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Canada's ICT Sector and the Digital Economy

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As Canada's national ICT business association, the Information Technology Association of Canada (ITAC) champions the development of a robust and sustainable digital economy in Canada. A vital connection between business and government, we provide our members with the advocacy, networking and professional development services that help them to thrive nationally and compete globally. A prominent advocate for the expansion of Canada's innovative capacity, ITAC encourages technology adoption to capitalise on productivity and performance opportunities across all sectors. A member-driven not-for-profit, ITAC has served as the authoritative national voice of the $150-billion ICT industry for 60 years. More than 33,500 Canadian ICT firms create and supply goods and services that contribute to a more productive, competitive and innovative society. The ICT sector generates one million jobs directly and indirectly and invests $4.8 billion annually in R&D, more than any other private sector performer.

Canada's ICT Sector and the Digital Economy

1. INTRODUCTION

The digital economy continues to be top of mind at all levels of government. With the release of the *Digital Canada 150* strategy in early 2014, Canada's federal government set itself the broad goal of "ensuring Canada can take full advantage of the opportunities of the digital age." In December the government released the more detailed *Seizing Canada's Moment: Moving Forward in Science, Technology and Innovation 2014.*

The digital economy is also a priority for the private sector as individuals and businesses rely increasingly on online tools, mobility solutions, analytics and related resources to improve their lives, increase their productivity and contribute to economic growth. Canada's information and communication technology (ICT) sector generates one million jobs directly and indirectly and invests more in research and development than any other industry sector. More importantly, it provides the technologies, solutions and services that enable competitiveness and productivity gains in other sectors across the Canadian economy, and plays a crucial strategic role in technology adoption.

2. TECHNOLOGIES AND CAPABILITIES

With an impressive network infrastructure in place, along with the high speeds that it supports,[1] the battleground of the future will be innovative and efficiency-enhancing applications based 'in the cloud' rather than on personal devices. Canadian companies will continue to be part of the mix, developing and commercialising a broad array of applications. The resulting jobs and profits will be of tremendous benefit to the economy, and the fact that Canadians are more likely than others to develop applications that respond to particularly Canadian demands and trends is also of benefit to our society.

Key individual technologies have been integrated to form powerful capabilities, such as cloud computing and mobility. Cloud computing enables business solutions based on a cost-effective and rapid-deployment paradigm. It also optimises data storage so that scale can be used to take advantage of best practices in security, privacy protection and analytic capabilities, and to reduce the total cost of ICT infrastructure. Mobility allows individuals and organisations to take advantage of work-life efficiencies enabled by the ability to do what is needed when and where it can best be done. Mobility solutions are rapidly extending traditional desk-based enterprises, putting information into hands in the field, thereby enhancing efficiency and productivity.

These and other capabilities have already transformed the service landscape – e-health, smart grid, government online and others. Healthcare has been transformed over the past five years by the deployment of numerous digital innovations, including electronic health records, and physician-office systems, telemedicine, monitoring,

[1] See ITAC, *Canada's Networks and the Digital Economy*, 2013.

e-prescribing and public health surveillance.[2] The smart grid merges information technology with the power sector's traditional operational technology. Government online reduces costs while improving provision of and access to government services and enhancing civic engagement.

3. EMERGING TRENDS

In addition, powerful newer capabilities are just coming to the fore – the internet of things, big data and analytics and cognitive computing.

3.1 The Internet of Things

The 'internet of things' (IoT) has been defined as "a network of networks of uniquely identifiable end points (or things) that communicate without human interaction using IP connectivity."[3] The IoT is a capability rather than a technology, a complex convergence of the various technologies and services that make up the ICT sector. These include computer and telecom hardware, equipment and services, software, semiconductors, analytics, applications development, mobile platforms, security and radio-frequency identification technologies (RFID).

Put simply, RFID is used to connect intelligent sensors and other devices to the internet and large databases. Sensors with embedded intelligence enhance the power of the network by collecting data from their environment, generating information and raising awareness about context.[4] Already, billions of devices are connected to the internet for data collection and processing into "useful and actionable information".[5] Globally, 23.6 billion sensors were shipped in 2014 alone.[6]

The Canadian market for IoT solutions has been projected to increase from $5 billion in 2013 to $21.1 billion in 2018. High-potential markets are expected to include asset tracking in retail and distribution and government, connected vehicles, process control in oil and gas and utilities, monitoring in healthcare, situational awareness for public-safety missions, and smart cities and smart buildings.[7]

3.2 Big Data and Analytics

An extremely large volume of data is generated through economic and social interactions. In addition to data collected at the point of engagement (for example, information systems, electronic records, and forms and applications), useful data can now be captured from social media – and much more will flow from the online sensors and other devices that comprise the internet of things.

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[2] ITAC, *Advancing Health and Prosperity: A Brief to the Advisory Panel on Healthcare Innovation*, 2014.
[3] IDC Canada. *Canadian Realities of The Internet of Things: Defining and Creating New Opportunities*, 2014.
[4] International Telecom Union, *The Internet of Things*, 2006.
[5] David Crane, "Canada's future depends on smart, green, innovative cities", *Hill Times*, June 2, 2014.
[6] Cisco, *The Internet of Things: Capturing the Accelerated Opportunities*, 2014.
[7] IDC Canada. *Canadian Realities of The Internet of Things: Defining and Creating New Opportunities*, 2014.

The bulk of this data currently is dispersed across a great many systems that do not easily communicate with each other, so cannot be used to its full potential unless there is also sufficient capacity for storage, retrieval and analysis. New skills and practices in analytics also need to be developed and deployed if organisations are to take full advantage of the potential of big data to generate predictive insights that improve decision making.[8]

3.3 Cognitive Computing

Cognitive computing (or artificial intelligence – AI), together with IoT, big data and analytics, can be expected to drive organisations to a sense-and-respond business model that up-ends how products and services are delivered. Leading organisations are already gaining competitive advantage by deploying these technologies, whether in a customized retail experience or an AI engine performing medical diagnostics.

4. FUNDAMENTALS THAT NEED TO BE IN PLACE

ITAC sees *Digital Canada 150* and *Seizing Canada's Moment* as jumping-off points for further discussion of how Canada can best leverage its resources to promote greater adoption of digital technologies. To begin with, a number of foundational elements must be in place:

- strong and stable infrastructure
- a predictable and trusted regulatory framework
- access to a sufficient pool of skilled workers
- access to markets
- access to capital.

4.1 Strong and Stable Infrastructure

Canada's broadband networks are well developed and among the best in the world in terms of technological advancement and coverage. With limited exceptions, Canadians have access to the high-speed services that allow us to take advantage of the benefits of greater connectivity, including enhanced access to government services, healthcare, education and the vast array of products and services that are offered online. However, Canada's networks will require continuous investment and renewal if consumers and businesses are to continue to receive the services and service levels they have come to expect, and if the potential of new technologies, trends and capabilities is to be achieved.

The digital era presents the opportunity for Canadians to benefit profoundly from increased access to information anywhere, anytime. Inevitably, considerations

[8] Accenture, *The Digital Public Service*, 2014.

regarding the security of communications and data will come to the fore as businesses and consumers move to take advantage of newly available efficiencies. Users must be confident that their information will be treated in a manner that reflects their privacy interests if new technologies and solutions are to be adopted. Finding the right balance between user experience and privacy protection will be key.

4.2 Predictable and Trusted Regulatory Framework

Infrastructure renewal is a very expensive undertaking. Given the costs and risks involved, it is imperative that the regulatory environment is stable and predictable and does not impose undue obstacles to investment. Otherwise, the result will be become unnecessarily adversarial and distracting, weakening our capacity to build a strong, competitive digital economy in Canada.

At the same time, the regulatory framework must be trusted to protect the interests of the user community if they are to accept and adopt digital services and solutions. As in any economy, market players must be able to interact with confidence. Online commerce presents additional complexities for securing consumer, enterprise and government communication platforms, all of which call for security techniques and strategies tailored for the online world. The success of these platforms will rest on user trust and confidence of the customers that the solutions service.

4.3 Access to a Sufficient Pool of Skilled Workers

ITAC fully recognises that the brainpower of highly educated people is the ICT industry's primary resource. We also recognise that changes taking place across the economy will require a transformation in workforce skills and capabilities. Furthermore, the move to digital introduces a host of challenges for employers in both public and private sectors. Organisations of all types must demonstrate innovation and agility in improving products and services and in delivering them more efficiently. The new workforce will be drawn to organisations that are innovating and evolving solutions and services to suit the new digital reality, and will expect the same ability to collaborate in the workplace that they now experience in their formal education and in their social lives.

4.4 Access to Markets

In a globalised world, Canadian companies must look beyond our small domestic market in order to succeed and grow. This means that, beyond their own vision and drive, they need access to foreign markets – which are too often unwelcoming and still maintain various tariff and non-tariff barriers to protect their own companies. Canada must open itself to the world as we look to other countries to open their markets to our companies and their products.

4.5 Access to Capital

Clearly, a company in today's world needs money if it is to move ahead successfully. In most cases, self-financing is not an option and outside investment must be sought – from banks, from government, from larger companies, from investment houses. While there has been debate around whether or not Canada has enough venture capital, it is safe to say that those looking for capital have too often been unsuccessful in accessing funding from Canadian sources.

5. MEASURING SUCCESS

The opportunities available to Canada and Canadians point towards a stronger, more dynamic digital economy – provided we take the correct steps. If we are to maintain our status as a prosperous and forward-looking nation, is very important that Canada move decisively to improve our capacity to innovate in Canada. Only then can we maintain and create jobs in ICT and repatriate the thousands of jobs in the Canadian ICT services domain have been displaced offshore in recent years.

An important part of any digital economy strategy is indicating how success will be measured. ITAC would like to see more clarity on timelines and metrics for the various initiatives contained in *Digital Canada 150* and *Seizing Canada's Moment*. The measures of success must include the following:

- ICT adoption by individuals, industry and government
- enhanced productivity, competitiveness and economic growth
- reduction of society's carbon footprint
- attainment of a culture of innovation.

5.1. ICT Adoption

5.1.1 Bringing Small Business Online

Enhancing the Canadian economy's productivity and capacity to innovate is of paramount importance in today's increasingly digital world. Unfortunately, Canadian businesses, particularly the SMBs that form such a significant part of our economy, have been slower to use digital technologies than firms of similar size in other countries.

Recently published research has found that Canadian companies are less likely than companies elsewhere, including the US, to be increasing their investment in R&D (71% for Canada versus 80% globally and 87% for the US). Canadian companies are also vulnerable to companies that are quicker to integrate digital solutions into their business processes – especially in 'digitally contestable markets' such as healthcare, payments, shopping, education, manufacturing and travel.[9]

[9] Accenture, *Canada's Digital Innovation Imperative*, 2014.

The lag in adoption of technology among Canadian SMBs remains one of the primary impediments to the growth of the Canadian economy, in terms of both revenue and employment. Wary of the complexity and risk associated with ICT investments, many small companies simply don't have the analytical expertise to make the appropriate investments in new products and services, or in newer productivity-enhancing approaches such as cloud computing.

Trade is a key element of Canada's competitiveness and is essential for helping SMEs scale up. The federal government's initiatives in expanding Canadian access to international markets are important. Still, we must continue to invest to help Canadian business understand the potential of these markets and to seize the opportunities presented by new trade agreements.

5.1.2 Protecting Canadian Business Online

When the internet was simply a useful platform for individuals and organisations, the consequences of failures were manageable at the individual level and government policy was about helping to prevent and manage such incidents. However, as the internet has become essential for the economy and society, the consequences of failure can impact society as a whole – so need to be dealt with at a much higher level.[10]

Large enterprise of all kinds, including government, must also take serious steps to defend themselves, adopting harmonised security standards for all devices connected to the internet and employing best cyber-defence practices. Threats to security have increased markedly, and a handful of successful cyber attacks have resulted in massive data breaches that severely compromised the confidentiality of personal and corporate information and damaged company reputations.

It stands to reason that if government and large enterprises cannot prevent attacks on their systems, SMBs are much less likely to have confidence in their own ability to protect themselves. Public Safety Canada has acknowledged that "While cyberspace brings significant benefits, our ever-increasing reliance on it is creating new and significant vulnerabilities."[11]

5.2 Leadership through Digital Government

Canada has a strong reputation for leadership in delivering public services and in e-governance, but we must move forward. Improving citizen engagement and satisfaction, economic competitiveness and public-sector productivity is certainly not beyond our capability, but will require strategic investments and a new focus on long-term solutions.

[10] OECD, *Analysing a New Generation of National Cybersecurity Strategies for the Internet Economy,* 2012.
[11] Public Safety Canada, *Action Plan 2010-2015 for Canada's Cyber Security Strategy*, 2013.

5.2.1 Open Government and Open Data

In recent years the federal government has undertaken a number of open-data initiatives. These include publishing government data sets for use by the public, events like the recent Canadian Open Data Experience (CODE), and the announcement of a new Open Data Institute in the 2014 federal budget. Open Data is a promising area for the private sector to work with the government and promote the digital economy.

The *Digital Canada 150* strategy includes making Canada a leader in open government and open data. "Canada is seeking to provide citizens with more open data and information, and to increase opportunities to learn about and participate in government."[12] Building on its 2011 *Open Government Strategy*, Ottawa seeks to open government data vaults to the benefit of Canada's digital economy.

5.2.2 Accessing Government Services via Multiple Channels

Digital Canada 150 promises to create "a new log-in approach to government services that leverages industry investment to provide a client-centric and secure online authentication solution." In short, the federal government wants to take as many of its services online as possible, both to make services more easily accessible to citizens, and to reduce costs. ITAC and its members support and expect to be centrally involved in these efforts, and also in efforts to move to an 'omni-channel' approach that includes in-person, the internet, mobile and call centres.

More broadly, governments at all levels should seek opportunities to collaborate in the delivery of services. Some have begun to consolidate their respective websites and certain services on functional bases, making it easier for citizens and small businesses to access the desired information or service without dealing with organisational hierarchies and formal departmental roles. Existing shared-service models should form the basis of additional collaboration across jurisdictions and with other delivery partners, including the private sector.

5.2.3 Government and Cloud Computing

It is generally recognised that the adoption of cloud computing by government will serve Canadians better, respond better to the expectations of Canadian citizens and Canadian businesses, enable modernisation of government ICT capabilities and support the development of Canada's cloud economy. Industry has much to offer to governments wishing to understand and implement coherent and effective approaches to establishing the requisite infrastructure and application for cloud computing, and to moving operations and services to the cloud.

[12] Government of Canada, *Canada Proposes New Action Plan on Open Government*, 2014.

5.3 Enhancing Productivity, Competitiveness and Economic Growth

ITAC sees the lag in ICT adoption as something that must be addressed as a priority, as under-use of technology impairs Canada's overall capacity for innovation. It is one of the key challenges that Canada must overcome in the interest of our future success and prosperity. Canadian companies must increase their focus on innovation in digital technologies, a fundamental element in the innovation growth equation. Canadian companies must adopt digital technologies to improve their own business processes to become more productive and efficient in their operations, to better serve existing customers and to reach new customers in Canada and around the world.

5.4 Reducing Society`s Carbon Footprint

Society increasingly accepts that our carbon footprint must be reduced if we are to address climate change. It is also clear that ICT has an important role to play: "The scale of emissions reductions that could be enabled by the proper integration of ICT into new ways of operating, living, working, learning and travelling makes the ICT sector a key player in the fight against climate change, despite our industry's own growing carbon footprint. No other sector can supply technology capabilities so integral to energy efficiency across such a range of other sectors or industries."[13] The following have been identified as large and 'accessible' opportunities for ICT to contribute: smart automotive systems; smart logistics; smart buildings; smart grid. In most cases, this means the integration of IoT technologies into traditional industries and practices; the "IoT has broad implications for sustainability, providing ways for consumers and business to use resources such as water and energy more efficiently."[14]

In Canada, the ICT sector contributes less than 1% of Canada's total emissions of greenhouse gases (GHG), whereas "the opportunities of ICT-enabled GHG reductions in the wider economy are an order of magnitude larger. These arise from reducing travel, replacing physical materials and processes with electronic solutions, enhancing the operating efficiency of buildings and transportation, and generally facilitating low-carbon behaviours and lifestyles."[15]

6. A RENEWED FOCUS ON INNOVATION AND COMMERCIALISATION

ITAC, the voice of ICT industry, has long advocated for the strategic use of internet-based technologies and applications to expand innovative capacity and drive stronger productivity across all sectors of the economy. Innovation is a critical factor in efforts to enhance both the Canadian economy and the range and level of services available to Canadians.

[13] The Climate Group, *SMART 2020: Enabling the low carbon economy in the information age*, 2008.
[14] Harvard Business Review, *Internet of things: Science Fiction or Business Fact*, 2014.
[15] World Wildlife Fund, *Innovating toward a low-carbon Canada*, 2009.

Working together, industry and government need to focus on creating an environment that promotes and fosters innovation, thereby unleashing the creativity and ingenuity to develop ICT-based solutions that meet the real needs of our society and our economy. In many cases, changes to internal operations, structures and governance will be required, both to enable innovation and to ensure balanced and well-integrated solutions. Furthermore, globalisation demands that these innovations can be scaled and exported beyond Canada's borders.