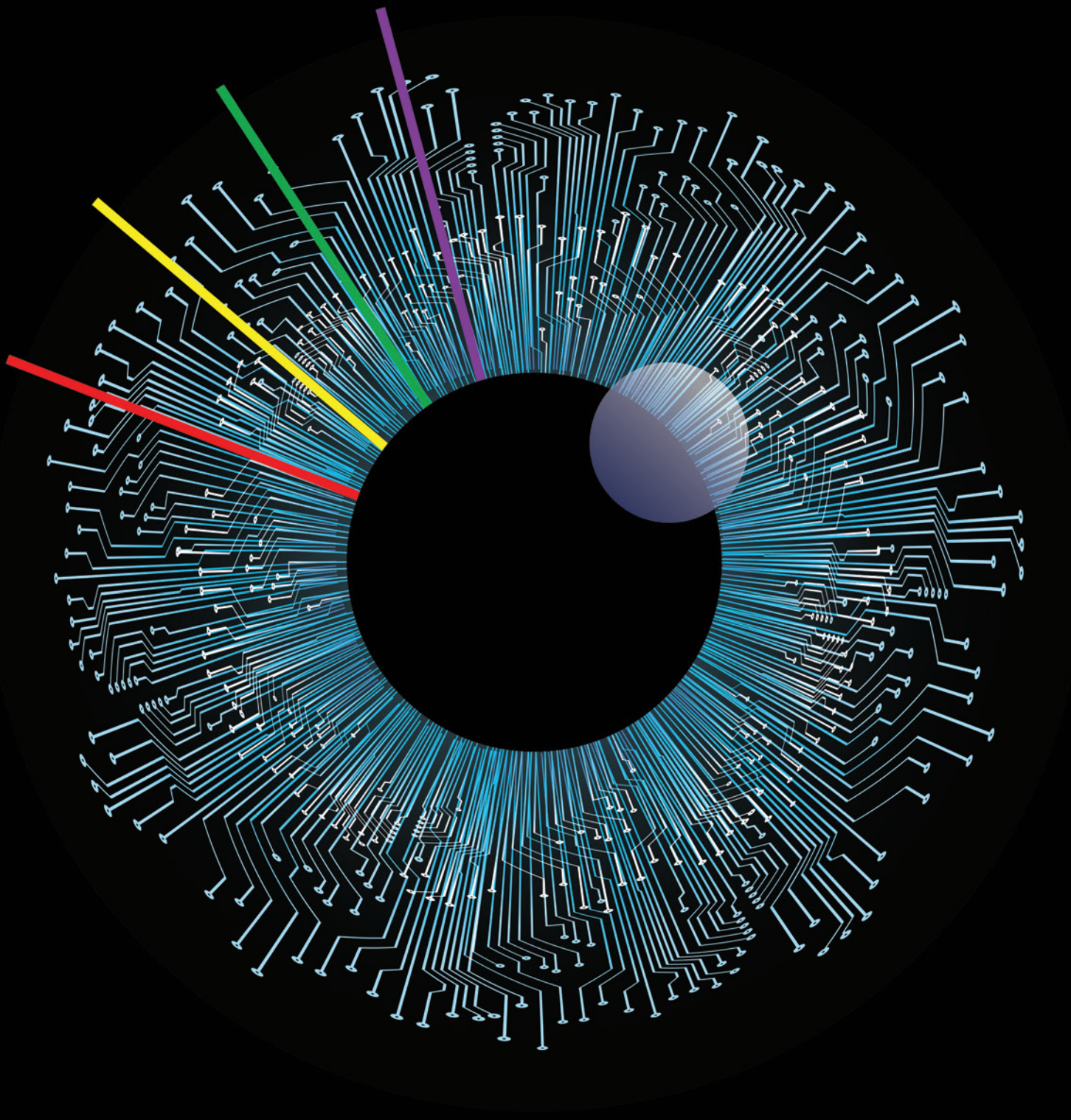
Deloitte.

HRPA Human Resources Professionals Association



The Intelligence Revolution

Future-proofing Canada's workforce

Contents

With thanks to our funding partner

Ontario

A new age of opportunities

The term "Industrial Revolution" conjures images of smoke-belching factories, overcrowded cities, and soulless, repetitive work overseen by avaricious robber barons. The Industrial Revolution also generated tremendous wealth and innovation, including the rise of the modern corporation, workplace protections for employees, and fundamental changes in international commerce. Its less obvious contribution was the creation of the very concept of a job: a combination of work tasks, regular hours, and specific compensation.

Subsequent phases of the Industrial Revolution included changes in technology that may have changed how effectively work is done, but did not alter the fundamental definition of the job itself.

Over the next decade, the future of work will be shaped by a completely new force: an "Intelligence Revolution", driven not by incremental automation in manufacturing processes but by exponential change based on machine learning, virtually free data storage and communication, and ever-increasing computational power that rivals some human capabilities.

These developments will change what a job means, affecting the work we do and how we do it. It will also require policy changes by organizations and governments as dramatic as those created by the first Industrial Revolution.

The Industrial Revolution aggregated work into jobs and people went to where the work was. The Intelligence Revolution will disaggregate jobs and the work will go to where people are. Three important factors will drive this future:

- **Machine learning:** In the past, computers were programmed to function in ways that were clear and understood. Today's machines are fed algorithms or guidelines but they learn autonomously, seeking the best solution to problems by trial and error. Even the humans who program the machines are not entirely sure how the result is reached.

- **Computing power:** A human can take weeks or years to perfect a new skill. When one computer learns a new skill, every computer in the world can instantly replicate it, creating a foundation for more powerful models. It would be like a human learning quantum math and his child being born with the with the same level of comprehension.

- **Machines exceeding humans:** The point of singularity is reached when machine intelligence exceeds human intelligence. Some experts believe we are already there; others say it will take 10 to 50 years. Regardless, this force is already changing how we work today through the growth in the gig economy, the creation of new types of jobs, and the creation of virtual lawyers, investment analysts, insurance agents, and medical diagnosticians.

Many studies suggest up to 50 percent of today's jobs will be lost to these trends. Others say the impact will be minimal. In this report, we take the view that both outlooks are correct because of two simple principles.

First, when automation of any kind is introduced, costs go down and demand increases, creating more work. Second, for the foreseeable future, computers and humans will have different but complementary strengths. Humans have capabilities that tend to be broad and shallow, while highly intelligent robots have skills that are narrow but deep. Because of these principles, work will continue to be plentiful, but who performs it will shift. Repetitive parts increasingly will be conducted by computers while those elements requiring judgment will be done by humans.

In short, we believe the amount of work will increase but the capabilities needed to perform it will change. This will result in new job categories, described in this report as archetypes.

The Intelligence Revolution has profound implications for the future of work. Organizations, governments, and individual working-age Canadians themselves need to understand the forces at work and take action now to enable Canada to seize the opportunities on the horizon. We look forward to working with leaders in all sectors to ensure Canadians thrive in this new world of work.

Stephen Harrington
National Lead,
Talent Strategy,
Deloitte

Jeff Moir
Partner and National
Human Capital Leader,
Deloitte

J. Scott Allinson
Vice President
Public Affairs & Research
Human Resources
Professionals Association

Executive summary

Waves of change are disrupting the Canadian workforce. Automation, artificial intelligence (AI), robotics, machine learning, and other technologies are revolutionizing industries, transforming workplaces, and even redefining what it means to hold a job.

The pace will only gather speed. We call this transformation the Intelligence Revolution, and we believe it holds tremendous opportunities for Canada.

This report is designed to provide insight into this new world of work—insight that leads to action. We aim to jumpstart a meaningful discussion among Canadian business executives, government leaders, and workers themselves not just about how to survive in the Intelligence Revolution but how to thrive in it.

To this end, we outline the future-proofed capabilities Canadians will need to succeed in the Intelligence Revolution and describe a series of the new work archetypes we envision as the necessary foundation for the future of work. And finally, we offer a series of recommendations for Canadian government, business, and workers that we believe must be implemented to put us on the path to success.

In examining the future of work in Canada, we undertook extensive research, including nearly 50 interviews with leading experts, research into the psychology of future capabilities, and a deep review of the academic literature. We are confident in these conclusions; if anything, we risk underestimating the pace of change.

Our position is clear: We believe Canada can—and must—emerge as a winner in the Intelligence Revolution. But this will not happen by accident.

Canada can build upon many strengths to develop a position of global leadership. Canadians at all levels of business and government must not only recognize how the Intelligence Revolution is reshaping our world but also actively embrace this change to stay ahead of it.

As an example of these forces at work, consider the rise of the gig economy, which turns the traditional one job/one employee/one employer model on its head. Since 1997, Canada's contingent workforce has grown from 4.8 million to 6.1 million. It now accounts for about one-third of all jobs, and is likely to keep growing.[1]

The gig economy changes the nature of work, because participants act as both employees and self-employers, and the nature of a career, because people can easily work for several companies at the same time. Government, too, is affected by this change. How will taxes be collected with this increase in non-traditional employment? How can the social safety net be reformed? How should education adapt?

Of course, employees outside the gig economy will also experience the profound nature of this change. The traditional corporate hierarchy is giving way to new organizational structures that are turning employees into free agents who bring their skills to a specific project or team, then move on to the next assignment when the job is completed.

The changing concept of a job is only the beginning of the transformation of work. Machines are now learning faster than humans and becoming more intelligent as they advance to take on tasks that are more complicated. This convergence of technologies opens new opportunities for machines—and for humans.

We aim to jumpstart a meaningful discussion among Canadian business executives, government leaders, and workers themselves not just about how to survive in the Intelligence Revolution but how to thrive in it.

Technology's impact is growing wider and deeper. For the first time technology is targeting jobs in fields that have so far been immune to the impacts of automation. In short, an entirely new workforce is taking shape. The repercussions for Canada and Canadian institutions will be profound.

How can Canadian workers prepare for these changes? The best approach is based on building what we see as the one universal future-proofed capability, a capability that is portable and transferable and that will pass the test of disruption: information-seeking. This universal capability is not simply the capacity to search for and find information, it is the capacity to make sense of what we find—to recognize opportunity and make decisions that lead to effective free agency.

Building on future-proofed capabilities, the heart of the report describes eight archetypes of jobs of the future, each supported by several critical capabilities and connected to both current and future jobs. These archetypes represent our effort to help Canadians prepare for the future by moving beyond the frustrating debate over which jobs might be lost to technology or how many employees may be displaced.

The new work archetypes

The **Protector** provides the human element machines cannot deliver, demonstrating qualities like empathy and judgment, especially in stressful situations when trust is critical.

The **Innovator** is an idea-generator who can think creatively, thrive in ambiguity, and operate in rapidly evolving environments by anticipating problems.

The **Influencer** demonstrates the broad leadership capacity to inspire others, drive innovation, and challenge the status quo in the face of disruptive change.

The **Integrator** connects systems and people to create competitive advantage. As technological disruption causes work to become more fragmented, Integrators will be needed to bring together new combinations of machines and people in ways that engage employees and deliver business results.

The **Scorekeeper** develops and implements organizational controls, including policies, rules, and standards that guide people and, increasingly, machines. Scorekeepers will help orchestrate the controls to ensure the workforce aligns with organizational goals.

The **Performer** is a master of creative expression in all forms, using new technologies to deliver entertainment in more innovative and accessible ways.

The **Builder** implements the systems, programs, and processes to create both physical and virtual assets. Builders will be needed for the immense task of integrating AI and robotics into a cohesive workforce operating side-by-side with people.

The **Curator** designs and delivers highly tailored, customer-centric experiences. Curators will be essential to entrepreneurs and startups, helping them evaluate markets, understand customers, and develop products and services people want.

The report concludes with a series of challenging and thought-provoking recommendations for action by all stakeholders: government, business, and individual. From modernizing provincial labour law and the social safety net to reflect 21st-century workforce realities to reimagining Canada's education system, these recommendations seek to transform current debates into concrete, and in some cases radical, action to seize the very real opportunities for Canada.

For Canadian workers, the future of work begins now.

The future of work is here

"It's wrong to think of these changes as something that will come in the future. It is happening now and, in my opinion, is a major cause of the political unrest we are experiencing in many parts of the world. Developing our responses to these changes will require time, and there is little to no time to wait."

Jeff Moir, Partner and Canadian National Human Capital Leader, Deloitte

Canadian best-selling author and futurist William Gibson got it exactly right. Waves of disruptive change have already hit the Canadian workforce. Automation, AI, robotics, machine learning, and other technologies are revolutionizing industries, transforming workplaces, and even redefining what it means to hold a job.

This change is arriving faster than anyone predicted. We see it everywhere today, with new technologies changing work fundamentally. And the pace will only gather speed.

While some call this a new phase of an ongoing Industrial Revolution, we view it through a fundamentally different lens: we see it as a shift to a new context, one we call the Intelligence Revolution.[2]

"Companies will be experimenting in a very potent way with lifelong learning. I expect countries like Canada to be at the forefront of this movement."

Jeff Schwartz, Partner and Leader for the Innovation Tech Terminal, Deloitte

Various stages of the Industrial Revolution made workers more effective, efficient, and productive in their jobs. The way we worked changed, but the jobs we did stayed basically the same. The Intelligence Revolution upends the whole concept of a job: it calls for an entirely new way of defining work, the workplace, and workers themselves.

One example of these forces at work is the rise of the gig economy, which turns the traditional one job/one employee/one employer model on its head.

- **A new way of working:** The gig economy changes the nature of work, because participants act as both employees and self-employers, scheduling their work based on their own availability, not a corporate time clock.
- **A new organizational structure:** It changes the nature of the organization, pushing companies to adopt new structures to account for contingent workers and other non-traditional employees. Some gig economy pioneers like Uber, Lyft, and Airbnb have succeeded by doing away with large, hierarchical organizational structures altogether.
- **A new definition of career:** It changes the nature of a career, because people can easily work for several companies at a time, not just one.
- **A new role for government:** And the gig economy changes the role of government as well: How will taxes be collected? How will companies be regulated? How do we reform the social safety net when the very concept of unemployment is up in the air? How should education be reformed to ensure Canadians enter the workforce with the future-proofed skills they need to succeed?

Our goal in this report is to provide the insight needed to start defining this new world of work. We want to jumpstart a meaningful discussion among Canadian business executives, government leaders, and workers themselves not just about how to survive in the Intelligence Revolution but also how to thrive in it.

Awareness is the starting point for collaboration, innovation, and action. Unfortunately, the current debate over AI, automation, robotics, and other technologies that affect the future of work offers little other than a stark, unhelpful dichotomy of job losses vs. job gains, machines vs. people, and scarcity vs. abundance.

Technology leaders themselves can't seem to agree on where this is headed.

Amazon CEO Jeff Bezos predicts AI will usher in a renaissance and a golden age that will "improve every business."[3] Meanwhile, Dominic Barton, chair of the federal finance minister's Advisory Council on Economic Growth, worries about "a world that is going to get worse for [the middle class] because of automation."[4] Alibaba Chairman Jack Ma warns that in the coming decades "the world's pain will be much more than happiness" due to technology-induced job disruptions.[5] These disruptions won't be limited to factory workers. In 30 years, Ma says, "the *Time* magazine cover for the best CEO of the year will very likely be a robot."[6]

The rise of the gig economy
The gig economy is a labour market that is predominantly comprised of what are sometimes called contingent workers, including independent contractors, freelancers, consultants, and other temporary employees. Workers perform short-term gigs, working for organizations, for themselves, or through digital platforms like Uber, Lyft, Upwork, and others.

"Work has always been disrupted—just the speed is changing."

Steve Orsini
Secretary of the Cabinet, Head of the Ontario Public Service, and Clerk of the Executive Council, Government of Ontario

Current research data provides more context, but little strategic direction. According to three recent studies, based on 2011 Census data from Statistics Canada (see Figure 1), predictions about the number of jobs threatened by automation range from 35 to 42 percent.[7] The varying percentages result from different approaches to calculating the coming speed and pervasiveness of automation. Methodology aside, even at the low end of the range, the potential impact demands action.

Since we last wrote about the future of work (2012's *The lost decade, unsustainable prosperity or the northern tiger? Canada Works 2025*[8]), many of our predictions have come true. But we underestimated the pace of change.

Compared to previous technologies, which often took decades to become pervasive in the marketplace, the adoption of 21st-century technology is advancing at an exponential rate and shows no signs of slowing down.

"Everything written and developed on the future of work is very theoretical. What businesses want and need is: 'What do we do about it now to prepare our business and leaders?'"

Heather Stockton
Partner and Global Future of Work Leader, Deloitte

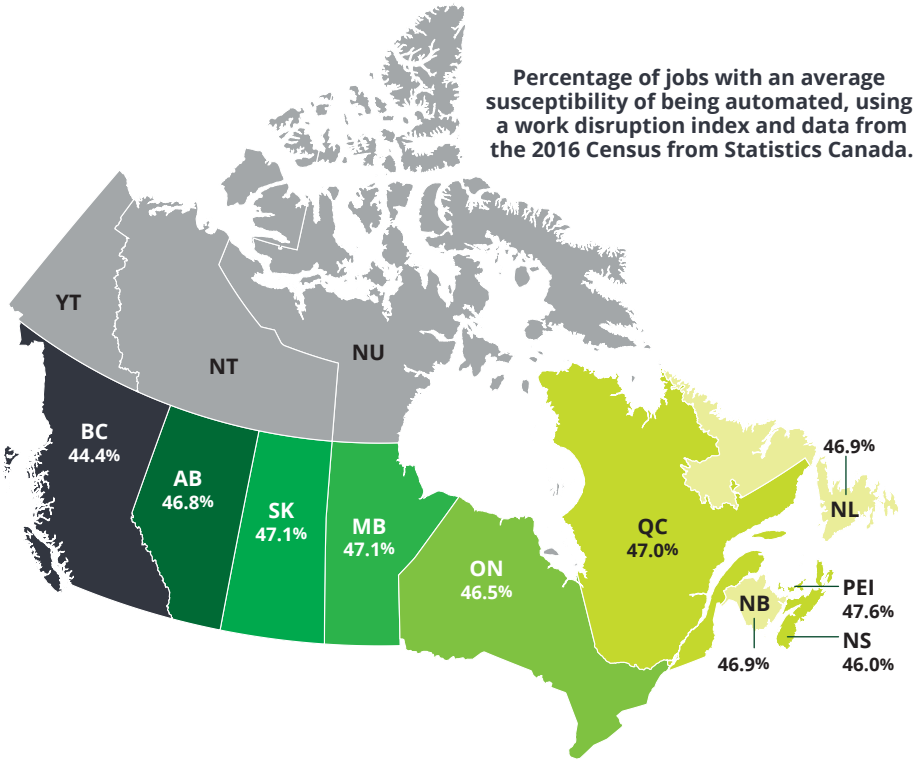
Figure 1: Percentage of jobs highly susceptible to automation in Canada

35.0%
C.D. Howe Institute

38.0%
Organisation for Economic Co-operation and Development

41.9%
Brookfield Institutes for Innovation and Entrepreneurship

Figure 2: Potential work disruption across Canada

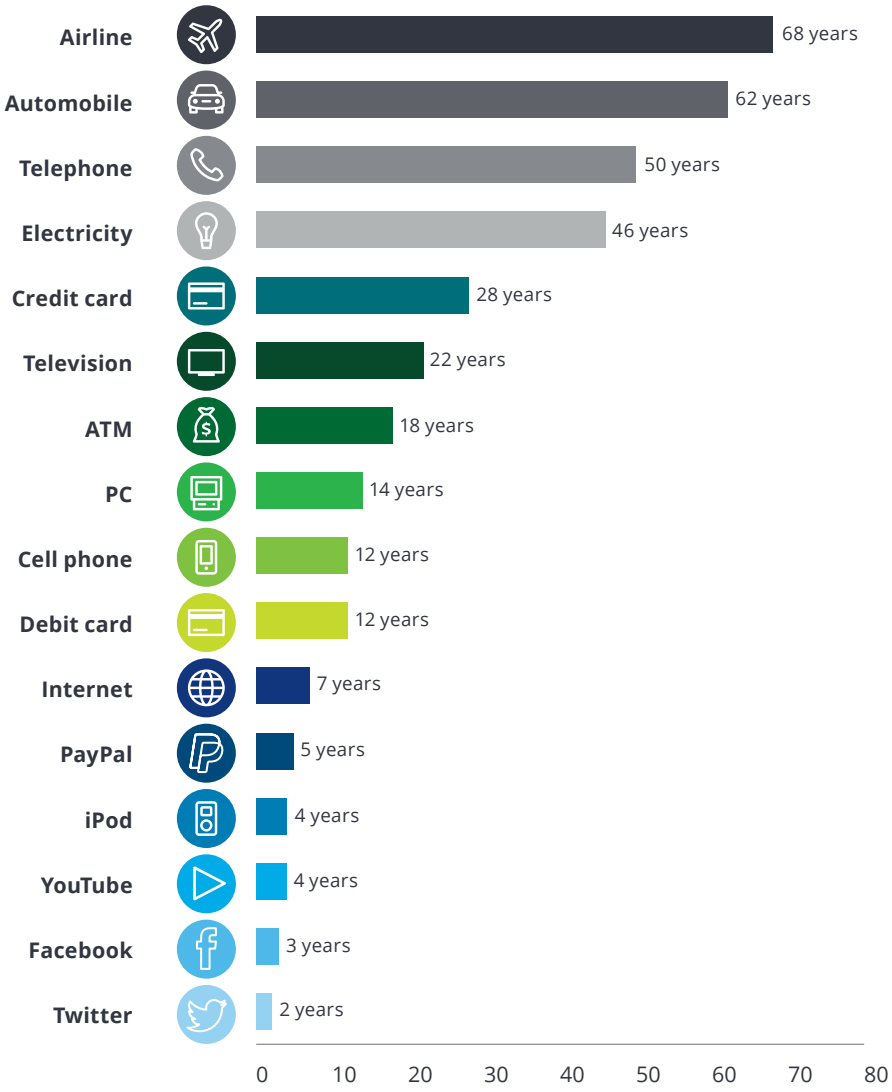


Source: https://www.canada.ca/en/innovation-science-economic-development/news/2016/05/2016-census.html

In 2012, Canadians were just beginning to appreciate the transformative power of smartphones. Today, 3D printers can generate mini solar panels[10] and even small homes.[11] In the near future, collaborative robots, or cobots[12], will work alongside us in the workplace. And it won't be long before driverless cars are commonly seen navigating our roadways[13]—in fact, Uber has already created a new research hub in Toronto to pioneer the object-recognition software needed to make driverless vehicles a safe reality.[14]

The power of 3D printing
3D printing turns an object into thousands of tiny slices and then builds it from the bottom to the top. The tiny layers stick together to form one solid object. The potential applications of this technology are breathtaking and transformative. A 3D-printed home can be built in less than a day, for a cost of just over US$10,000. Recently, a seven-year-old girl with a rare medical condition threw out the first pitch at a Major League Baseball game using a 3D-printed hand.[9]

Figure 3: Number of years it took for each product to gain 50 million users



Source: https://www.linkedin.com/pulse/road-50m-growing-number-vrar-user-adoption-savin-gatchalian

Cobots joining the workforce
Cobots—or collaborative robots—are equipped with sensors and AI tools that enable them to see and feel, allowing them to work closely with humans. Innovative companies are making cobots designed to work with employees, rather than replace them, by streamlining repetitive tasks and freeing human colleagues to concentrate on more creative, intellectually engaging work requiring uniquely human traits like communication, personal service, and strategic decision-making. The question for companies is not "'How many cobots can take the place of traditional employees?", it is "How can cobots can best augment workers to increase employee productivity and engagement?'"

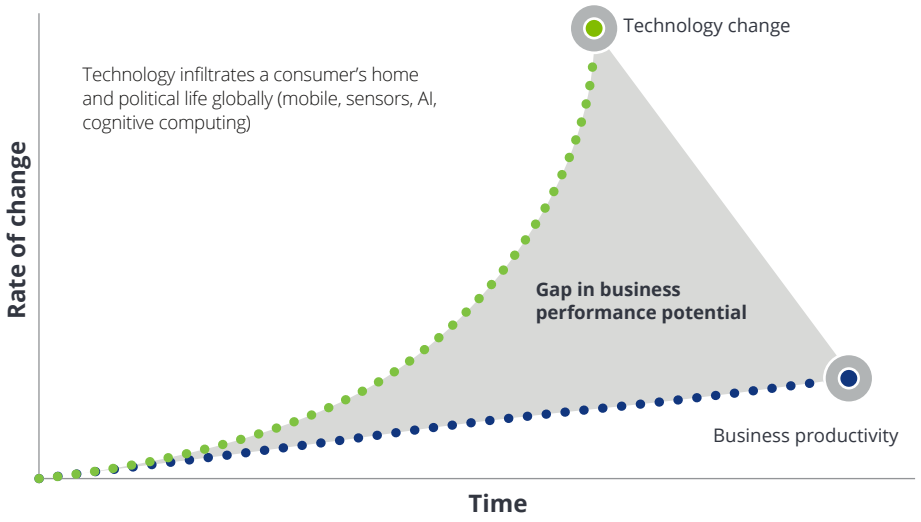
While many individual Canadians appear to be adapting relatively well to technological change, larger institutions in both business and government are lagging behind.[15] Figures 4 and 5 provide one explanation. The speed of technological advances has become so rapid that it is outpacing the speed at which organizations adapt.

Technology advances outpacing organizations' ability to adapt

AI and the future of work

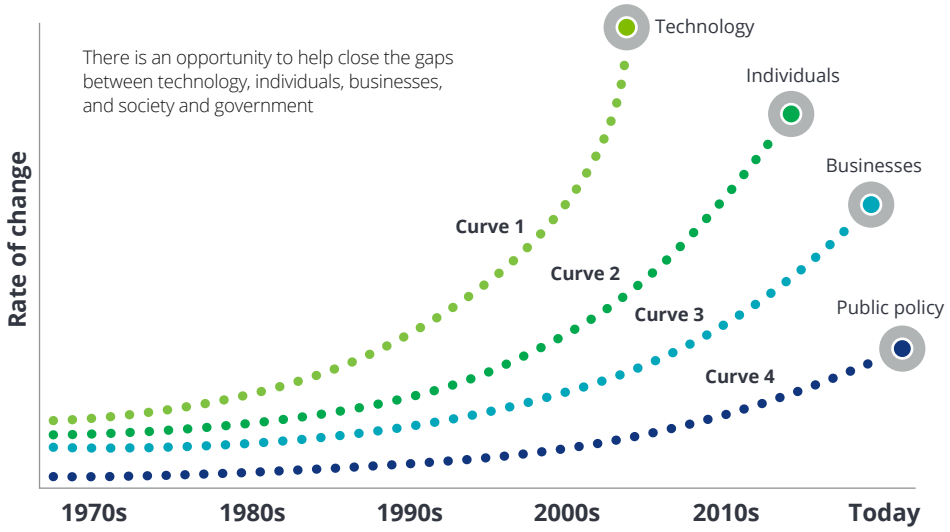
Artificial intelligence (AI) refers to any machine that replicates human activities like problem-solving by using sophisticated algorithms. The essential difference between humans and AI is that human capability is wide and shallow. We can do a great many tasks, but none perfectly. AI, on the other hand, is narrow and deep: great at specific tasks, but within a limited range. These fundamental differences could create interesting synergies, allowing humans and machines to work together and increasing the productivity of both. While many fear the day when AI can replace humans altogether, that future is currently the domain of science fiction, lying decades in the future if at all.

Figure 4: What *appears* to be happening



Source: https://dupress.deloitte.com/dup-us-en/focus/human-capital-trends.html

Figure 5: What is *really* happening



Source: https://dupress.deloitte.com/dup-us-en/focus/human-capital-trends.html

This report aims to close the gap by helping Canadian businesses, governments at all levels, and individual workforce participants understand the forces of disruptive change and help enable Canada to master them. By providing insight into these forces, we hope to spur action at the corporate, government, and individual levels.

"There's an opportunity in Canada. People are turning to Canada to be ambitious in a way that's consistent with its values."

Jean-Noé Landry, Executive Director, Open North

Our position is clear: We believe Canada can—and must—emerge as a winner in the Intelligence Revolution. But this will not happen by accident.

Canada can build upon many strengths to develop a position of global leadership. In some cases, we're already ahead of the game. Google, for example, has announced plans to open cutting-edge artificial intelligence labs in Toronto and Montreal.[16]

To build on successes such as this, Canadians at all levels of business and government must not only recognize how the Intelligence Revolution is reshaping our world but also actively embrace this change to stay ahead of it. After all, the business obituaries are filled with the names of failed companies that saw change coming but didn't take action fast enough: Nokia, Nortel, Kodak, and Blockbuster, for example.

Peter Drucker, one of the world's leading business thinkers, once said, "The best way to predict the future is to create it."[17] In other words, the future of work in Canada is ours to define.

The future of work in Canada: Ours to define

Shaping the future

Automation relieves people of mundane, repetitive tasks, freeing humans to work on more creative, intellectually challenging work.

Large, inflexible organizational structures are replaced by agile, flexible arrangements that create empowered workers in a gig economy with high labour-force participation.

Canada becomes the premier destination for immigrants of all skill levels, drawn by successful bets placed on a collection of industries where Canada has fundamental strengths, such as ocean technology, agriculture and food, financial technology, and mining.

VS.

Watching it happen

Robots and AI replace humans at an unprecedented rate, leaving the bulk of workers without meaningful work, benefits, or pension plans.

Organizational structures fail to adapt to new realities, leaving companies unable to compete and workers frustrated and alienated.

Canada suffers from brain drain as jobs and workers leave because the country failed to adapt both its business organization and public policies to the new realities of work.

The Intelligence Revolution is changing work fundamentally

"What we're beginning to see now, and what will become more of a norm, is people stepping in and out of the paid labour force. People will make a contribution and have that contribution recognized and compensated in a way that won't look a lot like salary and where everyone is treated the same."

Nora Spinks
Chief Executive Officer,
Vanier Institute of the Family

What makes the Intelligence Revolution so different from economic transformations of the past? And why does it require new strategies by business, government, and individual workers alike? Several factors stand out:

#1 The concept of a job has fundamentally changed.
Most Canadians today think of their job and their work as the same. The concept of a job as an amalgamation of certain work responsibilities came about in the mid-19th century, the result of increasing industrialization and specialization. For Canadians working in the Intelligence Revolution, this is no longer true.

An increasing number of workers throughout many industries are becoming free agents, bringing their skills to a specific project or team and then moving on to the next assignment when the task is completed.

Or think of the gig economy, mentioned earlier. Thanks to digital and mobile technology, a person may hold many jobs at once—driving for Uber, renting their home on Airbnb, and offering their expertise in plumbing or electrical work through TaskRabbit, for example. Online marketplaces, such as MTurk and Kahuso, post and advertise digital micro-tasks for pay, creating new avenues for people to monetize their skills.

In this radically new environment, free agent employees often construct their own job descriptions based on their time and interests. Many work outside formal hierarchies, operating through loose, team-oriented structures rather than inhabiting a specific box on an organizational chart. They connect with work through digital platforms—websites, apps, and software that use algorithms—instead of managers.[18] By itself, this is a profound change in the nature of work.

"AI doesn't have any prejudice. All industries will be affected by it."

Terry Stuart, Partner and Chief Innovation Officer, Deloitte

#2 Machines are learning faster than humans.

Another significant dimension of the Intelligence Revolution is the evolution of machine intelligence. This evolution is progressing rapidly, as machines advance to take on tasks that are more complicated.

Six years ago, IBM's Watson defeated the most successful *Jeopardy!* champions.[19] Today, Watson is helping doctors diagnose and treat cancer patients. In one celebrated case, the AI technology diagnosed a rare form of leukemia in a 60-year-old patient that had eluded doctors for months. As Arinobu Tojo of the University of Tokyo's Institute of Medical Science explained, Watson was able to sort through mutations in more than 1,000 of the patient's genes, determining which were diagnostically important within 10 minutes—a task that would have taken doctors weeks to complete.[20]

The technology has far more varied applications. Last year, for example, a leading US law firm brought on a Watson-powered robot to help its bankruptcy lawyers review legal documents. The new legal researcher, called ROSS, uses machine learning technology and feedback from human lawyers to adjust its approach and improve its results.[21] Now many more firms are using technologies like ROSS.

These are not simply examples of well-programmed machines driven by sophisticated algorithms. Machines are actively learning as they work, constantly upgrading their intelligence, skill, and capability. No wonder Alibaba's Jack Ma foresees the day when robots capable of machine learning join a company's C-suite, not just its production line.[22]

#3 The convergence of technologies opens new opportunities for machines and humans.

Artificial intelligence is becoming more integrated into routine jobs, leading to a redefinition of work as the sum of both machine and human capabilities. According to research by International Data Corporation (IDC), by 2018, 30 percent of new robotic deployments will be collaborative robots capable of working side-by-side with human colleagues.[23]

A convergence of technologies, such as sensors and advanced cameras with a central AI platform, make this type of new work possible. It doesn't eliminate the human element but rather augments employee skills with machine intelligence, thus freeing humans for the types of work at which they excel.

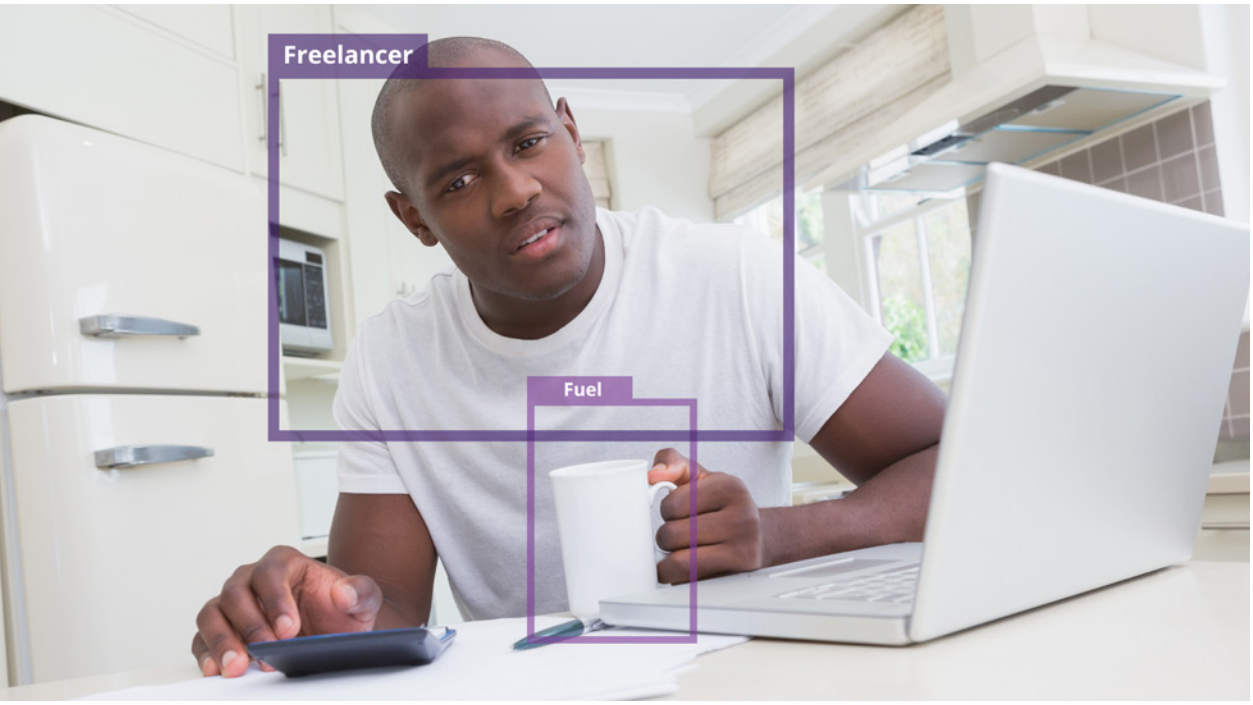
Amazon is planning to roll out Amazon Go stores that use motion sensors, cameras, and AI to track customers, tally the items they select, learn based on customer patterns, and automatically charge their purchases through their smartphone.[24] This example illustrates what a web of converging technologies makes possible.

Integrating these technologies into the workforce represents an entirely new challenge for businesses. It's a transformation that ranges well beyond implementation and integration, a disruption of the nature of work itself. Yet, most companies are not ready to address it.

According to Deloitte's 2017 Human Capital Trends report, a worldwide survey of C-suite business executives and HR leaders reveals that only 40 percent see robotics, cognitive computing, and AI as an important trend.

"It will be a powerful catalyst to step back and identify the unique capabilities we can harness as humans to differentiate ourselves, such as curiosity, imagination, creativity, and emotional and social intelligence—the things the school system is doing a bad job of nurturing and developing in us."

John Hagel
Co-chairman,
Center for the Edge, Deloitte



"Our system is not set up for a world where every five years your career changes. And to change those systems is very tough."

Bill Currie
Partner and
Vice Chairman, and
Global Managing Director,
Deloitte

#4 The disruptive impact of technology is wide and deep.

We all recognize cases where technology has affected jobs in our everyday lives, replacing humans with machines: the calendar program replacing administrative assistants, the automated voice handling customer support services, digital banking enabling financial transactions. But the Intelligence Revolution marks the first time technology is targeting jobs in elite fields such as medicine, law, and investment banking that have historically been immune to the impacts of automation.

Not long ago Goldman Sachs employed 600 senior-level US cash equity traders. Today there are just two, supported by 200 computer engineers, accomplishing the same amount of work.[25]

A company called Blue J Legal has developed software that uses deep learning to analyze huge amounts of case law, accomplishing in moments what would take a junior associate days to complete.[26]

#5 An entirely new workforce is taking shape.

The emergence of the gig economy is also leading to the rise of a major new workforce segment: contingent workers. These are independent contractors, freelancers, consultants, crowdsourced workers, or other off-the-books workers who join firms to complete a specific task and then move on to the next project.

Since 1997, Canada's contingent workforce has grown from 4.8 million to 6.1 million. It now accounts for about one-third of all jobs[27], and is likely to keep growing. In fact, according to Statistics Canada, more than 90 percent of jobs created in 2015 and 2016 were temporary positions—and paid, on average, over 30 percent less than permanent positions.[28, 29]

As this data makes clear, although some Canadians may join the contingent workforce because they enjoy the variety and flexibility, others only turn to it because traditional jobs are becoming more scarce.

Because the contingent workforce has grown so quickly, employment laws and public policies are struggling to catch up. Most contingent workers are not currently eligible for traditional employer benefits, pension plans, and personal time off. In fact, only 24 percent of private sector workers are covered by a plan in 2017.

~1/3

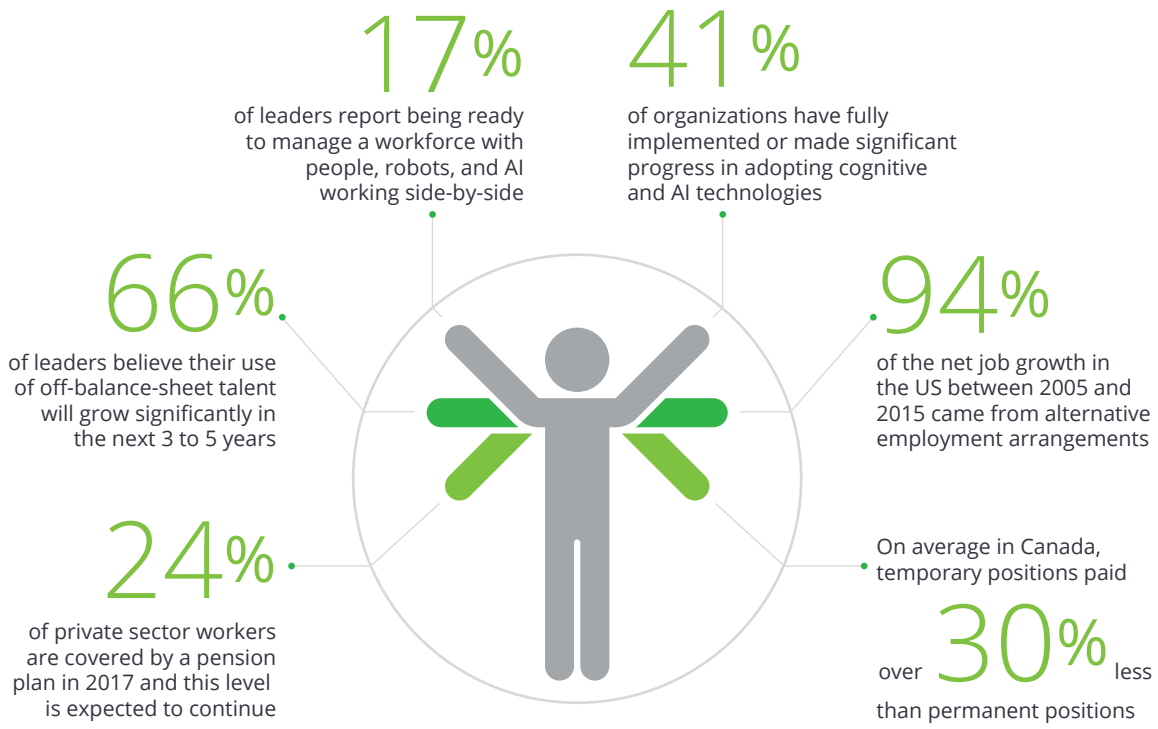
of jobs are for contingent workers

This number has grown from 4.8 million in 1997 to 6.1 million in 2015

"The new generation is telling us how to change the organization. That's the biggest difference. We have the spokespeople for the future and we just have to listen to them."

Lekan Olawoye
Lead Executive, Studio Y, MaRS

Figure 6: Contingent work is exploding



Source: Walsh, B., Bersin, J. and Pelster, B.,"Global Human Capital Trends–Rewriting the rules of the digital age", Deloitte University Press, 2017.

Separating the signal from the noise: A review of current research

Over the past five years, several studies have attempted to assess the percentage of the Canadian workforce that may experience automation's impact. The three primary studies summarized in Figure 7 used differing methodologies in concluding that between 35 and 42 percent of the workforce will be affected.

Figure 7: Recent studies predicting risk to Canadian jobs from automation

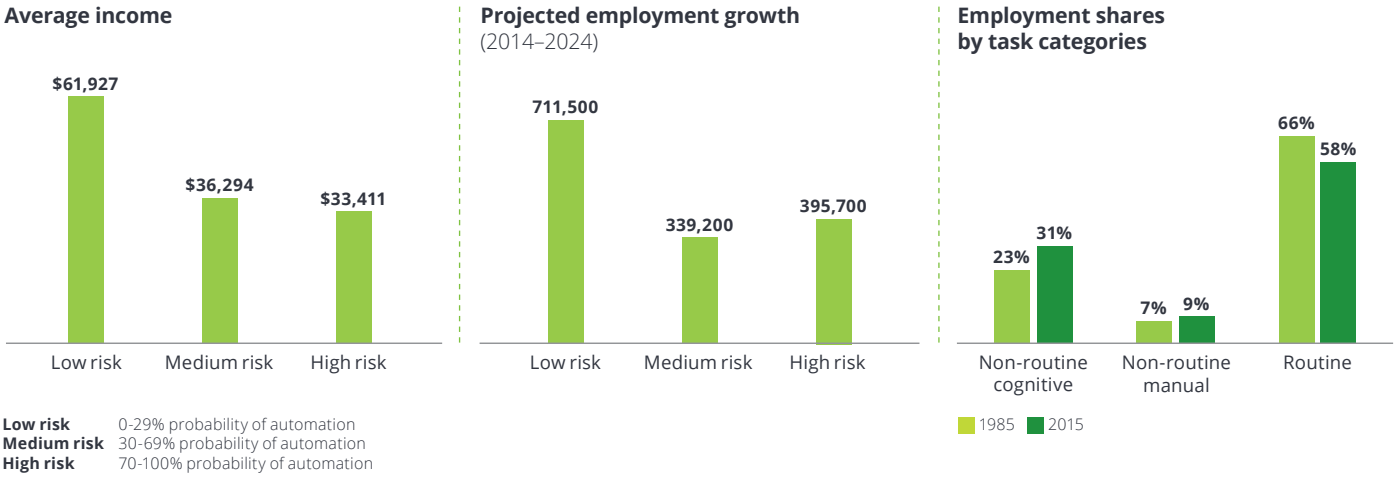
Source	Year	Methodology	Country	Predicted work disruption
Brookfield Institute for Innovation and Entrepreneurship	2016	Replication of Frey and Osbourne's[30] occupation-based methodology.	Canada	42% of the Canadian labour force is at high risk of being affected by automation.
C.D. Howe Institute	2017	Adaptation of Frey and Osbourne's[31] occupation-based methodology. Advances to the methodology include an updated list of skills that cannot be computerized and weighting of skills level for each occupation by importance of that skill to the occupation.	Canada	35% of occupations are highly susceptible to automation.
Organisation for Economic Co-operation and Development (OECD)	2016	Task-based methodology that spanned 21 countries. Paper argues that an occupation-based methodology creates inflated percentages given that occupations labelled as high-risk still had a considerable portion of tasks that would be difficult to automate.	21 countries, including Canada	In Canada, 38% of jobs are at high risk of being automated.

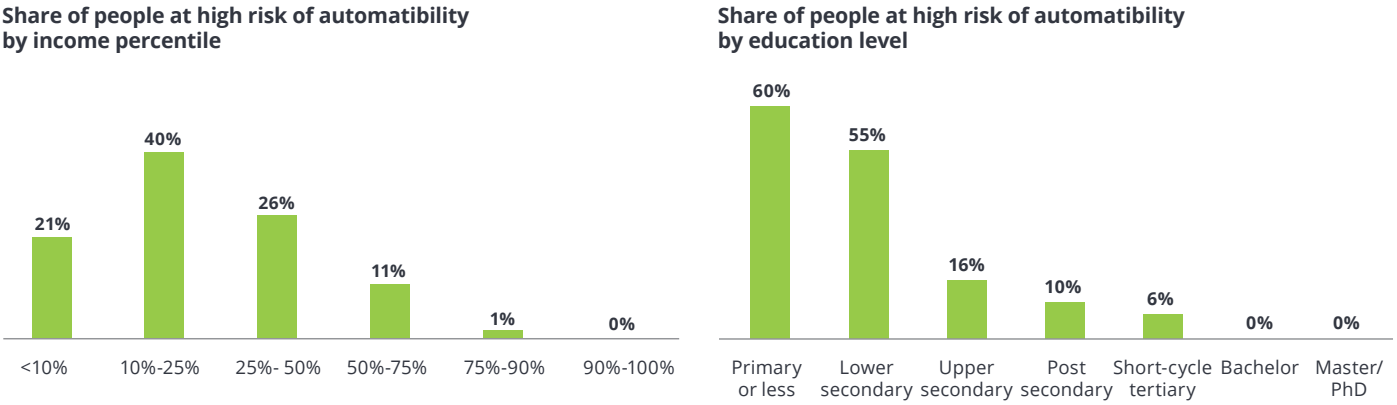
Sources: Arntz, M., T. Gregory and U. Zierahn (2016). *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis.* OECD Social. Employment and Migration Working Papers. No. 189, OECD Publishing, Paris. Forbes (May 2015). *Shocker: 40% of Workers Now Have 'Contingent' Jobs, Says U.S. Government*

https://www.forbes.com/sites/elainepofeldt/2015/05/25/shocker-40-of-workers-now-have-contingent-jobs-says-u-s-government/#6b8da96d14be. UK/US: Deloitte study using census, national statistics, O'net data, and academic research.

Additional research brings this data into clearer focus. The bar graphs in Figure 8 provide insight into which jobs face a low, medium, or high risk of automation based on income, job tasks, and education levels.

Figure 8: Risk level from automation





Source: Arntz, M., T. Gregory and U. Zierahn (2016). *The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis.* OECD Social. Employment and Migration Working Papers. No. 189, OECD Publishing, Paris.

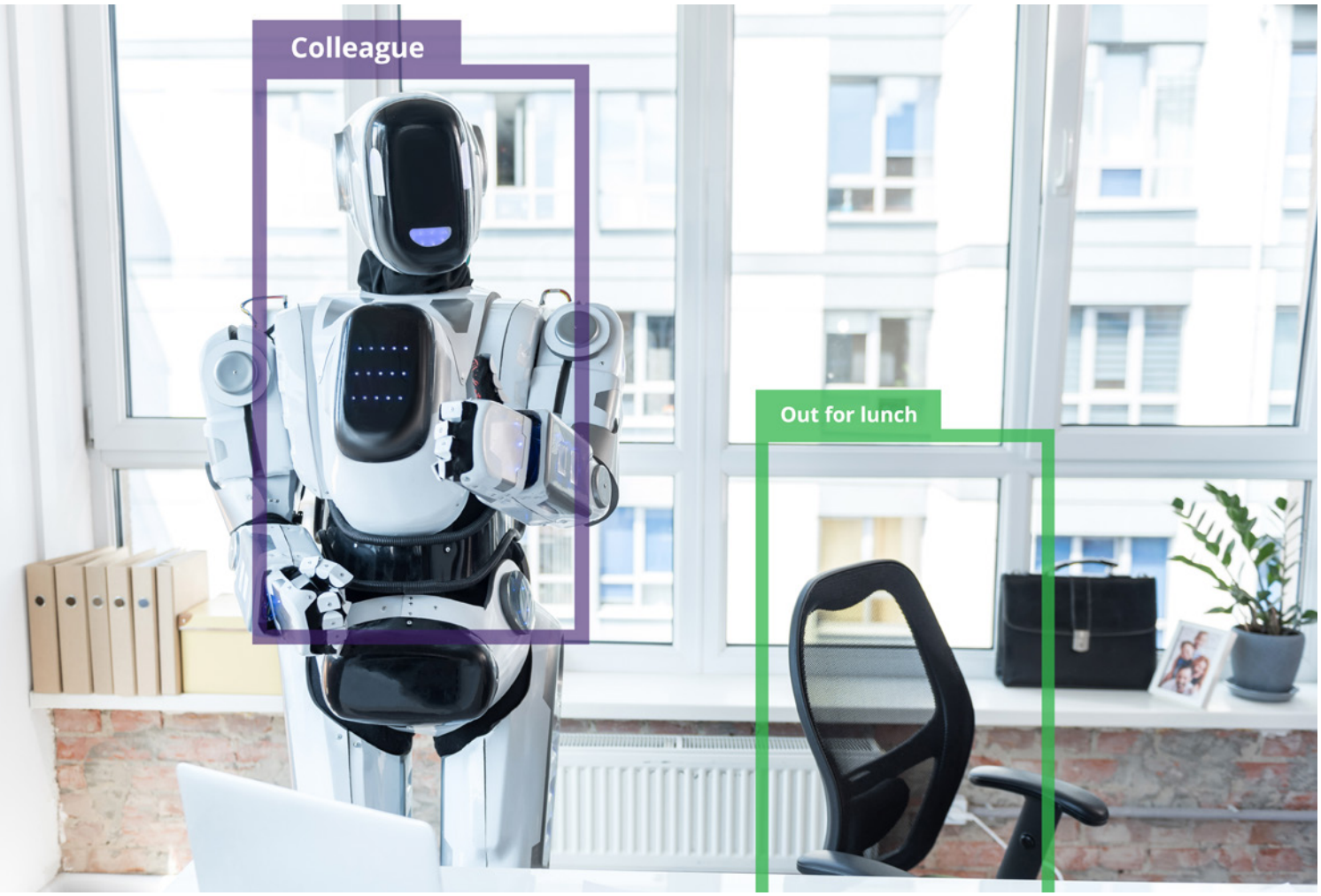
These studies share a heavy focus on the number of jobs potentially affected by automation. But they offer little if any guidance on how Canada should prepare for a disrupted future, much less turn it to our advantage.

Even as these forces of change unfold before our eyes, most Canadians do not appear to feel much urgency about the future of work and its implications. There are several reasons that may explain this complacency:

- **It won't happen to me:** Most media reports highlight the impact on automation in the manufacturing sector. For those outside these industries, it can be easy to conclude they won't be affected.
- **Fuzzy research:** Canada is awash in a sea of numbers about predicted job losses. But this research provides little clarity about the real question on the minds of Canadian workers: What does it mean for me?
- **Head in the sand:** Constant headlines about major job disruptions due to automation create a sense of doom and gloom. This sense of inevitability creates inertia and distracts from the far more important question of how to devise the strategies Canada must develop to prepare for this future and turn it into an opportunity.
- **Overwhelmed by the challenge:** The enormous number of technological advances we learn of on a daily basis makes it difficult to identify the transformative technologies that demand our attention from the transient ones that can be safely ignored.
- **Never saw it coming:** While some people are overwhelmed by the pace of change, others never see it coming. Or, by the time they do, it's too late to adapt.

"People understand the future of work intellectually, but only a few are really taking time to pause, take in the whole complex topic, and figure out what this means for the organization and me day-to-day."

Karen Pastakia
Partner and Toronto Human Capital Lead, Deloitte



Understanding the forces of change

Mastering change in our era of disruption requires an understanding of the forces at play, including the main strands of technology that are converging to create the Intelligence Revolution.

"If you train yourself to be a robot, then you're out of a job."

Gordon Sandford
Partner and Deloitte Digital Canada Lead, Deloitte

These new technological forces, combined with the broader demographic shifts in Canadian society—from aging baby boomers to the rise of the millennials—require us to rethink everything from business structures to the public policies that support Canada's social safety net.

Major forces include:

Robotic process automation

What it is: Robotic process automation (RPA) is loosely defined as computer-coded software or programs that replace humans performing repetitive, rules-based tasks.[32] This technology can operate 24/7 with increased accuracy and lower costs compared to humans.

Today's impact: RPA is already undertaking many administrative tasks in office environments, such as copying and pasting and making calculations. Traditional robots have long been used in factories to automate simple production line tasks; RPA is stretching the impact of this technology beyond the factory floor.

Where it's headed: According to research by the C.D. Howe Institute, routine tasks declined by more than 12 percent between 1987 and 2015 in Canada, while non-routine cognitive tasks increased by more than seven percent.[33] We believe this process will accelerate over the next 10 to 15 years. By 2030, RPA will be embedded in most organizations to replace routine work.

How it will redefine work: RPA is not likely to affect tasks requiring so-called people skills, such as communication, strategic decision-making, empathy, and critical thinking. These tasks are challenging to translate into a series of rules, making them much more difficult to automate.

Where the impact will be felt: A study by the Brookfield Institute of Innovation and Entrepreneurship[34] calculated that about 40 percent of workforce tasks are candidates for automation.

What the positives are: We believe that the possibility of automating routine tasks, and ultimately letting the robots be robots, will allow humans the opportunity to do more human-like work.[35]

"There's so much technology coming at us all the time. It's not about knowing all the names in the race; it's about knowing the ones that are going to win."

Duncan Stewart
Partner and Director of Research, Deloitte

Figure 9: People are consumed by data

Source: Global Future of Work Center of Excellence (2016). *Future of Work Disruptions Index. Deloitte UK; Walsh, B., Bersin, J. & Pelster, B. (2017). Global Human Capital Trends – Rewriting the rules of the digital age.* Deloitte University Press.

Artificial intelligence

What it is: There are two types of AI: general AI and narrow AI. Narrow AI is already changing the way we live and work. A device using this type of AI is programmed with a series of algorithms that can crunch large amounts of complex data that would otherwise be impossible to interpret. This type of machine learning includes IBM's Watson and Apple's Siri.

What it will affect: Narrow AI is enabling machines to complete not only routine, repeatable tasks but also more complicated work that requires knowledge and judgment. For example, Quest Diagnostics is using Watson to help clinicians interpret a patient's genome-sequencing data, compare it with the medical literature, and identify possible options for the diagnosis and treatment of rare disease.

How narrow AI can work with humans: This medical example clearly shows how humans and narrow AI can work collaboratively, complementing one another. Clinicians work closely with Watson to complete their work more rapidly and accurately than ever before. In this case, Watson allows humans to focus on tasks that require higher-order cognitive skills and dedicate their time to more creative tasks.[36]

How AI affects workplaces today: As AI technology—both narrow and general—evolves, it will have an impact across all industries.[37] Deloitte's 2017 Human Capital Trends report found that 41 percent of companies have already fully implemented or made significant progress in adopting cognitive and AI technologies in their workforce.[38] We expect this figure will increase rapidly over the next few years.

What lies in the future: General AI. Greater than its narrow cousin, think of general AI as a machine that can successfully outperform a human at any intellectual task, and that can re-program and improve itself. For now, general AI lives only in our imagination.[39] Were it to become possible, it could exceed human intellectual capacity and even human control. Technology leaders like Elon Musk[40] and Bill Gates[41] have warned that general AI could pose a serious danger to civilization. Predictions about when it will emerge vary wildly, from five years to 100.[42]

Many HET devices and wearables are embedded with software, sensors, and internet connections to make them even smarter, allowing them to communicate and exchange data.

Human enhancement technologies

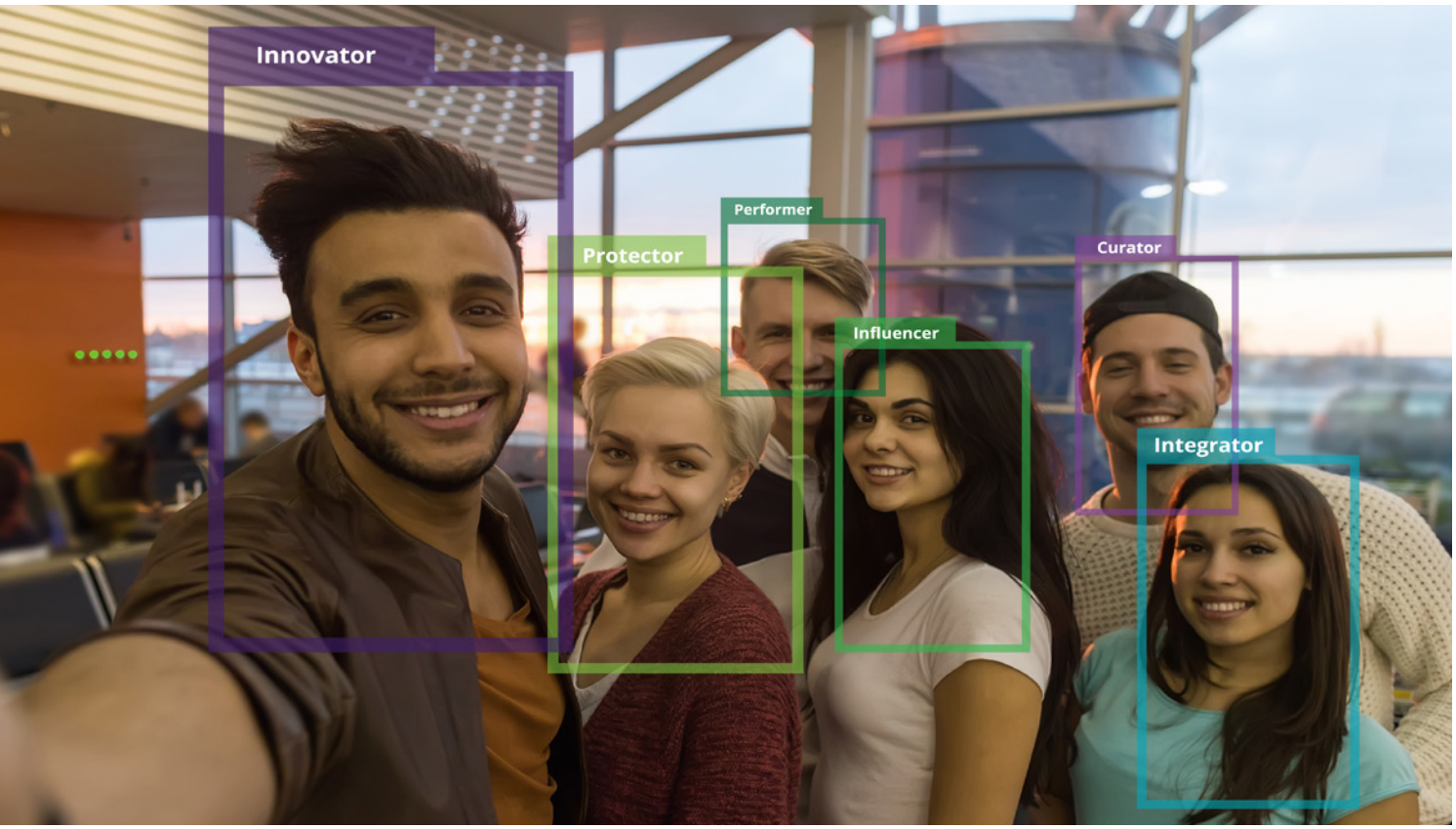
What they are: Human enhancement technologies (HETs) refer to any temporary or permanent attempt to use technology to overcome the limitations of the human body or enhance human capabilities. There are two categories of HETs: devices and wearables.

What HET devices are: Providing humans with enhanced abilities, examples of these devices are smartphones and GPS tools. Smartphones help us overcome the limits of memory by allowing us to upload our schedules to calendars, which then remind us about important events.

HETs are implants, too: think of the long-accepted technology of pacemakers. Future medical applications will grow to include gene therapy, 3D printing of human organs, nanomedicine, and neural implants. The US firm Three Square Market recently announced it was offering employees the opportunity to implant a small RFID chip in their hand to open doors, log in to computers, and make purchases in the break room.[43] The US military is also using HET to design new protective suits for soldiers.[44]

What HET wearables are: As the name suggests, these are devices we wear to enhance our limited abilities. Examples include Google Glass, smart watches, and fitness bracelets. Other HET wearables that help to reduce inequalities include cochlear implants for the hearing-impaired and robotic hands for the physically disabled.

How they work together: Many HET devices and wearables are embedded with software, sensors, and internet connections to make them even smarter, allowing them to communicate and exchange data. This system is known as the Internet of Things (IoT). For instance, your refrigerator could snap a picture of its contents and send it to your smartphone, just in time for you to swing by the grocery store on your way home from work.



A glimpse of the future: The new work archetypes

What can Canadians do to prepare themselves for both the challenges and opportunities of the Intelligence Revolution? How can we begin to think critically and strategically about how to ready ourselves for very different career paths than previous generations experienced?

Moving beyond skills

Historically, most workers prepare to enter the workforce by honing the skills required to succeed at a single job. Auditors learned how to audit; auto mechanics learned how to fix cars. Yet this skills-based approach is rapidly becoming obsolete, as skills quickly become out of date. The shelf-life of a learned skill is now about five years.[45]

In this digital age, skills are susceptible to disruption at every turn. While JavaScript is a staple web development competence today, a new coding scheme may soon take its place. We are already seeing new coding languages like Dart and CoffeeScript rise in popularity,[46] and they require new skills.

To add to the challenge, it is difficult to predict which technologies will catch on and to what degree they will disrupt, making it impossible to determine which skills may have more longevity. In short, skills remain important. But they are a supporting role, not a lead act.

Instead of focusing training and education on technical skills, Canadians are better served to think in terms of sustainable capabilities that are portable and transferable between many occupations—where AI and robots cannot compete in the foreseeable future—and that will pass the test of disruption. These include talents such as collaboration, adaptability, and conceptual thinking that will always be a competitive advantage for humans over machines.

"If you want to prepare me for the gig economy, you have to teach me in a gig environment."

Duncan Sinclair
Partner and Vice-chair,
Deloitte Centre for Innovation, Deloitte

Figure 10 : The workforce-ready Canadian

A capability represents a person's ability in a given area that is transferable across tasks and work environments.

What you can do
- Experience
- Know-how (capabilities)

Your potential
- Personal traits

Tools you use
- Skills
- Knowledge

Canadians need to focus on **what they can do** to prepare their future-proofed work capabilities.

"The biggest increase in jobs are hybrid jobs—jobs that require many types of skills, not just one."

Josh Bersin
Principal and Founder,
Bersin by Deloitte

We believe there is one universal future-proofed capability that will be required by all Canadian workers in the future: information-seeking. This is not simply the capacity to search for and find information, it is the capability to make sense of what we find, to recognize opportunity, and to make decisions that lead to effective free agency. Importantly, this is a capability everyone can learn: it is about building know-how, not about being smarter, more emotionally intelligent, and more agile, as so many experts suggest we need to be. Throughout our work on archetypes of future work, we have maintained the view that capabilities are about building know-how, not magically shifting our core individual psychology.

Beyond the impact on workers themselves, moving toward an emphasis on future-proofed capabilities has huge implications for both business and government organizations. Companies will need to adjust their people strategies, training and development programs, and other talent initiatives. Government must embrace educational reform, including redesigned curricula, to ensure Canadian schools are teaching the capabilities needed to navigate and succeed in the new world of technological disruption.

New workforce archetypes: the capabilities of the future-proofed worker

So what does the future-proofed worker look like? We have identified the most critical capabilities workers will need to succeed in the future and grouped them into eight new work archetypes. Each archetype is supported by several critical future-proofed capabilities and is connected to a list of current and anticipated jobs. The capabilities tied to each archetype do not represent all of those required, but rather those deemed most important to operate successfully in the work associated with the archetype.

Our development of these archetypes represents our effort to help Canadians prepare for the future by moving beyond the frustrating debate over which jobs might be lost to technology or how many employees may be displaced. The truth is, no one can predict with any accuracy. Regardless of how AI, robotics, and other technologies evolve, people with the future-proofed capabilities rooted in these archetypes will be well-positioned for success.

The work archetypes are organized in the shape of a wheel to illustrate their relationship with one another. Archetypes that are side-by-side are more similar than those that are opposite each other. While each archetype is distinct, a person is likely to be interested in more than one—perhaps identifying with a primary archetype, while also having an affinity for neighbouring ones.

Let's get to know our archetypes:

New workforce archetypes

Protector

Description

The **Protector** provides the human element machines cannot deliver, qualities like empathy and judgment, especially in stressful situations when trust is critical.

AI and robotics will evolve to perform some tasks performed by today's Protectors. For example, IBM's Watson collects information about a patient's symptoms and suggests a possible diagnosis. But a gap exists between tasks a robot can perform and tasks that require a human touch, like sharing a terminal disease diagnosis with a sick patient. Protectors will address this gap.

Future-proofed capabilities

- **Social awareness:** Builds and sustains interpersonal relationships while being aware of nuance (e.g., personality, individual preferences) and societal factors (e.g., customs, norms, potential conflict). Seeks critical pieces of information by asking questions and adapting communication style.
- **Judgment:** Takes information obtained through personal interaction and interpreting it within a broader context (e.g., language, culture, environmental cues) to make a well-informed decision.

Job examples

Current jobs with a higher risk of automation:

- Medical laboratory assistant
- Security guard
- Pharmacist

Current jobs with a lower risk of automation:

- Police officer
- Family doctor
- Speech/language pathologist

Jobs with potential to grow in prevalence:

- Geronto-kinesiologist
- Tele-nurse
- End-of-life therapist

Influencer

Description

The **Influencer** demonstrates the broad leadership capacity to inspire others, drive innovation, and challenge the status quo. The need for influencers will expand exponentially as all organizations face the need to transform due to disruptive change.

Influencers combine a deep understanding of people with the courage needed to push conventional boundaries. While many Influencers will have formal roles within companies, leaders from outside the organization may also emerge.

Future-proofed capabilities

- **Influence:** Excels at building relationships and using those relationships to persuade, guide, and initiate change.
- **Inspirational leadership:** Has the ability to motivate and inspire others to create a shared sense of purpose.
- **Competitive edge:** Has the courage and confidence to drive change, navigate disruption, and accelerate innovation.

Job examples

Current jobs with a higher risk of automation:

- Administrative services manager

Current jobs with a lower risk of automation:

- Leader in financial technology
- Coach
- Politician

Jobs with potential to grow in prevalence:

- Online community manager
- Incubator relationship manager

Innovator

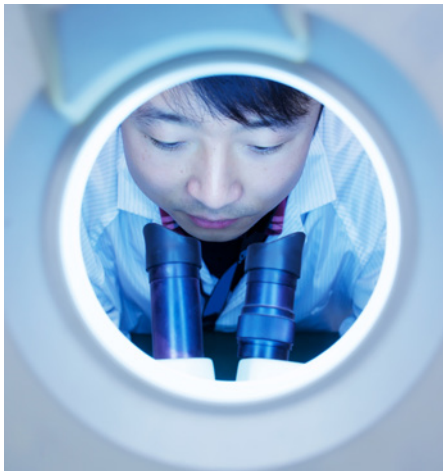
Description

The **Innovator** is an idea-generator who can think creatively, thrive in ambiguity, and operate in rapidly evolving environments. Innovators can look into the future to anticipate problems and apply their creativity to solve them.

As AI and robotics take over many routine workplace tasks, the Innovator will be critical in helping organizations discover how best to make use of human capital and engage employees to deliver value that cannot be replicated by machines.

Future-proofed capabilities

- **Competitive edge:** Has the ability to create a climate of continuous improvement and creativity, aimed at driving disruptive change.
- **Judgment:** Thinks systematically by first identifying problems and understanding the dynamics that underline them, then gathering essential information, and finally applying effective solutions, no matter how controversial they may be.
- **Execution:** Puts plans into action by organizing resources in novel ways that help organizations or groups seize new opportunities.



Job examples

Current jobs with a higher risk of automation:
- Not applicable

Current jobs with a lower risk of automation:
- Aerospace engineer
- AI designer
- University professor
- Game developer

Jobs with potential to grow in prevalence:
- Startup specialist
- Continuous improvement agent
- Mechatronics engineer

Integrator

Description

The **Integrator** connects systems and people to create competitive advantage. As technological disruption causes work to become more fragmented, Integrators will be needed to bring together new combinations of machines and people in ways that engage employees and deliver business results.

Future-proofed capabilities

- **Collaboration:** Identifies opportunities to connect people and ideas that will drive business values, and makes partnerships work between diverse groups.
- **Judgment:** Combines the ability to think analytically about complex problems with the capacity to design and communicate solutions that build confidence in others to work together.
- **Creativity:** Can uncover relationships between seemingly unrelated things to create new synergies.

Job examples

Current jobs with a higher risk of automation:

- Executive assistant
- Real estate agent
- Railway traffic controller

Current jobs with a lower risk of automation:

- Journalist
- Executive chef
- Retail buyer
- Teacher

Jobs with potential to grow in prevalence:

- Networking specialist
- Company culture ambassador
- Simplicity expert

Scorekeeper

Description

The **Scorekeeper** develops and implements organizational controls, including policies, rules, and standards that guide people and, increasingly, machines. As the workforce expands to include non-traditional workers such as contractors, contingent workers and machines, Scorekeepers will help orchestrate the controls to ensure the workforce aligns with organizational goals.

In an environment characterized by disruptive change, Scorekeepers play a critical role in monitoring and mitigating risk to the organization. They serve as trusted advisors to Influencers, helping to ensure that the organization runs smoothly, safely, and optimally.

Future-proofed capabilities

- **Judgment:** Has the ability to identify and quantify risks, measure and evaluate potential outcomes, and align an organization or groups to address risks effectively.
- **Competitive edge:** Uses analytical insights to identify opportunities, implement solutions, and measure outcomes.
- **Social awareness:** Can build and sustain interpersonal relationships in a way that promotes ethical behaviour and integrity in all aspects of professional life.

Job examples

Current jobs with a higher risk of automation:

- Paralegal
- Auto insurance brokers
- Accountant

Current jobs with a lower risk of automation:

- Lawyer
- Actuaries
- Employment insurance officer

Jobs with potential to grow in prevalence:

- Curriculum standards manager
- Big Data scientist
- Cybersecurity analyst

Builder

Description

The **Builder** implements the systems, programs, and processes to create both physical and virtual assets for an organization. Builders will be needed for the immense task of integrating AI and robotics into a cohesive workforce, operating side-by-side with people.

Builders work closely with Innovators and Integrators to bring conceptual plans into existence. They will be tasked not only with building but also with overseeing and maintaining new workplace systems and processes.

Future-proofed capabilities

- **Judgment:** Gathers information about the environment and the needs of the system or structure to make decisions about the best possible build.
- **Execution:** Leverages key resources and people to design and build solutions and structures, encouraging performance when the environment becomes too complex for individual workers to understand.

Job examples

Current jobs with a higher risk of automation:

- Line cook
- Carpenter
- Transport truck driver
- Drycleaner

Current jobs with a lower risk of automation:

- Car mechanic
- Financial analyst
- Oil field worker

Jobs with potential to grow in prevalence:

- Urban farmer
- AI developer
- Auto-transport analyst
- Robotics programmer

Performer

Description

The **Performer** is a master of creative expression in all forms, using new technologies to deliver entertainment in more innovative and accessible ways. Their skills will be in strong demand across every form of entertainment, from enhancing the aesthetics of games to improving the user-friendliness of apps and other mobile tools.

Performers will take advantage of technological advances to create visual enhancements that help athletes, exploit 4D holograms (many experts suggest moving real-time 3D images introduce the fourth dimension of time), and channel 3D printing to create exciting new works of art. Performers thrive where machines cannot tread, thinking creatively about what appeals to a human audience and connecting people with new entertainment experiences.

Future-proofed capabilities

- **Creativity:** Possesses the uniquely human ability to develop and express creative ideas in ways that are popular or of high cultural value.
- **Execution:** Translates the creative vision into reality, getting the right people to do the right things when working with groups.
- **Social awareness:** Has the insight to read social situations, assess audience reactions, and make adjustments as required.

Job examples

Current jobs with a higher risk of automation:

- Sports referee

Current jobs with a lower risk of automation:

- Musician
- Film producer
- Professional athlete
- Broadcaster

Jobs with potential to grow in prevalence:

- Enhanced reality game/ film producer
- Vlogger (multi-media blogger)
- Personal brand strategist

Curator

Description

The **Curator** designs and delivers highly tailored, customer-centric experiences by relying on their deep understanding of customer needs and desires. Curators will be essential to entrepreneurs and startups, helping them evaluate markets, understand customers, and develop products and services people want.

These highly skilled people bring a knowledge of social networks and digital platforms to diverse organizations. Curators may reside within organizations, but many will operate in the gig economy, providing insights and advice to many organizations.

Future-proofed capabilities

- **Customer insight:** Possesses a deep insight into what motivates customers along every phase of the customer journey—identifying what people want and how to deliver it.
- **Creativity:** In a world of increasing commoditization, crafts unique, tailored solutions for customers by using design thinking, imagination, and intuition.
- **Social awareness:** Anticipates customer reactions and gauge responses through exceptional listening and communications skills.

Job examples

Current jobs with a higher risk of automation:

- Hotel front desk clerk
- Travel guide
- Customer service cashier

Current jobs with a lower risk of automation:

- Hairstylist/barber
- Advertising manager
- Outdoor sports and recreational guide

Jobs with potential to grow in prevalence:

- Customer service psychologist
- Customer experience strategist

"I try to be action-oriented when thinking about the future. We can't predict it, so as we think about the challenges ahead, let's agree on what we can do. Let's identify those actions that will have a positive impact and produce favourable outcomes no matter what the future holds. And then let's get on doing them."

Valerie Walker
Vice President Talent and Skills,
Business Council of Canada

Embracing the future of work: Recommendations

Recommendations for action are common; genuine action is rare. Canada cannot afford to wait.

These recommendations reflect our research as well as the insights of nearly 50 Canadian thinkers and business leaders we interviewed for this report. In addition to offering specific proposals, we also want to challenge all stakeholders to stretch their thinking and explore ideas that reach beyond the status quo. These ideas may seem preliminary, vague, or even far-fetched. However, they are designed to spur our imaginations and open new areas of debate. We outline these thoughts in **What if** sections throughout the recommendations.

Our hope is that government, businesses, and citizens work together to develop uniquely Canadian solutions that empower us to master disruptive change, seize the opportunities inherent in the Intelligence Revolution, and shape the future of work to the benefit of all Canadians.

Canada can win in the new world of work. But we must be first movers, not fast followers.

Government action

"We should worry about how to deal with the new rise of non-standard employment (self-employment, limited term contracts). We need to make sure those people have access to self-funded pensions, access to contract jobs—a new set of policy initiatives. "

Morley Gunderson
Professor of Economics, Centre for Industrial Relations and Human Resources, University of Toronto

1. Modernize provincial labour law and the social safety net to reflect 21st-century workforce realities.

Canada's existing labour law, employment practices, and social programs are vestiges of the Great Depression of the 1930s. Legislation, practices, and programs based on the standard employment model of one career/one employer must be modernized to embrace the 21st-century world of work. While Ontario has been debating reforms to raise the minimum wage and improve the labour market, policymakers across the country need to design solutions that reflect both the opportunities and the challenges facing free-agent employees in traditional companies as well as gig-economy workers.[47] This includes significant reform to the way Canadian public policy approaches:

- Retirement planning
- Income taxes
- Unemployment insurance
- Training programs
- The 40-hour work week
- Support for workers engaged in volunteer and social enterprises

What if...
government took the lead in changing the way work is done by tearing down monolithic, bureaucratic departments and creating structures that are more agile and responsive to fulfilling their critical missions? Instead of merely pushing public policy out toward the private sector, government can be a first mover by revolutionizing the way work is performed in the public sector.

What if...
it becomes increasingly difficult to capture tax revenue through income tax, due to the increasing number of people taking part in the gig economy and online work? Should we consider a pure consumption tax? The objective of this idea would be to eliminate income tax and with it the burden of tracking individual income, shifting all tax to consumption. Consideration would need to be given as to how to ensure low-income Canadians wouldn't be overburdened by such a change; this could be managed by setting lower tax rates on common household items, for example. Tax is a hot topic in the future of work; Bill Gates has even suggested we tax robots. In any event, it seems likely that the current approach to government revenue generation will become cumbersome and outmoded soon.

2. Rethink universal basic income.

Given the prospect of job losses due to automation, many policy thinkers have revived the idea of establishing a universal basic income (UBI). To date, the debate has centred primarily around the affordability of such a program; tax claw backs may be one solution. As for the actual design of a UBI program, a vast number of options are available. We need a more robust discussion that addresses questions such as:

- Who would be eligible?
- Should it be time-limited?
- How would employment income affect universal income?
- How would we pay for it?
- Will it support Canadians engaged in volunteer or social enterprises?
- Would it encourage Canadian entrepreneurs to start a new business?

What if...
UBI became a platform for more entrepreneurial risk-taking that spurs new ways of thinking about how Canadians contribute economically and socially to our society?
Young adults graduating from our universities would enjoy new options given the certainty of UBI income to bridge from education to career, from starting a business to launching a social enterprise. In this way, UBI could not only help generate a more dynamic economy, it could also open new avenues for community engagement and enlarge the scope of how citizens can create economic value in Canada.

3. Adopt a bold, focused approach to capitalize on Canada's strengths.

Our country has built powerful industry centres that lead the world in dynamic innovation. Vancouver and Halifax are vying for the title of Canada's "Ocean Technology City". Toronto and Montreal are becoming hotbeds for AI research and development. Kitchener/Waterloo remains the centre of cutting-edge technology. Public policy must funnel financial resources, incentives, and infrastructure investment toward winning industries and the cities and regions they call home in order to create lasting competitive advantage.

To encourage additional centres of innovation, Canada should turn once again to the concept of competitive federalism. Under this policy, provinces, cities, and regional industries would receive federal backing and compete to see which performs best in terms of job growth and economic performance. The best performers—regions rather than individual companies—would be promoted through deeper government investment.

"Provinces learn a lot from one another. If one province gets a better program, the other provinces will soon copy it. And the reverse is true—they learn from their mistakes. We end up having a better system in Canada."

Pierre Pettigrew
Former Federal Minister
(Foreign Affairs, International Trade)
and Executive Advisor, Deloitte

"This is about a radical rethink of economic and skill-based immigration that opens the floodgates. It's not a carte blanche; it's bringing the best of the world into Canada."

Amir Rahnema
Partner and Global Organization Design Leader, Deloitte

4. Strengthen our commitment to immigration.

Amid rising nationalist and protectionist sentiment around the world, Canada's vision of a multicultural society that welcomes immigrants from around the world is increasingly unique. We must capitalize on this competitive advantage to bring the world's best talent to our country. Government at all levels and businesses of all sizes must work together to create a national immigration policy that is strategic and future-focused. This includes:

- Attracting immigrants with the talents and capabilities of the archetypes we described earlier, the abilities we know Canada will always need to grow our economy.
- Taking advantage of the frustration of professionals in the US and abroad, who are concerned with the rise of nationalism and divisive politics, to win key talent.
- Aligning immigration policy to meet the needs of the winning industries as identified during the competitive federalism process.
- Recognizing and promoting the economic value of immigrants to Canada and accelerating their integration into the labour market.

"We are entering a period of rapid and fundamental change. There is an implicit assumption that individuals and institutions are capable of making these changes in a short time. This is a vulnerable assumption with potential for serious unintended consequences."

Peter Padbury
Chief Futurist, Horizons Canada

5. Reimagine Canada's education system.

Canada's education system was designed to meet the needs of the 19th- and early 20th-century workplaces. It won't serve the nation's needs or keep its businesses and workers competitive in the decades to come. Canada must start reinventing its education system today. We should be experimenting aggressively in areas such as:

- Overhauling the curricula to ensure young Canadians are acquiring the capabilities needed to succeed in a digital world.
- Re-examining how we organize our schools, from the physical setup to the school year itself.
- Placing a greater emphasis on interdisciplinary work, mental agility, critical thinking, teamwork, relationship management, and the capacity to learn itself—in other words, coaching the integrated capabilities needed for the future instead of teaching individual subjects.
- Encouraging students of all ages to take risks, fail, and begin again to equip them with the courage and resilience they'll need to learn new capabilities, start a new career, or launch a new business.

"We need to encourage kids to experiment and fail while they're young. Get them while they're young, inspire them, and encourage them to build and fail and fail again."

Abdullah Snobar
DMZ Executive Director,
Ryerson University

"We've ended up coupling things that shouldn't be and decoupling things that should be. We decouple learning and work—these things need to be coupled together."

Hamoon Ekhtiari
Founder and CEO, Audacious Futures

Business action

"Ideally, corporations would be training their own workers and anticipating what their industry is going to look like in the next five years and prepare for that, but most organizations are not ready."

Sunil Johal
Policy Director, Mowatt Centre

1. Take a leadership role in promoting future-proofed capabilities.

The declining shelf-life of skills has profound implications for the learning and development programs at every Canadian business. Workers today face the need to upgrade their capabilities constantly. And in an always-connected digital/mobile world, they see no reason why their employers shouldn't offer learning opportunities on demand—when they want, in the form they want. In fact, employers that don't offer these opportunities will find it increasingly difficult to recruit and retain top talent. Businesses that want to future-proof their workforces should consider:

- Replacing static learning and development programs with dynamic, continuous learning opportunities.
- Making learning available on-demand, 24/7 to all employees on any digital platform: computer, tablet, or smartphone.
- Tapping into the wealth of off-site, virtual learning networks such as massive online open courses (MOOCs).

What if...
the concept of guilds made a comeback? The guilds of the 21st century would help free-agent employees and gig-economy workers stay connected through educational opportunities, information sharing, and social platforms. These groups wouldn't be accreditation bodies or unions bargaining collectively, but rather communities of like-minded people joining forces to help each other succeed in an ever-changing labour market. These new guilds—organized around work, not employers—could collect dues and even sponsor portable pension plans that members could carry from job to job or employer to employer.

2. Rethink educational opportunities to ensure Canadians acquire the capabilities needed to succeed.

Employers can't simply sit back and rely on educators to produce workers with the skills and knowledge required to succeed in the age of the Intelligence Revolution. Canadian businesses need to take an active role in creating innovative ways for the workers of tomorrow to arrive on the job ready to succeed. Potential approaches include:

- Collaborating with colleges and universities on curriculum reforms that reflect both current and emerging workforce needs.
- Expand the traditional trade-oriented apprenticeship programs into white-collar market segments to develop talent from the ground up for future workplaces.
- Focus work and educational activities around projects and teams selected based on conscious assessment of the capabilities needed for success.

What if...

employers became curators of knowledge, rather than organizers of training programs? Technology has led to an explosion of free content, available online over any digital or mobile platform. Instead of corralling employees into 19th century-style classrooms for training, employers could create learning platforms that enable employees to supplement knowledge and skills as needed, on demand and on their own schedules. Employers would still set standards but they would act as a resource for employees proactively seeking to enhance their capabilities.

3. Empower Canadian workers to manage their careers and thrive in the new world of work.

In addition to overhauling leadership and development programs, businesses need to develop a talent strategy that enables their people to succeed in a world of continuous technological disruption and an ever-evolving, more fluid organizational structure. This new strategy would encompass:

- Helping employees work effectively in an environment of networked teams and continuous, rapid change.
- Delivering a holistic, end-to-end employee experience to a workforce that will increasingly include full-time, contract, contingent, and crowdsourced workers.
- Developing new platforms and structures to help workers find work and manage their careers in a more uncertain world.
- Shifting talent strategy to identify critical roles, understand the disruptions that will likely affect those roles, experiment with the technologies positioned to disrupt them, and build new capabilities to be ready for the future starting now.

Individual action

What if...
Canadians turned Canada into the world's leading centre for digital work? We should determine how to tap effectively into the immense talent spread across this vast country, not just that clustered around our major cities. Through digital technology, Canadians should be able to seize the opportunities provided by the Intelligence Revolution wherever they live.

Take responsibility for actively managing our own careers.

For Canadian workers, the future of work should begin now. The country's labour market has already changed profoundly and the pace of change is accelerating. Canadians must take a more active responsibility for continually upgrading their capabilities and taking ownership of their careers. Specifically, individuals should:

- Learn how to work effectively outside traditional hierarchical corporate structures, such as in hyper-networked teams and matrix organizations.
- Get comfortable with the free-agent mindset that aligns with both new organizational structure and the gig economy.
- Continuously acquire new skills, knowledge, and experiences to stay current and marketable in their field.
- Navigate personal and electronic networks to search for and find information and opportunity.
- Think like an entrepreneur to create livelihoods from an always-changing mix of jobs, careers, gigs, projects, clients, and employers.

Appendix: Methodology

We developed the work archetypes though a comprehensive literature review of published articles and research.[48] In addition to a traditional literature review, we also interviewed nearly 50 Canadian thinkers and business leaders, and conducted focus groups with subject matter experts (SMEs) in business, education, economics, innovation clusters, and public policy.

Following this analysis, we compiled a list of current capabilities that will either remain critical or gain importance in the future and those that will emerge. We then worked to prune down the list to those capabilities with disproportionate significance for the future of work. The short-listed capabilities were grouped together into common types of current and likely future work for which the capabilities will be essential.

We then developed the groupings into work archetypes and tested them against emerging technological and societal disruptive factors to validate their ability to stand the test of time. To further validate that the archetypes included all possible jobs, we conducted a national occupational classification (NOC) code analysis by mapping all surviving occupations[49] (more than 300) to an archetype. We also considered potential future jobs that align to each.

Once we were certain we covered the gamut and that the capability groupings were valid and distinct from one another, we again returned to a small subset of our SMEs to ask for expert input. Based on their review of the archetypes, we further refined the groupings and asked a different grouping of our SMEs for expert input.

As a final check, we conducted testing with industrial and organizational psychologists, experts in competency modelling who had not yet been exposed to our archetype framework, to validate the final set of eight archetypes and associated competencies.

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Interviewee list

- Rosalyn Bell, Assistant Commissioner, Productivity Commission, and Jenny Gordon, Principal Adviser Research, Productivity Commission (Economics)
- Josh Bersin, Partner and Founder, Bersin by Deloitte
- Ian Chan, Exponentials and Innovation Leader, Deloitte
- Daneal Charney, Director of Talent, MaRS
- Tim Christmann, National Consulting Leader, Deloitte
- Bill Currie, Vice-Chair, Global Managing Director , Deloitte
- William (Bill) Eggers, Executive Director, Center for Government Insights, Deloitte
- Hamoon Ekhtiari, Founder and CEO, Audacious Futures
- Jason Galea, Learning Solutions Leader, Deloitte
- Frank Gerencser, Founder and CEO,TriOS College
- Aaron Groulx, HR Transformation Leader, Deloitte
- Morley Gunderson, Professor Emeritus at the University of Toronto, CIBC Chair in Youth Employment
- James Guszcza, US Chief Data Scientist, Deloitte
- John Hagel, Fellow at WEF, Co-Chairman, Center for the Edge, Deloitte
- Glenn Ives, Chair, Deloitte
- Sunil Johal, Policy Director at the Mowatt Centre
- Krista Jones, Managing Director of Work & Learning, MaRS
- Jean-Noé Landry, Executive Director, Open North
- Diane McArthur, CTO, OPS
- Erin McGinn, Assistant Deputy Minister, Highly Skilled Workforce, MAESD, and team
- Paul MacMillan, National Strategy & Operations Consulting Leader, Deloitte
- Kate Morican, National Strategic Transformation and Change Leader
- Linda Nazareth, Senior Fellow for Economics and Population Change, Macdonald-Laurier Institute
- Lekan Olawoye, Lead Executive of Studio Y, MaRS
- Steve Orsini, Secretary of the Cabinet, Clerk of the Executive Council, Head, OPS

- Peter Padbury, Chief Futurist, Policy Horizons Canada
- Karen Pastakia, GTA Human Capital Practice Leader, Deloitte
- Pierre Pettigrew, Executive Advisor, International, Deloitte
- Amir Rahnema, Global Organizational Design Leader, Deloitte
- Craig Robinson, National Higher Education Consulting Leader, Deloitte
- Alex Ryan, VP Systems Innovation and Program Director, MaRS Solutions Lab
- Gordon Sandford, National Digital Leader, Deloitte
- Jeff Schwartz, Global Human Capital Leader, Marketing, Eminence and Brand, Deloitte
- Duncan Sinclair, Vice-Chair, Deloitte
- Duncan Sinclair, Farah Huq, and Paul Bien, Future of Canada Centre Leadership, Deloitte
- Peter Sloan, Financial Services Leader, Deloitte
- Abdullah Snobar, Executive Director of DMZ, Ryerson University
- Nora Spinks, CEO, Vanier Institute of the Family
- Jim Stanford, Economist and Director of the Centre for Future Work (Australia)
- Terry Stuart, Chief Innovation Officer, Deloitte
- Heather Stockton, Global Future of Work Leader and Americas Human Capital Practice Leader, Deloitte
- Duncan Stewart, Director of Research, Technology, Media and Telecommunications, Deloitte
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- Kathy Woods, National Talent and Leadership Practice Leader, Deloitte
- Miyo Yamashita, Managing Partner, Talent & Workplace and Chief Transformation Officer, Deloitte
- Van Zorbas, Managing Partner, Risk Advisory, Deloitte

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