



RESEARCH

DIGITAL ECONOMY ANNUAL REVIEW 2017



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PREFACE

This study was funded by the Government of Canada's Sectoral Initiatives Program. The authors made all reasonable efforts to ensure accuracy in compiling this document. The opinions and interpretations in this publication are those of the authors and do not necessarily reflect those of the Government of Canada.

ICTC's labour market research captures critical labour market and other economic indicators to inform competitive businesses as well as human resource strategy planning, decision-making, and career development in ICT, which together drive the development of a more prosperous Canadian ICT workforce and industry in a global digital economy.

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EXECUTIVE SUMMARY

The Information and Communications Technology Council (ICTC) is pleased to present the *Digital Economy Annual Review 2017*, exploring broad trends over the past year in Canada's digital economy with respect to economic impact, labour market, technology adoption, and more.

The report utilizes historical data starting from 2002 through to 2016, along with estimated data for 2017 based on January 2017 - July 2017 results.

Skilled workers are the foundation of economic growth in today's globalized digital economy. The latest innovative technologies – and in particular virtual reality (VR) and augmented reality (AR); fifth generation (5G) mobile technology; three-dimensional (3D) printing; blockchain; and artificial intelligence (AI) – have the potential to significantly heighten Canada's competitive advantage. Over the next few years, the adoption of emerging technologies will continue to reshape all sectors of our economy including manufacturing, natural resources, financial services, health, transportation, media and more.

With all sectors of the Canadian economy poised to adopt and be impacted by these technologies, we will see an increased hiring requirement in Canada for ICT talent. More, as increasing numbers of workers will be retiring from the ICT workforce in the coming years, the need to focus on knowledge retention and hiring for leadership roles is crucial.

ICT's contribution to GDP continues to rise

From 2013 onward, the ICT sector has outperformed the overall economy four years in a row. More, these gains contributed to the overall stabilization of the Canadian economy. Real gross domestic product (GDP) produced by Canada's ICT sector between 2016 and 2017 increased by nearly \$2.43 billion, reaching \$74.7 billion. Current estimates suggest that this trend is set to continue, with gradual but increasing adoption of ICT products and services in all economic sectors supporting this growth.

Canada's ICT sector is a diverse, innovative and growing segment of the overall economy. Over the last five years, annual growth in Canada's ICT sector averaged 2.2%. Much of this growth can be attributed to the significant business adoption and consumer use of give the latest innovative technologies.

Strong showing in the labour market

In 2017 1,450,300 professionals were employed in the Canadian digital economy, with a total of 1,305,600 ICT professionals employed across all industries in Canada. Growing by an additional 85,800 jobs in 2017 - the largest increase in the last 15 years – the unemployment rate for ICT professionals remained far below the national average in totaling 2.6%.

The demand for top ICT talent continues to grow and has resulted in expanded career options for current ICT professionals. As of 2017, 60% of ICT workers were found to be working in all sectors of the economy, whereas only 40% of ICT professionals were employed specifically in Canada's ICT sector. This is yet another clear indicator that ICT will continue to play a leading role in the overall growth of the Canadian labour market as well as the economy in the years to come.

Improved workforce diversity critical to Canada's future

Over the past 10 years, four significant trends can be observed in the composition of Canada's ICT workforce:

- ❖ **Older** -13% (167,700) of today's ICT professionals are above the age of 55, compared to 9% (94,000) of workers in 2007. By comparison, youth aged 15-24 comprised only 6% of all ICT employees.
- ❖ **Multicultural** - 37% of today's ICT workforce was born outside of Canada, compared to 30% in 2007

- ❖ **Well educated** - Approximately 54% of today's ICT workforce possess a bachelor's degree or higher, compared to 33% in the overall economy.
- ❖ **Male-dominated** – The ratio of male to female ICT workers remains constant throughout the period, at three-to-one.

Canada's digital economy has a lot to look forward to in 2018 and beyond

The economic prosperity and employment growth that Canada's digital economy enjoyed in recent years are both robust building blocks to future progress. ICTC expects that Canada's ICT employment will continue to show strong growth in 2018 and onward.

Having a steady supply of skilled talent is critical to support this fast-growing economy, and in many ways, talent is the key to leveraging the full potential of new technologies and solutions that will drive the future growth and prosperity of the Canadian economy. The demand for top ICT talent continues to grow and has resulted in expanding career options for ICT professionals – this is something that only places further competitive pressure on employers who need skilled workers. Prioritising the skills enhancement of current-day jobseekers, along with career transitioners and workers already in the ICT workforce, is paramount to support business growth across all sectors of the economy.

Interested readers are encouraged to review ICTC's related recent research exploring the long-term labour market outlook, talent solutions, and the adoption of digital technology by Canadian enterprises of all sizes. These studies provide insight at the municipal, provincial and federal level. This insight is designed to assist employers, policymakers and educators to optimize their contributions to the digital economy through appropriate policies and training programs.

Recent ICTC insights, studies, and solutions addressing these issues include:

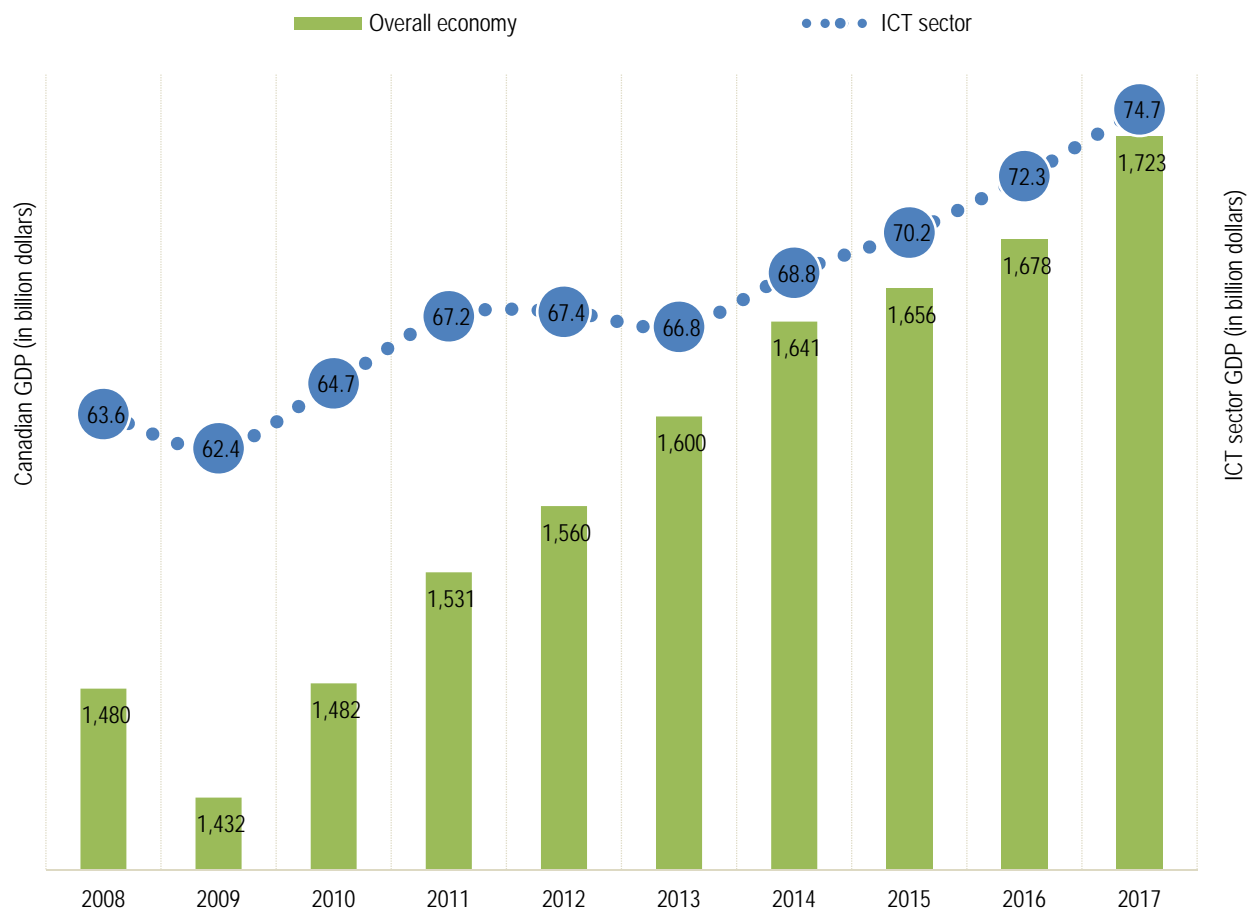
- ❖ Canada's first online Talent insights for the digital economy at www.etalentcanada.ca
- ❖ [The Next Talent Wave: Navigating the Digital Shift - Outlook 2021](#)
- ❖ [Additive Manufacturing in Canada: the Impending Talent Paradigm](#)
- ❖ Digital Economy Talent Supply: [Indigenous Peoples of Canada](#)
- ❖ Digital Economy Talent Supply: [Immigration Stream](#)
- ❖ [Presenting Canada to the World](#)

ECONOMIC GROWTH

CONTRIBUTION TO GDP

Real gross domestic product (GDP) produced by Canada's ICT sector increased by nearly \$2.43 billion to \$74.7 billion.¹ between 2016 and 2017² This trend is expected to continue, as the adoption of ICT products and services in all economic sectors continues to increase.

Canadian and ICT sector GDP (in billion dollars)



Source: ICTC; Statistics Canada

The ICT sector currently accounts for 4.3% of Canada's total output of \$1,723 billion as of June 2017. During 2017, ICT services³, representing 95% of total Canadian ICT sector GDP, grew by 3.3% or \$2.28 billion from 2016. ICT manufacturing⁴, contributing approximately 5% to the total Canadian ICT sector GDP, has increased by a total of 4.4% or \$156 million from 2016.

¹ In 2007 chained dollars. Chained dollars are real dollar amounts adjusted for inflation.

² GDP figures for 2017 are calculated using January 2017 to June 2017 data.

³ This combines the North American Industry Classification System (NAICS) codes 4173, 5112, 517, 518, 5415, 8112. See Appendices

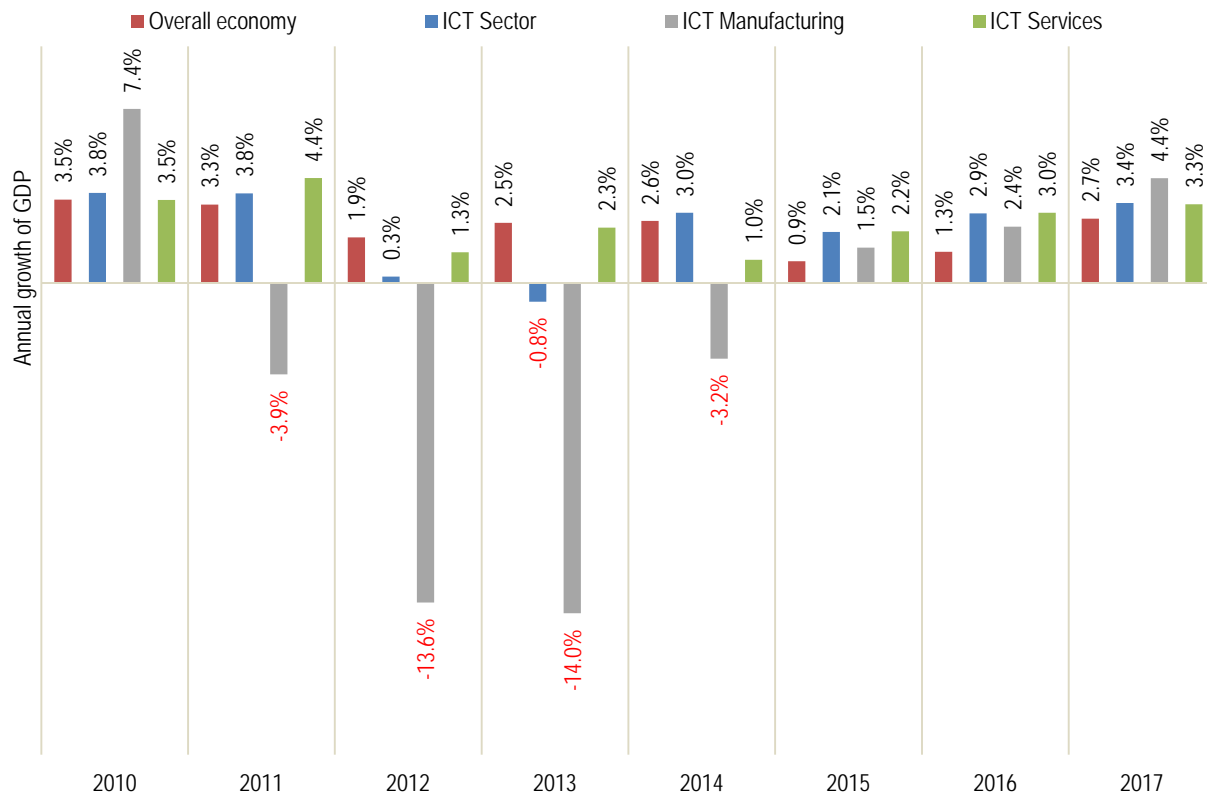
⁴ This combines the North American Industry Classification System (NAICS) codes 3341, 3342, 3343, 3344, 3346. See Appendices



Since 2013, the ICT sector has outperformed the overall Canadian economy. This trend continued in 2017 with the ICT sector growing by 3.4% vs. 2.7% for the overall economy. ICT sector output has increased by 8.7% compared to three years ago (2014), and 11% compared to five years ago (2012).

Canada's ICT sector is strongly intertwined with the overall economy. This connection is exemplified by the 71% positive correlation⁵ between growth in the ICT sector and growth in the overall Canadian economy over the last eight years.

Annual growth of GDP



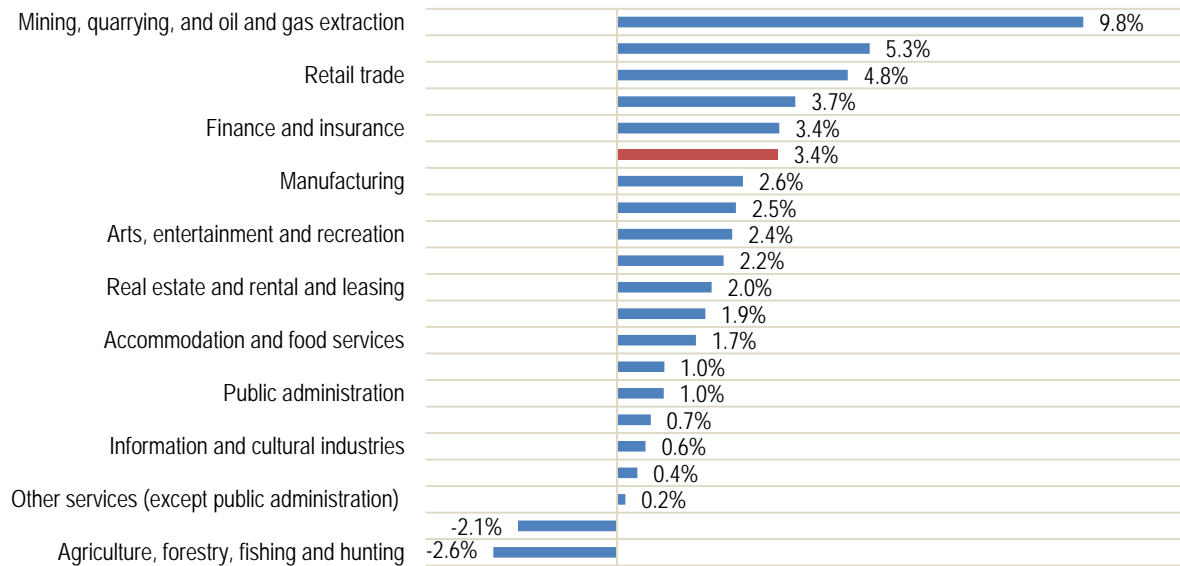
Source: ICTC; Statistics Canada

Canada's ICT sector is a diverse, innovative, and growing segment of the overall economy. Average annual growth in Canada's ICT sector has totaled 2.2% over the last five years – achieved through stronger growth in ICT service industries that recorded 2.5% average annual growth in that period. By comparison, ICT manufacturing⁶ industries experienced a 1.9% average annual decline during the same period. Some of the emerging ICT subsectors (e.g. artificial intelligence (AI), augmented reality and virtual reality (AR & VR), Advanced Manufacturing) have been growing at an even more advanced rate, fueling the growth in Canada's ICT sector as well as the overall economy.

⁵ Correlation was calculated using GDP growth rates in the overall economy and in the ICT sector

⁶ This combines the North American Industry Classification System (NAICS) codes 3341, 3342, 3343, 3344, 3346. See Appendices.

Average annual growth – 2017



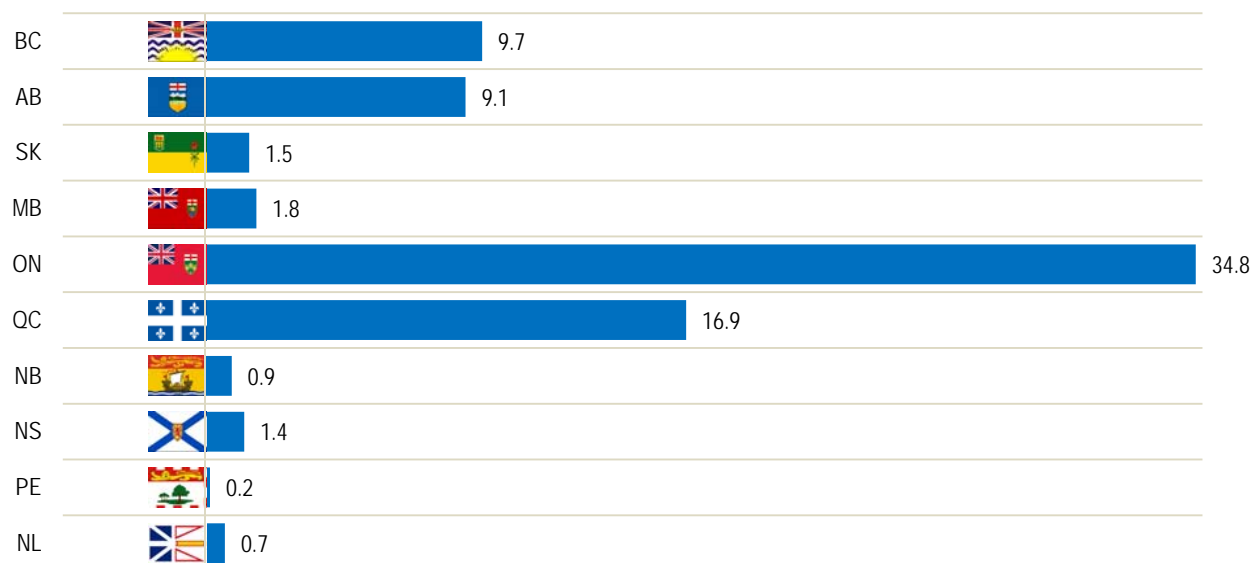
Source: ICTC; Statistics Canada

The ICT sector grew by 3.4% in 2017, outpacing the growth seen in the following sectors and many others: manufacturing, professional, scientific and technical services, utilities, and construction.

GDP GROWTH BY PROVINCE

The province of Ontario remains Canada's ICT leader, contributing \$34.8 billion to the total Canadian ICT output in 2017. Other notable ICT output contributors are Quebec (\$16.9 billion), British Columbia (\$9.7 billion), and Alberta (\$9.1 billion).

ICT sector output by province (in billion dollars) — 2017



Source: ICTC; Statistics Canada

Quebec and British Columbia are the only two provinces that have been able to maintain a positive ICT sector GDP growth rate in each of the previous five years. The ICT sector in Ontario (▲5.0%), New Brunswick (▲3.8%), and British Columbia (▲3.6%) grew the most, while the ICT sector in Alberta (▼0.3%) saw a modest reduction in 2016.

ICT sector GDP by province (annual percentage change)

	2012	2013	2014	2015	2016
Newfoundland and Labrador	-0.3%	-4.6%	-1.5%	-0.2%	0.3%
Prince Edward Island	1.9%	-0.5%	2.0%	1.3%	2.2%
Nova Scotia	0.5%	-4.8%	2.6%	1.4%	2.9%
New Brunswick	-0.7%	-6.7%	-0.1%	-0.1%	3.8%
Quebec	0.0%	5.8%	1.4%	3.7%	2.4%
Ontario	-1.0%	-0.7%	3.3%	3.1%	5.0%
Manitoba	0.8%	-2.3%	0.4%	0.3%	-0.0%
Saskatchewan	6.9%	-1.2%	2.0%	-0.8%	0.7%
Alberta	1.9%	-0.9%	4.6%	-1.7%	-0.3%
British Columbia	2.7%	0.2%	4.9%	2.8%	3.6%

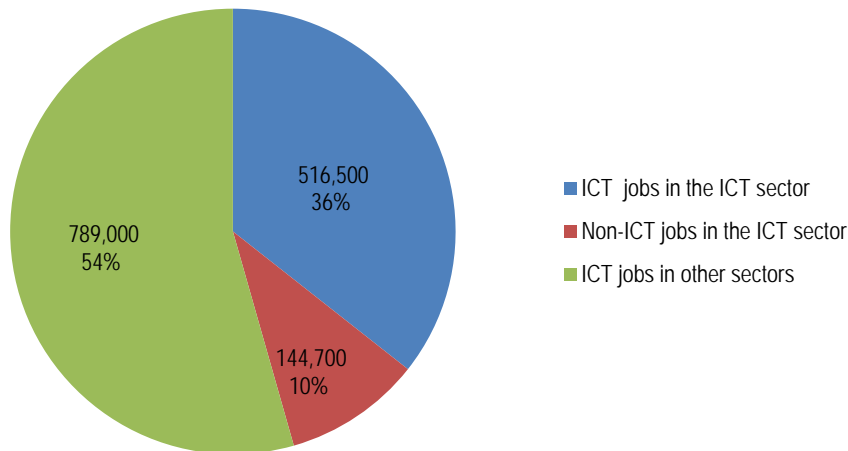
Source: ICTC; Statistics Canada

EMPLOYMENT AND UNEMPLOYMENT

Much of the substantial growth that Canada's ICT sector achieved in recent years is owed to the growth in consumer and business adoption of the latest innovations in ICT. The emergence of these technologies has created incremental economic opportunities in all sectors of the economy. Emerging technologies are driving the demand for talent, and approaches that can be adopted by stakeholders are needed.

In 2017, 1,450,300 professionals were employed in the Canadian digital economy, a figure that is 5.5% higher than it was in 2016. The digital economy includes 516,500 ICT professionals working in the ICT sector, 789,000 ICT professionals working in other sectors of the economy, and 144,700 non-ICT professionals working in the ICT sector.

Employment segmentation of the digital economy - 2017



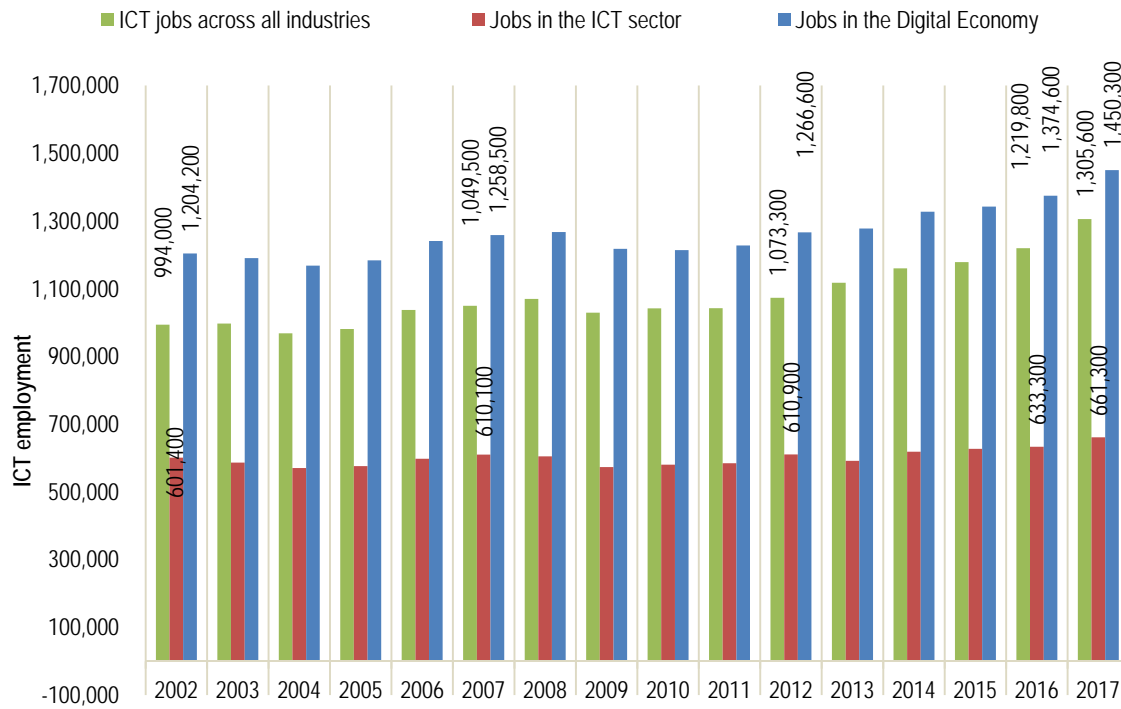
Source: ICTC; Statistics Canada

In 2017, there are 1,305,600 ICT professionals employed across all Canadian industries.⁷ Driven by the rapidly expanding ICT industry and increasing demand for ICT talent across all industries, employment of ICT professionals substantially grew in 2017 adding 85,800 new jobs or 7%, which is the largest increase in the last 15 years. By contrast, employment in the overall economy grew by only 1.2% in 2017 compared to the previous year.

The Canadian ICT sector added approximately 28,000 new jobs in 2017, showcasing a growth of 4.4% over the total number of ICT jobs available in 2016. This brings the total number of jobs in the ICT sector to 661,300.

⁷ Based on data from January 2017 to July 2017

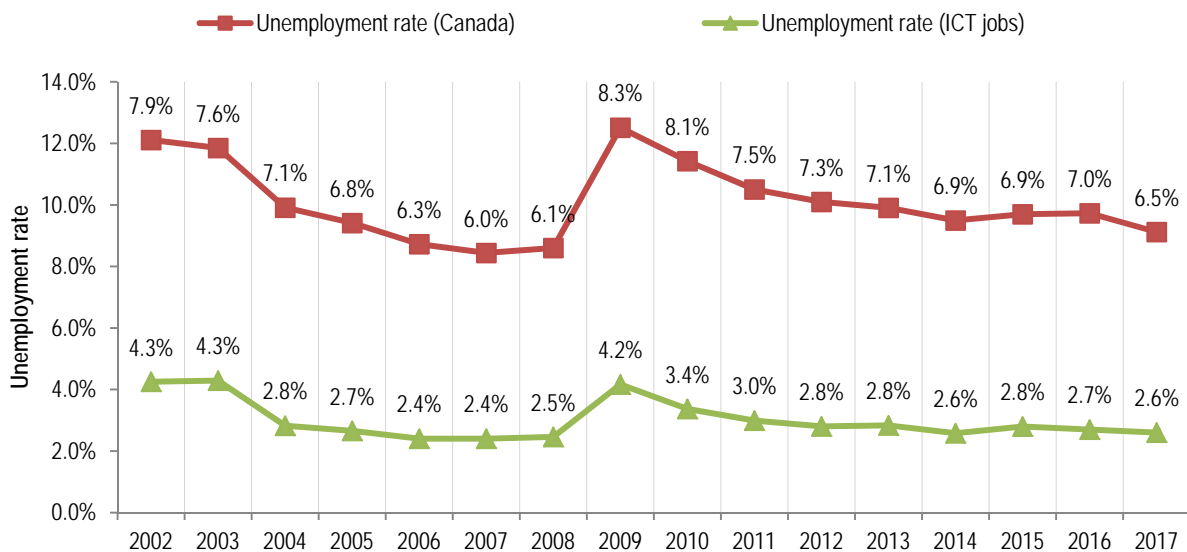
ICT employment and unemployment rates – 2002 - 2017



Source: ICTC; Statistics Canada

The unemployment rate for ICT professionals totaled 2.6%, down slightly from 2016. Compare this to the national average which totalled 6.5%, during the same period

Unemployment rates – 2002 - 2017

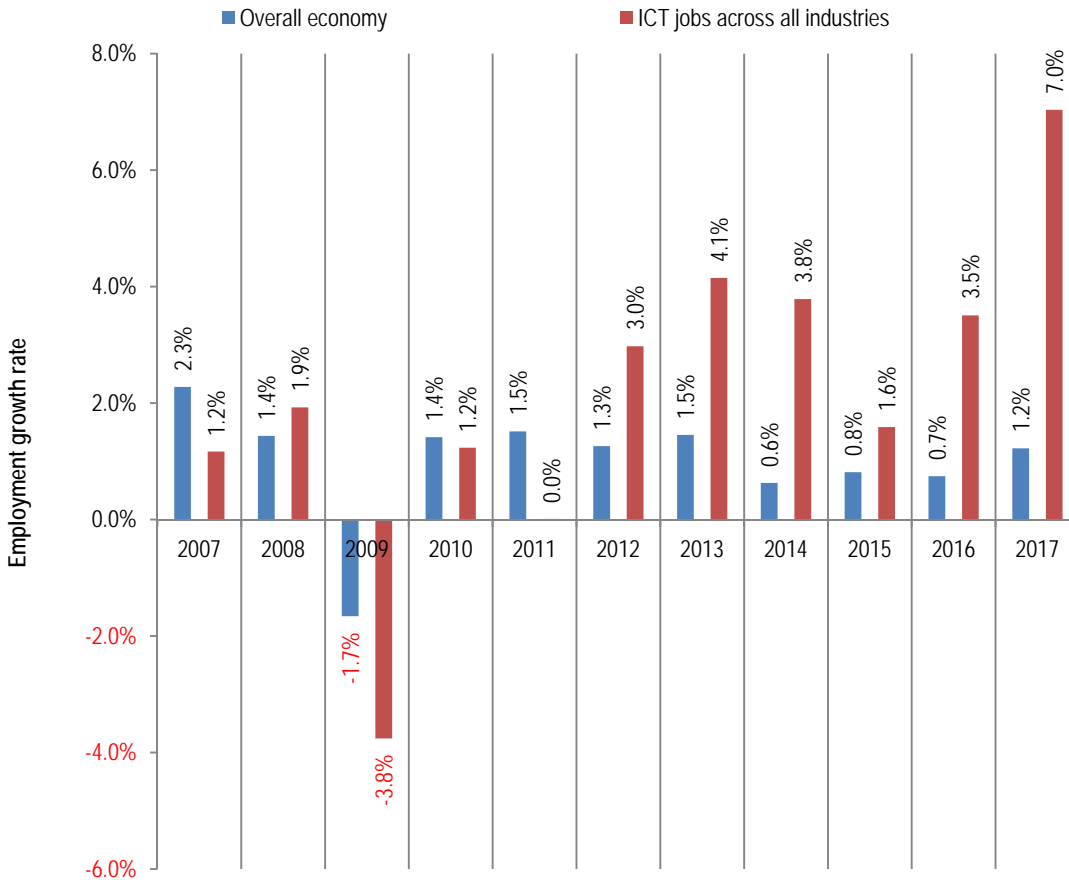


Source: ICTC; Statistics Canada

EMPLOYMENT GROWTH

Growth in ICT jobs far outpaced average Canadian job growth in almost every year of the previous decade, with an ever-increasing percentage of Canada's new jobs coming from the ICT sector. On average, 46,460 new ICT jobs have been created in Canada annually over the last five years, at an average annual employment growth rate of 4.3%, compared to a 1% average annual employment growth rate in the overall economy. Today, 1,305,600 of the 18,301,000 jobs in Canada are ICT jobs. In 2017, this represented 7% of all jobs in Canada.

Employment growth – 2007-2017

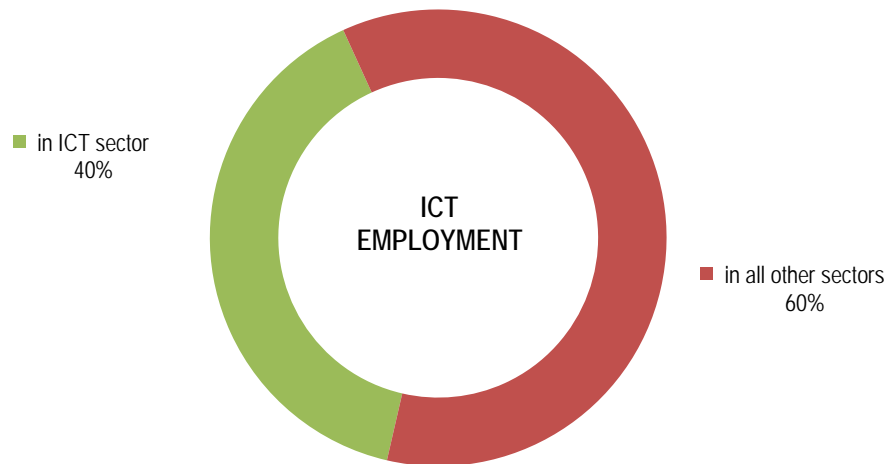


Source: ICTC; Statistics Canada

EMPLOYMENT BY SECTOR

All sectors of the Canadian economy are in need of ICT workers. The demand for top ICT talent continues to grow and has resulted in expanding career options for ICT professionals. In 2017, 60.4% of ICT workers were spread across all sectors of the economy with 39.6% of ICT professionals employed in Canada's ICT sector. That number is up from 2016 where 60.8% of ICT workers were employed across all sectors of the economy, and 39.2% of ICT talent employed in Canada's ICT sector.

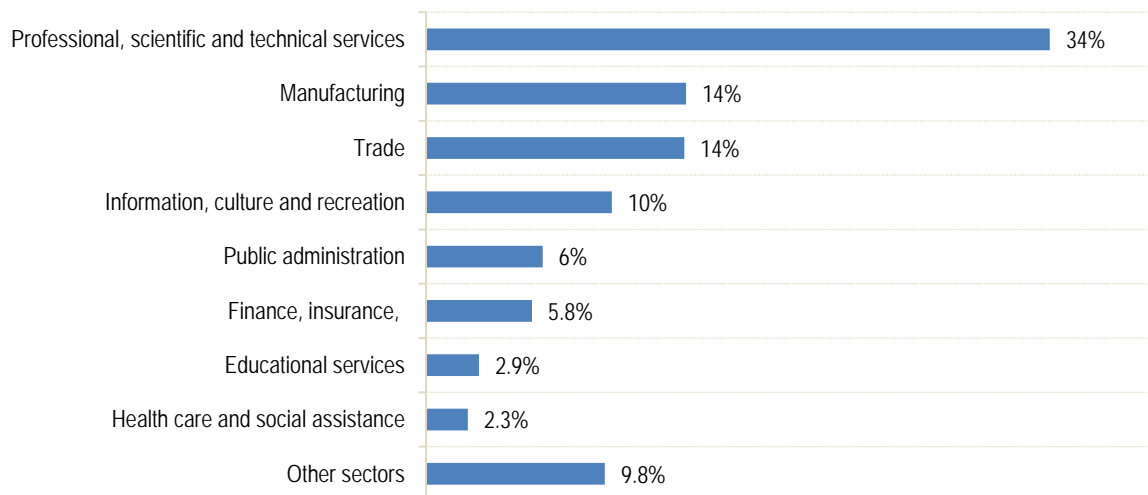
ICT employment - 2017



Source: ICTC; Statistics Canada

Companies in the professional, scientific and technical services industry employ 34% of all ICT professionals in Canada and are by far the largest. By comparison, the next five sectors employing ICT workers are: 14% in manufacturing, 14% in trade, 10% in the information, cultural and recreation industry and 6% in both public administration and the finance and insurance industry.

ICT employment by industry - 2017



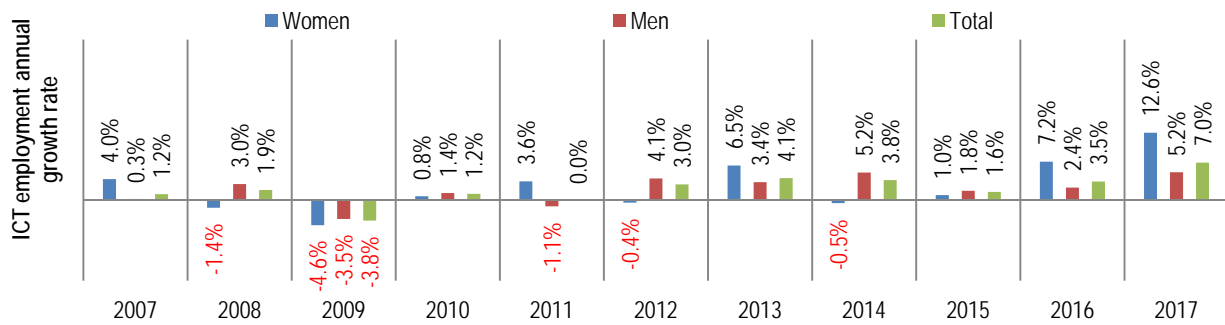
Source: ICTC; Statistics Canada

TALENT SUPPLY

WOMEN IN ICT

Women currently only make up 25% of the 1,305,600 ICT professionals working across all sectors of the Canadian economy. Under-represented at all levels, women in managerial positions are especially low. Over the last ten years, Canada's ICT workforce has been male-dominated by a ratio of 3:1. However, the representation of women in ICT professions has been gradually increasing. Over the last ten years, there has been a 3% average annual employment growth for women in ICT positions. Overall, 332,200 women and 973,400 men are employed in ICT positions across all sectors of the economy in 2017.

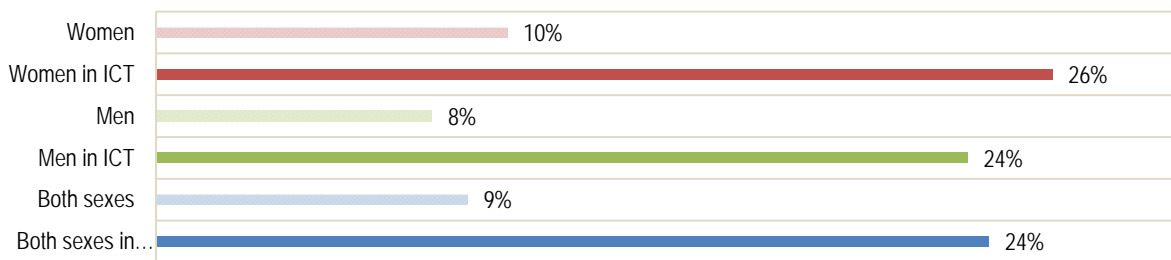
ICT employment growth by gender - 2007 to 2017



Source: ICTC; Statistics Canada

Since 2007, women's employment grew by 10% across all sectors of the economy, compared to an 8% growth amongst men. In that time, ICT employment for women increased by 26%, versus 24% for men.

Employment growth by gender and type of job 2007 - 2017



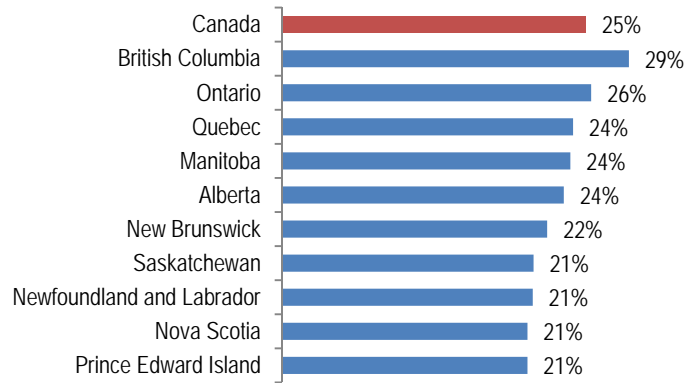
Source: ICTC; Statistics Canada

The unemployment rate for women in ICT professions was 2.8% in 2017, a figure less than half of the unemployment rate among women participating in the overall Canadian economy (5.9%).



The ratio of women in ICT professions fluctuates across provinces. In British Columbia, women working in ICT positions make up the highest ratio, totaling 29% in 2017, while women in Saskatchewan, Newfoundland and Labrador, Nova Scotia and Prince Edward Island make up only 21% of the people employed in ICT positions.

Proportion of women in ICT positions by province - 2017

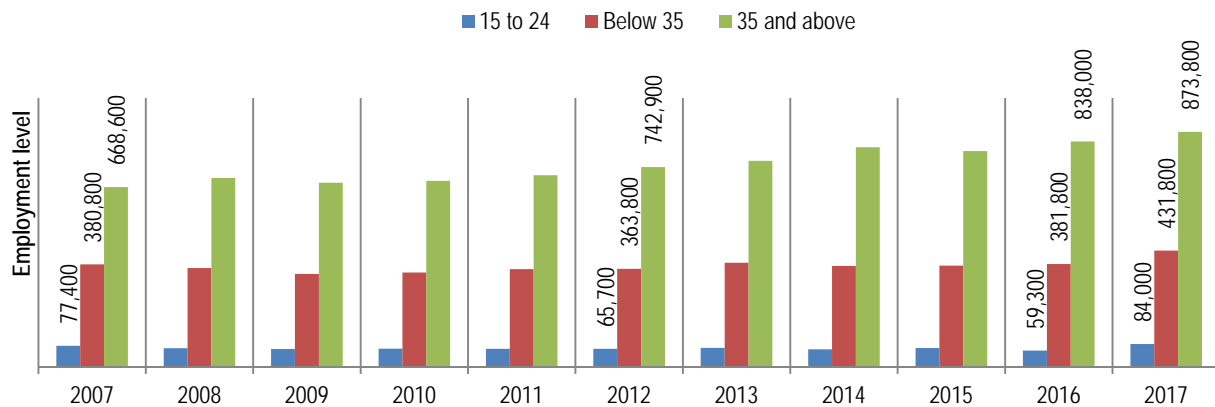


Source: ICTC; Statistics Canada

YOUTH IN ICT

Youth (15-24 years old) currently represent only 6% of the total number of ICT workers in Canada. Between 2007 and 2017, ICT employment among those aged 15 to 24 has grown from 77,400 to 84,000 (9% growth). However since the 1% decline in 2008, youth have managed to retain approximately 5%-6% of the market share despite a significant number of older workers entering the industry.

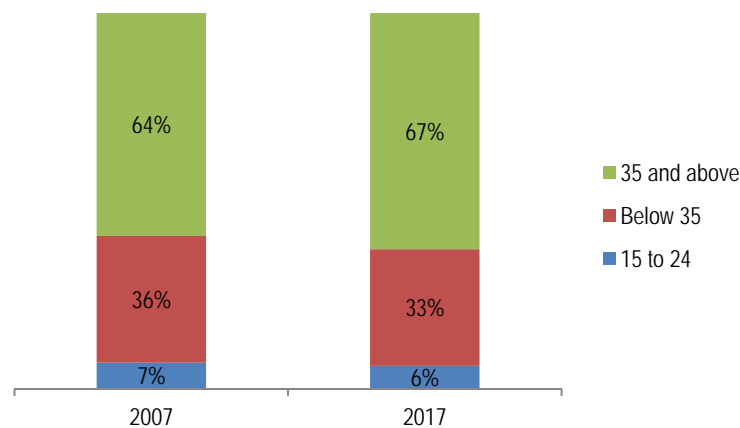
ICT employment by age groups 2007 - 2017



Source: ICTC; Statistics Canada

Between 2007 and 2017, ICT employment among those aged 34 and under has grown from 380,800 to 431,800 (13% growth). However, as a proportion of the total number of people employed in the ICT industry, those aged 34 and under declined from 36% to 33%. In the same 10-year period, those aged 35 and above have become the biggest cohort in the ICT industry, growing from 668,600 (64% of the total) in 2007 to 873,800 (67% of the total) in 2017, growing as much as 31% since 2007.

ICT employment breakdown by age 2007 vs 2017



Source: ICTC; Statistics Canada

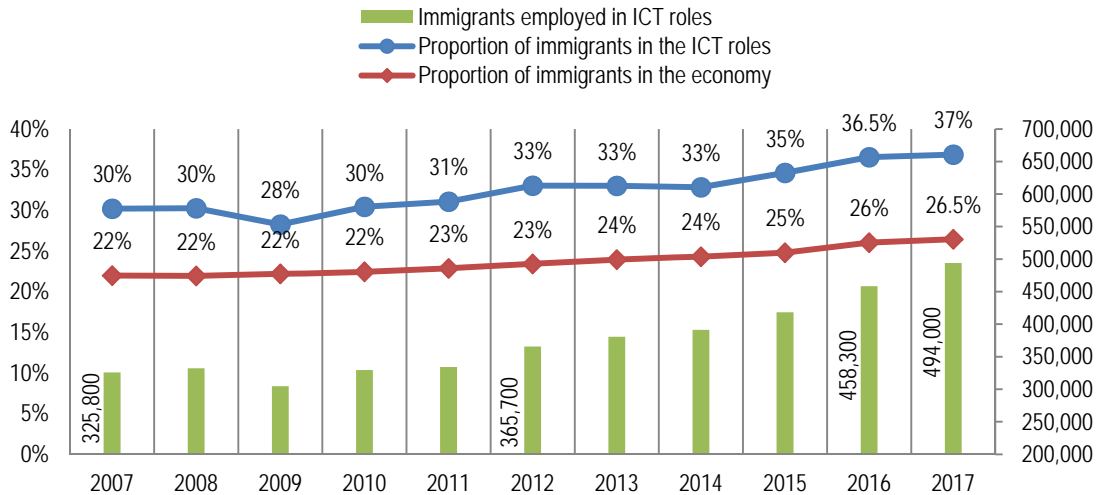
The unemployment rate for youth in ICT professions totaled 3.9% in 2017. By comparison, the unemployment rate for youth in the overall Canadian economy during 2017 was more than triple that of the ICT professions, totaling 12.7%.

IMMIGRANTS IN ICT

494,000 or 37% of the total ICT jobs in Canada are held by immigrants.⁸ Jobs that have a strong emphasis on technical skills - for instance software programming or web development - are constantly demanding skilled workers.

Overall, the proportion of immigrants in the ICT professions has grown from 30% in 2007 to 37% in 2017. ICT employs a far greater number of immigrants than the overall economy where 26.5% of all jobs are held by immigrants as of 2017. This is further evidence of a strong demand for ICT talent throughout the economy.

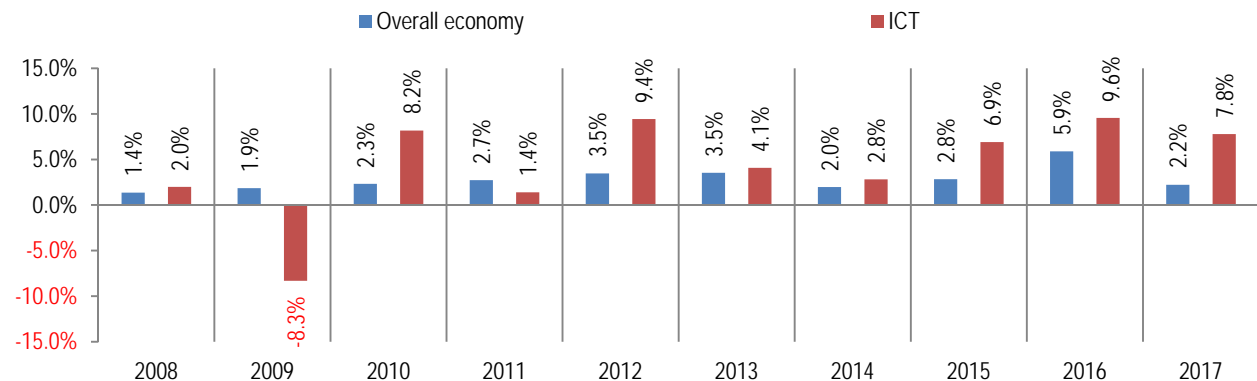
Employment for immigrants 2007 - 2017



Source: ICTC; Statistics Canada

ICT employment among immigrants increased by 52% between 2007 and 2017. ICT employment among immigrants for the last 10 years increased on average by 5% annually.

Growth in employment among immigrants 2008-2017



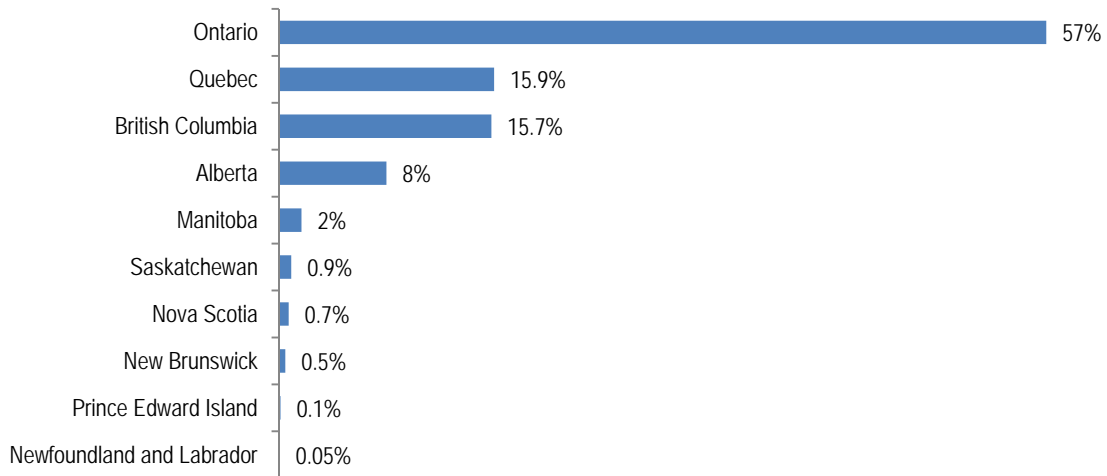
Source: ICTC; Statistics Canada

⁸ Refers to people who were born outside of Canada



Unemployment amongst ICT immigrant professionals was consistently low at 2.4% in 2017 and has remained relatively steady for the past five years. By contrast, the unemployment rate among immigrants in the overall Canadian labour market is 7.0%.

Proportion of immigrants in ICT positions by province - 2017



Source: ICTC; Statistics Canada

Provincially, Ontario employs the highest number of immigrants in ICT roles, totaling 278,300 or 57% in 2017. By comparison, ICT employment among immigrants is 78,100 or 15.9% in Quebec, 77,000 or 15.7% in British Columbia, 39,000 or 8% in Alberta, 8,200 or 2% in Manitoba close to 1% in Saskatchewan, Nova Scotia and New Brunswick and less than 1% in Prince Edward Island and Newfoundland and Labrador.

LOOKING AHEAD

Canada's ICT sector is a diverse, innovative, and growing segment of the overall economy that contributes \$74.7 billion to Canadian GDP at present, growing 2.2% annually over the last five years. The substantial growth that Canada's ICT sector achieved in recent years owes a lot to the tremendous growth in consumer and business adoption of the latest innovations in ICTs – VR, AR, 5G Mobile, Advanced Manufacturing, Blockchain and AI.

The demand for ICT talent continues to be very strong in all provinces and across all sectors, as evidenced by the creation of over 311,600 new ICT jobs in Canada since 2002. The Canadian labour market absorbs almost all of the available supply of ICT talent, resulting in a low ICT unemployment rate of 2.6% at present. By contrast, the unemployment rate in the overall Canadian labour market is 6.5%.

ICTC's in-depth consultation with Canadian employers – through a survey of over 1,000 representative employers across Canada, with representation in all provinces and sectors – clearly shows a skills gap in the ICT workforce, often resulting in a lack of candidates with the right blend of skills, qualifications, and experience that employers require immediately. Canada must overcome talent shortages, skill gaps and the slow pace of digital adoption to ensure its continued status as a globally modern economy.

As greater technology adoption holds tremendous promise for the Canadian economy the hallmark of success in this environment is equipping Canadians with the relevant technology skills to innovate, adopt technologies, and produce higher-value goods and services. Ensuring that we have the right talent to lead the adoption and use of emerging technologies is more critical than ever before, as talent is key to leverage the full potential of exciting new technologies that will drive the future growth and prosperity of the Canadian economy.

The quest for talent in Canada's evolving, dynamic digital economy is predicted to intensify during the next five years due to demographic shifts and retiring workers⁹. As discussed above, Canada has been coping with an aging ICT workforce along with a weak growth of young ICT workers. Prioritising skills enhancement of jobseekers, career-transitioners, and also those already in the ICT workforce – is thus paramount in order to support business growth across all sectors of the economy. Policy makers, industry leaders and educators must collaborate to help grow youth ICT talent, from elementary and secondary education, through to post-secondary education and build pathways to employment.

⁹ The Next Talent Wave: Navigation the Digital Shift - Outlook 2021

APPENDICES

DIGITAL ECONOMY WORKFORCE

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.

The sum total of workers (workers that are employed in these occupations as well as workers that are currently unemployed, but actively looking for work) in these occupations and workers in all other (non-ICT) occupations in the ICT sector is the total digital economy labour force in Canada. The table below summarizes the core ICT occupations:

Index	NOC Code	Occupation Title
1	0131	Telecommunication carriers managers
2	0211	Engineering managers
3	0213	Computer and information systems managers
4	0911	Manufacturing managers
5	1252	Health information management occupations
6	2133	Electrical and electronics engineers
7	2147	Computer engineers (except software engineers and designers)
8	2171	Information systems analysts and consultants
9	2172	Database analysts and data administrators
10	2173	Software engineers and designers
11	2174	Computer programmers and interactive media developers
12	2175	Web designers and developers
13	2241	Electrical and electronics engineering technologists and technicians
14	2242	Electronic service technicians (household and business equipment)
15	2243	Industrial instrument technicians and mechanics
16	2281	Computer network technicians
17	2282	User support technicians
18	2283	Information systems testing technicians
19	5222	Film and video camera operators
20	5223	Graphic arts technicians
21	5225	Audio and video recording technicians
22	5241	Graphic designers and illustrators
23	6221	Technical sales specialists - wholesale trade
24	9222	Supervisors, electronics manufacturing
25	9523	Electronics assemblers, fabricators, inspectors and testers

ICT SECTOR

The table below summarizes the ICT sector:

Index	NAICS Code	ICT Sub-sector
1	3333	Commercial & Service Industry Mach. Manuf.
2	3341	Computer & Peripheral Equip. Manuf.
3	3342	Communications Equip. Manuf.
4	3343	Audio & Video Equip. Manuf.
5	3344	Semiconductor & Other Electronic Component Manuf.
6	3345	Navigational, Medical & Control Instruments Manuf.
7	4173	Computer & Comm. Equip. & Supplies Wholesale distribution
8	5112	Software Publishers
9	5171	Wired Telecommunications Carrier
10	5172	Wired Telecommunications Carrier (except satellite)
11	5174	Satellite Telecommunications
12	5179	Other Telecommunications
13	5182	Data Processing, Hosting, and Related Services
14	5415	Computer Systems Design & Related Serv.
15	8112	Electronic & Precision Equip. Repair & Maintenance