

March 2017



Future-proof:

Preparing young Canadians
for the future of work

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ISBN 978-1-926769-62-2

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INTRODUCTION



“Canada’s future prosperity and success will rely on us harnessing the innovation of our entire talent pool. A huge part of our success will depend on how well we integrate this next generation of Canadians into the workforce. Their confidence, optimism and inspiration could be the key to helping us reimagine traditional business models, products and ways of working.”

David McKay, President and CEO, RBC

There are a number of major trends that have the potential to shape the future of work, from climate change and resource scarcity to demographic shifts resulting from an aging population and immigration. This report focuses on the need to prepare Canada’s youth for a future where a great number of jobs will be rapidly created, altered or made obsolete by technology.

Successive waves of technological advancements have rocked global economies for centuries, reconfiguring the labour force and giving rise to new economic opportunities with each wave. Modern advances, including artificial intelligence and robotics, once again have the potential to transform the economy, perhaps more rapidly and more dramatically than ever before. As past pillars of Canada’s economic growth become less reliable, harnessing technology and innovation will become increasingly **important** in driving productivity and growth.^{1,2,3}

The primary burden of realizing this enormous opportunity rests on the shoulders of Canada’s young people. To succeed in the knowledge economy, the pipeline of young talent will need to be dynamic and resilient, equipped with a broad suite of technical and soft skills. **While youth are always the cornerstone of a country’s future workforce, the rapid pace of technology-driven change makes the task of effectively integrating them into the labour force more challenging—and more critical—than ever before.** Failure to do so will not only inhibit Canada’s economic growth, but may result in a large swath of the population being left behind in the knowledge economy.

Youth are entering a labour market where job requirements are becoming more complex. Entry-level jobs are at a high risk of being impacted by automation, yet work experience is more important than ever. At the same time, underemployment, part-time, and precarious work are becoming more prevalent. As a result, it is becoming more challenging for youth to seamlessly enter the labour force.

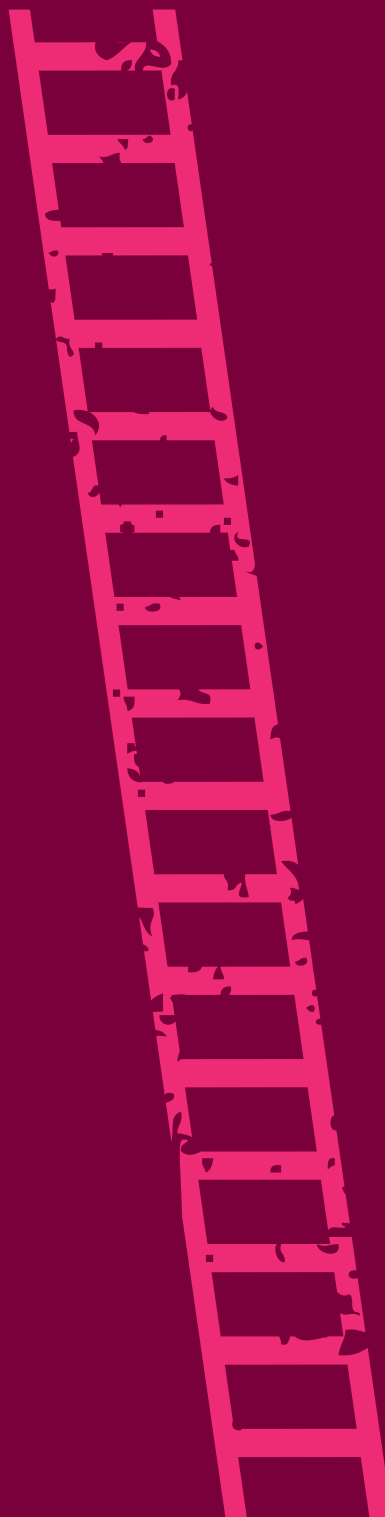
These issues are particularly salient for youth facing multiple barriers to labour force participation and for those who have traditionally been underrepresented in knowledge-based industries—including women and indigenous youth—some of whom represent the fastest growing segments of our population.

The good news is that Canada has a strong foundation with some of the **highest rates of educational attainment in the world**,⁴ and a tech sector that **has never been stronger**.⁵ Canadian youth are highly skilled, well-educated, entrepreneurial and arguably among the best suited to adapt to the complex skills required for the future of work.

No one sector can address this challenge alone. As Canada begins to focus more deliberately on inclusive economic growth, it is paramount that the country's public, private and non-profit sectors work together to ensure that Canadian youth have the skills and experience to benefit from and drive technological progress.

This report illustrates the need for urgent attention to be paid to this issue. It will start by describing some of the technological trends that are reshaping the future of work, and the challenges and opportunities they present for youth. It will explain the impact of these trends on the skills and experience that will be increasingly demanded of youth entering the workforce. Finally, it will outline potential avenues that can be explored to help ensure Canada's youth are well-positioned to thrive and prosper in the future.

Canadian youth are highly skilled, well-educated, entrepreneurial and arguably among the best suited to adapt to the complex skills required for the future of work.



THE IMPACT OF TECH TRENDS ON YOUTH ENTERING THE WORKFORCE

Technological disruption is not a new phenomenon. In 1911, over 34 percent of the Canadian labour force worked in agricultural industries. By 1971, this had declined to about 6 percent—largely as a result of advances in machinery.⁶ However, these same advances have also been associated with a net increase in jobs across the economy.^{7,8}

As technologies such as artificial intelligence and robotics become more sophisticated and commonplace, the pace and magnitude of change could increase.^{9,10} These technological trends will have diverse impacts on the Canadian economy. On the one hand, they are projected to lead to a significant decline in demand for certain forms of routine or predictable labour. On the other hand, technology can be viewed as a powerful economic driver, simultaneously creating entirely new industries, improving productivity, and increasing demand for highly skilled labour.

Navigating this rapidly shifting economic landscape presents unique challenges and opportunities for Canada's youth.

THE ROBOT REVOLUTION: CHANGING THE WAY WE WORK

The impact that current technological trends will have on the labour force is not obvious. A range of scenarios are possible. Some project widespread

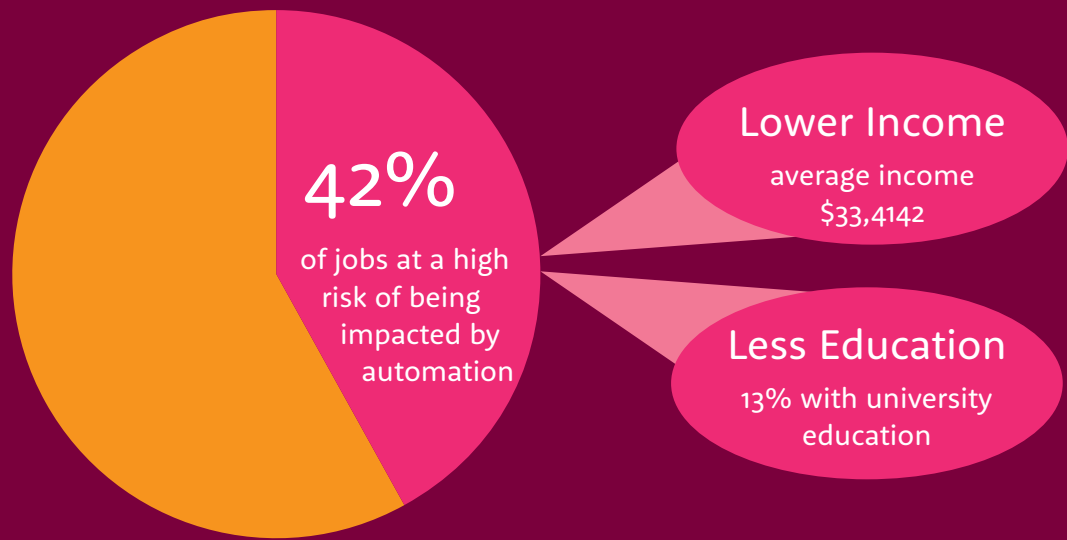
job loss, while others anticipate a future in which overall employment remains relatively constant, but the nature of jobs, as well as the tasks performed within them, are significantly different. In either scenario, the benefits and risks of technological trends will not be evenly distributed.

Over the past several decades, technology has been particularly effective at replacing workers who supply primarily routine tasks, following well-defined procedures. These routine tasks are often characteristic of many middle-skilled, middle-income jobs, such as those in the manufacturing sector.¹¹ From 2003 to 2009, Canada lost 380,000 mainly routine plant and machine operator, labourer and assembly jobs.^{12,13}

Today, technologies are advancing into the realm of automating non-routine and cognitive tasks, a trend that is projected to disproportionately impact individuals working in low-skilled, low-earning occupations, such as retail salespersons.¹⁴ However, a number of white-collar occupations involving predictable tasks—for example, paralegal jobs—are also susceptible to automation.¹⁵ A recent [report](#) by the Brookfield Institute for Innovation + Entrepreneurship (BII+E) estimated that 42 percent of the Canadian labour force is at a high risk of being affected by automation in the next 10 to 20 years. High-risk occupations earn less and require less education, on average, than the rest of the Canadian labour force.¹⁶

While these occupations are at the highest risk of being affected by automation, this does not mean that they will be lost. Instead, many will be restructured, often with corresponding increases in productivity. Moreover, the actual impact on

jobs will depend on a number of factors, such as the mix of skills required in different workplaces, the relative cost of technology over labour, and societal preferences for dealing with humans over machines.

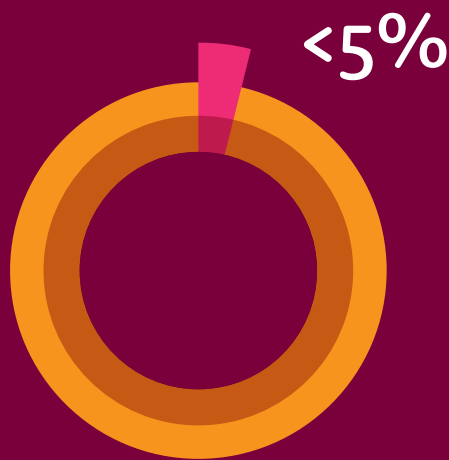


BII+E, *The Talented Mr. Robot*, 2016

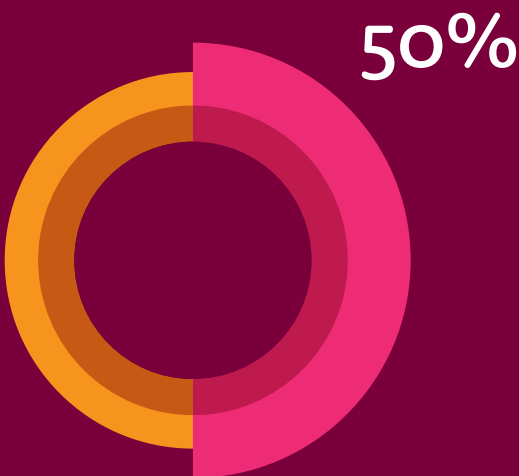
Within each occupation, workers perform a variety of tasks, some of which are more automatable than others. A recent [report](#) by McKinsey & Company found that while very few occupations

are fully automatable (less than 5 percent) about 50 percent of all work activities around the world can be automated using current technology.

Percent of Fully Automatable Jobs



Percent of Automatable Tasks



McKinsey & Company, *A Future That Works*, 2017

This suggests that automation is less likely to eliminate entire occupations, but instead will change the nature of work, reducing demand for routine labour while increasing the value of tasks that technology cannot replicate.

Youth aged 15 to 24 are one of the population segments that are most likely to experience changes in job roles and skill demand as a result of automation. Youth comprised nearly 20 percent of employees at a high risk of being impacted by automation in Canada, but only made up 13

percent of the labour force. More than triple the number of youth were employed in high-risk occupations, compared to low-risk occupations.¹⁷

The likely explanation for this is that entry-level positions, which are typically staffed by youth, are at a high risk of being impacted by automation. This is of particular concern because these positions enable youth to acquire the skills and experience necessary to eventually enter into higher-paying, lower-risk jobs.



BII+E, *The Talented Mr. Robot*, 2016

THE RISE OF THE TECH ECONOMY: GROWING DEMAND FOR KEY SKILLS

While technology is projected to disrupt a large segment of Canada's labour force, it is also creating many opportunities.

According to a BII+E [report](#), Canada's tech sector employed over 860,000 Canadians and contributed 7.1 percent to GDP in 2015.¹⁸

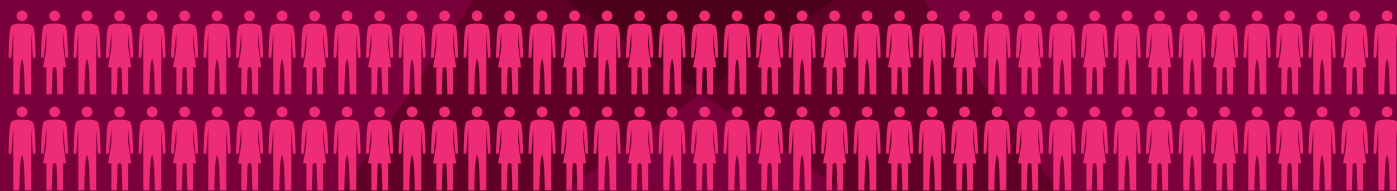
"Today, the digital economy is the economy. There is not a single industry that digital technologies don't touch anymore. Digital technologies underpin every sector, from fishing to farming and health... Canada must do more to give people the [digital] skills and experience they need to compete in a global and digital world."

The Honourable Navdeep Bains, Minister of Innovation, Science, and Economic Development

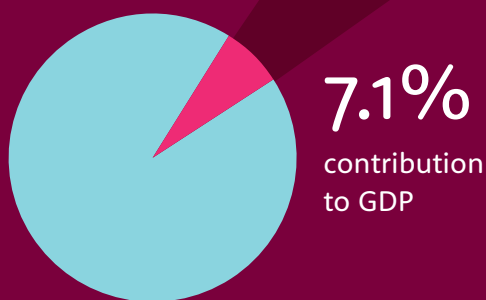
In 2015, Canada's tech sector
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860,000

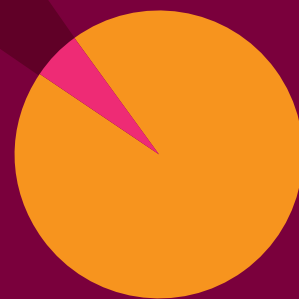
Canadians



×10,000

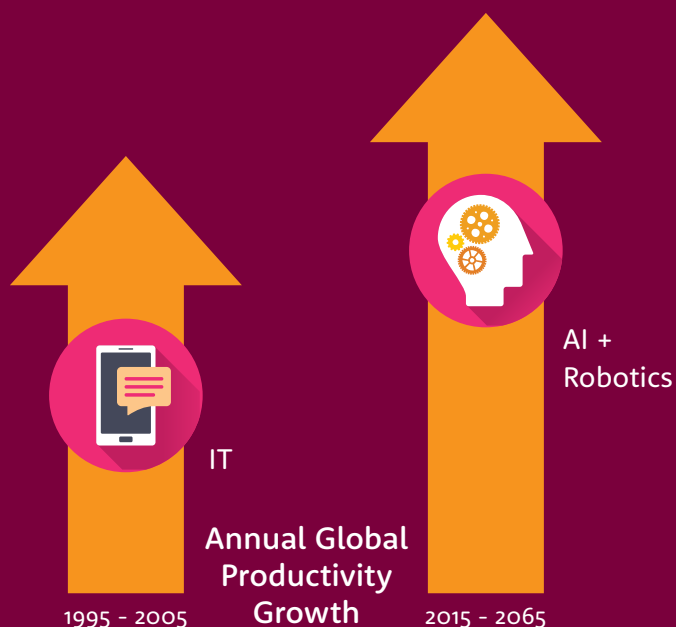


5.6%
of Canada's total
employment



Technology is increasingly being deployed across sectors—well beyond those traditionally considered tech—often leading to improved productivity and increased demand for labour to fill occupations and supply tasks requiring skill sets that technology alone cannot replicate.¹⁹

A recent [report](#) showed that technologies such as artificial intelligence and robotics could raise global productivity growth by 0.8 to 1.4 percent annually between 2015 and 2065—in contrast to the 0.6 percent annual growth attributed to information technology between 1995 and 2005.²⁰



McKinsey & Company, A Future That Works, 2017

Over the next decade, about two-thirds of job openings in Canada will be in occupations typically requiring post-secondary education or in management roles.

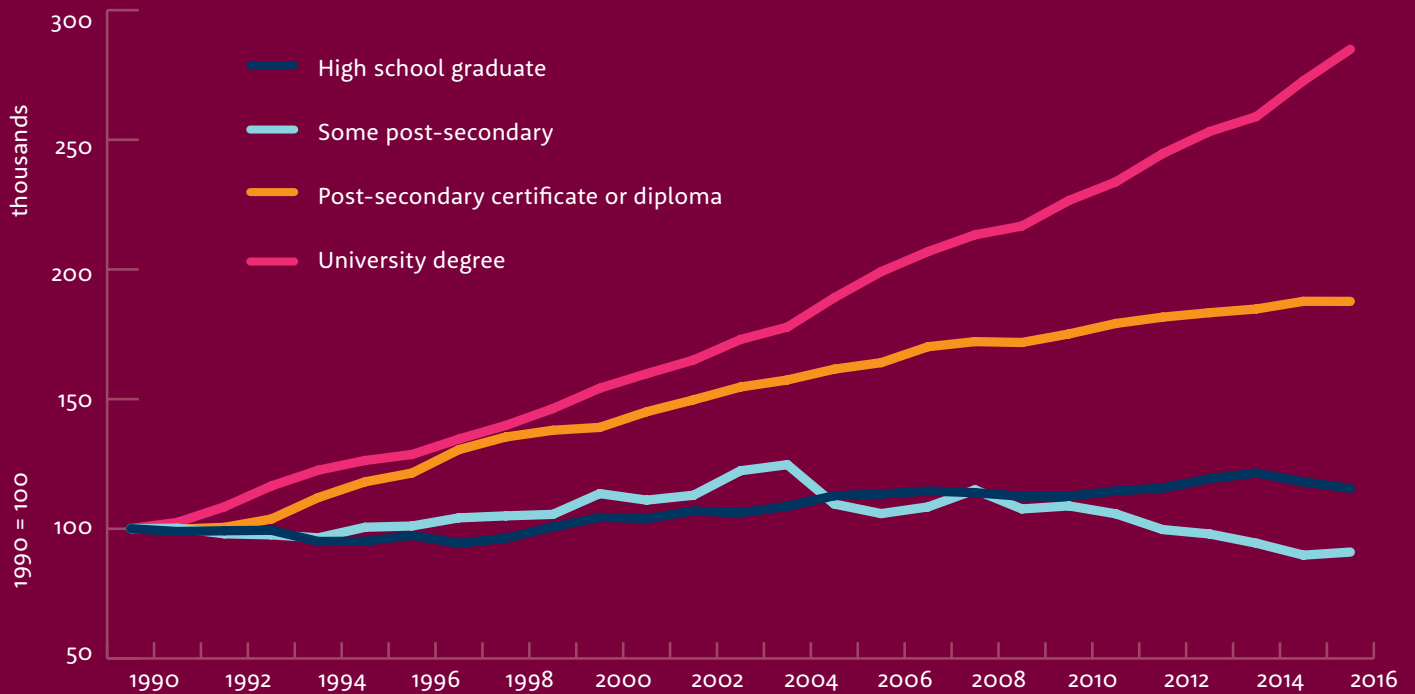
Government of Canada,
Department of Finance, 2014

With so much potential for technology-driven economic gain, there will likely be a significant surge in demand for new tech talent in the workforce. A 2016 World Economic Forum [report](#) revealed that between now and 2020, across 15 major developed and emerging economies, computer and mathematical jobs are expected to be one of the major drivers of employment growth, producing 405,000 net new jobs not just within the information communications technology (ICT) industry, but across a broad range of industries, including financial services, media and entertainment. This growth is expected to be largely driven by data analysts and software developers.²¹

Another [study](#) showed that between 2000 and 2010, over 70 percent of new industries that emerged in the United States (US) were directly connected to digital technologies.²² Jobs in these industries often required highly-skilled workers with at least a bachelor's degree, often in the science, technology, engineering and mathematics (STEM) fields. Workers in these industries earn twice the median wage on average.²³

Technological trends over the course of the twentieth century have largely favoured highly skilled workers.²⁴ In Canada, from 1990 to 2016, those employed in the labour force with a university degree—which generally correlates with high-skill job requirements—increased by over 3.5 million individuals, representing over 50 percent of employment expansion for this time period.²⁵ Highly skilled jobs are often also associated with high wages. Job creation in Canada since the 2008-2009 recession has largely been driven by high-wage, private-sector jobs. From July 2009 to January 2014, more than two-thirds (71 percent) of all jobs created were in high-wage industries.²⁶ The shift towards highly skilled employment is expected to continue. Over the next decade, about two-thirds of job openings in Canada are expected to be in occupations that typically require post-secondary education, or in management occupations.²⁷ Not surprisingly, many of these occupations correspond to those at a low risk of being affected by automation.²⁸

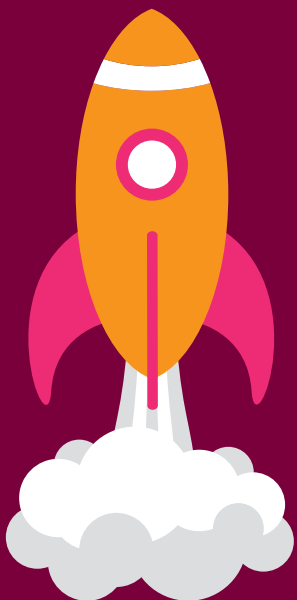
Employment by Educational Attainment



Cansim Table 282-0004, BII+E Analysis

New technologies are also increasing the rate of change in the economy. Technology has contributed drastically to the increased rate of business growth, as well as business failure. Since 2003, a technology company reached a \$1 billion valuation in the US every three months. The time

it takes to do so has rapidly declined.²⁹ According to a recent Deloitte survey of 700 business leaders across Canada, nearly 60 percent believe the pace of change will increase over the next five to 10 years.³⁰ However, only 13 percent of Canadian firms are adequately prepared for disruption.³¹



Technology is increasing the pace of change. Nearly

60%

of Canada's business leaders agree.

Deloitte Canada, 2015

"In a world that is increasingly shaped by exponential changes in technology, new opportunities are arising at an ever more rapid rate. But risk also increases because of accelerating change and increasing uncertainty. What we need are entrepreneurs who are willing and able to cope with those risks and to see and harness the opportunities on the other side."

—John Hagel III, Founder and Chairman, Deloitte Center for the Edge

AN EXPANDING FREELANCE ECONOMY: WORKING FROM GIG TO GIG

The rise of the gig economy, characterized by short-term contract work, has been well-documented. The number of people freelancing is increasing, as is the number of people who are doing so on a full-time basis. One study estimates that 35 percent of the US workforce freelanced in 2016, up from 34 percent the previous year, and suggests that most (63 percent) are doing so by choice more than necessity.³²

The gig economy is being **experienced** differently by different workers. Those with highly specialized, in-demand skills can acquire a diverse array of interesting, high-paying jobs, while being afforded the ability to structure their own working arrangements. For lower-skilled workers, gigs can mean temporary, contract or on-call work with lower wages and a lack of benefits and security.³³

Much of this work is happening through digital platforms (take Uber and Airbnb, for example) that allow individuals to earn income using their existing assets and spare time. Micro-tasking is also becoming more common, a system in which individuals are paid for small, short-term tasks often carried out remotely. This digital marketplace, which new companies such as **Hyr** are facilitating, is enabling people to build careers based on short-



term engagements, while creating more efficient matches between labour supply and market and employer demand.

For youth, the gig economy may become the new normal. While data on how this trend is playing out in Canada are limited, according to a 2014 **study**, over half of all workers in the Greater Toronto and Hamilton Area (GTHA) were employed in some form of precarious work.³⁴ **Anecdotal evidence** suggests that a growing number of Canadian youth are choosing to freelance.³⁵

This is an opportunity as well as a challenge. Freelancing can provide more flexibility and job experience to highly skilled workers, which can, in some cases, help youth transition into full-time employment, if they so choose. It also means increased uncertainty and working without some employment benefits that have yet to catch up to this new reality.

“Many young people and service providers are concerned with what they call the **gig economy**: An economy characterized by short-term contracts, no benefits, no stability, and no vacation. Some youth thrive in this environment. Excited about forging their own path, these youth have the support they need from friends or family to help them to manage any associated risk.”

Expert Panel on Youth Unemployment,
Government of Canada, 2016

UNEQUAL ACCESS TO OPPORTUNITIES: TURNING ATTENTION TO INCLUSIVE ECONOMIC GROWTH

When it comes to the interaction between technology trends and youth talent development, the experience of Canadian youth is not uniform. Certain segments of the population face much more significant barriers to labour force participation, and not all groups are equally represented in the tech economy.

Youth facing multiple barriers are particularly vulnerable to unemployment. According to the latest census data, almost one-quarter of youth aged 20 to 24 were members of a visible minority group. The unemployment rate for these individuals, born and educated in Canada, was 17.2 percent compared to 14.1 percent for their white counterparts in the same age group.³⁶ The unemployment rate for indigenous youth in the same age category was 22.6 percent.³⁷ This is particularly troubling as Canada's indigenous population is very young—almost half are under the age of 24—and one of the fastest growing in the country.³⁸

“To capitalize on Canada’s STEM potential, it is vital to increase diversity among the population of STEM-skilled individuals ... a wider pool of excellence can confer economic, social, and scientific benefits.”

Council of Canadian Academies

In addition, there is evidence of gender underrepresentation in STEM fields. Canadian women are much less likely to be enrolled in university STEM programs, even though they represent the majority of university graduates. According to the most recent census data, women account for only 39 percent of university graduates aged 25 to 34 with a STEM degree, but represent 66 percent of non-STEM graduates.³⁹

Female University Graduates: STEM versus non-STEM, 2011



Hango, Statistics Canada, 2013

Other studies have shown a lack of diversity in tech jobs. For example, in the US, it was **found** that black and Hispanic engineering and computer science graduates were less likely to go into technology jobs than their white and Asian counterparts. The study found that 40 percent of Asian graduates continue into jobs in the tech sector, compared with 16 percent of black graduates and 12 percent of Hispanic graduates.⁴⁰ Similar trends are **likely** playing out in Canada.⁴¹

This uneven picture underlines the need for thoughtful, tailored solutions that are designed in close collaboration with the populations they are intending to support, to ensure that youth from all backgrounds are afforded equal opportunities in Canada's dynamic, growing tech economy.

“Equipping workers with the skills required to thrive in an increasingly digital world will be critical to laying the groundwork for an inclusive economy.”

Canada's Advisory Council on Economic Growth;
Building a Highly Skilled and Resilient Canadian
Workforce Through the Futureskills Lab



THE FUTURE OF WORK REQUIRES NEW SKILLS AND EXPERIENCE

Youth will need to be equipped with a broad suite of technical and soft skills, including skills associated with digital literacy, entrepreneurship, and social intelligence.



Given the rapidly evolving economic landscape, equipping Canadian youth with the skills and experience needed for success will require focused attention. Beyond educational requirements, the jobs of the future will demand a complex set of skills and, as automation changes the nature of entry-level positions, the expectation for prior work experience will grow.

SKILLS FOR THE JOBS OF THE FUTURE

Youth will need to be equipped with a broad suite of technical and soft skills, including skills associated with digital literacy, entrepreneurship, and social intelligence.

In the near term, the job tasks least at risk of automation are management, stakeholder interaction, specialized expertise, problem solving, creativity and unpredictable physical work.^{42,43} These skill sets will likely increase in relative importance in the future. As suggested by Ontario's [Highly Skilled Workforce Expert Panel](#), many of these skills can be acquired through training in the liberal and applied arts, indicating that a STEM education alone is not the answer.⁴⁴

This is a continuation of existing trends. For example, during the Computer Revolution in the 1980s, workers in affected industries increasingly performed abstract analytic and interactive tasks as routine work became automated.⁴⁵ Similarly, in a study of occupations and industries from 1880

to 2000, it was revealed that job tasks involving communication and interpersonal interaction increased in prominence across the US.⁴⁶ Another study showed that while 40 percent of US high-tech firms offshore job tasks, they often keep those that require interpersonal interactions.⁴⁷

A 2016 survey of 90 large Canadian private-sector employers identified teamwork, communication, and problem-solving capabilities as some of the most important skills for entry-level positions.⁴⁸

The pace of change will also increase the value of those who are able to take risks, manage uncertainty and adjust rapidly. In other words, entrepreneurial skills will grow in importance, not just for startups but for all Canadian firms. Successful entrepreneurs have many of the skills necessary for the future of work. Research suggests that entrepreneurs score above the average in terms of persuasion, leadership, personal accountability, goal orientation and interpersonal interaction.⁴⁹ Other research suggests that founders, compared to non-founder business leaders, are better at identifying opportunities, are more comfortable with uncertainty, and have stronger vision and influence.⁵⁰

The growing demand for digital literacy skills—the ability to use digital skills to solve problems—across industries and occupations will likely continue to increase in the future. There is strong recognition among businesses that building digital literacy and computational thinking skills in the workforce is crucial for their anticipated labour needs.⁵¹ A study from Burning Glass Technologies found that nearly 7 million job openings in the US in 2015 were for roles requiring coding skills, representing 20 percent of the total job market for career-track jobs that pay more than \$15 an hour. In addition, 49 percent of job openings in the top income quartile valued coding skills.⁵²

“By prioritizing coding, Canadian children will be better prepared for the jobs of the future, which is essential for the country’s future economic engine and innovation.”

Ebony Frelix, VP of Philanthropy and Engagement, Salesforce

The rapid pace of technological change has also increased the need for lifelong training and skill acquisition. Skills and experience that are relevant upon entering the workforce may lose relevance as technology continues to disrupt existing jobs and open new opportunities. A US survey found that 54 percent of all employed Americans believe it is essential to develop new skills throughout their career, a recognition that increases to 61 percent for those under 30.⁵³

Canada’s current supply of skilled labour is not significantly out of step with demand. The Council of Canadian Academies suggests there is no shortage of advanced STEM skills in the Canadian economy, even though local imbalances may exist.⁵⁴ In addition, according to the Organisation for Economic Co-operation and Development (OECD), Canada ranks relatively high when it comes to digital literacy skills.⁵⁵ However, as skill requirements shift and increase it will be critical for education and training to keep pace, and for employers to engage more closely in talent development.

GAINING EXPERIENCE FOR THE JOBS OF THE FUTURE

Given the increasingly complex set of skill requirements for jobs across the economy, it is not surprising that formal education alone cannot equip youth with all that they need to be successful. Recent graduates face the paradox of needing experience to get a job and needing a job to get experience. Despite possessing relevant hard skills, they often lack the soft skills and work experience that employers are seeking.⁵⁶ As automation reduces the number of traditional entry-level positions and jobs increasingly demand work experience and a complex mix of technical and soft skills, the expectations placed on new hires are growing.

A 2014 survey of 316 employers conducted by the Higher Education Quality Council of Ontario found that the most commonly provided reason for not filling an advertised position was insufficient work experience, with 53 percent of employers identifying this as a barrier.⁵⁷

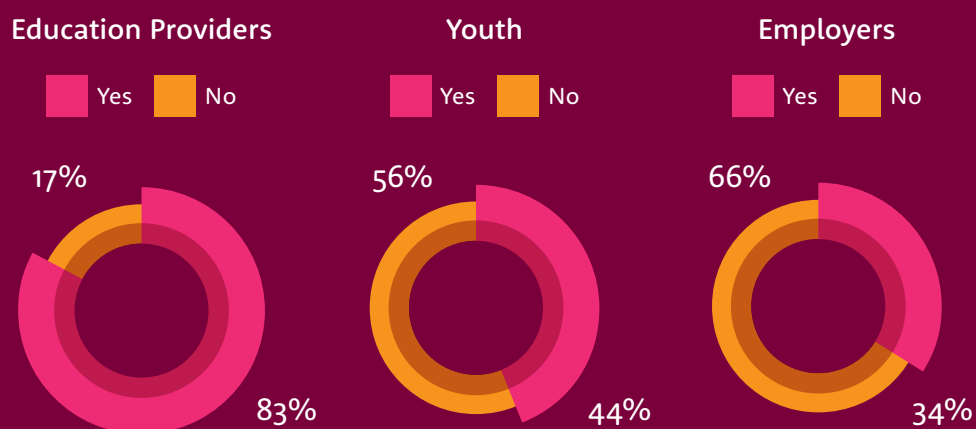
According to a 2015 report produced by McKinsey & Company, even though 83 percent of Canadian

Recent graduates face the paradox of needing experience to get a job and needing a job to get experience. Despite possessing relevant hard skills, they often lack the soft skills and work experience that employers are seeking.

education providers feel that youth are adequately prepared for the workforce, only 44 percent of youth and 34 percent of employers feel the same way.⁵⁸

This could suggest a need for employers to play a stronger role in providing workplace relevant training programs that complement post-secondary education. However, Canadian employers are slowing down in terms of their investments in skills training. Between 1993 and 2013, the amount that Canadian employers invested in employee training declined by 40 percent.⁵⁹

Are Canada's youth adequately prepared for the workforce?



McKinsey & Company, *Youth in Transition*, 2015

CANADA MUST PREPARE YOUTH FOR THE JOBS OF TOMORROW — TODAY

Youth are Canada's most valuable asset when it comes to preparing for the future of work—but the opportunity to fully realize their potential could be easily missed and the possible consequences of inaction are significant. Every cohort of young people that enters the labour market under-prepared erodes Canada's future prosperity.

40 percent of post-secondary graduates in Canada take more than three months to land their first job, and one in ten take longer than a year.⁶⁰ One study showed that the impact of the “scarring effect”—the wage penalty associated with a period of unemployment when youth are first entering the labour market—could be equivalent to 0.7 percent of GDP or \$12.4 billion over the next 18 years.⁶¹

The rapid pace of change could mean that access to up-to-date labour market information and guidance may be increasingly difficult to obtain, particularly for youth whose personal and family networks are more limited.⁶²

Ensuring youth are equipped for success is not only about avoiding lost economic growth, but is also about youth themselves. An inclusive society demands ongoing efforts to broaden the spectrum of opportunity available to everyone, particularly youth, whose social and economic outcomes later in life may be shaped early on.

The “Scarring Effect”

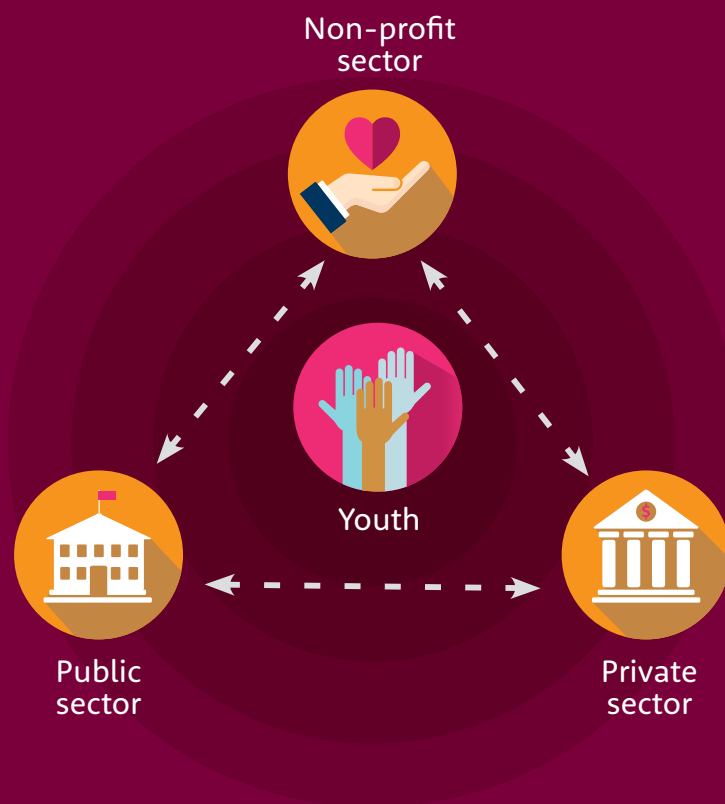


TD Economics, Assessing the Long Term Cost of Youth Unemployment, 2013

CALLING ALL SECTORS: TIME TO WORK TOGETHER

Education, training and employment initiatives and institutions must stay ahead of the curve. **The pace of technological change demands creative, new approaches to talent development that are broadly accessible and adaptive to a shifting labour market context.** These approaches will need to focus on improved near-term employment outcomes, as well as on developing the basic hard and soft skills that will be required across sectors and, most likely, over the long term.

This will necessitate removing boundaries that typically exist between educators and employers, between policymakers and leaders of the non-profit and private sectors, and between those delivering programs and the youth participating in them.



The following list outlines some potential solutions and areas meriting further exploration. This list is by no means comprehensive. It aims to spur a much broader conversation—one that engages the country’s public, private, and non-profit sectors.

1. **Develop work-integrated learning (WIL) models applicable to different sectors.** BII+E’s research suggests that WIL can effectively ease the transition from school into full-time work, and that employers therefore have an important role to play in providing workplace training and experience that complements post-secondary education. This can strengthen

the talent pipeline for Canadian companies—particularly in light of an aging workforce and a decline in traditional entry-level jobs. WIL models applicable to multiple sectors, to large companies as well as small and medium-sized enterprises, and to a broader base of students could be explored and adapted to specific industry and student needs.

2. **Explore digital literacy programs for youth across Canada, including in urban, rural and remote communities.** While not all Canadian youth need to be coders, the jobs of the future will increasingly require an ability to interface effectively with technology. Overall, Canada can greatly benefit from cultivating more skilled digital talent and strong computational thinkers. A range of interventions will be needed, in the formal and informal education systems, that recognize the different skills that make up digital literacy and their relative importance from a labour market perspective. Access to digital literacy programs for youth that have traditionally been underrepresented in the knowledge economy will also be an important area of focus.
3. **Identify and address potential barriers to youth entrepreneurship and intrapreneurship.** The future of work will increasingly require a labour force equipped with entrepreneurial skills to adapt to technological change and challenge the status quo. Youth should be introduced from an early age to entrepreneurial thinking, including acceptance of risk, failure and uncertainty. Attention should be paid to understanding how different demographic groups learn to ensure a diverse pool of entrepreneurial talent equipped to start new ventures and to contribute to companies that are under increasing pressure to adapt and innovate.
4. **Provide timely labour market data, career planning and mentorship support for youth entering the labour force.** Properly integrating into the labour force requires knowledge of what opportunities are out there and advice on how to capitalize on them. This requires a combination of timely labour market information—available to youth before, during, and after their education in a format that is accessible and easy to use—as well as mentorship to help navigate the job search.
5. **Enable lifelong learning and rapid, job-specific upskilling and retraining.** The journey for youth does not end after they land their first

gainful position, nor does education finish after college or university. To remain ahead of the curve in an environment of rapid technological change and disruption, it will be important for youth to have opportunities for constant upskilling and retraining. While there are a number of programs that already exist, from online, modular courses to coding camps, this is another area that will increasingly warrant attention from employers, governments and educators.

6. **Develop a data strategy to build a stronger evidence base for policy and program solutions.** Technological trends are complex and there are a lot of unknowns in the Canadian context. New data and research is needed to develop a more granular understanding of the talent supply and demand across regions and demographic groups. This would enable governments, employers, and educators to track trends and design solutions based on labour market needs. Canada's 2016 Census data, which is in the process of being released, will help, but will leave a number of gaps that researchers and policymakers should seek to fill. Data is also needed to monitor the effectiveness of new interventions.

These are only some examples of avenues that could be pursued to better prepare youth for the jobs of tomorrow. Clearly, there is a need for new models that are focused both on improving youth employment outcomes and on building a stronger talent pipeline for Canada's future economy. Understanding the hurdles confronting youth and designing solutions to address them will require collaboration between governments, employers, private sector leaders, philanthropists, community organizations, innovators from all sectors, and youth themselves.

ENDNOTES

1. Rao, S. (2011). *Cracking Canada's Productivity Conundrum*. IRPP Study. P. 5.
2. Muzyka, D. and Hodgson, G. (2015). *To boost productivity, Canada needs to focus on innovation*. Globe and Mail. Retrieved from: <http://www.theglobeandmail.com/report-on-business/rob-commentary/to-boost-productivity-canada-needs-to-focus-on-innovation/article26283449/>
3. Aghion, P., Akcigit, U., and Howitt, P. (2014). *What Do We Learn from Schumpeterian Growth Theory?* Handbook of Economic Growth, ed. by P. Aghion and S. Durlauf, Vol 2B: 515-563.
4. OECD. (2014). *Canada Shows Highest Level of Tertiary Education Attainment, Says OECD*. Retrieved from: <http://www.oecd.org/canada/eag2014ca.htm>
5. Lamb, C., and Seddon, S. (2016). *The State of Canada's Tech Sector, 2016*. Brookfield Institute for Innovation+ Entrepreneurship.
6. Denton, F.T. (1999). Historical Statistics of Canada: Section D: The Labour Force. Statistics Canada. Retrieved from: <http://www.statcan.gc.ca/pub/11-516-x/sectiond/4057750-eng.htm>
7. Autor, D.H. (2015). *Why Are There Still So Many Jobs? The History and Future of Workplace Automation*. Journal of Economic Perspectives. 29 (3). P. 4-6.
8. Deloitte. (2015). *Technology and People: The great job-creating machine*.
9. Frey, C.B. and Osborne, M. (2013). *The Future of Employment: How Susceptible are Jobs to Computerisation?* Oxford Martin School. P.44.
10. Frey, C.B. and Osborne, M. (2013). *The Future of Employment: How Susceptible are Jobs to Computerisation?* Oxford Martin School. P.44.
11. Autor, D.H. (2015). *Why Are There Still So Many Jobs? The History and Future of Workplace Automation*. Journal of Economic Perspectives. 29 (3). P. 5-6.
12. Statistics Canada Labour Force Survey (LFS) Estimates. Cansim Table 282-0142. Brookfield Institute for Innovation + Entrepreneurship analysis.
13. It must be noted that technological progress is not the only factor influencing these trends. For example, a recent [study](#) by David Autor and colleagues found that between 1999 and 2011 China's rapid import growth into the United States made low-skilled workers worse off and cost the country roughly 2.4 million jobs—nearly 1 million were in manufacturing.
14. Executive Office of the President of the United States of America. (2016). *Preparing for the Future of Artificial Intelligence*. National Science and Technology Council. P. 2.
15. Frey, C.B. and Osborne, M. (2013). *The Future of Employment: How Susceptible are Jobs to Computerisation?* Oxford Martin School. P. 37.
16. Lamb, C. (2016). *The Talented Mr. Robot: The impact of automation on Canada's workforce*. The Brookfield Institute for Innovation + Entrepreneurship. Pp. 8-15.
17. Lamb, C. (2016). *The Talented Mr. Robot: The impact of automation on Canada's workforce*. The Brookfield Institute for Innovation + Entrepreneurship. P. 15.
18. Lamb, C., and Seddon, S. (2016). *The State of Canada's Tech Sector, 2016*. Brookfield Institute for Innovation + Entrepreneurship.
19. Autor, D.H. (2015). *Why Are There Still So Many Jobs? The History and Future of Workplace Automation*. Journal of Economic Perspectives. 29 (3).
20. McKinsey Global Institute. (2017). *A Future That Works: Automation, Employment, and Productivity*. P. 94.
21. World Economic Forum. (2016). *The Future of Jobs: Employment, Skills and Workforce Strategy for the Fourth Industrial Revolution*. P. 15.
22. Berger, T., and Frey, C.B. (2015). *Industrial Renewal in the 21st Century: Evidence from US Cities*. Regional Studies. P.4.

23. Berger, T., and Frey, C.B. (2016). *Structural Transformation in the OECD: Digitalisation, Deindustrialisation and the Future of Work*. OECD Social, Employment and Migration Working Papers, No. 193, OECD Publishing, Paris. P. 25.
24. Berger, T., and Frey, C.B. (2016). *Structural Transformation in the OECD: Digitalisation, Deindustrialisation and the Future of Work*. OECD Social, Employment and Migration Working Papers, No. 193, OECD Publishing, Paris. P. 8.
25. Frenette, M., and Frank, K. (2017). *Do Postsecondary Graduates Land High-skilled Jobs?* Statistics Canada Social Analysis and Modelling Division. Catalogue no. 11F0019M – No.388.
26. Government of Canada, Department of Finance. (2014). *Jobs Report: The State of the Canadian Labour Market*. P. 8.
27. Government of Canada, Department of Finance. (2014). *Jobs Report: The State of the Canadian Labour Market*. P. 39.
28. Lamb, C. (2016). *The Talented Mr. Robot: The impact of automation on Canada's workforce*. Brookfield Institute for Innovation + Entrepreneurship.
29. Deloitte Canada. (2015). *Age of Disruption: Are Canadian firms prepared?* Deloitte Future of Canada Series. P. 3.
30. Ibid.
31. Deloitte Canada. (2015). *Age of Disruption: Are Canadian firms prepared?* Deloitte Future of Canada Series.
32. Edelman Intelligence. (2016). *Freelancing in America: 2016*. Retrieved from: <http://www.slideshare.net/upwork/freelancing-in-america-2016/1>
33. Schragar, A. (2015). *The gig economy is only good for some workers-but it doesn't need to be that way*. Quartz. Retrieved from: <https://qz.com/477270/the-gig-economy-is-only-good-for-some-workers-but-it-doesnt-need-to-be-that-way/>
34. Poverty and Employment Precarity in Sourthern Ontario research group. (2014). *The Precarity Penalty: The impact of employment precarity on individuals, households and communities—and what to do about it*. P. 12.
35. Maddeaux, S. (2016). *If the 'gig economy' is booming, why is 'freelance' still considered a dirty word associated with failure?* The National Post. Retrieved from: <http://news.nationalpost.com/life/if-the-gig-economy-is-booming-why-is-freelance-still-considered-a-dirty-word-associated-with-failure>
36. Jackson, A. (2014). *Canadian-born visible minority youth face an unfair job future*. Broadbent Institute. Retrieved from: <http://www.broadbentinstitute.ca/en/blog/canadian-born-visible-minority-youth-face-unfair-job-future>
37. Parliament of Canada. (2013). Chapter Three: Youth As Potential or Current Employees. Retrieved from: <http://www.parl.gc.ca/HousePublications/Publication.aspx?DocId=6658485&Language=E&Mode=1&Parl=41&Ses=2&File=225>
38. Macleans. (2015). *Why the youth unemployment crisis isn't what it seems*. Retrieved from: <http://www.macleans.ca/work/jobs/why-the-youth-unemployment-crisis-isnt-what-it-seems/> https://www.thestar.com/news/canada/2013/05/08/national_household_survey_aboriginal_population_young_and_growing_fast.html
39. Hango, D. (2013). *Gender differences in science, technology, engineering, mathematics and computer science (STEM) programs at university*. Statistics Canada. Catalogue no. 75-006-X. P. 1.
40. Bui, Q., and Miller, C.C. (2016). *Why Tech Degrees Are Not Putting More Blacks and Hispanics Into Tech Jobs*. The New York Times. Retrieved from: <https://www.nytimes.com/2016/02/26/upshot/dont-blame-recruiting-pipeline-for-lack-of-diversity-in-tech.html>
41. Hughes, M. (2015). *Tech community facing an ethnic diversity problem*. The Globe and Mail. Retrieved from: <http://www.theglobeandmail.com/report-on-business/small-business/talent/technology-community-facing-an-ethnic-diversity-problem/article27434180/>

42. McKinsey Global Institute. (2017). *A Future That Works: Automation, Employment, and Productivity*. P. 7.
43. Frey, C.B., and Osborne, M. (2013). *The Future of Employment: How Susceptible Are Jobs to Computerisation*. University of Oxford. P. 31.
44. The Premier's Highly Skilled Workforce Expert Panel. (2016). *Building the Workforce of Tomorrow: A Shared Responsibility*. Report submitted to the Honourable Kathleen Wynne, Premier of Ontario. P. 36.
45. Berger, T. and Frey, C.B. (2016). *Did the Computer Revolution Shift the Fortunes of US Cities? Technology Shocks and the Geography of New Jobs*. Regional Science and Urban Economics. P. 57.
46. Michaels, G., Rauch, F., and Redding, S.J. (2013). *Task Specialization in U.S. Cities From 1880-2000*. NBER Working Paper Series.
47. Tambe, T. and Hitt, L.M. (2012). *Now IT's Personal: Offshoring and the Shifting Skill Composition of the US Information Technology Workforce*. Management Science. 58 (4). Pp. 678-695.
48. Business Council of Canada. (2016). *Developing Canada's future workforce: a survey of large private-sector employers*. P. 4.
49. Bonnsetter, B.J. (2012). *New Research: The Skills That Make an Entrepreneur*. Harvard Business Review. Retrieved from: <https://hbr.org/2012/12/new-research-the-skills-that-m>
50. HBS Working Knowledge. (2016). *Skills and Behaviours that Make Entrepreneur Successful*. Harvard Business School. Retrieved from: <http://hbswk.hbs.edu/item/skills-and-behaviors-that-make-entrepreneurs-successful>
51. In July 2016, 18 high-level tech executives in British Columbia wrote to Premier Clark asking to increase the amount of technology talent in the province. Globe and Mail (2016). B.C. Premier promises 'significant' new funds for postsecondary tech education. Retrieved from <http://www.theglobeandmail.com/news/british-columbia/tech-schooling-a-priority-for-bc-to-combat-chronic-talent-shortage-clark/article32157887/>
52. Burning Glass Technologies. (2016). *Beyond Point and Click: The Expanding Demand for Coding Skills*.
53. Brown, A. (2016). *Key findings about the American workforce and the changing job market*. Pew Research Centre. Retrieved from: <http://www.pewresearch.org/fact-tank/2016/10/06/key-findings-about-the-american-workforce-and-the-changing-job-market/>
54. Council of Canadian Academies. (2015). *Some Assembly Required: STEM Skills and Canada's Economic Productivity*. P. 33.
55. OECD. (2016). *Skills Matter: Further Results from the Survey of Adult Skills*. OECD Skills Studies, OECD Publishing. Paris. P. 53.
56. OECD. (2014). *Canada Shows Highest Level of Tertiary Education Attainment, Says OECD*. Retrieved from: <http://www.oecd.org/canada/eag2014ca.htm>
57. Refling, E., and Borwein, S. (2014). *Bridging the Divide, Part II: What Canadian Job Ads Produced*. Higher Education Quality Council of Ontario. P. 3.
58. McKinsey & Company. (2015). *Youth in transition: Bridging Canada's path from education to employment*. P. 9.
59. Munro, D. (2014). *Developing Skills: Where are Canada's Employers?* Conference Board of Canada. Retrieved from: http://www.conferenceboard.ca/topics/education/commentaries/14-03-20/developing_skills_where_are_canada_s_employers.aspx
60. McKinsey & Company. (2015). *Youth in transition: Bridging Canada's path from education to employment*. P.6.
61. TD Economics. (2013). *Assessing the Long Term Cost of Youth Unemployment*.
62. Expert Panel on Youth Employment. (2016). *Understanding the Realities: Youth Employment in Canada: Interim Report of the Expert Panel on Youth Employment 2016*. Government of Canada. P. 9.

