THE LABOUR MARKET SHIFT

Training a highly skilled and resilient workforce in Ontario
The Institute for Competitiveness & Prosperity is an independent not-for-profit organization that deepens public understanding of macro and microeconomic factors behind Ontario's economic progress. Research by the Institute is intended to raise public awareness and stimulate debate on a range of issues related to competitiveness and prosperity. It is the aspiration of the Institute to have a significant influence in increasing Ontario and Canada's competitiveness, productivity, and capacity for innovation. We believe this will help ensure continued success in creating good jobs, increasing prosperity, and building a higher quality of life. We seek breakthrough findings from our research and propose significant innovations in public policy to stimulate businesses, governments, and educational institutions to take action.

The Institute was formerly the research arm of the Task Force on Competitiveness, Productivity and Economic Progress established in 2001 by the Ontario Premier, and led by Roger L. Martin. The Task Force completed its work at the end of 2014. The Institute is now advised by Ontario's Panel for Economic Growth & Prosperity, led by Tiff Macklem.

Comments on this report are welcome and should be directed to the Institute for Competitiveness & Prosperity. The Institute is funded by the Government of Ontario through the Ministry of Economic Development and Growth. The views expressed in this report are the views of the Institute and do not necessarily represent those of the Government of Ontario.

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September never ends

I AM PLEASED to present our 29th Working Paper, *The labour market shift: Training a highly skilled and resilient workforce in Ontario*. This paper is the second in a workforce participation series we are exploring this year. This paper focuses specifically on a story we all know too well – the changing labour market.

Things have been changing for many years – jobs, career paths, and expectations of skill sets in the workplace. We’ve all seen the headlines – manufacturing plants around the province have been closing resulting in layoffs for many. Automation and technological change are disrupting industries and workers within those industries. What supports are available during these times of transformation? This Working Paper explores these questions, particularly the skills retraining programs of Employment Service and Second Career, and workplace-based training. In some ways, the changing dynamic of the labour market has created a new reality for Ontario workers, one in which they are always going “back to school.” For some, September never ends.

Our team engaged in an ambitious fact finding mission over the past year. They spoke with experts in the skills training field from all over the province including service providers, academics, practitioners, job seekers, public servants, municipal governments, and employers. They also developed a strong relationship with the Data and Analytics Unit within the Ministry of Advanced Education and Skills Development. This relationship allowed for a data sharing partnership to be developed. The analysis in this paper was completed with the help of data that normally remain inside government. As a result, our analysis is timely, accurate, and exclusive.

This Working Paper explores the role of Ontario’s employers in the skills training ecosystem. There are benefits for employers and employees if skills training in the workplace is prioritized. Unfortunately, the limited data available may be skewing our perception of the issue. Training budgets appear to have declined across Canada since the 1990s, and many Ontarians may not have access to training through their workplace. Through support programs like the Canada-Ontario Job Grant, there is a role for the government in supporting employer-led training as well.

If Ontarians are outside the workplace, they may need help re-entering. This is where government skills training programs come in. Programs must be well designed and funded appropriately to best support Ontarians. They must focus on the long-term impact of placing someone in a sustainable job, or equip them with the skills to navigate the labour market once they have exited a program. If they don’t, we risk funneling individuals through the system over and over again, perpetuating a problem rather than solving it.
Things have been changing for many years – jobs, career paths, and expectations of skill sets in the workplace. What government supports are available during these times of transformation?

The Institute strongly recommends that each actor commits to their role in training Ontario’s highly skilled and resilient workforce. To that end, we encourage workplaces to collect and share their training data with governments, explore cost-effective ways to offer training such as open online courses, and prioritize skills-based hiring over credential-based hiring to meet their needs.

The Ontario government also has some work to do to modernize its training programs. To start, it should change the way Employment Service providers are evaluated and funded to focus on long-term job sustainability and allow providers to specialize and adapt to local labour market needs. Additionally, the government should examine the Canada-Ontario Job Grant and work with employers to modernize its criteria.

Although not the primary focus of this Working Paper, our team gathered a number of insights on the role of educational institutions. The Institute encourages them to focus on teaching broader skill sets to facilitate smoother transitions of graduates through the labour market and create shorter, more flexible programs to accommodate adult learners.

The Institute would like to thank the Brookfield Institute for Innovation + Entrepreneurship for their collaboration and support on this project. The BII+E team of Caitlin Cassie and Creig Lamb were instrumental in framing the Working Paper with our team and supplied the analysis on labour market polarization and the impact of automation in Ontario. We are indebted to their contributions.

As always, the Institute for Competitiveness & Prosperity is grateful for the funding support from the Ontario Ministry of Economic Development and Growth, and to the Data Analytics Unit of the Ministry of Advanced Education and Skills Development for their data sharing partnership. We look forward to discussing our final work and findings with Ontarians. All comments and suggestions for improvement are welcome.
THE LABOUR MARKET SHIFT

THE CHALLENGE

- Jobs and skills are changing.
- The occupations most at risk of automation in Ontario over the next 10 to 20 years include retail salespeople, food counter attendants, cashiers, administrative assistants, and financial auditors.
- Today, workplaces spend less on training than they did in the 1990s.
- The Canada-Ontario Job Grant is inaccessible to many.
- Employment Ontario services focus on short-term outcomes rather than sustainable long-term employment.

THE STORIES

The following are three hypothetical individuals who experience challenges in Ontario’s labour market. They represent the main thematic challenges examined in this Working Paper.

**ERIN**
Data Entry Clerk
Sudbury

Erin is 33-years-old and lives in Sudbury, Ontario. She has worked for an insurance company, as a data entry clerk, since graduating from university 11 years ago. There have been several layoffs at her company and Erin knows she needs to upgrade her skills to remain competitive. She has a young family and cannot afford to take the two to four years off required for retraining. Other responsibilities prevent her from attending evening classes, and she remains unsure which jobs will be in demand in Sudbury over the next few years.

**RICHARD**
Machinist
Cambridge

Richard was laid off from his Cambridge, Ontario, machinist job in 2015. He worked for the same company in the transportation-manufacturing sector since leaving high school in the late 1970s. He rose through the ranks to become a senior manager. Richard faces several challenges in his current job search. He has never conducted a job search previously and does not think his skills are transferable since he only has a high school education. He knows he needs to gain digital skills to become marketable in the workplace.

**VANDANA**
Engineer
London

Vandana came to Ontario five years ago from India, trained as an engineer. When she arrived, she accessed Employment Ontario services through a local college, getting help navigating Ontario’s labour market and workplace culture. An employment counselor helped her apply for some jobs, but she found that her credentials and foreign work experience were not recognized. Vandana eventually found employment in the retail sector, where she has worked for three years. Due to her precarious work schedule, it is difficult to attend training programs to update her credentials.
Jobs and skills are changing. The occupations most at risk of automation in Ontario over the next 10 to 20 years include retail salespeople, food counter attendants, cashiers, administrative assistants, and financial auditors. Today, workplaces spend less on training than they did in the 1990s. The Canada-Ontario Job Grant is inaccessible to many. Employment Ontario services focus on short-term outcomes rather than sustainable long-term employment.

Technology can drive economic growth. Automation has the potential to make workers more productive and transform industries for the better. The future requires a mix of skills including creativity, problem solving, communication, teamwork, and digital literacy. Training provides many benefits to employers and employees. Short-term, flexible course structures are growing, making it easier for people to upgrade their skills.

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Erin is 33-years-old and lives in Sudbury, Ontario. She has worked for an insurance company, as a data entry clerk, since graduating from university 11 years ago. There have been a few layoffs at her company and Erin knows she needs to upgrade her skills to remain competitive. She has a young family and cannot afford to take the two to four years off required for retraining. Other responsibilities prevent her from attending evening classes, and she remains unsure which jobs will be in demand in Sudbury over the next few years.

Richard was laid off from his Cambridge, Ontario, machinist job in 2015. He worked for the same company in the transportation-manufacturing sector since leaving high school in the late 1970s. He rose through the ranks to become a senior manager. Richard faces several challenges in his current job search. He has never conducted a job search previously and does not think his skills are transferable since he only has a high school education. He knows he needs to gain digital skills to become marketable in the workplace.

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Employers, government, and educational institutions have vital roles to play in resolving the challenges in today’s labour market.

The following are the main thematic challenges examined in this Working Paper:

**THE WORKPLACE**

- **Erin**
  - Data Entry Clerk
  - Sudbury

**THE EMPLOYMENT OFFICE**

- **Richard**
  - Machinist
  - Cambridge

**THE EDUCATIONAL INSTITUTION**

- **Vandana**
  - Engineer
  - London

**THE OPPORTUNITY**

- Technology can drive economic growth.
- Automation has the potential to make workers more productive and transform industries for the better.
- The future requires a mix of skills including creativity, problem solving, communication, teamwork, and digital literacy.
- Training provides many benefits to employers and employees.
- Short-term, flexible course structures are growing, making it easier for people to upgrade their skills.
THE RECOMMENDATIONS

To mitigate the challenges and seize the opportunities brought on by shifts in Ontario’s labour market, the Institute recommends specific actions be taken by workplaces, government, and educational institutions. These recommendations will help train a highly skilled and resilient workforce.

**EMPLOYERS SHOULD:**

- Focus on skills-based hiring to expand hiring opportunities.
- Find shorter, cost-effective ways to offer training to employees like massive open online courses (MOOCs).
- Collect training data and metrics to provide governments with vital information needed for policy development.

**GOVERNMENT SHOULD:**

- Focus on teaching broader skill sets to facilitate easier transitions through the labour market.
- Create shorter, more flexible programs so adult students can upgrade their skills later in life.
- Coordinate with employers to ensure university and college training curriculum are meeting employer needs.

**EDUCATIONAL INSTITUTIONS SHOULD:**

- Expand the criteria of the Canada-Ontario Job Grant to ensure greater uptake among employers and employees.
- Change the way Employment Service organizations and training programs are evaluated and funded to focus on long-term job sustainability.
- Allow service providers and training programs to adapt to local needs.
- Expand the role of the Local Employment Planning Council to be a greater resource to the employment-training ecosystem.
Focus on skills-based hiring to expand hiring opportunities. Find shorter, cost-effective ways to offer training to employees like massive open online courses (MOOCs). Collect training data and metrics to provide governments with vital information needed for policy development.

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- Create shorter, more flexible programs so adult students can upgrade their skills later in life.
- Coordinate with employers to ensure university and college training curriculum are meeting employer needs.
Ontario’s labour market has changed rapidly since 2001. Technology, and other drivers, are the source of irreversible shifts in jobs, skills, and Ontario’s economic structure. Automation presents challenges for many workers, particularly those in routine occupations that can be easily computerized. Ontario can help manage these impending shifts through skills training.

A skilled workforce contributes to a prosperous economy

Creating a highly skilled workforce is a priority for the Ontario government, and rightly so. A highly skilled labour force is a necessary element for a competitive and prosperous economy because it creates effective human capital, economic resiliency, and flexibility. In a highly skilled economy, the productivity of labour and capital is increased. This can increase innovation. Such economies also tend to be more resilient, and able to easily manage economic shocks and risks.

The Institute focuses on three main actors in the skills training ecosystem: employers, government, and educational institutions. While it is recognized that there are many others, this Working Paper focuses on the role of employers and government in providing skills training and retraining. As such, a deep dive into the role of educational institutions is outside its scope.

There are many voices in the education space at the moment, and the Institute noticed an opportunity to provide a thorough review...
Technology is both a substitute and a complement in the economy. It makes some job tasks obsolete and others more efficient.

Technology can automate certain job tasks – especially ones that are routine and repetitive.

Occupations that are easy to automate are shrinking while occupations that involve more complex analytical and interpersonal tasks are expanding.

Today, it’s desirable to have a higher, more complex and varied skill level to combat the risk of automation.

As a result of these trends, Ontario’s goods-producing sector, which is more easily automated, has been shrinking. The service-producing sector has been expanding.
of government skills retraining programs like Employment Service and Second Career. Even though a detailed review of educational institutions is not included, the Institute discovered insights throughout this research that allowed for the development of educational recommendations.

Outside the home, Ontarians first develop skills in the primary, secondary, and post-secondary education systems. However, adult skill development is more diverse and complex. It can take place in the workplace, in part-time or certificate course work, through mentorship, online courses, experiential learning, apprenticeships, or through government skills retraining programs (hereby training programs), and many others.

**Ontario’s labour market has shifted in jobs, wages, and sectoral composition**

Technology is one of the major drivers of economic growth that impacts the labour market. Other factors such as demographic shifts and labour force participation are also considerations, but are not the focus of this analysis.

Technological progress improves productivity, increases wealth, and creates entirely new industries and occupations. Indeed, technology can increase demand for workers across the economy. Among professional and managerial positions, technology complements human labour. In the Information and Communications Technology sector, for example, workers are able to increase the scope of data and analytical tools available to them, and spend less time performing routine tasks. Consequently, they tend to experience increased productivity, wages, and demand. However, technology can also be disruptive, eliminating the need for certain kinds of jobs and skills.

Technology has impacted Ontario’s labour market in fundamental ways. Three main shifts include:

1. Jobs polarization (page 13).
2. Wage polarization (page 15).
3. Growth in the service sector and a decline in the goods-producing sector (page 15).

**Defining job tasks**

All jobs are collections of interrelated tasks. Understanding task types within occupations in the labour market allows for insights into how employment and wages may shift now and in the future. Task structures are especially relevant for understanding the changing labour market because certain tasks are more easily automated than others. Tasks that are codifiable can be easily computerized and are thus at a higher risk of being automated (Exhibit 1). Less susceptible occupations involve complex problem solving and interpersonal interactions.

### EXHIBIT 1 Definitions of non-routine and routine job tasks

<table>
<thead>
<tr>
<th>Task category</th>
<th>Definition</th>
</tr>
</thead>
</table>
| Non-routine cognitive and analytical | Jobs that require a higher level of education and often pay more than the rest of the labour force. They are primarily comprised of tasks that involve critical thinking, creativity, problem solving, and interpersonal interaction. Jobs in this category are usually complemented by technology that helps improve worker productivity. These professions typically require interpersonal interaction.  
**EXAMPLE OCCUPATIONS:** Managers and professional and technical occupations in the applied sciences. |
| Routine cognitive or routine manual | Jobs that consist mostly of routine tasks, like accounting or data entry, where the outputs are repetitive. These tasks can be followed by explicit, programmed rules. They are typically middle wage and require a lower level of interpersonal interaction. In these jobs, technology can easily substitute for labour, since routine tasks are easily codifiable (computerized). They are broken down further into two categories: routine manual and routine cognitive.  
**EXAMPLE OCCUPATIONS:** Routine manual: Assembly line manufacturing, transportation, and equipment operators.  
Routine cognitive: Accounting, bookkeeping, clerical, and some sales roles. |
| Non-routine manual                  | Jobs that involve manual and interactive work in an unstructured environment. These jobs are less complemented or substituted by technology. They generally require lower levels of education and higher levels of interpersonal skills. There is a wide range of wages within these jobs – they can be high for some and low for others. Plumbers, for example, often make a high wage, while food and beverage servers earn a much lower one.  
**EXAMPLE OCCUPATIONS:** Child care workers, cleaners, security, food service, home health care jobs, personal care workers, chefs, and cooks. |

The Institute adopts two broad task categories for this analysis: routine and non-routine. Routine tasks are more likely to be automated because they are repetitive, making it easier for machines to duplicate them. Non-routine tasks are less easy to duplicate because they involve more interpersonal interaction and sometimes involve complex problem solving.

1. Jobs have polarized
Ontario experienced a period of job polarization between 2001 and 2015 (Exhibit 2). Polarization means that the labour market has experienced a hollowing out of its typically medium-skilled, routine cognitive and manual occupations. Non-routine cognitive and non-routine manual occupations saw much larger employment growth than routine cognitive and routine manual jobs because these tasks tend to be complemented rather than replaced by technology. Although this trend was observed between 2001 and 2015, it may not continue to the same extent into the future. In fact, non-routine analytical and manual occupations may be at future risk of automation.

In Ontario, employment and wages for routine jobs are in decline.

Jobs based around non-routine manual tasks, such as cleaning, security, food service, and home health care jobs, have historically had limited opportunities for substitution or complementarity, although this is starting to change. As wages among the middle and upper income classes rise, demand for these activities will increase. Historically, the routine bias of technology has contributed to job polarization, or the simultaneous growth in high-wage analytical occupations and...
low-wage manual occupations, while middle-income routine occupations declined.12 In the aggregate, this trend has played out across many advanced countries since the 1980s.13

From 2001 to 2015, non-routine analytical and interactive occupations grew by 33 percent, adding 820,000 jobs in Ontario. Job growth for this category was largely dependent on growth in professional and technical occupations, which expanded by 28 percent during this time period (Exhibit 3). Wages also grew by 7 percent over this period. However, growth in wages has declined slightly since 2013.

The proportion of middle-income, routine occupations decreased by nearly 70,000 jobs. The decline in this category was tied to the decline in production, operative, and labour occupations. Median wages in these occupations declined by 5 percent over this period and have experienced a particularly strong downward trajectory since 2012.

The occupations primarily based on non-routine manual tasks, such as childcare and home support services, skilled trades, and food and beverage services, grew by 26 percent, adding nearly 250,000 jobs. Service occupations and the skilled trades drove growth in this category. Median wages for these occupations increased by 8 percent from 2001 to 2015.

Technological advancements will continue to impact the makeup of jobs, wages, and sectors, and Ontario must be aware of what is coming.
2. Wages have polarized
Wages in Ontario also polarized from 2001 to 2015. (Exhibit 4). Median wages in routine cognitive occupations declined by 5 percent and have experienced a strong downward trajectory since 2012. Median wages for non-routine manual positions increased by 8 percent. This was also a time during which an increasing minimum wage disproportionately affected workers in service occupations.

This gives further evidence to the polarization effect observed in Ontario in the last 15 years, showing that middle-income, routine jobs are in decline both in employment and wages. This rising polarization is associated with claims about the disappearing middle-income groups and the middle class, which may affect economic growth in a negative way. This impacts how many workers will be in need of government programs in the future. It also helps policymakers pinpoint the skills that retraining programs should focus on, and the skills that are becoming obsolete.

3. Ontario has transformed into a service-based economy
Ontario has transitioned away from a primarily goods-producing economy to one that is predominantly service-producing. In 2015, employment in Ontario’s service sectors made up 78.7 percent of the labour force, while employment in the goods sectors was only 21.3 percent.
Ontario’s future labour market is at risk of automation

Technological advancements will continue to impact the makeup of jobs, wages, and sectors, and Ontario must be aware of what is coming. To estimate the impact of modern technology on the Canadian labour force, the Brookfield Institute for Innovation + Entrepreneurship (BII+E) applied Frey and Osborne’s (2013) findings to Canadian data. BII+E determined that 42 percent of the occupations in the Canadian labour force will be highly susceptible (probability of 70 percent or higher) to automation in the next 10 to 20 years.\(^6\)

Classifications for the risk of automation in a 10 to 20 year time horizon is: low (0-29 percent likelihood of being impacted by automation), medium (30-69 percent), or high (70-100 percent) (Exhibit 5). Slightly more than 41 percent of the jobs in the Ontario labour market are at a high-risk of being susceptible to automation in the next 10 to 20 years.\(^7\) This proportion is slightly lower than the Canadian average, and the lowest of all Canadian provinces. At 38 percent of the labour force, Ontario also has the highest proportion of occupations that are at low risk of being automated.

EXHIBIT 5  Probability of labour market at risk of automation in 10-20 years, Ontario, 2011

<table>
<thead>
<tr>
<th>Probability of automation (%)</th>
<th>Low probability (0-29%)</th>
<th>Medium probability (30-69%)</th>
<th>High probability (70-100%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>38.0%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20.6%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>41.1%</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: See Appendix B for methodology.
The 10 occupations in Ontario that are most susceptible to automation, and employ 50,000 people or above include retail salespersons, transport truck drivers, administrative officers, and cooks (Exhibit 6). Robots have become increasingly integrated with sophisticated sensors and language processing technology, so they can substitute for traditional service work such as hotel reception jobs.19

Ontario’s economy is not the economy of yesterday. Workers in declining occupations will need to transition into new professions. In order to develop the correct skills to remain resilient in the labour market, Ontarians will need to understand how to transition their current skill set into one that is more desirable. Government employment training programs will need to take the realities of the changing labour force into account so as not to train people for jobs that are highly susceptible to automation in the near to medium term.

<table>
<thead>
<tr>
<th>OCCUPATION</th>
<th>PROBABILITY OF AUTOMATION WITHIN 10 TO 20 YEARS (%)</th>
<th>PROPORTION OF OCCUPATION WITH A UNIVERSITY CERTIFICATE, DIPLOMA OR DEGREE AT BACHELOR LEVEL OR ABOVE (%)</th>
<th>MEDIAN EMPLOYMENT INCOME</th>
<th>NUMBER OF WORKERS, 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retail salespersons</td>
<td>92%</td>
<td>14%</td>
<td>$13,400</td>
<td>251,000</td>
</tr>
<tr>
<td>Food counter attendants, kitchen helpers &amp; related occupations</td>
<td>92%</td>
<td>7%</td>
<td>$8,300</td>
<td>124,400</td>
</tr>
<tr>
<td>Cashiers</td>
<td>97%</td>
<td>8%</td>
<td>$8,600</td>
<td>111,300</td>
</tr>
<tr>
<td>Administrative assistants</td>
<td>96%</td>
<td>18%</td>
<td>$34,600</td>
<td>104,900</td>
</tr>
<tr>
<td>Administrative officers</td>
<td>96%</td>
<td>29%</td>
<td>$41,700</td>
<td>93,700</td>
</tr>
<tr>
<td>Transport truck drivers</td>
<td>79%</td>
<td>6%</td>
<td>$38,700</td>
<td>92,000</td>
</tr>
<tr>
<td>General office support workers</td>
<td>96%</td>
<td>18%</td>
<td>$30,000</td>
<td>87,300</td>
</tr>
<tr>
<td>Financial auditors and accountants</td>
<td>94%</td>
<td>67%</td>
<td>$58,400</td>
<td>78,800</td>
</tr>
<tr>
<td>Material handlers</td>
<td>85%</td>
<td>7%</td>
<td>$29,400</td>
<td>65,900</td>
</tr>
<tr>
<td>Cooks</td>
<td>83%</td>
<td>6%</td>
<td>$13,700</td>
<td>59,200</td>
</tr>
</tbody>
</table>

Note: Occupations are based on NOC-S. See Appendices A and B for methodology.
The Future of Skills
A Mix of Skills is Needed to Thrive

Technological changes are increasing the demand for workers with a complex mix of technical, cognitive, digital, and problem solving skills. Ontario’s workforce is highly educated, yet, many lack the foundational skills needed to develop these higher order skills. Moreover, provincial scores in numeracy, literacy, and problem solving in digital environments need improvement. To solve this, government must explore ways to upgrade skills through employment or government training programs.

The future requires a mix of critical thinking, digital, and problem solving skills

Skills matter. The Organisation for Economic Co-operation and Development (OECD) defines skills as “the key cognitive and workplace competencies needed for individuals to participate in society and for economies to prosper.” Skills are the foundational building blocks of a workforce. Whether Ontarians are able to thrive in the labour force depends on their ability to maintain skills relevant to their current and future jobs.

Moving forward, it will be beneficial for Ontarians to gain skills that can be transferred across occupations and sectors. For instance, demand for skills that involve higher cognitive functions, making them difficult for technology to replicate, will be desirable. Such skills for the future include:

- Creativity
- Critical thinking
- People management
- Problem solving
• Applying expertise
• Communication
• Teamwork
• Digital literacy
• Entrepreneurial capacities

These skills enable individuals to be resilient and adaptable through change, taking on new tasks or roles with less difficulty than individuals without them. This mix of transferable skills are what the Institute considers to be highly skilled.

Ontario has a well-educated workforce
Between 2001 and 2015, the number of people employed in Ontario with a university degree grew by 68 percent (Exhibit 7). However, the province is not immune to economic changes. Employers, educators, service providers, and governments must understand which skills will be in demand in the future, and how to offer opportunities for people to acquire and upgrade their skills.

To ensure Ontarians are not left behind as more complex skills become necessary, the province needs to consider where and how they are taught. It will especially need to examine the formal education system, ensuring such skills are evaluated and built into the current and future curricula. This is not just a job for government, but a job for all involved in the skills training ecosystem including employers, service providers, universities and colleges, unions, and industry associations.

Certain skills are more at risk of automation than others
When faced with declining job prospects, successful movement throughout the labour market depends, to a large part, on whether one’s skills are transferable across occupations. In this sense, the composition of an individual’s skills are more important than whether those skills are deemed higher or lower, with the exception of skills that are at high risk of automation.

On average, the occupations at highest risk of automation earn less and require less education than other occupations in the labour force. However, not all higher order jobs

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Note: Post-secondary certificate or diploma includes a trade certificate, vocational schools, apprenticeship training, community college, CEGEP, and school of nursing.
Whether Ontarians are able to thrive in the labour force depends upon their ability to maintain skills relevant to their current and future jobs.

(Non-routine cognitive and analytical) are isolated from automation. The availability of big data combined with advances in machine learning have made it possible to isolate, define, and automate a diverse array of complex cognitive tasks, including providing legal advice and the delivery of medical diagnoses. Tasks currently completed by lawyers and technicians in the medical health field may be substituted by technology as well. To what extent this will occur in Ontario remains to be seen. Overall, two considerations need to be made when individuals are assessing what skills to acquire: Are these skills highly transferable, and are they likely to be automated?

**Ontario must improve its digital problem solving skills**

Examining surveys that quantify skill proficiency are useful in understanding Ontario’s progress on skill development. The Programme for the International Assessment of Adult Competencies (PIAAC), administered by the OECD, conducts the survey of Adult Skills, which classifies skills by literacy, numeracy, and problem solving in technology-rich environments (PS-TRE). These three skill categories are considered the foundation upon which all higher order skills are built. The Survey has only been administered once so far, but there are plans for a second round in the near future.

To measure proficiency, scores are calculated from 0 to 100, and placed into categories from Below Level 1 to Level 5. For literacy and numeracy, Level 3 is considered by ABC Life Literacy Canada (a non-profit organization in Toronto) as the level required to succeed in a technology-rich environment. However, there are varying opinions among stakeholders as to whether Level 3 truly represents the degree needed for employment success. This threshold does not apply for the PS-TRE category since the levels of scoring only go up to 3, instead of Level 5 as in the other categories. This also does not mean that anyone below Level 3 will be unemployed, it is simply a conceptual threshold.

Close to half of Ontario’s population have less than a Level 3 proficiency in literacy. The Canada-wide results are similar. The province’s results are even worse for numeracy – 53 percent of the population is similarly below a Level 3 numeracy proficiency. While these results are similar to the OECD average, there is cause for concern about their implications. It is harder to advance the skills required for the future of work without strong basic skills in place.

For problem solving in technology-rich environments (PS-TRE), participants are asked to complete a series of digital exercises, including page navigation, retrieving information on a website, and answering questions related to online content. The tasks measure the ability to “use digital technology, communication tools, and networks to acquire and evaluate information, communicate with others, and perform practical tasks.” At the highest possible scoring for PS-TRE, problem solving requires users to navigate across pages and applications and use tools to discover the answer to a problem (i.e., the Microsoft Excel “sort” function). The respondent may have to define the goal of the exercise themselves, reading through information and discarding what is irrelevant.
Only 9 percent of Ontario’s population scored at Level 3 on the PS-TRE assessment (Exhibit 8). This is not unlike many of its peer jurisdictions and the OECD average, although less of Ontario’s population scored at Level 2 proficiency on the test than the populations of British Columbia, Australia, Sweden, and the Netherlands. Regions fall within a few percentage points of one another on this measurement. However, there is strong recognition among businesses and advanced economies that digital literacy skills are crucial for future labour needs. This demand extends beyond the need for coders and software developers. It is anticipated that, with increasing rapidity, digitally literate talent will be in demand across all occupations and industries.34

Ontario should consider its plan to advance these PS-TRE skills in the coming years, especially for individuals who perform at or below Level 1. In this category, tasks require the use of widely available and familiar technology applications.35

For Ontarians to thrive in the current and future labour market, they must have workplace and government supports for skills training.

### Exhibit 8 Proficiency in problem-solving in technology rich environments, Ontario and select peers, 2012

<table>
<thead>
<tr>
<th></th>
<th>Below Level 1</th>
<th>Level 1</th>
<th>Level 2</th>
<th>Level 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario</td>
<td>16%</td>
<td>37%</td>
<td>38%</td>
<td>9%</td>
</tr>
<tr>
<td>British Columbia</td>
<td>16</td>
<td>35</td>
<td>39</td>
<td>10</td>
</tr>
<tr>
<td>Quebec</td>
<td>22</td>
<td>38</td>
<td>32</td>
<td>7</td>
</tr>
<tr>
<td>Canada</td>
<td>18</td>
<td>37</td>
<td>36</td>
<td>9</td>
</tr>
<tr>
<td>Sweden</td>
<td>15</td>
<td>35</td>
<td>40</td>
<td>10</td>
</tr>
<tr>
<td>Netherlands</td>
<td>14</td>
<td>38</td>
<td>40</td>
<td>8</td>
</tr>
<tr>
<td>United States</td>
<td>20</td>
<td>41</td>
<td>33</td>
<td>6</td>
</tr>
<tr>
<td>Australia</td>
<td>12</td>
<td>38</td>
<td>42</td>
<td>8</td>
</tr>
</tbody>
</table>

Note: Some amounts will not add to 100 percent due to rounding.
SKILLS TRAINING IN THE WORKPLACE

HOW WORKPLACES AND EMPLOYEES CAN BENEFIT FROM TRAINING

After education, a common place to acquire and build skills is in the workplace. Unfortunately, not all Ontarians receive the same amount of workplace training. The majority of employers that offer training are large private sector firms where training is disproportionately received by workers who are already highly educated. This leaves a gap for the province’s low-educated and vulnerable populations. One way to improve this is by adjusting the design of the Canada-Ontario Job Grant and for workplaces to experiment with shorter, flexible online courses.

Skills training in the workplace is fundamental for employees

The workplace is an ideal place to acquire and build new skills. However, the shifting labour market means that companies may have to balance investing in their employees with adopting new technology, which might mean laying off workers. Automation presents risks as well as opportunities. Investing in and adopting new technologies can be good for many businesses, but can sometimes have negative consequences for workers.

In the short term, not all companies can substitute labour with technology, so some may need to train employees to work with technology. Workplace skills training and development is one way to respond to the increasing prevalence of technology, and the need for new and complex skills. Some workplaces have more than enough capacity to design and execute training programs in-house, but others lack human and financial capital and need government programs to bridge the gap. However, such programs must be designed for and by companies and employees to be effective.
What is workplace training and development?

Workplace training and development is broadly defined as:

“Organized, systematic education and activities where people take part in order to obtain knowledge and/or learn new skills for a current or a future job, to increase earnings, to improve job and/or career opportunities in a current or another field and generally to improve their opportunities for advancement and promotion.”

There are two types of workplace training:

- **Formal training** is delivered through courses provided by educational institutions or instructors, i.e., an external, third-party provider.
- **Informal training** is provided through on-the-job sessions, mentoring by managers, co-workers, or business owners, i.e., the firm.

The content or type of training can range from essential skills to professional development, as seen in the following framework (Exhibit 9).

This pyramid illustrates the training options available to firms. They may choose to train their employees at just one level, or move employees through the pyramid toward professional development.

![Exhibit 9: Workplace training and development pyramid](image-url)
Training provides benefits for firms

Workplace training can improve worker productivity, performance, retention, and job satisfaction. It can also increase firm competitiveness, business growth, and act as a differentiator in attracting and retaining quality talent. Estimating returns on their investment and when they will occur is often a challenge for businesses.

Productivity & performance. Employee training provides gains in productivity at both the individual and firm levels. The marginal productivity of a trained worker is, on average, substantially higher than an untrained worker. In a meta-analysis of 60 studies, training had a significant positive effect on productivity. It was also found to impact workers at all levels – executives, middle managers, and entry-level employees.

Profitability. The importance of training for profitability varies by industry. In the retail sector, investing in employees has been linked to increased sales. The marginal productivity of a trained worker is, on average, substantially higher than an untrained worker. In a meta-analysis of 60 studies, training had a significant positive effect on productivity. It was also found to impact workers at all levels – executives, middle managers, and entry-level employees.

Retention & employee satisfaction. Training can increase employee satisfaction and performance. The most common reasons that employees leave their jobs are opportunities for career growth, pay and benefits, their direct manager or management, culture, and job fit. Training is one such way to offer this connection, building loyalty and, therefore, retention.

Adapting in the face of technological change. By offering regular employee training, businesses can manage risks and disruptions related to technological change. This could include helping workers adapt with a new technology or learn how automation can complement or change aspects of their job.
Data are needed on workplace training in Ontario
Unfortunately, little information is available on workplace training in practice in Canada or Ontario.\textsuperscript{50} Data are sparse, inconsistent, or anecdotal. Statistics Canada discontinued their Workplace and Employee Survey in 2006. Firms struggle to collect training data, and when they do, are unlikely to share it publicly. The lack of quality data makes it difficult to come to conclusions about the state of workplace training in the province.

Recent employer surveys conducted by the Business Council of Canada, the Canadian Federation of Independent Business, and the Conference Board of Canada add to the conversation.\textsuperscript{51} But, while useful snapshots, the surveys reflect a small sample of Canadian companies’ activities on training. They also may include companies that agree to participate because they have positive feelings about their internal training procedures, creating a selection bias. Nonetheless, these surveys allow for some insights into training in Canada to be gained.

Canadian firms are spending less on training today
Available data show that spending on workplace training across Canada has declined since 1993.\textsuperscript{52} The training that still occurs is happening in large private sector firms and for highly educated workers (see What we know about workplace training in Ontario).\textsuperscript{53}

WHAT WE KNOW ABOUT WORKPLACE TRAINING IN ONTARIO

How much is spent?
\begin{itemize}
\item Between 1993 and 2015, per employee spending (in constant dollars) on workplace training in Canada declined by 37 percent – from $1,207 per employee in 1993 to $800 in 2014.\textsuperscript{54}
\item Canadian organizations spent 1.41 percent of their annual payroll on training activities in 2014-15.\textsuperscript{55}
\end{itemize}

Who trains?
\begin{itemize}
\item Delivery of training depends on engagement and commitment by the employer.
\item Training in Ontario is concentrated among large firms and in regulated industries.\textsuperscript{56}
\end{itemize}

Who receives training?
\begin{itemize}
\item Highly educated workers are more likely to receive training. Workers in lower wage occupations, older workers, those with less education, non-unionized workers, and women are less likely to receive employer-sponsored training.\textsuperscript{57}
\end{itemize}

What are the impacts?
\begin{itemize}
\item Employers are unsure how to track the impact that training has on individuals and firms.
\item Companies need guidance and information on the optimal level of employee training.
\end{itemize}

What are the challenges?
\begin{itemize}
\item Costs, risk of turnover, and poaching, and a lack of human resource capacity are barriers to training.
\item Small-to-medium-sized enterprises report being more disproportionately impacted by these challenges.\textsuperscript{58}
\end{itemize}
Compared to its peer jurisdictions, data from the OECD illustrate Canada’s public spending on all training activities including institutional, workplace, and training through apprenticeship programs sits at 0.07 percent of Gross Domestic Product (GDP) in 2014 (Exhibit 11). This is in line with the Netherlands, but less than spending by the Swedish government. However, this data may not fully reflect all spending in Canadian provinces and territories, and may only have included a measurement of federal spending on training programs. Unfortunately, data for training among these peers are not available solely for training undertaken by workplaces.59

Less than half of Ontarians received workplace training in 2012
PIAAC’s 2012 survey results (latest data available) illustrate that less than half of employed Ontarians (44 percent) received on-the-job training (Exhibit 12).60 Compared to its peer jurisdictions, more Ontarians are receiving on-the-job training than their counterparts in Sweden and Québec, but less than in the Netherlands. Such training falls into Job and Firm Level Training on the workplace training and development pyramid.

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**EXHIBIT 11** Public spending on training, Canada and select peers, 1985-2014

<table>
<thead>
<tr>
<th>Year</th>
<th>Sweden</th>
<th>Canada</th>
<th>Netherlands</th>
<th>United States</th>
<th>Australia</th>
</tr>
</thead>
<tbody>
<tr>
<td>1985</td>
<td>0.3</td>
<td>0.4</td>
<td>0.2</td>
<td>0.3</td>
<td>0.4</td>
</tr>
<tr>
<td>1990</td>
<td>0.6</td>
<td>0.5</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>1995</td>
<td>0.7</td>
<td>0.6</td>
<td>0.6</td>
<td>0.5</td>
<td>0.4</td>
</tr>
<tr>
<td>2000</td>
<td>0.4</td>
<td>0.3</td>
<td>0.4</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>2005</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>2010</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>2014</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Note: Training includes institutional, workplace, and alternate/integrated training, as well as spending on apprenticeship programs.
Source: Institute for Competitiveness & Prosperity analysis based on data from the Organisation for Economic Cooperation and Development.

**EXHIBIT 12** On-the-job training completed in last 12 months, Ontario and select peers, 2012

<table>
<thead>
<tr>
<th>Country</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Netherlands</td>
<td>47%</td>
<td>53</td>
</tr>
<tr>
<td>Ontario</td>
<td>56%</td>
<td>44</td>
</tr>
<tr>
<td>Sweden</td>
<td>61%</td>
<td>39</td>
</tr>
<tr>
<td>Québec</td>
<td>62%</td>
<td>38</td>
</tr>
</tbody>
</table>

Note: On-the-job training is defined as organized sessions by supervisors or co-workers. These activities have planned periods of training, instruction or practical experience, using normal tools of work. It is usually organized by the employer to facilitate adaptation of new staff. It may include general training about the company as well as specific job-related instructions (safety and health hazards, working practices). “Don’t knows” and “valid skips” have been removed.
There are Innovative solutions for training
As outlined in Chapter 1, the labour market has undergone many structural shifts in employment, wages, and GDP contribution, largely driven by changes in task demand as a result of technology. Companies respond to these changes as best they can, but may face additional barriers to offering training.61

Many Ontario firms have expressed difficulty sourcing and retaining appropriate talent over time.62 It is one thing to recruit the appropriate candidate, but another to retain and train them to meet future company needs. Some small-to-medium-sized employers also fear that larger companies will poach their employees after they train them.63

Where these challenges exist, there are innovative solutions available to employers. There are a wide variety of massive open online courses (MOOCs) in which employers could encourage their staff to enroll. Employers could allow dedicated skills development time during the workday. This is of low cost to the employer, since they simply need to provide the time during scheduled work hours to complete training. It is easily accessible for employees because they can continue course work at home if they choose. For instance, if an employee wants to explore a new coding program or develop one of the in-demand skills discussed in Chapter 2 (creativity, entrepreneurship, digital literacy, etc.) they can simply search an online data base, like edX, and begin.

When faced with costs constraints, there are innovative solutions available to firms.

There are new and emerging companies that assist firms in identifying and offering employee training. Palette Inc, a not-for-profit platform in the incubation stages at BII+E, will work with high growth companies to identify skill needs and leverage existing training organizations to create retraining programs that meet talent demands. The intended outcome is an ecosystem of companies that can locally find the talent they need and a cohort of skilled mid-career workers.

Ontario firms should look to Siemens Canada for inspiration on integrating lifelong learning into the workplace. The company offers tuition reimbursement for employee’s continuing education and e-learning. They emphasize training in soft skills and interpersonal courses to complement the core skills they already expect of their employees.64

However, where gaps in workplace training persist, there is a role for government to support and incentivize employer training.
The Canada-Ontario Job Grant must be modernized to support workplace training

How government should intervene in workplace training is a complex public policy issue, especially given lack of reliable training data.

The COJG is the main government program for workplace training. Launched in 2014, the COJG’s purpose is to “reduce inequalities in access to and participation in adult learning, especially among the low educated and low skilled.” The grant is for unemployed workers seeking training to obtain a job, underemployed workers seeking training for a better job, and employed workers seeking training for a better job. Employers can use the grant to train unemployed individuals so long as they hire that individual at the end of the training.

The program is a cost-splitting grant for employers and goes toward formal workplace training. Employers are required to contribute a minimum of one-third of the costs. The grant pays the remaining eligible costs up to a maximum of $10,000 per person. Companies with less than 50 employees that hire and train unemployed individuals could be eligible for 100 percent funding and up to $15,000 per person.

Despite its good intentions, evidence suggests that the program is not living up to its goals. Some of the main challenges identified with the program include:

- **Uptake**: When the federal government first implemented the grant, the program hoped to train 130,000 Canadians each year. As of 2016, only 37,000 participants across the country were funded for training. As of July 2017, the number of grants administered in Ontario was 12,861. The majority of grants were accessed by the manufacturing and food sector. In total, just over 66,000 Ontarians participated in the training over a 4-year period.

- **Training criteria**: The program guidelines indicate that training must be delivered by external providers. Not all training can be provided by a third party provider – sometimes the company has more capacity and knowledge on the specific skill set it needs. As a result, employers want the criteria broadened to include informal training that they can offer in-house.

- **Program design**: Employers with less than 50 employees receive leniency on costs. However, the criteria do not distinguish between the types of organization. A not-for-profit with over 50 employees could experience the same cash flow challenges as an organization with a small number of employees. Employers would like the grant to be revised to consider these factors.

- **Access**: A two-year review of the grant showed a low uptake among unemployed individuals. If the government wants to assist the unemployed through this grant, they must consider how to connect these individuals with employers. They must also consider whether there are sufficient incentives and channels in place for employers to find unemployed individuals.

- **Incrementality**: It is an ongoing challenge to prove that the grant is providing money above and beyond what would have already been spent by employers. In Ontario, one third of employers indicated they would have paid for the training regardless of receiving the COJG funding.

- **Administration**: Employers have stressed the administrative burden involved in obtaining and implementing the grant. Some employers require more flexibility in the proportion of the grant money that can be spent on administrative tasks.
Employer vs. individual driven: The grant design places training decisions in the hands of the employers, and in many ways, removes control from the individual. This might be problematic if training decisions are made in absence of the employee’s wants and needs. An individual could go years without receiving training through their workplace, forcing them to supplement with outside learning or no learning at all. Employer driven training is essential, especially when it comes to determining what skills are most needed for their workplace. However, it may be worthwhile to consider how individuals can be involved in the grant more directly.

The Institute encourages government to engage in a full review and modernization of the COJG, involving employers, employees, and Employment Ontario service providers.

Workplace skills training is a proactive approach to creating a highly skilled workforce that can remain resilient in the face of automation. However, many Ontarians are unemployed and workplace training remains out of reach. Due to the shortcomings of the COJG, there is a need for reactive, government skills training programs.
Ontario should rethink its skills training programs to ensure it is creating nimble, responsive programming with a long-term perspective. Despite changes in the labour market, such as the decline in employment and wages in routine manual occupations, government training programs, like Second Career, have remained unchanged since 2008. Many of the challenges facing these programs stem from a short-term focus on job placement and an ineffective funding structure.

**Government programs can bridge the training gap**

Ontario’s government skills training programs attempt to bridge the gap between individuals’ skills and workplace needs. They are designed to help individuals overcome barriers to labour market entry and recover from setbacks such as layoffs and disruptions. As technological change and automation cause labour market shifts, training programs are especially necessary for individuals in industries or occupations facing a high probability of automation.

Ontario has a large array of innovative training programs available for all individuals. In recent years, the province has made attempts to modernize and integrate its employment and training system to increase the access and effectiveness of its programs. This includes launching the Ontario Centre for Workforce Innovation in 2016, exploring new sources of labour market information (LMI), and improving technology for both service providers and government. This is a positive step and recognition of the importance of skills training and retraining.
Two of the largest training programs, Employment Service (ES) and Second Career (SC) are the focus of this evaluation. ES and SC account for over 65 percent of the total employment and training budget and, in 2015/16, assisted 194,294 and 8,626 Ontarians respectively. They were transferred by the federal government to the provinces in 2007. They are designed and delivered from a 20-year-old labour market and service delivery framework, and operate in a confusing network of training programs with multiple stakeholders and governance structures.

To measure whether these programs are meeting the needs of Ontarians, the Institute took into account the following: the extent to which programs are nimble and responsive to labour market changes, the extent to which programs help clients obtain sustainable, long-term employment, and the extent to which programs are taking into account shifting occupation demand in the face of automation.

ES and SC do not show a preparedness for future changes. They have a short-term focus, job retention rates are low, the client base has changed since implementation. These factors suggest areas of weakness within the programs.

There are four main challenges preventing the programs from meeting their goals and being prepared for future changes:

1. Training programs are supply-led, not demand-informed. There is limited emphasis on employer needs and knowledge of the local labour market conditions.

2. Government is not tracking the correct outcomes. There is an over-emphasis on short-term outcomes rather than long-term impact. This is encouraged by current funding arrangements.

3. Competition for clients affects quality of service. The service delivery framework does not incentivize collaboration among service providers. They compete for clients rather than working together to help clients achieve optimal outcomes.

4. There is a lack of real time local labour market information and program data analysis.

**Employment Service and Second Career are failing to adapt to the labour market and meet the needs of Ontarians.**

**The design of Employment Service and Second Career is not serving Ontarians**

The Ministry of Advanced Education and Skills Development (MAESD) is the main administrator of training programs in Ontario through a network of service providers called Employment Ontario (EO). EO served more than one million people in 2015/16, including laid-off workers, apprentices, older workers, newcomers, and youth.

Of the eight Employment and Training programs offered by EO, ES and SC are particularly focused on placing Ontarians into sustainable jobs. To effectively serve Ontarians, these programs should assist clients in getting jobs in which they are able to remain and advance their skills over the long term.

**An evaluation of Employment Service**

ES intends to help Ontarians find sustainable employment by delivering career counselling support through a network of around 400 service providers across the province. ES providers offer three types of services: one-on-one job search assistance, job matching, and job training and retention assistance. These assisted programs are intended for those who are further from the labour market, such as workers older than 44 years of age, with a grade 12 education or less, and who have been out of school, work, or training for six months or more.
Many ES clients are highly educated, young, and recently unemployed. Though being targeted towards vulnerable populations and those under-represented in the labour market, assisted services are largely used by individuals between 25 and 44 years old (47 percent), those with a college or university degree (50 percent), and by individuals who have been unemployed for three months or less (47 percent). The data show that the services are being used by people for whom the programs were not originally intended to serve.

Some of these rates are higher than provincial averages (i.e., 27 percent of the population is aged between 25 and 44) and hint at larger issues regarding whether people are being misdirected into ES programs and a potential skills mismatch between the education system and the province’s shifting labour market. These are issues that need to be addressed by policymakers and program designers.

ES is not resulting in sustainable employment. After using a service, a client exits the system. In 2015/16, 68 percent of clients reported being “employed on exit” (Exhibit 13). Of the 32 percent of clients who did not find employment on exit, only 45 percent of those found employment after six months. There was also a drop in the response rate of clients over time – from 100 percent on exit to 28 percent after 12 months, suggesting that there is room for improvement. There needs to be a greater focus on improving the long-term impact of the ES program and on the employment rates over six and 12 months. Without incentives or resources, it is difficult for service providers to maintain relationships with clients over time so that longitudinal data can be collected. These limitations impact results and program evaluation.

<table>
<thead>
<tr>
<th>EXHIBIT 13 Employment Service outcomes, Ontario, 2015/16</th>
</tr>
</thead>
<tbody>
<tr>
<td>ON EXIT</td>
</tr>
<tr>
<td>100%</td>
</tr>
<tr>
<td>68% of clients indicated they were employed</td>
</tr>
<tr>
<td>15% of clients reported being employed in the area of their training or choice, on exit</td>
</tr>
<tr>
<td>13% of clients entered training or education programs, on exit</td>
</tr>
</tbody>
</table>

Note: If an ES client reports being employed on exit, the service provider is not required to conduct a 6- or 12-month follow up. Similarly, if a client has a ‘positive’ outcome at the 6-month follow-up, a 12-month follow-up does not need to be done. Thus the 45 percent of clients who report being employed at 6 months is not 45 percent of all ES clients, but rather 45 percent of those ES clients who were not employed on exit. Values may not add to 100.

Source: Institute for Competitiveness & Prosperity analysis based on data from the Ministry of Advanced Education and Skills Development.
Clients are returning to occupations that are at high risk of automation. The top 10 occupations that ES clients were employed in after exiting the program are all at a medium-to-high risk of being affected by automation in the next 10 to 20 years (Exhibit 14). This is problematic in terms of job sustainability for younger clientele, but perhaps not so for workers who are close to retirement age. For example, truck drivers are currently in high demand in many regions in Ontario. Over time, however, it is expected that the tasks involved in truck driving will evolve and that it may be in less demand 10 to 20 years from now. While truck driving provides reasonable employment opportunities in the short- and medium-term, it might be a more sustainable occupation for a 55-year-old to be transitioned into, but not a 40-year-old.

ES clients work with a Job Developer to find suitable employment options. Job Developers must consider the current and future labour market trends as well as employer demand in the local labour market when assisting individuals in finding sustainable employment. Job Developers must use the information they have to best transition clients into long-lasting employment. This decision making would benefit from more information sharing with local labour boards and the new Local Employment Planning Councils (LEPCs), which should have the most accurate, in-time labour market information for clients.

Exhibit 14: Employment Service occupations on exit and risk of automation, Ontario, 2015/16

<table>
<thead>
<tr>
<th>Employed Occupation on Exit</th>
<th>Percentage of Total Clients Served in 2015/16 (%)</th>
<th>Probability of Automation in the Next 10-20 Years (%) and Risk Level of Automation (Low to High)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service representatives, other customer and personal services (e.g., hotel front desk clerk)</td>
<td>10%</td>
<td>85% High</td>
</tr>
<tr>
<td>Service support (janitor and caretaker)</td>
<td>8</td>
<td>68 Medium</td>
</tr>
<tr>
<td>Labourers in processing, manufacturing and utilities (machine operator)</td>
<td>8</td>
<td>66 Medium</td>
</tr>
<tr>
<td>Sales representatives and salespersons – wholesale and retail trade (retail salesperson)</td>
<td>5</td>
<td>92 High</td>
</tr>
<tr>
<td>Administrative and financial supervisors and administrative (administrative assistant)</td>
<td>5</td>
<td>77 High</td>
</tr>
<tr>
<td>Sales support (cashier)</td>
<td>5</td>
<td>86 High</td>
</tr>
<tr>
<td>Trades helpers, construction labourers and related (construction worker)</td>
<td>5</td>
<td>88 High</td>
</tr>
<tr>
<td>Office support (receptionist)</td>
<td>5</td>
<td>95 High</td>
</tr>
<tr>
<td>Transport and heavy equipment operation and related maintenance (transport truck driver)</td>
<td>5</td>
<td>80 High</td>
</tr>
</tbody>
</table>


An evaluation of Second Career

SC was designed as a short-term response to the Great Recession, but was regarded as a successful program and became permanent. The program funds skills training for recently laid-off workers seeking employment in high-demand occupations. It provides up to $28,000 per client to assist with tuition, books, transportation, and basic living expenses. Clients are required to demonstrate how their proposed training course meets the needs of the labour market. The program limits clients to a maximum of a two-year college degree or diploma program.

The Auditor General’s 2016 Annual Report indicated that only 38 percent of SC clients were employed upon program completion and only 14 percent of those individuals found employment in their field of training, a professional occupation, or a more suitable job than before starting the program. Over the long term, however, the SC program has seen success with 81 percent of clients reporting being employed after 12 months of completing their training in 2015/16. Despite this, the Annual Report suggests that there are larger problems within SC, including the changing demographics of participants, outcomes, and the occupations in which individuals are trained.
The users of Second Career have changed since the program was introduced in 2008. The changing labour market impacted the composition of clients using SC, but the program design has not changed with them. Clients today are older, have lower levels of education, and are more likely to have been laid off from lower-skilled occupations compared to previous years.85

Participants are being trained into low-demand occupations. SC was designed to assist laid off workers entering employment in high demand occupations. However, a review of the program illustrates that clients are seeking training for and obtaining employment in non-high growth sectors in the local labour market. Further, around 10 percent of participants are trained in the same occupations from which they were laid off.

The Institute uses an index to measure the extent to which training occupations match local job demands (Exhibit 15). Relative to the whole province, SC participants in northeastern Ontario are trained in occupations that have the highest matching score with the local demand (11 of 30 occupations trained in the northeast are considered well matched). Participants in Ottawa, on the other hand, are the least well matched in their training for the local market (only eight of the 35 occupations trained in Ottawa are well matched). Although this index does not forecast future labour market demand, for a program whose sole focus is to match participants into high demand occupations, better results would be expected.

However, there are caveats with labour market information. Just because 20 health care administrator jobs are available in Hamilton today, does not mean there will be any health care administrator jobs available after a client completes a two-year course. In an ideal program, there would be increased collaboration among ES agencies, training institutions, SC program advisors, employers, local labour boards.

Second Career evaluation focuses on immediate outcomes rather than overall impact. The program is evaluated based on the number of individuals who are employed in

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**EXHIBIT 15** Second Career labour market match by region, Ontario, 2015/16

<table>
<thead>
<tr>
<th>REGION</th>
<th>REGIONAL AGGREGATE TRAINING MATCHING SCORE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Northeast</td>
<td>62.7</td>
</tr>
<tr>
<td>2 Muskoka-Kawarths</td>
<td>57.1</td>
</tr>
<tr>
<td>3 Kingston-Pembroke</td>
<td>44.0</td>
</tr>
<tr>
<td>4 London</td>
<td>40.0</td>
</tr>
<tr>
<td>5 Kitchener-Waterloo-Barrie</td>
<td>39.9</td>
</tr>
<tr>
<td>6 Windsor-Sarnia</td>
<td>39.5</td>
</tr>
<tr>
<td>7 Hamilton-Niagara Peninsula</td>
<td>38.6</td>
</tr>
<tr>
<td>8 Toronto</td>
<td>37.2</td>
</tr>
<tr>
<td>9 Stratford-Bruce Peninsula</td>
<td>35.4</td>
</tr>
<tr>
<td>10 Northwest</td>
<td>35.0</td>
</tr>
<tr>
<td>11 Ottawa</td>
<td>33.5</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>46.6</strong></td>
</tr>
</tbody>
</table>

Note: The higher the score, the better matched the participants’ training was with local labour market demands. See Appendix C for a detailed methodology of the regional aggregate training matching index. Regions are based on Economic Regions, as defined by Statistics Canada and Ontario, 2006. Source: Institute for Competitiveness & Prosperity analysis based on data from the Ministry of Advanced Education and Skills Development and Statistics Canada, CANSIM Table 285-003 and 282-0157.
their field of training upon exit. Today, it takes longer for clients to find suitable employment than in 2009, so measuring success by this metric may be less meaningful today. SC could benefit from refocusing who the program is meant to serve and redesigning how it is evaluated. Focusing on the impact of training over a longer period of time rather than the immediate outcomes combined with more post-training employment support for clients who need it could change the success rate of the program.

The Targeted Initiative for Older Workers (TIOW) is a training program designed for unemployed workers aged 55 to 64, but was phased out in 2017 (See Older Workers Need Training). Older workers may now be forced to enter other programs like SC. Currently, older clients are less likely to obtain full time employment once completing their training compared to younger clients – especially those over the age of 65 (Exhibit 16).86

OLDER WORKERS NEED TRAINING

Older workers (55 to 64 years) are an essential and growing component of Ontario’s workforce, representing 16 percent of the labour force in 2016, up from 14 percent in 2011.87 Yet, they are one of the demographics most impacted by technological disruption and face significant and unique barriers to finding work.88

The TIOW program is cost-shared between the provincial and federal governments. It helps unemployed older workers, providing programming that “increases their employability, reintegrates them into employment and ensures they remain active and productive labour market participants.”89 The 2017 Federal Budget renewed the government’s commitment to supporting older workers and announced the creation of new Workforce Development Agreements that consolidate existing agreements, including the TIOW programming. However, in March 2017 the program was phased out in Ontario and it seems unlikely that a replacement will be put in place before the Workforce Development Agreements are finalized. As a result, eligible candidates may not have access to any resources until the agreements are initiated.90

With workplace underinvestment in training and a lack of government programs that specifically target this age group, older workers will face more challenges adapting to the changing workplace in the future. With these considerations, the future of training programs for older workers must be made a priority in both the federal government and within the province. The two jurisdictions should coordinate their programming to ensure that no group is left behind.

EXHIBIT 16 Employment rate of Second Career clients by age group after 12 months, Ontario, 2010-2016

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Employed (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15-24 years</td>
<td>54%</td>
</tr>
<tr>
<td>25-44 years</td>
<td>48%</td>
</tr>
<tr>
<td>45-64 years</td>
<td>47%</td>
</tr>
<tr>
<td>65+ years</td>
<td>35%</td>
</tr>
</tbody>
</table>

Source: Institute for Competitiveness & Prosperity analysis based on data from Ministry of Advanced Education and Skills Development.
Focusing on the impact of training over a longer period of time rather than the immediate outcomes could change the program’s success.

There are four opportunities for improvement in Employment Ontario programs

ES and SC are failing to adapt to the labour market and meet the needs of their clients. There are four areas that can be improved upon to encourage a greater focus on the long-term impact of the programs.

1. **Ontario’s training programs should strive to be demand informed**

The EO model has adopted a supply-side approach as its funding mechanism. Program administrators focus on the skills that clients already have to help them gain employment. The program is not designed in a way that allows agencies the time and resources to address the core reasons why someone has difficulty finding and keeping work. Further, if the skills that the clients already have are not the ones that employers are looking for, it will be hard for them to find, keep, and advance in a job.

A demand driven program would mean focusing on the skills employers need. To create demand-informed programs, agencies can use their Job Developers and local labour boards. Job Developers can create direct relationships with employers and labour boards, resulting in improved client-to-job matching. If a client is matched to a job that can use their skills, retention rates improve. To this end, Job Developers need to be given the supports and time to develop relationships alongside finding existing client placements. Further, LEPCs and labour boards should be utilized more effectively to facilitate the connection between employers and Job Developers.

2. **MAESD needs to incentivize service providers to achieve long-term impact**

The way programs are funded directly impacts how they operate. MAESD funding to agencies is contingent on meeting targets, particularly employment outcomes on exit. However, the targets do not incentivize service providers to focus on long-term client or service quality improvements year-over-year. While the targets for some service providers do change year-over-year, the adjustments seem to be more ad-hoc than strategic. Tying funding to performance creates unintended consequences, such as a focus on clients who are easier to serve (i.e., clients who are easiest to match with job placements) in order to meet reporting requirements.

Additionally, in the current program evaluation, anecdotal and intrinsic benefits are difficult to capture. For example, a client who faces multiple barriers to employment may experience an outcome above and beyond job placement, such as an increase in confidence or knowledge of the Canadian labour market.

Using job retention rather than job placement rates on exit as a funding requirement could be a remedy. However, this solution will not be simple to implement since it can be challenging for service providers and MAESD to follow up with clients after they stop using the services. Resources and funding for service providers would be needed to maintain relationships and follow-up with clients over time.
3. Service providers should collaborate – instead of compete – for collective success

The current funding mechanism increases competition between agencies instead of encouraging collaboration, specialization, and innovation between them. When government has a target-based funding system it creates an artificial market. Agencies compete for clients to meet their targets and may put funding interests ahead of the client. Increased collaboration would allow clients to receive the most appropriate, specialized, and effective assistance possible.

By changing the funding structure to focus on improving long-term outcomes each year, MAESD can encourage best practice in the agencies, reduce competition for clients, and increase the trust between the Ministry and the service providers.

4. Greater labour market information and program data analysis will improve program outcomes

Reliable up-to-date labour market information is vital for effective training programs. It allows staff to provide relevant workshops and training guidance that aligns with local needs. Data gaps currently limit practitioners’ ability to advise clients at a local level. MAESD funds workforce boards to assess local labour market conditions, but many of these groups have been found to be ineffective and out-dated. They should be the proactive local knowledge source for labour market information. Although labour market information has limitations for anticipating future skills needs, with greater access to employer needs, service providers will be able to better serve their clients.

A challenge for practitioners and MAESD is the large size of datasets produced by the case management system. It is hard to determine the validity of these data, especially when there is intense pressure to achieve targets and when agencies have been known to skew their data. With the establishment of the new Data Analytics Unit within the Employment Ontario Division, hopefully MAESD will be able to conduct more in-depth program analysis and pass that knowledge on to the agencies.

Skills training practitioners are working with limited resources to make quality employment and training programs in Ontario. However, there is much room for improvement. If Ontario wants its programs to keep pace with the shifting labour market, the EO business model must be re-designed. Moving forward, all actors need to be willing to examine the program results and talk openly about ways to revitalize their function.
There are risks as well as opportunities in the labour market shift. The province can seize these opportunities – but only if everyone involved embraces their role in the system. The Institute proposes 10 recommendations for government, employers, educational institutions, and employment training providers to prepare Ontario’s workforce to be resilient in the face of current and future labour market shifts. The personas of Erin, Richard, and Vandana are revisited to show how these recommendations would impact their lives.
BUILDING ONTARIO’S RESILIENT WORKFORCE

FOCUS ON SKILLS-BASED HIRING
The traditional hiring approach focuses on the credentials of an individual. In today’s shifting labour market, employers can adopt a skills-based hiring approach whereby they review applications based on the skills an individual possesses. This will help to better match individuals with job roles. Skills are often transferable to many professions and tasks. To this end, individuals should also focus on skill presentation in applications and interviews.

FIND SHORTER, COST-EFFECTIVE WAYS TO OFFER TRAINING TO EMPLOYEES
With the increase of open online training platforms and innovative training ventures, like MaRS Work & Learning, there are more ways than ever for employers to embrace continuous learning in their workforce. Employers could encourage employees to use slow periods to gain a new skill set through open online courses, which are often of no cost to the employer.

COLLECT TRAINING DATA AND METRICS
To ensure governments can best support Ontario businesses with their training needs, employers must work to collect data on training and share it when possible. Working with the Ontario Chamber of Commerce may be a place to start. A deeper understanding of the training occurring in the province will assist policymakers in finding new and better ways to support businesses.

THE ROLE OF EMPLOYERS

The workplace and Erin
To help Erin stay up to date with her skills, her employer runs an intensive digital skills training program for all middle management employees. Erin and her coworkers are given the opportunity to learn new skills to increase productivity in their current roles and give them general skills training for future job tasks and roles. This gives Erin a greater sense of loyalty and ownership over her role and she feels a sense of renewed commitment to her organization.

ERIN
Data Entry Clerk
Sudbury
EXPAND THE CRITERIA OF THE CANADA-ONTARIO JOB GRANT
Several aspects of the COJG criteria should be examined and further flexibility
given to employers. The grant must recognize employer-led informal training
where appropriate, make it easier for unemployed individuals to receive
funding, and understand that financial constraints do not only apply to firms
with less than 50 employees. A review of the program’s administration and
incentive structure must be conducted to improve overall uptake by employees
and employers.

CHANGE THE EVALUATION AND FUNDING STRUCTURE
OF EMPLOYMENT SERVICE ORGANIZATIONS AND
TRAINING PROGRAMS
Ontario must move to a performance measurement system and funding model
that focuses on more than just the placement rates of clients on exit. Adopting
a long-term view of the impact of employment and training programs over
immediate outcomes is crucial for policymakers and program designers to
improve service delivery and design. This requires an overhaul of the current
case management system to prioritize collecting job retention rates over time
and the performance of service providers. One way to achieve this is through
experimentation with a few larger, more established organizations. By working
with larger organizations to create the most effective business model, smaller,
less-resourced organizations can more easily replicate the results.

ALLOW SERVICE PROVIDERS TO ADAPT TO LOCAL NEEDS
Individual communities have individual needs. Service providers should be
encouraged and equipped to specialize according to local need and refer clients
to other local service providers who are best suited to the client, rather than
encouraged to keep each client to meet targets. For example, if there is one
agency that is better equipped to service older clients, they should be the go-to
agency to which other agencies refer their older clients.

EXPAND THE ROLE OF THE LOCAL EMPLOYMENT PLANNING
COUNCILS (LEPCs)
Fresh perspectives and approaches are needed to improve labour market infor-
mation and the effectiveness of local workforce boards. The LEPC pilot project
is effective in collecting up-to-date, local labour market information. LEPCs
need to take on the role of the intermediary, connecting employment service
providers, employers, and clients. By aligning training programs with local job
development activities, more successful employment outcomes will be achieved.

The employment office and Richard
Richard was referred to a local employment service provider
that specializes in older clients who have been laid off from the
manufacturing sector. He worked with the agency’s Job Developer
identifying his transferable skills, updating his resume, and gaining a
better understanding of the local labour market and its in-demand skills.
As a result, he found a job as an electrical trades contractor.
FOCUS ON TEACHING BROADER SKILL SETS
Future skills and occupation trends are hard to predict. Educational institutions should focus on helping students identify and train in a wide variety of skills, especially those identified as being in demand in the future (creativity, problem solving, critical thinking, digital literacy). Skills-focused education, especially transferable skills, will allow students to transition through the labour market more seamlessly. The old model of moving from education to a single, long-term career is becoming far less common.

CREATE SHORTER, MORE FLEXIBLE PROGRAMS
Educational institutions must be willing to create training programs that are much shorter and more flexible to adapt to adult learners. Adults returning to school need to fit education into an already busy schedule. New models, such as MOOCs, are more agile and responsive to employer and individual needs. These programs also need to be affordable and in line with local labour market demands.

COORDINATE WITH EMPLOYERS
There should be increased information sharing and alignment of objectives between primary, secondary, and post-secondary education and employers. Training institutions and employers should meet regularly to seek input on curriculum to ensure they are graduating students with work ready skills. Work-Integrated Learning (WIL) and co-operative education programs are one way to achieve this.

To ensure Ontario’s workforce is resilient for the future, all actors in the skills training ecosystem must play their part. Employers, government, and educational institutions must work together to implement these recommendations to help prepare Ontario for current and future labour market shifts.
### APPENDIX A Task breakdown by NOC-S code

#### NOC-S 47 2001

<table>
<thead>
<tr>
<th>Task breakdown by NOC-S code</th>
<th>Occupation Group</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-routine cognitive and analytical</strong></td>
<td></td>
</tr>
<tr>
<td>A0</td>
<td>Senior Management Occupations</td>
</tr>
<tr>
<td>A1</td>
<td>Specialist Managers</td>
</tr>
<tr>
<td>A2</td>
<td>Managers in Retail Trade, Food and Accommodation Services</td>
</tr>
<tr>
<td>A3</td>
<td>Other Managers n.e.c.</td>
</tr>
<tr>
<td>B0</td>
<td>Professional Occupations in Business and Finance</td>
</tr>
<tr>
<td>B1</td>
<td>Finance and Insurance Administration Occupations</td>
</tr>
<tr>
<td>C0</td>
<td>Professional Occupations in Natural and Applied Sciences</td>
</tr>
<tr>
<td>C1</td>
<td>Technical Occupations Related to Natural and Applied Sciences</td>
</tr>
<tr>
<td>D0</td>
<td>Professional Occupations in Health</td>
</tr>
<tr>
<td>D1</td>
<td>Nurse Supervisors and Registered Nurses</td>
</tr>
<tr>
<td>D2</td>
<td>Technical and Related Occupations In Health</td>
</tr>
<tr>
<td>D3</td>
<td>Assisting Occupations in Support of Health Services</td>
</tr>
<tr>
<td>E0</td>
<td>Judges, Lawyers, Psychologists, Social Workers, Ministers of Religion, and Policy and Program Officers</td>
</tr>
<tr>
<td>E1</td>
<td>Teachers and Professors</td>
</tr>
<tr>
<td>E2</td>
<td>Paralegals, Social Services Workers and Occupations In Education and Religion n.e.c.</td>
</tr>
<tr>
<td>F0</td>
<td>Professional Occupations in Art and Culture</td>
</tr>
<tr>
<td>F1</td>
<td>Technical Occupations in Art, Culture, Recreation and Sport</td>
</tr>
<tr>
<td>G0</td>
<td>Sales and Service Supervisors</td>
</tr>
<tr>
<td>G1</td>
<td>Wholesale, Technical, Insurance, Real Estate Sales Specialists, and Retail, Wholesale and Grain Buyers</td>
</tr>
<tr>
<td><strong>Routine cognitive and routine manual</strong></td>
<td></td>
</tr>
<tr>
<td>B3</td>
<td>Administrative and Regulatory Occupations</td>
</tr>
<tr>
<td>B4</td>
<td>Clerical Supervisors</td>
</tr>
<tr>
<td>B5</td>
<td>Clerical Occupations</td>
</tr>
<tr>
<td>G2</td>
<td>Retail Salespersons and Sales Clerks</td>
</tr>
<tr>
<td>G3</td>
<td>Cashiers</td>
</tr>
<tr>
<td>H8</td>
<td>Trades Helpers, Construction and Transportation Labourers and Related Occupations</td>
</tr>
<tr>
<td>I0</td>
<td>Occupations Unique to Agriculture Excluding Labourers</td>
</tr>
<tr>
<td>I1</td>
<td>Occupations Unique to Forestry Operations, Mining, Oil and Gas Extraction and Fishing, Excluding Labourers</td>
</tr>
<tr>
<td>H2</td>
<td>Stationary Engineers, Power Station Operators and Electrical Trades and Telecommunications Occupations</td>
</tr>
<tr>
<td>H3</td>
<td>Machinists, Metal Forming, Shaping and Erecting Occupations</td>
</tr>
<tr>
<td>H4</td>
<td>Mechanics</td>
</tr>
<tr>
<td>H5</td>
<td>Other Trades n.e.c.</td>
</tr>
<tr>
<td>H6</td>
<td>Heavy Equipment and Crane Operators Including Drillers</td>
</tr>
<tr>
<td>H7</td>
<td>Transportation Equipment Operators and Related Workers, Excluding Labourers</td>
</tr>
<tr>
<td>I2</td>
<td>Primary Production Labourers</td>
</tr>
<tr>
<td>J0</td>
<td>Supervisors in Manufacturing</td>
</tr>
<tr>
<td>J1</td>
<td>Machine Operators in Manufacturing</td>
</tr>
<tr>
<td>J2</td>
<td>Assemblers in Manufacturing</td>
</tr>
<tr>
<td>J3</td>
<td>Labourers in Processing, Manufacturing and Utilities</td>
</tr>
<tr>
<td><strong>Non-routine manual</strong></td>
<td></td>
</tr>
<tr>
<td>G4</td>
<td>Chefs and Cooks</td>
</tr>
<tr>
<td>G5</td>
<td>Occupations in Food and Beverage Service</td>
</tr>
<tr>
<td>G6</td>
<td>Occupations in Protective Services</td>
</tr>
<tr>
<td>G7</td>
<td>Occupations in Travel and Accommodation Including Attendants in Recreation and Sport</td>
</tr>
<tr>
<td>G8</td>
<td>Childcare and Home Support Workers</td>
</tr>
<tr>
<td>G9</td>
<td>Sales and Service Occupations n.e.c.</td>
</tr>
<tr>
<td>H0</td>
<td>Contractors and Supervisors in Trades and Transportation</td>
</tr>
<tr>
<td>H1</td>
<td>Construction Trades</td>
</tr>
</tbody>
</table>
APPENDIX B
Methodology for Brookfield Institute for Innovation + Entrepreneurship polarization and automation analysis

Job polarization:
To examine potential job polarization in Ontario, the Brookfield Institute for Innovation + Entrepreneurship examined the growth of occupations from 2001-2015 classified as either:

(1) Non-routine analytical and interactive: involve tasks demanding creativity, flexibility, problem-solving and complex communications

(2) Routine cognitive and manual: involve tasks that can be followed by explicit, programmed rules

(3) Non-routine manual: involve manual and interactive work in an unstructured environment.

Classifications are from Autor, Levy, and Murnane’s original analysis (2003) and Green and Sand (2015). To track growth in employment for these occupation classifications BII+E used Statistics Canada’s Labour Force Survey (LFS) data, which is a monthly survey that provides a representative sample of the Canadian labour market to track employment and unemployment rates, and constructed an index for Ontario where 2001 = 100.

Automation:
Frey and Osborne estimate the proportion of occupations that can be automated over the next 10 to 20 years. They used the 2010 U.S. Department of Labor’s O*Net data, which contains information about 903 occupations. They aggregated them to correspond to the 702 U.S. Standard Occupation Classification (SOC) codes. Frey and Osborne then drew from machine learning experts to classify 70 occupations as either automatable or not, based on their task structures. They next identified whether these subjective classifications were related to the bottlenecks of computerization, defined as tasks that cannot be substituted by computers in the near term, and which include perception and manipulation, creativity and social intelligence. To do so, for each of the 70 occupations they linked O*Net variables to each of the bottlenecks and developed a model to determine if they corresponded to an occupation’s risk of being affected by automation. The estimates of this model were then used to predict the probability of automation for the remaining 632 occupations. They estimated that 47 percent of the jobs in the US labour market will be highly susceptible to automation in the next decade.

To apply these probabilities to the Canadian context, BII+E linked 498 four-digit NOC codes with six-digit US SOC codes using a crosswalk methodology modelled after the US Bureau of Labor Statistics and Nesta, UK. Military NOCs were removed from the study, as they had no equivalent SOC.

Based on the probability of being impacted by automation, occupations were then classified as either: low susceptibility to automation (0 to 29 percent probability), medium susceptibility to automation (30 to 69 percent probability), and highly susceptible to automation (70 percent or higher probability). Employment in each of these categories in Ontario was determined using the National Household Survey (NHS), 2011.
APPENDIX C
Methodology for Regional aggregate training matching index,
Second Career (Chapter 4)

To score each region in Ontario (i.e., the aggregate of the Second Career (SC) job training centres located in each region) on the degree to which the jobs in which they train SC participants are in demand in the local (regional) labour market.

1) Within each region, the NOCs were ranked ordinally on 5 variables:
   • $A_i$ the number of SC participants trained for that NOC
   • $B_i$ the number of vacancies for that NOC (in the average quarter in 2015 and 2016)
   • $Γ_i$ the size of employment in that NOC
   • $E_i$ the percentage change in employment in that NOC (in 2015 and 2016)
   • $Z_i$ the average offered hourly wage for vacancies in that NOC (in 2015 and 2016)

For example, in the Northeast region NOC 14 (Office support occupations) has the second highest number of SC participants ($A_i=2$) among NOCs in the Northeast, the 12th highest number of vacancies ($B_i=12$), the ninth highest employment level ($Γ_i=9$), and so on.

2) The raw Training Matching Score (TMS) measures the “distance” (i.e., absolute value of difference in values) between $A_i$ and each of the other variables (i.e., between $A_i$ and $B_i$, $A_i$ and $Γ_i$, $A_i$ and $E_i$, etc.). This is based on the assumption that the highest ratings should go to NOCs where the number of SC participants trained in that NOC is closest to the number of workers in that NOC demanded for in the local (regional) labour market. For example, a NOC with a high number of SC participants and high labour market demand has a high TMS, as does a NOC with a low number of SC participants and little labour market demand.

The raw Training Matching Score (TMS) for NOC $i$ in region $j$ is calculated as:

$$raw \ TMS_{ij} = \frac{|B_{ij} - A_{ij}|}{+\frac{|Γ_{ij} - A_{ij}|}{|E_{ij} - A_{ij}|} + \frac{|Z_{ij} - A_{ij}|}}$$
3) The indexed TMS allows for better comparability across NOCs. As well, the indexed TMS makes it easier to calculate how many NOCs in the region fall in each quartile, one regional performance measure of matching training with labour market demand.

The indexed Training Matching Score (TMS) for NOC \( i \) in region \( j \) is calculated as:

\[
\text{indexed TMS}_{i,j} = 100 - \left( \text{percentile rank of raw TMS}_{i,j} \right) \times 100
\]

4) Regional aggregate TMS is the weighted average of all NOCs in a region. Each NOC’s weight in the average is determined by the NOC’s share of all SC participants trained in that region (given by \( W_i \), such that \( 0 \leq W_i < 1 \)). Although in the dataset there are 38 NOCs in each region, since the data is incomplete in most cases \( n < 38 \).

The regional aggregate Training Matching Score (TMS) for region \( j \) is calculated as:

\[
\text{reg.agg.TMS}_j = \frac{\left( \sum (\text{indexed TMS}_{i,j} \times W_i) \right) + \cdots + (\text{indexed TMS}_{n,j} \times W_n)}{\sum W_i + \cdots + W_n}
\]
58 Cooke, Zeytinoglu, and Chowhan. "Barriers to Training Access."
60 The survey defines training as being any organized session by co-workers or managers.
62 Hewitt. "Canada’s Future Workforce.”
63 Sims, Wong, Autremont, and Zai. "Small Business, Big Investment"; Personal communication with employers, educators, and workforce development practitioners.
68 Goss Gilroy Inc., "Canada Job Grant Year 2 Review."
69 ibid.
70 ibid.
71 ibid.
78 ibid.
79 Lamb. "The Talented Mr. Robot.”
82 ibid.
83 ibid.
84 Data from the Ministry of Advanced Education and Skills Development.
86 ibid.
87 ibid.
88 Data from Statistics Canada, CANSIM Table 282-0138.
92 Personal communication from expert interviews with Employment Service providers across Ontario.
96 ibid.
98 Personal communication from expert interviews with Employment Service providers across Ontario.
The Institute for Competitiveness & Prosperity is an independent not-for-profit organization that deepens public understanding of macro and microeconomic factors behind Ontario’s economic progress. Research by the Institute is intended to raise public awareness and stimulate debate on a range of issues related to competitiveness and prosperity. It is the aspiration of the Institute to have a significant influence in increasing Ontario and Canada’s competitiveness, productivity, and capacity for innovation. We believe this will help ensure continued success in creating good jobs, increasing prosperity, and building a higher quality of life. We seek breakthrough findings from our research and propose significant innovations in public policy to stimulate businesses, governments, and educational institutions to take action.

The Institute was formerly the research arm of the Task Force on Competitiveness, Productivity and Economic Progress established in 2001 by the Ontario Premier, and led by Roger L. Martin. The Task Force completed its work at the end of 2014. The Institute is now advised by Ontario’s Panel for Economic Growth & Prosperity, led by Tiff Macklem.

Comments on this report are welcome and should be directed to the Institute for Competitiveness & Prosperity. The Institute is funded by the Government of Ontario through the Ministry of Economic Development and Growth. The views expressed in this report are the views of the Institute and do not necessarily represent those of the Government of Ontario.

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The Institute for Competitiveness & Prosperity
ISBN: 978-3-927065-24-2

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DESIGN
Hambly & Woolley Inc.
www.hamblywoolley.com
Illustration: ©2017 Gracia Lam
THE LABOUR MARKET SHIFT: TRAINING A HIGHLY SKILLED AND RESILIENT WORKFORCE IN ONTARIO

WORKING PAPER
SEPTEMBER 2017


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