Canada's 'Inclusive' Innovation and Skills Plan in the Face of the Employment Threat of Automation

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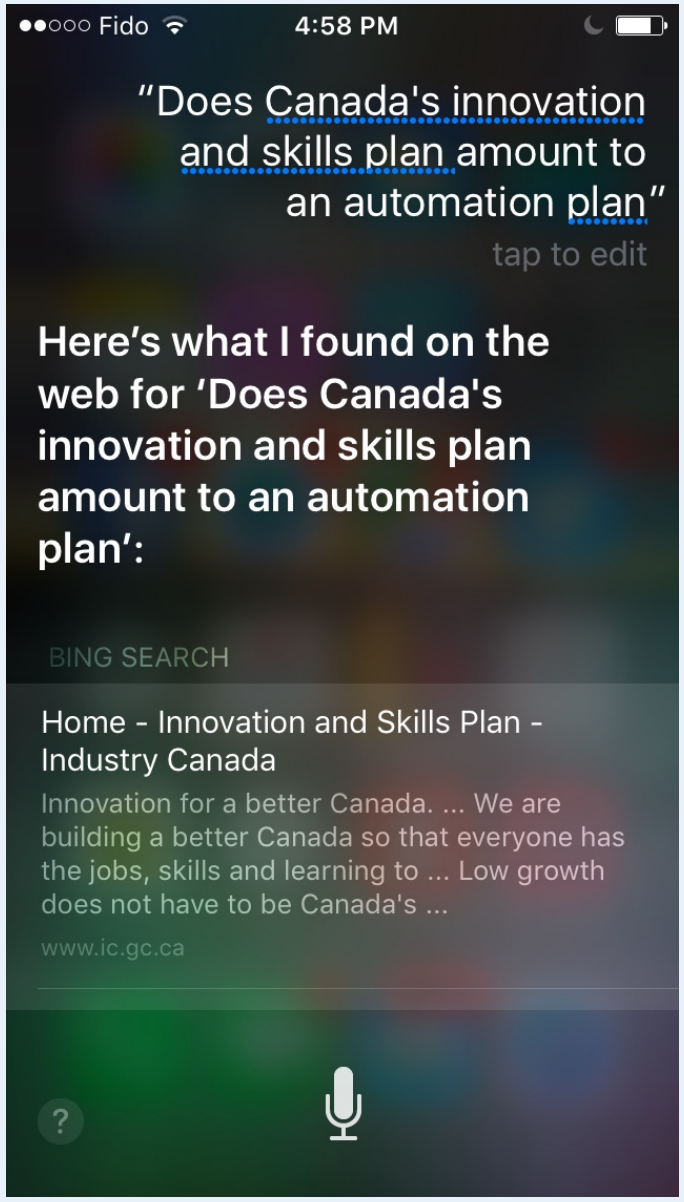
Q: Does Canada’s Innovation and Skills Plan amount to an Automation Plan?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4:58 PM
“Does Canada's innovation and skills plan amount to an automation plan”
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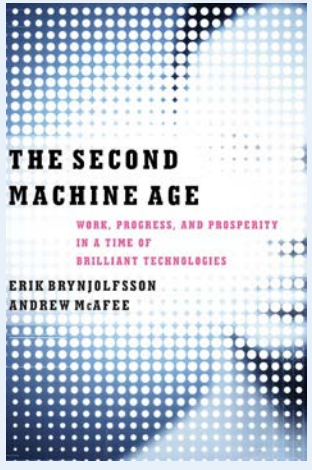
Here’s what I found on the web for ‘Does Canada's innovation and skills plan amount to an automation plan’:
BING SEARCH
Home - Innovation and Skills Plan - Industry Canada
Innovation for a better Canada. ... We are building a better Canada so that everyone has the jobs, skills and learning to ... Low growth does not have to be Canada's ...
www.ic.gc.ca
?

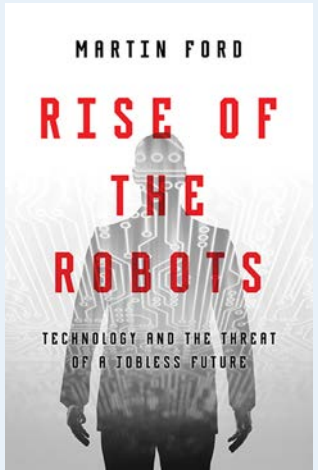
Agenda

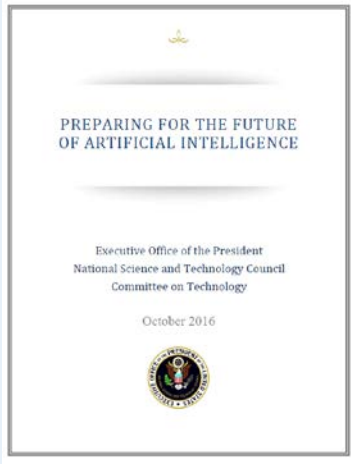
- Context
  - Automation Literature
  - Canada's 'Inclusive' Innovation and Skills Plan
- Assessing the Employment Threat of Automation
- 3 Pillars of an Automation Plan
  - Creating new jobs via innovation policy
  - Supporting skills modernization via Education and Training Policies
  - Supporting the displaced via transforming the social safety net

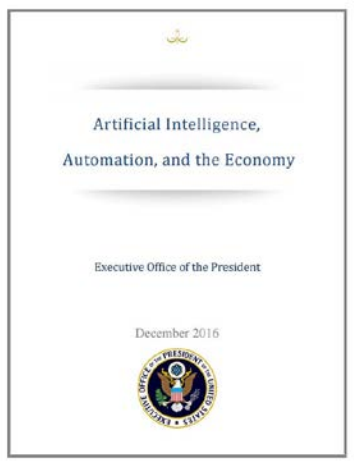
Context - Automation Literature

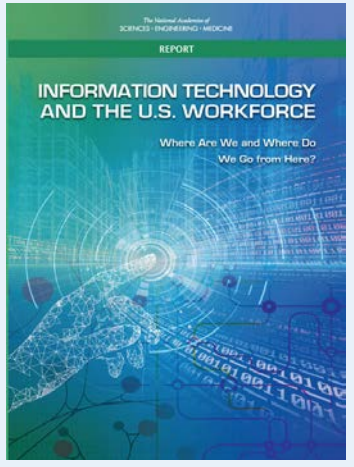
- ‘Automation Plan’ is a policy mix collated mostly from post-*Second Machine Age* literature:
  - Brynjolfsonn & McAfee (2014), Rise of the Robots (2015), Obama White House AI reports (2016) McKinsey Global Institute (2017), National Academy of Science, Engineering, and Mathematics (2017), + more
- This literature tends to place less emphasis on policy compared to technology







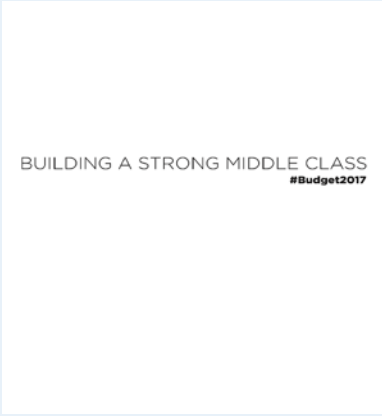




Context: Canada's 'Inclusive' Innovation and Skills Plan

"Positioning Canada to Lead: An Inclusive Innovation Agenda" – June. 6, 2016

"40 percent of Canadian jobs today could be automated in the next 10 years. Literally automated. That's an incredible number" – Domenic Barton, Feb. 7, 2017



"With those innovations will come opportunities… technological change can also create anxiety—among workers who worry if their jobs will disappear due to automation," –Budget 2017, March. 22, 2017

Assessing the Employment Threat of Automation

Percentage of Work Activities that Could Be Automated by Adapting Current Technology

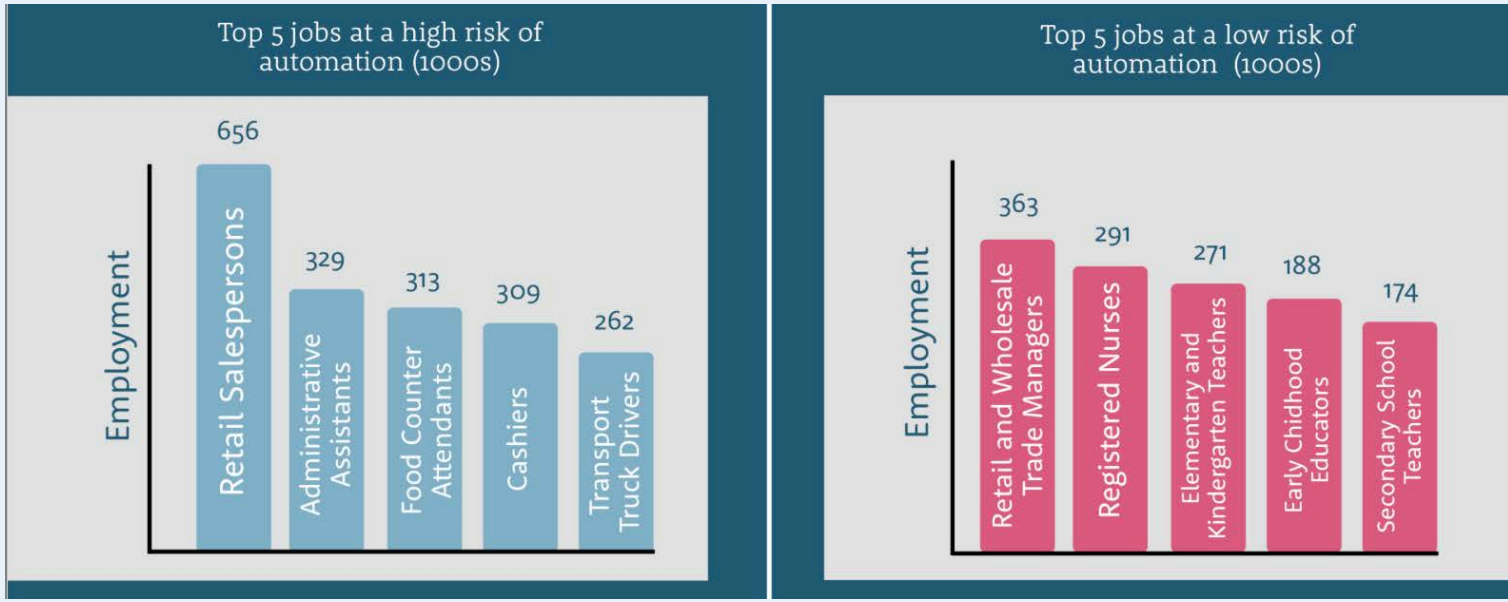
AFRICA		ASIA/AUSTRALIA		EUROPE		NORTH AMERICA		SOUTH AMERICA	
Kenya	51.9%	Japan	55.7	Czech Rep.	52.2	Mexico	51.8	Peru	53.2
Morocco	50.5	Thailand	54.6	Turkey	50.4	Costa Rica	51.7	Colombia	53.0
Egypt	48.7	Qatar	52.0	Italy	50.3	Barbados	48.7	Brazil	50.1
Nigeria	45.7	South Korea	51.9	Poland	49.5	Canada	47.0	Chile	48.9
South Africa	41.0	Indonesia	51.8	Spain	48.5	U.S.	45.8	Argentina	48.2
		India	51.8	Germany	47.9				
		Malaysia	51.4	Greece	47.8				
		China	51.2	Austria	47.4				
		Russia	50.3	Switzerland	46.7				
		Philippines	47.9	Sweden	46.0				
		U.A.E.	47.3	Netherlands	45.4				
		Oman	46.8	France	43.1				
		Bahrain	46.1	U.K.	42.8				
		Saudi Arabia	46.0	Norway	42.4				
		Australia	44.9						
		Singapore	44.2						
		Kuwait	41.1						

Source: Chui et al., 2017, in Harvard Business Review

Assessing the Employment Threat of Automation - Canada

- Task-based method: nearly 42 percent of Canadian work activities could be automated using current technologies
- 18 percent of Canada's labour force could have 70 percent or more of their work activities automated

Occupation-based Method:
Top 5 High-Risk and Low-Risk Occupations at Risk of Automation



Source: Brookfield Institute (2016), p. 1.

Labour Obsolescence

- “we must define and analyze changes that affect changing labour demand in the extended ecosystem (or the business web), inside and outside a core sector. The result of this analysis is often a combination of job creation, job destruction and job displacement” (Ticoll, 2017)

Example: Autonomous Vehicles

“Changes that will result in labour obsolescence include:

Core technologies: Vehicle hardware will shift from steel to electronics and lightweight materials. Will this further erode the jobs in Canada’s already reduced auto sector? Also, demand for oil and gasoline will decline. Electric vehicles will need less routine maintenance (no oil changes!). All this means more jobs for information technologists and fewer jobs for oil workers, gas station attendants and car mechanics.

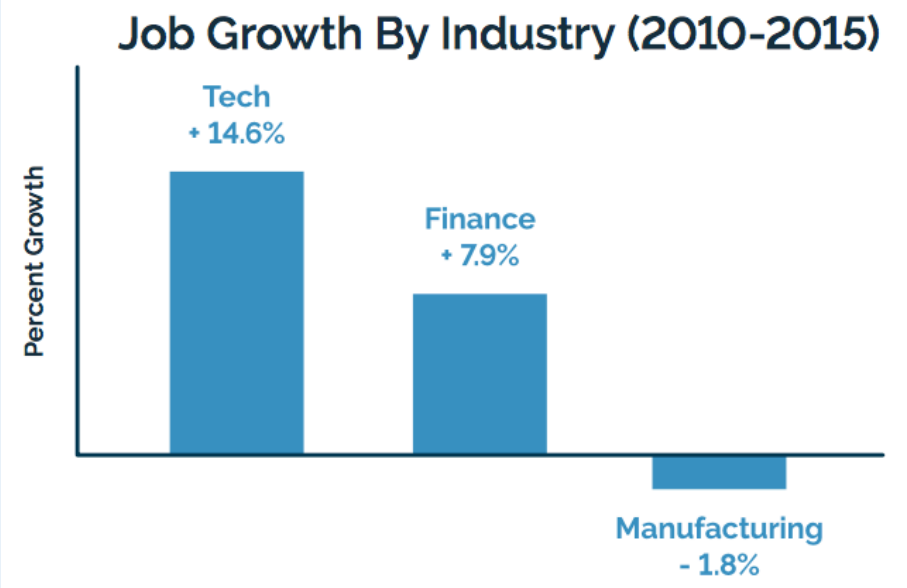
Disintermediation: Mobility services will use their own fleets and deal directly with consumers via mobile apps. This will have an impact on car dealers and car rental firms.

Externalities: A major benefit of automation will be improved vehicle safety and traffic self-management. This will mean fewer jobs in auto body repair, policing, and accident-related medical services” (Ticoll, 2017).

TechToronto Report (2016)

TechToronto, Munk School Innovation Policy Lab, & PWC

Toronto's Tech Sector (2015)



	Three Pillars of an 'Automation Plan'		
	Creating New Jobs Via Innovation Policy	Supporting Skills Modernization Via Training and Education Policies	Supporting the Displaced Via Transforming the Social Safety Net
Best Practice Derived From Global Literature			
Canada's Innovation and Skills Plan as Outlined in Budget 2017			
Fulfilment of 'Automation Plan' Requirement?			

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Best Practice Derived From Global Literature	-Support development of automation technology -Embed labour obsolescence analysis into innovation policymaking		
Canada's Innovation and Skills Plan as Outlined in Budget 2017	Sector-specific 'supercluster' and AI strategies do not mention incorporation of labour obsolescence analysis		
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Best Practice Derived From Global Literature	-Support development of automation technology -Embed labour obsolescence analysis into innovation policymaking	- Invest in training and education - Coordinate private/public data sharing on automation technology diffusion and employment impact to better inform skills modernization initiatives	
Canada's Innovation and Skills Plan as Outlined in Budget 2017	Sector-specific 'supercluster' and AI strategies do not mention incorporation of labour obsolescence analysis	-Investments in education and training -Unclear if skills organization will collect private/public automation-specific labour market data	
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Best Practice Derived From Global Literature	-Support development of automation technology -Embed labour obsolescence analysis into innovation policymaking	- Invest in training and education - Coordinate private/public data sharing on automation technology diffusion and employment impact to better inform skills modernization initiatives	- 'Flexicurity' policies to enable portable benefits -Taxing capital, ex: 'robot tax' -Basic Income Guarantee
Canada's Innovation and Skills Plan as Outlined in Budget 2017	Sector-specific 'supercluster' and AI strategies do not mention incorporation of labour obsolescence analysis	-Investments in education and training -Unclear if skills organization will collect private/public automation-specific labour market data	Adjusting EI to widen eligibility for training programs
Fulfilment of 'Automation Plan' Requirement?	**Partial**: Focus on creating new jobs via innovation policy does not evaluate the automation impact from these new technologies	**Partial**: Investments in Supporting Skills Modernization Via Training and Education Policies do not include mention of automation-specific labour market data	**Minimal**: Lack of commitment to transform the social safety net to support workers displaced by automation

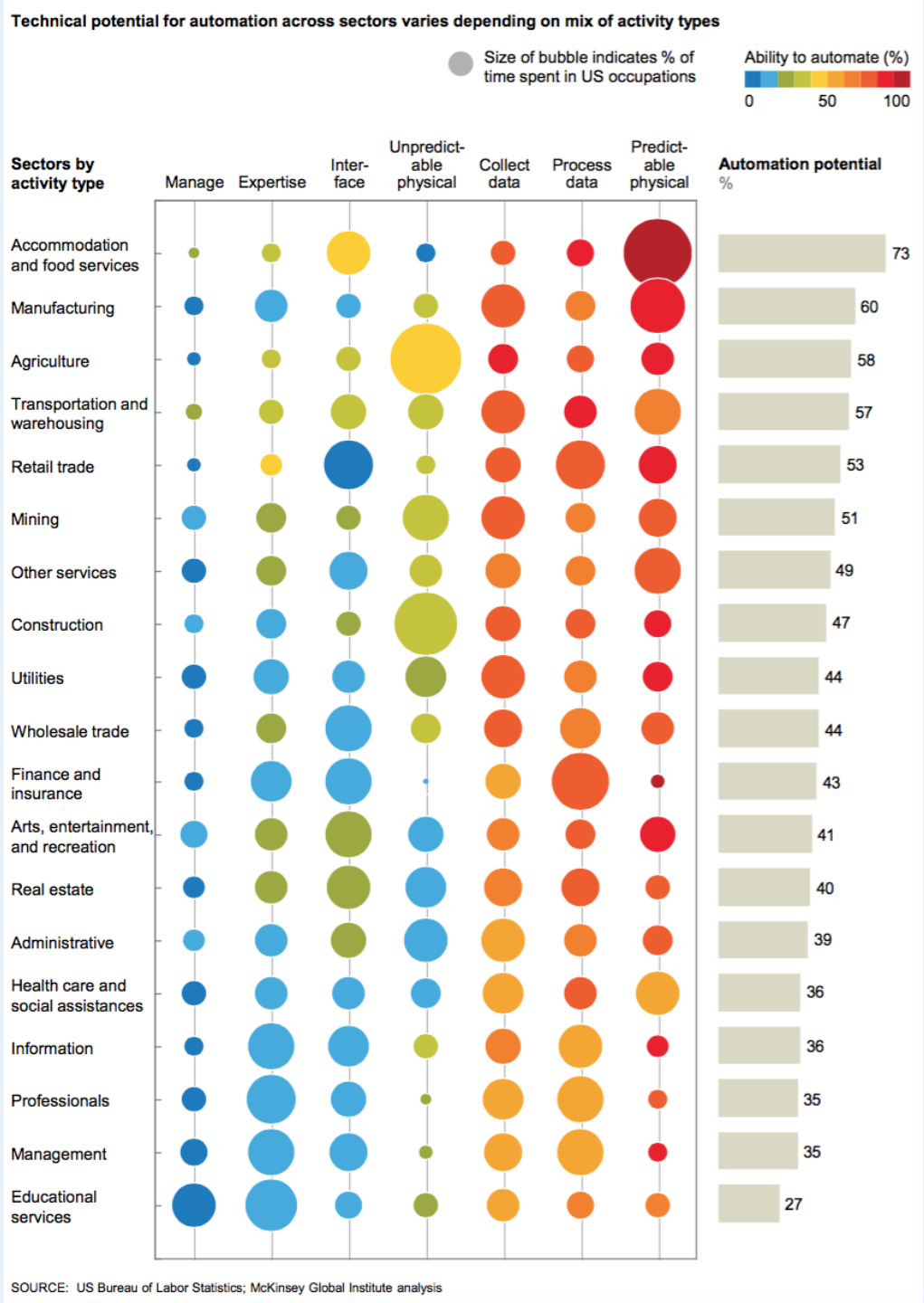
Conclusion/Future Research

- Q: Does Canada's Innovation and Skills Plan amount to an Automation Plan?
  - A: Only Partially…
- The role of politics going forward
  - "Joe Populist is more worried about having his job displaced by innovative technologies than seeing the country becoming more adept at creating new ones" (Martin, 2017).
  - "The question we ought to be worried about now is not simply what policies need to be adopted to make life better in this technological future, but how to manage the fierce social battle, only just beginning, that will determine who gets what and by what mechanism" (Avent, 2016, p. 16-17).
  - Politicization of innovation policy could erode the support for policies needed for Canada to lead the digital economy (Taylor, 2016)

Appendix

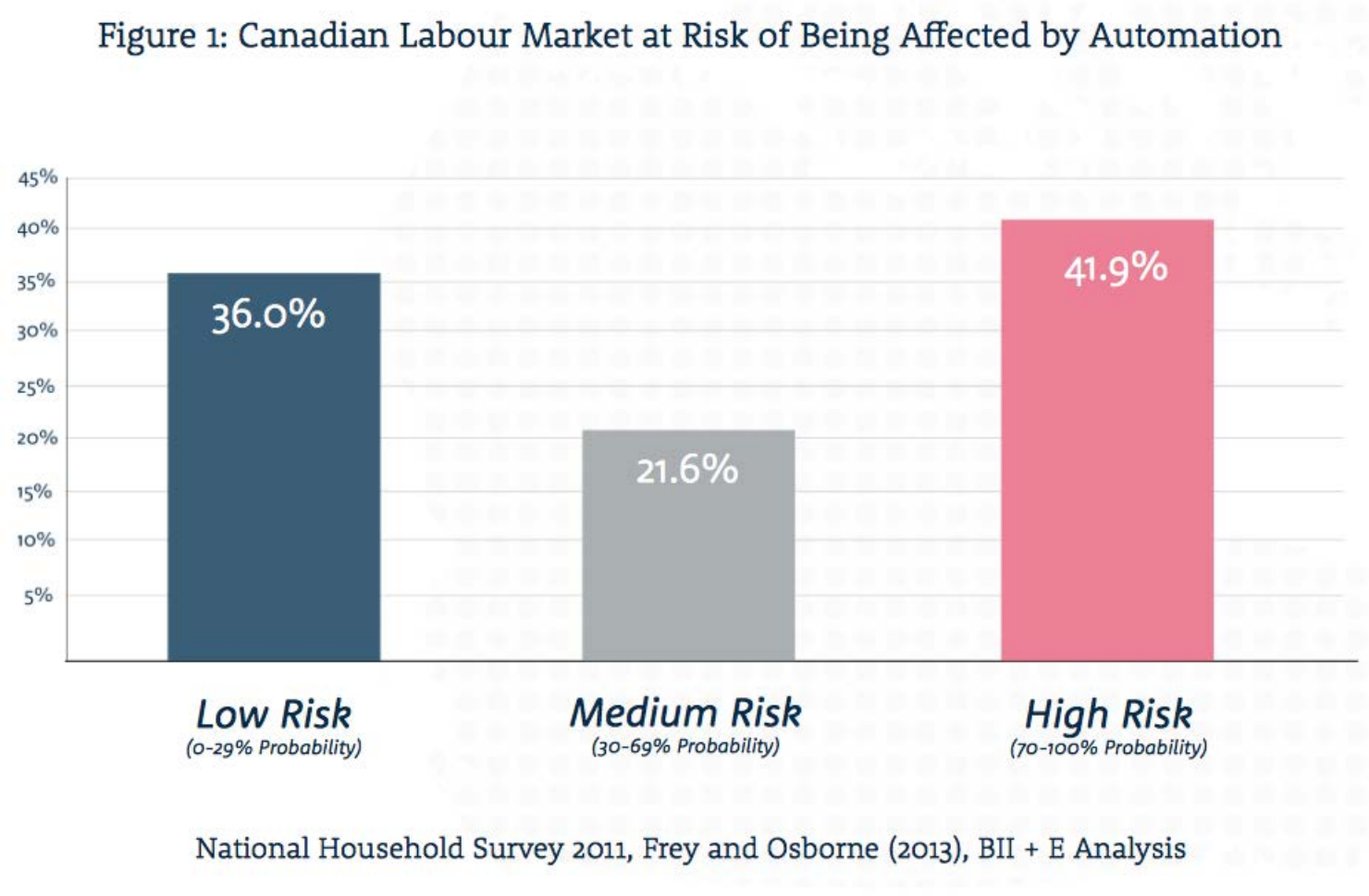
Carl Benedikt Frey and Michael A. Osborne	Citibank with Frey and Osborne	OECD	World Economic Forum	McKinsey Global Institute
Date				
September 2013	January 2016	June 2016	January 2016	January 2017
Unit of analysis				
Jobs/occupations	Jobs/occupations	Tasks	Not applicable	Work activities
Scope				
US labor market	50+ countries and regions	21 OECD countries	15 major developed and emerging economies	46 countries representing about 80% of global labor force
Approach summary				
Analysis of 702 occupations (70 hand-labeled working with ML researchers, followed by a tailored Gaussian process classifier to estimate others and confirm hand-labels) to approximate the impact of future computerization on the US labor market	Extension of Frey-Osborne (2013), using World Bank data, to estimate impact of automation globally. Further analyses include examination of demographic changes, global value chain, etc.	Estimates of automatibility of tasks were developed based on matching of the automatibility indicators by Frey-Osborne and the PIAAC data occupational codes, followed by a two-step, tailored regression analysis	Analysis of large-scale survey of major global employers, including 100 largest global employers in each of WEF main industry sectors, to estimate the expected level of changes in job families between 2015-2020 and extrapolate number of jobs gained/lost	Disaggregation of occupations into 2,000 constituent activities and rating each against human performance in 18 capabilities. Further analysis of time spent on each activity and hourly wage levels. Scenarios for development and adoption of automation technologies
Key relevant findings				
▪ About 47% of total US occupations are at high risk of automation perhaps over the next decade or two ▪ Wages and educational attainment show a strong negative relationship with probability of computerization	▪ Building on Frey and Osborne's original work, data from the World Bank suggests the risks are higher in many other countries; in the OECD, on average 57% of jobs are susceptible to automation. This number rises to 69% in India and 77% in China	▪ On average, 9% of jobs across the 21 OECD countries are automatable ▪ There are notable differences across OECD countries when it comes to automation (e.g., the share of automatable jobs is 6% in Korea vs. 12% in Austria)	▪ Automation and technological advancements could lead to a net employment impact of more than 5.1 million jobs lost to disruptive labor market changes between 2015–20, with a total loss of 7.1 million jobs—two-thirds of which are concentrated in the office and administrative job family—and a total gain of 2 million jobs in several smaller job families	▪ Almost half of work activities globally have the potential to be automated using current technology. <5% of occupations can be automated entirely; about 60% have at least 30% of automatable activities ▪ Technically automatable activities touch 1.1 billion workers and $15.8 trillion in wages. China, India, Japan, and the United States constitute over half ▪ Automation's boost to global productivity could be 0.8–1.4% annually over decades

McKinsey Global Institute (2017)



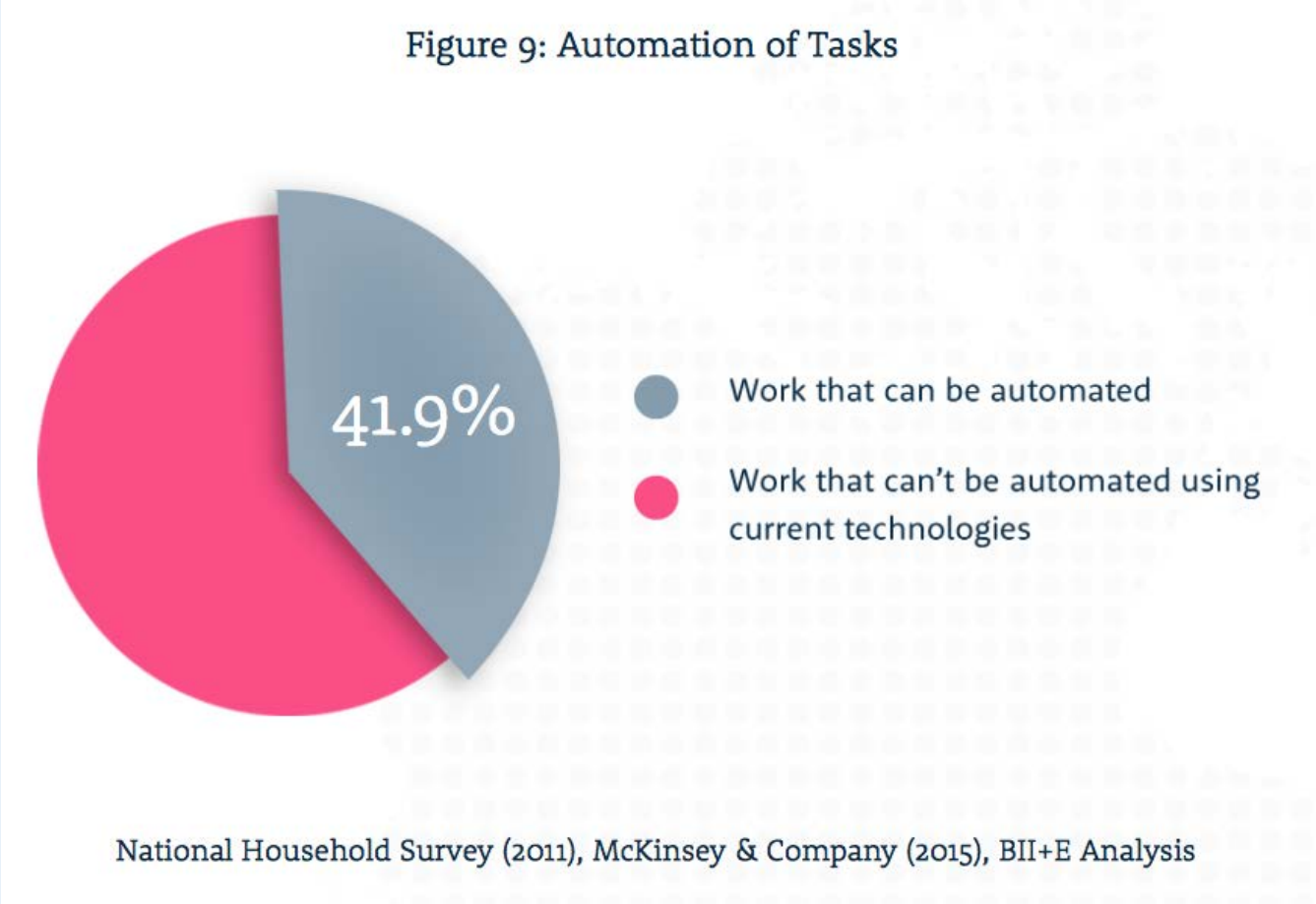
McKinsey Global Institute (2017)

Brookfield – Automation by Occupation



Brookfield Institute (2016)

Brookfield – Automation by Task



Brookfield Institute (2016)

Brookfield Comparison

Job	Transport Truck Drivers	Retail Salespersons	Senior Managers	Specialist Physicians
Probability of automation in the next 10-20 years (Frey and Osborne)	79%	92%	9%	0.4%
Proportion of tasks that can be automated (McKinsey & Company)	69%	47%	24%	23%
Number of employees, 2011	261,775	656,395	54,880	36,550
Average Earnings, 2011	$40,871	$21,113	$160,560	$175,088
Proportion with university education	4%	12%	60%	98%

Brookfield Institute (2016)

Brookfield Methodology

To answer the question of how susceptible Canadian jobs are to automation, we utilized the findings of Frey and Osborne and McKinsey & Company. Both studies are designed to address the question of automation in two different ways.

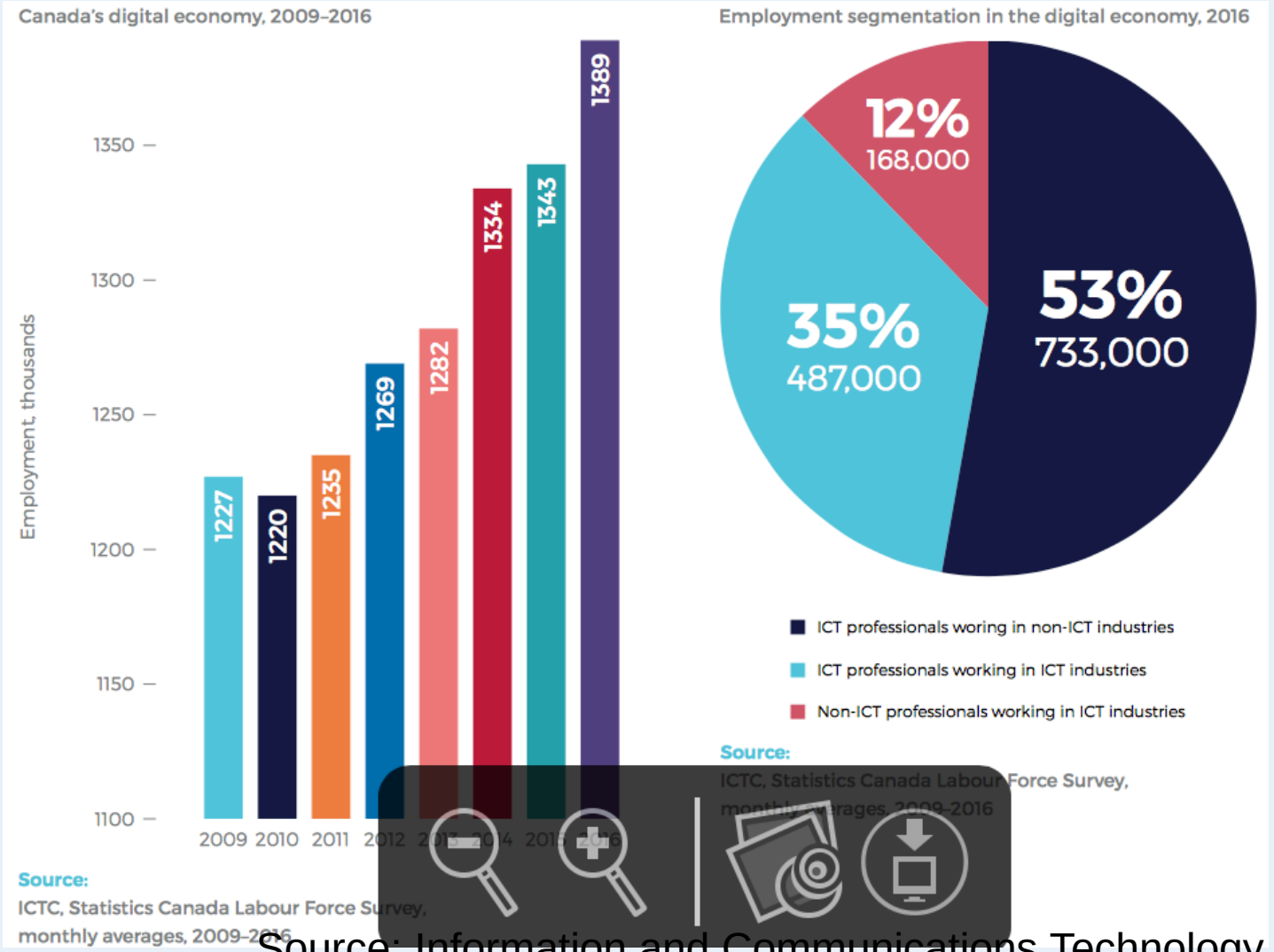
Frey and Osborne estimated the proportion of occupations that can be automated over the next 10 to 20 years. They used the 2010 U.S. Department of Labor's O*Net data, which contains information about 903 occupations. They aggregated them to correspond to the 702 U.S Standard Occupation Classification (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. Next, they 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, 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.[xxii]

The authors of the McKinsey study took a different approach. They examined the percentage of work activities that could be automated using existing technologies. The authors analyzed 2,000 detailed work activities for 800 U.S. occupations. They then assessed these activities against 18 identified capabilities that they determined could be automated.[xxiii]

Both studies use U.S. SOC codes in their analysis. In Canada, we use the NOC system. To apply the U.S. studies' probabilities to the Canadian context, we linked all 500 four-digit NOC codes with six-digit U.S. SOC codes using a crosswalk methodology. While crosswalk methodologies vary, they have been successfully applied by Statistics Canada, the U.S. Bureau of Labor Statistics and Nesta.

Brookfield Institute (2016)

Employment in Canada's Digital Economy



Source: Information and Communications Technology Council (2017, p. 6)

Table 1.1
The Innovation and Skills Plan—Helping Canadians Succeed in the New Economy

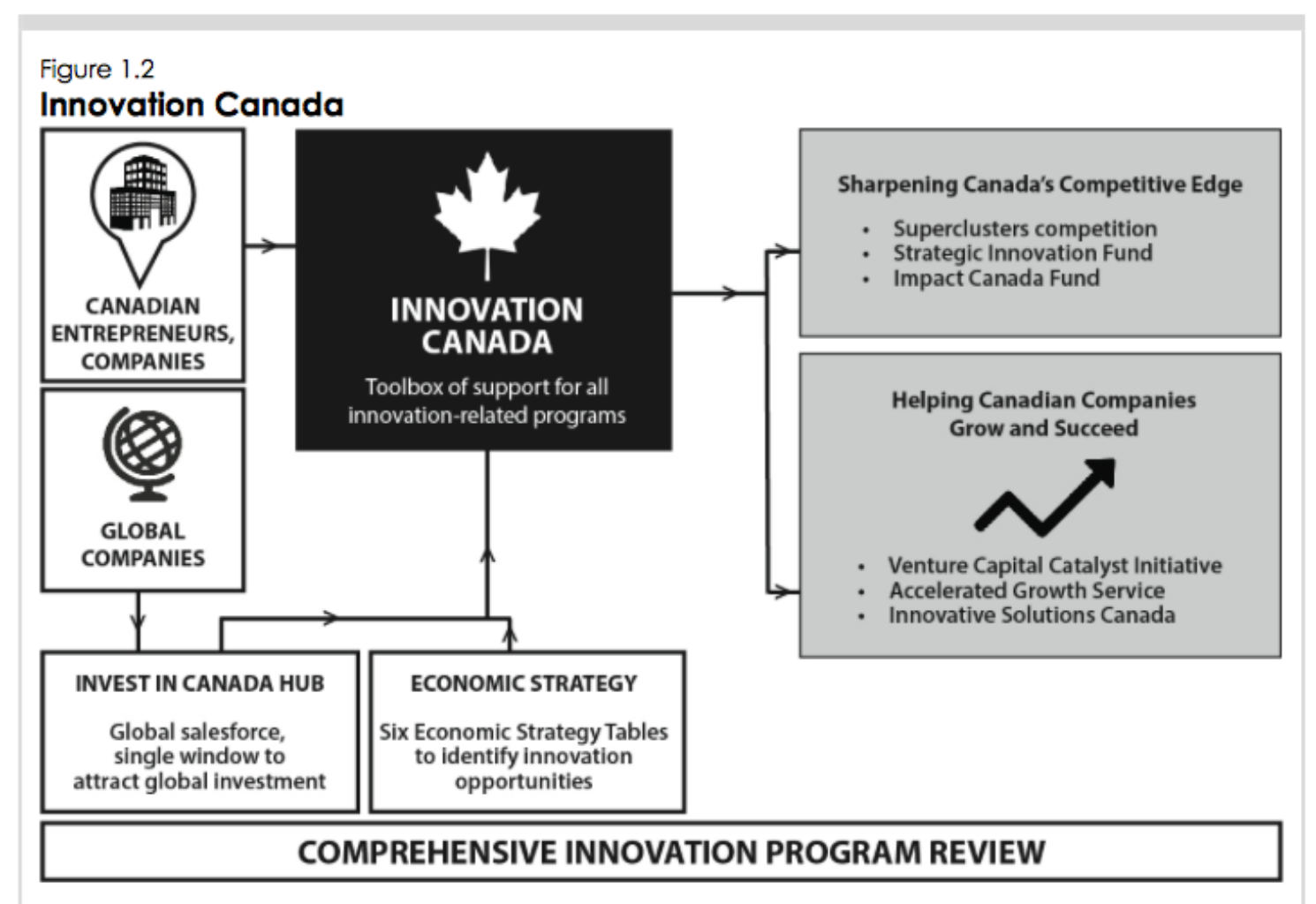
Skills	**Most Skilled, Talented, Creative and Diverse Workforce in the World**
Innovation is changing the way Canadians work. Keeping pace with these changes means equipping Canadians with the tools, skills and experience they need to succeed in the workforce, now and into the future. It also means attracting more top talent from around the world to help grow our economy. The Government's Innovation and Skills Plan must ensure that all Canadians have the opportunity to participate and thrive in the new economy.	• Help young Canadians get the skills and experience they need to kick-start their careers. • Make training opportunities more accessible to working Canadians. • Increase the number of Canadians participating in work-integrated learning. • Increase business investments in training. • Improve access to global talent through accelerated processing times. • Grow the number of Canadians equipped with science, technology, engineering and mathematics (STEM), coding and digital skills, especially among underrepresented groups.
Research, Technology, Commercialization	**World-Leading Discovery and Innovation**
Canada's governments and post-secondary institutions invest significantly in science, research and development, but Canada's business community tends to underinvest in these areas. As a result, Canadian discoveries and innovations often find greater success—and create good, well-paying jobs—in other countries. To better support job growth in Canada, the Innovation and Skills Plan must encourage greater business investment in research and help bridge the commercialization gap.	• Increase investment in innovation by business in six key areas—advanced manufacturing, agri-food, clean technology, digital industries, health/bio-sciences and clean resources. • Accelerate a small number of business-led innovation "superclusters" that focus on innovative industries. • Increase the number of collaborations between industry, post-secondary institutions and research institutions. • Reinforce world class research strengths at post-secondary institutions in areas such as quantum computing, stem cells and artificial intelligence. • Assist Canadian innovators in finding a first customer to test and validate their technologies through the federal government.

Table 1.1
The Innovation and Skills Plan—Helping Canadians Succeed in the New Economy

Program Simplification	**Better Supporting Canadian Innovators**
The Government of Canada's vast array of innovation programs makes it difficult for businesses to find and secure the support they need. The Innovation and Skills Plan must simplify this program suite to be client-centric and ensure that programs offer the best support to Canadian innovators.	• Review dozens of innovation programs situated across many departments to see how they might be consolidated and simplified. • Provide a client-centred approach with simpler application processes, quicker processing, and assistance that is more responsive and focused on results. • Bring a greater data focus to understanding, driving and reporting to Canadians on impacts from federal support.
Investment and Scale	**Growing Canadian Businesses to Compete in the World**
Canada is home to many small businesses and innovative start-ups, and is recognized internationally as a good place to invest. At the same time, too many Canadian companies believe that in order to grow, they must relocate outside of Canada. The Innovation and Skills Plan must develop better tools to help Canada attract investment and support the growth of a diverse range of Canadian companies.	• Grow Canada's goods and services exports—from resources, advanced manufacturing and others—by 30 per cent by 2025. • Double the number of high-growth companies in Canada, particularly in the digital, clean technology and health technology sectors, from 14,000 to 28,000 by 2025. • Create new, good, well-paying jobs in Canada's areas of economic strength. • Increase the availability of late-stage venture capital for growing firms. • Help women entrepreneurs grow their businesses. • Provide a single, streamlined tool to attract and support new high-quality business investments that accelerate areas of economic strength and expand the role of Canadian firms in regional and global supply chains.

Federal Budget 2017

Pillar I – Innovation Policy



Federal Budget 2017

Pillar I – Innovation Policy

What Would Superclusters Look Like?

Risk sharing to develop platform technologies and disruptive technologies that will boost Canada's competitiveness in areas of economic strength (e.g. advanced manufacturing, agri-food, clean technology, digital economy, health/bio-sciences, clean resources, and infrastructure and transportation).

Strong connections between businesses, from large anchor firms to start-ups, post-secondary institutions and research institutions that support private sector-led research and development that is linked to commercial outcomes with application in the real economy.

Create opportunities to grow Canadian companies through globally integrated supply chains.

Diverse and skilled talent pools enhanced by advisory services and business mentoring for start-ups and small and medium-sized enterprises that lead to opportunities for Canadians to access high-value, well-paying jobs.

Focus on innovative solutions that will improve the quality of life of Canadians and allow businesses to better perform in a competitive environment.

Federal Budget 2017

Pillar II – Skills Modernization

- Policymakers are ‘flying blind’
- “policymakers are flying blind into what has been called the fourth industrial revolution or the second machine age. There is a remarkable lack of data available on basic questions, such as: what is the scope and rate of change of the key technologies, especially artificial intelligence (AI)? Which technologies are already eliminating, augmenting or transforming which types of jobs? What new work opportunities are emerging, and which policy options might create jobs in this context” (Mitchell & Brynjolfsson, 2017, p. 290)?

Pillar II – Skills Modernization

- Public-Private Data Gap
  - “websites for job-seekers contain data about millions of posts, the skills they require and where the jobs are. Universities have detailed information about how many students are taking which courses, when they will graduate and with which skills. Robotics companies have customer data showing demand for different types of automated assembly system. Technology-platform companies have data about how many freelance workers they employ, the hours they work and where. These sorts of information, if connected and made accessible in the right way, could give us a radically better picture of the current state of employment. But hardly any such data are being shared now between organizations, and so we fail to capture their societal value” (Mitchell & Brynjolfsson, 2017, p. 291).