Impact of Automation and Technological Change

Sarah Doyle, Director of Policy + Research
Section 1

Ubiquity of tech
1. Shift to Digital
Increased digital component of jobs and industries.

2. “Uber-ization” of Jobs
Rise of “gig economy”-type jobs.

3. Robots Taking Jobs?
Automation, AI and other technologies disrupting existing jobs — and creating new ones.
Job and skill impacts are uneven
Over 36% of jobs in Canada’s labour market are highly susceptible to automation (containing 50% or more tasks that could technically be automated, based on McKinsey analysis).

This does not mean that all of these jobs will disappear. Most jobs comprise a variety of work activities, only some of which are automatable.
The Brookfield Institute’s Talented Mr. Robot report showed that impacts are likely to vary for different parts of Canada’s population.

Automation Potential + Avg. Income

Automation Potential + Proportion of Labour Force with University Education (bachelor or above)
Impacts are likely to vary by industry...

- Accommodation and food services: 69%
- Transportation and warehousing: 61%
- Manufacturing: 61%
- Mining, quarrying, and oil and gas: 52%
- Agriculture, forestry, fishing and hunting: 52%
- Construction: 51%
- Retail trade: 49%
- Wholesale trade: 46%
- Other services (except public): 45%
- Utilities: 44%
- Arts, entertainment and recreation: 42%
- Management of companies and enterprises: 42%
- Finance and insurance: 42%
- Public administration: 41%
- Administrative and support, waste: 41%
- Real estate and rental and leasing: 41%
- Information and cultural industries: 38%
- Health care and social assistance: 37%
- Professional, scientific and technical: 35%
- Educational services: 30%

These industries have the highest proportion of work activities that are technically automatable (top quartile).

- About 62 percent of work activities could be automated within these industries
- Equivalent to 2.5 million jobs

These industries are least susceptible to automation (bottom quartile).

- Account for 28 percent of Canada’s total employment

GEOGRAPHIC + REGIONAL IMPLICATIONS

...and by geography

Concentration of work activities with the potential for automation (location quotient) by CMA and CA

- Small economies specializing in manufacturing or mining, quarrying, and oil and gas extraction are most susceptible to automation.
- Cities and towns with a large hospital, post-secondary institution or public sector presence are less susceptible.
- Larger, more diverse labour markets are more likely to reabsorb displaced labour and weather potential automation impacts.
Technology can be disruptive for employment in certain industries.

+ In 1911, over 34 percent of the labour force worked in agricultural industries. By 2011, this had dropped to roughly 2 percent, largely because of breakthroughs in technology and machinery.

But overall, jobs increased in Canada. Why?

+ Productivity gains increased the demand for goods and services elsewhere in the economy, enabling the growth of new occupations and new industries.
As technology takes over certain job tasks, demand for people to perform other tasks will increase.

+ As AI automates prediction it will increase the value of and demand for human judgment.

+ Technology is leading to increased demand for digital skills across occupations and industries.

+ Technology is increasing demand for social skills and jobs requiring a high degree of social interaction.

Source: Agrawal et al. (2017); Muro et al. (2017); Deming (2015)
Change is happening, but maybe not fast enough?
Ontario faces simultaneous pressure to accelerate tech adoption and help workers adjust.

- Ontario lags on automation technology adoption, hindering firm competitiveness.
- Despite this lag, automation is occurring, contributing to shifts in the occupational composition of the province and changing the skills that workers need.
## Key Findings

### Impact of Technology on Canada's Workforce

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<th>Key factors contributing to tech adoption</th>
<th>Key factors inhibiting tech adoption</th>
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<td><strong>Manufacturing</strong></td>
<td>+ Global competition</td>
<td>+ Cost and risk aversion, particularly for smaller firms</td>
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<td>+ Aging workforce</td>
<td>+ Limited supply of skills required to implement, operate, and maintain new tech</td>
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<td>+ Looming retirement of existing workers</td>
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<tr>
<td><strong>Finance + Insurance</strong></td>
<td>+ Global + FinTech competition</td>
<td>+ Regulatory hurdles</td>
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<td>+ New business models emerging to take advantage of vast amounts of data</td>
<td>+ Limited supply of skills required to implement, operate, and maintain new tech</td>
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<td>+ Consumer expectations for mobility, speed, and customization</td>
<td>+ Legacy technology incompatibility</td>
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Low tech adoption is stifling competitiveness.

- Ontario + Canadian manufacturers lag peer jurisdictions in tech adoption.
- While Ontario experienced a 5.5% drop in manufacturing employment from 2001 to 2011, the US and Germany—jurisdictions with higher technology adoption—saw manufacturing employment drop by only 4.2% and 4% respectively.

Source: Statistics Canada CANSIM 031–0005 & 379–0030, BII+E Analysis
Note: Manufacturing includes NAICS 31–33
“Adapt or Perish”

There is a general sense that automation is happening, its scope is increasing, and it will disrupt many sectors and change how Ontarians work.

A range of perspectives

Some feel automation has reduced jobs to button-pushing; for others, it has made jobs safer, allowed them to work on more interesting tasks, or provided greater flexibility.

When does automation occur?

Automation replaces human labour in particular when work is unsafe, when it involves repetitive, routine tasks, and when working conditions are such that jobs are hard to fill reliably.

Skills gaps

Some are eager to learn new skills and adapt; others are not. Mid-career workers with few computer skills may have the hardest time adapting.

“People are equally scared, hopeful, don’t know, or don’t care. They are hopeful that with automation work can become more interesting, less physical, less dangerous. But they also fear their own ability to adapt — and if they will even be given the opportunity to adapt. It sparks a lot of emotional reactions.”
– University researcher in Kingston

“Some people are learners, and want a challenge. There are some 55-year-olds who are like that. Others say ‘I’m out of here, I can’t learn that’, and they leave. Then we lose process knowledge, product knowledge, and company knowledge.”
– Manufacturing sector stakeholder
Where businesses lag behind their competition in adopting and implementing technology, this may pose just as large a risk for workers as for them.

Automation is already disrupting some jobs and, if the pace of adoption increases as seems likely, a larger number of workers will struggle with changing skills demands and possible job loss.

Decision-makers in the public, private, and non-profit sectors will need to collaborate to advance technological adoption, while ensuring that workers have the skills, knowledge, and tools to adapt in the face of change and to realize their potential role in driving innovation and prosperity.

...requires a dual response
A coordinated, cooperative approach to firm and worker success
Automation, offshoring and increased international competition contributed to a loss of over 200,000 jobs in North Carolina’s traditional manufacturing sectors between 1996-2006.

At the same time, biomanufacturing firms were setting up shop, but struggling with a shortage of qualified production-line technicians.

Industry, education, and state-level government responded by creating BioWork. Available at participating community colleges, it was designed to:

- **Satisfy production-line needs** of the rapidly growing biotech industry.
- Be **accessible to at-risk or displaced workers** from traditional manufacturing sectors, open to anyone with a secondary education.
Uptake of BioWork by both candidates and companies sparked a successful talent pipeline that supports the continued growth of North Carolina’s biotechnology sector, while creating pathways for displaced workers to participate in an innovative sector.
In response to global competition and technological advancements in the mobile phone industry, Nokia scaled back operations in Finland in 2011 and laid off 5,900 workers.

Working with government and other partners, Nokia developed the Bridge program to help workers transition out of the company. Approximately 5,000 workers participated in different regions of Finland.

The Bridge program provided affected employees with career development pathways, supporting them in:

- Finding reemployment;
- Furthering education; and/or
- Starting a new company.
Employees who opted for the **entrepreneurship pathway** were able to attend business training, compete for funding grants, and negotiate for patent + technology licenses for the projects they had been working on within Nokia.

400+ startups were created from this pathway, with 90% still functioning in 2016.
Key success factors:

1. Resilient partner networks + anchor organizations
2. Collaborative design process engaging employers and other delivery partners
3. Transparent information sharing among stakeholders
4. Up-to-date knowledge of demand and supply
5. Flexibility to adapt to changing needs
6. Design with worker skills, needs and interests in mind
7. Recognizing that any worker can be an engine of innovation
A HIGH-LEVEL STRATEGY

Potential Avenues for Exploration:

1. A coordinated, cooperative approach to firm and worker success
2. A system for lifelong education that makes a wide array of modular retraining and upskilling programs and credentials accessible
3. A user-friendly job pathways tool to empower workers to make informed decisions about work and learning
4. Investment in tech R&D and adoption
Thank You
Sarah Doyle  
Director of Policy + Research, BII+E

Sarah leads the development of the Brookfield Institute’s research agenda and oversees the work of the policy team, with a commitment to policy that supports inclusive growth. Sarah’s experience and passion for public policy inspires more collaborative spaces and the ability to harness the collective insights of a wide range of stakeholders.

@SarahDoyleTO  
sarah.doyle@ryerson.ca

For more information, visit brookfieldinstitute.ca.