



WHAT TO EXPECT WHEN YOU'RE EXPECTING [DISRUPTION]: THE DIGITAL ECONOMY AND BRITISH COLUMBIA

HIGHLIGHTS

- The digital economy increasingly permeates all aspects of business and society. Already, its effects have been felt across the economic landscape, including the skills needed to get a job, the production and delivery of services, and political and policy decision-making.
- In the emerging digital economy, a growing share of trade in goods and services is taking place through electronic commerce on the Internet. The digital economy has three primary components — supporting infrastructure, electronic business processes (how business is conducted), and electronic commerce transactions (selling of goods and services online).
- A growing share of economic activity is unmeasured or poorly measured by government statistical agencies, in part because current approaches to calculating GDP and collecting statistical data do not reflect the value of digital consumption.
- BC has an opportunity to leverage the forces of disruption and be a leader in the transition of traditional industries to the digital economy.
- In addition to encouraging the development of a strong digital supercluster in BC, policymakers should also be considering steps to stimulate the take-up and diffusion of digital technologies, platforms and tools across the economy. This can be a powerful way to raise productivity in the broader business sector.

WELCOME TO THE FOURTH INDUSTRIAL REVOLUTION

You are in the midst of a revolution. The Fourth one, in fact. So, what is it — and in what ways may it transform life as we know it?

Historically, there have been three previous industrial revolutions. The emergence of the digital economy is considered by some to represent the fourth.

The first industrial revolution originated in Britain, roughly in the mid-eighteenth century, and centred on the shift from rural-agrarian to urban-mechanized

systems of production. The second spanned most of the century after 1870 and focused on the shift to mass production, distribution and communication — especially in the United States but also in some other developed economies. Key innovations during this period included electricity, the telephone, radio, television and mass transportation infrastructure. The third revolution took off in the 1960's with the rise of more advanced computing and telecommunications capabilities, such as the switch from mainframe to personal computers, faxes, photocopying, and electronic

documents — culminating in the introduction of the Internet in the late 1990s.

Enter the Fourth Industrial Revolution. At first glance, it might seem less noticeable than preceding industrial revolutions but its impact is arguably more disruptive. At the root of the fourth industrial revolution is accelerating technological innovation that is upending business models in existing industries, breathing life into new ones, and giving rise to a new economic paradigm: the digital economy.

A NEW MODEL

The OECD sees the digital economy as “enabling and executing the trade of goods and services through [electronic commerce on the Internet](#)”. The National Bureau of Economic Research describes the digital economy as having [three primary components](#) — supporting infrastructure, electronic business processes (how business is conducted), and electronic commerce transactions (selling of goods and services online).

However it is defined, the digital economy increasingly permeates all aspects of business and society. Already, its effects have been felt across the economic landscape, from the skills needed to get a job, the production and delivery of services, and policy and political decision-making. It influences the way people connect with one another and with information through a combination of technologies and big data. These technologies can help to solve (or better manage) complex problems, while big data will assist (hopefully) in evidence-based decision-making. The new economy is knowledge-based and relies predominantly on intellectual capabilities — be it human or artificial — thereby reducing the impact of limitations such as geographic distance and constraints on physical inputs or capacity. In this environment, knowledge, skills and expertise are as critical as any other economic resource.

A SNAPSHOT OF THE DIGITAL ECONOMY

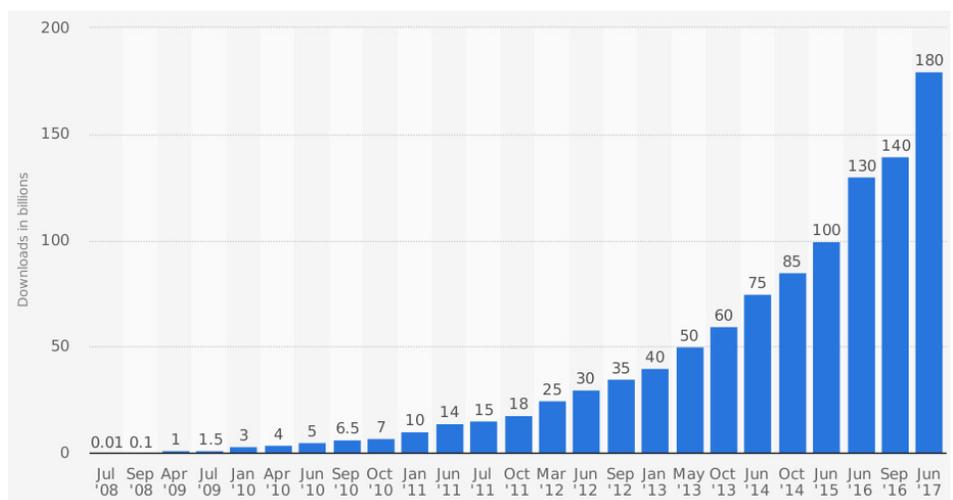
The digital economy is transforming the way people function and how

firms conduct business. Advances in computing power supporting the digital revolution have led not only to significant quality improvements and stepped up innovation, but also to new, broadband-driven economic exchanges between consumers and providers of goods and services.

Today, the United Nations’s [International Telecommunication Union](#) estimates that half of the world’s population has regular access to broadband, a third are on a social network, and 1 in 2 people now use mobile technology and service apps. The digital economy represents an explosion of consumer-supplier connectivity based on technological infrastructure, increasingly intuitive devices and interfaces, and a whole new medium enabling communication and commerce with a global audience. The backbone of the digital economy

is hyper-connectivity: the growing connection of people to other people, firms, and other organizations, coupled with intelligence and data exchange powered by broadband and mobile technology, Big Data, cloud computing, online platforms, Artificial Intelligence, sensors, and the Internet of Things (IoT)¹ — to name just a few. The digital economy encompasses activity that results from billions of daily online connections among people, businesses, devices, and data. A [2017 United Nations report](#) estimates that, given the limits of existing national economic accounting and measurement systems (discussed below), the global digital economy generated around \$3 trillion in economic activity in 2016. And the figure is set to increase dramatically in the next decade.

FIGURE 1: CUMULATIVE NUMBER OF APPS DOWNLOADED FROM THE APPLE APP STORE FROM JULY 2008 TO JUNE 2017 (IN BILLIONS)



Source: [Apple Inc. Statistics](#).

¹The Internet of Things refers to connected devices that collect data which can be aggregated and analyzed.

OCEANS OF DATA

The digital economy brings with it data — oceans of data, in fact. At least two generations of today’s citizens already choose to give away personal details in exchange for gaining access to web-based platforms and higher levels of information and analytics. Citizens increasingly are the target — but also the biggest beneficiaries — of big data, as seen through the explosion of integrated lifestyle apps and IoT products. According to Apple, [over 180 billion](#) apps have been downloaded in less than a decade (see figure 1). Combined with fitness trackers, other wearables, fintech tools, online banking and other IoT technology, they enable commercial or personal data collection mechanisms such as Google Home or Amazon Alexa to win broad market acceptance. More and more consumers are now “voting with their fingers” by giving away personal details (and in many cases, even paying for the chance to do so). In return, big data delivers personalized analytics, greater and more time-sensitive consumer information and choices, and enhanced quality of life opportunities.

HOW TO MEASURE ECONOMIC ACTIVITY IN THE DIGITAL ECONOMY?

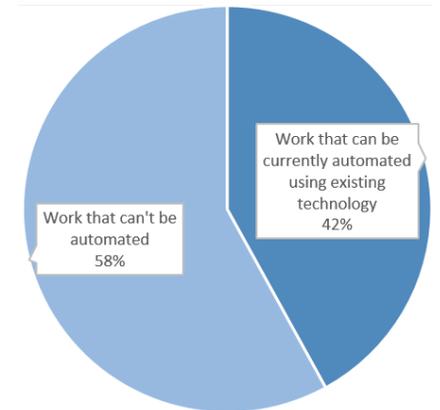
In truth, this is one of the biggest challenges surrounding the digital economy. A growing share of economic activity is unmeasured or poorly measured, because current approaches to calculating GDP and collecting statistical data [do not reflect the value that people derive](#)

[from digital consumption](#). For example, virtual “free” goods are on the rise — these include the public consumption of content published without a cost to the consumer, such as video-streaming platforms like [YouTube](#), or digital-only news sites like the Vancouver-based [Daily Hive](#). These companies deliver information and products to consumers for zero cost, and are often funded through means other than paid subscriptions, such as advertising. Globally-accepted practices for tracking and accounting for economic transactions can neither capture the benefits of these “free” goods/services nor compute the value of the associated economic activity. Other forms of e-commerce are also excluded from government-collected data due to a lack of measurement capacity and inadequate analytical tools. The reduction of search and matching costs offered by a variety of online platforms (the “gig” economy) is another benefit that cannot be calculated by existing productivity indicators. This, in turn, is linked to the expansion of markets for underused goods that can be utilized to fuller potential thanks to on-line platforms, like cars, tools or homes (dubbed the “sharing” economy). Modifying and improving government’s official statistical systems is a pressing task if the goal is to understand and properly measure the size and impact of the digital economy.

THE AGE OF THE MACHINE

Automation and the future of work is another big topic in the era of the digital economy. Some studies suggest [more than 40%](#)

FIGURE 2: AUTOMATION OF TASKS IN THE CANADIAN LABOUR MARKET



Source: [Brookfield Institute, 2016](#).

of the Canadian labour force may be affected by automation by 2035. A similar share of the “tasks” currently performed by paid employees could be automated using existing technologies (see Figure 2). Another recent study from [McKinsey](#) estimates that in 60% of all current jobs, more than 30% of work-related activities could be digitized. As new technologies push the frontiers of automation and encroach on some of the advantages that humans have been thought to possess over machines, [the way we work](#) is changing. This is not new to the Fourth Industrial Revolution, of course. Previous generations of workers were also sometimes [replaced by machines](#). While it is uncertain how many current jobs will be “lost” to automation, the digital age is sure to see the automation of many specific tasks and bring wide-ranging changes to the workplace.

Technological displacement is likely to have the greatest impact on tasks that are routine, administrative, sales

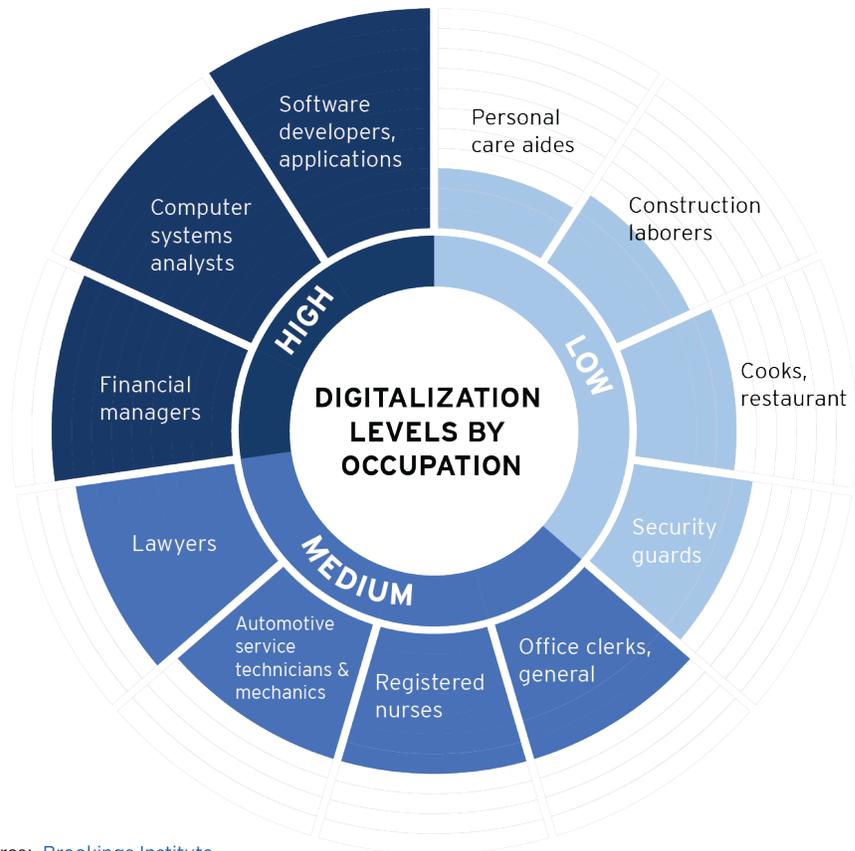
and service-oriented in nature. Such tasks tend to be quite repetitive and can be recreated by intelligent algorithms. According to [the OECD](#), jobs in which 70% (or more) of the tasks are deemed automatable are at the highest risk of displacement. At the opposite end of the spectrum are complex problem-solving tasks that artificial intelligence has yet to be able to recreate. Overall, digitization is transforming jobs by both [expanding the digital content](#) of hundred of existing jobs (see figure 3) and shifting the overall job mix toward more digitally-intensive occupations. The challenge for workers in the “age of the machine” will be to figure out where they can add value and/or perform non-automatable tasks.

**WHAT TO EXPECT
WHEN YOU'RE EXPECTING
[DIGITAL DISRUPTION]**

How will the digital economy transform the economy — even more than it already has? Below is a partial summary of recent predictions from [The Bank of Canada](#) and the academic literature:

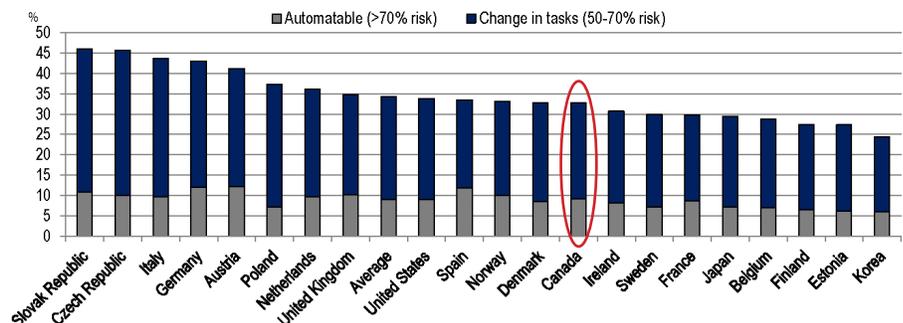
1. *Increased data collection and analysis.* Government and business will be able to collect ever larger amounts of information about consumer and citizen preferences that can be used to predict behaviours and improve service delivery and product offerings. Increased data collection facilitates cross-industry learning opportunities and may bring a host of benefits, including efficiency gains, better health, and improved safety and environmental outcomes. Large

FIGURE 3: **SELECT OCCUPATIONS AND DIGITAL SKILLS LEVEL, 2016**



Source: [Brookings Institute](#).

FIGURE 4: **PERCENTAGE OF WORKERS IN JOBS AT HIGH AND MEDIUM RISK OF AUTOMATION**



Note: Data for the United Kingdom corresponds to England and Northern Ireland. Data for Belgium corresponds to the Flemish Community.

Source: OECD calculations based on the Survey of Adult Skills (PIAAC) (2012) and Amtz, M. T. Gregory and U. Zierahn (2016), “The Risk of Automation for Jobs in OECD Countries: A Comparative Analysis”, *OECD Social, Employment and Migration Working Papers*, No. 189, OECD Publishing, Paris.

Source: [OECD](#).

data sets will help inform fact-based decisions on production and resource allocation.

2. *Personalization and customization.* With more data and analysis, the public and private sectors will be able to better target intended demographic groups and provide more individually-tailored services.
3. *Greater transparency.* Government, business and consumers will be able to track, monitor and verify the performance of others with whom they are transacting or entering into agreements. Advances in Big Data, sensor technology, drones and block chain will facilitate new types of economic transactions, produce real-time feedback for participants, and increase investment certainty.
4. *Interconnectivity.* Advanced communications technology (e.g. cloud computing, video conferencing, virtual reality/augmented reality, mobile devices) allows people and ideas to interact without the physical limitations of geography and differing time zones.
5. *Automation and labour market disruption.* Large data sets will feed into intelligent algorithms that automate systems and enhance productivity. Repetitive tasks are most likely to be replaced by machines, while novel tasks will largely remain within

the purview of human talent. A well-educated and suitably trained labour force will need to be prepared to keep pace with technological change.

BC'S DIGITAL ECONOMY

There are no official estimates of the size of the digital economy in Canada, nor at the provincial level. The high technology sector is the backbone of the digital economy. In BC, the high-technology industry has grown faster than the overall economy for a decade or more. Today, it generates approximately [\\$26 billion a year in revenue](#). In 2016, [150,000 British Columbians were employed in tech-related jobs](#),² in positions ranging from digital animation, gaming, life sciences, software development and clean tech, but also, increasingly,

in forestry, mining, energy, manufacturing, agriculture, medical diagnostics, and transportation. BC is home to the fastest-growing tech workforce in Canada as

well as a host of global technology companies — some locally-based, others larger firms that have established a presence in the province.³ As noted in a recent [Deloitte report](#), BC has the potential to become a leader in the digital economy due to its excellent post-secondary education and training institutions and strategic geographic position close to Asia and within the [Cascadia Innovation Corridor](#).



LEVERAGING BC'S POSITION AS A DIGITAL ECONOMY LEADER

Recently, the Government of Canada announced that it will invest \$950 million in support of a handful of innovation hubs. Also referred to as “superclusters”, these are regions/communities with concentrated industry expertise in more than one technology that can help to accelerate economic growth, innovation and partnerships. A BC-led Digital Supercluster application has been put forward to leverage BC’s position as a digital leader.

What would this supercluster look like? The foundation of BC’s supercluster would be supported by three areas of commercial and research strength, or platforms:

- **data visualization:** uses include visual effects, gaming, simulation and modelling, mapping, as well as [virtual, augmented, and mixed reality](#);
- **data analytics:** uses include machine learning, artificial intelligence, cloud, as well as quantum and supercomputing; and
- **data collection:** uses include data repositories, connectivity, and the Internet of Things.

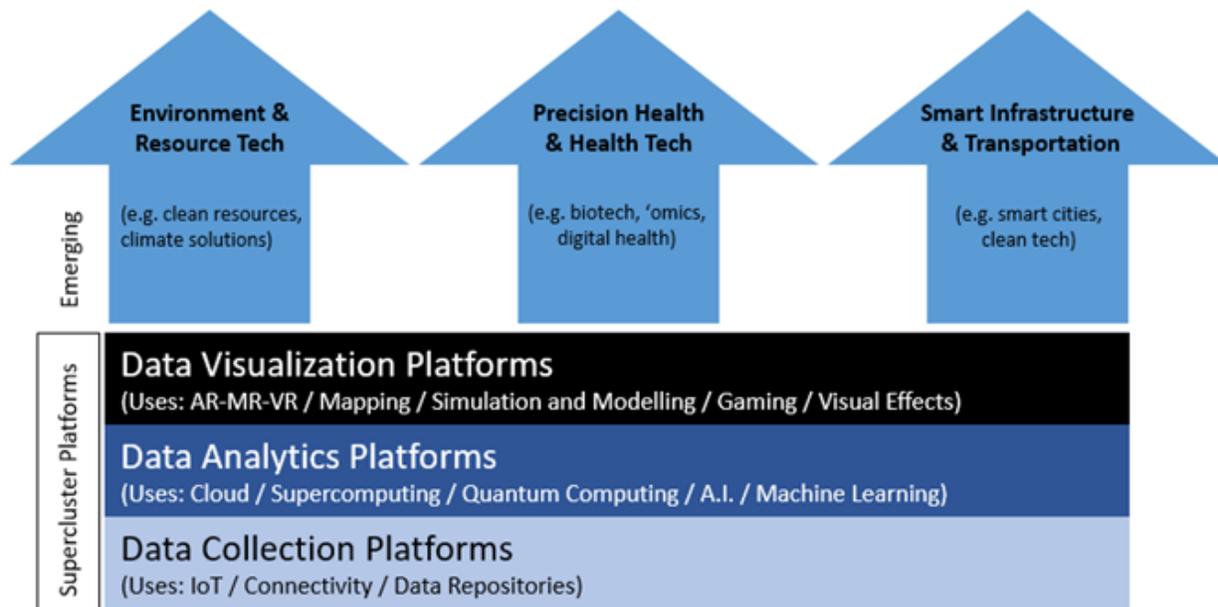
Once established, these platforms would support the growth of other emerging technology clusters within the province:

- environmental and resource technologies (clean resources, climate solutions);
- precision health and other health-related technologies (biotech,

² Of these, more than 90,000 work in industries that produce goods and services that are classified as part of the high technology industry itself by BC Stats; the others are in jobs across the rest of the economy.

³ Some companies include: Microsoft, Amazon, Cisco, Disney, GE, Sony, Electronic Arts, Boeing, Finning, SAP, Sierra Wireless, Wavefront, D-Wave, Hootsuite, Slack, Bardel Entertainment, and Finger Food Studios.

FIGURE 5: **A SNAPSHOT OF BC'S DIGITAL TECHNOLOGY SUPERCLUSTER**



Source: <http://www.bcbc.com/bcbc-blog/2017/tech-tonic-shifts-supporting-the-growth-of-a-bc-tech-supercluster>.

- digital health); and
- smart infrastructure and transportation (smart cities, clean tech).

BC has an opportunity to leverage the forces of disruption and be a leader in the transition of traditional industries to the digital economy. Embracing the cluster approach can enhance the competitiveness of BC and Canada while also supporting our traditional industries — such as natural resources, infrastructure, manufacturing and transportation — as they rely on increasingly sophisticated technologies and data. A digital technology supercluster has the potential to create a more dynamic investment environment, grow more significant BC companies, increase trade, and boost the number of high quality jobs in the province. And, harnessing the power and

potential of the digital economy can allow BC to attract, develop and retain highly skilled people to fuel the future of research, innovation and government and business operations.

MANAGING THE TRANSITION TO DIGITAL

As the Government of Canada decides where its \$950 million in “supercluster” investments will go, there is understandable excitement about nurturing a world-class digital sector in British Columbia. But to successfully manage the transition to digitization and bolster overall productivity, policy-makers should also be considering steps to stimulate the take-up and diffusion of digital technologies, platforms and tools across the economy. It is not enough simply to build a strong

digital technology sector. Even more important is leveraging the benefits that digital technologies offer to improve performance in all industries. De-risking the incorporation of new technologies into the operations of business and government is one priority. Another is developing a qualified and skilled workforce. We need to ensure that education, work-integrated learning, and immigration polices and programs mesh well together to meet the evolving needs of employers and equip people with the skills to prosper in the digital age.

AUTHORED BY

Kristine St-Laurent
Policy Analyst