PUBLIC POLICY FORUM

FULL REPORT

Canada Next

12 Ways to Get Ahead of Disruption

JANUARY 2019

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1400 - 130 Albert Street
Ottawa, ON, Canada, K1P 5G4
613.238.7858
1400 - 130 rue Albert
Ottawa, ON, Canada, K1P 5G4
Tél : 613.238.7858

ISBN: 978-1-988886-41-1

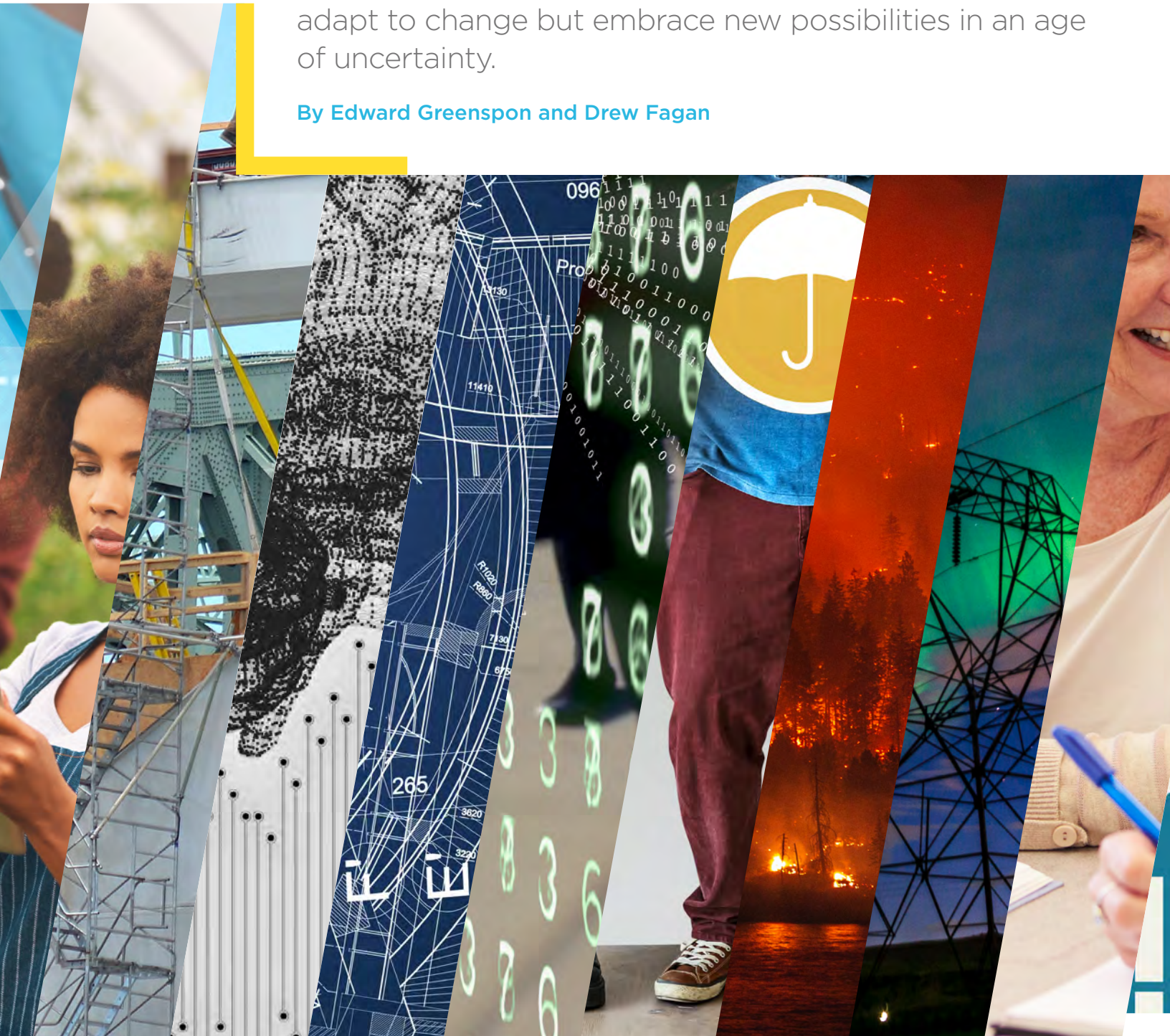
www.ppforum.ca **@ppforumca**

CANADA NEXT

Introduction

Canada is in flux. Technological, demographic and climate disruption will have a profound effect on the economy, the workforce, democracy, and on public services. In Canada Next: 12 Ways to Get Ahead of Disruption, top policy thinkers suggest how Canadians can not only adapt to change but embrace new possibilities in an age of uncertainty.

By Edward Greenspon and Drew Fagan



In the past 18 months or so, new governments have taken power in three of the four largest provinces—British Columbia, Ontario and Quebec. The fourth, Alberta, will go to the polls this year, as will Canada as a whole. Regardless of the result of the federal election, much of the country is under control of governments new to office and rethinking things in light of new mandates.

They have plenty to ponder. The world is changing at a pace akin to the Industrial Revolution. Decision makers in all fields face intense challenges to even keep up—from geopolitical transformation, including rising U.S.-China rivalry, to the new concentrations of power and wealth caused by the sweeping innovations of the digital age, to the impacts on autonomy and the world of work sparked by artificial intelligence, to the catastrophic effects of climate change.

Phenomenal powers of insight are required not just to grasp the pace and impact of these changes, but also to anticipate and respond in timely fashion

Canada, like other countries and societies around the world, is in flux. Technological disruption will have a profound effect on the workforce and on the public services Canadians depend on. Meanwhile, climate change, shifting demographics and evolving social values are having an impact on the well-being of Canadians and how they interact with one another. **How can policy-makers stay on top of emerging public policy trends and plan for this disruption?** In this report, scholars, think tank leaders and former top public servants share their ideas on a range of topics demonstrating how policy can be nimble and responsive in an **age of great uncertainty.**

or, better yet, to get ahead of things and shape the future we want.

It falls primarily to two groups to represent the public interest in shaping the future: elected officials and the public servants who advise them.

Planning is one of the key functions of a non-partisan public service as exists in Canada and other countries that operate under the Westminster system. Many governments have cabinet committees focused on priorities and planning, and corresponding units in the public service to support them.

The priorities part gets most of the attention because it is about delivering on a government's programs and responding to events of the day. It's the bread and butter of government.

Planning is different. Planning entails lifting one's eyes from the messy table of daily government functions to look around the corner or out to the horizon. In some circles, the word foresight is used to describe this long-term thinking. No one can divine the future but any government is smart to try.

In addition to helping the government deliver on its current policy priorities, then, policy-makers need to plan for the medium and longer term, including developing policies and advice to address emerging trends that will affect the future well-being of Canadians.

Meanwhile, Canada's political parties and non-political public servants also consult more widely than they did not long ago as each learns, sorts and synthesizes to govern well. In the digital age, nobody holds a monopoly on understanding the future. Planning in a period of extreme change is humbling and necessary work.

It is with similar humility that the Public Policy Forum is releasing Canada Next: 12 Ways to Get Ahead of Disruption as part of Canada's planning conversation.

This report is composed of papers by professors, think tank heads, former senior government officials and respected researchers, and follows extensive consultations with thought leaders and doers. It is aimed at helping policy-makers identify potential future policy directions to address a range of emerging trends. Officials from the federal government and seven provinces also provided their perspectives about what's going to matter next and how policy-makers can best get prepared.

Two messages from those consultations were that disruption can be both positive and negative. While the contributors to this report have focused in particular on technological change, including its implications on the workforce and on the public services Canadians depend on, their preoccupations for Canada's future extend beyond planning for disruption to include the impacts of shifting social values, demographics and climate change.

Simply put, there are three ways to deal with what has come to be known as disruption:

- let it do its own thing and adjust accordingly;
- implement policies intended to hold back the tide; or
- use policy levers to manage change for competitive advantage and harm mitigation.

Under the first approach, the damage to individuals or groups (for example, residents of rust belt areas, fossil fuel-producing regions, rural areas, or those with little education) is difficult to bear. And in the internet age those individuals can be swept

Planning entails lifting one's eyes from the messy table of daily government functions to look around the corner or out to the horizon.

easily into a reactionary force fighting the tide of change. Smooth adjustments are hard. During the farm-to-factory adjustment of the 19th century, anti-market philosophies arose in response—the most notable being the writings of Karl Marx and Friedrich Engels. Communism exacted a heavy toll in the 20th century, as did fascism, which arose in response to political, economic and social pressures of 1920s and 1930s Europe. When such extreme ideologies arise, it is a sure sign that enlightened public policy leadership has failed.

Under the second approach, long-term national benefit is damaged for short-term advantage. Freedom itself—political autonomy, economic agency—is sometimes the victim. This suppression of expectations also can lead to greater shocks to the system later. Creative destruction cannot be denied without profound costs. At best, it can be channeled.

The third approach is the moderate course. It has enjoyed the greatest success, albeit by different measures in different circumstances by a varied array of social democrats, liberals and conservatives. The moderate course employs different blends of market reliance and political intervention to set free, to channel or to mitigate the process of change.

For example, the Munk School's **Daniel Munro** suggests in his article three ways to address issues arising from artificial intelligence, including a laissez-faire approach to allow AI "to develop and diffuse without limit" and a precautionary approach to restrain development until "risks are better understood and capacity to manage them is in place." Between these bookends is "a case- and context-sensitive risk management approach." This, he argues, allows space for "AI technologies and applications to develop while monitoring and managing possible risks as they emerge in specific applications."

Other writers in this report have sought to find the same sweet spot; to put forward ideas that manage disruption such that innovators aren't handcuffed and the tech savvy can ride the crest of change. But their proposals also ensure that those not so well-placed to benefit from the new economy aren't left behind.

Some papers propose strategies to ensure that Canada gets the most out of the digital economy.

Teresa Scassa writes about the value of data—the new oil, or perhaps the new plastics—and the values needed to manage them, and suggests a national data strategy to grapple with the trade-offs.

Shannon Macdonald writes about how the digital environment can transform Canada's publicly financed healthcare system and make it a "playground for invention".

Lori Turnbull suggests ways to combat the prevalence of cyberattacks and fake news made easy by digital platforms, and ways to maximize the benefits of interchange between public- and private-sector employees.

Wendy Cukier suggests strategies to reduce the urban/rural divide and build the broadband infrastructure needed for citizens outside urban centres to prosper in an innovative, modern digital world.

Brian Topp proposes a sweeping strategy to reconfigure Canada's balkanized electricity system.

Glen Hodgson writes about the key implications and necessary responses to climate change from the perspective of a northern economy.

Drew Fagan suggests ways that Canada's infrastructure spending can be made more effective through data and technology-driven planning and construction.

Other papers focus on improving Canada's capacity to prepare citizens for the digital economy.

Jon Shell proposes a multinational effort of unprecedented scale to link people with training and job opportunities.

Sunil Johal and Wendy Cukier write about achievable strategies to provide portable benefits to those working in the gig economy.

The Public Policy Forum hopes that these papers are of broad interest, but particularly to those charged with the difficult task of planning smart public policy: the elected officials and public servants making Canada battle ready for what's just around the corner or out on the horizon. Public policy is difficult to execute at the best of times but it is hugely difficult in times of sweeping change. We wish them the best of luck.

Edward Greenspon is President and CEO of the Public Policy Forum. He has worked at the intersection of journalism and public policy for more than 30 years. Before joining PPF, Ed was a journalist with The Globe and Mail, Bloomberg News and newspapers in Western Canada. He is also the author of two books on Canadian politics, policy and public opinion.

Drew Fagan is a PPF Fellow who worked for many years in the public service in senior executive positions at the federal and provincial level. For the government of Ontario, Drew was Deputy Minister for the 2015 Pan/Parapan American Games, Deputy Minister of Tourism, Culture and Sport, and Deputy Minister of Infrastructure.

HEALTHCARE AT OUR FINGERTIPS: Enabling a Digital Health Environment for Canadians

Canadians are adopting digital- and data-driven solutions to improve their health, but their healthcare system lags far behind. Governments must adopt innovation, consumer-driven models and new regulatory frameworks in order to improve health outcomes for all. By Shannon MacDonald

Disruption is at the door of Canada's healthcare system. The increase in development and uptake of personalized, digital health solutions across Canada is an inevitable next step. We are about to experience the effect of multitudes of innovations in how digital enters the healthcare operating model.

Are we ready?

From coast to coast to coast, citizens, start-ups, researchers and corporations are in the game of problem solving for the health of our citizens. As individuals, we stand in lines, wait for follow-ups, fit in our workouts, go to annual screening appointments. We see the opportunity. We are frustrated and often moved to solve problems through our own inventions.

As a result, technological and digital solutions are being created every day. Yet the path for these inventions into the healthcare system—and into the hands of Canadian healthcare consumers—is often fraught with challenges and barriers. As a result, the consumer experience is not rapidly changing. We lack a true vision for the experience of the citizen in a digital- and data-driven healthcare environment.

SUMMARY AND RECOMMENDATIONS

In one century, advancements in research and technology have helped humankind to add an average 28 years to our lives. Over the past decade, healthcare consumers have become empowered by the volume and ease of access to health information. Yet the operating model for delivering healthcare has not fundamentally changed. The current model favours institutions rather than consumers, with less than 10 percent of Canadians taking advantage of e-services.

With stronger healthcare data usage, we have the opportunity to make our system more patient-centric by improving the accessibility and national portability of healthcare services.

If a publicly funded Canadian health system were created today, it would improve service delivery using human-centered digital tools. In fact, Canadians are eager to adopt digital health solutions that could dramatically improve the system.

To realize a system that enables equal access by delivering a consumer-driven model, federal, provincial and territorial governments must leverage existing performance data to:

- **establish fee structures that fairly compensate physicians for their remote and virtual services, providing for stronger accessibility and portability**
- **develop a national strategy for the adoption of healthcare innovations that enable ideas and invention, and that improve the patient experience**
- **develop a federal, provincial and territorial policy framework for the adoption of digital healthcare solutions so that all Canadians can use their individual health data in partnership with their health professionals to identify personalized health solutions**

The current consumer experience is also challenged by population density trends in Canada. Healthcare inequality has increased along with income inequality over the past 20 years. About 19 percent of Canadians live in rural areas, but only eight percent of physicians practice there. We have accepted ranges of healthcare outcomes, particularly where effectiveness of scale is not available. One recent study found that rural hospitals in Canada had higher 30-day, in-hospital mortality rates following stroke than either urban academic hospitals or the Canadian average.

Canada ranks low for healthcare system performance

The Commonwealth Fund ranked Canada ninth out of 11 countries for healthcare system performance and 10th for access sub-indicators. In accessing healthcare, consumers face several issues:

- Wait times continue to increase. The Commonwealth Fund's 2016 International Health Policy Survey of Adults found that Canadians reported the longest wait times among 11 countries. Wait times between getting a referral from a general practitioner and getting medically necessary treatment vary across Canadian provinces, with New Brunswick reporting the longest median wait time, at 41.7 weeks.

- More than 40 percent of Canadians said that the last time they visited an emergency department, it was for a condition that could have been treated by their regular providers if they had been available.

- And access to dental care is also an issue for some Canadians, with half of Canadians in the lower income bracket having no dental insurance. Dental health affects overall health and yet, with the exception of dental surgery in hospital, it is largely excluded from our traditional system.

Canadians are eager to move forward with digital health solutions

The development of personalized, digital health solutions is a natural go-to place for inventors and problem solvers looking to address inequality, lack of accessibility and poor system performance. Consumers are increasing the use of self-service digital health tools. Use of The Internet of Health Things solutions like smart scales and wearables, and use of social platforms such as online communities, has nearly doubled in two years. Consumers are willing to share their wearable health device data with doctors (90 percent), nurses and other healthcare professionals (88 percent). Increasingly, Canadians are willing to share wearables data with online communities or other app users (up from 38 percent in 2016 to 47 percent in 2018).

Patients are quickly becoming accustomed to the electronic collection and use of health data. One in three people surveyed across seven countries have accessed their electronic health records and almost 9 out of 10 Canadians agree that accessible, secure information sharing between individuals and healthcare professionals would have a positive impact on the health of Canadians. Nearly one third of Canadian adults reported using mobile apps to monitor their health.

If we look at other jurisdictions' approaches to healthcare challenges, we see that digital health solutions are a priority. The European Health Parliament's Committee on robotics, artificial intelligence (AI) and precision medicine is promoting the development of digital health solutions under three

Data-driven digital tools can improve the way we communicate, help with cost and accessibility, and gather rich data to enable predictive analytics

main themes: availability, affordability and accessibility. Medicaid in the United States is looking specifically at digital technology to serve rural populations. Mercy Virtual, a virtual hospital in the U.S. with no beds, serves a population of 750,000 by using technology.

Our health system must use digital solutions

As citizens of the digital age, we see the benefits of personalized digital health services and more efficient use of our health data. Data-driven digital tools can facilitate the way we communicate with each other, help us address cost and accessibility issues, gather rich data from various sources to enable predictive analytics, and improve the health and wellbeing of populations. Yet, our healthcare system provides little incentive to use these tools. Among the challenges: the accountability and compensation models in healthcare do not consider the consumer experience an important criterion; our access to online appointments, test results and virtual consultations is inconsistent; and privacy concerns cause data to be siloed in the databases of different service providers.

A number of key factors will have to be addressed at national, provincial and territorial health tables to create an environment that promotes the use of digital health tools to create a more patient-centric healthcare system.

RECOMMENDATIONS

1 **To enable a system that delivers easily accessible, personalized healthcare services when and where they are needed, our governments must create fee structures for physicians that provide adequate and fair compensation for virtual consultations, and that incentivize using information gained through consumer devices. A national framework to guide this would be beneficial.**

While some provinces have implemented pilots or revised fee structures, there is no consistent strategy at the national level. The availability of publicly funded telehealth varies across the country, with some provinces providing little or no funding for it. Many providers resort to digital communication (i.e. text messaging, photos and emails) in an unsecure environment to accommodate patient demands for improved ways of communicating with their general and specialist practitioners and their teams. Virtual consultations currently have some licensing and regulatory constraints that limit their use across provincial borders, slowing down their uptake and impact.

2 **The Government of Canada should develop a national strategy on the adoption of healthcare innovations. The strategy should aim**

to ensure successful innovations inspired by patient-centered interests will be integrated into future healthcare delivery.

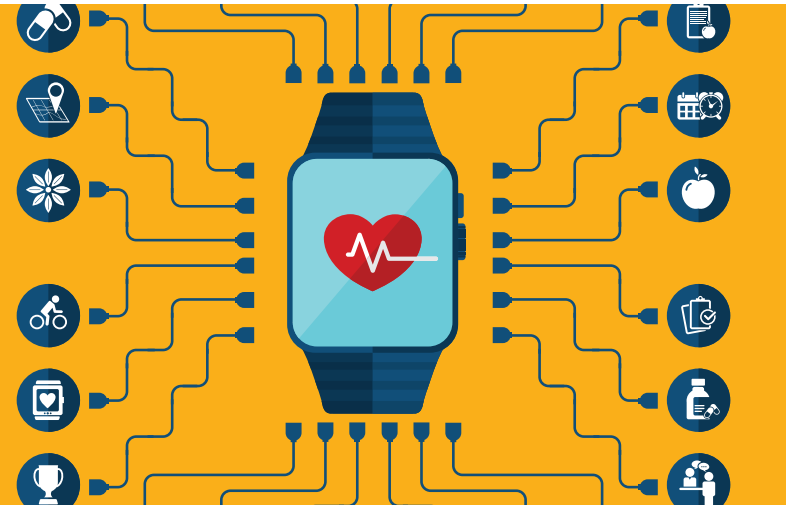
Governments are currently encouraging and supporting an entrepreneurial culture by establishing incubators and accelerators. By building on this via a nationally designed vision for the future of healthcare, governments would enable a more logical curation of inventions that could be channelled into transforming the healthcare operating model. The consumer experience should be carefully designed to focus on the patient, caregiver and family rather than on the system and institutions. A thorough design study of patient experience would likely reveal a wealth of opportunities for realizing efficiencies through digital health applications.

3 **Federal and provincial counterparts should collaboratively design a policy framework for the effective adoption of secure digital health solutions. Security concerns present a barrier to adopting innovations.**

It is time to enable new technologies, such as cloud solutions and blockchain, to provide secure data oversight. This could pave the way for shared policies and standards that will allow us to take full advantage of the significant data generated by our healthcare system. Right now, changes are being made too slowly. The creation of data-sharing agreements between hospital corporations, for example, can often take years to execute.

The Institute for Clinical Evaluative Sciences' data repository alone currently holds health records for as many as 13 million people in Ontario. The Canadian Institute for Health Information has been collecting the country's health data for decades. Imagine a rules-based framework that would enable public use of such rich data for future research.

According to a recent Healthcare Information and Management Systems Society survey, "Cloud solutions are an extension of a healthcare organization's communications infrastructure and connecting to the cloud is as mission



90%

of consumers are willing to share their wearable health device data with doctors, 88% with nurses and other healthcare professionals. In 2018, 47% of Canadians said they were willing to share wearables data with online communities or other app users.

critical as the platform itself." A past concern about hosting data in Canada has been largely resolved by cloud providers building infrastructure in Canada to house the data. Concepts such as value-based care, population health management, and digital/mobile user demand would require even more storage infrastructure, which only the cloud can provide efficiently and affordably. Cloud providers are generally better than healthcare organizations at managing the risks associated with infrastructure, software, and privacy and security protocols.

We also need to expand the notion of group buying and procurement beyond just hospitals. There are thousands of healthcare agencies and primary care practices that need assistance in technology procurement, co-ordination of leading practices, standard templates, education and training, data security and privacy compliance, and access to technology solutions. These smaller healthcare delivery organizations often find it challenging to keep up with technology and find the right solution. These organizations would benefit from more clearly defined best practices for purchasing and securely integrating new technologies into their healthcare delivery models; they need more coordinated system support to help them adopt new ideas and approaches.

CONCLUSION

Observing how digital tools have impacted other industries in significant ways, we can predict that healthcare will not be immune to disruption. Canadians are already embracing this change by using digital tools and devices for personal healthcare purposes, leveraging mobile apps, websites and wearables to harness personal health data where available to them. They are driving a consumer-centered approach to healthcare information management.

Canadians are also proud of their publicly funded system. The foundational tenets of the Canada Health Act ensure portability and accessibility. By moving our system forward with national cohesion and leadership, we can better ensure a digital future that consistently adheres to the goals of our healthcare system. Canadians have an opportunity to ensure digital transformation is consistent and fair for everyone. Effective patient-centered transformation will require the integration of federal, provincial and local governments.

Shannon MacDonald is a senior Managing Director at Accenture Canada, leading Health and Social Services in the Canadian marketplace. With 30 years of professional experience, she has led client relationships for significant organizations in Canada. This has included significant transformations in governments and health care organizations. Shannon has established a reputation as a thought leader and popular speaker on topics ranging from productivity and governance to financial imperatives for provincial government programs and health care systems.

INCLUSIVE INNOVATION:
Using Technology to Bridge the Urban-Rural Divide

Canada must unlock the vast economic and human potential of small towns and rural communities by building the broadband infrastructure needed for citizens to prosper in an innovative, modern digital world.

By Wendy Cukier

In recent decades, the proportion of Canadians living in small towns or rural areas has increased. According to Statistics Canada's Labour Force Survey, employment in the rural fringe around urban centres is increasing at more than double the national rate. Proximity to urban labour markets enables rural workers to obtain higher-paying, urban-based jobs, which pushes up average earnings. In fact, rural areas close to urban centres have outperformed urban areas for economic growth, attracting businesses and people by offering lower costs and better quality of life.

Meanwhile, entrepreneurship and small- and medium-sized enterprises (SMEs) are considered engines of economic growth in Canada, and SMEs are key to the Toronto-Waterloo corridor as well as to rural and small-town Canada. Self-employment represents 21 percent of total employment in those areas. Small communities such as the Beauce in Quebec have strong entrepreneurial cultures and disproportionate shares of small businesses. Several studies have revealed the potential of rural-based innovation in, for example, agribusiness and tourism (Niagara, Ont. and Fogo Island, N.L., respectively), and the emergence of the rural creative class (Prince Edward County, Ont.

SUMMARY AND RECOMMENDATIONS

Small towns and rural areas in Canada have much to offer—access to nature, lower cost of living, lifestyle advantages—but many are declining with dwindling populations, lower education and lower employment levels. While they have the potential to drive economic growth and innovation, small towns and rural communities often lack the broadband infrastructure needed to prosper. Among our recommendations to bridge the urban-rural divide, governments need to:

- **recognize the importance of rural communities in fueling innovation, testing new solutions, driving economic development and attracting foreign investment**
- **accelerate the expansion of citizens' access to high-speed networks**
- **support solutions that strengthen linkages between smaller and larger communities and that attract and grow businesses in rural areas**
- **promote smaller communities so they can build partnerships and attract investment**
- **consider investments to address affordability of broadband connectivity and other digital services**

and Salt Spring Island, B.C.).

Smaller communities also have the advantage of being nimble and can be ideal sites for pilot projects and technology trials. For example:

- Hastings County, Ont. has been working with NASA's Jet Propulsion Lab to test the artificial intelligence application "Assistant for Understanding Data through Reasoning Extraction and sYnthesis" (AUDREY) to support emergency healthcare delivery and decision making by paramedics

- Stratford, Ont. was selected as the test site for a connected vehicles trial

- a number of smaller communities are shortlisted for the federal Smart Cities Challenge

None of these are possible without high-speed internet.

Lack of technology is holding back small towns and rural areas

Despite the blurring of boundaries between town and country and the assets of rural areas, many challenges remain for them, including declining birth rates, lower employment rates and wages, lower educational attainment and much less access to services such as public transportation, health care, policing and, in particular, high-speed internet. These issues are often amplified in rural communities with large Indigenous populations. Traditional explanations for this tend to be grounded in physical rather than digital economies. For example, proximity to large urban employment and consumer markets is particularly important when the focus is on moving people and physical goods.

But there is increasing evidence to support the notion that the issue lies in technology—that investing in technology infrastructure spurs economic development, especially in rural areas. In a seminal study, Ivus and Boland analyzed the impact of broadband deployment on urban and rural areas, concluding that the deployment of broadband from 1997 to 2011 promoted growth in aggregate employment and average wages in rural regions across Canada, particularly in service industries, while curtailing growth in urban areas. In other words, "it helped overcome the geographical barriers that have traditionally hampered rural employment growth."

This is partly because the digital economy operates in unique ways. Research suggests that the spatial dimensions of clusters for knowledge-intensive services are different than traditional physical supply chains and are less bounded by geography. In e-commerce, digital services and other industries, numerous examples exist of small rural companies becoming part of national and global supply chains, bypassing traditional networks. For example, Warkworth, Ont. engineer Marcus Leng commercially launched BlackFly, a revolutionary electronic personal aerial vehicle (ePAV) with help from the local incubator. His company, Opener, is now based in Silicon Valley after it connected to an international supply chain and global markets from Warkworth.

Some gaps are amplified by the digital divide

Despite decades of discussing the opportunities technology offers as a substitute for transportation in telecommuting, e-health, e-learning and more,

Access to digital assets is one of the fundamental drivers of economic and social development, much as the transportation systems supporting physical movement of goods were in the past.

the fact remains that many gaps between urban haves and small town or rural have-nots are amplified by the digital divide. These gaps include access to affordable inclusive digital infrastructure, digital skills and adoption of digital products and services. Many communities within 100 km of major urban centres are considered internet black-out zones, sometimes because of geography. Incumbent providers have tended to ignore rural and smaller communities, paving the way for enterprises such as the Eastern Ontario Regional Network and the Woodstock, N.B. Xplornet, which fill gaps in 5G service, and the Manitoba First Nations Technology Council, which is bringing internet access to Indigenous communities.

Canada has committed to ensuring that rural communities have priority access to wireless technology, particularly where other options are not available. While spectrum allocation decisions need to consider reliability and sustainability, some would argue that the processes historically have tended to favour big players with deep pockets rather than supporting new, innovative solutions. Recent decisions may help level the playing field.

Access to technology is not only important to support digital businesses, but also to support access to human and supply chain networks. It is also needed for social capital and intermediary services for start-ups and established businesses, including knowledge transfer, training, financing, legal services and marketing strategy development.

Federal, provincial and municipal governments in Canada and around the world are investing heavily with private sector and community partners to expand broadband development. Internationally, some governments treat internet access as a human right, and in Canada, a number of policy initiatives have been announced as a result of the CRTC's declaration that broadband is a basic service that should be available to all Canadians. Compared to other countries, however, Canada's geography and diffuse population make expanding broadband access especially challenging outside of urban centres. While 99 percent of Canadians have access to wireline telephone service, only 84 percent of Canadian households have access to fixed broadband internet services that meet CRTC's target speeds. However, there are massive disparities: 39% of rural households have access to this kind of service, versus 96% in urban areas according to a recent report of the Auditor General.

For decades, the Government of Canada has

invested in telecommunications to bridge geographic divides—from early experiments using satellites to later initiatives to build the "Information Superhighway." Public convenience and necessity have underpinned telecommunications regulation in an effort to ensure basic service provision to all Canadians. Predictably, as more competition has been introduced to the market, the disparity between the technology haves and have-nots has been exacerbated.

According to a CRTC report, at the end of 2015 the higher the download speeds, the wider the service availability gap between urban and rural areas. The report also emphasized the intersecting issues in First Nations communities, where it can be uneconomical to invest in broadband. A Manitoba Keewatinowi Inc. submission to the CRTC report said, "It is hard for the regulator to respond to market-driven change where there is no market."

Governments have tried to ameliorate these realities. The Broadband for Rural and Northern Development program invested $80 million in 63 projects from 2002 to 2005. More recently, the Broadband Canada: Connecting Rural Canadians program ran from 2009 to 2013, investing $225 million in 84 projects. Supported by these initiatives, regional programs have forged innovative public-private partnerships, such as the Eastern Ontario Regional Network, which invested $175 million and achieved impressive results, driving service delivery improvements and small business growth. Most important, the project broke new ground for establishing and leveraging complex partnerships and exploring new ways to think about innovation in a rural context.

More recent developments have included the release in December 2016 of the CRTC report Telecom Regulatory Policy CRTC 2016-496 "Modern telecommunications services—The path forward for Canada's digital economy," which proclaimed broadband internet a basic telecommunications service in Canada. A CRTC submission to the Canadian Innovation Agenda summarized these initiatives:

- Canada's Connect to Innovate committed $500 million dollars by 2021 to bring high-speed internet to 300 rural and remote communities in Canada.
- Canada announced trials to upgrade to 5G in the Toronto–Montreal corridor, including licenses for small players.
- The Smart Cities Challenge could help bridge the digital divide in rural communities (several Indigenous communities are among the finalists).

$7 BILLION

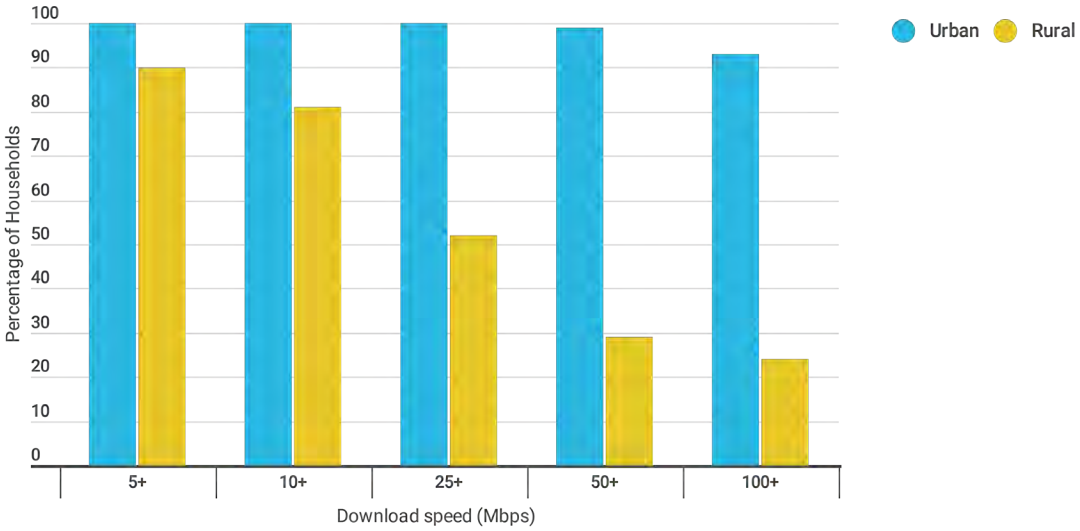
Current financial commitments from government, communities and the private sector serve only a fraction of what is needed to achieve equitable connectivity … an investment of $7 billion is needed to address the rural broadband shortfall.

Canada needs a cohesive strategy

These investments will help Canada regain its position among the world's most connected nations,

RURAL AREAS LESS LIKELY TO HAVE FAST INTERNET ACCESS

National broadband availability, urban and rural population centres, 2015 (CRTC):



but a cohesive strategy is needed. Despite technological advances, we have only a fraction of the support needed to provide equitable access to internet services for Canadians. The most recent report, released in April 2018 by the Government of Canada's Standing Committee on Industry, Science and Technology, called Broadband Connectivity in Rural Canada: Overcoming the Digital Divide, affirmed the importance of innovative partnerships to improve connectivity. It also confirmed that current financial commitments from government, communities and the private sector serve only a fraction of what is needed to achieve equitable connectivity. They suggested an investment of $7 billion was needed to address the rural broadband shortfall.

The current public-private mix of investments has produced uneven results and, for many, slow progress. But what if the costs and benefits of access to digital infrastructure were reframed more broadly as foundational to providing access to the full range of public services, employment and education opportunities and as a way of strengthening the networks that build human as well as financial capital?

A chapter in Malcom Frank's recent book is titled "Data is Better Than Oil", pointing to the growing importance of the digital economy. As such, access to digital assets is one of the fundamental drivers of economic and social development, much as the transportation systems supporting physical movement of goods were in the past. By thinking of digital networks not as expenditures but as enablers, governments can unlock assets by:

- recognizing the importance of rural communities in fueling innovation, testing new solutions, driving economic development and attracting foreign investment
- taking an inclusive, user-centric approach to innovation, moving beyond digitizing government services to ensuring citizens have the tools, skills and bandwidth to access them
- applying a "rural" lens to the full range of government investments in technology, innovation, skills and economic development

- adopting an asset-based approach that conceptualizes digital networks as essential to driving economic development across all sectors, including agriculture, tourism, resources, service industries, etc.

Specific considerations and recommendations include the following:

CONSIDERATIONS

1 **Reframe the urban/rural dichotomy to recognize the range along the continuum. Include a rural lens on policies related to innovation, economic development, international trade and direct foreign investment, ensuring broader range of sectors (e.g. agribusiness) are considered.**

2 **Recognize that the high-speed networking requirements of business are significantly larger than those of consumers.**

3 **Recognize that innovation is manifest differently in smaller communities than it is in large centres and may be incremental, focused on process improvement and new business models.**

RECOMMENDATIONS

1 **Accelerate expansion of citizen access to high-speed networks to support drivers of economic development such as the development of digital skills and business, e-learning, e-health and telecommuting (e.g. Eastern Ontario Regional Network).**

2 **Incentivize solutions that strengthen linkages between smaller communities and larger centres (e.g. allocation of spectrum that privileges smaller communities, outsourcing functions that can be done remotely, specialized training and services beyond call centres).**

3 **Consider digital services investments to address affordability, similar to the Northern Ontario fuel tax credit.**

4 **Focus on incentives—such as one-stop shopping, networks and concierge services that help small businesses navigate the resources that support them—in order to attract and grow businesses in rural communities.**

Dr. Wendy Cukier is one of Canada's leading experts in disruptive technologies, innovation processes and diversity, with more than 200 published papers on technology, innovation and management. She is the coauthor of the bestseller "Innovation Nation: Canadian Leadership from Java to Jurassic Park". Wendy serves on a host of boards in the private and non-profit sectors and has helped create and grow several successful startups and social ventures including Flybits, Think2Thing and Growing North. She is the Academic Director of the Diversity Institute at Ted Rogers School of Management, Ryerson University which advances evidence-based strategies for inclusion.

Special thanks to Kathryn Wood of Pivotal Momentum Inc. for her insights and encyclopedic knowledge of rural innovation and Catherine Middleton for her important research on the digital divide, as well as to the Eastern Ontario Warden's Caucus and Eastern Ontario Regional Network (EORN) for supporting early research on inclusive innovation.

CANADA'S INFRASTRUCTURE REVIVAL: Let's Get the Biggest Bang for our Buck

Canada's governments are preparing to spend historic amounts on infrastructure. To avoid creating 'white elephants', they should follow six key principles that will help the projects improve the country's productivity, competitiveness and social equity. By Drew Fagan

CHAMPLAIN BRIDGE, MONTREAL, QUEBEC

Complaining about infrastructure is almost as Canadian as complaining about the weather. It begins with the fact that the two are linked; Canada's harsh winters and extreme temperature fluctuations as the seasons change take a toll on the country's roads (and vehicles) and other infrastructure.

But it's more than that. Sometimes it's as if everyone has a story about infrastructure gone wrong. Cost overruns. Late delivery. Sub-optimal results. Politics that trumps evidence.

'Twas always thus? Canada's first government fell over a scandal involving the contract for Canada's first megaproject: the Canadian Pacific Railway. Canada's postwar government was fatally wounded over parliamentary procedures regarding a national pipeline. These two massive initiatives knit the country together successfully and, indeed, pay economic dividends to this day. On the other hand, Canada's biggest cross-border infrastructure initiative—the St. Lawrence Seaway—was built on time and on budget but never lived up to expectations.

And today? In Toronto, the project cited as an example of how one *shouldn't* plan is the one-stop Scarborough sub-

SUMMARY AND RECOMMENDATIONS

The Government of Canada is leading a resurgence in infrastructure spending, with a 12-year budget of more than $180-billion and the creation of key institutions such as the Canada Infrastructure Bank. Provinces are doing their part, with long-term infrastructure plans and more spending, and municipalities are also increasing their infrastructure budgets.

But will this spending be remembered for being visionary, innovative and inclusive, for building the country's productivity, competitiveness and social equity? Or will the successes be outweighed in the public mind in the years to come by the failures?

To ensure that infrastructure funding is spent to best effect, governments should set priorities and make decisions according to the following six principles:

1. **SMART PLANNING that prioritizes key sectors critical to nationwide competitiveness and innovation, especially transportation and next-generation telecommunications**
2. **SMART PROCUREMENT that jump-starts the traditional procurement process**
3. **SMART CONSTRUCTION that focuses on execution and includes sharing best practices in new technologies to enhance productivity**
4. **SMART BENCHMARKING that establishes a national effort to standardize how infrastructure data is collected and used to enhance capacity**
5. **SMART EMPLOYMENT that focuses on the skilled trades and inclusion of under-represented groups, especially in priority communities**
6. **SMART COORDINATION that gives infrastructure a higher profile as a driver of Canadian prosperity**

way extension, which led a global list of "urban white elephants" compiled last year by *The Guardian* newspaper. In Montreal, the epitome of how one shouldn't build is the Champlain Bridge, which is now being replaced but needn't have so soon had it been built to last in the 1950s. And on it goes, or so it seems.

And yet Canada is experiencing an infrastructure revival like almost never before. It is on a scale approaching the construction of the 1950s and 1960s, when modern Canada—our universities and colleges, our hospitals, our highways—was built.

Canada is making up for lost time on infrastructure renewal

The federal government, which spent a generation reducing assets and spending only what it had to, is now leading the charge with a 12-year budget of more than $180-billion—almost double what it was less than a decade ago in nominal terms—and the creation of the reform-minded Canada Infrastructure Bank (CIB).

Provinces—Ontario, Quebec, Alberta and others—have created long-term infrastructure plans and increased spending significantly. Ontario's most recent plan, announced by the previous Liberal government, called for annual spending of about $20-billion—again, almost twice what it was less than a decade ago. Municipalities, which control about 60 percent of publicly owned infrastructure but have less revenue-raising authority than Ottawa and the provinces, have increased their budgets significantly, too.

The federal Parliamentary Budget Officer, and some of his provincial counterparts, have criticized the slow pace of actual expenditures, noting that monies budgeted have not been spent as fast as planned. Prime Minister Justin Trudeau emphasized this point in his most recent "mandate letter" to the infrastructure minister, asking that the pace of federal-provincial infrastructure agreements and expenditures be made a priority.

But it's important that infrastructure projects be done well as opposed to quickly. The Prime Minister has also emphasized that he wants his government to be judged on its performance from the perspective of 25 years hence, as well as from the perspective of a limited four-year mandate.

Infrastructure, in particular, still suffers from a stigma as a cyclical investment, made when the economy needs a boost, as opposed to a long-term tool for productivity and competitiveness. Fast is good but good is better.

Doing it smarter

So what should be done to ensure that the increased funds are spent to best effect? It's all about doing it smart, or smarter. In some cases, initiatives are already underway in Canada to do infrastructure smarter. In other cases, Canada has much to learn from countries that have invested more in thought leadership, especially technological innovation.

What is smart infrastructure? Smart infrastructure, according to the Cambridge Centre for Smart Infrastructure and Construction in Great Britain, comes from melding physical infrastructure with digital infrastructure so as to improve information and drive better decision making, construction and operations. As just one example, smart grid technology promises to reduce the cost of electricity production, consumption and distribution by iden-

Infrastructure still suffers from a stigma as a cyclical investment, made when the economy needs a boost, as opposed to a long-term tool for productivity and competitiveness.

tifying and reducing wasteful consumption, matching demand with supply and providing information to consumers.

Digital infrastructure—sensors and networks, big data and machine learning—is the key to getting more out of the infrastructure already built by increasing capacity, efficiency, reliability and resilience. It also means more effective planning of future infrastructure investment. Greater infrastructure efficiency means enhanced service delivery with lower costs and often a smaller physical footprint and less environmental impact.

This is critical for mature economies such as Canada's, where new infrastructure assets add no more than one percent annually to the total value of existing infrastructure, as well as emerging economies such as India, which expects to more than double its infrastructure stock by 2030.

There are myriad ways to get to smarter results in infrastructure, including smarter planning, procurement, construction, benchmarking, employment and coordination.

1 SMART PLANNING

Canada has not done a national infrastructure audit—although some provinces have—nor a national infrastructure plan, as have countries such as Australia, New Zealand and Great Britain.

The federal government has set up what promises to be a world-class infrastructure agency in the CIB. The CIB is focused primarily on leveraging $35-billion in seed capital to draw in private and institutional money to build revenue-generating infrastructure.

The CIB also has been charged with leading a broader effort to gather infrastructure data and information nationwide to improve the evidence base for decision-making. To that end, as the CIB moves from start-up to build-out and steady-state operations, it will be well placed to participate in conversations about Canada's infrastructure priorities and provide thought leadership on how best to get these done.

For example, should Canada have a single policy anchor to prioritize capital investment, such as productivity enhancement? If so, what sectors and initiatives would be prioritized? Most likely, according to experts inside and outside government interviewed for this paper, they would fall into two overarching and linked areas:

1. Transportation, including multi-modal transportation networks and enhanced rapid transit, as well as gateway transportation infrastructure to the United States and to the east and west coasts for

trade with offshore markets

2. Next-generation telecommunications, such as 5G networks, which are becoming "table stakes" for countries pursuing a digital future, including for driver-assisted and autonomous vehicles. (4G made smartphones ubiquitous, including by making streaming video available 24/7; 5G will drive both a business and consumer transformation by enabling the Internet of Things—the interconnection of computing devices in objects big and small, enabling instantaneous transmission of data.)

2 SMART PROCUREMENT

Canada has been at the forefront of a global trend toward greater private sector involvement in construction and operations of public infrastructure assets. Public-private partnerships have been proven, by many studies, to be more effective than traditional public sector delivery, especially through the pricing of risk, whereby private sector consortia are paid a premium to take on responsibility for any cost overruns when building and operating infrastructure to government specifications.

This was an innovative model even if, according to some experts, P3s have never driven the degree of innovation envisaged because governments remain averse to being too cutting-edge for fear of getting things wildly wrong.

What if governments didn't just sign contracts to build projects that they specify, but also opened the infrastructure field entirely, by asking any and all comers to provide new ideas about what should be built and how it should be built?

As one infrastructure expert put it: solicited proposals result in "small 'i' innovation," while unsolicited proposals will result in "big 'I' innovation."

WHAT IS SMART INFRASTRUCTURE?

Melding physical infrastructure with digital infrastructure to improve information and drive better decision making, construction and operations. Digital infrastructure—sensors and networks, big data and machine learning—is the key to getting more out of infrastructure already built by increasing capacity, efficiency, reliability and resilience.

The wonderfully named Office of Extraordinary Innovation within the Los Angeles County Metropolitan Transportation Authority has made unsolicited proposals the backbone of efforts to do things smarter. It has reviewed dozens of proposals, including in areas encouraged by the office itself—such as big data, data analytics and data management, and mobility on demand, shared rides and micro-transit. The goal, according to the office, is to "jump-start the traditional procurement process."

A key mandated role for the CIB will be the encouragement and evaluation of unsolicited proposals. Indeed, the first investment made by the CIB relates to an unsolicited proposal—the Réseau express métropolitain project in the region of Montreal proposed by the Caisse de dépôt et placement du Québec.

Infrastructure agencies at the provincial and municipal levels would benefit from the same process.

3 SMART CONSTRUCTION

Why does the construction industry, which employs about eight percent of the world's working-age population, lag all sectors in productivity growth except agriculture and hunting? The reasons have much to do with who pays the bills. Construction is funded to a sizeable extent by government, which means it remains heavily regulated, following often opaque rules and bound to a risk-averse culture.

But the construction industry also is ripe for disruption. It remains widely fragmented, with a significant variance in capacity between global companies and national and local companies, which often benefit from less than transparent contracting practices. It lags industries such as automotive and financial services in deployment of advanced analytics and planning tools. In construction, these include building information modelling and so-called digital twins, which provide representations of a project's physical and functional characteristics and operations.

It's not just technological innovation that must be improved to bring sector productivity growth up to the average for the global economy—one percent annually compared to almost three percent over the past 20 years, according to the McKinsey Global Institute. Better supply-chain management and onsite execution, better contracting—including better allocation of risk—and a better-trained workforce (more on that below) would go a long way, too.

The National Infrastructure Commission (NIC) in Great Britain released a study last year on global best practices in deploying technology to boost sector productivity throughout the asset lifecycle. Examples included Virtual Singapore, which maps the urban areas of Singapore in real time on multiple factors related to asset efficiency, and other innovations gleaned from Europe, the Middle East and Asia.

Canada has numerous globally competitive construction companies, but the sector would benefit through the sharing of best practices around construction productivity enhancement.

4 SMART BENCHMARKING

Infrastructure remains stuck in the past—not just in the way it often operates, but also in the image it often projects. Asphalt is infrastructure, certainly. But so is building information modelling, for example, and so is data. As the NIC noted in

another recent report "Data is part of infrastructure and needs maintenance in the same way that physical infrastructure needs maintenance."

An effective data strategy starts with a prioritized audit of existing assets and builds on this with the deployment of real-time data monitoring and secure data sharing to ensure maximum benefit. As an example, Transport for London is a leader in the sharing of information on travel patterns, which has encouraged travel apps and real-time alerts, reducing uncertainty and increasing public transit use.

Closer to home, Ontario's most recent long-term infrastructure plan, released in November 2017, included the province's first inventory of all provincially owned infrastructure, set out by sector and by asset condition.

Queen's Park is now working on a digital condition index, beginning with the primary and secondary school system, under the assumption, as set out in a recent paper, that schools now consider "internet technology as the 'electricity' that powers the education process." Proposed benchmarks include internet connectivity, WiFi coverage and other communications infrastructure measurements.

The CIB could help lead a national effort to broaden and standardize infrastructure data collection and deployment, rather like the Canadian Institute for Health Information does in the health sector.

5 SMART EMPLOYMENT

The infrastructure sector needs to recruit experts in the effective deployment of technology, including big data. But it also needs to recruit those educated in the skilled trades. Over the next decade, roughly 200,000 sector workers are expected to retire. But the apprenticeship training system will strain just to replace those leaving, let alone expand the numbers to keep up with rising demand due to rising infrastructure expenditures.

Why such a challenge? Ottawa as well as numerous provinces have launched new funding programs and initiated policy reviews to encourage young people to consider as a career skilled trades such as electricians, plumbers and carpenters. But the trades continue to suffer as the perceived poor cousin of the post-secondary sector, behind universities and colleges. And the path to an apprenticeship certificate is particularly challenging, including hard to navigate enrollment processes and inflexible rules concerning on-the-job training.

A coordinated national effort is overdue. Different provinces and territories are projected to have different needs, certainly, but all are expected to face challenges that must be addressed if infrastructure projects are to have the skilled workers needed in a decade or two. This would include a recruitment focus among underrepresented groups—women, visible minorities, Indigenous Peoples and people with disabilities—and community benefits packages in infrastructure projects, such as local job creation and training opportunities and improvement of public spaces, especially in communities with below-average incomes. The largest transit project in the country—the Eglinton Crosstown LRT in midtown Toronto—has a well-received community benefits program and British Columbia is the latest province to initiate such a policy province-wide.

6 SMART COORDINATION

The federal government and the provinces and territories have established a formal coordination process. Ministers now meet annually, includ-

ing with representatives of municipal governments. Many of the challenges and opportunities cited in this paper would benefit from discussion at this table, particularly if the CIB is included and given a leading role in guiding progress in key areas.

But, more generally, infrastructure deserves a higher profile as a driver of Canadian competitiveness and prosperity.

Best practices deserve to be highlighted, such as Stratford, Ont.'s early and widespread adoption of broadband and digital technology, and Innisfil, Ont.'s recently expanded experiment with micro-transit, in which the town contracted Uber to provide pooled, flat-fare rides between high-volume locations.

Initiatives such as the federal government's Smart Cities Challenge and the CanInfra Challenge sponsored by the Boston Consulting Group deserve to become regular affairs, sparking continued efforts within government, the private sector and even students to think smart about what it means to build 21st century infrastructure. After all, some of the infrastructure we build today, if built smart, will still exist when the 22nd century dawns.

Drew Fagan is a professor at the Munk School of Global Affairs and Public Policy, University of Toronto. He previously worked in senior positions at the federal and provincial level. For the government of Ontario, Drew was Deputy Minister of Infrastructure and Deputy Minister of Tourism, Culture and Sport with responsibility for the 2015 Pan/Parapan American Games. Previously, he was Assistant Deputy Minister for strategic policy and planning at the Department of Foreign Affairs and International Trade (now Global Affairs Canada). Before his public service career, Drew worked at The Globe and Mail, where he held numerous senior positions including parliamentary bureau chief, associate editor of Report on Business and Washington correspondent.

GOVERNING AI:
Navigating Risks, Rewards and Uncertainty

To encourage innovation in artificial intelligence while minimizing risks, Canada should adopt an incremental risk management approach to AI governance, supported by two new advisory institutions. By Daniel Munro

At the heart of the AI policy challenge is a need to strike the right balance between supporting the development and diffusion of AI technologies that promise social, economic and other benefits for Canadians, and ensuring that risks to the rights and well-being of Canadians are addressed. This is not an easy task.

Because AI is an emerging technology, the exact nature and extent of potential benefits and risks are highly uncertain. Some observers favour a laissez-faire approach that places few limits on AI research and applications in order to accelerate discovery and access to benefits. The benefits may be economic—such as growth and job creation by Canadian firms that develop and commercialize AI technologies—as well as social, financial, political and health-oriented.

Image recognition and predictive analysis, for example, improve diagnosis of eye and cardiovascular diseases, breast cancer and melanoma. Predictive analysis is also being used to reduce work-

SUMMARY AND RECOMMENDATIONS

Artificial intelligence—the ability of machines to perform intelligent tasks such as sorting, analyzing, predicting and learning—promises substantial benefits for Canadians. Businesses that develop and commercialize AI have the potential to grow and create jobs, while organizations that adopt AI technologies can improve operations, enhance productivity and generate health, social and economic benefits for all.

Yet, some AI applications pose risks for individuals and communities:

- **AI-enabled automation threatens to disrupt labour markets and employment**
- **predictive analytics in finance, education, policing and other sectors can reinforce racial, gender and class biases**
- **data used in AI development and applications are often collected in ways that violate privacy and consent (see, for example, *Weapons of Math Destruction: How Big Data Increases Inequality and Threatens Democracy*, *Twitter and Tear Gas: The Power and Fragility of Networked Protest*, and *Data Governance in the Digital Age*)**

AI policy makers face a tension. They must establish conditions that allow AI to thrive and deliver benefits, while recognizing and responding to the harm that some AI applications can generate or reinforce. Options for addressing the tension range from a laissez-faire approach that would allow AI to develop and diffuse without limit, to a precautionary approach that would restrain the development of AI until risks are better understood and capacity to manage them is in place. Given that AI is a platform technology with many possible applications—and thus various risk profiles—it should be governed with an incremental risk-management approach that is case- and context-sensitive, rather than a blunt laissez-faire or precautionary approach. A risk-management approach allows space for AI technologies and applications to develop while monitoring and managing risks as they emerge in specific applications. To institutionalize a risk-management approach to governing AI in Canada we recommend that the Government of Canada create two new institutions:

- **an AI risk governance council**
- **an algorithm impact assessment agency**

place accident risks, identify children who might be at risk of violence, predict individuals' risk of hospital readmission, and assess the credit worthiness of individuals who lack conventional credit histories, among other applications. Advances in natural language processing support increasingly common applications such as voice-activated assistants, automated customer support, translation, spam filters and interactive dialogue.

Other observers favour a precautionary approach that would limit the development and use of AI until more is known about the risks and how they can be managed. Early advances and uses of AI have already revealed serious challenges and risks, including:

1. Bias

Algorithms, and the data that feed them, have the potential to reinforce existing racial, gender, class and other biases and inequalities. The use of biased data in predictive policing models, for example, can bring additional police scrutiny to neighbourhoods with higher concentrations of minority residents—not because more crime is likely to occur, but because datasets on which the predictive models depend include more crime reports for those neighbourhoods due to past over-policing.

2. Safety

Numerous AI applications pose safety risks, ranging from algorithm-based models in the financial sector that malfunction and generate catastrophic financial losses to the development of AI-enabled lethal autonomous weapons that lack meaningful human control.

3. Privacy and consent

Access to massive datasets to support machine learning and improve analytical and decision-making capacity is essential to AI research and innovation. Yet, data is sometimes collected and used without explicit and meaningful consent from people from whom it is obtained, and often by violating privacy rights and expectations (see, for example, "At least two malls are using facial recognition technology to track shoppers' ages and genders without telling" and "Big other: surveillance capitalism and the prospects of an information civilization").

4. Explainability and accountability

There are unanswered questions about the extent to which decisions and actions must be explained to those affected by AI, and about who or what is ultimately accountable for AI-enabled decisions and actions. A key challenge is that although people expect organizations to offer explanations for the decisions that affect them—such as being denied a loan or government benefit, or receiving a fair criminal sentence—more advanced machine learning AI systems produce results based on analysis too complex for human beings to follow. For example, some systems will collect and analyze internet browsing history from loan applicants and assign a credit score (see *Weapons of Math Destruction*, 143-5) based on the extent to which their browsing history matches those of previous loan defaulters. But exactly what is problematic in the browsing history—and how it links to other data and patterns—can move beyond simple explanation. This will present challenges, especially for public sector innovation, given that justifications for AI decision-making will likely be required as a matter of political legitimacy.

A precautionary approach would tread cautiously in the face of these risks, but could also delay discovery and access to social, economic and other benefits for Canadians. How should AI governance

Although people expect organizations to offer explanations for the decisions that affect them—such as being denied a loan, a government benefit or a fair criminal sentence—more advanced AI systems produce results based on analysis too complex for human beings to follow.

proceed in light of this tension between innovation and risk?

Canada needs policies on AI ethics and governance

Canada's current approach to AI governance favours innovation over risk management. As such, it is ill-equipped to address the emerging risks associated with certain AI applications.

The federal Pan-Canadian Artificial Intelligence Strategy has little to say about AI ethics and governance and, until recently, there was little evidence that the Ministry of Innovation, Science and Economic Development (ISED)—or any other federal agency—has been thinking about a more comprehensive approach to identifying and managing the ethical, social and political risks and implications of AI. The pan-Canadian AI strategy calls for the development of "thought leadership on the economic, ethical, policy and legal implications of advances in artificial intelligence" and supports academic researchers exploring these issues through the AI & Society Program. But the "expected results" of the strategy include no mention of AI ethics and governance, focusing instead on Canada's international profile on AI research and training, developing and attracting AI talent, and enhancing innovation for socio-economic benefit.

When asked how AI will be regulated and governed, ISED says only that AI development and use must be consistent with the existing "marketplace framework," the Canadian Charter of Rights of Freedoms and the Personal Information Protection and Electronic Documents Act. Treasury Board Secretariat is leading consultations on responsible use of AI within the public sector, Global Affairs Canada coordinated a multi-university student symposium on AI and human rights issues, and some analysts within the federal government are working on approaches for algorithm bias and impact assessment. Additionally, ISED has launched National Digital and Data Consultations, which should address some of the data collection and use issues. But there is little evidence that an explicit, comprehensive federal strategy for AI ethics and governance is being developed or considered.

Some indication that Canada will pay more attention to AI ethics and governance emerged during a December 2018 meeting of G7 nations to discuss the impacts of artificial intelligence. Canada and France announced that they are seeking to create

an International Panel on Artificial Intelligence with a mission to "support and guide the responsible adoption of AI that is human-centric and grounded in human rights, inclusion, diversity, innovation and economic growth." The panel aims to engage stakeholders in science, industry, civil society, governments and international organizations on issues such as data collection and privacy; trust in AI; the future of work; responsible AI and human rights; and equity, responsibility and public good. While an important sign that AI ethics and governance are on the Canadian agenda, it is not clear what tangible effect the panel's work will have on AI governance in Canada.

OPTIONS FOR AI RISK MANAGEMENT

Canada has a government strategy to support AI research and innovation, and some provinces are making substantial investments in AI research, but it lacks strategies and institutional arrangements to identify, monitor and mitigate AI risks.

Following a case- and context-sensitive risk-management approach to governing AI, what principles and policy options might fill the gap?

The principles

To manage the tension between supporting innovation and addressing risks, Canada's approach to AI governance should do the following:

- Follow a policy on the responsible development and use of AI that prioritizes fairness, equality, safety, economic and political security, and the health and well-being of all people.

- Focus specific risk-management and regulatory actions on AI applications, not AI in general. AI risks will manifest only in the context of concrete applications and uses in specific activities and sectors, such as health diagnosis, loan assessments, predictive policing or benefits eligibility assessment. Risk assessment and management should focus on what is appropriate in those contexts.

The policies

With respect to specific policies and regulations, Canada's governments should consider the following:

- Develop and adopt a declaration on the responsible development and use of AI that

Canada's current approach to AI governance favours innovation over risk management. As such, it is ill-equipped to address the emerging risks associated with certain AI applications. A better balance is needed.

would signal to private sector developers and adopters, and public sector decision makers and civil servants, the importance of prioritizing fairness, safety, security, health and other values, principles and interests in the development and use of AI. The declaration could build on the Montreal Declaration for the Responsible Development of Artificial Intelligence.

- Develop a more comprehensive AI strategy that provides explicit guidance and funding to explore and manage the ethical, economic, legal and social dimensions of AI that are largely neglected in the current innovation-focused pan-Canadian strategy. This would bring Canada more in line with other countries working to address both the innovation and ethical dimensions of AI in their national contexts. Insights can be drawn from France's *For a Meaningful Artificial Intelligence: Towards a French and European Strategy*, Sweden's *National Approach to Artificial Intelligence*, and the U.K.'s *AI in the U.K.: Ready, willing and able?* among others.

- Require algorithm impact assessments to be completed before AI is used in sensitive areas such as healthcare, education, public safety and government benefits delivery. These would be similar to health technology assessments and environmental impact assessments but would focus on AI risks and benefits for individuals and communities, as well as the distribution of risks and benefits across demographic groups.

- Consider establishing a right to an explanation when an AI-based system produces decisions that have a significant effect on individual's financial, legal or other substantial interests. Discussion about whether and how to establish the right should be guided by the European Union's General Data Protection Regulation, which (arguably) establishes such a right. Whether such a right should exist—and whether it is technically feasible for explanations to be offered—will require public discussion. At a minimum, AI users in the private and public sectors should be alerted that they will be held accountable for outcomes that affect individuals' rights and interests.

Institutional arrangements

To realize these principles, policies and assessment activities—and to provide mechanisms for ongoing discussion about and risk management of AI—certain institutional arrangements should be established. Canada, the provinces and territories should consider creating the following:

1 **A dedicated artificial intelligence risk governance council.** This should be composed of people with technical, legal and ethical expertise to discuss, assess, report on, and provide advice to government and industry about AI innovation and risk management. Specifically, the council should:

   - lead the drafting of a declaration on the responsible development and use of AI, and a more comprehensive strategy for AI governance

   - monitor and report on trends in AI research and application, and conduct regular risk assessments of new, emerging and proliferating applications

   - provide advice to government and industry

on how to manage risks, drawing on risk-assessment results and best practices in other jurisdictions

- serve as a coordinating body for Canadian and international discussions about AI risk across sectors (e.g. health, education, innovation, economic development, law) and levels of government (federal, provincial, territorial and municipal)

The council could be created as a permanent, stand-alone arm of the federal government's existing arms-length science assessment body, the Council of Canadian Academies (CCA), and thereby benefit from the CCA's existing operational capacity and strength in convening experts from academia, industry and not-for-profit organizations. The council should support the work of the International panel on Artificial Intelligence, while also drawing from the panel's insights to articulate principles and promote practices appropriate to the Canadian context.

2 **Create an algorithm impact assessment agency.** This should be composed of technical, legal and ethics experts to conduct assessments deemed necessary or desirable by federal, provincial and territorial ministries and agencies, and to ensure that AI and algorithm applications respect the rights, interests and well-being of Canadians.

TOWARDS AI INNOVATION AND GOOD GOVERNANCE

Canada has an opportunity to be a global leader in AI research and innovation, and in effective AI governance. But while generating health, economic and social benefits from AI is already a priority among Canada's governments, managing the potential health, legal, economic and ethical risks of AI applications has largely taken a back seat. Experience with other emerging technologies should have taught us that prudent risk management is a precondition both for identifying and minimizing harms and, in turn, for generating sufficient public confidence to allow innovation to proceed. Time will tell if those lessons will be applied to AI governance or whether we face a future of unregulated AI risk and stalled AI innovation.

Daniel Munro is a Visiting Scholar and Director of Policy Projects at the Innovation Policy Lab in the Munk School of Global Affairs and Public Policy at the University of Toronto. His research interests include science, technology and innovation policy and applied ethics, including the ethics of new and emerging technologies.

For helpful suggestions and insightful conversations, the author would like to thank Tim Dutton, Sylvia Kingsmill, Maya Medeiros, Aaron Reynolds, and Mark Sutcliffe.

AN ‘INTERNATIONAL SPACE STATION FOR WORK’: The Case for a Global, Open Platform for Training and Employment

As permanent employment declines, workers switch jobs more often, and training programs fail to adapt, the world needs an open platform for employment and training. A global effort, like the one that built the International Space Station in the 1990s, could provide the funding and critical mass of data needed—and Canada could lead it. By Jon Shell

Our government-funded employment and training system is largely still set up for a bricks and mortar world. Many employment advisers still source jobs through pre-existing relationships with businesses when 85 percent of jobs are posted on the internet. Almost all of the system's training recommendations are for college and university programs, even though there's an increasing supply of short, high-quality online courses from providers like Coursera and Udemy that might be more appropriate for many job seekers.

Attempts are underway to reform the system, but they are disconnected. At least three provinces (Ontario, Nova Scotia and Newfoundland and Labrador) have set up incubation and acceleration labs, while the federal government is launching the Future Skills Centre. These tend to support promising but limited initiatives, such as a better approach to apprenticeship in the construction industry or a pathway for career progression in the childcare sector. Meanwhile, jurisdictions are building their own small platforms or considering local agreements with companies like LinkedIn and Monster.com. This raises questions about personal data privacy and, as jurisdictions choose different partners, the system will become even more fragmented; the lack of an integrated platform is frustrating efforts to

SUMMARY AND RECOMMENDATIONS

Policy-makers today face complex issues about employment. Permanent, full-time employment is in long-term decline, workers are changing jobs at an increasing pace, and outdated training programs are failing to connect with what businesses need. Jurisdictions are wrestling with how to modernize their employment and training systems by incorporating technology. But they are coming up with small, disconnected solutions that are insufficient for the challenges ahead. We need to think bigger:

- **Technology alone won't solve the challenges facing Canada's workforce. But a robust employment and training technology platform with open standards would be an extraordinary enabler for public policy innovation and the individual efforts of workers and companies. It would build resiliency into the system and give workers the tools they need to help themselves in a time of rapid change**
- **The ideal system would require a new, independent and international organization. Given the failures of national governments to build technology at scale, it is unrealistic for Canada, or any one country, to build such a solution on its own. Partnerships with large technology companies are also problematic, particularly due to concerns around data ownership and privacy**
- **Several countries working together could gather the funding and critical mass of data required to create a truly transformative platform—one akin in scale and ambition to the International Space Station built in the 1990s. If such a platform could be operated independent of bureaucracy, be managed like a tech company, and follow strict data privacy, a new "Space Station for Work" could help prepare us for the ongoing transformation of our labour markets**
- **Canada, with its significant talent pool in artificial intelligence, large existing commitment to innovation, and strong reputation on the diplomatic stage, is well positioned to champion such a project**

take solutions to scale. In a digital age, we can do better.

We need bold new thinking. What would the perfect employment and training system look like? How can we bring together the reach and resources of government and the dynamism of the technology sector to build the system we need? How can we elevate the challenge to a global level, and how could Canada be a catalyst for action?

A trusted platform and marketplace for the labour supply chain

The ideal platform for the labour supply chain would understand people's skills, competencies and interests, both traditional and non-traditional, as well as their mobility and availability for work. It would have access to all available jobs, permanent and freelance, and would match people with their best possible opportunities. It would know all the training options if people need upskilling and could track, verify and provide credentials for their progress. It would continuously monitor the labour market and make suggestions to help people transition into more secure work *before* they lose their income.

Employers, meanwhile, would have access to tools to remove bias from the hiring process, leading to better outcomes both for companies and job seekers. The platform would use open standards and be interoperable, enabling employment and training companies to access clients seamlessly. For government, it would organize labour market information in a way that allows them to better target interventions like training and wage subsidies, and enable the long-term tracking of outcomes. As employers hire available talent, tax-credit and subsidy paperwork would be processed automatically, decreasing red tape and making programs more effective.

None of this is science fiction

This technology already exists, and private sector companies, government agencies and non-profits have created tools that address many of these needs. For example, Pairin uses testing to identify core skills, Credly provides credentials for non-traditional training and Jobiri is an online career coach. There are hundreds like this, along with established organizations like Indeed for recruiting and Khan Academy for training.

What's missing is a platform or marketplace to tie everything together, much as Apple's App Store provides a trusted place to buy tools for your phone. The private sector currently consists of a number of closed systems, and the tools that exist use different technologies that largely don't speak to each other. An open platform that's easy to plug into, with great technology for work and training matching, widespread usage and trusted data protection would be the foundation on which a powerful and helpful system could develop.

The benefits would be enormous

Let's say you juggle shifts for Tim Hortons and Lyft, but you've completed an online assessment that identifies you have core skills to succeed in software engineering. The tool recommends a set of online courses to help you get started and track your progress. Your data is anonymously aggregated and the government is informed that a number of people like you live in the area, helping them convince Shopify to open their new data centre in the area and train local workers like you. Underemployed individuals get a career breakthrough, while Shopify finds skilled workers.

This technology would amplify our "lab" investments. For example, the career pathways program

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in the childcare sector identified above provides wrap-around supports to help transition low-income workers into stable, living-wage jobs. Our platform could identify candidates for this program and track their progress into employment, making it much easier to scale and more efficient to operate.

Our current training system is built to be reactive. We try to guess what skills will be needed in the future, and then slowly change our education systems to suit. But predicting the future is a fool's errand. A robust employment and training platform, based on real-time information, would help build adaptability and resiliency into the system. It would help the public and private sectors provide training for the skills actually demanded by the market. This would enable our workers to stay ahead of the curve in a time of rapid change.

Despite extraordinary potential, significant barriers exist

Governments are bad at delivering on large-scale technology projects, which easily become ammunition for partisan attacks. Procurement regulations lead to poorly motivated contractors. The Phoenix pay system is a great example of what can go wrong. In the case of employment and training, federal-provincial jurisdictional issues would make governance and decision making challenging.

Global private sector technology platform companies would also struggle to build a solution. They generally make their money by keeping their platforms closed and making people pay to use them. Think of Apple's iTunes, Uber or Microsoft Office. Our system would require open standards and a focus on enabling other private sector companies and public sector programs. Some of the most useful employment platforms, like LinkedIn and Google for Jobs, are closed and disconnected and therefore couldn't support what's described here. And even if a company did agree to create an open-source system, the government is still unlikely to partner at a national level with a single technology company. There would be many issues, from how to pay for it to how to manage people's private data.

The ideal platform: An 'International Space Station for work'

If our government can't build it, and the private sector won't build it, what's next? The platform

LARGE-SCALE IT FAILURES

National governments have a track record of failure when they attempt to build technology at scale. Just a few examples:

PHOENIX

A report estimates the Phoenix payroll system has cost the Canadian government more than $1 billion and could require an additional $500 million a year until it is fixed.

HEALTHCARE.GOV

This U.S. government healthcare website was plagued with user difficulties that required significant repairs. The Department of Health and Human Services says the website cost $834 million. A report by Bloomberg says the government now the estimates cost at $2.1 billion.

NHS NATIONAL PROGRAMME FOR IT

The U.K. government's attempt to implement a top-down digitization of healthcare in the National Health Service (NHS) was ultimately abandoned after the costs incurred grew to somewhere between £10 billion and £11.4 billion.

described here is what Silicon Valley would call a "moonshot." Named after John F. Kennedy's 1961 speech in which he committed to putting a man on the moon—without any idea how he was going to do it—moonshots are ambitious, risky ventures with an enormous potential payoff.

Google has a "moonshot factory" called X, where they make massive investments in things like robotics and driverless cars. Like those projects, our moonshot platform would need significant funding, access to resources and top talent. It would also require independence from bureaucracy to avoid the pitfalls that cause government technology projects to fail.

In the late 1990s, as the world was healing from the scars of the Cold War, Canada joined 14 other countries in building the International Space Station. By looking at space as a collective opportunity rather than a jurisdictional competition, these countries created a far better platform than any one country could have built itself. It was structured as an independent organization, with a specific mandate to remove it from political considerations, and funded by multiple countries that each contributed particular expertise.

The same ambitious, international approach could make this platform for work a reality.

Canada should enlist the cooperation of other countries, all of whom have the same challenges in reforming their employment and training systems in the face of a rapidly changing economy. We should create a new, independent organization with a streamlined governance structure so it can be as nimble as a technology company. With the right "investor" countries involved, we'd have both the funding and the critical mass of data required to drive widespread adoption of a new, open platform. By adopting a stringent set of standards for security and data protection and housing data in each investor country, the platform could comply with regulations internationally while ensuring individuals' data rights are fully respected.

Recently, the World Economic Forum signalled its support for more collective and systemic action to create a next-level reskilling platform. And there is a model out there that combines government support, entrepreneurial initiative and technology: Bob Emploi—an online employment coaching tool for unemployed people in France, built by a non-profit called Bayes Impact. Its co-founder, Silicon Valley data scientist Paul Duan, was tired of building algorithms to sell advertising and wanted to use his skills in the public interest. Because of that mission alignment, the French government was willing to trust Bayes with crucial employment data, and their platform has grown to 150,000 clients since it was launched in 2016. Of those on the platform who have re-entered employment, 42 percent said Bob's coaching contributed to their success. True to its start-up mentality, Bob Emploi is moving quickly to scale. True to its commitment to the public interest, the tool is open source, meaning anyone can use it or build on it.

Building an action plan

Bayes illustrates how entrepreneurial talent, funding and access to data can produce powerful tools, and our moonshot platform would need lots of each. With 10 investor countries contributing, the project would be amply funded at a fraction of most developed countries' current spend on employment and training. Each country would also contribute employment data to fuel the matching platform. To lead the project, we'd focus on people who have technology chops and demonstrated mission

alignment, like Jennifer Pahlka at Code for America or Marten Kaevats of Estonia's digital government—proven technologists and team builders who would attract world-class talent.

It is best to start with a framework of six key principles:

1 **Embrace risk.** Accept that this is a risky venture, and that to succeed we need to think like a tech company, and not a government.

2 **Ensure independence.** Create a light-touch, tech-savvy governance structure to enable the agility and the quick decision making required.

3 **Protect data rights.** As the world wrestles with how to ensure people can control, protect and be compensated for their personal data, this project would be a perfect "live" experiment.

4 **Marshal existing resources.** Canada and others are making large investments in artificial intelligence innovation at their universities; this would be the perfect project for dedicating those resources.

5 **Design for users.** To achieve maximum impact, both employers and actors within employment and training systems will need to see real value in the platform.

6 **Make it open source and flexible.** The system has to be adaptable to different national contexts, and open so that people can build off it and plug into it.

Established non-government partners would also help. The World Economic Forum set up the Centre for the Fourth Industrial Revolution specifically to encourage projects like this.[1] Similarly, OpenAI, the research centre funded by some of technology's biggest names, is focused on making artificial intelligence a force for good.

With the right design and early commitments from leading countries, an impressive, well-resourced coalition could quickly be built.

Canada can be the catalyst

Canada is in the perfect position to champion such a project. We have significant artificial intelligence skill at home, a massive pre-existing commitment to innovation, and a strong position on the international diplomatic stage. And with $363 million committed to fund innovative employment and training initiatives with the Future Skills Centre, there's already a pool of money.

To get the ball rolling, we could offer to partner with France on the Bob Emploi project, ensure the newly created Future Skills Council explores international cooperation as part of its mandate, and commit to leading a working group on this topic through the G7 and G20.

1 The WEF's Center for the Fourth Industrial Revolution published a pamphlet entitled "Artificial Intelligence and Machine Learning" to describe how they want to partner on similar projects

For public policy makers, the window to be a leader in building the employment and training platform of the future, and therefore to influence the critical decisions as to how it serves people, is closing quickly. Choosing a risky path, with great urgency, has never been a hallmark of government. But transformative technology, talent and resources are available right now. It's time to build the International Space Station for Work.

Jon Shell is Managing Director and Partner of Social Capital Partners (SCP), a Canadian non-profit founded in 2001 by entrepreneur and philanthropist Bill Young. His current focus is finding and developing ideas to help people prepare for the changing nature of work. A life-long entrepreneur, Jon has founded and grown successful companies in both Canada and Australia, and was formerly a consultant with McKinsey & Company.

For their feedback and insights, the author would like to thank David Nordfors, Nick Ellis, Hamoon Ekhtiari and Jack Graham.

CANADA'S DATA PLAN: We Need a Data Strategy that Supports our Values and Encourages Innovation

As our economy becomes more data driven, Canadians need a national data strategy that encourages innovation, provides security and privacy, prioritizes transparency and oversight, and that transcends jurisdictional barriers. By Teresa Scassa

SUMMARY AND RECOMMENDATIONS

Companies that harvest data are increasing in power, and Canadians are understandably anxious about it. As our economy becomes more data driven—and as data becomes more valuable—Canadians need a national data strategy that provides a common framework for data security and privacy, that prioritizes transparency and oversight in the processing of data, and that transcends silos and jurisdictional barriers. Such a strategy must embrace an innovative future and, at the same time, protect our society's most deeply held values.

To develop a national data strategy for Canada, governments must begin by:

- **developing a statement of values for a digital society**
- **reforming data-protection and intellectual property laws to meet modern needs**
- **setting rigorous data-security standards for big data and Internet of Things technologies**
- **ensuring greater transparency and oversight of the algorithms used to process data**

Data is the fuel for the engines of big data analytics, artificial intelligence and other rapidly evolving and transformative technologies. Data's shift from being the "exhaust" of industrial and economic activity to being an asset in its own right means that data is harvested at every opportunity and in every context.

For example, The Internet of Things has expanded into homes, vehicles and public spaces, and much of the data collected is personal information, leading to growing anxieties about privacy. The few companies that are well-positioned to harvest data wield considerable and, arguably, excessive market power. The ability of Canadian governments and businesses to own and control the data they need to prosper economically is diminishing.

New uses are being found for data. While many promise innovative solutions to long-standing problems, others raise concerns about ethics, bias, fraud and manipulation. Fragmented and weak data governance threatens to undermine the trust of citizens and businesses alike. Within this rapidly evolving context, Canada's legal and policy infrastructure struggles to keep up, leading to calls for the development of a national data strategy. A failure to act quickly will leave us playing catch up with data, like we did with social media, as major technology companies stake out their turf.

In many ways, smart cities are a crucible for the data governance challenges we face. Smart cities depend on the collection of massive quantities of data about urban infrastructure and residents' activities. It is crucial to know who will own and

control this data, who will be able to access and reuse it, and for what purposes. The protection of privacy is also critical in cities in which data collection is constant and comprehensive. Data security is essential to protect both individuals and infrastructure. Smart cities will also require oversight to ensure that data- and algorithm-driven decision making is fair, accountable and transparent.

Yet smart cities initiatives are often seen as high-tech innovation projects that pay insufficient attention to important data stewardship issues. The public pushback over Sidewalk Toronto's proposed development on the city's waterfront, combined with a public scolding of Canada's Smart Cities challenge by federal, provincial and territorial privacy commissioners, make it clear that a national data strategy is needed not just to support innovation, but also to provide a principles-based framework for innovation that is consistent with national values.

The legislative and policy reform we need

There is no shortage of examples of areas where the demands of the digital economy and society require legislative and policy attention. Some of these are:

Privacy and data protection: Canada's private sector data protection law, the Personal Information Protection and Electronic Documents Act (PIPEDA), is badly in need of reform. This was so even before Europe's new General Data Protection Regulation (GDPR) took effect; the European regulation just makes the need for reform more urgent. If Canadian law does not offer an adequate level of protection for personal data, the flow of data between Europe and Canada could be affected. While a reformed PIPEDA need not replicate the GDPR, the status quo is unacceptable. Enforcement is a key area of weakness. Our consent-based regime may need to be supplemented, and there is considerable interest in consumer- and competition-friendly tools such as data portability.

Consumer protection and competition: Rapidly accumulating concerns over unfair terms in consumer contracts for digital devices and services, a lack of competition, and deceptive commercial practices drive calls not just for better consumer protection laws, but also for a new federal focus in this area. Large concentrations of data in the hands of a few companies, combined with tight controls by those companies over access to and reuse of the data also create competition law issues.

Trade secrets and copyright: The issue of protecting trade secrets and confidential information is receiving more attention internationally and domestically. Algorithms and the data that fuels them may be treated by companies as confidential commercial information. Their place at the heart of the digital economy means that there is pressure to offer more robust protection. At the same time, the use of algorithms and massive quantities of data to drive public and private sector decision making creates a need for new mechanisms to ensure that technology-driven decision making is fair, transparent and accountable.

Copyright law, strengthened over the years at the urging of content industries, may now be stifling innovation by creating costly and time-consuming barriers for the development of artificial intelligence. Calls for copyright reform that balances the rights of copyright owners with those who seek to use protected content for text and data mining are erupting in countries that seek to benefit from the development of artificial intelligence and machine

There is no justification for practices that lead to social exclusion and discriminatory outcomes. Inadequate data governance may be more of a brake on the economy than thoughtful and responsible governance.

learning technologies.

Cybersecurity: More concerted attention needs to be paid to cybersecurity in the public and private sectors. To date, a rising number of data security breaches have been associated with individual harms or losses, as well as significant reputational and monetary losses for organizations in some cases. Cybersecurity threats can also cause much broader disruptions, including to core utilities, services and even democratic institutions. As technology becomes more deeply enmeshed with our homes, our vehicles, our governments and our cities, cybersecurity becomes an increasingly urgent issue.

Transcending silos: In addition to outdated laws, we are faced with the reality that our legal infrastructure has built rigid silos to address and contain certain issues. Many of the challenges we face in the big data era can no longer effectively be addressed in this manner. In theory, privacy problems are the domain of the federal or provincial privacy commissioners, competition problems go to the federal Competition Bureau, and human rights issues fall to the appropriate human rights commission.

But the big data context raises issues of human rights, privacy and competition that cannot so easily be disentangled. The denial of services to an individual based on a profile generated using massive quantities of personal information and a non-transparent algorithm may simultaneously raise issues of discrimination, privacy, human rights and consumer protection. To make matters more complicated, the division of powers between federal and provincial governments creates further silos that can be barriers to robust and responsive public policy. A national data strategy must find a way to create law and policy that transcends these silos, facilitates redress and minimizes jurisdictional barriers.

How will a national data strategy look?

On June 19, 2018, Canada's Minister of Innovation, Science and Economic Development announced the start of national consultations on digital and data transformation. The three themes of the consultation are broad: unleashing innovation; trust and privacy; and the future of work. The consultation could lead to the development of a national data strategy.

But what, exactly, is a national data strategy? One view is that it should be something concrete, manageable and realizable. Estonia's digital public service innovation is perhaps the most well-known example of such a project—one that has received global acclaim. More controversially, China is pursuing e-government reforms based on big data and artificial intelligence, drawing on massive

stores of both private and public sector data. In the U.K., work to develop a national data strategy will involve the creation of a Centre for Data Ethics and Innovation that will support the responsible and ethical use of artificial intelligence.

There is no shortage of suggestions for a possible project for Canada, including development of the infrastructure needed for network sovereignty; taking global leadership in big health data; and developing big data capacity around Canada's primary industries.

The project-based approach is no doubt attractive to government. It is certainly more manageable than a complete overhaul of laws and policies. If successful, such an approach will yield visible, measurable results. Canada could become the international poster child for the chosen project in much the same way that Estonia is now the global e-society darling. Beyond this, a successful project will build capacity and will foster trust in government data stewardship. But even if a project-based approach is adopted, Canada will have to grapple with the cumbersome and outdated law and policy infrastructure that leaves it ill-prepared to meet the challenges of the data economy and society.

Pursuing innovation consistent with society's values

The expanded role and importance of data creates new social and economic challenges. Lisa Austin has criticized the federal government's approach to its digital strategy consultation for "fram[ing] the central issue as seeking a balance between economic innovation and privacy." This tired paradigm creates a binary proposition in which choosing privacy means stifling innovation, and it fails to adequately recognize the important human and social dimensions of data that go beyond privacy. The complex web of values impacted by data was evident in the recent Cambridge Analytica scandal, in which massive amounts of personal information were used to subvert democratic processes. It is also evident in concerns about how non-transparent and potentially biased algorithms or training data may adversely impact individuals and communities.

While we cling to an individual, consent-based model for data protection, it is increasingly obvious that personal privacy is not the only right or value threatened by the unchecked and unaccountable collection of personal information. Equality, free-

'Economic innovation vs. privacy'

This tired paradigm creates a binary proposition in which choosing privacy means stifling innovation, and it fails to adequately recognize the human and social dimensions of data that go beyond privacy.

dom of expression, justice and transparency are all at stake. In a world where data is used to influence and manipulate to unprecedented extents, we need transparency and accountability not just to protect consumers, but also to protect communities and democratic institutions. The issue is not that we face a choice between either pursuing technological innovation or preserving human values; it is about deciding that we will pursue technological innovation that is consistent with and supportive of human values.

There is no justification for practices that lead to social exclusion and discriminatory outcomes. Inadequate data governance may be more of a brake on the economy than thoughtful and responsible governance. Data security breaches and irresponsible data practices undermine confidence and carry with them increasingly burdensome economic costs.

RECOMMENDATIONS

In developing a national data strategy, the government should consider the following to adapt our legal and principles-based infrastructure for the age of big data:

1 **Develop a statement of values for the digital society that will inform how laws are developed, interpreted and applied, and that makes explicit the implicit (and therefore often overlooked) principles that should guide the adoption of new technologies. These values should be drawn from existing, enacted instruments, including human rights legislation and the Canadian Charter of Rights and Freedoms, and should be adapted to the digital context.**

2 **Reform Canada's public and private sector data protection laws to deal with the realities of the big-data environment. Reforms must be ones that enable technological advancement consistent with values that go beyond individual privacy.**

3 **Reform intellectual property law in ways that are sensitive to data and information as building blocks of expression, innovation and communication—and not just as assets to be owned and exploited.**

4 **Develop laws and policies that allow Canadian governments and businesses to retain sufficient control over the data we need to govern ourselves and flourish in a digital economy.**

5 **Set rigorous data security standards for big data and Internet of Things technologies and ensure they are met with a view to providing appropriate levels of protection against economic, social and individual harm.**

6 **Ensure greater transparency and oversight of the algorithms used to process data and influence decision making.**

Teresa Scassa is the Canada Research Chair in Information Law and Policy at the University of Ottawa, Faculty of Law. She is also a senior fellow with the Centre for International Governance Innovation's International Law Research Program and a member of the Waterfront Toronto Digital Strategy Advisory Panel.

For her helpful feedback and comments on an earlier draft, the author would like to thank Bianca Wylie.

PORTABLE BENEFITS:
Protecting People in the New World of Work

In a fast-changing economy characterized by part-time work, gigs, frequent changes of employers and reskilling, Canada should consider creating a nimble benefits and pension system that is tied to the worker rather than the employer and ensures ease of access, portability, coverage and generosity. By Sunil Johal and Wendy Cukier

SUMMARY AND RECOMMENDATIONS

Canadians live and work very differently today than they did 50 years ago. The emerging gig economy and changing business practices are diminishing stable, full-time work and, as a consequence, more workers are finding themselves without adequate pension or benefit coverage. The solution may be to explore a nimbler, targeted model for providing benefits called portable benefits.

To move forward on this key employment issue, more information and analysis are needed on the potential costs and advantages of a portable benefits plan, as well as the impact that such plans would have on under-represented groups. Federal, provincial and territorial governments should, at a minimum:

1. **Conduct detailed analysis of the costs and benefits as well as the feasibility (economic, operational, technological, political, legal) of a portable benefits model**
2. **Consult extensively with stakeholders to understand their diverse interests and needs**
3. **Evaluate existing models of portable benefits, beginning with the Washington State case study referenced within this policy brief**

The traditional, single-earner household supported by stable, full-time income, pension and benefits is increasingly the relic of a bygone era. Temporary and part-time employment have increased steadily in recent decades and the prospect looms of the digital gig economy fuelling a surge in task-based, on-demand forms of work. Even large employers have tended to gut defined benefit plans to cut costs.

The standard employment relationship in the post-war period, when most of Canada's social programs were designed, was characterized by employers that provided retirement income security and extended health benefits. These employer-provided supports are backstopped by universal government programs providing relatively modest benefits such as the Canada Pension Plan, Old Age Security or provincial pharmaceutical programs for low-income residents and seniors.

Yet, this is no longer the reality for many workers in Canada. Non-standard work, such as temporary, part-time, and self-employed positions, has accounted for 60 percent of job growth in advanced economies since the mid-1990s. These positions tend to have far less access to pensions and benefits. In 2011, fewer than a quarter of Ontario workers who engaged in non-standard employment had medical insurance (23%), dental coverage (22.8%), life/disability insurance (17.5%) or an employer pension plan (16.6%). By comparison, three-quarters of workers in standard employment relationships (e.g., full-time, indefinite positions) had access to medical and dental insurance, and more than half had a pension plan.

However, in the 21st century more and more workers are not employed by such companies, which leads them to ask: If I am not able to access sufficient pension and benefit coverage through my own work efforts, and government programs don't cover me either, where should I turn?

Portable benefits may be the logical next step

One notion is starting to gain traction: that of a portable benefits account that workers, employers—and potentially even the government—pay into to increase benefit levels and access in areas such as pharmacare, life insurance, vision care and mental health services. One of the advantages of portable benefits is that it is tied to the employee, not the employer. Not only would portable benefits offer flexibility and advantages for workers, but the broader access that portable benefits would provide might also remove some disincentives to employment reported among marginalized groups. For example, single parents and persons with disabilities on social assistance have reported that a significant "cost" of accepting employment is the loss of government-provided benefits, such as drugs and dental. Portable benefits could significantly reduce this disincentive to employment.

The Province of Ontario recognized the challenge of losing government-provided benefits by offering the Transitional Health Benefit if the recipient is no longer financially eligible for Ontario Disability Support Payment income as a result of employment earnings, paid training or income from self-employment—and if comparable benefits are not provided by the employer. But this is not the case across Canada. Fundamentally, this type of re-alignment of incentives and disincentives between programs and work status is rooted in the notion that it is better for people to be working than collecting social assistance.

From a systems perspective, there is some evidence that expanding access to certain types of benefits—for example mental health services, dental, physiotherapy and other allied health services—can reduce overall health costs by preventing the occurrence or intensification of illnesses that will require more expensive interventions later, or that could result in disability. And many reports suggest that entrepreneurship and small- and medium-sized enterprises are drivers of economic growth, but their inability to provide stable benefits may be an impediment to attracting and retaining the talent they need. Portable benefits could help solve these issues.

Applicable to all employment classifications

A portable benefits approach could offer workers in part-time, temporary and gig roles the opportunity to have some level of coverage for their medical, health and retirement needs without either requiring high levels of public investment or unnecessarily burdening employers with high additional costs for these types of roles—as well as averting other social costs and potentially driving increased entrepreneurship.

Fundamentally, a portable benefits model would remove the question of employment classification from the benefits equation. Whether a worker is engaged in full-time, part-time, temporary or gig employment, they ought to be entitled to benefits. Employers and workers could both be mandated to pay a portion of earnings into a protected, centrally administered account, which could be withdrawn for certain purposes (e.g. upon retirement for gen-

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eral income, for pharmaceutical purchases or health services).

A wide range of options for a portable benefits model

The exact scale and model of the portable benefits account could vary widely. In practice, we are already seeing similar models in certain sectors. For example, in New York City, the Black Car Fund, which has provided worker's compensation benefits for livery and black car drivers since 1999, has recently expanded its mandate to include vision coverage and appointments with doctors for Uber and Lyft drivers.

Canada's 1.7 million workers in the non-profit sector, nearly half of whom are on contract or working part time, may soon be able to participate in a portable retirement savings scheme. Common Wealth is working with Prosper Canada, the Maytree Foundation, Boys and Girls Clubs of Canada and the United Way Greater Toronto to assess interest amongst workers in a plan that would deliver lower fees than mutual funds, portability between jobs, flexible contribution rates and optional employer contributions.

Others have suggested that new platforms creating new opportunities for flexible working arrangements can also provide new types of safety nets for workers. For example, Wonolo is an online platform with an occupational accident insurance mandate. Some have argued that this model should be expanded to provide online platforms that connect people with benefits and coverage suitable to their individual circumstances.

Sectoral approaches are appealing because they are easy to implement among commonly situated workers. However, a more universal approach to portable benefits spearheaded by the federal government would realize far greater cost savings and efficiencies through scale, and by spreading risk amongst a broader pool of workers. A federal approach could also leverage the Canada Pension Plan and Employment Insurance programs operated by Service Canada and Employment and Skills Development Canada.

Another key design consideration, beyond who creates and administers the program, is the scope of the program. The range of benefits used during an initial implementation (whether it be a broad range of benefits or a small selection) would be a significant factor determining the expense and scope of the program. Whether or not the program were

universal would also be an important factor, as a universal program could reduce contribution rates significantly. Including skills-training funds could benefit a broad swath of workers who aren't currently eligible for employment insurance and associated training programs, and may be of particular relevance in a future world of work where people are frequently bouncing between different roles that require upskilling and reskilling.

A RAFT OF QUESTIONS MUST BE ANSWERED

While much discussion has taken place from different perspectives about the potential advantages of portable benefits—and many models have been generated and pilot projects launched—a number of challenges remain to implementing such a program in Canada. At this stage, there seem to be more questions than solutions, and a number of issues have surfaced that warrant further exploration. Some bodies, such as the Aspen Institute, have begun to develop guidelines for potential projects.

Among the questions that have been raised are:

- Who qualifies? How are entitlements accumulated and tracked? Some have suggested the idea of an "hour bank," which would require a minimum number of hours per month but could accumulate (and be verified) across multiple employers. Some models apply to gig workers for specific employers (e.g. Uber) or across specific industries or subscribing to specific platforms. Ideally, the model would be universal and apply to the full range of non-standard workers. Additionally, there are questions about opting in or opting out of a potential program.

- What is covered? Are the benefits selected from a suite of options that can be adapted to the circumstances of an individual—for example, life stage and needs? Are there basic packages with add-ons for additional costs? How would a new model fit with existing programs such as RRSPs, the CPP and EI, and avoid duplication?

- Who pays? How are costs shared among government, employers and beneficiaries? Or are surcharges levied on customers by companies employing gig workers?

- Who manages? How will the relationships be navigated between private service providers, employers, employees and government? How

For more and more workers, the question is: If I am not able to access sufficient pension and benefit coverage through my own work efforts, and government programs don't cover me either, where should I turn?

are different levels of government involved? In the United States, several private sector organizations, social enterprises and unions have moved into the space, creating opportunities for new collaborations and public-private partnerships.

- How can technology be leveraged to provide a platform for tracking and supporting a shared benefits system? There are risks associated with efforts to develop large, centralized platforms, and also with fragmentation across multiple platforms. Work should be done quickly to assess options and ensure there is a coordinated approach that could, analogous to health records, devolve to systems where individuals hold their records with a trusted intermediary to validate, track and verify.

- What are the barriers to implementation? Establishing portable benefits would require significant rethinking of existing labour law. Failing an innovative platform or self-organized blockchain solution, portable benefits would require a certain level of bureaucracy to develop, administer and enforce.

More information is needed to assess the costs and benefits of such an initiative as well as its potential impact on under-represented groups, individually and systemically. Providing mechanisms to enhance health in under-served segments of the population, and remove disincentives to employment and self-employment, would appear to have significant value not just for individuals but also for system-wide outcomes and fiscal concerns. However, given the range of interests and diverse stakeholders, extensive consultation would be required.

A PORTABLE BENEFITS CASE STUDY FROM THE STATE OF WASHINGTON

The U.S. state of Washington introduced a portable benefits bill during the 2017 legislative session, and again during the 2018 session. The bill, which earned public support from Uber, the Service Employees International Union and entrepreneur Rick Hanauer, establishes a portable benefits fund to cover any business that "facilitates the provision of services by workers to consumers seeking services and where the provision of services is taxed under 1099 status." Businesses subject to the law would be required to:

- contribute an amount determined by the state labour department for workers' compensation

- contribute 15 percent of the total fee collected from a consumer transaction for a provided service, or $2 for every hour that the worker provided services to the consumer, whichever is less

- make monthly contributions to the fund

In addition to workers' compensation, the benefit providers could provide a range of other benefit options—determined with worker input—from health insurance, to paid time off, to retirement benefits.

More detailed analysis is needed of the costs and benefits as well as the feasibility (economic, operational, technological, political, legal) of a portable benefits model. Additionally, evaluating existing programs (e.g. the new Washington State project) or developing small-scale evaluations of pilot projects might allow for the concept to be trialed in a low-risk environment to inform intelligent policy and implementation, perhaps supported through social finance. While legislative approaches might be considered, so too might localized "benefits innovation zones" in smaller, self-contained jurisdictions.

Portable benefits approaches could address a range of different challenges associated with the present and future of work. As Canada continues to grapple with the challenges of transitioning into a 21st century digital economy, our approaches to the provision of benefits should also be reconsidered for their ease of access, portability, coverage and generosity.

Sunil Johal is Policy Director at the Mowat Centre, Munk School of Global Affairs and Public Policy at the University of Toronto. He leads the centre's research activities, manages the research team and teaches a variety of executive education courses. He has a broad range of public policy expertise across economic, social, intergovernmental and regulatory fields.

Dr. Wendy Cukier is one of Canada's leading experts in disruptive technologies, innovation processes and diversity, with more than 200 published papers on technology, innovation and management. She is the coauthor of the bestseller "Innovation Nation: Canadian Leadership from Java to Jurassic Park". Wendy serves on a host of boards in the private and non-profit sectors and has helped create and grow several successful startups and social ventures including Flybits, Think2Thing and Growing North. She is the Academic Director of the Diversity Institute at Ted Rogers School of Management, Ryerson University which advances evidence-based strategies for inclusion.

WHAT NEEDS TO CHANGE IN A CHANGING CLIMATE: Managing Risk Requires Decisive Policy and Innovative Technology

Innovative policy, new technology, faster adaptation and ways to build public support are all needed to manage climate-change risks, which will be critically important to Canada for decades to come. By Glen Hodgson

Recent Abacus polling suggests a majority of Canadians understand that climate change is real. They recognize that something must be done to adapt to the new climate reality, provided our standard of living and lifestyles are not severely constrained. However, it should also be noted that a full social consensus on climate change adaptation has not been reached, and policy shifts are likely to occur in response to changes in public opinion.

There has been surprisingly little debate about the current and expected economic costs of climate change. Doing little or nothing to curb emissions has an economic cost, as does failing to encourage adaptation. The public policy debate and related decisions need to recognize those costs and take steps to manage and limit them.

Rising costs are now being felt in two key areas: in dealing with the many effects of increasingly severe weather, such as floods and fires; and in dealing with the effects that extreme weather has on public infrastructure. A third key area of focus in the coming years will be the risk of stranded assets, most notably in sectors and regions that have high greenhouse gas (GHG)-emissions intensity.

SUMMARY AND RECOMMENDATIONS

Climate change is creating a growing array of economic and societal costs and risks, including severe flooding and forest fires, threats to infrastructure, and the risk of stranded assets in oil and gas production and distribution worth many billions of dollars. At the same time, potential opportunities exist in the low-carbon economy as public and private organizations develop innovative, disruptive technologies.

Managing climate change risk will be critically important to Canada and the international community for decades to come, as evidenced by the fact that other jurisdictions are already moving forward with effective regulatory and policy practices. Innovative public policy and technology will be required in Canada to address and manage climate change risks, and to promote faster adaptation without sacrificing robust economic growth.

While we have made a strong start in addressing the consequences of climate change, the Government of Canada needs to focus its policies on completing and implementing key transitions, such as:

- **establish carbon pricing and revenue cycling, as well as complementary smart regulations where pricing requires support**
- **significantly expand public investment in infrastructure to reflect the increased frequency of extreme weather events and their related impacts**
- **enhance regulatory oversight to avoid stranded assets**
- **foster the development and commercialization of technologies that reduce greenhouse gas (GHG) emissions**
- **promote public and private procurement of technologies that reduce GHG emissions without relying on these technologies to meet emissions targets**

Severe weather, floods and fires

One clear consequence of climate change is a steady increase in global losses due to extreme weather events and related impacts—most notably an increase in the frequency and severity of overland floods and forest fires. The Organization for Economic Co-operation and Development report Financial Management of Flood Risk states that annual losses from overland flooding have grown to over US$40 billion annually in recent years; more flood events occurred from 2010 to 2013 than in the whole decade of the 1980s.

Not surprisingly, there has been a dramatic rise in government funding, liabilities and insurance claims due to flood damage and remediation. Canadian government spending on floods and recovery has increased dramatically since 2000, from around $100 million annually to a high of $2 billion in 2013–2014. The Parliamentary Budget Office has projected that natural disaster recovery costs will remain high for the federal government, at a conservative estimate of $900 million annually for the next five years. Nearly $675 million of that cost each year will result from floods alone.

Today, roughly 10 percent of Canadians live in high-risk flood zones. They live in floodplains, urban areas with inadequate storm-water drainage, or in low-lying coastal areas subject to saltwater inundation. However, mapping of flood risk in Canada is inconsistent and mapping information may not be widely available. Many property owners have chosen to live in these areas based on inadequate and incomplete historical information. While mapping is improving with more sophisticated technology, risk mapping and flood-risk information are not managed or distributed under an integrated system.

Extreme instances of wildfires—particularly in British Columbia—have also caught the attention of Canadians. The Province of British Columbia's Wildfire Service estimates that approximately 1.3 million hectares have been affected by wildfires since April 2018—the worst year in the province's history. In 2017, approximately 1.2 million hectares burned, leading to 65,000 displaced people and costing $568 million for fire suppression.

Major threats to infrastructure

A second key source of rising costs from climate change is public infrastructure spending to ensure that buildings, roads and culverts, bridges, dams, levees, sewers and drainage systems can stand up to more extreme weather. Existing infrastructure will require reinforcement, and new projects will need enhanced design and construction to increase their resilience to extreme weather such as torrential rainfall, heavy snowfall, high winds, drought and wild temperature swings that can precipitate events such as ice storms and wildfires.

Direct government financing from federal, provincial, territorial and local governments is generally the first funding option for infrastructure. Yet Canadian governments have systematically underinvested in public infrastructure for decades. The Canada Infrastructure Report Card for 2016 estimates $141 billion as the replacement value for existing assets deemed to be in poor or very poor condition. Funding is now being put in place to close this public infrastructure deficit, and to further expand and enhance public infrastructure to ensure it is adequate to withstand the effects of climate change.

Placing undue faith in the capacity of potential new disruptive technologies to redress climate change and mitigate related damage may undermine the political will needed to take near-term action.

Newly built and retrofitted infrastructure can also help reduce future GHG emissions by using low- or lower-carbon energy sources, and by making design and operational choices that help minimize emissions. Expansion of public transit powered by low-carbon electricity—buses, streetcars, light rail, intercity rail—is an obvious example of enhanced low-carbon infrastructure investment.

Growing risk of stranded assets

A third area of impact in the coming years will be the risk of stranded assets and unproductive investments that could undermine confidence in Canada's financial system and institutions. The ground is shifting on what public and private investors regard as a sustainable investment and, as a result, regulatory and market oversight is being examined in detail.

For example, much recent international discussion has taken place on the increased transparency and disclosure needed to help identify, mitigate and manage firm-level climate change risk, and possible systemic financial risk. The G20's Financial Stability Board created the Task Force on Climate-Related Financial Disclosures in 2015. The task force provided detailed recommendations in December 2016 on four areas for action to improve climate-related reporting for firms across many sectors:

1. **Governance:** Disclose the organization's governance around climate-related risk and opportunities.
2. **Strategy:** Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy and financial planning.
3. **Risk management:** Disclose how the organization identifies, assesses and manages climate-related risks.
4. **Metrics and targets:** Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities.

Enhanced disclosure of climate-related risks and opportunities would enable investors to make more informed decisions about a firm's potential for long-term business success. The four areas of action would apply most directly to publicly traded firms but could also help inform business decision

making in privately held firms.

The Government of Canada created the Expert Panel on Sustainable Finance to explore the role of the financial sector in supporting the clean growth agenda in Canada; in particular, by identifying opportunities for integrating environmental, social and governance criteria into business and investment decisions. Defining Canadian policy on standards for business transparency is particularly important for financial institutions that provide the capital for energy development. It is also important for firms with significant assets and processes that have high GHG emission intensity, such as those in the energy sector, key energy services like energy transmission, and sectors like petrochemicals and cement.

Other jurisdictions are moving forward

The Bank of England, which regulates the dominant global debt market in the City of London, has been active in advancing the work of the Financial Stability Board task force. The European Union adopted a package of measures in May 2018, implementing several key actions on sustainable finance. The EU package includes:

- a regulatory framework to gradually create a unified classification system on what is considered an environmentally sustainable economic activity
- regulations on disclosure obligations for how institutional investors and asset managers integrate environmental, social and governance factors in their risk and investment decision-making processes
- amended regulations on low carbon and positive carbon impact benchmarks, which provide investors with better information on the carbon footprint of their investment

$2 BILLION

Canadian government spending on floods and recovery has increased dramatically since 2000, from around $100 million annually to a high of $2 billion in 2013–2014. The Parliamentary Budget Office has projected that natural disaster recovery costs will remain high for the federal government, at a conservative estimate of $900 million annually for the next five years. Nearly $675 million of that cost each year will result from floods alone.

Regulatory and policy practices in financial market segments also have an impact on the capacity of Canadian financial markets to adapt to climate change. For example, investment portfolio regulations, guidelines and practices across the investment industry and within firms could promote or inhibit the diversification of investment assets toward lower-carbon activities.

Canada must leverage conventional and disruptive technologies

What specific role could be played by the development and procurement of conventional and disruptive technologies in managing climate change risk? Recent research by the Canadian Academy of Engineering, presented in the Trottier Energy Futures Project, indicates that the wide deployment of existing and known emerging technologies could allow Canada to achieve its commitments under the Paris Agreement. This deployment will require massive private investment over the coming decades—estimated by the Conference Board of Canada at $2 trillion or more. Profound changes will be required to how we produce and consume energy, guided by policies that encourage individuals, businesses and governments to actually purchase and use these technologies.

The following are some examples of disruptive technologies that could help manage climate change risk and accelerate low-carbon transition:

- Enhanced remote mapping information technology would improve management of extreme weather risk and aid community development planning. It could also promote better access to private insurance coverage for extreme weather events, notably floods.

- Disruptive information technology and the use of artificial intelligence could enhance financial sector risk analysis and management, reducing the risk of stranded assets.

- Advances in decarbonization technology could reduce carbon from conventional energy production, from energy consumption and even from the atmosphere.

- Technology is being explored to convert stored carbon into economically useful products.

- Electric and automated vehicles could help reduce transportation emissions, although widespread viability is still a work in progress.

While disruptive technologies may indeed play an important role in addressing climate change, they are not a panacea. There may be limits to their use. For example, it will be challenging to use disruptive technology to achieve significant GHG emission reductions in freight transport, according to recent Conference Board of Canada research.

Disruptive technology can also be a double-edged sword. It often creates economic and social losers as well as winners; for example, consider the impact of ride-hailing mobile applications like Uber and Lyft. The net impact of technological disruption on society is not always obviously positive. Regulatory frameworks will need to evolve quickly if the greatest benefits are to be captured from disruptive technology and adjustment costs minimized.

In addition, placing undue faith in the capacity of potential new disruptive technologies to redress climate change and mitigate related damage may undermine the political will needed to take near-term action based on current knowledge.

Canadian policy has made a strong start

A combination of creative public policy and technological innovation will be needed to address the consequences of climate change and promote the transition toward a lower carbon economy. Transition policies that have begun include the following:

- **Pricing carbon and recycling revenue.** The Ecofiscal Commission (of which the author is a member) has suggested pricing carbon initially at a modest level, such as $20 a tonne, and increasing the price steadily over time. There is no consensus among economists on the optimal or desired price for carbon; in our view, a target price of $75 to $100 a tonne would provide a clear signal to consumers and businesses to modify their behaviour, reduce carbon emissions and avoid paying the carbon price. There are many options for recycling revenue from carbon pricing, but returning the revenue to taxpayers as a dividend may help build wider public support.

- **Using complementary smart regulations in areas where prices alone will not produce significant change.** For example, GHG emissions from methane, or from the agricultural sector, may be technically and practically difficult to price. Well-designed regulations may be more effective in achieving reductions in these areas.

- **Encouraging public investment in more robust infrastructure**, as discussed earlier.

- **Enhancing financial regulatory oversight to avoid stranded assets.**

- **Fostering the development of technologies that reduce GHG emissions and help manage climate risk.**

- **Developing policies to promote public and private procurement in these technologies, and their sale internationally.**

A good start has been made in implementing many of these structural policies, but there is much more to do. As noted earlier, a significant minority of Canadians remain unconvinced of the reality and negative impacts of climate change. As the policy framework advances, finding ways to build public support will be as important as the measures themselves.

NEXT STEPS

Public policy today aimed at addressing the consequences of climate change and promoting the transition toward a lower carbon economy should focus on completing and implementing the transition policies outlined above and acting based on current knowledge and technologies.

While disruptive technologies can make an important contribution to the transition, relying excessively on "discovery" may deflect from taking necessary near-term actions that can reduce adjustment costs and generate foreseeable payoffs. Ongoing and enhanced investment in promising areas of disruptive technologies should be pursued, but only as a complement to the framework of other efforts.

Glen Hodgson is an economist and author who brings deep pools of knowledge of economic policy and growth related to recent work on energy and climate policy. He has accumulated 35 years of experience in global and Canadian macro-economics, international trade and finance, fiscal and tax policy, and other "big picture" topics.

FIX THE GRID: How Canada can Integrate Its Electricity Systems for a Clean, Prosperous Future

While some provinces feast on clean power and export excess to the United States, others face electricity famine. A Canada Clean Power Fund could knit together a national grid to create a competitive advantage in the low-carbon future. By Brian Topp

Canada is a world leader in clean electricity, with two-thirds of production coming from renewables and roughly 80 percent from emissions-free sources of one type or another. About 11 percent is exported over 34 major intercontinental transmission lines, according to Natural Resources Canada.

The exports originate in British Columbia, Manitoba and Quebec, three of Canada's "have" provinces in the electricity sector, which control some 65,000 megawatts of hydroelectric power. They are pursuing plans to substantially increase their capacity—for example, through B.C. Hydro's recently approved Site C Clean Energy Project. These provinces are pursuing the short-to-medium term financial benefits of selling into the American market.

Unfortunately, this practice diverts power from the domestic market and builds yet more economic dependence on the United States. Current proposals to develop five new international power lines would further reinforce this long-term vulnerability, including HydroQuebec's Northern Pass transmission line project, transmission lines associated with the New England Clean Energy Connect project, and plans to build a transmission

SUMMARY AND RECOMMENDATIONS

Canada's present and future economic success increasingly depends on access to affordable, clean, reliable electricity delivered at the lowest and most sustainable price. Dependable access to clean electricity provides a tremendous competitive advantage in a world of carbon reduction (think: the emergence of electric vehicles). However, certain historical patterns and recent developments in how we create and distribute electricity in Canada stand in the way of this country reaching its potential.

Canada's electricity story is one of feast coexisting with famine in which a patchwork of systems improvised over time has created highly disparate outcomes for the provinces. Provinces have each attempted to be self-sufficient, creating "haves" and "have-nots" in electricity generation—the "haves" being able to access affordable, relatively clean electricity such as hydroelectric power, and the "have-nots" requiring costly, polluting projects to meet public need.

There is little inter-provincial trade in electricity to take advantage of each province's relative strengths and weaknesses in production, and no national strategy in this area of provincial jurisdiction. One result has been that the "haves" are pursuing the short-to-medium term financial benefits of selling into the American market, which diverts power from the domestic market and increases Canada's economic dependence on the United States.

Canada's clean energy surpluses should be diverted into the domestic Canadian market. And, to the extent that Canadian federalism permits, a unified national grid—called the Canada Clean Power Fund—should be woven together to pool access. A pan-Canadian approach to electricity distribution provides an opportunity to turn export vulnerability into domestic competitive advantage.

line between Quebec and New York City. Instead of increasing our U.S. dependence, that surplus electricity could be used domestically to attract investment to energy-intensive industries. In Canada, Quebec's feast of inexpensive electricity has attracted the energy-intensive aluminum industry and, more recently, the new 67-kilometre electrical light rail system under construction in Montreal. And there are many similar opportunities arising. In the new economy, the so-called "cloud" requires large quantities of dependable electricity.

As demonstrated by the fraught negotiations leading to the United States Mexico Canada Agreement—and by Canada being deemed a national security threat by the Government of the United States—it is arguably in Canada's long-term best interest to reduce its exposure to our American friends and partners where possible. Canada's "have-not" provinces, meanwhile, seek to fulfill peak loads totaling about 43,000 megawatts combined. They achieve this by turning to costly or polluting solutions for generating electricity.

- Alberta derives 65 percent of its electricity from coal generation, a carbon-intensive dependence it aims to reduce to zero by 2030. The province's consumption peaks at around 12,000 megawatts.

- Saskatchewan derives 50 percent of its electricity from coal and an additional 34 percent from natural gas. Its peak load is around 3,800 megawatts.

- Ontario derives 63 percent of its electricity from nuclear power—much of it from generators near the end of their service life. Peak demand in Ontario in 2017 was slightly less than 22,000 megawatts. Ontario is pursuing a $25 billion refurbishment to extend the service life of its existing nuclear fleet by 25 to 30 years, which means the province will need to begin planning and preparing for a permanent solution within a decade.

- Nova Scotia derives 42 percent of its electricity from coal. Peak demand is around 2,200 megawatts.

- New Brunswick derives 40 percent of its electricity from fossil fuels (natural gas, coal and petroleum) and 30 percent from nuclear. Peak demand is around 3,000 megawatts.

- Prince Edward Island imports the bulk of its electricity from New Brunswick.

WHY THE PROVINCES DON'T POOL

The geography of Canada's low-carbon renewable hydro power is both curious and convenient in that what one province lacks, its neighbours have in abundance. British Columbia has clean electricity that Alberta needs; Manitoba has it and Saskatchewan and Ontario need it; Quebec has it and, again, Ontario and New Brunswick need it; Newfoundland and Labrador has it and the Maritimes need it. With continued advances in the efficiency of electricity transmission, these proximities provide a strong base off which to operate.

In its interventions in the electrical grid to date, the federal government has focused on the poverty of the east-west grid, and the need for much greater transmission capacity between Canadian jurisdictions. These initiatives have been politely received, in part because free federal money is always welcome. But no province is currently contemplating a

59.1%

of Canada's electricity comes from hydro generation, but there is wide disparity among provinces:

Manitoba	97.0%
Quebec	95.3%
Newfoundland and Labrador	94.3%
Yukon	93.7%
British Columbia	89.4%
Northwest Territories	37.4%
Ontario	22.3%
New Brunswick	21.5%
Saskatchewan	13.3%
Nova Scotia	8.7%
Alberta	2.8%

Source: Natural Resources Canada

move away from provincial self-sufficiency.

Why? Here are some of the arguments often put forward by government officials and industry experts for maintaining provincial self-sufficiency.

Economic development

Provincial governments want to keep economic stimulus and job creation opportunities in the province. The large construction and capital budgets involved in major power development can be used as counter-cyclical economic development tools, and to generate politically popular job creation. Buy-local and community-benefits policies can also be used to spread the economic benefits of development more widely through the provincial economy. These benefits could all fall to "have" provinces in a poorly designed, nationally pooled system.

Capital retention

Provincial self-sufficiency means that gross billings for electricity remain in the provincial economy and, in provinces with public power systems, net profits go to the provincial treasury. A pooled system with no national role would tilt gross and net revenue to the four "have" provinces—a very large transfer of wealth and economic opportunity.

Defending incumbents and invested capital

All provinces have incumbent power providers, who have placed 20- to 100-year bets on the stability and predictability of the regulatory regime and the competitive environment in each province. A shake-up in Canada's electricity system, in particular the large-scale entry of B.C. Hydro, Manitoba Hydro, Hydro Quebec and a newly powerful New-

EYES ON EXPORTS

As spelled out in their strategic plans, British Columbia, Manitoba, Quebec, and Newfoundland and Labrador aim to produce a larger net return to their provincial governments by expanding export sales to the United States.

- **B.C. Hydro** is relatively circumspect about export plans, since its generation expansions are controversial in the province and are most easily defended as designed to meet domestic requirements. But the province is tightly integrated into the Pacific Northwest electricity market. It has periodically investigated export opportunities to Alberta, but these have not come to material fruition, despite Alberta's current transition away from coal.
- **Hydro Quebec** is aiming to double its gross revenue by 2030 by expanding export opportunities, and through out-of-province acquisitions.
- **Manitoba Hydro** derives 25 percent of its total electric revenue from export sales and is aiming to expand this.
- **Newfoundland and Labrador**, meanwhile, is in its own category as a "have" province. It is the site of some 7,600 megawatts of power generation—the overwhelming majority (5,400 megawatts) generated at Churchill Falls but controlled by Hydro Quebec. Runaway costs notwithstanding, a development at Muskrat Falls will add 824 megawatts by the end of 2020, this time under Newfoundland and Labrador's control. The surplus electricity produced at Muskrat Falls has been identified as an opportunity to export power. The province consumes less than 1,600 megawatts of electricity domestically a year, and so will proportionately be the largest clean power exporter in Canada when it reclaims control of its resources. Its contract with Hydro Quebec expires in 23 years, which is relatively soon in the timescale of power development.

foundland and Labrador Hydro into other provincial power markets, could potentially result in the downgrading of debt, a flight of equity capital and, potentially, a stranding of capital in the provinces' uncompetitive incumbent power plants. Many generators might not survive the experience, leading to a greater concentration of the industry.

Lack of trust

Finally, there is the question of trust. As a good deal of public opinion research demonstrates, Canadians generally prefer publicly owned power utilities because they believe that given a choice between the public interest or narrow financial interest, publicly owned utilities will put citizens first. Provincially owned or regulated power utilities, however, owe this duty of public interest only to the citizens in their own jurisdictions. As recent history demonstrates, provinces do not feel a duty of public interest to each other. Here are three examples of that missing confidence getting in the way of inter-provincial cooperation:

- **Churchill Falls**: History shows that Newfoundland Premier Joey Smallwood was most ill-advised to sign the Churchill Falls agreements with Hydro Quebec. These agreements price Newfoundland power for a fraction of its worth and provide Hydro Quebec with an ocean of virtually free electricity it can export to the United States. All legal challenges to these agreements have failed and no attempt at moral suasion, keeping in mind that Newfoundland is one of Canada's poorer provinces, has altered the terms of these agreements. The two lessons of these events are not lost on other provinces: a provincially owned or regulated power utility will attend to the public interest only in its

own jurisdiction; and it is exceptionally hard to correctly predict appropriate prices and rules in a very long-term agreement, in this case a 65-year contract.

- **Saskatchewan and Manitoba**: In the 1990s, Saskatchewan Premier Roy Romanow made the following offer to the Government of Manitoba: He proposed that Manitoba give Saskatchewan its provincially owned telephone utility, in return for which Saskatchewan would give Manitoba its provincial power utility. The result would be that both utilities would serve both provinces. Manitobans would get better and cheaper phone service—Sasktel being a first-class utility—and the people of Saskatchewan would enjoy the benefits of stable, inexpensive and clean hydroelectricity, ridding the province of its dependence on brown coal. In summary, the Government of Manitoba thanked Mr. Romanow for this good idea but said they had a better one, and then they privatized their phone company. In a trade-off between a quick local win and a long-term economic benefit for the country, the local win prevailed, as it often does.

- **British Columbia and Alberta**: Alberta is currently implementing a policy to replace 65 percent of its power generation with clean power. The province has a strategic need to reduce greenhouse gas emissions associated with oil sands production. British Columbia, its western neighbor, has abundant and scaleable hydroelectric resources. But co-operation between these two provinces has been fatally poisoned by 10 years of pipeline disputes between the governments of B.C. and Alberta across the political spectrum, in addition to the self-sufficiency considerations set out above.

THE SOLUTION: A CANADA CLEAN POWER FUND

For all these reasons—economic development, capital retention, incumbents and trust—it is unlikely, absent the introduction of a strong incentive, that Canada's provincial governments will collaborate to create a pooled national grid anytime soon. Progress could be made by introducing a new national player that has a public interest mandate and is sensitive to the economic and fiscal pressures at play, and prepared to partner with incumbents to give them an opportunity to evolve into useful components of a more integrated national system. A new national player (not necessarily the federal government) could enter into a more positive relationship with provincial actors than provinces often have with each other.

The Government of Canada should consider authoring the establishment of a publicly owned, national Canada Clean Power Fund with a mandate to partner with willing parties to address the many challenges. The fund should be given a broad mandate to connect Canada's clean power grid together where it finds willing provincial partners or open, regulated markets in which it can participate. Led by an expert board and team with strong knowledge of, and relationships with, the players in Canada's electricity system, the purpose of the Canada Clean Power Fund would be to identify and invest in opportunities to connect provincial electricity systems.

Some transactions, such as funding the construction of inter-provincial electricity transmission ties, would likely be straight public infrastructure investments without an intended return of capital. Others—for example, providing risk capital for the con-

struction and commercialization of low-emission power generation—could be designed to look for returns similar to what investors can expect from investments in regulated industries. Some transactions—for example, when the Clean Power Fund acts as a broker between provinces to facilitate power sales—would be political acts, fundamentally. They would be attempts to supply a trusted third party to facilitate the blindingly obvious benefits of inter-provincial electricity sales between provincial players that cannot trust each other with their economic futures because their public and private power generators are accountable to the legislature of only one province.

Well-capitalized and aggressively led, a Canada Clean Power Fund could focus on three contributions with the objective of creating a clean national electricity grid.

1 TRANSMISSION

The Canada Clean Power Fund could capitalize and drive the construction of a robust east-west power grid, and then either operate it in the public interest, or spin it off to regulated private operators. Mercantile considerations could not apply in this work. Like the rail system a hundred years ago, geography wants the electricity system to flow north-south. Similar to the creation of Canada itself, the creation of this grid would require an act of political will and vision for long-term economic benefits that only governments can finance. It would be a foundation stone of a modern, digital economy fueled by electricity for the next century or more.

Notably, the Government of Canada is already considering some of these issues from a regional perspective, focusing on Atlantic Canada and western Canada.

Transmission investments should be twinned with a careful review of Canada's national interest in any further expansion of north-south interties (interconnections permitting the passage of current between electric utilities).

2 SURPLUS DIVERSION AND DOMESTIC POOLING

The Canada Clean Power Fund could provide "have" provinces with an alternative market to the United States by reselling electricity to "have-not" provinces, with appropriate revenue recycling arrangements to mitigate wealth transfer issues. Again, mercantile considerations would need to be set aside. Under this proposal the federal government would need to make clear it is not seeking new revenue streams; breaking even while developing the national economy would need to suffice. Revenues would be appropriately recycled to the jurisdictions where they were raised, akin to the federal backstop to the carbon levy.

As Canada's electricity system is woven together, a strong and flexible data-sharing hub will enhance electricity producers' abilities to meet needs, forecast requirements, plan and manage storage, and appropriately price electricity. Much of this work could be assisted by advanced artificial intelligence (AI) technology. Provinces are currently developing these tools independently. A common, widely adopted platform could be integrated over time to form a national IT and AI backbone for Canada's electricity system. If a national IT system is not practically or politically viable, at minimum

Without a strong incentive, it is unlikely that Canada's provincial governments will collaborate to create a pooled national grid anytime soon. A well-capitalized and aggressively led Canada Clean Power Fund could focus on three contributions with the objective of creating a clean national electricity grid. Transmission, surplus diversion and domestic pooling, and new clean capacity

attention should be given to ensuring interoperable IT and AI infrastructure for electricity across Canada.

3 NEW CLEAN CAPACITY

In regulated markets open to new entrants, a new Canada Clean Power Fund could partner with incumbents or other players to capitalize renewable and clean generation, where appropriate. For example, several hydroelectric opportunities await capitalization and an electricity buyer in Alberta. The governments of Canada and some provinces, including New Brunswick, have **studied the feasibility of zero-emissions small-scale reactors**. Of course, all new energy developments come with environmental challenges, including the impacts that hydroelectricity can have on local ecosystems and populations. But these are no different if a development is slated for domestic or foreign consumption.

In all of these initiatives, the Canada Clean Power Fund would need willing provincial partners, since electricity systems are run and governed provincially. Patience will therefore be required. Progress would be incremental—likely first through one or more regional grids, which could be combined into a national grid (including an advanced and intelligent IT dispatching spine) over time.

Risks would need to be managed, and trust built, perhaps aided by governance structure. What happens, for instance, in periods of energy shortage? Would the "have-not" provinces make themselves vulnerable in a manner that would be politically unacceptable? We already deal today with crisis management situations and, whether energy is being exported to the U.S. or another province, mechanisms exist for assigning this risk. As for fundamental supply issues, these tend to be more theoretical than real. In any case, they would have to be carefully managed through long-term supply agreements back-stopped by the federal government. It is worth noting that to mitigate oil shortage fears, the Canada-U.S. Free Trade Agreement introduced a proportionality clause. It stipulated

that the percentage of supplies exported before a shortage would be required to continue in the aftermath of a shortage.

Moreover, how would new developments be squared with Indigenous rights and reconciliation? Again, these issues are no different if the project's output is slated for domestic or foreign consumption. Perhaps more to the point, the Federal Court of Canada's judgment quashing the approval of the Trans-Mountain pipeline expansion provides a roadmap to what constitutes appropriate consultation in the case of energy and infrastructure projects. Governance and ownership structures and the inclusion of community benefits in development agreements could also form part of an answer. The recent purchase of the port of Churchill and the rail line includes an ownership position for all First Nations in the region.

CONCLUSION

A pan-Canadian approach to electricity distribution provides an opportunity to turn Canada's export vulnerability into domestic competitive advantage. Our future digital economy looks like it lives on the cloud—but it will also be a physical infrastructure, a construction of computers, switches, mass storage and transmission that will require telecommunications and electricity systems of unprecedented efficiency, resiliency and scale delivered at the most economical price possible. It is hard to imagine that we will be powering our digital future with coal generation. The realities of climate change will drive Canada to the cleanest possible power in the years and decades to come. So we would be wise to consider now what kind of electricity system we want, and how we can capture the best possible economies from the cleanest possible generation. There is very little evidence that this will happen consistently across Canada by itself.

Some will argue that such a direct intervention into the electricity system would be an over-reach in this era of diminished expectations for government. Would it be more efficient for provinces to simply deal with each other? Considering the results to date, this seems unlikely. Perhaps the Churchill Falls agreement between Quebec and Newfoundland would not have remained in its current form had the federal government been the bridge between these actors. Perhaps Alberta will someday consider clean hydroelectricity from British Columbia, were it on offer from some party other than the Government of B.C.

The federal-provincial issues of establishing a Canada Clean Power Fund would not be small; the blander and more technical a launch, the better. But this proposal at least highlights the serious issues Canada's electricity system faces—issues that go well beyond technical access to east-west interties. They merit a careful strategic review.

Canada might not be wise to continue to increase its economic dependence on the United States—the likely consequence of growing electricity exports to the south instead of east-west. And access to affordable, clean, reliable electricity is central to the country's economic future. Electricity is the string that ties the pearls of Canada's future clean power and digital economy together.

Brian Topp is a political strategist, writer and former union leader who most recently served as chief of staff to Alberta Premier Rachel Notley. He also directed her transition team when she took office in 2015. Brian has long been involved in both the provincial and national political arenas. He was Director of Research for Saskatchewan's executive council before becoming former premier Roy Romanow's deputy chief of staff. He was also the federal New Democratic Party's national campaign director in 2006 and 2008 and, following the death of Jack Layton in 2012, he ran for the party leadership. An avid writer, Brian has published extensively on Canadian policy issues. He was director of the Broadbent Institute until 2015 where he now serves as a board member and currently works as a partner in Kool, Topp and Guy, a strategic consulting firm. Brian is a Fellow of the Public Policy Forum. Brian has written this proposal solely on his own behalf; it does not represent the views or interests of any other individual or organization.

LET'S GET 'SKILLS SECURE':
Closing the Gaps in Canada's Lifelong Education System

Canada's labour market will not have the skilled workers it needs unless we change the way we train workers today. As automation spurs rapid change, Canada needs to change its approach to education, training and skills development in order to close the skills gap. By Lori Turnbull

Research by global management consulting firm McKinsey indicates that 45 percent of what we're paid to do could be automated in the coming decades, and 60 percent of all occupations could see 30 percent or more of their activities automated. While opinions vary on the proportion of jobs that are likely to be destroyed, created or changed, there is little doubt disruption is coming. A report by the Government of Canada's Advisory Council on Economic Growth states that, by 2030, automation could threaten more than 10 percent of Canadian jobs. Workers need to build new skill sets to be competitive and meet the needs of the changing labour market.

A report co-authored by accounting firm Deloitte and the Human Resources Professionals Association paints a starker picture: it estimates that 35 to 42 percent of Canadian jobs could be threatened by automation. Low-skill and low-paying jobs are not the only ones vulnerable; machines can also drive trucks, build cars, read x-rays, diagnose cancer, investigate crime and crunch data with much more accuracy and precision than humans. Despite the current preoccupation with coding, even computer scientists are not immune to displacement.

SUMMARY AND RECOMMENDATIONS

Labour markets in Canada and around the world are being disrupted by the gig economy and the corresponding need for diverse and shifting skill sets, as well as by artificial intelligence and technological developments. Jobs of the future will demand skill sets and competencies that we cannot yet anticipate; at the same time, many skills that have made individuals competitive in the past will become automated.

Canada's labour market will not have the skilled workers it needs unless we change the way we train workers today. Michael Wernick, Clerk of the Privy Council, has spoken about the importance of creating the right "mix of skills" in the public service; it is a top priority of his to "raise the capabilities" of the federal workforce. If the skills gap is to close, cultural and attitudinal changes will be necessary to support the implementation of a new approach to adult learning and skills development. To prepare Canadians in all sectors for the future, governments should take the following actions:

- **develop a comprehensive national platform that improves the flow of information between employers and job seekers**
- **build partnerships with employers and post-secondary institutions to identify labour market needs and ensure educational programs are aligned with those needs**
- **harmonize employment and income supports with skills and employment services to provide appropriate incentives for upskilling**
- **use incentive structures to promote innovation in post-secondary systems**
- **emphasize training and competency building in the kinds of capabilities that are not transferable to robots**
- **use evidence-based approaches in working toward skills security, recognizing the important role of arts and social sciences as well as science-based disciplines**

In the short to medium term at least, the effects and implications of automation will vary by community and region in Canada, straining the ties that bind our federation. Smaller communities that depend on resource extraction such as mining, agriculture and forestry may be heavily affected. These industries are concentrated in the Prairie provinces, southwestern Ontario and southern Quebec. A place like Fort McMurray, Alta.—once an economic engine for the country and job mecca for Canadians—may be deeply transformed by automation and machine learning. As the trend towards automation increases, "artificial intelligence creep" will become more pervasive and affect a broader and more diverse range of occupations. As these developments continue, we have a responsibility to consider how increased automation could affect segments of the population already under-represented in the labour market, including Indigenous people and persons with disabilities.

Canada should cultivate the labour force of the future

Currently, Canada's labour market and skills ecosystem is not up to the task ahead. Traditional linear pathways through formal education no longer guarantee success. Post-secondary institutions, including both colleges and universities, are at great risk of disruption partly because, historically, they have been highly resistant to change. That said, many institutions have made enduring and meaningful changes to how they recruit and respond to students, deliver content, and build and recognize skills and competencies. We need to build on this capacity and momentum for innovation by taking larger steps toward reforming our education system so it more closely responds to employer needs. For example, as employers such as Shopify focus more on competencies than degrees, educational institutions are being pushed to offer alternatives to more traditional modes of teaching and learning. For example, Northeastern University's Toronto campus

A BIG ASK

Canadians are being asked to abandon the notion of job security as they have always known it in favour of "skills security," and that's a big ask. Instead of grooming employees who are responsive to their employers and to their specific job descriptions, Canadians are being asked to be more versatile.

As employers such as Shopify focus more on competencies than degrees, educational institutions are being pushed to offer alternatives to more traditional modes of teaching and learning.

is responding to this push by offering specialized Master of Science programs in Regulatory Affairs, Project Management and Cybersecurity.

To maximize the effectiveness of new approaches, Canadians need to know about, and have easy access to, education, training and skills development—as well as to employment opportunities that match their unique and upgraded skills.

RECOMMENDATIONS

To close the skills gap and prepare Canadians for the future, Canada needs to reposition its approach to education, training and skills development in the following ways:

1 **We must develop a comprehensive national platform that links employers and job seekers.**

The Magnet-Orbis partnership is an example of how this could be done; these companies are working together to build a network that would connect employers and students.

2 **Governments should build partnerships with employers and post-secondary institutions to identify labour market needs and ensure that educational programs and products are aligned to those needs.**

This partnership won't come for free. To put a number on it, the Advisory Council on Economic Growth estimates that investments of $15 billion per year in adult skills development will be necessary to meet the demands of the shifting labour market.

3 **Canada should harmonize employment and income supports with skills and employment services to provide appropriate incentives and supports for upskilling, particularly for those furthest from the job market—persons on social assistance, those with disabilities, newcomers and persons in low-employment regions. This will help such people navigate and access opportunities.**

4 **Governments should consider using incentive structures to promote innovation in post-secondary systems and to develop new intermediaries that will encourage collaboration, sharing, competency-based modular approaches, alternative pathways, technology-enabled testing and learning, and new forms of credentials and outcomes tied to**

employability.

Granting councils, provincial ministries, employers, accreditation bodies and new forms of competition can all help drive change while collaborating with universities and colleges to build a modular curriculum that increases opportunities for online learning. This will enable Canadians to simultaneously learn and work, increasing their opportunities to earn certificates quickly—in addition to taking courses and earning degrees over longer periods.

This is not to suggest that universities are not investing in these approaches already. But their emphasis today is on delivering degree programs on campus with the expectation that students will leave a university with letters after their name. Universities could shift their priorities to devote more attention and resources to lifelong learning, with educational products to match the shifting needs of the labour market. Through federal granting agencies, such as the Social Sciences and Humanities Research Council and the Natural Sciences and Engineering Research Council, as well as the Government of Canada's new Innovation Superclusters Initiative, government can work effectively with universities and colleges to set priorities and develop work plans.

5 Governments should emphasize training and competency building in the kinds of capabilities that are not transferable to robots.

Specifically, federal, provincial and territorial governments need to build capacity across the board in human competencies such as communication, collaboration, empathy, inclusion, reconciliation, ethical leadership and strategic planning. These competencies are not easily replicated by robots, given the need for discretion, human intelligence and judgment. These skills are also applicable across disciplines and workplaces.

6 Governments should work toward "skills security" by embracing evidence-based approaches and by finding ways to become more innovative and responsive to change. They should track and respond to employment outcome data and labour market information, recognizing that science, technology, engineering and math disciplines are foundational to skills security.

Working toward 'skills security'

Though no job is immune from the effects of automation, not every job will be completely transformed. Some Canadians will work in secure, salaried positions for the same employer for decades, but an increasing number will not. Canadians are being asked to abandon the notion of job security as they have always known it in favour of "skills security," and that's a big ask. Instead of grooming employees who are responsive to their employers and to their specific job descriptions, Canadians are being asked to be more versatile. As the Government of Canada's Advisory Council on Economic Growth points out, this will require substantial collaboration among employers, governments, universities, community organizations, service providers and workers.

Lori Turnbull is an Associate Professor at Dalhousie University and a PPF Fellow. She focuses her research on Canadian political institutions, democratic reform and the Senate expense scandal. Prof. Turnbull's work has been published in the Canadian Public Administration journal, the Canadian Political Science Review, the Journal of Parliamentary and Political Law and How Ottawa Spends. In 2011, she co-wrote Democratizing the Constitution with Peter Aucoin and Mark Jarvis, a book that won the 2011 Donner Prize and the 2012 Donald Smiley Prize.

SKILLS AT SPEED: Why Canada's Public Service Should Grow Its Interchange Program to Build Skills and Networks

The public sector should expand its interchange program with the private sector in order to diversify its employees' networks and skill sets and, in so doing, help the public service face employment challenges and disruptive technologies. By Lori Turnbull

The public service is at present too insular and isolated from the rest of the economy and from labour markets. This prevents well-educated, smart, dedicated, ambitious public servants from acquiring and developing critical skills, such as strategic thinking and planning, tactical management (in particular, project management), and subject-matter expertise.

There are ways for the public service to harness the benefits of the new economy and maximize opportunities for public servants to build new skills and networks. Michael Wernick, Clerk of the Privy Council, has spoken publicly about his intention to build the skills capacity of the public service. Wernick's position stems from a widely acknowledged need for skills renewal in the public sector as well as in the private sector. Public servants need to acquire up-to-date competencies in the areas of data analytics, cybersecurity, infrastructure planning, ethics and privacy, and other sectors that are proving essential to navigating future

SUMMARY AND RECOMMENDATIONS

As the labour market shifts from full-time work toward short-term and part-time contracts, workers and organizations are experiencing benefits and drawbacks. While many individuals worry about a lack of job security, others appreciate the flexibility and opportunity that "gig" work provides.

Employment in the public service and gig work are at opposite ends of a spectrum: the public service offers job security and a sense of vocation, while the gig economy offers flexibility and opportunity. Job security within the government is seen to be integral to the specific role that the public service plays within Canada's Westminster system and its capacity to speak truth to power regardless of political realities and government transitions. However, government employment is also seen as rigid, hard to penetrate, hard to leave, regimented; this is the price public servants pay for protected, secure employment. The private sector, meanwhile, falls somewhere in the middle: formal employment contracts exist, but people move freely between jobs. Private sector employment is less risky than the gig economy and provides some opportunities for self-reinvention.

The public sector should strike a balance between these extremes by creating a bridge to the private sector that encourages interchange experiences among employees. Such experiences could diversify public service employees' networks and skill sets and, in so doing, help equip the public service for the employment challenges that lie ahead.

To this end, the federal government should more actively promote and encourage regular use of Interchange Canada, a program of the Treasury Board of Canada Secretariat (TBS) that facilitates exchanges in and out of the public service. Specifically, government should:

- **expand the use of Interchange Canada by creating the administrative infrastructure and financial incentives needed for significant uptake of the program**
- **require TBS to work with interchange partners to develop a competency-based approach to interchange arrangements**
- **advertise targeted interchange assignment opportunities on the Canada-wide online Interchange database**
- **focus on securing interchange arrangements for a critical mass of public servants in key sectors, including artificial intelligence, big data and disruptive technologies**

challenges.

To limit the vulnerability of the public service in a rapidly changing world, the individuals within it need to acquire these increasingly in-demand competencies. Though the public sector values and normalizes lifelong, full-time employment, as a workplace it can and should be more inclusive of short-term placements that promote skills diversity and network-building.

The Government of Canada has a role to play

TBS administers a program called Interchange Canada, designed to facilitate temporary work assignments in and out of the Core Public Administration. The primary goals of the program are to enhance knowledge transfer, network building and professional development for public servants and workers in the private sector. The idea is that someone who does an interchange grows as an employee, leader, worker and colleague by being exposed to a new environment; at the same time, the institution gains from the knowledge, skills and networks that the person on interchange brings to the table. The interchange is mutually transformative and beneficial.

Interchange Canada is a good model and, with improvements, could provide the infrastructure for an effective bridge between the public and private sectors. Unfortunately, we lack global numbers on how many people use the program, for how long, and what experiences they gain—information that would be useful to judge and maximize the effectiveness of the program.

To promote Interchange Canada and support public servants as they build their skillsets, the Government of Canada should do the following:

1 Expand the use of Interchange Canada by creating the administrative infrastructure and financial incentives government departments, private sector partners, universities and think tanks require to offer rotating interchanges of various durations.

The current program sets up interchanges for up to three years; this duration might be suitable in some cases but the objectives of the interchange can often be met within shorter periods. Also, more frequent use of briefer interchange periods would allow more people to take advantage of the program, and with greater frequency. Interchanges should become a normal part of full-time employment in the public service and should be valued and incentivized in the performance-management process. For example, a public servant motivated to climb the ranks to the executive level should see an interchange as a pivotal step toward promotion.

2 Require TBS to work with prospective interchange partners to develop a universal, competency-based approach to interchange arrangements in which individuals register their credentials or certificates.

Such a registry would verify that individuals have developed new skills and competencies, such as leadership, strategic communication, risk management and financial planning. This skills-based approach would give structure and purpose to the interchange beyond the general goals of the program, and would help make participants more competitive for future jobs, both within and outside the public service. The skills individuals learn would be applicable across jobs and sectors.

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3 Advertise targeted interchange assignment opportunities on the Canada-wide online Interchange database.

This would help prospective participants become aware of opportunities and apply for interchange arrangements that fit with their strategic professional priorities. To maximize benefits, it would be prudent to target individuals at critical points in their careers—for instance, young professionals with a long runway ahead, as well as seasoned executives in leadership positions. Young professionals exiting their degree programs in search of employment would benefit from a program that facilitates short-term placements, both in the public and private sectors. Government and private sector partners could work together to arrange these opportunities.

4 Build partnerships in Canada and elsewhere to secure interchange arrangements for a critical mass of public servants in the following sectors: cybersecurity, data management, artificial intelligence, ethics and privacy, infrastructure planning and blockchain technology.

This would be a quick and affordable way to build the public service's capacity in the fastest-growing industries, in relation to emerging and disruptive technologies, and in response to the most pressing public priorities. Interchange Canada stated that 400 assignments were started in Fiscal Year 2017-2018 and that this has been increasing over the last five years. To be effective, the interchange program needs to continue to grow and be effectively utilized as a key talent development tool within government. Further, the partnerships that result would help calibrate public and private sector efforts in coping with challenges presented by advancements in technology, including security threats.

Lori Turnbull is an Associate Professor at Dalhousie University and a PPF Fellow. She focuses her research on Canadian political institutions, democratic reform and the Senate expense scandal. Prof. Turnbull's work has been published in the Canadian Public Administration journal, the Canadian Political Science Review, the Journal of Parliamentary and Political Law and How Ottawa Spends. In 2011, she co-wrote Democratizing the Constitution with Peter Aucoin and Mark Jarvis, a book that won the 2011 Donner Prize and the 2012 Donald Smiley Prize.


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