



**RESEARCH**

**DIGITAL ECONOMY SUPPLY**  
**CANADA'S POST-SECONDARY EDUCATION STREAM**

**The Information and Communications Technology Council | 2015**





**RESEARCH BY:**



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Thank you!

ICTC's labour market research captures critical economic and labour market indicators to inform competitive business and human resource strategy planning, decision-making and career development in ICT, thereby driving the development of a more prosperous Canadian ICT workforce and industry in a global digital economy. Occupational demand and supply outlooks are affected by a variety of factors and change over time. Multiple sources of information should always be considered prior to making HR decisions based on estimations.

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# FOREWORD

The success of Canada's Digital Economy is dependent on having the required highly skilled resources to leverage the power of the newer technologies for our mutual benefit. Based on solid research and analysis, this ICTC study confirms that there will be insufficient resources with the necessary skillsets to meet the anticipated hiring demands across all industry sectors, including manufacturing, retail, financial and healthcare to name a few. This talent supply shortage will have a negative impact on the ability of organizations to rapidly transform their operations using digital technologies and thus will further hinder Canada's overall competitiveness in the global marketplace.

This issue is of importance to all of the players within the digital economy, but is of particular concern to the Canada's Chief Information Officers (CIOs) who have the mandate to lead the digital transformation for their respective organizations. There are already skills shortages today and this study highlights that this situation will further deteriorate unless corrective action is undertaken. In fact, the anticipated cumulative demand is for 182,000 ICT skilled workers by 2019 (Outlook: ICTC, 2015). It is clear that development and leverage of talent from all avenues (women, youth, immigrants, and aboriginals) will be necessary to support the rapidly evolving job market requirements.

This study not only outlines the challenges that we collectively face, but also represents a call to action for Educators, for the Industry and for Policymakers with solid strategies to help address the obvious shortcomings in our labour markets today and to better position all of us for Canada's Digital Economy competitiveness tomorrow. It is well worth your time and attention and I highly recommend it to you.

*Gary Davenport*

President

CIO Association of Canada



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## ACRONYMS

DE	Digital Economy
HR	Human Resource
ICT	Information and Communications Technology
ICTC	Information and Communications Technology Council
IT	Information Technology
LFS	Labour Force Survey
M2M	Machine-to-Machine
PSIS	Post-secondary Student Information System

# EXECUTIVE SUMMARY

## EXECUTIVE SUMMARY

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### What this study covers?

Continuous innovation and improvements in technology need to be synchronous with the required number of skilled ICT professionals for the digital economy to grow sustainably. To better understand the supply-side dynamics of ICT talent, this study concentrates on (i) the supply flow of ICT talent from Canada's post-secondary education stream, and (ii) strategies outlining the way forward to enable better decision making by all stakeholders for a more productive, innovative, and globally competitive Canadian economy. In addition, availability of gender disaggregated enrolment and graduation data allows us to gain a better understanding of talent supply by gender.

### Structure of the study

This study begins with an outline of its analytical framework. The next section provides an in-depth overview of ICT supply from Canada's post-secondary education stream. The gender perspective and other important considerations are explored in the following two sections. In a final section of the paper, the findings of this study are summarized in the context of a discussion about strategies to stimulate the Canadian economy with required skilled ICT talent.

### Supply from Canada's post-secondary education stream

ICT graduates are potentially the biggest source of incoming supply of Canada's ICT workforce, as they are trained to acquire the knowledge and skills required for the technical nature of ICT work. The transfer rate is not 'full', however, as not all ICT graduates become ICT professionals. ICTC's research indicates that many ICT graduates change career paths for a variety of reasons, including shifting employer needs and change in personal interests.

### Enrolments in ICT

Students enrolled in ICT fields of study represent a pool of potential ICT labour force. Annual ICT enrolment in Canada increased by 24,200 (▲24%) compared to five years ago in 2010. In 2015, 2.21 million students enrolled in post-secondary education in Canada. Of them, nearly 126,000 (6%) students enrolled in ICT, with 72,000 enrolled in universities and nearly 54,000 enrolled in colleges. Following the collapse of the dot-com bubble, ICT enrolment decreased gradually every year for seven consecutive years since 2001. The enrolment in ICT stagnated for a short period around the time of the financial downturn of 2008, followed by gradual annual increases since then on account of strong job market potential. Overall enrolment in post-secondary education, as well as enrolment in ICT fields of study, did not change uniformly across the provinces over the past two decades.

### ICT graduates

Graduating from an ICT field of study provides a stepping stone for a career as an ICT professional, as these graduates are prepared and skilled – at least partially – to join the ICT workforce. In 2015, over 527,000 students are graduating from the post-secondary education system in Canada. Of them, over 29,000 (6%) students are ICT graduates, with 12,800 graduating from universities and 16,300 graduating from colleges. Gradual decrease in ICT enrolments impacted the ICT talent supply through Canada's post-secondary education stream which became evident in 2004 and continued for five consecutive years. Since 2009, the number of ICT graduates has been in an upward trajectory, culminating to over 29,000 in 2015. Graduation numbers from the post-secondary education system, or the ICT fields of study, are not changing uniformly across the provinces and are at times at odds with the shifting realities of the local job markets.





## The gender perspective

ICT enrolment and graduation trends among women are quite different than those among men. Of the 29,000 ICT graduates across Canada in 2015, only 6,200 are women, and the other 22,900 are men. The number of women ICT graduates remained steady at the height of the dot-com boom in 2001, while there was a notable increase among men. The gender gap among ICT graduates really widened in those years. Many male ICT professionals returned to school for further education following the financial downturn of 2008, increasing the number of male graduates in the subsequent years. The macroeconomic uncertainty of that time, however, had a minimal impact on women.

58% of all students graduating across Canada in 2015 are women, compared to 42% men. In sharp contrast, only 21% of all ICT graduates across Canada in 2015 are women, compared to 79% men. The gender distribution of ICT graduates is not uniform across the provinces: New Brunswick, British Columbia, Alberta, and Ontario are the four provinces where the ratios of women ICT graduates are higher than the national average of 21%.

## The right blend of skills is crucial

Some of the contributing factors for the ICT talent mismatch include the growth in ICT employment (e.g. ICT employment in Canada increased by 52,000 in 2014) outpacing the growth in the number of ICT graduates in recent years and not many youth opting for ICT careers. Factors that are contributing to the skills mismatch include technologies redefining talent landscape – leaving much of the available talent lagging in new in-demand skills. In addition, not all ICT graduates are coming out of the post-secondary education stream job-ready. Many skills that are taught are foundational and not job specific. The fit, however, is seldom exact to the employers' needs, as beyond subject matter knowledge and skills, a lot of workplace (company) specific knowledge and skills are also required to perform optimally. A recurring theme in ICTC's recent in-depth consultation with over 1,000 ICT employers across Canada with respect to talent demand-supply dynamics was that there still remains some difference between what industry looks for in terms of skills and what they are getting among job applicants, especially among the new graduates.

Recruiting employers are often looking for an ideal blend of technical and interpersonal – also known as 'soft' or 'people' – skills and coming up short. ICTC's primary research (2014) indicates that finding the desired interpersonal skills such as initiative-taking, communications, motivation, eagerness to learn, team-oriented is a big challenge. Even if a candidate is endowed with these skills, the employer then turns attention to getting the right *cultural fit*, adding much to the challenge. Once the right candidate is found – often following a time- and resource-intensive process – employers continue to invest in employees to help ensure staff retention. Although most companies are equal opportunity employers and want to have a roster that is diverse and inclusive with respect to age, gender, and ethnicity, finding the right blend of skills takes precedence above all else, as companies want the best qualified candidate. Inclusion policies with respect to various diversity groups including immigrants, youth, women, and aboriginal peoples are not often developed or effective as a result.

## The way forward

The strong ICT employment growth – combined with retirement and other exits – of recent years makes urgent addressing of the talent and skills demand-supply imbalances crucial. This study and ICTC's in-depth consultation with industry and other stakeholders highlight multiple dimensions to talent supply challenges and guides the way forward to a comprehensive, multipronged approach needed to overcome these challenges. The final section of this study discusses key takeaways for the digital economy stakeholders and outlines a roadmap for the future.

# **DIGITAL ECONOMY SUPPLY**

**CANADA'S POST-SECONDARY EDUCATION STREAM**

## INTRODUCTION

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Enhanced by the cloud services and residing on interconnected devices that allow M2M connectivity, ICTs today are increasingly sophisticated, allowing the workforce and enterprises to improve productivity and efficiency by taking existing business models and practices to new heights. With continuous improvements in existing ICTs and the emergence of new ones – for instance some of the more recent innovations include the internet of things (IOT), Social, Mobile, Analytics, Apps, and Cloud (SMAAC) – enterprises across all sectors of the Canadian economy are gradually adopting ICTs in their business practices.

Continuous innovation and improvements in technology need to be synchronous with the required number of skilled ICT professionals for the economy to sustainably grow, as the cumulative hiring requirements in Canada for ICT talent are expected to be [182,000 by 2019](#). The economy-wide growing need for skilled ICT talent has expanded career options for ICT professionals, placing competitive pressure on the employers seeking talent. As the driving force behind Canada's digital economy, competition for skilled ICT talent in the medium term will continue to rise.

To better understand the supply-side dynamics of skilled ICT talent, this study concentrates on:

- ❖ the supply flow of ICT talent from Canada's post-secondary education stream
- ❖ labour market intelligence outlining the way forward to enable better decision making by the private sector, education system, policymakers, and all Canadians for a more productive, innovative, and globally competitive Canadian economy

The findings of this study indicate that Canada's post-secondary education system alone will not be able to fill the talent supply requirements of the digital economy, and consequently concerns of talent as well as skills mismatches continue to rise. Enterprises with the foresight to realize that the business environment and models will change even more drastically in the next five years are making innovation central to their business strategies. They also know that the investments they make in upskilling their in-house and in-coming ICT talent will help secure their future success. Canada's future competitiveness will depend on a workforce and workplaces that are universally equipped to take advantage of emerging innovations. By making effective, informed decisions we can all help ensure that the Canadian economy is well resourced for the skilled ICT talent. This will immensely facilitate the economy to grow, innovate, and compete in the global digital ecosystem.

Against this pressing backdrop, this paper begins in the next section with an outline of its analytical framework. The following section provides in an-depth overview of ICT talent supply from Canada's post-secondary education stream. The gender perspective and other important considerations are explored in the following two sections. In a final section of the paper, the findings of this study are summarized in the context of a discussion about strategies to stimulate the Canadian economy with required skilled ICT talent supply for Canada's digital economy.



## ANALYTICAL FRAMEWORK

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This is a mixed methods study, drawing on both quantitative and qualitative analysis. The evidence base comprises:

- ❖ A review of the existing literature
- ❖ Review and analysis of the post-secondary student information system (PSIS) national survey data
- ❖ Comprehensive industry feedback through in-depth consultation with over 1,000 representative employers across Canada
- ❖ Inputs of five regional focus group discussions and validation webinars with stakeholder groups
- ❖ Valuable insights of a 11-member distinguished Digital Economy Supply Advisory Group
- ❖ Major economic and socio-demographic trends

An assessment of talent supply for Canada's digital economy is challenging. When looking through the lens of diversity, the challenge becomes even bigger, and addressing it relies considerably on data availability. Since the post-secondary student information system (PSIS) national survey data is the biggest source of post-secondary enrolment and graduation data, and the PSIS data is disaggregated by gender and not by age, aboriginal status, or residency (immigration) status in Canada, our attempts to gain a better understanding of this important topic is limited to a gender analysis in this edition of the supply study.

Nevertheless, the findings presented in this study illustrate that there are notable challenges to equally integrate all diversity groups into the talent supply stream for Canada's digital economy. Future editions of this study will explore additional data sources and techniques to include an analysis of all diversity groups.

## SUPPLY FROM CANADA'S POST-SECONDARY EDUCATION STREAM

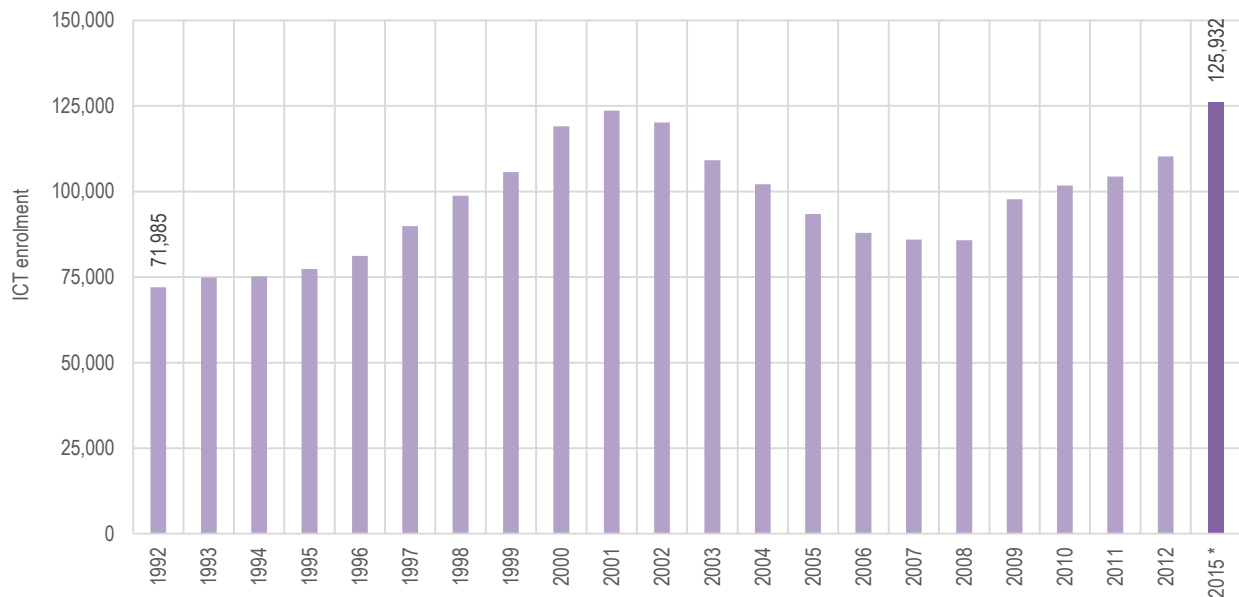
Graduates of ICT fields of study (referred to as 'ICT graduates' hereafter) are the biggest source of incoming supply of Canada's ICT workforce, as they are trained to acquire the knowledge and skills required for the technical nature of ICT work. Obviously the transfer rate is not 'full', as in not all ICT graduates become ICT professionals. ICTC's research indicates that many ICT graduates change career paths for a variety of reasons, including shifting employer needs and change in personal interests.

### ENROLMENTS IN ICT

The students that are enrolled in ICT fields of study represent a pool of potential ICT labour force:

- ❖ Annual ICT enrolment in Canada increased by 24,200 (▲24%) compared to five years ago in 2010.
- ❖ In 2015, 2.21 million students enrolled in post-secondary education in Canada. Of them, nearly 126,000 (6%) students enrolled in ICT, with 72,000 enrolled in universities and nearly 54,000 enrolled in colleges.

Enrolment in ICT by year



\* = Estimated

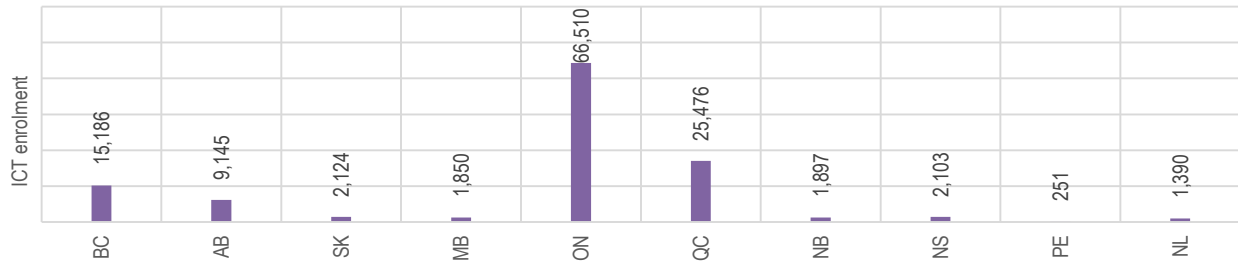
Source: ICTC; PSIS

### Takeaways

- ❖ Following the collapse of the dot-com bubble, ICT enrolment decreased gradually every year for seven consecutive years since 2001.
- ❖ ICT enrolment stagnated for a short period around the time of the financial downturn of 2008, followed by gradual annual increase since then on account of the high standing of ICT fields of study and strong job market potential.

Overall enrolment in post-secondary education, as well as enrolment in ICT fields of study, did not change uniformly across the provinces.

#### Estimated enrolment in ICT by province – 2015



Source: ICTC

Annual ICT enrolment in:

- ❖ **British Columbia (BC)** increased by 3,450 (▲29%) in 2015 compared to five years ago in 2010. In 2015, over 308,000 students enrolled in post-secondary education in BC. Of them, over 15,100 (5%) students enrolled in ICT, with 11,000 enrolled in universities and 4,000 in colleges.
- ❖ **Alberta** increased by 670 (▲8%) in 2015 compared to five years ago. In 2015, over 216,000 students enrolled in post-secondary education in Alberta. Of them, over 9,100 (4%) students enrolled in ICT, with 5,000 enrolled in universities and 4,000 enrolled in colleges.
- ❖ **Saskatchewan** increased by 830 (▲65%) in 2015 compared to five years ago. In 2015, over 63,000 students enrolled in post-secondary education in Saskatchewan. Of them, over 2,100 (3%) students enrolled in ICT, with 1,500 enrolled in universities and 500 enrolled in colleges.
- ❖ **Manitoba** decreased by 230 (▼11%) in 2015 compared to five years ago. In 2015, nearly 70,000 students enrolled in post-secondary education in Manitoba. Of them, over 1,800 (3%) students enrolled in ICT, with 800 enrolled in universities and 1,000 enrolled in colleges.
- ❖ **Ontario** increased by 16,000 (▲32%) in 2015 compared to five years ago. In 2015, over 868,000 students enrolled in post-secondary education in Ontario. Of them, over 66,500 (8%) students enrolled in ICT, with 35,000 enrolled in universities and 31,000 enrolled in colleges.
- ❖ **Quebec** increased by 3,000 (▲13%) in 2015 compared to five years ago. In 2015, over 558,000 students enrolled in post-secondary education in Quebec. Of them, over 25,400 (5%) students enrolled in ICT, with 15,000 enrolled in universities and nearly 10,000 enrolled in colleges.
- ❖ **New Brunswick** increased by 180 (▲11%) in 2015 compared to five years ago. In 2015, over 32,000 students enrolled in post-secondary education in New Brunswick. Of them, nearly 1,900 (6%) students enrolled in ICT, with 1,100 enrolled in universities and 800 enrolled in colleges.
- ❖ **Nova Scotia** increased by 160 (▲9%) in 2015 compared to five years ago. In 2015, nearly 59,000 students enrolled in post-secondary education in Nova Scotia. Of them, over 2,100 (4%) students enrolled in ICT, with 1,200 enrolled in universities and 900 enrolled in colleges.
- ❖ **Prince Edward Island** decreased by 80 (▼24%) in 2015 compared to five years ago. In 2015, over 7,600 students enrolled in post-secondary education in Prince Edward Island. Of them, 250 (3%) students enrolled in ICT, with 80 enrolled in universities and 170 enrolled in colleges.
- ❖ **Newfoundland and Labrador (NL)** increased by 190 (▲16%) in 2015 compared to five years ago. In 2015, over 29,000 students enrolled in post-secondary education in NL. Of them, nearly 1,400 (5%) students enrolled in ICT, with 600 enrolled in universities and 800 enrolled in colleges.



## ICT GRADUATES

Graduating from an ICT field of study provides a stepping stone for a career as an ICT professional. These graduates are prepared and skilled – at least partially – to join the ICT workforce. In 2015, over 527,000 students are graduating from the post-secondary education system in Canada. Of them, over 29,000 (6%) students are ICT graduates, with 12,800 graduating from universities and 16,300 graduating from colleges.

ICT graduates by year



\* = Estimated

Source: ICTC; PSIS

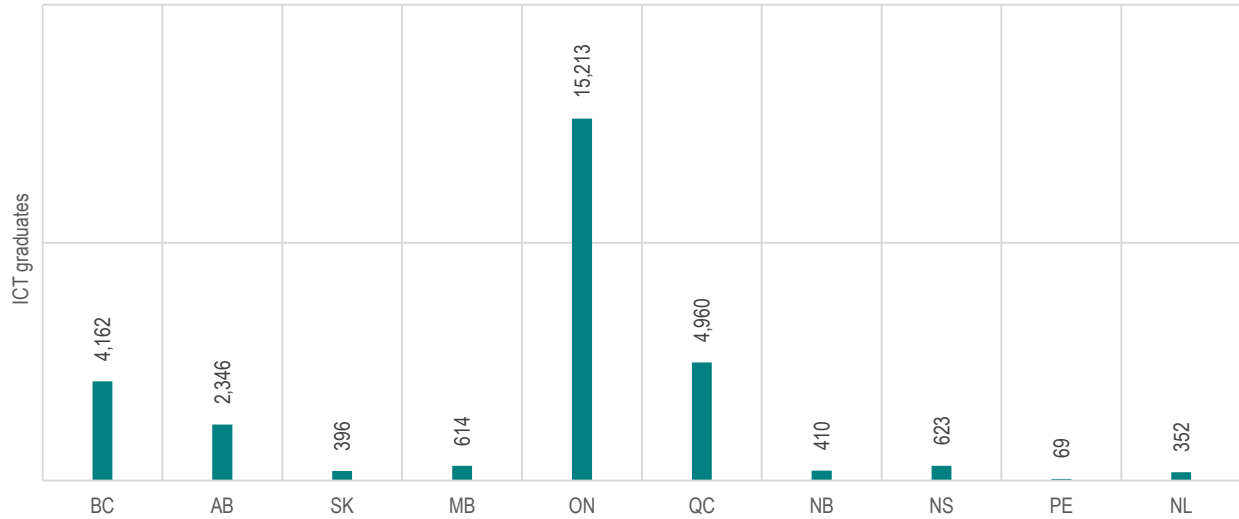
### Takeaways

- ❖ The number of ICT graduates increased throughout the 1990s until 2004.
- ❖ ICT enrolment started to decrease gradually since 2001, and the impact of that on the ICT talent supply through Canada's post-secondary education stream became evident in 2005. The number of graduates decreased gradually up to 2009.
- ❖ The number of ICT graduates has been in an upward trajectory from 2010 onward, culminating in the current level of over 29,000 in 2015.



The number of graduates from the post-secondary education system, as well as the number or ratio of ICT graduates, have not been changing uniformly across the provinces and at times impacted by the shifting realities of the local job markets.

**Estimated ICT graduates by province – 2015**



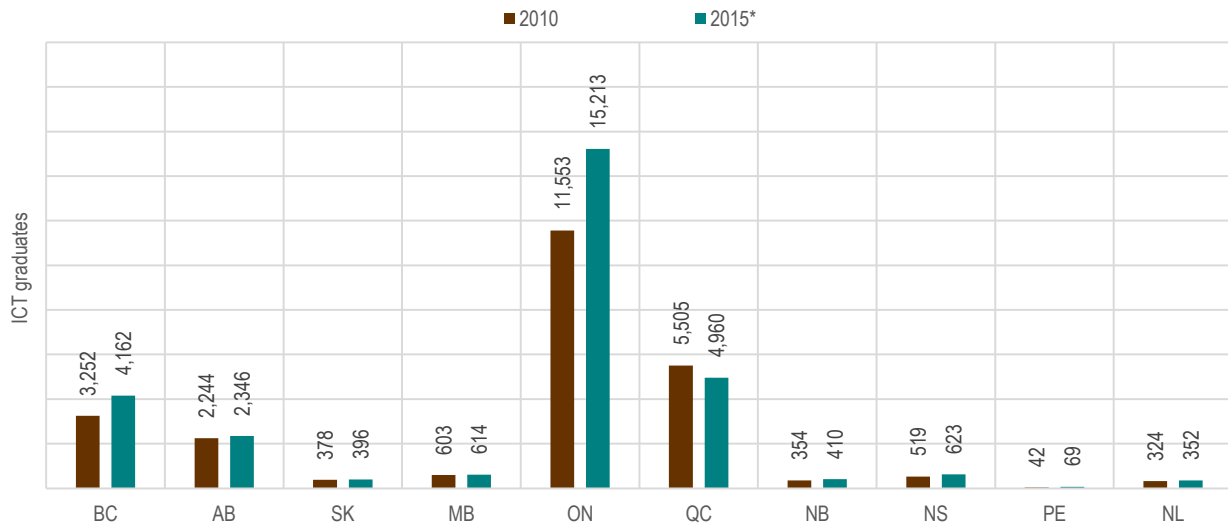
Source: ICTC

Annual ICT graduates in:

- ❖ **British Columbia** increased by 900 (↑28%) in 2015 compared to five years ago in 2010. In that period, ICT employment in the province increased by 22,800 (↑35%). In 2015, over 76,700 students are graduating from the post-secondary education system in British Columbia. Of them, over 4,100 (5%) students are ICT graduates, with 2,100 graduating from universities and 1,900 graduating from colleges.
- ❖ **Alberta** increased by 100 (↑5%) in 2015 compared to five years ago. In that period, ICT employment in the province increased by 5,600 (↑7%). In 2015, over 43,700 students are graduating from the post-secondary education system in Alberta. Of them, over 2,300 (5%) students are ICT graduates, with 900 graduating from universities and 1,400 graduating from colleges.
- ❖ **Saskatchewan** increased by 18 (↑5%) in 2015 compared to five years ago. In that period, ICT employment in the province increased by 3,200 (↑37%). In 2015, over 9,900 students are graduating from the post-secondary education system in Saskatchewan. Of them, nearly 400 (4%) students are ICT graduates, with 200 graduating from universities and 190 graduating from colleges.
- ❖ **Manitoba** increased by 11 (↑2%) in 2015 compared to five years ago. In that period, ICT employment in the province increased by 2,300 (↑16%). In 2015, over 13,200 students are graduating from the post-secondary education system in Manitoba. Of them, over 600 (5%) students are ICT graduates, with 190 graduating from universities and 420 graduating from colleges.
- ❖ **Ontario** increased by 3,600 (↑32%) in 2015 compared to five years ago. In that period, ICT employment in the province increased by 36,000 (↑11%). In 2015, over 213,500 students are graduating from the post-secondary education system in Ontario. Of them, over 15,200 (7%) students are ICT graduates, with 5,900 graduating from universities and 9,200 from colleges.

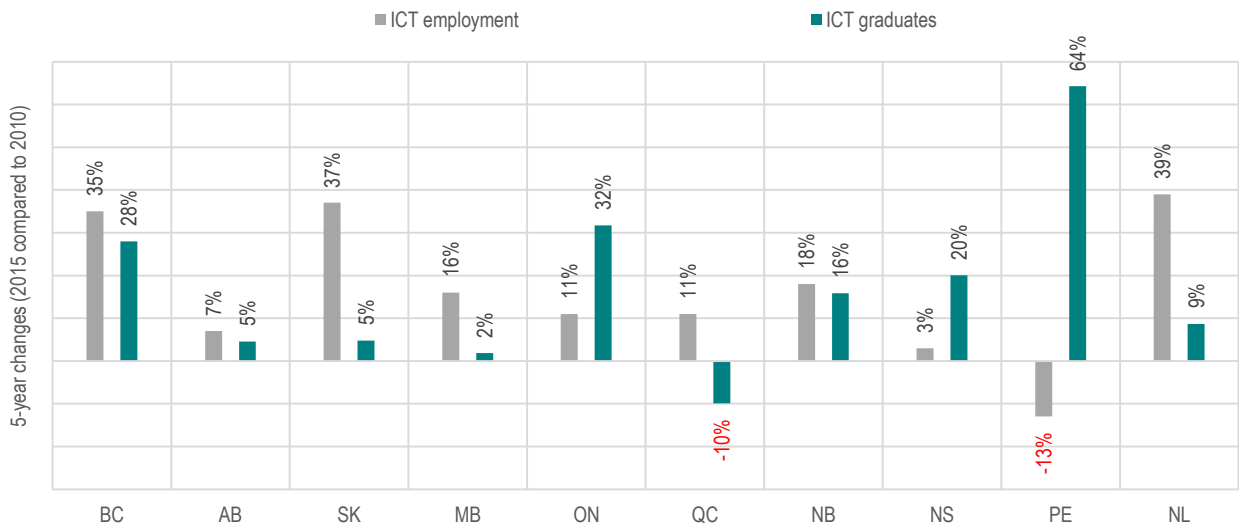


### ICT graduates by province, 2010 and 2015



\* = Estimated

### 5-year changes (2015 compared to 2010) in ICT employment and graduates by province



Source: ICTC

Annual ICT graduates in:

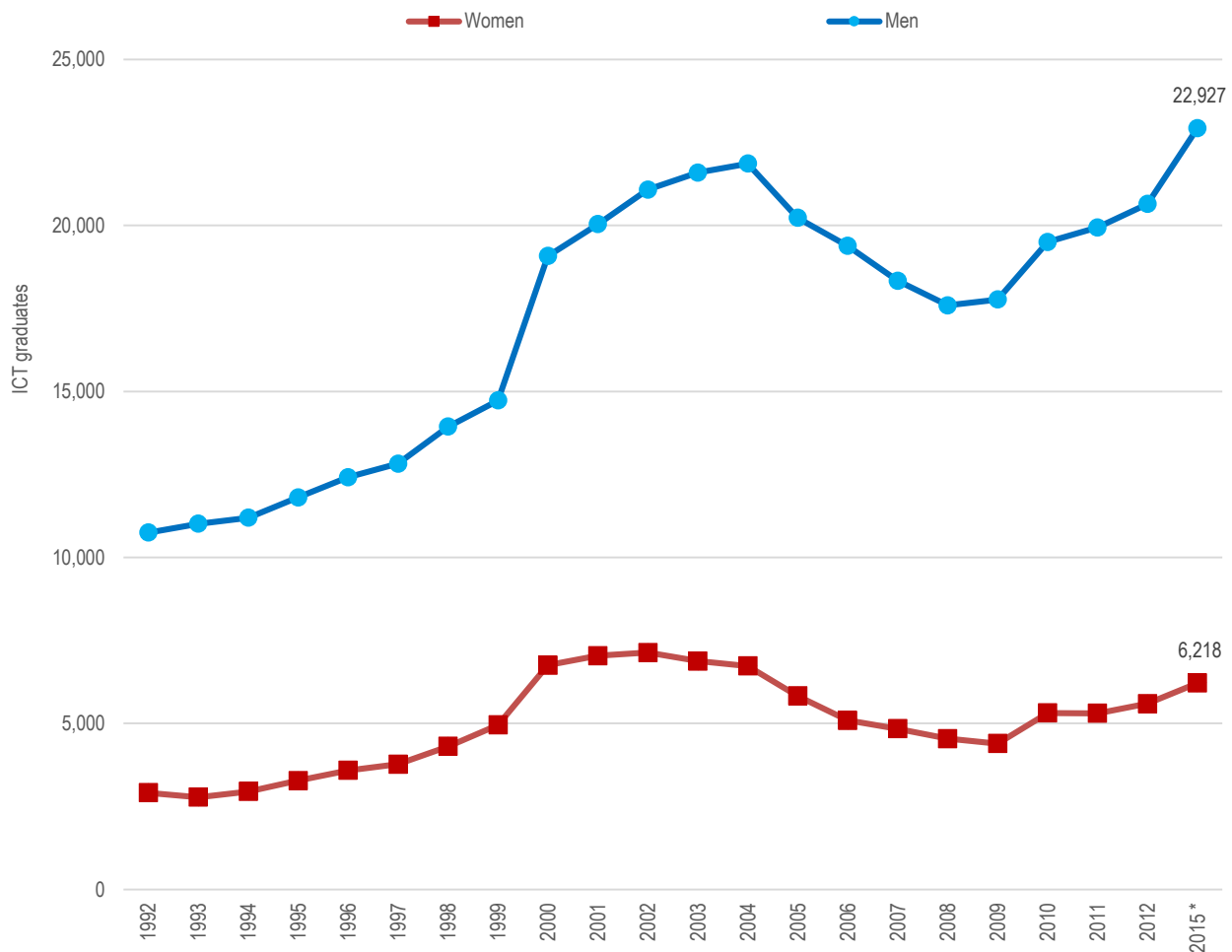
- ❖ **Quebec** decreased by 540 (↓10%) in 2015 compared to five years ago. In that period, ICT employment in the province increased by 25,200 (↑11%). In 2015, nearly 137,000 students are graduating from the post-secondary education system in Quebec. Of them, over 4,900 (4%) students are ICT graduates, with 2,600 graduating from universities and 2,200 from colleges.

- ❖ **New Brunswick** increased by 50 (▲16%) in 2015 compared to five years ago. In that period, ICT employment in the province increased by 2,200 (▲18%). In 2015, over 9,000 students are graduating from the post-secondary education system in New Brunswick. Of them, over 400 (5%) students are ICT graduates, with 150 graduating from universities and 250 graduating from colleges. New Brunswick – along with the other three Atlantic Provinces of Nova Scotia, Prince Edward Island, and Newfoundland & Labrador – face inter-provincial emigration. Many ICT professionals and jobseekers leave the region for better labour market outcomes (e.g. job opportunity and security, higher salary), compounding the talent and skills mismatch.
- ❖ **Nova Scotia** increased by 100 (▲20%) in 2015 compared to five years ago. In that period, ICT employment in the province increased by 500 (▲3%). In 2015, over 15,400 students are graduating from the post-secondary education system in Nova Scotia. Of them, over 620 (4%) students are ICT graduates, with 270 graduating from universities and 350 graduating from colleges.
- ❖ **Prince Edward Island** increased by 27 (▲64%) in 2015 compared to five years ago. In that period, ICT employment in the province decreased by 300 (▼13%). In 2015, over 2,100 students are graduating from the post-secondary education system in Prince Edward Island. Of them, 69 (3%) students are ICT graduates, with 15 graduating from universities and over 50 graduating from colleges.
- ❖ **Newfoundland and Labrador** increased by 28 (▲9%) in 2015 compared to five years ago. In that period, ICT employment in the province increased by 1,500 (▲39%). In 2015, over 6,800 students are graduating from the post-secondary education system in Newfoundland and Labrador. Of them, over 350 (5%) students are ICT graduates, with 110 graduating from universities and 240 graduating from colleges.

## THE GENDER PERSPECTIVE

ICT enrolment and graduation trends among women are quite different than those among men. Of the 29,000 ICT graduates across Canada in 2015, only 6,200 are women, and the other 22,900 are men. The number of women ICT graduates remained steady at the height of the dot-com boom in 2001, while there was a notable increase among men. The gender gap among ICT graduates really widened in those years. Many male ICT professionals returned to school for further education following the financial downturn of 2008, increasing the number of male graduates in the subsequent years. The macroeconomic uncertainty of that time, however, had a minimal impact on women.

ICT graduates by gender and by year

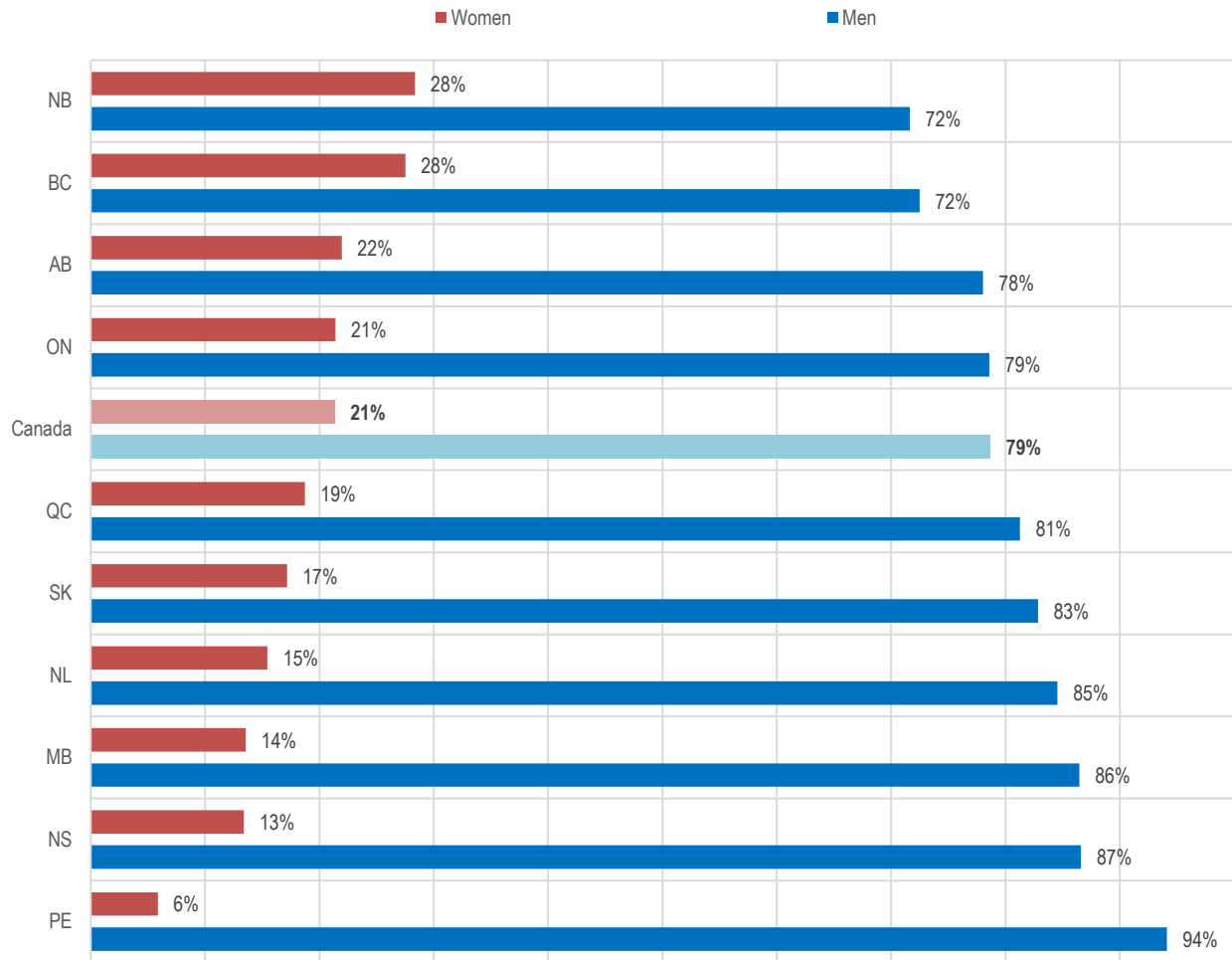


Source: ICTC; PSIS



58% of all students graduating across Canada in 2015 are women, compared to 42% men. In sharp contrast, only 21% of all ICT graduates across Canada in 2015 are women, compared to 79% men. The gender distribution of ICT graduates is not uniform across the provinces: New Brunswick, British Columbia, Alberta, and Ontario are the four provinces where the ratios of women ICT graduates are higher than the national average of 21%.

ICT graduates by gender, 2015



Source: ICTC; PSIS

## FUTURE LANDSCAPE AND IMPORTANT CONSIDERATIONS

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### Technologies redefining the labour market landscape...

Technology is redefining the demand-supply dynamics of the labour market. In today's fast paced environment, the products and services are rapidly changing as new technologies appear, leaving much of the available talent lagging in new in-demand skills. Organizations that are strategizing with their long term goals in mind are increasingly adopting enabling technologies and consequently are adding to the demand-side pressure for talent. [Emerging technologies](#) such as mobile technologies, cloud computing, social media, automation and robotics, artificial intelligence and augmented reality are influencing the direction of education and skills development, as employers are adapting these technologies and educators having to integrate these into the existing curricula. As the benefits of these technologies become known, new [subsectors](#) and sub-genres (FinTech, digital media, eHealth) of work emerge.

### Not many youth opting for ICT careers...

The number of ICT professionals aged 55 and above has nearly quadrupled in the last 15 years. 88,000 (11%) of Canada's current ICT workforce are above the age of 55, compared to 24,000 (4%) in 2001. This highlights the challenge facing the employers just to maintain the current levels of talent supply, excluding the additional talent supply required to meet growth in demand. This rapid aging of Canada's population and workforce over the next ten years warrants advanced HR planning. This involves hiring to accommodate business growth, replacing the retiring professionals in a way that ensures effective knowledge transfer from one cohort to the next, as well as professional and skills development for new and existing employees.

The harsh reality – as seen in the figures and analyses above, however – is that not many youth are opting for ICT careers, leaving a void that could potentially limit Canada's competitiveness before long. Significantly fewer youth work in ICT professions than in other jobs. In contrast, ICT professions have a greater proportion of workers in the older age groups compared to the total Canadian workforce. There is a strong need to encourage students to pursue post-secondary education in ICT fields of studies and help them obtain employment and benefit from the low joblessness as well as higher salaries offered to ICT professionals. This will also help address the [youth unemployment](#) challenge facing Canada. While most new graduates of today are facing uncertainty with respect to securing employment, ICT (and STEM) students are graduating from the education system with a much better labour market prospect. Collaborative focus needs to shift to *right skilling* of the workforce, as an appropriate skills strategy that is aligned with economic and digital strategies is crucial for Canada's competitive strength.

### Not all graduates are job-ready...

The talent demand-supply imbalance is further exacerbated by considerable skills mismatch. Not all ICT graduates are coming out of the post-secondary education system job-ready. Education prepares students to be able to contribute and adapt to the workplace requirements upon completion of their studies. Many skills that are taught are foundational and not job specific. The fit, however, is seldom exact to the employers' needs, as beyond subject matter knowledge and skills, a lot of workplace (company) specific knowledge and skills are also required to perform optimally.

This is particularly emphasized by the industry when addressing the issue of ICT talent demand. A recurring theme in ICTC's recent in-depth consultation with over 1,000 ICT employers across Canada with respect to talent demand-supply dynamics was that there still remains some difference between the skills industry seeks and what the job applicants offer, especially among the new graduates. The long lead time required to create or modify academic programs, evolving and emerging new technologies, and consequent changes in skills demand are all valid reasons behind these differences.

### Getting the right blend of skills is crucial...

Over two fifths of the survey respondents identified communications and interpersonal skills as important factors to succeed in ICT roles. Recruiting employers are often looking for an ideal blend of technical and interpersonal – also known as 'soft' or 'people' –



skills and coming up short. Finding the desired interpersonal skills such as initiative-taking, communications, motivation, eagerness to learn, team-oriented is a big challenge. Even if a candidate is endowed with these skills, the employer then turns attention to getting the right *cultural fit*, adding much to the challenge.

As a general rule of thumb, ICT positions are harder to fill. It takes between three to six months to fill a vacancy. This, despite using several widely used strategies that include: word-of-mouth, professionals networks, skill-focused websites, social media tools (e.g. LinkedIn), and partnering with post-secondary institutions, training facilities, and directly with professors.

Companies use these strategies to ensure they have the best talent as well as the right cultural fit. Once the right candidate is found – often following a time- and resource-intensive process – employers continue to invest in employees to help ensure staff retention. Although most companies are equal opportunity employers and want to have a roster that is diverse and inclusive with respect to age, gender, and ethnicity, finding the right blend of skills takes precedence above all else, as companies want the best qualified persons. Inclusion policies with respect to various diversity groups including immigrants, youth, women, and aboriginal peoples are often not developed or effective as a result.

## THE WAY FORWARD

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Talent supply for the digital economy through Canada's post-secondary education stream will not be sufficient to meet the hiring requirements over the next five years. This imbalance is further exacerbated by a continued concern of skills mismatch. This study and ICTC's in-depth consultation with industry and other stakeholders highlights the various dimensions to these challenges and guides the way forward.

### Right skilling is critical...

- ❖ Skills mismatch is often influenced by the cyclical gap between demand and supply, and as such, all aspects of the mismatch must be addressed. ICTC's *Labour market Outlook Survey* points out that 31% of surveyed employers face difficulty and/or delay in filling ICT positions due to the lack of suitable talent. While most new graduates of today are facing uncertainty with respect to securing employment, ICT and STEM students are graduating from the education system with a much better labour market prospect. Collaborative focus needs to shift to *right skilling* of the workforce, as an appropriate skills strategy that is aligned with economic and digital strategies is crucial for Canada's competitive strength.

### Industry-led skills enhancement with a conducive policy environment essential...

- ❖ Canadian employers and in particular micro and SMEs find it the hardest to provide on the job training. Programs to support on-the-job training – through mechanisms such as wage subsidies – that improves the job-readiness of youth or enables *nearly qualified* candidates to acquire necessary work-related skills are vital going forward.
- ❖ Programs are needed that target youth at a younger age (e.g. pre-high school) when they are still making decisions about their courses and career options, when they are being influenced by peers, teachers, and parents away from STEM in some cases due to misinformation about the opportunities.
- ❖ Industry support is required in the design and delivery of responsive and diversified programs that focus on applied learning. It is widely perceived and acknowledged that the industry is a critical partner for validating relevance, improving quality, and increasing efficiency in skills training. Industry-educator partnerships, internships, co-op, and placement programs are mechanisms by which the matching of skills with jobs can be strengthened. In addition, both employed and jobseekers need continuous professional development. Employers must invest in and offer learning opportunities to their workforce.
- ❖ The creation of innovation centres or talent incubators can bring together employers and jobseekers to provide hands-on experience. These innovation centres or talent incubators will facilitate expanded innovative research and development, and help foster new ideas for knowledge mobilization. In today's environment when traditional institution-based delivery is giving way to web-based delivery mechanisms, such new ideas can spark innovation and growth. Employment services such as career guidance and placement are crucial to constraints to workforce entry. Work placements and internships are assuming even more prominent roles in strengthening the link between educators and employers. These hands-on training mechanisms need to be modernized so that they are not perceived as a source of cheap labor to the industry. On-the-job training is also crucial for improved skills match. Lifelong learning and training are crucial for continued workforce participation.
- ❖ With many tasks becoming automated with the emergence of IOT and SMAAC, the demand is growing for information-processing and other high-level cognitive skills. ICTC's *Labour market Outlook Survey* shows a sharp increase in the demand for "business" skills, including critical thinking, interpersonal communication, self-management, and the ability to learn. The right combination of business skills and technical skills contributes to successful performance in the workplace, as business skills enhance application of technical skills. These skills are sometimes considered even more important than technical skills for performance in the workplace. This has implications for the design of curriculum and its delivery, the combination of courses on offer, and their regular renewal.

- ❖ A conducive policy environment is needed for industry to finance and provide skills training. Implementing several supportive measures in place will help foster a culture of partnership. Making compulsory employer representation on the governing boards and establishing employer advisory committees for all academic programs will speed updating and renewal of the curriculum to reflect employer expectations.

#### A ground up approach needed to engage all available talent...

- ❖ Canada's competitiveness depends on the skills level of its workforce. Many businesses entities have outsourced ICT functions. Outsourcing is a principal vehicle for off-shoring Canadian ICT work and also significantly alter the regional distribution of ICT employment by locating work in regions where labour costs are lower. Off-shoring gets bandied around quite extensively in the media and it creates apprehension among parents and youth, who worry that ICT jobs are being outsourced. They are uncomfortable in choosing STEM-related career paths, hence enrolment in STEM programs has been disappointing for some time.
- ❖ Women are 50% of the population, 47% of the overall Canadian workforce, yet greatly underrepresented in the ICT workforce. ICT professions face significant image and perception problems, including the view that these jobs are singularly computer-focused, male-dominated, lacking in social relevance, and predominantly anti-social. A gender-bias in STEM education and employment is widely known and thus there are few visible role models for young women. Concerted, cooperative promotion and outreach efforts are needed to counter the perceptions that there are fewer opportunities in STEM and ICT and that the careers are not stimulating. This is not an easy task and requires the industry to take an active role in communicating career paths more effectively. An outreach campaign is critical to reducing the negative perceptions that have become associated with careers in ICT professions.
- ❖ Many experts are of the opinion that providing incentives to employers to recruit members of specific group(s) may help with diversity of the ICT workforce. ICTC's *Labour Market Outlook Survey*, however, illustrates that to *not* be the case. Over 90% of Canada's ICT employers have no diversity recruitment policy in place. They may monitor the demographic composition of their staff and conduct additional outreach to underrepresented groups. When it comes down to making that vital hiring decision, however, they want to hire the best candidate regardless of gender, age, or race.
- ❖ *Mid-stream* approaches – involving incentives to recruit members of certain diversity groups – do not have a successful track record of promoting inclusion and diversity in ICT professions. Only a broadly-based *ground-up* strategy – founded on a guardian-industry-educator partnership – has the potential to alter the current gender and age imbalances. There is a significant disjuncture between the prevailing perception of ICT careers as quintessentially technical occupations and the way that ICT occupations have transformed in recent years. This mismatch between prevailing perceptions and the new reality of what ICT careers are actually about limits the flow of talent into ICT and thereby perpetuates many of the skills shortages that characterize the ICT labour market. There is a significant lag between broader perceptions of ICT careers and understanding the actual nature of those careers and the capabilities they require.
- ❖ ICTC's labour market forecasts, ongoing real-time trends reporting, and [interactive online portal](#) currently provide in-depth digital economy labour market research and analysis for 18 municipalities in 10 provinces, to be expanded into additional municipalities. The disaggregation of data to such a granular level means all stakeholders – job seekers, career transitioners, ICT professionals, employers, policymakers, and educators – can use this powerful information in decision making as well as really understanding whether efforts to address various labour market opportunities and challenges are broad-based enough and inclusive of all talent streams.



# ANNEX



## ANNEX A – ADVISORY GROUP

The contributions made by the Advisory Group members are greatly appreciated and the team thanks all members for their interactions, insights, and excellent feedback. ICTC is proud to present its distinguished **Digital Economy Talent Supply Advisory Group**:

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Tara Kelly, Splice Software, Calgary, AB

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## ANNEX B – ICT FIELDS OF STUDY

Radio, television and digital communication

Communications technology/technician

Audiovisual communications technologies/technicians

Graphic communications

Communications technologies/technicians and support services, other

Computer and information sciences and support services, general

Computer programming

Data processing and data processing technology/technician

Information science/studies

Computer systems analysis/analyst

Data entry/microcomputer applications

Computer science

Computer software and media applications

Computer systems networking and telecommunications

Computer/information technology administration and management

Computer and information sciences and support services, other

Educational/instructional media design

Computer engineering

Electrical, electronics and communications engineering

Engineering mechanics

Engineering physics/applied physics

Engineering science

Systems engineering

Electromechanical engineering

Mechatronics, robotics, and automation engineering



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Electrical and electronic engineering technologies/technicians

Electromechanical and instrumentation and maintenance technologies/technicians

Computer engineering technologies/technicians

Nanotechnology

Systems science and theory

Computational science

Human computer interaction

Electrical/electronics maintenance and repair technology

Visual, digital and performing arts, general

Medical illustration and informatics



## ABOUT ICTC

The Information and Communications Technology Council (ICTC) is a leading not-for-profit national centre of expertise conducting research, policy development, and creating talent solutions for the digital economy.

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