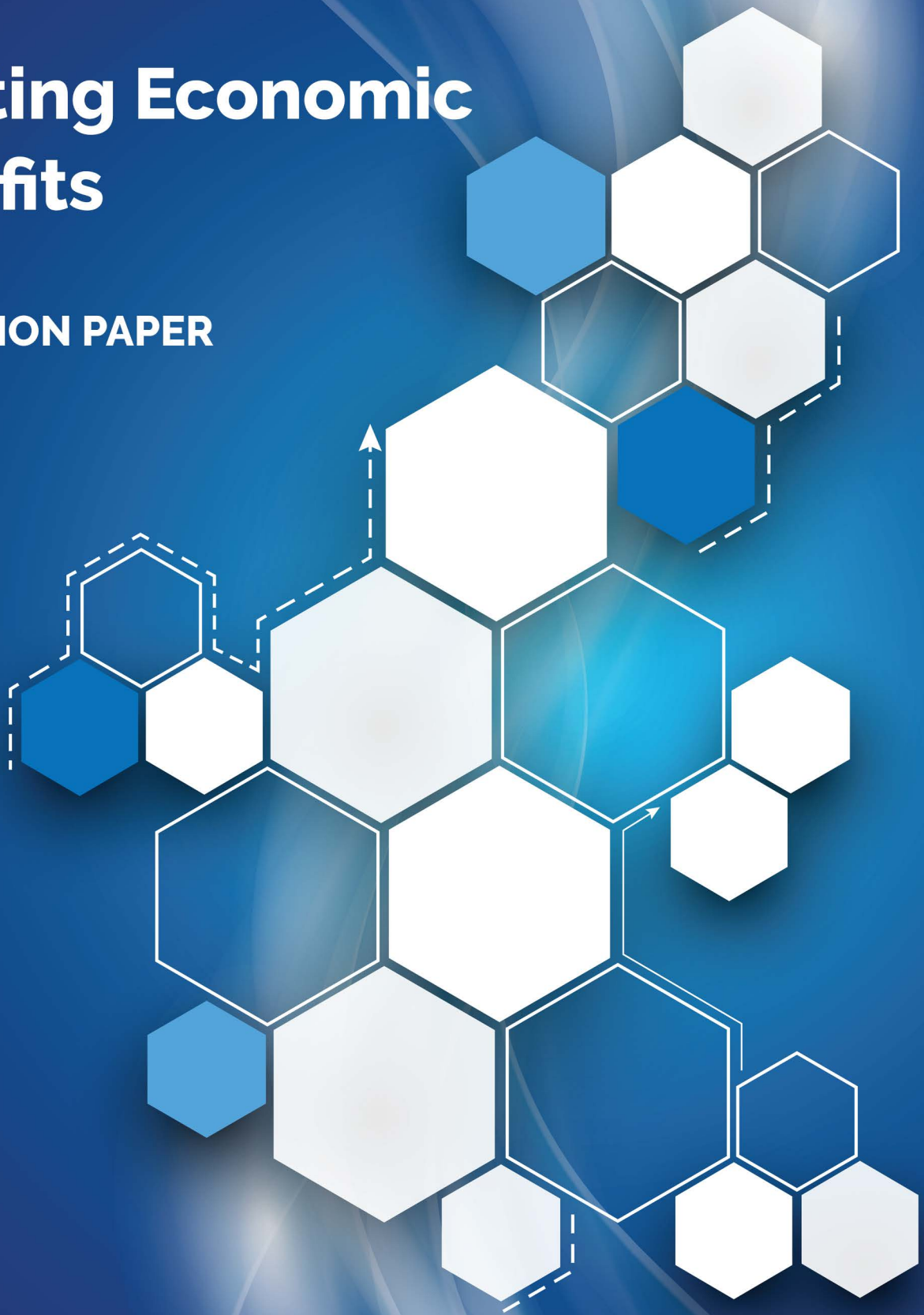
Creating Economic Benefits

DISCUSSION PAPER



Ontario

Creating Economic Benefits

Enabling Ontario firms to develop data-driven business models and leverage the commercial value of data.

DISCUSSION PAPER

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1 About This Paper: Starting the Conversation

The government of Ontario is developing Ontario's Data Strategy to explore new opportunities for data use across the province while protecting people's data rights from growing risks. We are developing the Data Strategy in close consultation with you, because it is your trust and confidence that provide the foundation for Ontario's data economy.

This document is the second of three Discussion Papers that we will release as part of our consultations to develop the Data Strategy. While the first paper, released in July 2019, focused on data and privacy protections, this paper is seeking input on how we can create economic benefits in relation to data.

We invite you to join the conversation by visiting engage.ontario.ca, our digital engagement platform. On the platform, you can choose how to participate in the way that is most comfortable for you. Options include:

- Taking part in an online dialogue about these discussion questions
- Sending us a formal, written submission by posting it on the platform or emailing us at digital.government@ontario.ca
- Joining us at in-person events in six communities across Ontario.

By participating in these consultations, you will help us develop a Data Strategy which reflects your needs and concerns – whether you are a parent concerned about your child's well-being, a business owner trying to launch a new data-driven service, or a resident concerned about how data-driven change is affecting your community.

Message from the Hon. Lisa M. Thompson, Minister of Government and Consumer Services

"Our government has embarked on an ambitious project to develop Ontario's first Digital and Data Strategy. We want you—the people and businesses of Ontario—to help us turn this vision into reality. Through this discussion paper, we aim to better understand how we can support businesses to unlock the commercial value of data, while ensuring that individuals' privacy is protected. The insights you share with us will help our government deliver change, make Ontario open for business and jobs, and protect the things that matter most to the people of our province. We're not just the government, we're your government. And we are listening."

Message from Ms. Linda Mantia, Chair of the Minister's Digital and Data Task Force

"Data is a resource with limitless potential: We have created more data in a two-year span than throughout the entire course of human history. This paper focuses on how we can harness the power of that data to drive transparency, public service improvement, innovation and new economic growth. The Minister's Digital and Data Task Force looks forward to hearing from all Ontarians about the concepts presented in the paper. Together, we can build a data economy that creates value for people and businesses across Ontario."

2 Where We Are Now

We live in a time of unprecedented data growth, enabled by fast-evolving technologies in virtually every industry. Data has the ability to power widespread innovation – from digital transformation in health care to the future of mobility. The prevalence of data has already given rise to hundreds of new enterprises, while helping established businesses to create new markets, drive innovation, and improve the efficiency and effectiveness of operations: in mid-2018, data-driven firms dominated the Standard & Poor's 500 Index, accounting for approximately US$4 trillion in asset value.[1]

As a result, Ontario – like many markets across the globe – is becoming an "intangibles economy," where data and other non-physical assets, such as intellectual property, are emerging as key drivers of competitiveness and growth. Traditional industrial strategies for growth are being challenged. The concept of a specific "digital sector" is disappearing; all sectors of our economy and by extension government must be digital in order to better serve Ontarians.

Ontario has broad strengths in a number of areas – a highly educated workforce,[2] strong academic research institutions,[3] and a diverse and stable economy. The province, like competing jurisdictions around the world, now needs to examine how to build on these strengths and assets, and enable success in the growing digital economy. To achieve this goal,

[1] Rethinking Industrial Policy for the Data-driven Economy. Centre for International Governance Innovation. 2018.
[2] The Labour Market Shift: Training a highly skilled and resilient workforce in Ontario. Institute for Competitiveness and Prosperity. 2017.
[3] 2015 Innovation Report Card. Conference Board of Canada. 2015.

our government is working to empower Ontario businesses to fully unlock the value of data and lead in the data-driven economy. This paper will examine current issues and challenges, where Ontario hopes to be in the future data economy and how our government can help get us there.

2.1 Key Trends in the Data Economy

Ontario, like other leading global economies, is currently impacted by key data-related trends. These include:

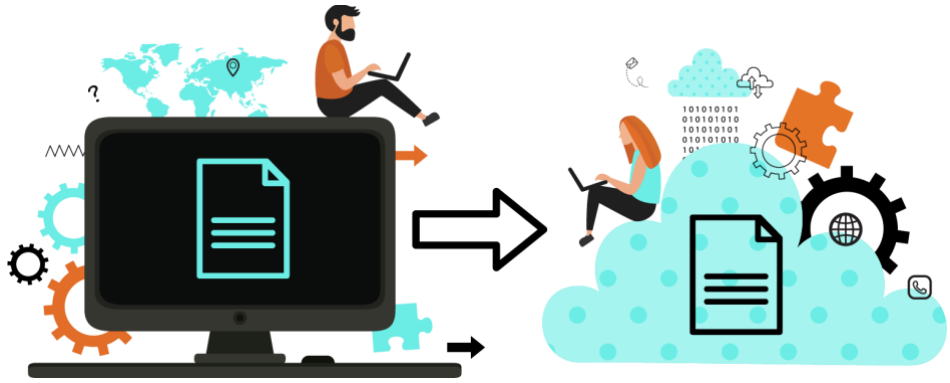
Winner-take-all economics: In the growing intangibles economy, competitive advantage is often derived from data and intellectual property. Businesses that can access large amounts of data and leverage it effectively can scale quickly to occupy dominant market positions. This results in a handful of companies being able to offer a wide variety of products and services, while smaller businesses find it difficult to do so. In turn, dominant companies can also collect large amounts of data, which further compounds their market advantage.[4] Smaller businesses typically face high barriers to succeeding in the data economy, with substantial upfront investment required to effectively harness data to create new products and services.

Low levels of digital/data technology adoption: When compared with global competitors, Ontario's companies are struggling to adopt digital and data products and solutions. While limited data exists on technology adoption at the sub-national level, Ontario's investment in Information and Communication Technologies (ICT), which amounts to 2.39% of GDP, is behind much smaller markets like Switzerland (3.83%) and Sweden (3.43%).[5]

[4] Consolidation in the Internet Economy. Internet Society. 2019.
[5] ICT Investment – Innovation Provincial Rankings – How Canada Performs. The Conference Board of Canada. 2019.

Key barriers to adoption include:

- Limited in-house technical expertise, and low awareness of security and privacy requirements.[6]
- Limited understanding of digital trends and their potential to enhance business processes.[7]
- The high cost of imported technologies, relative to physical labour costs.[8]
- Concerns about new technologies becoming obsolete.
- Difficulties in forecasting the return on investment for new technologies, particularly among small businesses.[9]
- Limited digital infrastructure within rural and northern regions.[10]



Increasing the availability and use of open data: Many governments are proactively pursuing open data policies that encourage government and other public sector bodies to make their data accessible to all users. The adoption of these policies recognizes that open data can be a key driver of economic growth and business innovation. A 2016 Open Data Institute report found that governments shifting to open data are likely to double the value of the reuse of data, adding about 0.5% to their GDP.[11] The European Data Portal estimates that, by 2020, the European market size for open data will be over €75.7 billion, an increase of 36.9% since 2016.[12]

The extent to which Ontario can see a share of this positive economic impact depends on *how* open data is used to drive revenue, reduce costs, and create jobs. Achieving the economic

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[6] Report from Canada's Economic Strategy Tables: Digital Industries. Innovation, Science and Economic Development Canada. 2018.

[7] Rethinking Industrial Policy for the Data-driven Economy. Centre for International Governance Innovation. 2018.

[8] Rethinking Industrial Policy for the Data-driven Economy. Centre for International Governance Innovation. 2018.

[9] Better, Faster, Stronger: Maximizing the benefits of automation for Ontario's firms and people. Brookfield Institute. 2018.

[10] Digital Technology Adoption in Northern and Remote Indigenous Communities in Canada. First Mile Connectivity Consortium. 2016.

[11] Research: The economic value of open versus paid data. Open Data Institute. 2016.

[12] Analytic Report 9: The Economic Benefits of Open Data. European Data Portal. 2017.

potential of open data is more complex than a government simply "opening up" its inventory of data. The return on investment can take years to be realized: Products such as software applications and artificial intelligence algorithms that are created from open data may not yield revenue or profits immediately.[13] Successful jurisdictions have shown that thoughtful planning is crucial to producing a widespread, meaningful return on investment for open data initiatives.[14]

Demand for stronger data governance: "Data governance" refers to the formal management of data assets within an organization, supported by set practices and processes. Strong data governance processes, coupled with privacy protections for personal information, can improve public trust and confidence--enabling businesses to use data responsibly to develop new products and services. Currently, multiple data governance frameworks exist, such as ISO standards and the COBIT (Control Objectives for Information and Related Technologies) framework for data security governance. Many organizations are also looking into developing their own governance practices in a time of heightened public awareness of data privacy and security. In general, ensuring stronger data governance–for example, by updating consent rules, increasing individuals' access to their personal data and improving the privacy and security of data management processes–is becoming a top priority for many governments to explore.

Fierce competition for data talent: The Conference Board of Canada has estimated that Ontario is losing up to $24 billion in GDP and $3.7 billion in tax revenue annually, as a result of digital and data skills deficits among every level of the province's workforce, and that inadequate digital skills reduce an organization's total productivity by 21.3%[15]. Across Ontario, large multinationals with regional headquarters in the province are drawing in top talent, leaving other employers to fill positions with staff whose skills are often misaligned with their needs.[16] More broadly, Canada ranks 18th among Organization for Economic Co-operation and Development (OECD) countries in its ability to retain talent.[17] A 2018 study also found that one in four STEM (science, technology, engineering and math) graduates from the University of Waterloo and the University of Toronto work abroad.[18] If the pool of skilled data talent does not expand at the same rate as demand, whether through retention, additional training, and attraction of skilled immigrants, the data skills deficit in Ontario may continue to grow.

The rise of Artificial Intelligence (AI): "AI" is a class of technologies capable of performing tasks that would usually require human intelligence. It is heavily data-driven as it analyzes large amounts of data to discern patterns, understand complex concepts, and interact in a human-like way. Organizations that have access to large data sets and can effectively leverage this

[13] ICT Investment – Innovation Provincial Rankings – How Canada Performs. The Conference Board of Canada. 2019.
[14] Open data for economic growth. A Stott. Washington DC: World Bank. 2014.
[15] Skills in the Digital Economy: Where Canada Stands and the Way Forward. ICTC. 2016.
[16] A New North Star: Canadian Competitiveness in an Intangibles Economy. Public Policy Forum. 2019.
[17] Competing in a global innovation economy: the current state of R&D in Canada. Council of Canadian Academies. 2018.
[18] A New North Star: Canadian Competitiveness in an Intangibles Economy. Public Policy Forum. 2019.

technology will be able to move quickly to innovate and adapt their business processes to the digital economy. Embedding AI across all sectors has the potential to create jobs and drive economic growth, and governments around the world are developing strategies and tools to govern and promote the adoption of AI to secure a competitive edge in the global economy.

Ontario has emerged as a leader in the global race to develop AI. The province is home to the Toronto-Waterloo tech corridor and, recently, this hub has become a global centre of excellence for fundamental and commercial AI research. Ontario's world-leading strengths in AI academic research are represented by the work of Geoffrey Hinton, a pioneering AI researcher from the University of Toronto, as well as across universities and colleges such as Waterloo University and University of Guelph. This excellence has attracted tech leaders to invest in Ontario: In September 2018 alone, corporations including Intel, Microsoft, Samsung, and Uber invested $1 billion in new AI initiatives in the province.[19] Canadian SMEs are benefitting from the growth in AI technology, including prominent AI start-ups such as Ross Intelligence, Element AI, Rubikloud and Deep Genomics. However, a major barrier to the growth of AI-based SMEs is the challenge they face in competing with large multinational companies for limited talent in Ontario.

Growing global "techlash": Over the past year, a "techlash"--a movement of declining trust in companies' ability to responsibly collect, manage, and use consumers' data--has been growing across the globe.[20] The Facebook/Cambridge Analytica scandal of 2018 served as a key catalyst for this movement. The scandal led to a slowing of Facebook's total user growth and the loss of 3 million users in Europe, resulting in a drop of 19% (over US$119 billion) in Facebook's value.[21] Although Facebook incurred a US $5 billion fine and will be subject to new government oversight requirements, these actions did not require changes to its fundamental business model—nor to the model of other similar companies—which is rooted in the monetization of users' data.[22] As such, the "techlash" movement is challenging governments to find new regulatory and oversight tactics to limit social and economic costs and hold companies which

[19] A New North Star: Canadian Competitiveness in an Intangibles Economy. Public Policy Forum. 2019.
[20] 2018 Trust in Technology. Edelman. 2018.
[21] Over $119bn wiped off Facebook's market cap after growth shock. The Guardian. 2018.
[22] Facebook's FTC Deal: Record Fine With Scant Ad-Business Reform. Bloomberg. 2019.

rely on this model to account. Left unaddressed, "techlash" could limit economic opportunities for established businesses as well as for smaller businesses trying to grow.

3 Where We Want to Be

Our government's vision is an Ontario where all people and sectors of the economy benefit from emerging data-driven technologies. We aim to increase the amount of data available to businesses, empower businesses to better leverage privacy-protected data, and ensure a fair and equal playing field for small and medium-sized enterprises (SMEs) when participating in public procurement. We also aim to give Ontarians of all backgrounds and expertise the opportunity to access skill building resources and education, as well as employment opportunities, in the data-driven digital economy.

Ontario's greatest opportunities for harnessing data to drive economic growth lie in supporting the diverse ecosystem of businesses in Ontario. This includes supporting high-growth data-driven SMEs and Canadian-owned businesses headquartered in Ontario, as well as assisting foundational industries like agriculture, manufacturing, construction and forestry on their "digital first" transformation journey. In addition, enhancing access to data and public procurement opportunities for all businesses is crucial for their growth and competitiveness in a broader market. Matching data and digital talent with the needs of data-driven businesses also ensures high-quality jobs for Ontarians and a competitive edge for Ontario businesses.

From the discovery of insulin to the launch of e-commerce leader Shopify, Ontario has a long history of innovation success stories. Ontario is well-positioned to create the next generation of innovators that leverages data for the betterment of society — through globally competitive businesses, better healthcare and education, high-quality jobs and a highly-skilled workforce. Strategic government action can help build a data-driven economy that is socially responsible and inclusive, with economic benefits shared by all. Our government is exploring the following areas of opportunity which have the potential to grow the economy.

3.1 Increasing Technology Adoption and Transfer

Effective use of data requires adoption of digital technologies by businesses. Greater adoption of digital technology can translate into significant economic gains for the province: a 1% increase in labour productivity resulting from the adoption of new technologies has the potential to yield an additional $8 billion in value to the Canadian economy.[23] Ontario, as the largest digital economy in the country,[24] is poised to benefit most significantly here. Our

[23] Skills in the Digital Economy: Where Canada Stands and the Way Forward. The Information and Communications Technology Council. 2016.

[24] ICT Investment – Innovation Provincial Rankings – How Canada Performs. The Conference Board of Canada, 2019.

government's vision for the future is one in which businesses from both digital and foundational sectors of Ontario's economy can realize this additional value and face fewer obstacles to bringing innovations to market – both domestically and abroad.

Supporting Small Businesses

Early-stage and small companies often face barriers to adopting new digital technologies due to the high cost associated with research, integration, and maintenance. One example of addressing this global concern is the approach taken by the European Commission, which encourages member states to actively pool resources among research institutions and has created a trans-European network of Innovation Relay Centres that facilitates technology transfer among 33 countries.[25]

Ontario needs creative solutions to facilitate the flows of knowledge and capital, while supporting small businesses in technology adoption and growth. The Expert Panel on Intellectual Property, formed by the Ontario government, is consulting postsecondary institutions, accelerators, Regional Innovation Centres, research institutions, and other economic development stakeholders across the province. These consultations will support the Expert Panel in exploring ways to better help small businesses grow and commercialize their technologies.

Transforming Foundational Sectors

Compared with "born digital," data-driven businesses, foundational sectors such as agriculture, manufacturing, mining and forestry may face greater challenges in adopting data-driven technologies and business models. There are a number of global jurisdictions already attempting to address these challenges, such as the U.S. and Germany. For example, in the U.S., the Connected Farmer Alliance, a public-private partnership between the government and private companies, uses mobile solutions for smallholder farmers to help them transact with peers and better manage their own farming data and finances for their agribusinesses.[26] In

[25] Growing Innovation Ecosystems: University-Industry Knowledge Transfer and Regional Economic Development in Canada. Allison Bramwell, Nicola Hepburn and David A. Wolfe. Program on Globalization and Regional Innovation Systems Munk School of Global Affairs University of Toronto. 2012.
[26] Digital Opportunities for Trade in the Agriculture and Food Sectors. OECD. 2019.

Europe, Germany's national "Industry 4.0" initiative is designed to transform the country's manufacturing sector by increasing digitization and the interconnection of products, value chains and business models.[27] Ontario farmers may be able to adopt data-driven technologies more widely through support from qualified crop advisors or agronomists—making it easier for farmers to transform agricultural data into actionable information with intuitive analytical tools.

Promoting Commercialization

Historically, Ontario's growth has been hampered by low commercialization rates for the innovations that our entrepreneurs and research institutions produce. Entrepreneurs also face challenges in developing robust go-to-market strategies for new data-driven technologies.

In British Columbia, the government has tried to address similar barriers by creating InnovateBC, which helps firms access funding, launch ideas and connect with industry experts. InnovateBC then connects firms with supports to access global markets and attract new investment. In a 2019 InnovateBC report, 92% of participating businesses confirmed that the programs have had a high-value impact on their technology ventures, and 97% state that they are able to be successful in their venture without needing to leave B.C. as a result of the program[28] Furthermore, InnovateBC has also contributed to the growth of B.C.'s high tech sector in both employment (5.4%) and new business creation (3.4%).[29] InnovateBC also provides policy and program advice to the provincial government, to foster the commercialization of British Columbia technologies.[30]

Similarly, the Manitoba Technology Accelerator Program provides wrap-around commercialization supports including funding, business coaching, and market introduction planning.[31] In Alberta, the Alberta-Europe Technology Collaboration Fund helps businesses become more globally competitive by developing innovative technologies, research-based alliances, and commercialization projects that aim to bring those products and services to market.[32] Calgary-based company Userful Corporation participated in the Alberta-Europe Technology Collaboration Fund, resulting in partnerships with German and French businesses to develop innovative videowall hardware and software solutions.[33] Userful experienced significant increases in revenue, hired 20 new employees, and gained access to international markets after participating in the program.[34]

While taking inspiration from British Columbia, Manitoba and Alberta, Ontario does not plan to create red tape. Our government aims to streamline data flow without creating intervening

[27] Germany: Industrie 4.0. European Commission. 2017.
[28] Innovate BC. Initiatives, Plans, and Strategies. British Columbia Government. 2019.
[29] Innovate BC2017/2018 Annual Service Plan Report. Government of British Columbia. 2018.
[30] Ibid.
[31] Manitoba's only Federally & Provincially Funded Incubator. Manitoba Technology Accelerator. 2019.
[32] Alberta-Europe Technology Collaboration Fund. German-Canadian Center for Innovation and Research. 2018.
[33] Success Stories- Advanced Video Wall Solutions. Alberta Government. 2018.
[34] Success Stories- Advanced Video Wall Solutions. Alberta Government. 2018.

agencies but will support small businesses in unlocking the power of that data in order to create a level-playing field and foster innovation.

3.2 Enhancing Access to Data for Businesses

The rise of open data presents new, broader opportunities for businesses to innovate. Access to government data, with adequate privacy protections can nurture an ecosystem of innovation. New standards and governance mechanisms are also crucial to guaranteeing that data-driven businesses operate transparently and fairly, and in compliance with international obligations. Data that are statistics or aggregate data are relatively easy to release - and often these are re-usable and "open" forms of information already available in a closed or printed form. However, in all cases, it is important for governments to ensure that the right level of detailed data is released while protecting government security and personal privacy.

Better Data Access

Ontario's government holds vast amounts of data that can help businesses develop new products and services that make Ontarians' lives easier, while ensuring that their privacy is protected. New collaboration with businesses can help us determine which data assets have the greatest potential to drive growth. Partnering with business can also help the government identify which datasets may be most useful to businesses, and those which government is uniquely positioned to use in order to measure the efficiency of its own programs and services, given government's role and scale.

Other jurisdictions show us what may be possible. For example, the United Kingdom's (UK) Open Government Initiative has streamlined the mutual exchange of datasets between

government and business, helping to drive domestic business growth.[35] An example of UK grocery chain Tesco stands out as a leading example of foundational businesses' use of open data: Tesco has adjusted its product mix by combining open weather data from the UK government with data on customers' past purchasing patterns – finding that certain products are purchased in correlation with various temperatures and weather trends. This modeling has helped Tesco reduce revenue losses and inventory spoilage.[36]

Better Data Governance and Regulation

In a future where data is easier to collect, store, manage, and trade, data governance models should be updated to streamline these processes. Ensuring that data is protected –and compliance with Ontario's international data-related obligations is upheld—are key priorities. New guidelines can help ensure that businesses:

- Collect only a select type of data from people and/or businesses in Ontario and provide guidance on selection criteria
- Make this data available to people/businesses transparently but anonymously, through a government-regulated portal
- Define, update and adopt best practice recommendations, as "privacy by design" or the incorporation of recognized data governance or security standards, in any collection, sharing, and resale of data
- Ensure that downstream users of their data do not use that data for unlawful or discriminatory purposes
- Follow recognized sector-specific open data standards allowing for data sharing and utilization
- Ensure people and businesses of Ontario have a way to share their data electronically and securely when interacting with service providers online

Establishing shared data standards, as a basis for data governance, is essential to promoting wider and more efficient data access. A lack of standards, or the existence of many contradictory standards, is a barrier to economic growth because it both prevents data sharing and hampers the interoperability of our data ecosystem.[37] By increasing access and allowing data sets to "speak to one another" or be readily used in combination, data standards can also support the development of data-intensive technologies such as artificial intelligence, which represent a growing segment of our economy.[38]

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[35] Growing Innovation Ecosystems: University-Industry Knowledge Transfer and Regional Economic Development in Canada. Allison Bramwell, Nicola Hepburn and David A. Wolfe. Program on Globalization and Regional Innovation Systems Munk School of Global Affairs University of Toronto. 2012.

[36] Open data: Unlocking innovation and performance with liquid information. McKinsey Global Institute, McKinsey Center for Government, McKinsey Business Technology Office. 2013.

[37] Canada Needs Standards to Support Big Data Analytics. Centre for International Governance Innovation. 2018.

[37] Canada Needs Standards to Support Big Data Analytics. Centre for International Governance Innovation. 2018.

[38] Canada's nascent AI sector needs data standards to thrive. The Globe and Mail. 2019.

3.3 Streamlining Public Procurement

A key goal of our government's Open for Business agenda is to ensure that innovative small businesses can easily partner with the province. Public procurement – the acquisition of goods and services by the government and other public bodies – represents a substantial opportunity to drive innovation and create market demand for data-driven technologies, as well as to create an enabling environment for businesses. Improving access to procurement data and adopting alternative procurement approaches--such as "innovation procurement--are two key ways in which government can promote fair competition and help data-driven businesses grow.

Open Contracting

Open contracting is the practice of publishing and using open, accessible, and timely information on government contracting to engage citizens and businesses in identifying and fixing problems.[39] Governments are looking at new ways to openly publish upcoming procurement opportunities, in order to engage citizens and businesses in the early identification of potential solutions to government challenges--and to better inform businesses about procurement opportunities. These initiatives can help create a level playing field for small data-driven technology firms by enabling them to more easily gain new market insights, so they can bid more effectively on government contracts and develop better products and services.

Innovation Procurement

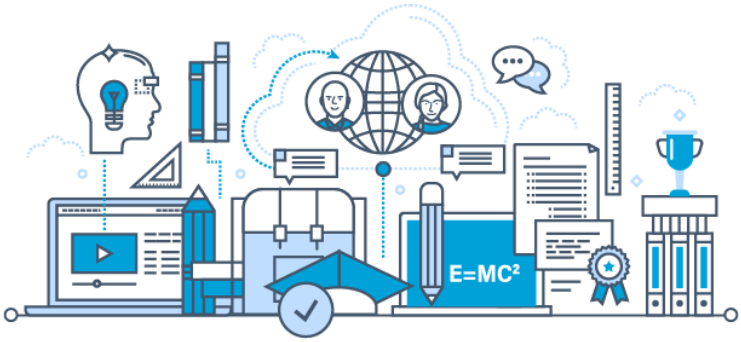
"Innovation procurement" is the purchase of solutions that do not currently exist in the market, or must be adapted or improved to meet specified needs.[40] It is a value-based alternative procurement approach that focuses on the overall value proposition and outcomes rather than price alone. Innovation procurement starts by identifying a problem or need rather than specifying technical requirements. With this approach, governments can help jumpstart innovation and become a strategic buyer of leading-edge digital and data-driven products and services from businesses. A key consideration for building an effective innovation procurement program is supporting businesses through the product development and go-to-market stages, instead of stopping short of commercialization.[41] When government acts as the "first buyer" of new technologies, and helps businesses commercialize their innovations for the larger market, it can help generate greater demand and help businesses to scale faster and compete with larger players.

3.4 Building Data Skills and Talent

Ontario's leadership in the data economy depends in large part on our ability to train, retain and attract talent. Opportunities exist to modernize education and training, build stronger links

[39] Open Government Global Report: Open Contracting. Open Government Partnership. 2019.
[40] BPS Primer On Innovation Procurement: Interim. Supply Chain Ontario. 2016.
[41] A Costly Gap: The Neglect of the Demand Side in Canadian Innovation Policy. Institute for Research on Public Policy. 2019.

between academic institutions and employers, and enhance efforts to attract top global talent to Ontario.



Modernized Education and Training

To create a market-leading data-literate workforce for the future, post-secondary institutions can increase their alignment with industry partners and develop curricula that focus on in-demand data skills. The K-12 system can also be modernized to emphasize the importance of teaching data literacy and skills and promote STEM (science, technology, engineering and math) pathways to Ontario's youth.

One opportunity to explore may be reforms to Employment Ontario and similar initiatives to better train job-seekers and prepare them for the changing skillsets required for the data economy. This approach could include focusing on a broader range of training programs that are tailored to key skills, rather than to specific job titles.[42]

Strategies to move mid-career workers from declining industries to growing ones are another area of potential opportunity. These workers have years of professional experience, knowledge and skills that are coveted by firms in the data economy.[43] For example, the Brookfield Institute recently launched Palette Inc, a non-profit that identifies skills gaps with industry and partners with training providers to create scalable upskilling programs for mid-career workers.[44] These types of approaches could help transform Ontario's labour market.

Retaining and Attracting Talent with Data Competencies

Strong pathways from school into the workforce are crucial to building high-quality talent pools for Ontario's data economy.[45] Carleton University and Shopify have recently collaborated to offer a new Computer Science program based on the Dev Degree Model, an opportunity that provides a fully accredited four-year degree in addition to a multi-year internship.[46] Students

[42] Better, Faster, Stronger: Maximizing the Benefits of Automation for Ontario's Firms and People. Brookfield Institute. 2018.
[43] Tech's Next Great Opportunity is Mid-Career Workers. U of T News. 2018.
[44] The Future of Work is Here. Be Ready. Palette Inc. 2018.
[45] A Looming Skills Gap Threatens Ontario's Future. The Conference Board of Canada. 2013.
[46] Carleton Students Take on Shopify Internships: Earning While They Learn. Carleton Newsroom. 2016.

receive a competitive salary and full tuition from Shopify, in addition to 4,500 hours of on-the-job experience.[47] Creating opportunities for academic institutions and industry partners to work together and offer more of these initiatives could yield significant returns in terms of talent retention and growth.[48]

In parallel, attracting highly skilled immigrants to Ontario can continue to build a high-quality talent pool for Ontario. Post-secondary institutions are a key starting point: making it easier for international students – particularly students in data-focused disciplines and/or STEM to learn about the immigration process can encourage them to remain in the province after they complete their studies.[49]

4 How We Get There

Our goal is to become Canada's first "digital first government." Building on the size and capabilities of this government and capitalizing on the value of the data held by the Ontario Public Service and the Broader Public Sector, we will be able to digitize the province's economy, creating data-driven economic benefits for Ontario's businesses and people. Below we set out some concrete actions we are taking as well as important considerations for next steps in planning a path of action.

To achieve this goal, we will partner with federal and municipal partners to align our goals, priorities and efforts for delivering the best outcomes for Ontarians. We will also work with other provinces to leverage best practices and innovative ideas in our path of action.

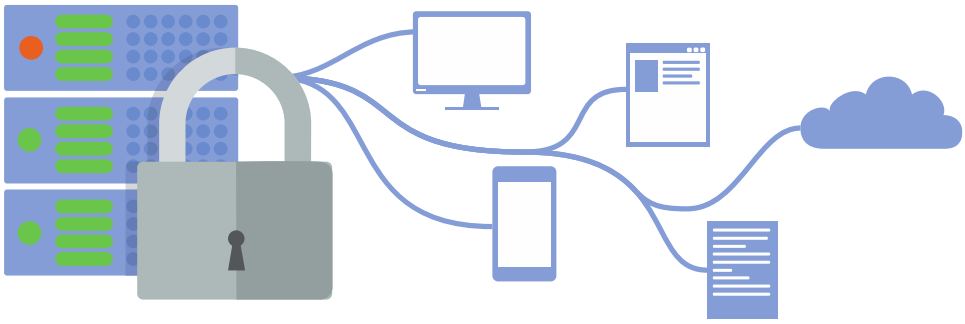
4.1 Sharing Data

Improving the sharing of government data with the public is key to building a healthy data ecosystem that can sustain a thriving digital economy.

The types of data that can potentially be shared and that can impact economic growth include, among others, geospatial reference data, weather data, road, employment data and population data. In the UK, six categories of data – geospatial, environment, economic, transport, energy and resources, and demographic – are used in at least 10 of the 20 defined sectors of the economy.[50] Given that Ontario has a wealth of data in digital health assets, clinical and administrative health data can also be considered as a high-value dataset that may present various opportunities for Ontario.

[47] Dev Degree: The Model. Dev Degree. 2019.
[48] A Looming Skills Gap Threatens Ontario's Future. The Conference Board of Canada. 2013.
[49] A Looming Skills Gap Threatens Ontario's Future. The Conference Board of Canada. 2013.
[50] Open Data for Economic Growth. The World Bank. 2014.

Ontario has a robust open data program that could be adapted to support a more value-focused approach to data sharing. Ontario can also consider how it can help its municipalities use data more easily – to provide better services and to enable data-driven Ontario businesses. The Association of Municipalities of Ontario (AMO) recommends that municipalities collaborate with each other to share data and establish coordinated digital initiatives.[51] Many municipalities and regions across Ontario, like Durham, York and Niagara, have embraced open data and launched open data portals.[52] Sharing datasets and collaborating across municipalities can provide larger, more comprehensive datasets, which could provide great value to Ontario businesses. Ontario can consider ways for municipalities to create and share data more easily and ensure that municipalities have the capacity and infrastructure to support the development of this data that would be accessible to Ontario businesses.



4.2 Expanding Digital Infrastructure

Building high-quality digital infrastructure is essential to enabling the growth of data and the digital economy, especially in the areas of broadband, 5G, and the Internet of Things (IoT). Ontario will be exploring the best approaches for creating and expanding access to this enabling infrastructure to help businesses thrive.

To ensure that all Ontarians can participate in the digital and data-driven economy, Ontario is investing $315 million over five years, as part of the Broadband Strategy, to expand broadband access in underserved areas and to expand access to reliable, fast and affordable broadband internet connectivity across the province. In the future, Ontario will continue to expand broadband across the province to ensure universal access.

The fifth generation of wireless networks, 5G, is intended to provide speeds 200 times faster

[51] #OnMuni Online: Towards Digital Transformation and Opportunities for Ontario's Municipal Governments. Association of Municipalities Ontario. 2017.
[52] #OnMuni Online: Towards Digital Transformation and Opportunities for Ontario's Municipal Governments. Association of Municipalities Ontario. 2017.

and one-tenth the latency of current 4G networks.[53] This next generation of wireless networks enables greater use of IoT services and applications and holds potential to stimulate innovation in the evolving digital economy.[54] ENCQOR 5G (Evolution of Networked Services through a Corridor in Québec and Ontario for Research and Innovation) is a Canada-Québec-Ontario partnership focused on research and innovation in 5G technology. ENCQOR has built a 5G testbed that enables businesses to get early access to a 5G development platform for prototyping new products and services through three access points in Ontario (Communitech, MaRS and InvestOttawa). The initiative will unlock the technological promise of 5G in the near term and drive long-term economic growth in Ontario and Québec and in the broader Canadian innovation ecosystem.[55]

IoT represents the next step in digital infrastructure that will enable data generation on an unprecedented scale. It is estimated that 25 billion devices will be connected by 2020.[56] With network connectivity, widespread use of sensors and sophisticated data analytics, large amounts of data generated by devices in homes, work places and the natural world can be aggregated and analyzed to drive research and innovation across multiple sectors.[57] With proper privacy protection measures in place, IoT holds the potential to substantially contribute to further economic growth and social prosperity.

4.3 Becoming a Digital First Government

Ontario aims to become a digital first government and use its size and capabilities to help digitize the rest of the economy and capitalize on the value of data, as well as provide more efficient and better targeted government services. Being “digital first” means being people-centric and results- driven to make government work better--and using the culture and practices of the internet era, along with modern tools, to put the needs of Ontarians first, whether we’re developing products, policies, programs or services.

As part of the 2019 Budget, Ontario introduced the *Simpler, Faster, Better Services Act*, which resets the bar for Ontario services so that they are easier to use, more efficient and accountable and legislates principles for opening government data. It also enshrines into law the role of a Chief Digital and Data Officer (CDDO), with a role in promoting open data and data sharing for the public service and broader public sector, potentially making more government data accessible to businesses. In addition, the CDDO is empowered to set standards for the release of government data.

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[53] The road to 5G networks. OECD. 2019.
[54] Ibid.
[55] ENCQOR 5G. 2019.
[56] The Internet of Things: Seizing the benefits and addressing the challenges. OECD. 2016.
[57] The Internet of Things: Seizing the benefits and addressing the challenges. OECD. 2016.

An example of an ongoing digital first initiative is the Licensing Modernization Project by the Ontario Ministry of Agriculture, Food and Rural Affairs (OMAFRA). It aims to modernize, standardize and streamline licensing, certification and permitting processes for OMAFRA licensing programs. This will make the process easier, faster, and more streamlined for Ontario businesses seeking a licence from OMAFRA, while continuing to protect food safety and public health.

4.4 Prioritizing Artificial Intelligence

AI is a fast-evolving data-driven technology that will have important impacts on businesses, government, and the Ontario economy. To better leverage existing strengths in the AI field, the government is also in the early stages of scoping an AI strategy that focuses on talent development and re-skilling, consumer protection, public and private sector adoption, transparency and accountability, and the ethical usage of AI. Formal work on this strategy will begin after the government releases its Data Strategy.

4.5 Public Engagement

Going forward, we are committed to creating a strategy that represents the voices of all Ontarians and generates clear economic benefits for businesses. To ensure that we build a data-driven economy that includes and benefits all Ontarians, we invite you to consider the four key areas below and share your input and feedback on these ideas. For details on how to participate, please visit engage.ontario.ca.

Increasing Technology Adoption and Transfer Among Ontario Businesses

It is important to:

- Help small businesses and Ontario's foundational economic sectors—such as agriculture, construction, and manufacturing—to understand and adopt new data-driven technologies more easily, including expanding digital infrastructure.

- Create a stronger ecosystem of innovation and commercialization by connecting data-driven businesses and their products with key markets.

Discussion questions:

- How do we incentivize businesses in Ontario to increase their adoption of data-driven technologies to drive growth?
- The Ontario government has established a number of programs and initiatives to incentivize businesses' adoption of data-driven technologies. In your view, what has worked? What hasn't worked?
- How can we help businesses in Ontario to compete more actively and successfully with international players in the data economy?

Enhancing Data Access for Businesses

It is important to:

- Build new collaboration models between government and businesses to determine which government data assets can best help drive business growth.
- Ensure that strong governance structures and standards are in place to promote privacy-protective data business growth.

Discussion questions:

- How does your business currently use open data to support growth and productivity? Are there examples of how and why access to data has helped your business?
- What steps can government take to make its data more available to business, and what types of data would be most helpful for businesses to access?
- How can we ensure that businesses generate, collect and resell data in a way that is consent-based and drives growth, but ensures transparency and prevents discrimination?

Streamlining Public Procurement

It is important to:

- Remove barriers so that Ontario's small businesses can access government procurement data and opportunities more easily and fairly.
- Promote government procurement of new, innovative data-driven products and services particularly for sectors with barriers to technology adoption and application.

Discussion questions:

- What steps can we take to make it easier for businesses to participate in the procurement process for data-driven services and products?
- How can we prioritize innovation procurement and help businesses develop solutions for government that can be commercialized for wider markets?

Building Data Skills and Talent

It is important to:

- Expand access to re-training and upskilling programs, and enable more on-the-job training, to build a pool of data talent in Ontario.
- Build a talent retention and attraction strategy by attracting highly skilled immigrants and creating more opportunities for work-based learning.

Discussion questions:

- How can we better enable on-the-job training in key data skills, particularly for employees at small businesses, without creating undue burdens on these employers?
- How can we maximize data-focused talent retention in Ontario?
- How can we better align K-12 and post-secondary curricula with industry needs to build data and digital competency in Ontario?

Comments on this discussion paper will be collected until October 9, 2019. We will post a summary of what we heard on engage.ontario.ca. Other consultations on subsequent discussion papers will follow in the coming months.

If you have questions or comments, please email us at digital.government@ontario.ca or send any other correspondence to the Ontario Digital Service, 595 Bay Street - Suite 1002, Toronto, Ontario, M7A 2C7.

5 Appendix

What is data?

For the purposes of Ontario's Data Strategy, we have defined data broadly as information collected with varying degrees of structure in both digital and non-digital formats. The Strategy will focus on digital data and the impacts of its collection and use. Our broad definition of data is meant to be enduring and adaptable to its varying forms, substance and governance. The definition will be supplemented with the following key attributes:

Government & public sector data
Data collected, produced or shared by government, such as:

- Open data
- Transit data
- Administrative data
- Statistical data
- Research and survey data
- Other types of operational data

Personal data

Data collected from, produced or shared by individuals, such as:

- Personally identifiable data
- Behavioural data
- Expressive data
- Biometric data
- Financial data

Business data

Data collected, produced or shared by businesses, such as:

- Operational and financial data
- Market research data
- Customer data
- Machine data

Derivative data

Data that has been processed, derived or transformed, such as:

- Anonymized data
- Linked data
- Predictions or inferences derived from data