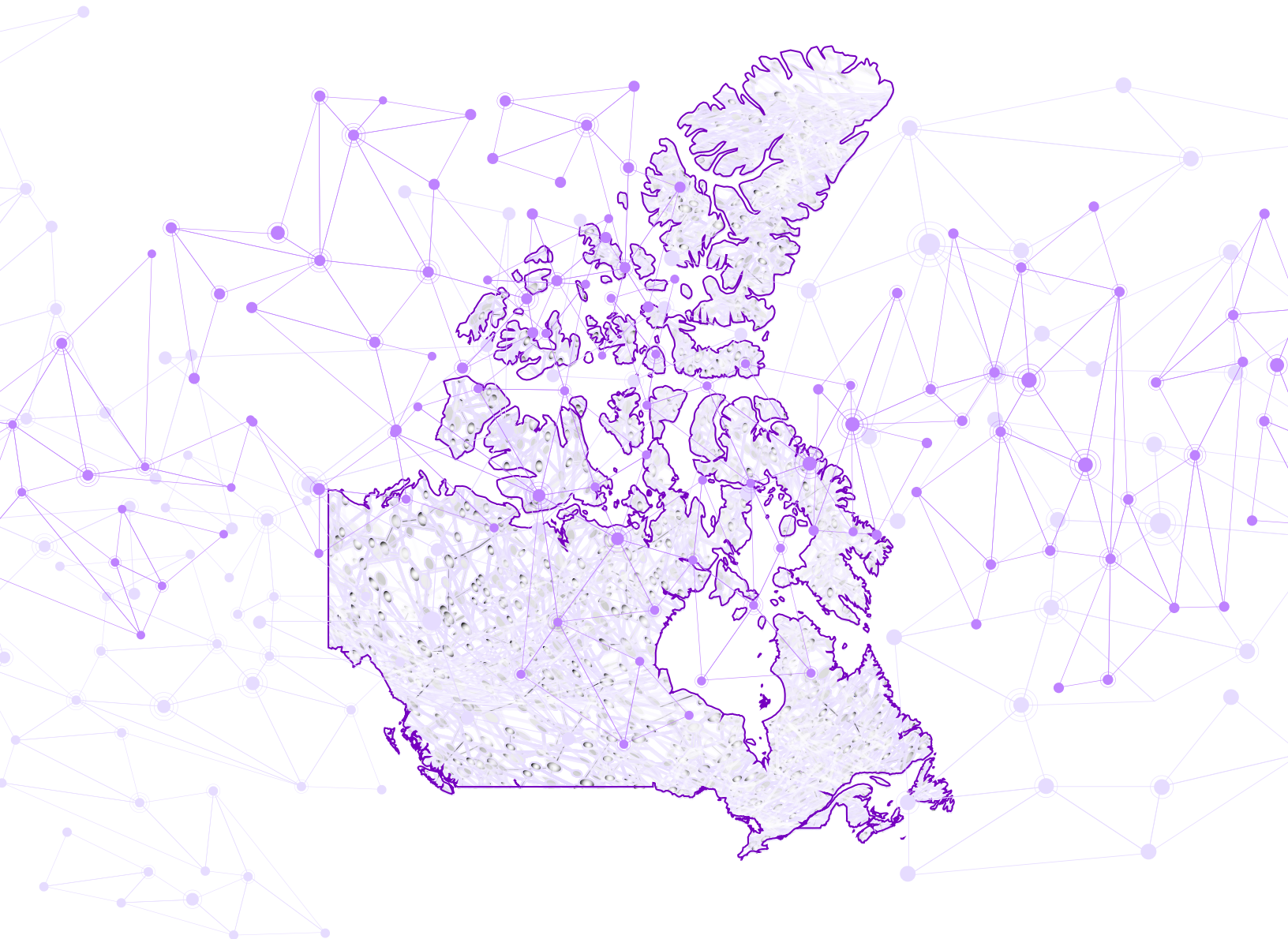


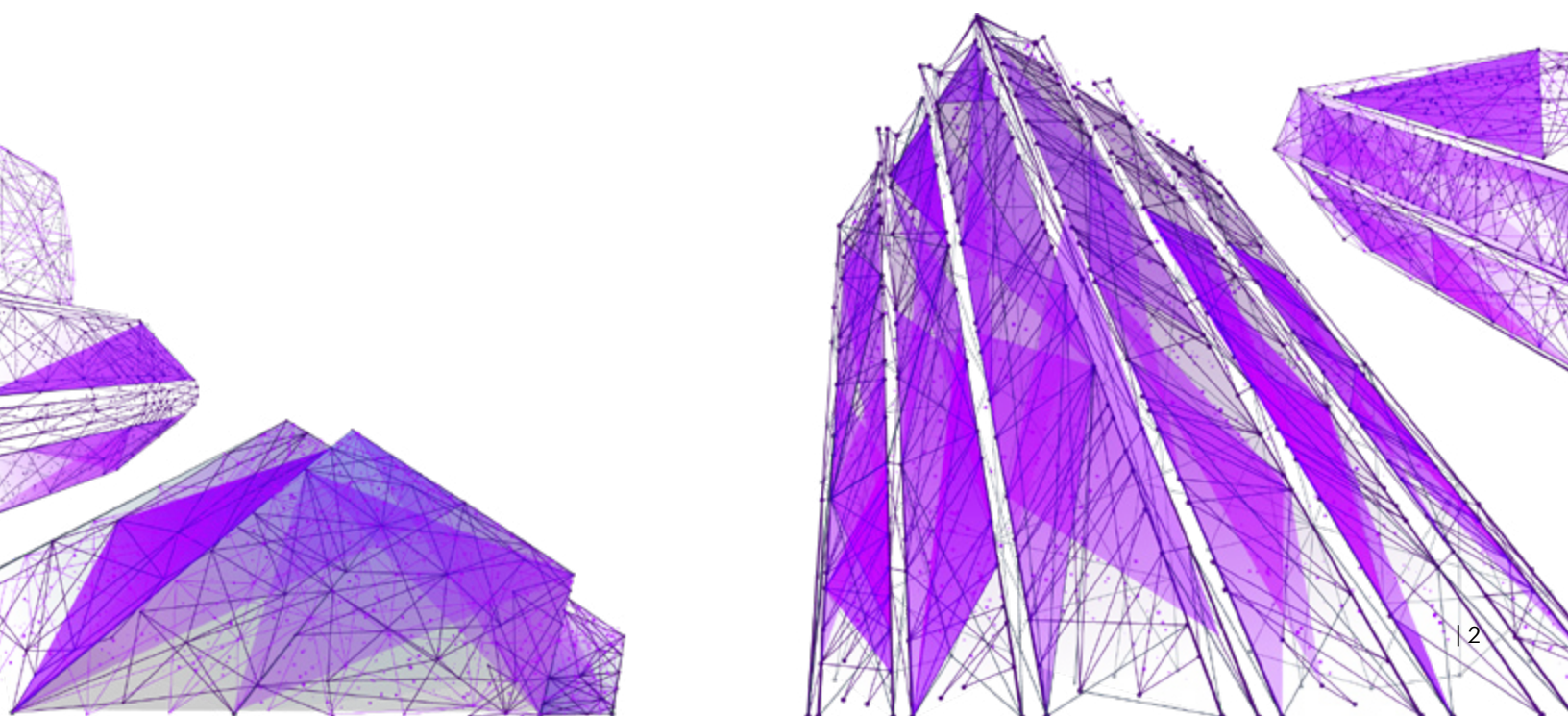
# Investing in Canada's Digital Infrastructure:

## The Economic Impact of Wireless/Wireline Broadband and the Post-COVID Recovery



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# Executive Summary

**Connectivity is no longer a luxury but a basic necessity for Canadians to participate in the digital economy. The exponential growth in digital traffic travelling across Canada's wireless and wireline superhighways, proliferation of connected devices, and rise in NextGen infrastructure unlocking new business models and sparking innovation in the country, shows that the telecommunications industry has become a stable and dependable cornerstone of the Canadian economy.**

Although Canada's overall economic growth had slowed in 2019, Accenture's analysis demonstrates that the telecommunications industry has continued to deliver increasing, meaningful contributions to GDP and employment across the country. Accenture estimates that the telecommunications industry directly contributed **\$74.5B in GDP impact** and **sustained 638,000 Canadian jobs** in 2019 through its value chain and enablement of sales in other industries as a result of increased connectivity. Capital investments into wireless and wireline connectivity by the private sector totaled more than \$10B in 2019.

The COVID pandemic has structurally transformed the way that our society operates and interacts in 2020. These unprecedented circumstances have revealed the resiliency of Canada's connectivity infrastructure, which has permitted Canadians to reliably transition from face-to-face interactions to digital communities, thus sheltering Canada from potentially far more devastating economic and social impacts. Communications service providers (CSPs) have **met or exceeded their COVID response expectations** and will continue to support businesses by improving their network infrastructure to support greater connectivity demands.

**The pandemic has exposed the need for continued investments** from both the private and public sectors into telecommunications infrastructure and services. These continued investments will bridge the urban-rural divide for connectivity, sustain new ways of working and living, support solutions in education for our students, and unlock massive opportunities for all industries to leverage advances in telecommunications services to meet the evolving short- and long-term consumer and business demands. Accenture's modelling estimates that the telecommunications industry's value chain alone will contribute \$199B - \$235B in direct, indirect, and induced GDP to the Canadian economy cumulatively over the next five years while sustaining 300K - 350K jobs annually.



# Introduction

## CWTA's Annual Economic Impact Study

This report, prepared by Accenture, has been commissioned by the Canadian Wireless Telecommunications Association (CWTA) and estimates the economic impact in terms of GDP contribution and employment driven by the telecommunications industry in the 2019 calendar year. While previous studies commissioned by the CWTA focused on the wireless industry exclusively, in this report, Accenture has considered the impact of both the wireless and wireline industries. This decision was made largely because of the increasing convergence of wireless and wireline infrastructure and services as well as the role that both types of technologies have played in keeping Canadians connected and sustaining Canada's economic and social activity during the COVID pandemic.

The economic modelling in this study defines the telecommunications industry as facilities-based network operators supplying wireless and wireline connectivity services. The analysis excludes television/video services and infrastructure as well as satellite connectivity and other supporting sub-industries (dealers, resellers, distributors, application stores, etc.). The economic impact outlined in this study represents the telecommunications industry's contribution to the economy through its value chain as well as the impact on additional industries that could drive greater sales and increase output due to new wireless and wireline connections in 2019. In this analysis, the value chain for the telecommunications industry includes the CSPs themselves (driving direct impact), the suppliers of CSPs (driving indirect economic impact), and the labour employed in the supply chain (driving induced economic impact).

## Summary of 2019 Growth

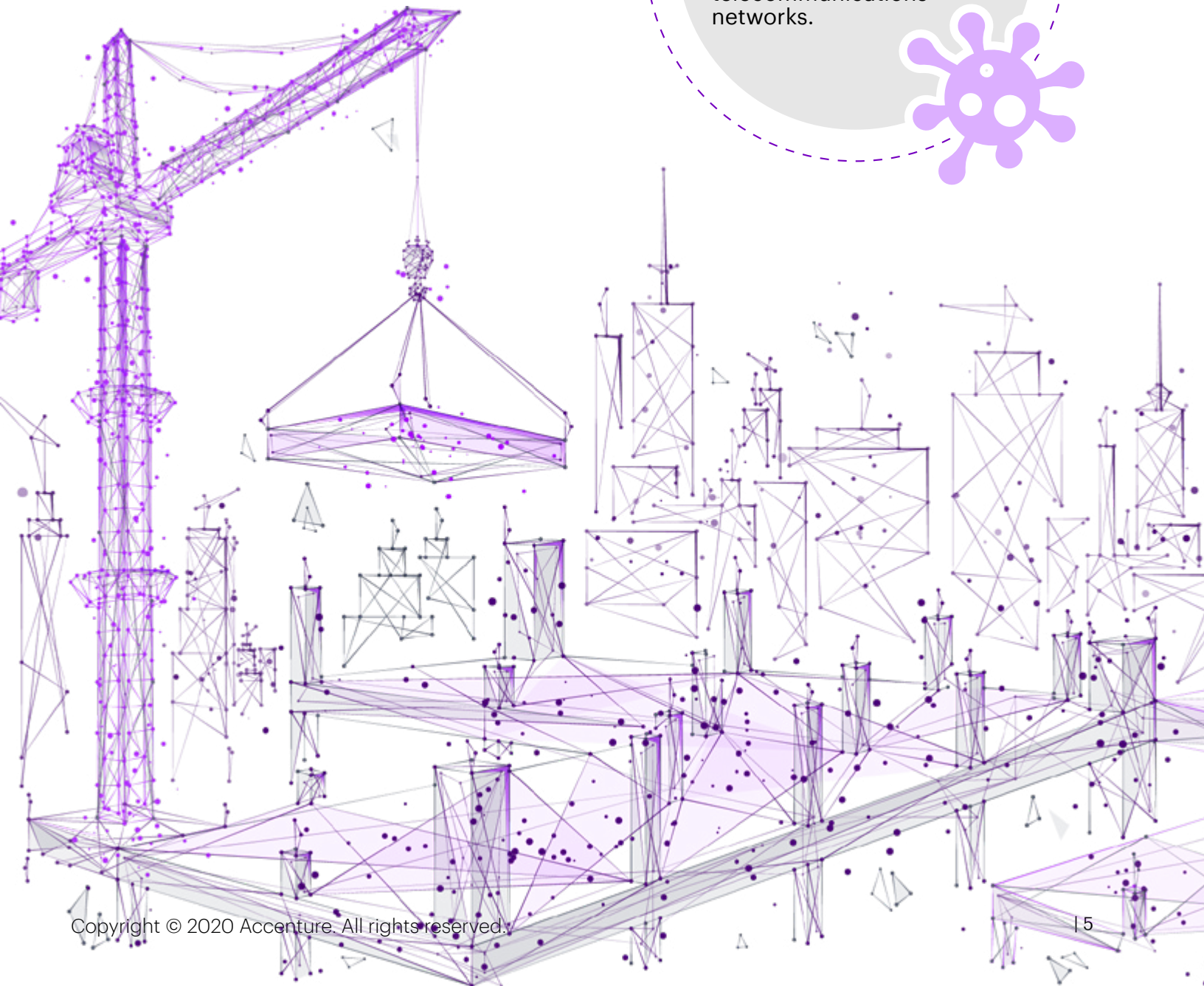
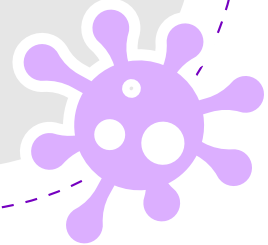
The Canadian economy experienced a modest 1.6% growth in 2019, down from 2.0% in 2018.<sup>1</sup> While the overall economy grew at a decreasing rate, the output of the Canadian telecommunications industry's value chain in 2019 grew by 2.6%, with a 1.2% historic 5-year CAGR. This growth was catalyzed by the telecommunications industry's significant capital investment in 2019 of more than \$10B towards wireless and wireline connectivity infrastructure, products and services,<sup>2</sup> as well as an additional \$3.5B in acquiring new spectrum licenses to support the launch of 5G services which began in early 2020 across Canada.<sup>3</sup>

## COVID Context-Setting (2020 and beyond)

The COVID pandemic has placed overwhelming pressures on the Canadian economy. Following a 2.1% and 11.5% drop in real Gross Domestic Product (GDP) for the first and second quarters of 2020,<sup>4</sup> respectively, the National Bank of Canada has forecasted that annual Canadian GDP will contract by 5.5% in 2020.<sup>5</sup> The impact on the economy would be much more significant if not for Canada's robust telecommunications networks. The resilient network infrastructure enabled Canadians to rapidly transition to digital solutions that allowed businesses, corporate offices, contact centers, governments, and educational institutions to remain operational while lockdown orders were in effect to ensure the safety of Canadians.

The telecommunications industry will also play a significant role in the economic recovery of a post-COVID world. The federal government can expedite telecom-led economic growth and job creation by ensuring a stable regulatory environment that encourages private investment in expanding network infrastructure and the next generation (NextGen) of telecommunications technologies. Where network expansion or capability advancements are not economically viable, federal and provincial governments have recently announced funding initiatives that will complement the on-going investments being made by facilities-based network operators. An example of this is the recent launch of the Federal Government's \$1.75B Universal Broadband Fund<sup>6</sup> and the allocation of up to \$2B in low-cost financing from the Canada Infrastructure Bank Growth Plan to go towards the financing of broadband projects.<sup>7</sup>

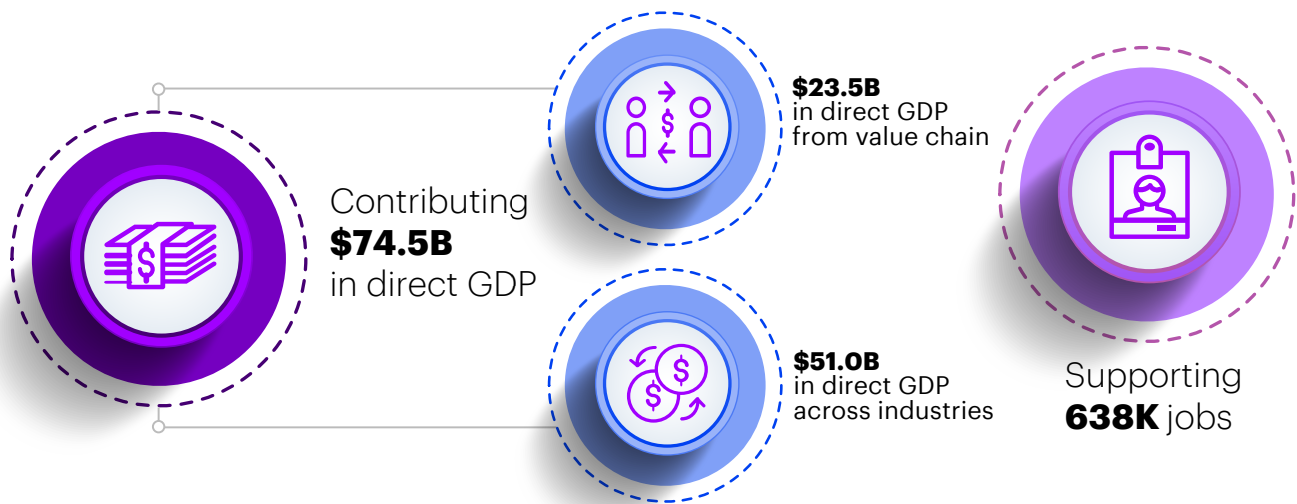
One can only imagine how much greater the impact of COVID could have been on the Canadian economy if Canada did not have robust telecommunications networks.



# Telecommunications Industry's Contribution in 2019

## Economic Contribution

### The telecommunications industry's direct contribution to the Canadian economy (2019)



All values are related to **direct** effects

Accenture estimates that the telecommunications industry (wireless and wireline) directly contributed \$74.5B in GDP impact, representing 3.7% of Canada's overall annual GDP in 2019.<sup>8</sup> This GDP contribution is composed of \$23.5B direct impact from the value chain of CSPs and \$51.0B direct impact due to other industries increasing their sales and output by adding incremental wireless and wireline connections. The direct impacts of the telecommunications industry, both within the industry itself and across industries which have benefitted from an increase in connections, supported 638K jobs across Canada.



## Impacts from the Telecommunications Industry's Value Chain

In addition to \$23.5B in direct GDP contribution, the telecommunications industry's value chain contributed \$11.3B in indirect and \$8.2B in induced GDP in 2019, for a total of \$43.0B in GDP contribution. Due to the way that the indirect and induced effects of the CSP's value chain are estimated, they are omitted from the calculation of total economic contribution above to avoid any overlap with the cross-industry direct impacts of \$51.0B. Investments and activity within the telecommunications industry's value chain are meaningful, with each \$1 of direct GDP contribution resulting in \$1.8 of total GDP impact across the value chain. The telecommunications industry's value chain also supports 307K Canadian jobs as every direct telecommunications job results in 2.3 jobs supported in the Canadian economy. Similarly, every \$1M in telecommunications sales supports 4.2 jobs in the Canadian economy.

## Breaking down the \$43.0B in GDP contribution from the telecommunications industry's value chain (2019)



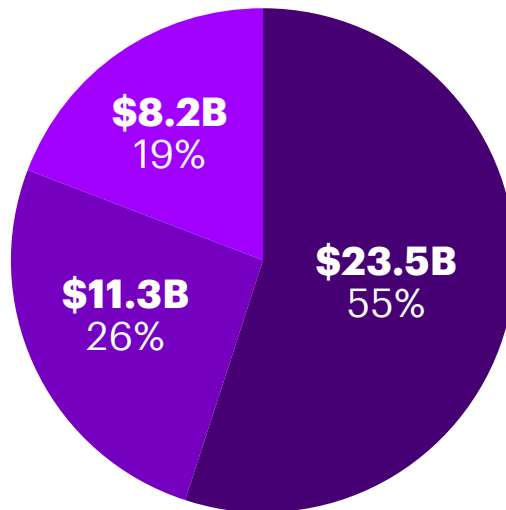
### Induced effect

The economic impact generated from increased consumer spending and household income



### Indirect effect

The economic impact generated indirectly through the supply chain as a result of rising demand from the industry

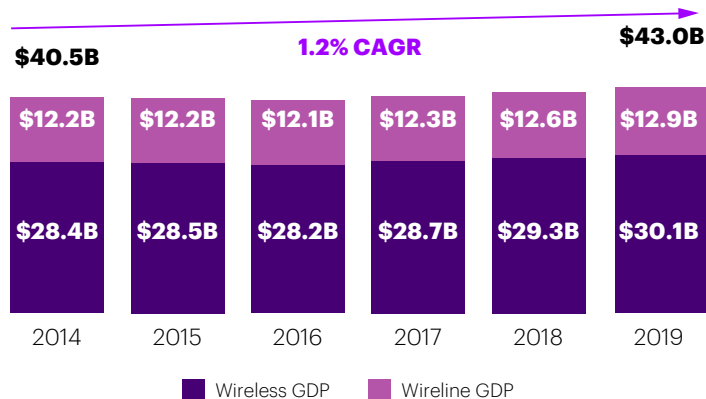


### Direct effect

The initial and immediate economic impact (GDP, earnings, and jobs) generated by the industry

The telecommunications industry's value chain has been a steady and dependable contributor to Canadian GDP over the previous 5 years, with contributions increasing at a compound annual rate of 1.2% - from \$40.5B in 2014 to \$43.0B in 2019. Between 2018 and 2019, the value chain's GDP contribution increased by 2.6%. Examined independently, the wireless value chain GDP contribution increased from \$28.4B in 2014 to \$30.1B in 2019 and the wireline value chain contribution increased from \$12.2B in 2014 to \$12.9B in 2019.

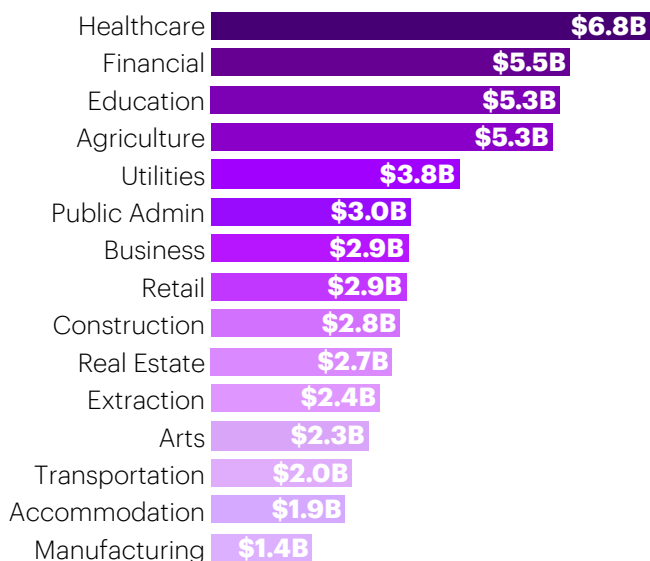
## The growth in GDP contribution by the wireless and wireline value chain



## Impacts from Incremental Connections Across All Industries

Another way to examine and articulate the meaningful impact of the telecommunications industry on the Canadian economy is to explore how telecommunications services are used by other industries to produce and sell their goods and services. Increases in sales across all industries from the rise in new connections of telecommunications services (i.e., incremental connections from 2018 to 2019) resulted in \$51.0B in GDP contribution to Canada's economy, of which 72.2% was driven by wireless connection growth and 27.8% was driven by wireline connection growth. Distinct from the direct value chain contribution, this impact captures the innovative ways in which other industries adopt telecommunications services and products to increase their output. Examples of this effect include transit authorities increasing ridership revenue by offering connectivity on buses and subways, and mining enterprises increasing their productivity by using connected sensors and real-time remote automation.

## Direct GDP contribution from the rise in new connections of telecommunications services across all industries





## Non-Economic Contribution

In addition to an economic contribution, the telecommunications industry provides Canada with various social and environmental benefits. As a result of ongoing investment in wireline and wireless networks, Canada's facilities-based carriers are expanding their networks into underserved areas and helping to reduce the rural and urban digital divide. Easing the digital divide is important, because having adequate broadband connectivity has become a baseline requirement to participate in the modern economy. These investments not only result in economic growth but can also increase the standard of living for Canadians in these communities. For example, access to digital networks enables online education opportunities, remote healthcare, broader employment prospects, and reduces social isolation.

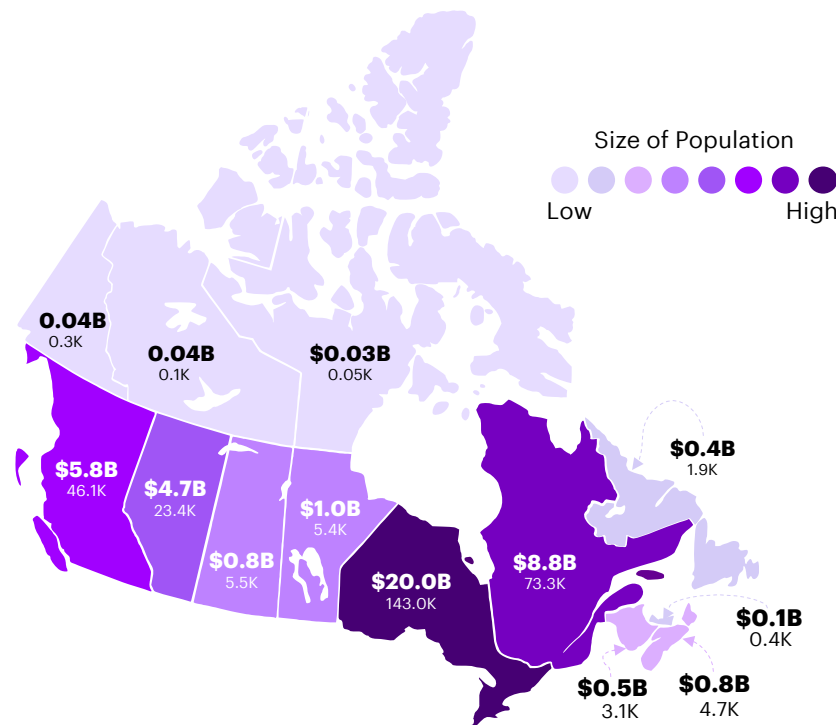
From an environmental perspective, Accenture's previous paper commissioned by the CWTA: [Accelerating 5G in Canada: The Role of 5G in the Fight Against Climate Change](#), outlined numerous advances in telecommunications services that enable all industries to innovate towards reducing human-made climate change, including adaptive traffic signals to reduce vehicle greenhouse gas emissions by optimizing travel time and sensed infrastructure to manage and analyze emissions emitted by buildings. These social and environmental benefits are amplified and even more apparent when considering COVID's impact on Canada in 2020 and beyond.

# Network Investment as a Key Factor in Economic Growth Across Canada

The convergence of wireless and wireline technologies and investment across both wireless and wireline infrastructure has played, and will continue to play, an important role in bridging the digital divide, meeting the growing demand for connectivity, and ensuring that Canadians benefit from the latest technological advancements in telecommunications. While not all historical data is available, CSPs have invested at least \$54.3B in wireless CAPEX since 1987 and \$150.3B in wireline CAPEX since 1996, as well as over \$18B in spectrum auction fees to establish Canada's current national infrastructure.<sup>9</sup> In addition to capital investments in 2019 totaling more than \$10B into wireless and wireline connectivity,<sup>10</sup> CSPs spent \$3.5B to acquire 600 MHz spectrum licenses to support their launch of 5G services across Canada. The next auction (postponed to June 2021 because of COVID) will be for 3500 MHz spectrum licenses. This spectrum is internationally considered to be a well-suited band for 5G deployment and uniquely beneficial for serving remote and rural communities.

## The Expansion of Digital Networks

### The GDP and jobs contribution of the telecommunications industry value chain by province and territory (2019)



Looking across Canada in 2019, the impact of the telecommunications value chain is ubiquitous, with substantial contributions both to GDP and jobs in every province and territory. Unsurprisingly, the impact on GDP and jobs is strongly correlated with population size and broadband service availability. Although increasing connectivity to remote populations across Canada's vast geography presents many challenges for CSPs (e.g., higher costs to build and limited scale to generate return on infrastructure deployment), continued investment in network expansion for CSPs, alone and in partnership with the public sector, has resulted in economic and social benefits for communities that were previously unserved or underserved. As referenced in a previous Accenture report commissioned by CWTA: [Accelerating 5G in Canada: Benefits for Cities and Rural Communities](#), studies show that a 10% increase in broadband penetration can achieve a 0.9% to 1.5% increase in GDP growth for a given region.<sup>11</sup> These regionally targeted investments have been deployed in line with the Federal Government's objective to make 50/10 Mbps broadband coverage available to 98% of Canadians by 2026, and 100% by 2030.<sup>12</sup> A continued focus on bridging the digital divide and achieving universal national broadband availability has the potential to drive tremendous marginal economic and social benefits throughout Canada.

## Meeting Growing Demand and NextGen Infrastructure

In addition to expanding the footprint of Canada's digital infrastructure, CSPs continue to invest in adding network capacity and introducing advanced technologies, such as 5G, to meet the increasing demand for advanced telecommunications services. The key drivers underpinning this growing demand are increasing data consumption, more connected devices, and the need for additional service capabilities offered by NextGen infrastructure.



**Data Consumption:** Canadian mobile data traffic grew 42% in 2019 to reach 1,704 PB.<sup>13</sup> This growth is a long-term trend that has been accelerated by the COVID pandemic and will continue as new 5G high-bandwidth services and fiber infrastructure continue to be expanded.



**Connected Devices:** There were more than 33M wireless subscribers in Canada in 2019.<sup>14</sup> It is expected that there will be 423M networked devices and 96M mobile connected devices in Canada by 2023, representing an 11.5% and 15% CAGR, respectively.<sup>15</sup> Small and medium-sized businesses (SMBs) and enterprises continue to drive network demand through the proliferation of Internet of Things (IoT) and Machine-to-Machine (M2M) connected devices, with the number of M2M devices in Canada expected to reach 271M by 2023 while growing at an 18% CAGR from 2018 actuals.<sup>16</sup>



**NextGen Infrastructure:** Interlinking wide, local, and personal access technologies will be an important driver of NextGen telecommunications, including 5G, cloud and edge computing, software-defined networking (SDN) and network-function virtualization (NFV), and fiber-to-the-home/premises (FTTH/P). Although they require significant investments, these technologies will act as operational enablers for data to move freely and easily, which will unlock new applications, device ecosystems, and exponential data processing and analytics power, enabling new business models to emerge across the economy.

Investments into network expansion, added capacity, and new technologies will be key to the role that the telecommunications industry will have in Canada's economic recovery and the post-COVID world.

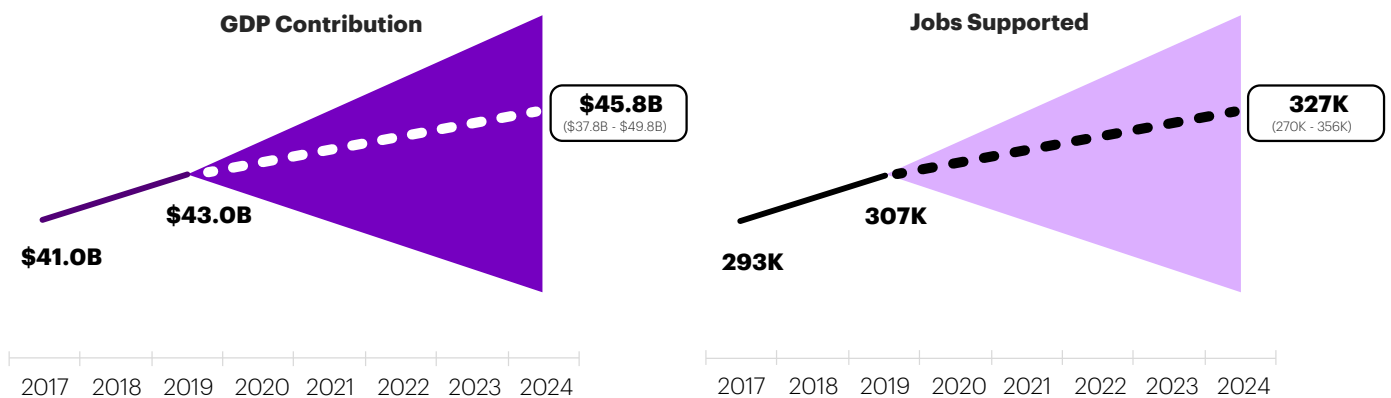


# Outlook: Telecommunications in the Economic Recovery and a Post-COVID World

## Economic Impact for 2020 – 2024 from the Telecommunications Industry’s Value Chain

Looking at 2020 and beyond, Accenture estimates that the telecommunications industry’s value chain will cumulatively contribute \$199.0B - \$234.9B in direct, indirect, and induced GDP impact to the Canadian economy over the next five years, and will support up to 356.3K Canadian jobs by 2024. Due to the exponentially greater number of variables that would need to be assumed relative to the estimate of economic contribution for 2019 in the first part of this report, these forward-looking estimates do not account for or seek to estimate the direct impact that incremental connections have on the sales and output of other industries. Consistent with the rest of this study, the baseline scenario uses Oxford Economics projections. The optimistic and pessimistic scenarios are informed by investment guidance provided by the telecom industry and broader secondary research on the likely impact of COVID and projected revenue trends for telecommunications in Canada. Relative to the baseline increase in connections projected over the next five years, the optimistic and pessimistic scenarios predict GDP contribution by assuming a 1.5% increase or decrease in sales growth as a result of new connections.

### Projections for the economic impact of the telecommunications industry’s value chain



# COVID's Impact on Relevant Trends in the Telecommunications Industry

While COVID has depressed the Canadian economy, it has also given rise to trends and consumer behaviors that will increase the demand for resilient networks and CSP services, resulting in a positive baseline outlook for the telecommunications industry's economic contribution to Canada in 2020 and beyond. The rise in remote working, learning, services, and living has increased demand for stronger connectivity networks, greater trust and safety, and technology-driven working and social practices. COVID is also fueling business innovation to support post-COVID growth and recovery plans.

## Short-Term Impact: An Accelerated Transition to a Digital Society

COVID has shifted short-term and long-term consumer and business priorities. The rise in remote working, learning, and socializing has highlighted the importance of resilient and uninterrupted network connectivity, with 64% of consumers thinking that home broadband is more important now than before the crisis.<sup>17</sup> These daily remote activities have become mission critical for many Canadians, which is a challenge since many households now have multiple people competing for bandwidth availability under the same roof.

The convergence of every component of day-to-day living has resulted in face-to-face interactions rapidly transitioning towards a digital society, and one that can be enabled from every Canadian's home. A series of reports published by the CWTA during the early months of the pandemic ([Part 1](#), [Part 2](#), and [Part 3](#)) point to an increase in wireline traffic by as much as 48.7% for download and 69.2% for upload,<sup>18</sup> mobile traffic increasing by as much as 41.5% for download and 40% for upload,<sup>19</sup> and mobile voice minutes increasing by as much as 60% when compared to pre-COVID baselines.<sup>20</sup>

Reflecting on the performance to-date of telecommunications services through these peak periods, 90% of consumers felt that their CSPs met or exceeded their COVID response expectations.<sup>21</sup> This strong performance has led to 36% of Canadian consumers expecting to work from home more in the future, and 26% of consumers being willing to pay for solutions that would help them communicate with friends and family more effectively.<sup>22</sup> Businesses will be looking to CSPs in the near term to help them quickly upgrade and improve their legacy infrastructure to support greater ongoing connectivity demands, suggesting increased reliance on telecommunication services in the future.

Businesses and consumers are increasingly reliant on their CSPs to safeguard their data and online privacy while they are working and socializing virtually from home. Landline and mobile communications were least disrupted during COVID, resulting in 45% of SMBs increasing their trust in their CSP.<sup>23</sup> Relative to other digitally-oriented industries,

Canadian CSPs have remained trusted stewards of their consumers' data, with 74% of Canadians trusting their CSP for data security, relative to 62% globally.<sup>24,25</sup>

Canada's ability to sustain economic and social activity in the face of a global pandemic was not a given. The significant capital investments CSPs have made over the years to establish a resilient national telecommunications infrastructure in Canada have played a key role in supporting Canadians during this difficult period, providing the level of performance, stability, and confidence that enabled Canadians to accelerate their transition to a digital society.

## Long-Term Impact: New Consumption Models in a Tech-Enabled Society

Statistics Canada estimates that close to one third of Canadian businesses expect that 10% or more of their employees will telework post-pandemic, while a higher percentage of businesses in some sectors such as information and culture industries (47.2%), and the professional, scientific, and technical sector (44.5%), are expecting the same.<sup>26</sup>

The increase in long-term demand for connectivity for Canadian businesses will be driven by the rise of new consumer consumption models, including e-commerce, tele-education, telehealth, and virtual entertainment. These new models have long-term implications beyond COVID, including the digitization of commerce, rise in cloud and edge computing, and continued enablement of remote workforces. The digitization of commerce in Canada is widespread, with eCommerce sales peaking in May 2020, up 110.8% year-over-year, and the proportion of retail sales taking place online rising to 11.4% in April 2020 relative to 3.8% in April 2019.<sup>27</sup> The increased concerns around business resiliency and productivity have resulted in 63% of SMBs planning to increase their use of the public cloud.<sup>28</sup> Some businesses will look to NextGen technologies, like cloud and network edge computing solutions, to help meet the new connectivity needs of their growing remote workforces.

Consumers and businesses will also see COVID as a catalyst to rebuild a more resilient, environmentally conscious, and technologically enabled society that can manage the proliferation of connected devices and rise in new consumption models. Governments and businesses are looking at 5G, cloud, and expanded broadband connectivity to fuel the required innovation and growth in a post-COVID world. In the pursuit of a more environmentally conscious and technologically enabled society, 5G will also be a catalyst for developing smart city infrastructure, including optimizing waste systems, managing traffic applications, and connecting a smart grid. These improvements will help to save fuel and emissions, enabling a green economic recovery.

According to a Google survey, 2.8M Canadians across all ten provinces have seen their living situations altered since COVID began.<sup>29</sup> With the rise in remote working and re-location out of urban areas towards suburbs and rural communities, the public and private sectors are both actively looking to increase broadband penetration to connect all Canadians to the digital economy.



# The Art of the Possible: CSP Services in Action

**Canada's health, public transit, education, and mining industries offer promising examples of how advances in telecommunications services enable sectors to address new ways of working and living while achieving short- and long-term social and economic benefits.**





Canada was an early pioneer in the development of virtual health care, using telephone consultations to remote sites across Newfoundland in the 1970s.<sup>30</sup> Canada has since been far surpassed by other countries in the uptake of virtual care, with only 1% of Canadians reporting using virtual care or online patient portals in 2018.<sup>31</sup> However, because of COVID, the health sector has begun to transition from face-to-face delivery models towards connected health. To fully capture the value of connected health, **the health sector can leverage advances in telecommunications services to address the need for proactive, geographically available, and predictive virtual care tools.**

Connected health is a healthcare management model that designs devices and services around patient needs and encompasses healthcare adoption of tele-health, wireless technologies, and data sharing services. The annual benefits of achieving full adoption of connected health, according to Canada Health Infoway in 2018, would be \$3.9B in health system value, 76M total patient hours saved, 15M total healthcare provider hours saved, and \$732M in economic productivity gains.<sup>32</sup> This adoption would directly improve the patient experience by increasing system capacity, widening access for specialized and non-specialized treatment across Canada, and reducing wait times.

COVID and connected health trends may strengthen the business case for private players to invest in broadband infrastructure for underserved communities across Canada. First, some Canadians that were previously content with the traditional healthcare system but have now experimented with telehealth may be willing to pay a subscription premium to continue using virtual health care services. For example, 40% of Canadians in 2019 said they would subscribe to paid virtual service that offered 24-7 access to a known physician.<sup>33</sup> Second, connected health will be uniquely helpful for patients requiring specialized treatment, such as tele- mental health for Canadians living in rural municipalities with a shortage of available mental health care providers. Finally, subscribers adopting connected health will need greater bandwidth capacity to accommodate telehealth's increasing data transport needs.

While 82% of Canadian physicians used electronic records in 2017, only 8% of patients could review their health information online, 6.5% could request appointments online, and less than 2% could alter their electronic records.<sup>34</sup> The Canadian healthcare sector can leverage cloud technology advances to improve the patient experience and roll-out advanced connected health services. For example, once patient data is uploaded to the cloud, healthcare providers can conduct patient analytics, observe social determinants of health, and remotely collaborate to advance treatment precision, boost clinical outcomes, and scale clinical research. With proper training and adherence to applicable federal and provincial health acts and privacy regulations, connected health will provide a transparent and secure source of patient information. Ultimately, the benefits of improved patient experience, reduced strain on providers' time, increased access to health services for underserved communities, more precise treatment, and greater visibility into medical records substantiate the case for increased infrastructure investments required to support healthcare providers' new connectivity needs.



COVID has drastically reduced ridership on Canadian transit lines, with an 85% year-over-year decline in April 2020<sup>35</sup> and a projected 58% drop in Canadians taking public transit to their offices after the pandemic.<sup>36</sup> Public transit may continue to suffer as commuters elect to either work remotely or use other modes of transportation. As a result, the public transit sector needs to build a recovery and growth plan focused on restoring ridership. **Transit agencies can invest in telecommunications services that improve the passenger experience, create new consumption models, and advance passenger and employee safety.** These solutions will help to capture the commuter market in a post-COVID world.

Historically, Canada's subway systems have been a productivity 'dead zone', which is misaligned to consumer preferences since 98% of rail users expect a rail network to do more than get them from point A to B.<sup>37</sup> Building stronger and more exhaustive connectivity networks across the transit system would allow commuters to be more productive, whether by working, online shopping, or consuming digital media. From a productivity standpoint, 78% of workers would use public transport to get to meetings if they could reliably work on documents.<sup>38</sup> Other improvements to passenger experience could include coordinating payments across districts and the enablement of contactless payment options via personal mobile devices. Especially now with COVID, customers want to minimize contact payments by fully utilizing their personal devices. These investments will provide transit authorities with direct value through greater customer data collection, which they can use to improve the customer experience and safety. They may also be monetizable, as 36% of passengers said they would pay more for their rail network if they received high-speed internet, and 28% said they would pay more for no black spots in mobile service.<sup>39</sup>

Enterprises should also look at advances in telecommunications services to explore the end-to-end passenger experience. In Accenture's previous paper commissioned by the CWTA: [Accelerating 5G in Canada: Benefits for Cities and Rural Communities](#), use cases related to smart traffic navigation and autonomous vehicles were outlined to improve traffic congestion. Furthermore, the deployment of 5G and other NextGen technologies that increase network capacity can help transit authorities manage and plan for capacity requirements in real-time by connecting their commuters with nearby traffic flows.

Advances in telecommunications services can also be used to improve passenger safety and the coordination of trains. Using sensors and connected devices, transportation entities can send safety messages to proximity-appropriate commuters and real-time updates to commuters' personalized devices when their train is delayed or cancelled. Transportation entities can also invest in positive train control, which is a train protective system that monitors and controls train movements to safeguard against human error and prevent derailments and collisions. To deploy these safety and coordination measures, resilient and exhaustive connectivity networks need to be built and maintained.

Implementing sensors and connected devices will also allow transit entities to monitor and improve their operational and energy efficiency, thereby reducing costs and emissions. As mentioned in [Accelerating 5G in Canada: The Role of 5G in the Fight Against Climate Change](#), traffic congestion is rapidly rising. Improving the overall transit experience will encourage commuters to continue using public transit, resulting in reduced road congestion and emissions.





The educational technology (EdTech) market has been growing for years, with global investments increasing by 30% in 2017.<sup>40</sup> COVID has hyper-escalated this growth now that people worldwide are opting for remote classrooms and offices. **Advances in telecommunications services provide creative opportunities to reimagine education, across telelearning for students and virtual training for remote workforces.**

Even when given the option, Canadian students have opted for a virtual classroom during COVID, with 72,000 students in Toronto choosing online learning for the 2020/21 school year.<sup>41</sup> This increased demand for online learning amplifies the need for broadband connectivity – whether wired or wireless. For students, broadband connectivity is imperative to have resilient two-way video throughout the school day. Considering connectivity challenges in rural and remote communities, limited availability of high-speed internet may further propagate a long-term divide in access to quality education. This will be compounded when only select communities have the bandwidth to support new EdTech innovations with advanced learning capabilities. Teachers managing both virtual and in-person classrooms will require re-tooling and -training, as well as vast server capacity. In the absence of adequate broadband access, creative short- and medium-term telecommunications solutions can be adopted. For example, underserved communities can equip school buses with mobile and WiFi hotspots, hang hotspots from existing aerial broadband lines, and disseminate drones capable of deploying standalone and secure 5G networks.

The rise in remote working has changed the way modern Human Resources (HR) teams train and engage their workforce. Companies who have embraced this change and lead their peers in employee experience and satisfaction have achieved a 116% market return increase over the S&P 500 benchmark.<sup>42</sup> This can be attributed in part to advancements in remote employee training and onboarding, with companies increasingly shifting away from in-person training centers to cognitive-based-training and e-learning curriculums. This shift has increased the dependency for businesses on resilient connectivity to deliver a rich multimedia and immersive experience that parallels the impact of in-person training on employee engagement and skills development.



Pulling wire and ethernet cable in a plant is costly and particularly difficult in a mine where the terrain is always changing. **Connectivity in the mining industry is a prime example of the convergence of wireline and wireless infrastructure.** One approach frequently employed by mining companies is to deploy wireline infrastructure from urban cities to a nearby wireless radio and then build a more resilient, scalable, and ubiquitous wireless mesh network locally, adaptable to the dynamic landscape of the mine. With a strong connectivity network in place, a connected mine can leverage mobile, tracking, analytics, and cloud technology to begin collating data and information into a digital application. **This connectivity allows the mining industry to adopt remote working to address labour gaps, reduce wage expenses, and improve mine productivity.**

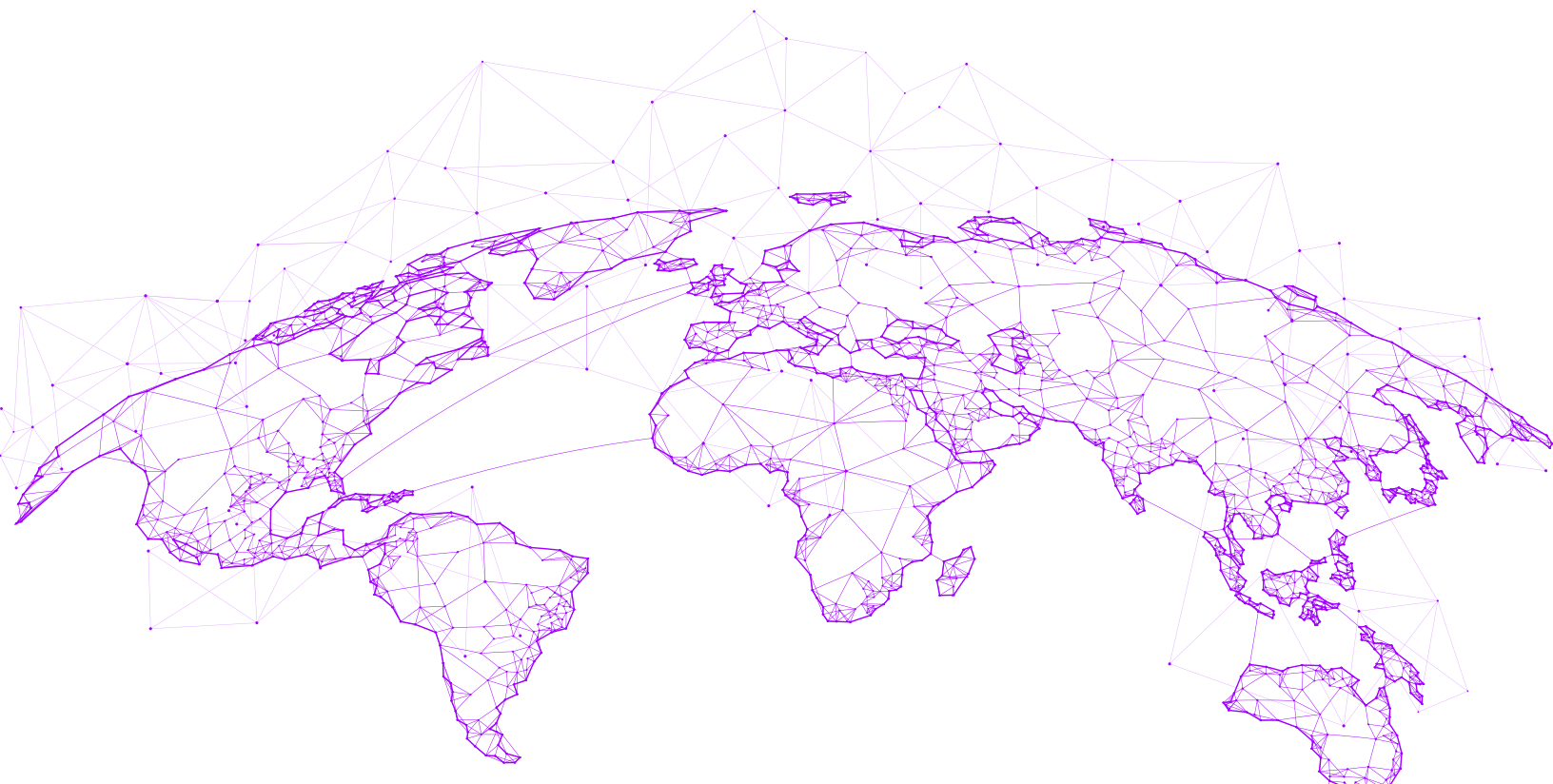
Canada is the 3rd richest country in the world in terms of natural resources, with \$33T worth of commodities.<sup>43</sup> However, the minerals and metals are extracted in predominantly remote areas located in 200+ mines and 7,000+ quarries across the country.<sup>44</sup> As a result, the mining industry must pay its workers \$37,000 - \$51,000 more than comparable industries to attract top talent for these remote locations.<sup>45</sup> The Canadian mining industry has a labour and skills gap, with expected demand for 79,680 new workers by 2030, a large proportion of which would be replacing skilled retirees.<sup>46</sup> Accenture's previous paper commissioned by the CWTA: [Fuel for Innovation: Canada's Path in the Race to 5G](#) outlined how Industrial Internet of Things (IoT) sensors can be used to predict maintenance needs and reduce costs through a reduction in unplanned downtime. Along with the convergence of wireless and wireline networks, these sensors can also enable remote expertise functionality. Remote expertise can help mitigate the skills gap as field experts can use videoconferencing and real-time dashboards to work on mines irrespective of their physical location. This would allow the mining enterprises to save on labour and transportation expenses.

The Fuel for Innovation paper further mentioned the role of 5G technology in improving productivity by shifting from computing power to the edge of the network, allowing for low latency predictions. Productivity can be further enhanced by combining private LTE with 5G technology to implement automation, autonomous drones, and remote monitoring, all while passing data through a ubiquitous network. For example, a remotely-located mine site operator could monitor real-time energy consumption levels to identify inefficiencies and reduce waste. Due to their remote location, they can easily log-on at any time of day to assess mining operations and take necessary action.<sup>47</sup> Given the nature of mine sites, remote working will also drive greater safety and health benefits for employees.

# Conclusion

Although the Canadian economy will likely continue to see depressed growth as a result of COVID, the telecommunications industry will continue to be a driving force of economic activity. Resilient connectivity and stable networks have become a key priority for businesses, consumers, and the federal government. As the infrastructure to scale 5G networks is deployed, various new business models and use cases across all industries will be unlocked, which can drive significant economic activity across Canada. Investments in NextGen technologies, such as cloud and edge computing, will increase productivity and exponentially grow the capabilities of existing products and services across many industries. Both the public and private sector have an ongoing role to play in making this a reality.

While government funding initiatives for increasing connectivity in underserved areas are important, private sector funding will remain a key driver of expanding connectivity into these areas. To foster the necessary private sector investments in expanding and upgrading Canada's digital networks, the federal government should ensure that Canada maintains a stable regulatory environment that allows for reasonable rates of return on investment. Governments can also play a key role by identifying and greenlighting specific projects for public investment allocation on a timely basis and further coordinating the available programs, including the Universal Broadband Fund, Canada Infrastructure Bank Growth Plan, CRTC Broadband Fund, and multiple provincial funding programs. This support will enable the private sector to continue investing in underserved areas where the business case for deployment may not otherwise be economically feasible and amplify the impact of the billions of dollars invested each year by CSPs in wireless and wireline connectivity in Canada.



# About This Paper

## About the Study

This study, commissioned by the CWTA and conducted by Accenture Strategy & Consulting, is an annual review of the telecommunications industry's impact on Canada's economy. In prior years, CWTA's commissioned studies focused on the wireless industry alone. This year the study is focused on the economic impact of both wireless and wireline communications service providers in 2019, and their role in the COVID recovery. The methodology used in this report differs in part from that used in previous economic impact studies commissioned by the CWTA, making direct comparisons difficult and not recommended.

Economic contribution modeling allows an estimation of how the current state of an industry supports the broader local economy. This type of model uses Input-Output (I/O) tables, constructed from standard economic accounts which measure intermediate purchases and demand between industries, as well as the actions of institutions. This allows for the calculation of multiplier effects through other industries (indirect) as well as household spending patterns (induced). As this type of model is a snapshot of the current economy, it does not attempt to capture complex econometric relationships that would, for example, affect price at different levels of production or through substitutes for wireless or wireline services. Regional distributions for direct value-add, employment and production patterns were driven by publicly available data from Statistics Canada,<sup>48,49,50</sup> and further adjusted based on available industry data. Standard economic software was used for the calculation of multiplier effects, as well as source data on regional business patterns. The COVID outlook and industry spotlights were informed by Accenture and CWTA subject-matter-advisor interviews, CSP interviews, and publicly available industry reports and articles.

## Methodology

The economic model used in this study captured contributions from two categories: the value chain for CSPs and cross-industry increases in sales.

### The Value Chain for CSPs

In this study, the telecommunications industry is defined as the wireless and wireline communications service providers. Using a narrow definition allows the study to identify the specific economic impact contributed by wireless and wireline services providers, rather than overestimating the impacts by including satellite providers, equipment manufacturers, additional support services providers, and 3rd party retailers of telecommunications services and devices. To quantify the impact of wireless and wireline services in the Canadian economy, data was sourced on real gross output in 2015 prices for the telecommunications industry from Oxford Economics. To meet the demand for wireless and wireline services, the telecommunication industry needs to source additional inputs for its supply chain from other industries in the Canadian economy. This generates a ripple effect of additional economic activity from the demand for communications services. To estimate the impact of this additional economic activity, we sourced the symmetric Input-Output tables for Canada



with detailed industry information at the province level. A few assumptions were made by the partial equilibrium analysis that must be understood before interpreting the input-output analysis results. First, industries do not change the mix of inputs used in their production process. Second, businesses within an industry use the same production process. Finally, there are sufficient inputs in the economy to meet the industry's increase in demand and supply shortages or price changes of inputs do not occur. While these assumptions are not always realistic, they are required to make estimations on GDP and jobs from the input-output analysis.

## The Cross-Industry Increases in Sales

We estimate the relationship between increases in connections of mobile and fixed broadband and industry output/sales over time. Data on industry output and new connections by type of connectivity technology are sourced from Oxford Economics and AnalysysMason, respectively. Additional endogenous determinants of output growth such as consumption, government expenditure, and trade are also obtained from Oxford Economics.

Next, a panel data regression estimation method is used to estimate the relationship between gross output/sales and increases in new connections on wireless and wireline services. This estimated relationship helps project the impact on sales from projected increases in connections for the sixteen key industry groups defined based on ISIC industry definitions.

The estimate for supported jobs as a result of the telecommunications industry represents all jobs across the economy that exist (in part) because of sales as a result of telecommunications products or services. In addition to jobs created by advances in telecommunications products and services, this estimate captures the ongoing jobs sustained by the telecommunications industry. The estimate is calculated using a jobs multiplier against sales both within the value chain for CSPs and across other industries.

Throughout this study, all dollar figures are represented in Canadian Dollars at a 2019 USD exchange rate of 1.3269 where required (Bank of Canada)

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## Industry Definitions (NAICS Codes)

<b>Name</b>	<b>NAICS</b>
Accommodation and Food Services	72
Agriculture, Forestry, Fishing and Hunting	11
Arts, Entertainment & Recreation	71
Construction	23
Educational Services	61
Finance and Insurance	52
Health and Social Work	62
Manufacturing	31-33
Mining, Quarrying, and Oil and Gas Extraction	21
Public Administration	92
Real Estate, Rental and Leasing	53
Transportation	48-49
Utilities	22
Wholesale & Retail Trade	42, 44-45
Telecommunication	517110, 517210



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