INFORMATION & COMMUNICATIONS TECHNOLOGY COUNCIL (ICTC)

The Canadian Digital Innovation Measure (CDIM) White Papers: A Four-Part Series

Part One: Inspiring unfettered imagiNation: Canada's Innovation Climate Index
Preface

ICTC’s trusted labour market research provides critical economic and labour market insights to inform innovative workforce and skills solutions, as well as practical policy advice. Together, these drive the development of a more prosperous Canadian workforce and industry in a global digital economy.

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Introduction

With a strong economy supporting diverse sectors spanning from natural resources, to manufacturing, to professional services and others, Canada is increasingly etching a path forward as an innovation leader on the global scale. As a result, in recent years, Canada has taken more of an active role in the quest for building the Canadian “brand”, both nationally and abroad. Including several measures, from workforce development to capital investment, these changes have served as the foundation for the development of a multi-faceted and sustainable digital economy – one that will be able to withstand technological disruptions and global shifts.

Understanding the value of technological innovation, Canada has made significant investments into supporting the growth of the Canadian technology sector. The results of these investments are evident; driving growth among the Canadian digital talent base and strengthening the digital economy. From 2011-2016, the Canadian technology sector generated impressive labour growth, climbing from 1.2 million workers in 2011, to 1.4 million in 2016 – an annual growth rate of nearly 2.4% [1]. By comparison, this figure was significantly higher than the annual labour growth rate for the rest of the economy, which averaged at 1.2% during the same period [2].

The rapid digitization of the economy and of society is the primary focus of our time. Digital technologies are now integral to the operations of any high-performing business and a key component of the Canadian innovation economy as a whole. Moreover, as we collectively continue to face changing economic outlooks on a global scale, including shifting social, trade, and environmental prospects, productivity alone cannot continue to guarantee success and growth. As a result, the need to innovate, start new businesses, grow companies, and create meaningful and sustainable employment prospects amidst these global changes, are vital considerations for all nations. Recognizing the foundational importance of innovation to a strong economy, the Government of Canada has recently embarked on an all-encompassing innovation agenda under the objective of creating a nation of creative thinkers and inventors, with digital technology as the fundamental premise.

Gauging Canada’s progress in its digital innovation journey will act as a central measurement of its overall role in the innovation economy. Responsible for 4.3% of total Canadian GDP in 2016 alone, Canadian technological innovation has and continues to create opportunities, societal solutions and high-quality, high-paying jobs. With technological evolution at the heart of economic success, Canada’s digital innovation standing can serve as a key component for the identification of future policy and program initiatives for all stakeholders including policymakers, educators, industry, and investors.

This paper, the Innovation Climate Index represents the first in a four-part series of white papers outlining ICTC’s pilot methodology for quantifying Canadian innovation, via the Canadian Digital Innovation Measure. Under the Innovation Climate Index, this paper will conduct a deep dive into the most relevant measurements that our research has identified as forming the foundational basis of an innovative climate.
While the index formula may comprise any combination of the indicators discussed, the below measurements serve as the most relevant components used to accurately deconstruct the successful growth, evolution and sustainable development of the Canadian digital economy.

This paper will be segmented into four main sections, each representing one measurement and thoroughly explaining the potential underlying indicators that may comprise them. Section one will outline R&D Expenditure & Capital Investment, providing a historical background of procurement, public and private R&D investment, as well as venture capital and angel investment. Section two will focus on Canadian Digital Product & Services Consumption, via indicators including Internet penetration and connectivity, mobile and fixed broadband usage, online activities, the strength of the Canadian entertainment industry, and the cost of connectivity. Section three will analyze Expenditures on Digital Talent, including various investments made towards human capital development, such as K-12 and post-secondary education, work-integrated learning, adult digital skill training, and immigration. Lastly, section four will focus on Innovation Culture, providing a background on Canadian startups in terms of size, growth and composition, along with an understanding of growth in patent and trademark filing and registration, as well as an overview of startup support networks such as accelerators and incubators. While not necessarily intended to be an exclusive list, together, these measurements can help us understand how Canada fares in its ability to create the right environment that encourages, shapes and supports strong and sustainable innovation on a global scale.

The Innovation Climate Index represents the first step in the methodological foundation of the Canadian Digital Innovation Measure. With these white papers produced on a quarterly basis, the Innovative Climate Index will be followed by the Innovation Capacity Index, assessing Canada’s industrial capability to innovate; the Innovation Outcomes Index, underlining employment and labour trends impacting Canadian innovation; and the Innovation Confidence Index, highlighting international investment trends and Canada’s international innovation standing.

Expected release dates for the subsequent three white papers are: March, June and September 2018.
The Innovation Climate Index: Why These Indicators?

In order to accurately measure the climate of innovation in Canada, we must first correctly identify the appropriate measurements to focus on. Next, we must expand on the underlying indicators comprising these measurements, with a basis of relevant quantifiable data.

Following careful research conducted through literature reviews and ICTC's own report findings, we have identified the following four (4) measurements as integral to shaping the Canadian climate of innovation: 1) R&D Expenditure & Capital Investment; 2) Digital Product & Services Consumption; 3) Expenditure on Digital Talent; and 4) Innovation Culture. The below provides a rationale for the indicators comprising each measurement, including a description of how those indicators can be analyzed for trend identification.

Measurement 1 - R&D Expenditure & Capital Investment

This measurement may include any combination of 3 indicators, together forming an understanding of the growth potential of the research and development and investment component in the Canadian digital economy. The first indicator to be analyzed is public and private-funded R&D. This will be measured by the amount (% of GDP) of federal and provincial investment into research & development activities on an annual basis, as well as privately-funded R&D which can be measured by BERD (business enterprise R&D spending) on an annual basis. For comparative purposes, Canada’s standing in terms of ICT R&D investment (against other international jurisdictions) can be tracked on an annual basis, as well.

The second indicator is government procurement, identifying federal purchasing levels of digital products and services on an annual basis. Given that historically, the rate of government procurement in Canada has been relatively low in comparison to that of competitors, annual procurement values (and % changes, year over year) can be compared to other leading jurisdictions including the US, the EU and Japan. The last indicator in this measurement is venture capital and angel investment. A strong determinant of business attitude and confidence in the market, venture capital and angel investment contributions will be measured on an annual basis, with a focus on increases in the amount (dollar value) of investment under each stream, as well as the total number of deals that those investments fall under.

Measurement 2 - Digital Product & Services Consumption

This measurement may be formulated based on a list of 4 indicators, underlining key elements of Canadian digital product and services consumption. As an inherent component of a successful innovation climate – that is, the increased consumption of digital products generating stronger demand for such products – analyzing these consumer trends presents a strong basis for determining future innovation needs. The first indicator, Internet connectivity, assesses the rate of connectivity across all provinces (i.e. % of homes in Canada that are connected to the internet), as well as the quality of Internet in terms of upload and download speed. The second indicator, time spent online, looks at the activities that Canadians engage in online (i.e. gaming, shopping, banking, etc.).
With the rise of new technologies including AR/VR and Blockchain, online activities can be used to understand where the “needs” and “opportunities” for innovative technology lie. The third indicator is the strength of the Canadian entertainment industry, via consumption and export of products and content including Canadian music, TV and film and video games. A significant player in the creative industry, the power and reach of Canadian entertainment products is a critical component of overall innovation strength. The final indicator is the cost of digital access in Canada – that is, the cost of home Internet and mobile subscriptions. Tracking and comparing the financial accessibility of Internet access can provide a base understanding of how heightened costs in this area affect innovation. With Canadian monthly mobile and Internet fees being among the highest in the world, where possible, these values will be compared with other international jurisdictions, including the US and EU.

**Measurement 3 – Expenditure on Digital Talent**

This measurement may include 5 indicators, together painting a comprehensive picture of investments made to the Canadian talent base, a necessary baseline to drive innovation. Firstly, tracking K-12 digital skill development will allow for the preliminary identification of long-term investments in digital literacy. This will be measured by analyzing a representative sample of secondary educational institutions across Canada that offer coding classes at the K-12 level. The second indicator is post-secondary investment, which will be analyzed via yearly budgetary investments (monetary) into post-secondary education. This may include investments made to research councils, tuition tax credits, educational tax credits, the student loan interest credit, and the Canada student loans and grants program. For the purpose of long-term trend evaluation, this indicator can be cross-verified with the national output of graduates on a 4-year cycle. The third indicator is experiential and work-integrated learning, which will be analyzed based on annual investments (monetary) to the Federal Youth Employment Strategy as well as numerical changes in co-op or internship enrollment on a year-to-year basis. Co-op enrollment data will be extracted from a representative sample of post-secondary institutions across all provinces. The fourth indicator is adult digital skill training. This will be measured via budgetary investments on an annual basis to adult digital literacy training programs. The final indicator in this measurement is immigration, a central component to understanding the diverse strength of the national talent base. Immigration, in relation to the innovation economy, will be measured by tracking the volume of skilled immigrants entering Canada on a year to year basis, then cross-referenced with the percentage of immigrants holding technology-relevant backgrounds [3].

**Measurement 4 – Innovation Culture**

This measurement may be comprised of 3 indicators, providing a comprehensive understanding of innovative culture in the Canadian startup community. Firstly, by looking at the growth and transition Canadian startups, we will be able to categorize the representation of Canadian small businesses in the innovation economy. These results can be achieved through an analysis of historical data showcasing growth (in volume) of Canadian startups, along with the overall representation (% of the total) of SMEs in the marketplace. Furthermore, the birth and death rate of startups will also be analyzed, along with the overall rate of startups that survive past the 1 and 2-year marks. For comparative trend purposes, data will be collected for these factors on an annual basis.
The second indicator for this measurement is the growth of patents and trademarks filed and registered in Canada, measured on an annual basis. Positive changes in this indicator can suggest a promising climate for innovation, with a rise in market-ready inventions. Lastly, the third indicator is startup support networks. This indicator will utilize historical data to measure the number, diversity, and regional distribution of Canada’s accelerators and incubators on an annual basis. Data relating to the change (% year over year) of follow-on revenue generated from the top Canadian accelerators and incubators will also be gathered. Results from this measurement can be used for comparative purposes against other nations, allowing for a large-scale categorization of local cultures of innovation.

**Measurement #1: R&D Expenditure and Capital Investment**

No strong innovation economy gets to be so without solid and sustainable investment in research and development. This investment can come in the form of government-sponsored funding, such as research & development capital or procurement; through private sector R&D investment; or it can be leveraged through venture capital and angel investment. Regardless of how the knowledge economy is invested in, all of the world’s leading innovation centers have one thing in common: strong, steady and reliable investment from both the public and private sector.

**Public and Private-funded R&D**

R&D expenditure in Canada has historically been approached with a fluid mindset, depending on the circumstances of each given economic period. Traditionally, investment has been split between research and development activities at the post-secondary level, and funding for research and development activities of Canadian-grown startups. The outputs of R&D investment in Canada are strong: coming in 4th behind the US, UK and Germany, Canada’s scientific research enterprise is consistently ranked as being among the best in the world [4]. Producing nearly 5% of the world’s most cited research papers [5], this is a robust indication of the high-quality research emitting from a country of only 35 million inhabitants.

However, despite the inherent tie between R&D investment and growth, government investment in R&D is something that has more or less flatlined in Canada since the early 2000s. In this realm, Canada has often been surpassed by several of its international competitors. 2000-2014 saw total government-funded R&D expenditure averaging 1.6% of GDP [6], placing Canada relatively on par with the global average for R&D spending, totaling 1.7% [7]. However, on a comparison with a similar group of states, Canada placed well below its OECD counterparts on R&D spending, where the average investment totaled 2.3% of GDP [8].
A further comparison of R&D investment made specifically towards top sectors of the innovation economy showcases yet a greater need for improvement. In 2013, Canada placed 26th in terms of investment in business research and development R&D and 13th out of 25 peer countries for investment in information and communications technologies [9]. Tracking federal R&D investment as a percentage of total GDP on an annual basis is a key method of identifying Canada’s strength in R&D expenditure, a crucial indicator underpinning the innovation climate.

Middle of the pack: Canada places 13th of 25 peer countries for ICT investment

This said, despite slow growth in government-funded R&D investment, countries with the most successful R&D scores tend to hold a mixture of public and private sector funding in research and development, rather than relying solely on government contribution. Key examples of countries that have utilized this blend of public and private R&D investment are the US, France and Israel – some of the world’s highest-ranking countries for innovation. Therefore, it is also pertinent to track, on an annual basis, Canada’s standing in Business Enterprise Expenditures on R&D (private sector spending on R&D). In this realm, Canada fared slightly better than on publicly-funded R&D, placing 26th [10] out of 41 top BERD states, with the US, Japan and Israel, placing 11th, 3rd and 1st, respectively [11]. Providing annual snapshots of progress in respect to global conditions, Canada’s position on R&D and BERD spending can be compared to other international jurisdictions.

BERD as a Percentage of GDP (2013)

[Bar chart showing BERD as a Percentage of GDP for various countries, with Israel leading at 3.5% and New Zealand at the bottom at 0%]

Source: OECD, Main Science and Technology Indicators, January 2015.
Government Procurement

Excluding the defense industry, government procurement in Canada has historically been limited. Yet, one of the main ways in which procurement has been utilized in the Canadian innovation sector is through the Build in Canada Innovation Program (BCIP). This program procures late-stage innovative goods and services from Canadian startups, primarily in the fields of emerging technologies, environment and cyber security [12]. Under this program, the federal government can test the product and provide feedback to the company, along with advice on how to enter the marketplace and remain competitive in the future.

Procurement is an effective method by which governments can purchase and promote the products of homegrown companies, while simultaneously helping those companies grow, develop and succeed. Ultimately, by acting as first buyer of Canadian technological products, the government can help support creativity and growth, while contributing to an innovative climate. Therefore, analyzing annual rates (% of the whole) of government procurement in the space of digital goods and services is an effective way to measure the impact of procurement on the national innovative climate.

Providing a further holistic and global perspective, Canadian digital procurement levels can also be compared to those of international counterparts. In 2015, for example, the Federal government’s average procurement contracts accounted for 1.2% of GDP at $18 billion per year ($2 billion of which were large information technology systems and infrastructure projects) [13]. Compare this to the European Union, where government procurement accounted for 16% of GDP across all member states, totaling EUR 1.3 trillion a year [14]; or the US, where procurement accounted for 2.6% of GDP culminating in $460 billion per year [15]. These comparisons are useful in our ability to categorize the strength of Canada’s investment as it relates to procurement, on an international basis.

Venture Capital & Angel Investment

With the understanding that investors congregate around clusters of innovation showcasing a sturdy capacity for business results, access to capital is one of the key features of a strong innovative climate. In turn, by providing avenues for technology leaders and startups to gain access to the funding they need, investment ensures that the culture of creativity, collaboration and innovative growth flourishes.

One of the most common sources of financing for emerging technology companies is venture capital. Tracking venture capital income, along with the total number of deals, is an important method for measuring access to capital as a driver of national innovation, and for comparative purposes with other jurisdictions. In this realm, Canadian startups have historically faced challenges in acquiring funding. This was such a pronounced trend that “access to financing” was cited, by Canadian companies, as the second most challenging factor to doing business in Canada in 2014 [16]. Compare this to US companies, which selected “access to financing” as the 6th most impeding factor to doing business [17].

Access to capital ranked as one of the biggest challenges to growth among Canadian businesses

In 2015, Canadian companies received $2.3 billion CAD ($1.8 billion USD) in venture capital funding, under a total of 536 deals [18]. Compare this to other jurisdictions like Israel which received $2.6 billion USD under 211 deals; India, which received $8 billion USD under 528 deals; China, which received $49.2 billion under 1,611 deals; the EU which received $14.4 billion USD under 1,598 deals; and the US, which received $72.3 billion USD under 3,916 deals during the same year [19]. This being said, while the acquisition of venture capital in Canada has historically been lower than many of its international counterparts, positive trends are beginning to emerge.

Venture Capital Received in 2015 (USD)

Source: Ernst & Young, Back to Reality: EY Global Venture Capital Trends, 2015
In 2013, Canada’s venture capital income totaled $1.9 billion CAD under 367 deals. This figure rose to $2 billion CAD under 433 deals in 2014, and the most impressive growth was seen between 2014-2015, where venture capital intake jumped to $2.3 billion CAD [20]. Moreover, recently, we have also seen strong investments made by the Canadian government in securing venture capital for startups. One of these developments was outlined in Budget 2017, where a total of $400 million in venture capital was committed to, under the Business Development Bank of Canada (BDC), for late-stage development [21]. Another positive recent development is the Canadian Business Growth Fund, set up by Canada’s biggest banks, providing up to $1 billion of long-term financing towards the development of high-growth businesses [22]. This positive trend has also been echoed at the provincial levels, namely in BC under the BC Tech Fund, offering $100 million in venture capital over 15 years to Series A companies [23]; and in Ontario and Quebec, where the provinces agreed to match funding up to $300 million [24] and $375 million [25] respectively, under venture catalyst funds.

**Venture Capital Income Received in Canada (CAD)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Value (B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>$0.575</td>
</tr>
<tr>
<td>2014</td>
<td>$1.15</td>
</tr>
<tr>
<td>2015</td>
<td>$1.725</td>
</tr>
<tr>
<td></td>
<td>$2.3</td>
</tr>
</tbody>
</table>

6.6% CAGR in VC attainment for Canadian startups between 2013-2015

![Graph showing venture capital income received in Canada (CAD) from 2013 to 2015 with a 6.6% CAGR](image)

Source: CVCA, 2015.

Angel investment is also a strong indicator of innovation strength in a given environment. Angel investors are individuals who provide small amounts of capital to startups, in order to help them with R&D, sales and other late-stage activities. All of this is provided in exchange for small amounts of equity in the company. Similar to venture capital, angel investment has also been historically low in Canada, but has recently experienced a considerable uptick between 2012-2015. In 2015, over $130 million was obtained via angel investment, representing a 48% increase from investment received in 2014, which totaled $90.5 million [26].

Moreover, angel investment has continued to undergo a steady climb in Canada from 2012 onward, namely in relation to crucial follow-on investment. In 2012, angel investment totaled $40.5 million, with follow-on investment representing only $7.3 million of that – just 18% of all investments that year [27]. By comparison, in 2015, where angel investment totaled $133.6 million, follow-on investment represented $87.1 million of that figure [28]— more than 65% of the total figure, a significant climb.

**Totaling $87.1 million in 2015, follow-on investment for Canadian startups was over 10x the amount received 2 years prior in 2013**
Measurement #2: Digital Product & Services Consumption

Measuring the total volume (monetary value) of venture capital and angel investment, along with the value of follow-on investment is a valuable method for identifying the strength of the capital investment metric itself, as well as the overall confidence that investors place in the local innovation ecosystem.

Internet connectivity and consumption of digital products is a good measure by which to understand the access capacity of given country, as well as the health of the digital industry. The more that Canadians consume and are open to new digital technology and products, the better the case for investment becomes, and the greater the potential output of innovative solutions and services.

Internet Connectivity

On the whole, Canada is very well-connected country. Showcasing an 89% Internet penetration rate in 2016 [29], the majority of Canadians have access to the online world. Moreover, this level of access has only increased in recent years, jumping from 88.4% in 2015 and 87.1% in 2014 [30].

This places Canada among the top 25 countries with the best Internet penetration rates in the world. On an international comparison, the Internet penetration rate in Canada surpassed that of Germany, France, and the United States, which in 2015 held rates of 87.6%, 84.7% and 74.6%, respectively [31].

Canada is among the Top 25 best connected countries in the world

Furthermore, the quality of download speeds in Canada were also relatively high, totaling 19.80 Mbps in urban areas and 14.81 in rural areas, with the Canadian average totaling 18.9 Mbps. This figure was slightly higher than the US where the national average download speed totaled 18.2 Mbps [32]. Continuing to track the overall national Internet penetration rate and quality of Internet services on an annual basis is important to dictating the level of access that Canadians have – something that is a foundational necessity to building an innovative climate.
## Internet Penetration Rate (2015)

Canadians are among the most engaged online users in the world, spending an average of 36.7 hours online per month, a figure that is higher than any other country [33]. With over half of Canadians having between 3-9 Internet connected devices per home [34], the majority (67%) of Canadians use their desktop the most frequently when online, whereas only 21% of users primarily use their phones [35]. Discussed in greater detail below, the high cost of mobile subscriptions in Canada is something that plays one of the more limiting roles in expanding access to and use of mobile services, in comparison to other jurisdictions.

Canadians spend their time online doing a variety of activities. Topping the list are email, banking, social media, news, web surfing and shopping, with 92%, 68%, 59%, 55%, 49% and 46% use, respectively [36]. On an international comparison, we find that US users largely spent their time accessing social media, online gaming and email [37], and EU users were primarily engaged in online hopping (44%), banking (52%) and reading the news (46%) [38]. The type of activities conducted online can be used to estimate the relative “payout” – in terms of number of users – for various types of technological applications.

Additionally, classifying the activities that Canadians conduct online, on an annual basis, can also prove useful for the ability to estimate market trends, including the future impact of various technologies (i.e. Blockchain for banking, AR/VR for gaming, etc.), the types of skills needed to fill in-demand roles in those subsectors, and the ways in which the climate of innovation compares to other international counterparts.
Strength of Canadian Entertainment Industry

Another indicator in being able to adequately identify the health of an innovative climate is the strength of the entertainment industry – that is, the value, absorption, growth and export of the film, television and gaming industry.

With the entertainment industry being at the pinnacle of creative services, the strength and presence of film, TV and gaming is a strong indicator of future innovation performance. Here, Canada’s position varies from film and TV to gaming. Overall in 2015, film and television production in Canada totaled nearly $7.1 billion in production volume [39], a steady increase from $5.9 billion the year prior [40]. However, of that total volume, less than $3 billion accounted for Canadian film and television content [41], showing a dominance of international entertainment content within the Canadian market. This international dominance is underlined in reference of economic output as well, where in 2015, the film and television industry generated nearly $9 billion in GDP, of which only $3.7 billion was a result of Canadian production [42].

Film & TV Production Value (2015)

- International: 58%
- Canadian Content: 42%

Film & TV Export Value (2015)

- International: 80%
- Canadian Content: 20%

Source: Canadian Media Producers Association, Profile 2015.

The export value of content produced in Canada also showcased similar results. In 2015, the export value of films and television content produced in Canada totaled over $3.2 billion, a steady increase from 2014 where export value totaled just under $2.5 billion [43]. However, a further breakdown of these figures underlines the relatively low impact of Canadian content, itself. Of the $3.2 billion of Canadian-produced export value in 2015, only $642 million was resultant of Canadian television and film content, with the remainder being entirely attributable to foreign productions [44].

**In 2015, Canadian content represented only 20% of all Canadian-produced Film & TV exports**

Similar results were evident in all preceding years, with the lowest representation of Canadian content seen in 2007, accounting for less than 13% of total export value. By contrast, the highest representation of Canadian content was seen in 2011, however, even in that year, Canadian TV and film still only accounted for 27% of total export value [45].
By comparison, the Canadian video game industry recorded signs of considerable strength, both in Canada and abroad. With a total GDP contribution of $3 billion in 2015, the economic strength of the Canadian gaming industry rose by 31% from 2013 [46]. This places Canada third globally in the video game industry, behind only the US and Japan [47]. A foundational pillar of the digital economy, gaming is increasingly growing, blending various innovative elements including AR/VR and AI, and continually generating an expanded customer base.

Based on the assumption that a strong entertainment industry is both a byproduct and enabler of a strong innovative climate, tracking the total Canadian contribution to production value and export in the film and TV industry on annual basis, as well as the standing (global ranking) of Canada’s video game industry is a good way to measure the strength of the overall Canadian entertainment industry.

**Cost of Digital Access**

While Canadians enjoy some of the highest Internet penetration rates in the world, the cost of broadband and mobile access is notoriously costly, in comparison to international counterparts. Even though more Canadians have mobile phones (85.6%) vs. landlines (75.5%) [48], the cost of mobile and Internet subscriptions in Canada is among the highest in the world. As a result, Canada places low in terms of mobile penetration, ranking 28th, with just 56 active subscriptions per 100 inhabitants [49]. By comparison, the OECD average is in 14th place, with roughly 90 subscriptions per 100 people [50]. Topping the list are countries including Finland, Japan, and the US, all possessing rates of well over 100 subscriptions per 100 inhabitants.

Much of this high cost is resultant of a lack of market competition among providers. In 2014, the market for Canadian Internet was still heavily dominated by five broadcasting companies (Bell Canada, Quebecor, Rogers, TELUS and Shaw), who together, accounted for 82% of all industry revenues [51]. Compare this to the US, where in 2014, five internet companies accounted for 70% of revenues [52]. As a result, Canadians paid and continue to pay substantially higher rates for Internet access than any other country in the world. In 2014, Canadians paid an average of $125 per month for Internet services, split between $83 per month on wireless services and $42 per month on fixed broadband – a figure that had even increased by 1.4% since the year prior [53].

**Telecommunications Revenue (2015)**

![Telecommunications Revenue Diagram](image1)

**Internet Revenue (2015)**

![Internet Revenue Diagram](image2)

*Source: CRTC, Communications Monitoring Report, 2016.*
Compare this to the US, where in 2014, the average American spent nearly $50 CAD [54] per each mobile phone subscription, and $26 for fixed broadband on a monthly basis [55], a figure that represents a decrease of 40% from Canadian mobile prices, and of 39% from the latter. Further exacerbating the cost difference of Internet and mobile subscriptions between Canada and the rest of the world, a comparative look demonstrates that in 2014, the average UK user paid $16 a month for a mobile subscription and $17 for fixed internet services; and the average French user paid even less at $14 a month for mobile and $19 for fixed broadband [56]. Overall, of five EU countries (UK, France, Germany, Italy and Spain), Spanish and German subscribers paid the most for mobile services, averaging $25 per month, whereas Germans paid the most for fixed broadband, totaling $32 per month [57]. With France having the lowest rates for mobile use at $14 a month and the UK having the lowest rates for fixed broadband at $17 a month [58], these figures represent a decrease in cost of 83% from average Canadian mobile prices, and a decrease of 60% from average Canadian fixed broadband prices.

Averaging $125 per month between broadband and wireless mobile services, Canadians pay the highest fees for Internet access of any country

As a result, Canada’s high cost of Internet access – whether mobile or fixed broadband – clearly acts as a deterrent to the full capacity of connectivity among Canadians. Tracking the cost and rate of home and mobile subscriptions on an annual basis, is one significant method by which to analyze the relative accessibility of connectivity. Based on the assumption that the lower the cost, the more subscriptions and therefore, the greater the consumer base for technologically innovative products, a lower cost of Internet access can play a crucial role in growing the local innovative culture.

<table>
<thead>
<tr>
<th>Country</th>
<th>Average Spending (CAD) per Mobile Subscription (2014)</th>
<th>Average Spending (CAD) per Fixed Broadband Subscription (2014)</th>
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<tbody>
<tr>
<td>France</td>
<td>$90</td>
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<td>UK</td>
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<tr>
<td>Canada</td>
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</tbody>
</table>

Measurement #3: Expenditure on Digital Talent

Moving toward the development of a fully innovative Canada, policymakers and industry are increasingly collaborating to shape Canada into a nation that is able to create and sustain long-term economic growth. Doing this requires investment in innovative technology, and supporting Canadian workers in acquiring the digital skills needed to obtain gainful employment. These investments in digital talent, spanning from youth digital skills integration, post-secondary, adult training programs, and immigration, form the bedrock of a strong and innovative Canadian digital economy.

K-12 Digital Skill Development

Canada understands that encouraging students to consider careers in the digital economy means starting at an early age, and that the more frequently young people see technology as integrated into their daily lives, the more comfortable they will be with it. As a result, when integrated properly, technology education will help students acquire the skills they need to survive in a technical knowledge-based economy [59]. Helping students become more comfortable with technological resources, and working on projects that are equipped with technological tools will inevitably help students in the long-run [60] by providing a snapshot of what their future careers may look like.

On a federal and provincial level, Canada has begun to understand that this type of change is necessary, and has committed to investing in technology integration from an early onset. A prime example, investing $50 million over the course of two years, Budget 2017 announced the commitment to help develop a template K-12 curriculum that integrates coding and digital skills education [61]. Working with digital skills training organizations, elementary and high school curriculums will be revamped to provide students with necessary coding and digital skills. A similar initiative had also been unveiled at a provincial level in early 2016, where the BC government announced that it would be integrating coding into K-12 curriculums, in an effort to ease chronic digital skills shortages evident across the province [62]. While Canada is still in the beginning phases of shaping such a curriculum, measuring the growth (adoption on an annual basis) of coding in K-12 curriculums based on a sample size of schools from each province is one way that we can identify developments in investment to youth digital skill training. Youth digital skill training acts as a key indicator in measuring the strength of investment in future digital talent, ultimately, playing a central role in shaping the innovative climate of Canada. Tracking progress made each year, K-12 coding curriculum adoption in Canada can also be compared to other international competitors, including benchmark countries such as the UK, Denmark and Ireland, all of which had already integrated coding into their K-12 national curriculums in 2015 [63].

Canada invests $50 million towards the development of a K-12 curriculum template that integrates coding and digital skills

With as many as 50% of 4th grade students having regular access to a smartphone [54], it is clear that young people are innately engaged with technology on a daily basis. As a result, experts suggest that millennials’ brains are in fact, being “rewired” to develop a strong information-processing skillset that they will need to survive in the future [55]. The formal integration of coding and digital skills into school curriculums at an early age can function to help young people identify and strengthen the linkages between technology and their future careers. In turn, this kind of investment is one that can produce a greater output of digitally-skilled graduates, essential to meet the ever-evolving needs of tomorrow’s digital economy.
Post-Secondary Investment

Historically, Canada has made strong investments in post-secondary education. With the understanding that education is the foundational pillar of innovation, post-secondary investment has consistently been a crucial input for the development of a reliable and stable economy. Displaying one of the highest levels of tertiary education attainment of any country in the OECD, 51.5% of all Canadians held post-secondary qualifications in 2015, with the highest attainment (59.2%) seen among Canadians aged 25-34 [66]. Compare this to the OECD average, which totaled 30.7% during the same time period [67].

Another solid example of positive investment, the 2017 Budget continued to echo Canada’s long-standing support for post-secondary education, though various measures aiming to produce a greater volume of graduates, namely in in-demand fields. Such measures included a $59.8 million investment in Canada Student Grants and Loans to be distributed in 2018, with $17 million per year thereafter. These investments will go towards helping part-time students receive the financial assistance they need in order to upgrade their skills [68] and become employed in high-quality jobs. Another significant commitment is the reduction of income thresholds in relation to the repayment of student loans. Under the new thresholds, a single Canadian would only be required to begin making student loan payments when their annual income totaled $25,000 per year [70].

Nearly 60% of Canadians aged 25-34 hold post-secondary qualifications

Post-secondary attainment levels among 25-34 year olds (2015)

This type of directive helps to alleviate the financial burden that many students face, following graduation. By increasing these thresholds, students are afforded more freedom to search for jobs that are aligned with their future career paths, rather than simply taking any job to repay their debt. Investment in post-secondary education on the whole can be measured through annual Federal budgetary commitments to programs that help encourage access and attainment. Among others, these include tuition tax credits, education tax credits, and Canada student loans and grants.

Another way to track investment to post-secondary in fields more directly related to innovation is through investment in facilities and infrastructure needed to conduct research and stimulate technological and innovative economic growth. In July 2016, allocated through the Post-Secondary Institutions Strategic Investment Fund, the Government of Canada had committed to providing $1.9 billion to universities throughout Ontario for the purpose of modernizing and enhancing their research facilities [71]. This includes the renewal of 546 labs at the University of Toronto’s 3 campuses, under the Lab Innovation for Toronto (LIFT) program [72]. Similar other initiatives include the BC Knowledge Development Fund, which since 2001, has invested over $520 million in research infrastructure across BC’s universities [73], as well as a $500,000 investment under the BCTECH Strategy, providing scholarships to post-secondary institutions that encourage women to take up studies in STEM fields [74]. Combined, these and other initiatives are essential in helping more students attend post-secondary institutions, and graduate in fields that are essential to the development of the digital economy.

Such investments made can be cross-referenced with the output of STEM graduates on an annual basis, for comparative purposes. As of 2010, Canada placed 12th out of 16 counterparts, in the number of graduates in STEM fields [75]. This means that only 21.2% of all Canadian post-secondary students graduated with STEM degrees [76]. While this proportion of graduates is higher than some of Canada’s international competitors including the US, analyzing the annual output of STEM graduates on a national level can help determine the correlation between post-secondary investments and graduation rates. Furthermore, a comparison to countries such as Finland and Germany, where 30-32% of graduates held STEM degrees [77], is useful to be able to rank Canada’s standing on an international basis.

**Experiential & Work Integrated Learning**

Ensuring that youth have the right support, both during and after their post-secondary careers is crucial to their successful transition into the workforce. Moreover, with the Canadian tech sector being heavily dominated by small (employing fewer than 100) and medium (employing fewer than 500) businesses, students are often faced with the challenge of wearing multiple hats and ramping up at speed during their first job. With 99.1% Canadian technology companies being small and 0.8% being medium in 2016 [78], these types of organizations often require personnel – at junior and senior levels – that can quickly assume their duties effectively and efficiently. As a result, investments in helping students develop practical work skills, through co-operative education, are essential to producing qualified graduates who are able to hit the ground running in the innovation economy.

Understanding the correlation between vocational training and strong graduates, both Federal and provincial governments have begun investing in co-operative education and work integrated learning programs, helping students bridge the gap between theoretical knowledge and practical experience.
A primary example, Budget 2017 announced a $395.5 million investment over 3 years in the Youth Employment Strategy and the Canada Summer Jobs Program, creating additional short-term employment opportunities for young Canadians enrolled in post-secondary programs, with 15,000 of these new opportunities being green jobs [79].

Budget 2016 also provided $73 million over 4 years for job-creation partnerships between post-secondary institutions and employers, ultimately culminating in 10,000 new work-integrated learning experiences over the next four years in STEM programs [80]. Realizing the benefit of such initiatives, this program was further expanded under Budget 2017, where an additional $221 million over 5 years will be provided to Mitacs, a non-profit specializing in building partnerships between post-secondary institutions and industry. The end goal of this program is to create 10,000 work-integrated learning placements for Canadian post-secondary students each year [81] This is further complimented by provincial investments in work-integrated learning, including: a $190 million investment over 3 years under Ontario’s Career Kick-Start Strategy, for the purpose of improving access to work-integrated learning, internships and online training [82].

Running one of the most robust co-op programs in the world, the University of Waterloo is a leading example of the value of vocational education. Boasting an employment rate of 86-99.9% [83], the University of Waterloo has approximately 19,000 students enrolled in co-op programs, and 5,200 employers participating, globally [84]. Co-op education and other similar programs like ICTC’s WIL Digital are extremely valuable, as they allow students the opportunity to gain work experience in their chosen fields, while studying. Annually tracking the number of co-op enrollments in STEM-related programs, based on a sample size of universities from each province, is one solid method for measuring investments in experiential learning at the national level. Based on current trends, the co-op participation rate in Canada has remained fairly stagnant, averaging a 12% placement rate at Canadian universities, from 2005-2010 [85]. While increasing investment may function to raise this figure, co-op participation rates can also be compared to other international jurisdictions for ranking purposes. In the EU-28, for example, 47.4% of post-secondary students completed some kind of vocational training program during their degree in 2014 [86].

In September 2017, Canada began rolling out a $73 million investment, creating 10,000 work-integrated learning experiences over 4 years

**Adult Digital Skill Training**

While crucial, ensuring that young people are trained with the necessary skills to succeed in the digital economy is only one part of the equation. With an anticipated shortage of 216,000 digitally-skilled positions in the Canadian economy by 2021 [87], it is clear that the volume of graduates from Canadian post-secondary institutions will not alone be sufficient to meet the full demands of the digital economy. Therefore, ensuring that adults – whether unemployed, underemployed, or employed in other sectors – have the ability to become retrained for jobs in tomorrow’s innovation economy is essential.

Budget 2017 has outlined several measures highlighting the importance of lifelong learning and skill development in Canada. Starting in 2017, the Federal government will invest $1.8 billion over 6 years to expand the provincial Labour Market Development Agreements [88]. These initiatives offer skills training, career counseling and other services for adults seeking to upgrade their skills.
Additionally, the government has committed to expanding Employment Insurance (EI) for adults returning back to school, while also promising an investment of $287.2 million over 3 years into a pilot program that seeks to create new approaches, making it easier for adult learners to return to school and qualify for the Canada Student Loans and Grants [89]. Provincial investments include Ontario’s $9 million towards helping adult learners complete high school and enroll in post-secondary programs [90], among others. Tracking annual budgetary investments to programs aimed at increased adult digital literacy is a method by which we can measure the level of investment in adult digital skill training. By affording adults the opportunity to become trained in the technology relevant to the future needs of the economy, we will be increasingly able to create and fill high-quality, sustainable jobs for all Canadian workers – a central component of the innovation economy.

Immigration

Lastly, investment in immigration is another key pillar to building a capable workforce, able to promote a thriving innovative economy. Fast-paced growth of the digital economy requires access to specialized talent from various parts of the world, with diversity and the exchange of different ideas acting as a driver of innovation.

Echoing Canada’s history of outward-looking immigration policies, Budget 2017 committed $7.8 million over 2 years to support the implementation of the Global Skills Strategy [91]. This program sets an ambitious 2-week standard for processing work visas for global talent that are needed to fill in-demand jobs in high-growth Canadian companies and global companies making large investments in Canada [92]. This includes occupations such as computer programmers, and web developers, to name a few. Complementing this program, Budget 2017 also committed $279.8 million over the course of 5 years to support the continued delivery of the Temporary Foreign Worker Program and the International Mobility Program [93], as well as $117.6 million over 8 years for the creation of 150 Research Chairs. The purpose of these Chairs is to attract top-tier international scholars and researchers to Canada, helping to build Canada’s reputation as an international center for innovation, science and research excellence [94].

**Canada’s Global Skills Strategy sets a 2-week standard for processing work visas for in-demand global talent in high-growth industries**

ICTC has also been directly involved in several initiatives aimed at preparing Canada-bound immigrants for careers in tech. These include: the GO Talent Program, connecting employers with Internationally Educated Professionals en route to Canada; the Unlocking Global Talent Initiative, a partnership with Washington-based non-profit Talent Beyond Boundaries, matching in-demand ICT sector roles such as computer programmers, interactive media developers, web developers and computer network technicians with skilled refugees in the area; and the IWES program, offering training for Internationally Educated Professionals looking to find work in the tech sector [95].

Tracking the volume (number) of skilled migrants entering Canada on an annual basis is a relevant starting point to analyze Canada’s standing in terms of outward-looking policies that understand the value of thought exchange and diversity to the digital economy. From there, these annual figures can be cross-referenced with the total number of immigrants in Canada that possess technological backgrounds, determined by National Occupational Codes (NOCs) relevant to the innovation economy.
Measurement #4: Innovation Culture

The culture of innovation plays a central role to the ability of small businesses to access the resources and tools necessary to research, develop and launch their products. In jurisdictions with strong technology ecosystems that value innovation and creativity, startups are able to grow and flourish, while providing creative solutions for societal challenges, and simultaneously strengthening the overall economy.

Growth and Transition of Canadian Startups

Since the early 2000s, innovative small businesses – startups – have grown with increasing frequency in nearly every major North American city, eventually becoming a well-known concept, worldwide. With their arrival, startups have also brought forth a new corporate culture – one inherently different from traditional office environments that are known for top-down leadership and well-defined employee roles. Functioning as small businesses with innovative components, startups place a heavier value on creativity, workplace collaboration and ecosystem growth, while simultaneously living by the concept of “paying it forward” and helping similar organizations succeed [96].

In 2016, Canadian small businesses – that is, businesses employing 100 people or fewer – represented 97.9% of all businesses across all sectors [97]. This breakdown increases to 99.1% for companies operating within digital or innovative fields [98], during the same year [99]. Representing the majority of players in the Canadian marketplace, clearly, small businesses are essential to the Canadian economy on the whole, and especially for the innovation sector. Yet, on a company-by-company basis, the greatest economic output is usually found among high-impact companies employing 500 or more. Here is where Canada currently trails slightly behind. While the total proportion of large companies across all sectors has nearly doubled to 0.3% in 2016 from 0.14 % in 2013 [100], this representation remains relatively unchanged for those operating in the technological space. In both 2013 and 2016, only 0.1% of technologically-based companies employed 500 or more [101]. Therefore, tracking the representation of technology companies in the small, medium and large (high-impact) categories, represents a poignant starting point for being able to measure the overall strength of high-impact business growth, contributing to the culture of innovation in Canada.

Company size of Canadian Businesses - Professional & Scientific Services (2016)

- Small (1-100): 99.1%
- Medium (101-500): 0.8%
- Large (500+): 0.1%

Another viable method of tracking shifts in Canadian innovative culture involves analyzing the birth to death ratio of small businesses per year, across industries – and, namely, in the technological space. New businesses need a supportive local ecosystem to develop and launch, and while businesses emerge and dissolve every year, a birth rate that surpasses the death rate may be an indicator of a strong local innovate climate. For example, in 2013, a total of 78,420 businesses were created across all sectors of the economy, and 83,960 exited, representing a higher death vs. birth rate among all Canadian small businesses (48.5% birth, 51.5% death) [102]. While business failure is a component of any innovative economy – and the attitude towards failure, a factor of business culture surrounding risk-taking – in 2013, the highest rate of births across all sectors took place in the technology sector, where a total of 13,820 new companies were created in that year, surpassing the number of companies that dissolved (12,590) [103]. The accelerated growth of new companies may be correlated to a positive ecosystem that promotes and supports research and the development of innovative startups. Further signifying the potential strength of the innovative economy, in 2013, with a 52.3% survival rate [104], the technology sector placed second out of three in possessing a business birth rate that clearly surpassed the death rate.

Lastly, the survival of those businesses year after year, also works to showcase a strong culture of innovation that supports those newly-formed startups, after they launch. In this realm, we also note a positive trend for Canada. Using a baseline of small businesses (employing 100 or fewer) that entered the market in 2007, a total of 86% of those survived past the 2-year mark [105]. Compare this to small businesses that entered the market in 2005. Here, only 70% of those survived past the 2-year mark [106]. This positive uptick, along with the solid influx of new technology companies each year, presents a favorable picture of innovative culture in Canada, where new small businesses are increasingly generated and able to survive in the marketplace for longer periods of time.

### Small businesses that entered the market in 2005

- **Survived to 2007:** 70%
- **Died by 2007:** 30%

### Small businesses that entered the market in 2007

- **Survived to 2009:** 86%
- **Died by 2009:** 14%

Patents & Trademarks

The development, growth and survival of Canadian startups is a key component driving the success and sustainability of the innovation economy. However, the ways in which startups shape both their products and their corporate culture are two crucial factors in determining their ability to compete and stay innovative. As Amazon CEO Jeff Bezos mentioned in his 2016 letter to shareholders, the philosophy of any successful startup should stay focused on Day 1 [107] – that is, based in the driven, creative, and open mindset.

Budget 2017 saw significant investments into the Canadian innovation economy, with many aspects specifically focusing on helping companies stay in that Day 1 phase through the creation of tools and environments needed to drive continual collaboration, idea-generation and creativity. One of those measures included a $950 million investment in job-creating superclusters, referring to densely-populated areas of innovation-driven business activity across the country [108]. This initiative primarily provides supportive services and funding to superclusters that attract small and large companies to collaborate with universities, colleges and non-profits, turning ideas into active market solutions. Operating under five areas, industries eligible for this funding include: advanced manufacturing, agri-food, clean technology, digital technology, health & biosciences, clean resources and infrastructure & transportation [109].

One method of tracking the growth of the innovative culture in Canada, as well as the output of investments like the above, involves assessing annual changes and trends among patents and trademarks filed and registered in Canada. With patents acting as an incentive for innovation by allowing the inventor to capitalize on the rewards of the given IP [110], a growth in patent and trademark output on an annual basis suggests a fertile ground for innovation. Showcasing promising potential, on an overall production basis, patent and trademark filing and registration have both increased since 2010, in Canada.

In 2015, the overall number of patents filed in Canada totaled 36,964, up by 4% from 35,449 in 2010 [111]. Similarly, Canada has also seen strong growth when it comes to patents granted. In 2010, a total of 19,120 patents were granted in Canada, this figure rising by more than 16% to 22,201 in 2015 [112]. The growth in patent filing and registration underlines a positive trend in both the volume and quality of innovative ideas emerging in Canada.

![Patents filed 2010-2015](chart1.png)

![Patents granted 2010-2015](chart2.png)

Source: ISED, IP Report, 2016
Similar results are also notable for trademarks, although trademarks have always had a stronger presence in the Canadian market over patents. In 2015, the total number of trademarks filed rose to 52,461, an increase of 16% from 2010 levels [113]. Registered trademarks also saw significant growth in Canada during the this 5-year period. Here, the overall number of trademarks registered grew by 5% to 31,507 in 2015, up from 29,990 in 2010.

The steady growth of patents and trademarks in Canada represents a piece of the innovative culture of the country, including its ability to produce products that capitalize on innovative trends and respond to consumer needs. “Day 2 is stasis”, as Jeff Bezos, noted – this includes a loss of touch with the customer, process-driven policies, failure to notice and embrace trends, and lack of timely decision-making. In short: Day 2 is decline [114]. Instead, all successful companies need to stay focused on the main components of Day 1: innovation, creativity, focus and drive. Creating an environment that allows these companies to do so, while giving them the opportunity to patent or trademark their technologies is a key component to ensuring that the innovative culture in Canada remains focused on Day 1.

**Startup Support Networks**

In order to adequately support the growth of Canadian startups, while encouraging scale up and market expansion, a variety of support networks need to be available in the local ecosystem. These support networks provide access to mentorship, business advice, investors and, oftentimes, space to conduct research. Most often, these support networks take the shape of accelerators and incubators. Accelerators function with the intent of eventually generating a return on investment. As a result, accelerators provide small amounts of capital to startups, along with mentorship services and business advice, for a certain amount of equity in the new company [115]. When small businesses join accelerator programs, they complete a 3-4 month “training program”, after which the company “graduates” and their product is deemed viable for market competition [116].

By contrast, incubators are most frequently funded by academic institutions or development corporations [117], and are primarily engaged in activities aimed at helping an already “graduated” startup reach commercialization. Incubators provide startups with operational space to further develop and refine their product, mentorship services, and access to networks of potential investors [118]. In short, accelerators help startups get their product off the ground, while incubators help them scale up and commercialize.

**With more than 140 across Canada, accelerators help startups get off the ground and incubators help them scale and commercialize**

One way that the strength of support networks can be measured is by assessing the number and geographic spread of these services. This can be used to track the growth of accelerators and incubators on an annual basis, and across geographic regions. Here, the assumption is that the greater and more widespread the availability of these support networks, the more opportunities companies will have to utilize their services and thereby, contribute to the innovation economy. Continuously growing, Canada’s innovative support networks consisted of 140 accelerators, incubators and hubs in 2016, with more than half specifically serving companies in the ICT, biotech and clean technology space [119]. During this year, the number of accelerators and incubators in Canada that were found across all provinces – although the majority were saturated in Ontario, Quebec and BC – totaled 32 tech-related accelerators and 48 tech-related incubators [120].
This figure can be tracked on an annual basis to show growth and distribution of these support networks across Canada. For comparative purpose, these figures can also be weighed against other leading innovation hubs. This includes the US which had 413 tech-related incubators across the country [121] or France, which had 30 across the country, in 2016 [122].

This being said, one point that also needs to be kept in mind, is that the volume (total number) of support organizations does not necessarily dictate the strength of each, on an individual basis. For example, despite the existence of more than 60 tech-related accelerators and incubators in Canada, the most significant follow-on investment ($1.7 billion) was found among the 20 top accelerators and incubators in 2016 [123]. In 2016, of this follow-on investment, nearly $350 million was attributable to accelerators, at an average investment of $1.2 million over 286 clients, creating a total of 4.7 additional jobs per client [124]. By comparison, hubs brought in roughly $1.1 billion in follow-on investment, but only generated an average of 2.3 jobs per client [125]. The most substantial impact was seen among incubators – that is organizations that take a developed product and help it commercialize. Here, in 2016, incubators only generated $260 million in follow-on investment over 316 clients with an average investment of $830,000 [126]. This investment also yielded the highest rate of jobs, creating a total of 2,379 jobs or an average of 7.5 jobs per client [127].

**Accelerators**

- $350 million follow-on investment
- 4.7 jobs per client

**Hubs**

- $1.1 billion follow-on investment
- 2.3 jobs per client

**Incubators**

- $260 million follow-on investment
- 7.5 jobs per client

Source: DEEP Centre, Accelerating Canada’s Startup Ecosystem, 2015.

Examining the total amount of follow-on investment, on an annual basis, is an important measure to take in order to identify the outputs of these support networks – assuming that heightened investment creates increased job opportunities. This way, we will be able to track investment from each type of institution, while also determining how these investments have translated into jobs, per given year.
Conclusion

The first of four pillars defining the Canadian Digital Innovation Measure, this paper outlines the key concepts found in the Canadian Innovative Climate Index. Describing the groundwork for innovative economic development are four central measurements: R&D Expenditure and Capital Investment; Digital Product & Services Consumption; Expenditure on Digital Talent; and Innovation Climate. Together, these ingredients underline the basis of the Innovation Climate Index, showcasing Canada’s strength points, opportunities, as well as challenges in the face of the continuously evolving needs of tomorrow’s digital economy.

While more time and investment is needed to reach the status of some of the world’s top digital ecosystems, Canada is a country with strong potential for innovation. Several factors contribute towards Canada’s ability to play an increasing role in the global digital economy, including access to financing, a strong talent base, and international confidence in Canadian digital goods and services, among others. However, conceptualizing Canada’s holistic potential as a leader in the innovation economy involves first understanding the foundational basis of it: Canada’s innovative climate.

The Innovation Climate Index, the first in a four-prong approach analyzing Canada’s digital innovation strength focuses on four key measurements, listed above, as the foundational pillars. These encompassing four measurements are underpinned by several indicators, including but not limited to: public & private R&D investment, capital investment, procurement, K-12 digital skill development, post-secondary investment, adult digital literacy investment, work-integrated learning, immigration, Internet connectivity, time spent online and digital services consumed, the strength of the entertainment industry, cost of internet access, startup growth and survival, patent and trademark filing and registration, and startup support networks. Combined, these factors have been identified as contributing towards the establishment and strength of the digital innovation climate in Canada.

Canada, like the rest of the world, is set to see considerable changes and shifts producing significant economic, social, environmental and political outcomes. Furthermore, with the advent of new technologies including Blockchain, AR/VR, AI, 5G mobile and additive manufacturing, digitization is increasingly permeating all aspects of the economy, and generating changes that create both challenges and opportunities for companies, workers, academic institutions and policymakers, alike. In this kind of environment, innovation and the ability to innovate is more valuable than ever. Canada has begun to take considerable steps in its journey towards creating world-class innovation capacity, experimenting with policies and initiatives that strive to push the country forward in this new global economy; and while some hurdles and setbacks are inevitable on the path to success, ultimately, the type of climate that the digital economy grows under will determine its ability to thrive.

The Canadian Innovation Climate Index marks the beginning of the discussion on the Canadian Digital Innovation Measure, analyzing Canada’s position in the rapidly evolving digital economy. Released once each quarter, this paper will be followed by the second of four indexes: the Canadian Innovation Capacity Index, providing a background on key factors influencing Canada’s capacity to innovate. This Index will include indicators such as technology exports, employment of ICT graduates, labour productivity and others.

We anticipate the release of the Canadian Innovation Capacity Index white paper in March 2018.
End Notes

2. Ibid.
3. To be derived from a total figure based on relevant National Occupational Codes (NOCs).
5. Ibid.
10. Government of Canada, Canada’s Science, Technology & Innovation System: Canada’s Innovation Challenges and Opportunities (State of the Nation Reports – 2014) <http://www.stic-ctic.ca/ecsite/stic-ctic.nsf/english/00909.html> Chapter 2, Fig. 2-1.
11. Ibid.
17. Ibid. P. 360.
27. Ibid.
28. Ibid.
31. Ibid.
32. Ibid. P.17.
33. Ibid. P. 21.
34. Ibid. P. 24.
35. Ibid. P. 21.
36. Ibid. P. 22.
39. The sum of production budgets.
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54. Conversions made from GBP to CAD based on 2014 average of 0.905912.
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