

ITAC

INFORMATION TECHNOLOGY
ASSOCIATION OF CANADA

ACTI

ASSOCIATION CANADIENNE
DE LA TECHNOLOGIE DE L'INFORMATION

ITAC's Response to the Consultation Paper on a Digital Economy Strategy for Canada

July 9, 2010



Table of Contents

Introduction	1
Capacity to Innovate Using Digital Technologies	3
Overcoming Under-investment in Information and Communications Technologies	3
Addressing Our Environmental Challenges	6
The Digital Economy and Public Services	7
Demographic Challenges	8
Governments as Model Users	9
Protecting the Online Marketplace	12
<u>Capacity to Innovate Using Digital Technologies - Questions</u>	14
Building a World Class Infrastructure	15
Digital Infrastructure is Much More than Broadband	15
Setting Canada's Goals for Broadband Infrastructure	15
<u>Building a World-Class Digital Infrastructure - Questions</u>	20
Growing the Information and Communications Technology Industry	21
<u>Growing the Information and Communications Technology Industry - Questions</u>	27
Digital Media: Creating Canada's Digital Content Advantage	28
<u>Digital Media: Creating Canada's Digital Content Advantage - Questions</u>	30
Building Digital Skills for Tomorrow	32
<u>Building Digital Skills for Tomorrow - Questions</u>	36
Summary and Conclusion	38
Recommendations	39

Introduction

As the national association of Canada's information and communications technology (ICT) industry, ITAC commends the Canadian Government for its decision to launch a digital economy strategy. For many years ITAC has explored various aspects of competitiveness, growth and prosperity for Canada. As the Consultation Paper points out, there is a significant movement around the world to put together digital economy or e-economy strategies. This is not happenstance. More and more, it has become apparent that digital technologies are changing our economies and societies in a pervasive and fundamental way and that a holistic, strategic approach is needed to secure success in this new environment.

While digital strategies have a number of basic common elements, they really need to reflect the circumstances of a particular country. This involves more than differences between a developed and a developing economy, or between a geographically large and a geographically small country. It is about things like Canada's advantages in terms of a well-educated population or a fiscally strong position, and its challenges in terms of productivity and innovation, or commercialization. There has been a general feeling that we have been falling behind and that we have both a history and a range of significant advantages that mean we can and should be a leader if we put together the right strategy, and execute it.

The Consultation Paper properly recognizes this. ITAC supports the determination to build on the Advantage Canada strategy to achieve the following goal, as expressed on page 9:

“Our goal for Canada is to have a world-leading digital economy; to be a nation that creates, uses and supplies advanced digital technologies and content to improve productivity across all sectors.”

Many of the issues in a digital economy strategy are inter-related and strategies and actions will have an impact on more than one objective. For example, the significant communications campaign recommended below will have a positive impact on both technology adoption across the Canadian economy and on the understanding by young Canadians of the interest and potential of digital economy careers. In a similar way, a strategy for governments as model users will help address fiscal and demographic challenges for our governments, improve access and service to the public and to businesses, promote the use of digital technologies throughout our economy, and help grow the ICT industry.

We are glad to see that the digital economy strategy consultation is being launched by three ministers and that it recognizes that an effective strategy involves collaboration across the whole of government, as well as between different levels of government, and indeed between governments, industry and the rest of Canadian society. Canada has proven in the past that it can coalesce around a major public policy goal and achieve exceptional results. Success in the digital economy is a goal of fundamental importance that we can and should similarly set for ourselves.

ITAC has approached its recommendations in a manner that recognizes fiscal challenges faced by our governments at this time. We do believe that a lot can be done that does not involve massive amounts of public spending. Nonetheless, ITAC points out that our different governments should be prepared to invest in a strategy that is fundamental to our economic future. We observe that other governments are committing significant, multi-billion dollar investments in their digital strategies.

Capacity to Innovate Using Digital Technologies

The Consultation Paper points out that enhancing our productivity and capacity to innovate is of paramount importance in today's increasingly digital world, but Canadian firms, particularly SMEs which form such a significant part of our economy, have been slower to use digital technologies than firms of similar sizes in other countries.

This is one of the key challenges that Canada must overcome in the interest of our future success and prosperity. We must also aggressively seize the opportunities that digital technologies present for our governments and public services.

In its comments below, ITAC has addressed each of the sub-headings in this section of the Consultation Paper, and inserted pieces on opportunities in terms of the Environment, Public Services and tackling our Demographic Challenges that are relevant to this section of the Paper.

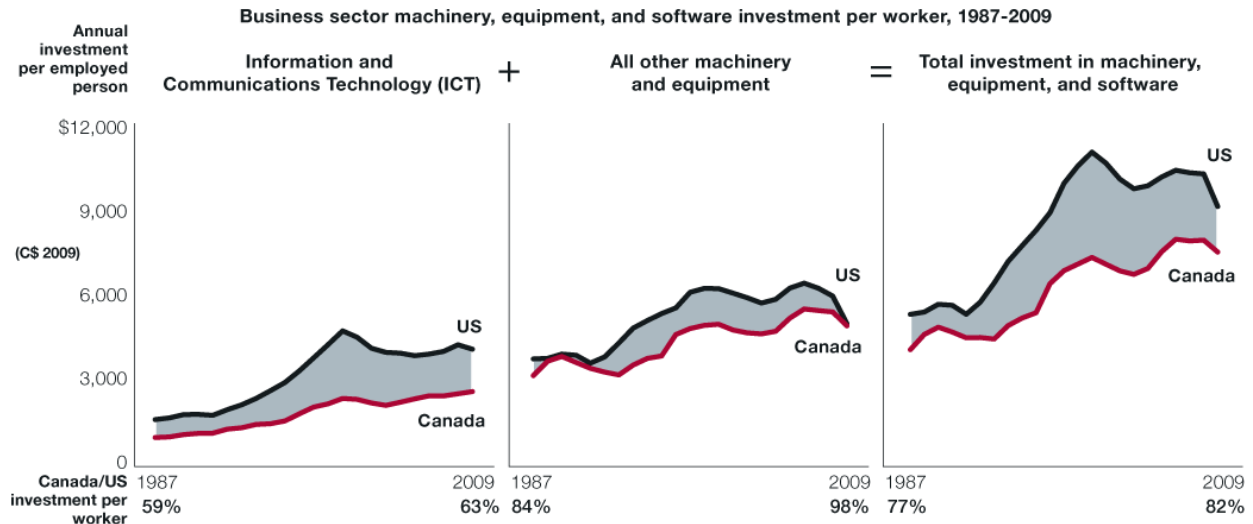
Overcoming Under-investment in Information and Communications Technologies

ITAC has been concerned about the chronic under-use of technology across the whole Canadian economy for over a decade now. We believe that this under-use of technology is a critical contributor to our lagging productivity. We believe it also impairs our overall capacity for innovation.

We are, therefore, very pleased to see that addressing this issue has a central place in the formulation of a digital economy strategy for Canada. Measures to remedy this persistent problem cannot come too soon. The latest report from the Institute for Competitiveness and Prosperity illustrates that the gap between Canadian and U.S. business sector machinery, equipment and software investment per worker is now entirely attributable to under-investment in ICT.¹ This helps to reframe the challenges. Canadian businesses use machinery and equipment as intensely as their U.S. competitors. We must encourage them to use digital tools with the same intensity.

¹ "Beyond the Recovery," Institute for Competitiveness and Prosperity Report on Canada 2010, page 39.

Exhibit 18 Canada has failed to close the gap in information and communication technology investment



Note: US dollars converted to Canadian dollars using 2006 PPP for M&E.
 Source: Institute for Competitiveness & Prosperity analysis based on data from Statistics Canada (special tabulations); Labour Force Survey (CANSIM Table 282-0002); US Department of Commerce, Bureau of Economic Analysis; US Bureau of Labor Statistics, Current Population Survey; CSLs Database of Information and Communication Technology (ICT) Investment and Capital Stock Trends: Canada vs United States, available online: <http://www.csls.ca/data/ict.asp>.

This problem of under-adoption has been as puzzling to policy makers as it has been to the ICT industry. Our own research has shown us that business people, including those in the small and medium-sized business groups, do not need to be persuaded that ICT investment can advance their ability to achieve business priorities. Yet they persistently demonstrate a higher level of comfort making labour and other non-ICT investments to achieve their objectives. This seems to be counter-intuitive economic behaviour.

There is a clear disconnect between knowing that ICT can improve business outcomes and knowing exactly how it will do so. One finding from our research has been that a substantial cohort of small and medium-sized business does not have ready access to expertise in how ICT can be used, having no ICT staff whatsoever, and that 50 percent of all SMBs have two or less full time equivalent ICT staff on their payroll.² Without trusted advisors in-house and wary of the complexity and risk associated with ICT investments, many SMBs simply don't have the analytical expertise to make the appropriate investments.

The need to better equip our whole workforce with the digital competencies to operate increasingly complex 21st century endeavours is a central imperative of the talent strategy that

² "Does ICT Matter to SMBs in Canada?" IDC, 2006.

we propose. If we are successful, this will help significantly resolve the knowledge gap in our SMB companies.

In the meantime, however, public policy interventions will be necessary to encourage behavior change among business owners. The challenge for public policy is to determine just what form this might take. Soon we may be able to assess the impact of the temporary 100 percent capital cost allowance rate on new computer hardware and systems software. This should provide a perspective on the impact of tax-based measures, albeit for only the hardware element of ICT technologies and services. Meanwhile, direct programs, such as the Federal Economic Development Agency of Southern Ontario's 'SMART' Program to encourage the use of ICT, green and lean technologies among Ontario manufacturers is coming to fruition. The grassroots impact of programs like SMART should not be minimized. While direct programs like this are not typically large enough to affect macro economic measures, they do alter the competitive landscape and encourage other business owners to make the investments they know will help to achieve their objectives.

ITAC is increasingly persuaded that a flexible combination of direct and indirect incentives is most appropriate. And we are coming to share the view of some of Canada's OECD rivals that voucher programs may provide a relatively low cost means to break the paradox of SMB under-adoption. Our recent study, "Leveraging ICT Adoption: What Can Work for Business?," summarizes this view:

... it is not possible to expect improvements in technology adoption by small (and at times unprofitable) businesses by relying on limited tax offsets such as accelerated depreciation, which to large extent target only a fragment of the ICT product market (e.g., computers in Canada). A broader range of policies interacting with one another is required. These policies may include direct assistance targeted to technology adoption and catalytic or collaborative procurement led by government as a launching customer.

Success of any policy intervention will not happen if the receptor conditions for assimilating new technologies by small firms are not met. These, in particular, include educating and training employees, and designing effective ICT business strategies. Voucher programs focused on building such capabilities offer a vehicle to strengthen the receptor conditions of the firm for adopting new ICTs.³

Thought leadership and communication must play an integral part of whatever public policy is implemented to improve Canadian use of ICT. This should be led by government and embraced by various sectors of business in order to have an impact commensurate with the importance of

³ "Leveraging ICT Adoption: What Can Work for Business," by Jacek Warda, January 2010, page 2.

the issue for all Canadians. In fact, it could be argued that this leadership is the clearest and most indisputable role for government. It can also be argued that communications measures to announce initiatives, like accelerated CCA or direct incentive programs like SMART, may be every bit as valuable as the measures themselves.

Communications should not only take the form of conventional advertising. This should include a range of activities and tools including public-private information and promotion programs. A pan-economic initiative to reclaim our former leadership in electronic commerce, electronic government and digital content can be galvanizing and change-creating in and of itself. It will also help the digital economy strategy overall, including other aspects such as the interest in digital skills and digital economy careers.

Effective communications, of course, begins with a sound foundation of fact. Our capacity to measure the inputs and outputs of the digital economy and to benchmark our performance against our competitors is an essential tool for achieving our leadership aspirations. We must renew and reinvigorate our efforts to collect, analyze and disseminate such data.

Finally, strategies around governments as lead users, discussed below, will also help address this issue.

Recommendations:

1. We need a high-profile campaign to promote the importance of leadership in the use of digital technologies throughout our economy. It should be led by government, but supported by various sectors of business in public-private initiatives.
2. We should set a goal to close the ICT investment gap between Canada and the U.S. by 2017, and deploy the means to achieve this, including investment incentives.

Addressing Our Environmental Challenges

Digital technologies have a significant role to play in reducing energy consumption and greenhouse gas emissions through smart energy grids, transportation infrastructure, buildings, production and work processes. They are also fundamental to addressing what are essentially information challenges, for example in the management of water resources. However, there is a

tendency to not single out digital technologies as a class from other technologies such as green energy sources or greener energy production. This tends to sub-optimize the contribution that can be derived from digital technologies. ITAC commends the submission by the International Institute for Sustainable Development in response to the Consultation Paper. That submission points out some of the significant contributions that digital technologies can make, which are considerable. ITAC fully supports its recommendations for the development of an integrated set of actions to maximize the linkages between the digital economy and the green economy. Our digital economy strategy should recognize the importance of ICT for dealing with our environmental challenges.

Recommendation:

3. Develop an integrated set of actions to maximize the linkages between the digital economy and the green economy.

The Digital Economy and Public Services

Our public services have a lot to gain from embracing the digital economy. For example, Governments at all levels have recognized the advantages, indeed the need, to pervasively digitize our healthcare system. The Federal Government has made significant commitments through Canada Health Infoway, most recently in its 2009 and 2010 Budgets, and provincial governments have similarly invested significantly in electronic health records and digital infrastructure. This is the most important thing that can be done to ensure the sustainability of our healthcare system and to achieve patient and performance outcomes that Canadians have a right to expect.

ITAC strongly recommends a concerted approach on the part of the Federal and provincial governments to complete the job of digitizing and connecting the various inter-related components of the system. While healthcare delivery is a matter of provincial jurisdiction except for a few areas of direct Federal involvement, there is an important role to play for the Federal Government in promoting and supporting technology adoption, as well as standards and interoperability. Indeed, there is still a big gap at this time in terms of standardization that would promote cost-effectiveness, interoperability and a viable Canadian base for digital health technologies.

Another example of a public service that can benefit tremendously from digital technology is our education system. Canada's education system has a long way to go to be brought into the digital age and this has significant implications for its effectiveness and its ability to build an advantage in terms of an educated and skilled population in the digital age. Here again, this is an area primarily of provincial jurisdiction, but one where the Federal Government has had and will continue to have a significant role, so there is a need for a holistic and collaborative national strategy.

Recommendations:

4. We need a concerted effort to complete the digitization of our healthcare system, using standards that are as international-level and national as possible.
5. We need to undertake a concerted national strategy to bring our education system into the digital age.

Demographic Challenges

The aging profile of our population has been a matter of public discussion for some years. It is a challenge we share with a number of other countries. In areas of our economy where information such as actuarial data are used regularly, such as in the pension industry, fact-based strategies and public policy are being developed to address the situation. ITAC believes that a similar, more fact-based approach is needed across our economy. Governments are likely to be the first to identify the shortages they will face and to develop strategies to deal with them. Obviously the strategies cannot aim to replace all employees that will retire, otherwise governments will simply exacerbate the problem faced in the rest of the economy. That means that strategies have to be developed now to aggressively automate government operations and to outsource non-core government functions to service providers who can then deploy the human resources involved so to serve a multiplicity of customers, or to use resources from other regions of the world where those human resources are more readily available. These strategies cannot be deployed overnight or await the advent of the shortages. They require considerable lead time.

Our large private sector companies should also be addressing these issues in a similar way. They have the means to access much of the required information and to develop the required

strategies, but ITAC does not believe that this is being done across our economy with the required sense of urgency or strategic approach.

SMEs on their part, which constitute the vast majority of enterprises in the Canadian economy, are conscious of issues such as succession problems for the ownership of their enterprises, but they do not have access to the information that will allow them to size the overall demographic problem they will face, nor to devise the appropriate strategies. ITAC observes that other countries have commissioned reports and developed plans to deal with inter-generational and demographic challenges. We believe that Canada must do the same.

First and foremost, we need to develop and publish estimates, taking into account current demographic trends including potential immigration, to identify the size, nature and timing of the gaps that we will be facing. We then need to collaboratively work on strategies to address this. ITAC has no doubt that these will involve greater automation and digitization but they could also involve developing more informed views about the jobs we want to keep in Canada and which we should plan to outsource more.

Recommendations:

6. Develop and widely communicate estimates of the size, nature and timing of demographic shortages we face.
7. Collaboratively develop strategies to deal with them.

Governments as Model Users

This is one of the basic common elements of most digital economy strategies. This is not surprising. When governments pursue concerted strategies to be leading users of digital technologies and services, they contribute to the achievement of a multiplicity of goals:

- More efficient and more responsive government, making it easier for citizens and businesses to access government services and improving productivity and performance in government operations;
- Promoting the adoption of digital technologies across the economy through digitization of government supply chains and government services;

- Contributing to digital skills and comfort with digital technologies throughout the population through interaction with government on a digital basis;
- Growing the information and communications technology industry: sophisticated, demanding customers are a key element of competitiveness strategies; governments are the largest and most complex users of digital technologies in our economy and they have a key role to play in this regard;
- Addressing our demographic challenges: as indicated above, digitization in government will be a key element in this regard; and
- Addressing our environmental challenges: digital technologies and changes to government operations and work processes enabled by them are key to green government strategies.

Canada has an enviable reputation and track record in terms of e-government but, as in other areas, we have been slipping in this regard and it is time for a renewed and concerted effort. It also happens that this is an exceptionally opportune time to do this: there is a significant need to improve efficiency of government operations in order to eliminate budgetary deficits and address looming human resources shortages; much of the basic digital infrastructure of our governments, such as basic administrative applications are 'rusting out' and can be replaced with more interoperable, higher performing applications and technologies. Our Federal Government has undertaken a review of its administrative functions and operating costs in order to improve cost, performance and services to the public.

Today, consumers and businesses are used to shopping, searching and transacting through commonly used online tools. Government services should be as easy to interact and transact with online as common consumer services.

ITAC notes that for many years our different levels of government have been working on citizen-centric delivery issues as manifested in the annual "Lac Carling" conference, and we are poised to move on this in a concerted way. This includes resolving identity and authentication issues.

It is therefore particularly appropriate for Canada's digital economy strategy to place a significant emphasis on the notion of governments as model users. Our governments should plan to aggressively use advanced digital technologies, such as cloud computing, and to implement process changes that digital technologies can enable. We note that the US-based

Brookings Institution found that US government agencies that switched to some form of cloud computing saw up to 50 percent savings.⁴ Cloud computing can also improve efficiency and collaboration in ways that are simply not possible under the legacy IT model.

This will involve significant investments. But, to some degree, these investments are unavoidable so we might as well seize the opportunity to achieve the goals outlined above while improving the cost of government operations. Moreover, there is also the opportunity to offload investments to the private sector, which can then recover its investments on the basis of charging for services at a lower cost than that of the previous operations.

In order to best achieve the outcomes referred to above, we must seize the opportunity to improve government procurement. We should automate government procurement and supply chains, which will make it easier for suppliers, large and in particular small, to be able to sell to governments. We should focus on buying outcomes, not inputs: this will enable more innovative solutions to be brought forth, will simplify and improve measurement of procurement objectives, shorten procurement cycles, and will allow the procurement process to better adapt to evolving technology and process innovations. Smart procurement will also mean that, notwithstanding the size of governments, not every project needs to be massive in scale: for example, new solutions can be tried out in a few departments and then gradually extended to others.

It is important for government to tap the expertise of the private sector, both on what technology can enable and on best practices for managing these transformations. This can be done within the procurement process by focusing more on outcomes and letting providers determine the most appropriate solution they wish to propose. It can also be done by seeking the advice of private sector councils or other less formal consultation mechanisms to deal with both processes and strategies as well as procurement issues.

In terms of growing the information and communications technology industry, leading use of digital technologies by governments can help build significant technology firms and teams with global mandates. At the same time, it is important to realize the potential of this for smaller firms who do not always have the resources or expertise to be able to effectively participate in government procurement. There are a number of things that governments can do to actually

⁴ Darrell M. West, *Saving Money Through Cloud Computing*, Governance Studies, The Brookings Institution, 7 April 2010: http://www.brookings.edu/papers/2010/0407_cloud_computing_west.aspx.

contribute to the development of SMEs in the technology space. Governments can craft their procurement in a way that encourages larger enterprises to partner with smaller firms. Governments can create internal teams that will focus on facilitating the participation of SMEs in government procurement, such as the Federal Office of Small Business and Enterprise – that Office should actually expand its role to more effectively champion the matching of government needs with the capability of our SMEs. Finally, governments can provide opportunities outside of the formal procurement process for pilot projects or trials that will serve to play the reference customer role as well as contributing to refining innovative solutions in a sophisticated and complex customer environment, as is the case with the SME Innovation Fund created in the 2010 Federal Budget.

Recommendations:

8. Government services should be as easy to interact and transact with online as common consumer services.
9. Set a goal to lead in e-government and in the use of digital technologies in government operations.
10. Pursue smart procurement, buying outcomes rather than inputs, and innovative procurement models and approaches that will foster the development of commercial innovations for digital technology firms both large and small.
11. Tap the expertise of the private sector through various formal and less formal means in terms of what technology can enable and best practices in implementation.

Protecting the Online Marketplace

Canada is recognized as having a sound legal regime that creates a favourable overall business environment. But we have been falling behind in terms of the digital economy. The Government has been addressing this with a range of legislative initiatives. These include legislation on ID theft and reporting of child abuse; the Fighting Internet Wireless and Spam Act, dealing with spam and malware; the proposed amendments to PIPEDA, which will implement improvements to a sound, world-recognized, principles-based regime; and modernization of our Copyright Act, which essentially currently pre-dates the Internet age and is perhaps the most visible gap in our digital economy legal regime.

Important changes to copyright legislation are usually controversial, primarily because a sound approach to copyright law requires a balancing of competing interests. ITAC considers that bringing forth these legislative changes within the framework of a digital economy strategy should facilitate the required consensus-building and collaborative mindset. We are definitely not going to be a world leader in being first to implement Internet age copyright legislation. But we can be a world leader in learning from the experience of others and in seeking to strike the most appropriate balance between the interests of creators and the interests of users.

ITAC believes that, with the legislative initiatives mentioned above, Canada's legal regime for protecting and fostering the online marketplace can again be seen as one of the most advanced in the world.

In addition to legislative changes, Canada needs a cyber security strategy. ITAC notes that this was referred to in the 2010 Speech from the Throne. We encourage the Federal Government to announce and implement its cyber security strategy, which has been under development for some time, without further delay. In addition to protection of infrastructure and systems, there are a number of issues around authentication, for example, that can and should be resolved to make the online marketplace safer and more trusted.

Recommendations:

12. Pursue passage of pending legislative initiatives, notably Copyright Act amendments.
13. Announce and implement a cyber security strategy for Canada.

Should Canada focus on increasing innovation in some key sectors or focus on providing the foundation for innovation across the economy?

Yes and yes. Our long term strategy of building a globally competitive tax regime has and will continue to produce a positive impact on the ability of Canadian firms to invest in all business assets. Pan-economic measures, such as the accelerated capital cost allowance, are bound to raise awareness of the importance of ICT investment and stimulate this business behaviour. Additionally the focuses on some key sectors manifest in programs like the SMART program for Ontario manufacturers are bearing fruit. There probably is no single policy prescription to close the ICT adoption gap. But this is a problem that needs to be addressed with all the means at our disposal.

Which conditions best incent and promote adoption of ICT by Canadian businesses and public sectors?

A competitive tax regime encourages business investments. A strong currency heightens the pressure on productivity for export-oriented businesses. Both of these conditions have been in place in the Canadian economy for some time now, yet the adoption gap persists. ITAC believes that direct measures, including incentives and direct communication about the importance of ICT, may be additionally necessary in the short term to accelerate adoption.

What would a successful digital strategy look like for your firm or sector? What are the barriers to implementation?

A successful strategy would be outcome driven, based on current research and benchmarks. It would measure and produce reports at regular intervals. It would engage all dimensions of society in its execution. The only barrier to implementation of such a strategy is our will as a nation to mobilize in this fashion.

Once anti-spam legislation and privacy and copyright amendments are in place, are there new legislative or policy changes needed to deal with emerging technologies and new threats to the online marketplace?

It is time to review our Privacy Act, to bring government privacy legislation into the digital age. ITAC does not see any significant other gaps remaining at this time, although review of our communications framework legislation will be required in the near future, as discussed below under Digital Content. The advent of cloud computing and the deployment of one-citizen public services will also require a review of our privacy protection regimes, notably at the provincial level, to ensure we do not unnecessarily restrict data flows.

How can Canada use its regulatory and policy regime to promote Canada as a favourable environment for e-commerce?

Canada needs to be more prominent in OECD and other international forums on the digital economy, in keeping with a leadership role.

Building a World Class Infrastructure

Digital Infrastructure is Much More than Broadband

ITAC notes that this section of the Consultation Paper focuses entirely on broadband infrastructure. But in the digital age, infrastructure means much more than broadband. It includes electronic health records, e-government and smart grids. It includes various business applications: indeed most enterprises would consider a whole range of hardware and software to be part of their infrastructure. Much of the productivity benefits of ICT come from the applications which form part of digital infrastructure.

Currently, the ability exists to instrument and gather data on our lakes, rivers and streams; our transportation system, energy grids, health care systems, etc. Indeed, the Internet is evolving towards an "Internet of Things" with a trillion connected "devices" – cars, appliances, cameras, roadways, pipelines, medical devices, etc. The "Internet of Things" will gobble up the capacity of the IPv4 Internet address system, heightening the need to move to IPv6.

The Federal Government has recognized the broader definition of infrastructure in its two most recent Budgets by putting under the topic of infrastructure, not just its broadband investments, but also investments in electronic health records as well as research and education.

ITAC believes that Canada's digital economy strategy should explicitly recognize a digital age definition of infrastructure. That being said, broadband is obviously a fundamental underpinning of a digital economy.

Recommendation:

14. Canada's digital economy strategy should explicitly recognize a digital age definition of infrastructure.

Setting Canada's Goals for Broadband Infrastructure

Broadband is another basic common component of all digital economy strategies. It is also an area where approaches should be expected to differ: Canada's circumstances are obviously quite different from those of countries with smaller territories and higher density of population; most countries in the world are largely dependent on a single wireline infrastructure, whereas

Canada is among those countries that have built up competing wireline infrastructures, complemented today by a multiplicity of wireless networks; Canada has an open market and private-sector-driven economy, whereas other countries may be used to more direct government involvement.

This is also an area where Canada had traditionally been a world leader but has slipped in rankings over the years. There has been considerable controversy around this issue. While investment cycles and competitive developments are resulting in significant improvements, there is a consensus that we are in a race that deserves a concerted strategy for leadership.

ITAC also believes that we have reached the point where the broadband element of a digital economy strategy has to focus on next-generation broadband. Next-generation broadband is a step forward: it involves higher download speeds than the 1.5 Mb/s target of our current public programs; it involves upload capacity as well as download; it includes the amount of capacity that can be used per month. Essentially it is about the ability to participate in the digital economy, ranging from personal interaction and communication, to accessing and using e-government services, to being able to do business or work from home as well as from the office. It means the ability to do interactive video, and communication of large files, as opposed to just text or one-way communication.

Another thing that is evolving is the availability and usefulness of a whole range of technologies, from copper wire, to coax, to fibre, to fixed wireless or mobile or satellite. For a country with Canada's geography and population density, it is necessary to remain open to the use of any and all of these technologies. Each is more or less appropriate in different circumstances of density, or in terms of economically sound investment evolution. All of these are currently used in Canada and this is likely to continue for the foreseeable future.

Fibre to the home is being deployed, mainly in parts of our country where there is aerial plant, and fibre is being laid in greenfield developments to be activated at some point in the future. Fibre is also being extended closer to the customer in telco and cableco networks. We have cable systems covering 92 percent of Canadian homes and cable technology is, or will soon be, able to deliver download speeds of 100 Mb/s or more. We have telco systems that are delivering 7 to 25 or more Mb/s in urban environments.

In our rural areas, ranging from the fringes of our cities to the more remote parts of our country, we have a range of wireline, wireless and satellite-based services including the current roll-outs of publicly-funded programs, targeting a minimum of 1.5 Mb/s. While real progress is being made in the form of viable and sustainable offerings to rural Canadians, many people outside urban environments still do not experience the capabilities they require.

Meanwhile, mobile networks are offering up to 21 Mb/s to 93 percent of the population, including thousands of small communities, and are being tried out for home environments.

Future evolutions and generations of all these technologies over the next five to 10 years will be able to deliver considerable increases in capacity and throughput.

In terms of setting our goals, ITAC has come to the conclusion that Canada should not try to out-100 million other countries, whether in terms of homes covered or download speed targets. Canada does not have the population base to or population density and ITAC does not believe that the typical 100 Mb/s download speed target is the most appropriate:

- These targets are typically set for approximately eight to 10 years out. ITAC believes that by then a more holistic measure of the broadband experience is likely to be used; the 100 Mb/s download speed may have proven to be unimportant (as has been the case over the past few years for clock speed on computers); and in any event it is likely to be significantly exceeded in urban environments if market needs evolve in that direction.
- A 100 Mb/s per second target is normally set for urban environments, which involves a policy-based digital divide.
- As indicated above, download speed is not a sufficient measure of the next generation broadband experience.

ITAC supports the view of the Senate Standing Committee on Transport and Communications that we should set our goals so that they cover the needs of all Canadians, and particularly Canadians in rural and remote parts of our country as well as the fringes of our large cities.

ITAC also believes that our goal should be functional, namely to reflect the holistic next generation broadband experience referred to above. We believe that this will require download

speeds greater than 1.5 Mb/s, more likely somewhere around 5 to 10 Mb/s or more. Most importantly, it will require uploads speed of around 5 Mb/s and access to monthly capacity in the 60 to 100 gigabytes range.

ITAC also suggests that the year 2017 would be a good choice as target year. It is the year of our sesquicentennial, it is sufficiently far away that our targets can be achievable by then and, in terms of proximity as well as by being inclusive of Canadians in all parts of our vast country, represents the kind of leadership that is relevant to Canada's circumstances.

In order to achieve this, ITAC does not believe that we should start with the premise of massive government investment. First and foremost, we should set a goal that coalesces the efforts of all. We should monitor and report our progress towards that goal. We should create more certainty and the right environment for business investment, and leverage and promote opportunities on the demand side. Currently, investment in rural Canada is being driven by present broadband targets. Investors need an economic and technological roadmap to validate both current and future investment. Our strategy should include:

- Mapping out and announcing plans for availability of spectrum for the next 10 years.
- Developing spectrum auction plans that promote rural deployments (including dealing with the fringe areas around our cities).
- Using public services and public institutions to spur adoption and serve as anchor tenants.
- Focusing public support on what would otherwise remain unaddressed, which may be for backbone or backhaul rather than at the customer-end.
- Try to avoid spending public money to displace private sector investment, perhaps by using investment incentives rather than funding specific business plans that may displace existing operators.

In terms of fostering private sector investment, ITAC points out that we should scale back the fees and levies we currently impose that represent a disincentive to network investment. Our governments have made significant strides in reducing taxation of business investment, be it in the form of capital taxes, corporate income taxes or sales taxes. We should approach fees and levies in the same manner.

The Government also derives very large sums from spectrum auctions. While ITAC recognizes that spectrum auction proceeds and ongoing spectrum fees should readily cover administrative costs and that spectrum does represent a valuable public good, auction proceeds are not part of regular, annual government revenues and they represent an exceptional opportunity to further the investments that must underpin a digital economy strategy for Canada. ITAC agrees with those who view spectrum auction fees as a digital dividend that should be reinvested, in considerable part, in the accomplishment of digital economy strategy objectives.

Finally, we must deploy all reasonable efforts to make more spectrum available and promote efficient use of spectrum. Wireless devices such as smart phones, wireless modems or remote sensors, and the data intensive applications they operate, place extreme demands on existing networks. The result for end users will be dropped calls, web pages that load slowly, and applications that are unable to deliver requisite data.

In this regard, we should remain conscious of the inhibiting effect on investment of the cost of spectrum, for example by trying to avoid spectrum auction designs that could make the costs (on a pro rata basis) less favourable than in comparator countries.

Recommendations:

15. Set a broadband infrastructure goal for Canada for 2017 that applies to Canadians in all parts of the country.
16. Set that goal on a functional basis that involves a holistic set of measurable characteristics that represent true, workable participation in the digital economy.
17. Create the right climate for business investment, including predictable access to spectrum and reduction of fees and levies.
18. Make more spectrum available for mass-market wireless telecommunications.
19. Use spectrum planning policies to promote efficient use of spectrum.
20. Target public investment to incenting business investment and then to any remaining unaddressed needs.
21. Reinvest significant proceeds from spectrum auctions to achieve the objectives of the digital economy strategy.

Building a World-Class Digital Infrastructure – Questions

What speeds and other service characteristics are needed by users (e.g. consumers, business, public sector bodies and communities) and how should Canada set goals for next generation networks?

ITAC does not believe that we should try to “out-100 million” other countries. Instead we support the view expressed by the Senate Standing Committee on Transport and Communications that we should express our goals in terms that address the needs of all Canadians in all parts of the country. Our goals should be expressed in functional, next generation broadband terms. Our ambition should be to allow all our citizens to participate fully in the digital economy, ranging from personal interactions and communications to accessing e-government services to conducting business from work or home.

What steps must be taken to meet these goals? Are the current regulatory and legislative frameworks conducive to incenting investment and competition? What are the appropriate roles of stakeholders in the public and private sectors?

ITAC recommends that we first make the business investment framework as predictable and favourable as possible, then identify needs for public investment.

What steps should be taken to ensure there is sufficient radio spectrum available to support advanced infrastructure development?

We need to identify spectrum that will become available over the next ten years, much of it freed up from other uses, and ensure it is made available on as timely and predictable a basis as possible. We need to ensure that spectrum can generally be resold.

How can we best ensure that rural and remote communities are not left behind in terms of access to advanced networks and what are the priority areas for attention in these regions?

We need a clear statement of our goals, then foster business investment. This will clarify where the remaining gaps in deployment will be. By working together collaboratively (federal, provincial and municipal government, industry and communities), we can agree on the priorities and determine the best (public versus private investment) strategies for serving these remain gaps.

Growing the Information and Communications Technology Industry

While Statistics Canada reports that there are 31,500 Canadian ICT companies, the vast majority of these are SOHO and small businesses primarily serving local clients with professional services in ICT. There are only 11 Canadian-headquartered companies reporting 2009 revenue of \$1 billion or more. Roughly 217 report more than \$10 million in revenue.⁵

Of this cohort of roughly 200 companies, all but a handful are export-oriented, R&D intensive firms. They represent the future of Canadian innovation capacity in ICT. And they face a perilous road toward the goal of achieving the success of a billion dollar global enterprise. Yet if Canada is to be a credible contributor to and competitor in the global ICT market, we must better understand these perils and place priority on public policy measures to address them.

In 2005, Drs. Douglas Barber and Jeffrey Crelinsten studied the spectrum of R&D intensive Canadian companies across the whole economy including a preponderance of ICT companies. Of the 9,000 firms in their study, they identified a relatively small group (about 200 firms) of companies that were R&D intensive and experiencing the strongest growth. And they noted that from 1994 to 2001, this small group of high growth R&D companies increased annually in size by only about 14 companies. The authors noted that while some new companies appeared over that time, they barely replaced those that were lost. This fragile base of companies is the source from which the next RIM or Bombardier will emerge. Yet it is facing acute challenges.⁶

Attempting to further understand the forces causing this condition, Barber and Crelinsten concluded a forensic study of 18 companies who 'disappeared' from this R&D intensive 'greenhouse'. Speaking frankly, the CEOs and their financiers reported on the obstacles they encountered and the mistakes they made. The long list includes:

- No revenue from customers;
- No input from customers on R&D performed or the product being developed;
- Misreading markets;

⁵ The Branham 300, 2009.

⁶ "Growing R&D Intensive Firms in Canada: Views of the CEOs in the Greenhouse," Dr. Douglas H. Barber and Dr. Jeffrey Crelinsten, March 30, 2005.

- R&D took longer than expected;
- More money needed. Financing, especially toward the end, was consuming for senior management; and
- Dysfunctional governance.

The authors concluded that a lack of commerce competence pervasively in both the technical founders of R&D intensive firms and their financial, legal and governing supporters was a key factor in the disappearance of the firms.⁷

Successful entrepreneurs in the R&D intensive ICT sector agree that the commerce competence that makes the difference between success and failure is not acquired in traditional business school programs. Acquisition of the skills and confidence necessary to identify a market need, assemble a research, development and marketing team, and to secure appropriate financing is generally learned on the job in a large, global R&D intensive company. And here lies the central conundrum of the task of growing Canada's information and communications technology industry. We need more large ICT firms in Canada to grow the expertise necessary to grow large Canadian ICT firms.

Historically, Canadian public policy support for economic capacity building has focused on companies in the early stages of their evolution through initiatives such as fully refundable SR&ED credits and IRAP. These programs are useful but, as Barber and Crelinsten point out, the impact of this investment has been to keep the population of 'high potential' companies in the 'greenhouse' more or less static. It has failed to foster the conditions necessary to bring a significant number of them to bloom.

For too long the focus of public policy discussions about this matter have focused on the need to build better linkages between universities and industries, to better transfer the knowledge universities produce into commercially viable products and enterprises. Industry generally views this debate as dilatory. It obscures the real role that universities play in knowledge-based industry creation which is predominantly as a prized source of talent and occasionally as a resource for intellectual property. The debate needs to shift from the focus on university spin-offs (of which there are very few examples in Canadian ICT) to a focus on the 'greenhouse' –

⁷ "Understanding the Disappearance of Early Stage and Start-up R&D Performing Firms," Dr. Douglas Barber and Dr. Jeffrey Crelinsten, 2009.

that pool of R&D intensive firms, many past the stage of start-up, who have for a variety of reasons failed to find the conditions for growth that can propel them into the mainstream leadership of Canadian ICT. This would place a focus on the limited number of R&D intensive companies currently reporting between \$20 and \$50 million in revenue.

Apart from the relatively shallow commerce capacity discussed above, a key obstacle to the growth of these companies is access to capital. The Consultation Paper accurately captures the troubling state of Canadian venture capital investments. It also details the remedial measures (such as \$475 million in BDC for early and late stage firms) the Federal Government has taken since the financial crisis to ensure that stimulus impacts are felt in the venture capital arena. These measures have been necessary but insufficient to support a strategy of aggressive, ICT-sectoral growth. That kind of growth will require a transfusion of billions – not hundreds of millions.

In our 2009 recommendations for a digital economy strategy for Canada, ITAC noted the particular impact the termination of Labour-Sponsored Funds have had upon the availability of capital. In an era of conservatism and retrenchment in the venture capital industry, we must look to the retail sector as a potential remedy. We must find measures to encourage unprecedented retail investment in knowledge-based companies.

One approach would be to create a tax credit for investment in R&D-intensive companies. The credit we envisage would apply to investments made in any SR&ED eligible, privately held company. This measure would have the impact of increasing the investment capacity of angels and other later stage investors by the value of the tax credit.

Instruments such as flow through shares, for example, have helped in the 20th century to reduce risk and encourage retail investment in mineral and energy exploration businesses. As we contemplate the aspiration to grow our information and communications technology sector, parallels with the resource exploration industry emerge. ICT research and development is a long term business strategy characterized like mineral and gas exploration by high risk, mitigated by high potential reward. The tax structure was used to excellent effect to help position Canada as a resource and energy powerhouse. In similar fashion, it may be the engine we need to solve the venture capital market crisis and propel the global standing of our ICT industry.

One way or another, we must come to terms with the centrality of the venture capital problem. We need bold thinking, we need to take some risks if Canadian companies are going to find the capital they need to bloom into the next generation's global technology leader. We need a commitment to measures to sustainably resolve the venture capital shortages.

Many of the leaders of qualifying Canadian-controlled private companies within the ITAC community have indicated to us that they are quite satisfied with the support the SR&ED program provides for research and product development. But for many of these firms, the task of marketing a technically superb product innovation in the global marketplace can be at least as challenging and risky as developing the product in the first place. The ICT industry has frequently suggested to extend SR&ED tax credits, or find other ways to cover costs of global sales and marketing.

Reform of SR&ED has been a long standing focus of ITAC's advocacy for the expansion of the ICT sector. We have, consistently over the past decade, suggested that our most important R&D incentive should be accessible to all R&D performers. Many Canadian firms have suggested this, but the need is particularly critical if we are to protect and grow the sizeable R&D investments made by Canadian subsidiaries of innovation-intensive multinationals. These companies have to compete with other jurisdictions to obtain or grow global mandates that represent a precious contribution to our digital economy ecosystem. Yet they do not have access to the same support as other firms.

For many of these companies SR&ED produces no direct incentive to maintain or expand R&D activity in Canada at all. The credits these subsidiaries earn on the millions of dollars they invest in R&D have the effect of reducing taxes payable in Canada while increasing taxes payable to the parent company in its headquarters' jurisdictions (particularly the United States). This effectively produces a flow of tax credits from the Canadian fiscal system into foreign treasuries without producing an incentive at all. We need measures to support the growth of these firms as we do for those that can benefit from our other programs.

In 2007, ITAC proposed a measure to address this, which involves a choice or trade-off that will mitigate the cost of dealing with this issue. The alternative design that we proposed would allow companies to choose between a refundable wage credit (similar to the research and development tax credit available in Québec today) and a non-refundable SR&ED credit as it

now exists. The choice would be made in each taxation year. The taxpayer would be choosing between immediate cash in a lower amount or a higher value credit for future use.

Our view is that this approach would focus the refundable credit on companies with significant R&D work forces here in Canada, helping to grow our R&D centres here and in the process nurturing the commerce and management skills that help to fuel our whole innovation ecosystem. The level of the non-refundable SR&ED credit and the optional wage credit could be set at whatever level resulted in an appropriate level of tax expenditure.⁸ We continue to believe that this measure would improve our chances for retaining and attracting new investments in Canadian R&D institutions in Canada.

ITAC has also heard that research on software and applications is not as readily accepted as research on hardware in qualifying for SR&ED tax credits. This is counter to a modern definition of technology, as discussed at the onset of our comments on infrastructure, and we must evolve our administration of SR&ED accordingly.

Finally, there is a regulatory issue that has become a barrier to one of our leading ICT sectors. Canada's cryptography sector has been a tremendous success story in recent decades, in part due to Canada's cryptography policy, which includes a commitment that "Canada will take into consideration the export practices of other countries and the availability of comparable products when rendering export permit decisions." To maintain that success in the face of global competition, it is imperative that Canadian exporters be on a level playing field as compared to their competitors from other countries – that they face a domestic export-control regime that is at least no more onerous than those faced by companies elsewhere, in accordance with Canada's stated policy. ITAC urges the Canadian government to review its Cryptography policy to ensure the legal and procedural frameworks in place operate so that Canadian exporters of cryptography are not disadvantaged but rather advantageously positioned as compared to their competitors in the US, EU and in other Wassenaar member countries. This is particularly urgent given the recent reforms announced by the US government to their export-control regime for cryptography products and technology.

⁸ "An Alternative for Extending Refundability of SR&ED Tax Credits," by Karen Wensley and Jacek Warda, 2007.

In sum, ITAC recommends the following actions to expand Canada's information and communications industry:

Recommendations:

22. Understand the characteristics of Canadian high-growth potential firms and the conditions that foster or impede their growth through sustained research activity.
23. Increase collaboration between our existing support mechanisms and entities, including across levels of government.
24. Set targets for growth of the Canadian ICT sector (e.g. 20 above \$1 billion by 2017) and measure annual progress toward that outcome.
25. Address the venture capital crisis as the largest impediment to all our ambitions for growth through new strategies (tax credits, flow through shares, etc.) to get the retail venture capital sector more active in developing the ICT industry.
26. Extend SR&ED credits or deploy other means to cover global sale and marketing investments of Canadian companies.
27. Allow companies to choose between a refundable wage credit and non-refundable SR&ED credits for eligible research and development activities.
28. Ensure that in our administration of SR&ED we do not treat research on software and applications unfavourably.
29. Continue to support commercialization programs that have a proven track record in aiding the formation of early stage enterprises such as IRAP (which is chronically oversubscribed) and Precarn. We will not achieve the significant step-up we need by simply trading off new initiatives against existing ones.
30. Urgently review Canada's regime of export controls for cryptography products to ensure the legal and procedural frameworks in place operate so that Canadian exporters of cryptography are not disadvantaged but rather advantageously positioned as compared to their competitors in the US, EU and in other Wassenaar member countries.

Growing the Information and Communications Technology Industry – Questions

Do our current investments in R&D effectively lead to innovation and the creation of new businesses, products and services? Would changes to existing programs better expand our innovation?

The evidence would suggest that we are not getting the leverage (in the form of commercial innovation, job creation and enterprise growth) we should from this investment. We have suggested improvements to proven programs, such as IRAP and Precarn. We have also suggested measures to expand SR&ED credits to cover the early stage costs of commercialization.

What is needed to innovate and grow the size of the ICT industry including the number of large ICT firms headquartered in Canada?

As we mentioned above, we need to shift our focus from the insemination of innovation driven companies to fostering the growth of companies with the high potential to become the large ICT firms headquartered in Canada that are so essential to any Canadian claim of global leadership. These companies typically range from \$20 million to \$50 million in revenues. Their largest barrier to growth is the availability of capital to continue to finance growth to maturity here in Canada.

What would best position Canada as a destination of choice for venture capital and investments in global R&D product mandates?

The reforms to SR&ED that we discussed on pages 24 and 25 and in our paper, “An Alternative for Extending Refundability of SR&ED Tax Credits,” would ensure that large foreign investors in R&D would derive incentive value from SR&ED.

What efforts are needed to address the talent needs in the coming years?

Our thorough discussion of this question begins on page 32. Canada suffers from a critical shortage of C-suite talent with experience in innovation driven companies. The importance of retaining large anchor companies in our industry is critical to addressing this shortage and overcoming a major barrier of growth for technology ventures.

Digital Media: Creating Canada's Digital Content Advantage

A focus on digital content is central to the formation of a digital economy strategy for two reasons: one, mastery in the manipulation of all forms of content across the broad range of linguistic and cultural components in the Canadian mosaic creates tremendous potential for commerce; and two, mastery of digital content for the amplification of the full range of Canadian experiences is essential to ensure that a strong share of voice persists for Canada in the growing digital cacophony. ITAC believes that digital content, along with broadband and electronic health records, are three foundations of a 21st century infrastructure.

Much of the focus of the Consultation Paper is on digital media rather than other forms of digital content, and properly so. Canada has built an exceptional success story in traditional media, and we definitely need a concerted plan to extend this to digital media.

ITAC is more versed on the technology end of that spectrum. But we do recognize and support the evolution of our public investments and support instruments to cover digital media. More and more, digital technologies and digital media are overlapping. There is enormous potential in this area. ITAC therefore supports a concerted approach to addressing the barriers to growth and success in this sector, notably financing and talent.

ITAC is in a position to make the following observations that should inform our strategies in this area: there are fewer borders in the Internet space, and scale is both more readily achievable and necessary to anchor world-leading success; Canada has strong assets in both the content and technology aspects, including digital effects and gaming for example, but we tend to overlook our world-class strengths deeper into the technology side, such as imaging, digital projection, signal processing, semiconductors or content management. This is a nascent sector worldwide with huge growth potential, and there is tremendous benefit as well as a natural government role in fostering interaction among our various players, large and small, to help seize the opportunities, as we have already started through various centres of excellence and other government initiatives.

While economic strategy is most relevant at this time, we need to address the complex and heretofore highly successful series of policy, regulatory and legal measures we have put in

place to build success through our broadcasting system. ITAC believes that the time has come to develop a strategy to evolve this policy regime for success in the digital age. An expert panel may be the most appropriate mechanism to do this so as to encompass the respective roles of government, regulators, creators, and both traditional and emerging industry players.

There is another issue that deserves to be dealt with in our digital economy strategy. Many countries have taken steps to digitize the repository of knowledge residing in centuries of written words and make it freely available to their citizens and the world electronically. Canada lags other countries in our productive use of the Internet for this purpose.

The Canada Online project would address this deficiency. It aims to provide Canadians the ability to access the entire output of Canadian publishing. It involves the creation of a Canadian digital library. This activity would be funded and performed in partnership with various levels of government and with the owners of the source content who would obtain ownership rights but would commit to making the information available freely to all Canadians. Most Canadians are now online. As a next step, Canada Online would provide the Canadian content needed for Canadians to participate effectively in the new economy. As an objective, Canada can and should look to make its 21st century infrastructure a competitive advantage.

Recommendations:

31. Aggressively pursue initiatives to foster collaboration among digital content players, including the full range of technology players.
32. Launch a review of our policy, regulatory and legal regime for broadcasting to adapt it to the digital and Internet age.
33. Pursue digitization of our public archival content through the Canada Online project or similar collaborative initiatives.

What does creating Canada's digital content advantage mean to you?

It means creating expertise that will help to create globally competitive companies. It will enrich our education processes. It will create jobs in demanding new fields that elegantly fuse the skill sets of art and technology.

What are the core elements in Canada's marketplace framework for digital media and content? What elements do you believe are necessary to encourage the creation of digital media and content in both official languages and to reflect our Aboriginal and ethnic cultural communities?

We must understand that from early radio broadcasts of Stanley Cup games to the latest in interactive games, Canada has exportable digital content for a market larger than our population. Education is the key element in building a strong expertise in the design and presentation of digital content. It is also central to the formation of a strong domestic marketplace for this content.

How do you see digital content contributing to Canada's prosperity in the digital economy?

If we become adept as expert users of digital content as a society, it will drive a virtuous circle that demands digitized solutions for communication and cultural exchange. This demand will drive enterprises that continue to drive innovation which will in turn raise expectations in the domestic marketplace positioning Canadian players as world leading exporters of both our content and the solutions that carry them.

What kinds of hard or soft infrastructure investments do you foresee in the future? What kinds of infrastructure will you need in the future at home and abroad?

The creation of a strong competitively differentiated talent pool in Canada (see pages 32 to 37), a world leading broadband infrastructure (see pages 15 to 20) and the support necessary to help grow innovative Canadian companies (see pages 21 to 27) are the essential ingredients in a sound national digital strategy.

How can stakeholders encourage investment, particularly early stage investment, in the development of innovative digital media and content?

There are, as the Consultation Paper points out, a broad array of public funding programs to support early stage digital content entities. We need additionally to look for opportunities to foster growth and consolidation beyond the start-up stage, and to address the need for capital as outlined in our comments on Growing the Information and Communications Technology Industry.

How can we ensure that all Canadians, including those with disabilities (learning, visual, auditory), will benefit from and participate in the Canadian digital economy?

As a self-consciously inclusive society, Canada has already demonstrated a concern for digital inclusiveness. This has created an array of innovations that are exportable flagships for Canadian know-how. This spirit of inclusiveness benefits from the public sector's insistence on accessible media. This leadership should continue.

Building Digital Skills for Tomorrow

Human brainpower is the primary ingredient in any successful national digital economy strategy. Many nations, including those formerly considered developing nations, have grasped the centrality of this idea and carved out strong competitive positions for themselves in the global digital economy. Perhaps the best example of this is India. With little digital infrastructure to speak of, but united by a shared vision of a competitive opportunity predicated in part by a large population and strong culture of education, the business, government and academic leadership of India transformed the nation into a preeminent source for software development and a major force in global outsourcing in less than a generation. China appears to have an excellent opportunity to establish its credentials as the world's manufacturing centre today and its research and development lab in the future. And in a similar fashion Russia and some Eastern European nations are transforming their acknowledged excellence in mathematics into wealth from advanced computing and software.

Positions at the starting line in the race for a digital economy strategy are rapidly being filled. Canada needs to take a careful assessment of the key strengths of its relatively small population and leverage its strengths into a formula for success. Such an assessment starts with excellent and timely data on all aspects of Canada's knowledge-based labour market – recognizing that this key data spans the period from a knowledge worker's early education to retirement.

Canada's poor performance in raising levels of interest in science, technology, engineering and mathematics should be a matter of deep concern if we are serious about digital economy leadership ambitions. Our mediocre ranking among OECD nation ICT sectors may be directly linked to another troubling OECD statistic. We are currently ranked 20th in our performance in producing science and engineering graduates. We need a major effort to renew our national enthusiasm for the STEM disciplines and encourage broader pursuit of scientific and technical courses of study. Better outcomes in this arena are simply table stakes if we are to compete in the 21st century economy.

Digital literacy, instructions in the appropriate use of computers, digital devices and digital media are key components of 21st century literacy and, of course, foundational for the pursuit of success in the STEM disciplines. Yet there is significant room for improvement in this area and

a troubling lack of national coherence in the instruction of digital and computer skills. We need a nation-wide commitment to ensure that graduates of the public education system can demonstrate appropriate mastery of the tools that will drive all 21st century endeavors from forestry and resource extraction to healthcare. We need to improve our performance in this endeavor simply to stay competitive in the digital age.

If we aspire to leadership, we need a comprehensive strategy to apply leverage to the asset of a well-educated population by encouraging a depth of expertise in a number of key areas. The Digital economy strategy submission of the Canadian Coalition for Tomorrow's ICT Skills maps out what these skills are:

1. **Digital literacy.** This is a skill set that every citizen needs in order to make effective use of digital media. It is the 21st century version of the 19th century's 3R's – reading, writing and arithmetic. Digital literacy entails an understanding of the nature and uses of various digital media and technologies, how to communicate effectively via digital media, creativity, etiquette, safety, health, and so on.
2. **Digital business skills.** Beyond literacy, this is the general skill set that every worker uses in a digital economy business setting. It also includes use of specialized tools in every field from scientific research to manufacturing production.
3. **ICT technology skills.** This is the traditional skill set of ICT workers; many of these skill sets are now becoming increasingly specialized and demanding. Some ICT workers configure and support pre-built ICT tools to meet business and consumer needs. More advanced ICT workers innovate and create new ICT tools.
4. **Highly specialized and hybrid technology skills** sets are either highly specialized with ICT, or combine ICT worker-class technical skills with an entirely different technical discipline.
5. **Business technology management skills.** This critical skill set combines ICT technical skills – whether ICT-specific or hybrid – with the knowledge and skills of a commerce degree or MBA.

ITAC believes that all five levels of digital capability are essential. The first three are foundational. The last two are the elements of a 21st century labour market that is truly competitive differentiated from our global rivals including India, Russia and even the United States.

Hybrid technology skills are particularly worthy of public policy focus for they reflect the central reality of the modern business environment. From farming to film making, the common currency

of 21st century endeavour is data. The sooner we grasp this concept and gear our educational and training processes to reflect this, the better our chances for leadership. To do this, Canada will need to craft a national digital skills strategy.

In a Canadian context with accountability for education vested in provincial and local authorities, this simple-sounding prescription is hugely complex. Yet the emergence of the knowledge economy and the demands it will place on the way we prepare our citizens for satisfying and productive careers places a historic imperative before us. We simply must meet this challenge if we are to bequeath to future generations the quality of life that present Canadians hold dear.

Finally, Canada has a key comparative advantage as an attractive and receptive place for the best and brightest to come from all parts of the world. But we are not doing as well as we should to integrate these immigrants from diverse backgrounds into our ICT companies, particularly smaller companies with more limited resources. We need to vigorously pursue our integration programs to address this.

So to build a strong, competitive labour force for the future, ITAC recommends the following:

Recommendations:

34. Develop a national digital skills strategy for Canada.
35. Improve our performance in the collection of timely and useful data about all aspects of the digital labour market including post-secondary enrollment data and data about the evolution of our progress toward the creation of a workforce that reflects a strong infusion of digital skills with all other specialties.
36. Coalesce the efforts of the private, public and NGO sectors to promote STEM literacy through a national campaign. Aim to improve Canada's performance in producing science and engineering graduates moving from our current OECD to the top 5 by 2016.

Additionally, ITAC supports the call to arms contained in the CCICT submission to make Canada the go-to country for brainpower resources in the global digital economy and endorses its recommendations notably that we:

Recommendations:

37. Double female enrolments in high value programs by 2017.

38. Create a skills marketplace to drive labour market agility and innovation.
39. Increase digital economy college and university seats by 20 percent by 2017.
40. Make the full range of digital literacy skills a priority in primary, secondary, post-secondary, mid-career and lifelong learning education.
41. Aggressively build awareness, supports, incentives and partnerships to drive change.⁹

⁹ "Canada the Go-to Country for Brainpower Resources in the Global Digital Economy," CCICT, pages 22-27.

What do you see as the most critical challenge in skills development for a digital economy?

We agree with the Information and Communications Technology Council that “The Canadian elementary and secondary school system is not prepared to deliver digital literacy skills to their students. This lack of preparedness is in the form of infrastructure, instructional ability and awareness of the opportunity and importance of technology in today’s society.”¹⁰ We are ill prepared at every stage of skills development from kindergarten to workplace training and retraining programs to meet the challenges of the digital economy. We must turn this situation around through the creation of a national talent strategy for the digital economy.

What is the best way to address these challenges?

Skill development is a multipartite mandate engaging all levels of government, the NGO community and the private sector. We need to begin with a clear inspirational statement from the centre of government about a national digital talent strategy and an appropriate mechanism to engage all players in fulfillment of that objective.

What can we do to ensure that labour market entrants have digital skills?

A national talent strategy should aim for a world class standard of proficiency on graduation from the primary and secondary school system. It should also stress the need for digital skills in all fields of endeavour. And it should stress the need for continuous skills upgrading throughout the duration of the worker’s career.

What is the best way to ensure the current workforce gets the continuous up-skilling required to remain competitive in the digital economy?

A national program for continuous skills upgrading appropriate to each sector in the economy could be designed and delivered through the sectoral council program of HRSDC. This commitment to retraining and skill refreshment should be a key plank in the national talent strategy.

Are different tactics required for SMEs versus large enterprises?

As we discussed in the “Capacity to Innovate Using Digital Technologies” section, we believe that one of the largest barriers to SME adoption of ICTs is the dearth of human resources with ICT competency serving this vital segment of the economy. We believe that a program of direct incentives, either through vouchers or other means of encouraging retraining in ICT proficiencies or the acquisition of ICT expertise, would help to encourage not only ICT adoption among SMEs – it would improve their capacity for innovation, productivity and overall competitiveness as well.

¹⁰ ICTC’s Digital economy strategy Consultation Submission, page 2.

How will the digital economy impact the learning system in Canada? How we teach? How we learn?

As they have in all other dimensions of the 21st century life, digital tools, platforms and processes have and will continue to transform learning. The impact of gaming technologies, interactive media and social networks has already altered educational practice and will continue to do so. A truly digital education and learning system will be different than today's, and we need a strategy to get there.

What strategies could be employed to address the digital divide?

With Canada's relatively high rates of penetration, the digital divide is relatively narrow and largely driven by economics. The relative size of our divide offers a tantalizing target – one that may mobilize engagement in the larger digital economy strategy. That is why we advocate setting our goals on a basis that does not institutionalize a digital divide.

Summary and Conclusion

As we pointed out at the outset of this submission, ITAC has been working for years on issues pertaining to Canada's competitiveness that are central to our digital economy strategy. The fundamental importance of this strategy for Canada's future and the pervasiveness of the impact of the digital economy are such that ITAC has set out a large number of recommendations. The issues identified in the Consultation Paper and in ITAC's submission are not silos. Many are inter-related. This illustrates the importance of dealing with the digital economy strategy on a whole of government basis, well beyond the three key ministers that launched this Consultation. It is also a truly national matter, involving all levels of government and other elements of Canadian society, well beyond the ICT industry.

In this regard, ITAC has been impressed by the considerable interest in our digital economy strategy and in this Consultation from across the country. We believe there is an exceptional degree of willingness to collaborate on these issues, which is both opportune and an opportunity to be seized.

Should we set targets for our "Made in Canada" digital strategy? Absolutely. As the Consultation Paper points out on page 34, other countries have set clear targets and timelines for reaching these targets and Canada should do no less. A strategy without targets would be missing fundamental substance.

Similarly, a strategy without investment commensurate with its importance would also be missing something fundamental. ITAC's approach has been to identify what can be done without major public investment, and there is a lot that can be done. But we have not avoided identifying the need for investment where it is required.

In terms of goals and targets, we believe the overall goal set out on page 9 of the Consultation Paper is very good. In terms of specific targets and timelines for reaching them, ITAC has proposed a number of them in its recommendations. For illustration purposes, these include:

- Close the ICT investment gap between Canada and the United States by 2017.
- Lead in the field of e-government by 2017.
- Deliver the benefits of next-generation broadband to all parts of Canada by 2017.

- Aim to have 20 Canadian headquartered ICT companies with revenues above \$1 billion by 2017.
- Turn on the flow of retail venture capital now.
- Produce more science and engineering graduates climbing into the top 5 in OECD by 2016.
- Double female enrolment by 2017.
- Increase digital economy college and university seats by 20 percent by 2017.

Fundamentally, we need a digital economy strategy that covers the following key basic elements:

- Qualified human resources.
- Access to required capital.
- Leadership in adoption of ICT to achieve world class productivity.
- Leadership in use of ICT in our governments and public services (notably healthcare) to ensure world class efficiency and service to the public.
- Next generation broadband for all Canadians.
- Leadership in digital media and content.
- A world leading regime for protecting the online marketplace.
- World leading government expenditure on R&D and business expenditure on R&D.

On the last point, ITAC notes that Canada is now doing well in terms of government expenditures on R&D, but that we suffer from a significant and persistent gap in business expenditure on R&D. The Federal Government has announced that it will be carrying out a review of its regime of support for R&D. It is important that the end result be such as to close the gap in our competitive position in something as important as R&D. ITAC does not believe that we can close such a major gap without commensurate additional investment.

Recommendations

Capacity to Innovate Using Digital Technologies

Overcoming Under-investment in Information and Communications Technologies

1. We need a high-profile campaign to promote the importance of leadership in the use of digital technologies throughout our economy. It should be led by government, but supported by various sectors of business in public-private initiatives.
2. We should set a goal to close the ICT investment gap between Canada and the U.S. by 2017, and deploy the means to achieve this, including investment incentives.

Addressing Our Environmental Challenges

3. Develop an integrated set of actions to maximize the linkages between the digital economy and the green economy.

The Digital Economy and Public Services

4. We need a concerted effort to complete the digitization of our healthcare system, using standards that are as international-level and national as possible.
5. We need to undertake a concerted national strategy to bring our education system into the digital age.

Demographic Challenges

6. Develop and widely communicate estimates of the size, nature and timing of demographic shortages we face.
7. Collaboratively develop strategies to deal with them.

Governments as Model Users

8. Government services should be as easy to interact and transact with online as common consumer services.
9. Set a goal to lead in e-government and in the use of digital technologies in government operations.
10. Pursue smart procurement, buying outcomes rather than inputs, innovative procurement models and approaches that will foster the development of commercial innovations for digital technology firms large and small.
11. Tap the expertise of the private sector through various formal and less formal means in terms of what technology can enable and best practices in implementation.

Protecting the Online Marketplace

12. Pursue passage of pending legislative initiatives, notably Copyright Act amendments.
13. Announce and implement a cyber security strategy for Canada.

Building a World Class Infrastructure

Digital Infrastructure is Much More than Broadband

14. Canada's digital economy strategy should explicitly recognize a digital age definition of infrastructure.

Setting Canada's Goals for Broadband Infrastructure

15. Set a broadband infrastructure goal for Canada for 2017 that applies to Canadians in all parts of the country.
16. Set that goal on a functional basis that involves a holistic set of measurable characteristics that represent true, workable participation in the digital economy.
17. Create the right climate for business investment, including predictable access to spectrum and reduction of fees and levies.
18. Make more spectrum available for mass-market wireless telecommunications.

19. Use spectrum planning policies to promote efficient use of spectrum.
20. Target public investment to incenting business investment and then to any remaining unaddressed needs.
21. Reinvest significant proceeds from spectrum auctions to achieve the objectives of the digital economy strategy.

Growing the Information and Communications Technology Industry

22. Understand the characteristics of Canadian high-growth potential firms and the conditions that foster or impede their growth through sustained research activity.
23. Increase collaboration between our existing support mechanisms and entities, including across levels of government.
24. Set targets for growth of the Canadian ICT sector (e.g. 20 above \$1 billion by 2017) and measure annual progress toward that outcome.
25. Address the venture capital crisis as the largest impediment to all our ambitions for growth through new strategies (tax credits, flow-through shares, etc.) to get the retail venture capital sector more active in developing the ICT industry.
26. Extend SR&ED credits or deploy other means to cover global sale and marketing investments of Canadian companies.
27. Allow companies to choose between a refundable wage credit and non-refundable SR&ED credits for eligible research and development activities.
28. Ensure that in our administration of SR&ED we do not treat research on software and applications unfavourably.
29. Continue to support commercialization programs that have a proven track record in aiding the formation of early stage enterprises such as IRAP (which is chronically oversubscribed) and Precarn. We will not achieve the significant step-up we need by simply trading off new initiatives against existing ones.
30. Urgently review Canada's Cryptography Policy to ensure the legal and procedural frameworks in place operate so that Canadian exporters of cryptography are not disadvantaged as compared to their competitors in the US, EU and in other Wassenaar Member countries.

Digital Media: Creating Canada's Digital Content Advantage

31. Aggressively pursue initiatives to foster collaboration among digital content players, including the full range of technology players.
32. Launch a review of our policy regulatory and legal regime for broadcasting to adapt it to the digital and Internet age.
33. Pursue digitization of our public archival content through the Canada Online project or similar collaborative initiative.

Building Digital Skills for Tomorrow

34. Develop a national digital skills strategy for Canada.
35. Improve our performance in the collection of timely and useful data about all aspects of the digital labour market including post-secondary enrolment data and data about the evolution of our progress toward the creation of a workforce that reflects a strong infusion of digital skills with all other specialties.
36. Coalesce the efforts of the private, public and NGO sectors to promote STEM literacy through a national campaign. Aim to improve Canada's performance in producing science and engineering graduates moving from our current OECD to the top 5 by 2016.
37. Double female enrolments in high value programs by 2017.
38. Create a skills marketplace to drive labour market agility and innovation.
39. Increase digital economy college and university seats by 20 percent by 2017.
40. Make the full range of digital literacy skills a priority in primary, secondary, post-secondary, mid-career and lifelong learning education.
41. Aggressively build awareness, supports, incentives and partnerships to drive change.