing Field for Tax Credit Investment in British Columbia

The provincial government should enable small businesses and venture capital managers participating under the *SBVC Act* to raise and invest venture capital, with the assistance of tax credits, under the same conditions that are presently offered to the one Labour Sponsored Venture Capital Corporation (LSVCC) operating in British Columbia and other LSVCCs operating throughout Canada.

To achieve parity with labour sponsored funds, the task group recommends the following amendments be made to the *SBVC Act*:

2.32 Allow program investors the option to invest directly from their self-directed retirement savings plans.

2.33 Make the tax credit incentives available for program investment within 60 days after the calendar year.

2.34 Increase program flexibility in program capital investment beyond simple common or preferred shares.

2.35 Provide VCC investors up to 24 months to complete investments.

2.36 Open up the tax credits provided to the sole LSVCC to competition by allowing other venture capital firms to enter the market to create a more dynamic venture capital community.

RESEARCH AND DEVELOPMENT

2.37 The provincial government should take steps to create an e-learning chair at one of BC's universities.

ATTRACTING TALENT TO BRITISH COLUMBIA (RECRUITMENT)

2.38 The provincial government should work with the federal government to change immigration

rules so that spouses of employees moving to British Columbia can work here automatically.

BRITISH COLUMBIA PROVINCIAL BRANDING

2.40 Develop a provincial branding and marketing strategy that feature technology and innovation as key drivers supporting British Columbia's image as a place with a sustainable and vibrant economy, including resource and knowledge-based industries, and an unparalleled quality of life.

2.41 Develop a strong macro-image positioning British Columbia as a desirable technology destination for investors, employees and site selectors.

2.42 Develop and execute its provincial branding strategy in consultation with the technology community.

MARKETING BRITISH COLUMBIA

2.43 Target its technology industry marketing effort at key audiences that include decision makers in technology investment, site selection and highly skilled workers.

2.44 Focus its technology industry marketing strategy initially on four sectors known as areas of strength within the province: biotechnology, wireless, alternative energy and new media.

2.45 Focus its marketing strategy to attract highly skilled workers or those individuals that may be predisposed to move to Canada such as expatriate Canadian and British Columbia technology workers and members of communities that are already represented in British Columbia.

1st Report

PUBLIC AWARENESS ON THE BENEFITS OF E-GOVERNMENT

1.8 Educate British Columbians about the benefits of being fully connected, including access to relevant Internet-based applications and information, and increasing e-government services.

RESEARCH AND DEVELOPMENT

1.1 Double the number of computer science and electrical engineering graduates from British Columbia post-secondary institutions.

1.2 Establish 20 British Columbia Research Chairs in the fields of medical, social, environmental, and technological research.

ATTRACTING TALENT TO BRITISH COLUMBIA (RECRUITMENT)

Attract senior professionals to accelerate industry growth by:

1.3 Making changes to immigration policy.

1.4 Establishing an Info-Office to aid in the recruitment of out of province technology workers and relocation of technology companies to British Columbia.

1.5 Implementation of a competitive provincial stock option program for British Columbia workers.

1.6 Resolution of cross-boarder security issues with the US.

MARKETING BRITISH COLUMBIA

Establish a domestic and international campaign to promote British Columbia's quality of life, superior infrastructure, education system, technology community and business-friendly environment.

Appendix B. PTC Members, Staff & Acknowledgements

PTC Members

CHAIR:

Honourable Gordon Campbell
Premier
Province of British Columbia

CO-CHAIR:

Greg Peet
Former Chairman, President and CEO
ALI Technologies

MEMBERS:

Brad Bennett
President
McIntosh Properties Ltd.

Dr. Daniel Muzyka
Dean, Sauder School of Business
University of British Columbia

Barbara Berg (Alexander)
Director Western Public Sector & Health
Microsoft Canada

Dr. Donald Rix, MD
Chair
MDS Metro and Cantest Ltd,

Reg Bird
Board of Directors
Vecima Networks

Don Safnuk
Founder, President, and CEO
Corporate Recruiters Ltd

Greg Kerfoot
Owner and President
Whitecaps F.C

John Sheridan
President and CEO
Ballard Power Systems

Paul Lee
General Partner
Vanedge Capital Partners

Dr. Gerri Sinclair
Director, Masters of Digital Media Program
CEO, Centre for Digital Media

Gerry Martin
Co-Owner
Kra-Mar Investments.

Morgan Sturdy
Director
Discovery Parks Inc.

Don Mattrick
Head
Microsoft's Xbox and Games Business.

Ralph Turfus
CEO
Arbutus Place Investments Ltd.

Jim Mutter
Former President
Premier's Technology Council

Mossadiq Umedaly
Chairman
BC Hydro

Janet Wood
Senior Vice President Customer Assurance
Business Objects/SAP

CO-PRESIDENT:

Cheryl Slusarchuk

CO-PRESIDENT:

Eric Jordan

PTC Staff

Andrew Wynn-Williams, Director of Operations

Serena Johnson, Executive Assistant

Mari Nurminen, Lead Analyst

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Ministry of Advanced Education and Labour Market Development

Robin Ciceri, Deputy Minister

Ian Mellor, Associate Executive Director

Ministry of Education

Renate Butterfield, Assistant Deputy Minister and Education Sector CIO

James Gorman, Deputy Minister

Ministry of Energy Mines and Petroleum Development

Greg Reimer, Deputy Minister

Geoff Turner, Sr. Policy Advisor

Janice Larson, Director

Ministry of Health

Gord McAtee, Deputy Minister

Larry Keith, Director

Ministry of Labour and Citizen Services

Lori Wanamaker, Deputy Minister

Dave Nikolejsin, Chief Information Officer for the Province of British Columbia

Wilf Bangert, Executive Director

Steve Radin, Senior Security Analyst

Grace Foran, Manager, Executive Operations

Ministry of Science, Technology and Economic Development

Don Fast, Deputy Minister

Glen Scobie, Director

Tim Ewanchuk, Manager

Todd Tessier, Director, Venture Capital Programs

Ministry of Transportation

Kevin Volk, Manager, Strategic Planning and Policy

Other individuals who assisted in the preparation of this report

Bev Van Ruyven, BC Hydro

Ken McDonald, BC Hydro

Jane Peverett, BC Transmission Corporation

Christine Massey, Research Universities Council of BC

Don Avison, Research Universities Council of BC

Soren Harbel, BC Innovation Council

Maureen O'Reilly, BC Innovation Council

Grace Battiston, Great Northern Way Campus

Janet Mainland, Hamill Creek Timber Homes

Steve Hnatiuk, Yaletown Venture Partners

Michael Ball, Genolgics

Peter van Bodegom, Cogent Systems

Jon Rhone, Nexterra

Raymond McAllister, Nexterra

Tarrnie Williams, Relic Entertainment

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Premier's Technology Council

730-999 Canada Place

Vancouver, British Columbia V6C 3E1

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