

A photograph of a young man and woman smiling and looking at a smartphone together. The man is in the foreground, holding the phone, and the woman is behind him, leaning over his shoulder. They are both wearing denim shirts. The background is blurred.

The Mobile Economy North America 2020



The GSMA represents the interests of mobile operators worldwide, uniting more than 750 operators with almost 400 companies in the broader mobile ecosystem, including handset and device makers, software companies, equipment providers and internet companies, as well as organisations in adjacent industry sectors. The GSMA also produces the industry-leading MWC events held annually in Barcelona, Los Angeles and Shanghai, as well as the Mobile 360 Series of regional conferences.

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Executive Summary



Connectivity has never been more important

Most of North America has been subject to lockdown measures at some point in 2020 because of the Covid-19 pandemic. During this time, mobile has proved crucial in keeping individuals safe and economies functioning. For example, mobile operators helped to disseminate vital information to keep citizens informed, allowed students to learn remotely and enabled large parts of the workforce to continue working productively throughout the crisis.

Mobile networks have held up well, rising to the challenge of keeping individuals and businesses connected during the pandemic, despite changes in data consumption patterns. This reflects the significant investments made by operators over a number of years to provide additional network capacity, which was supported by moves at the start of the pandemic to temporarily bolster spectrum holdings.



Operators remain committed to 5G amid pandemic

5G is poised to enable a new era of connectivity, bringing new services and increased efficiency across industries. Operators in North America continue to be among the world leaders when it comes to 5G deployment. This can be seen by the rollout of nationwide 5G in the US, enabled by spectrum refarming and dynamic spectrum sharing (DSS). Operators in the region are also advancing with standalone 5G deployments, which will be key to bringing many of the enhanced, latency-sensitive 5G use cases to market.

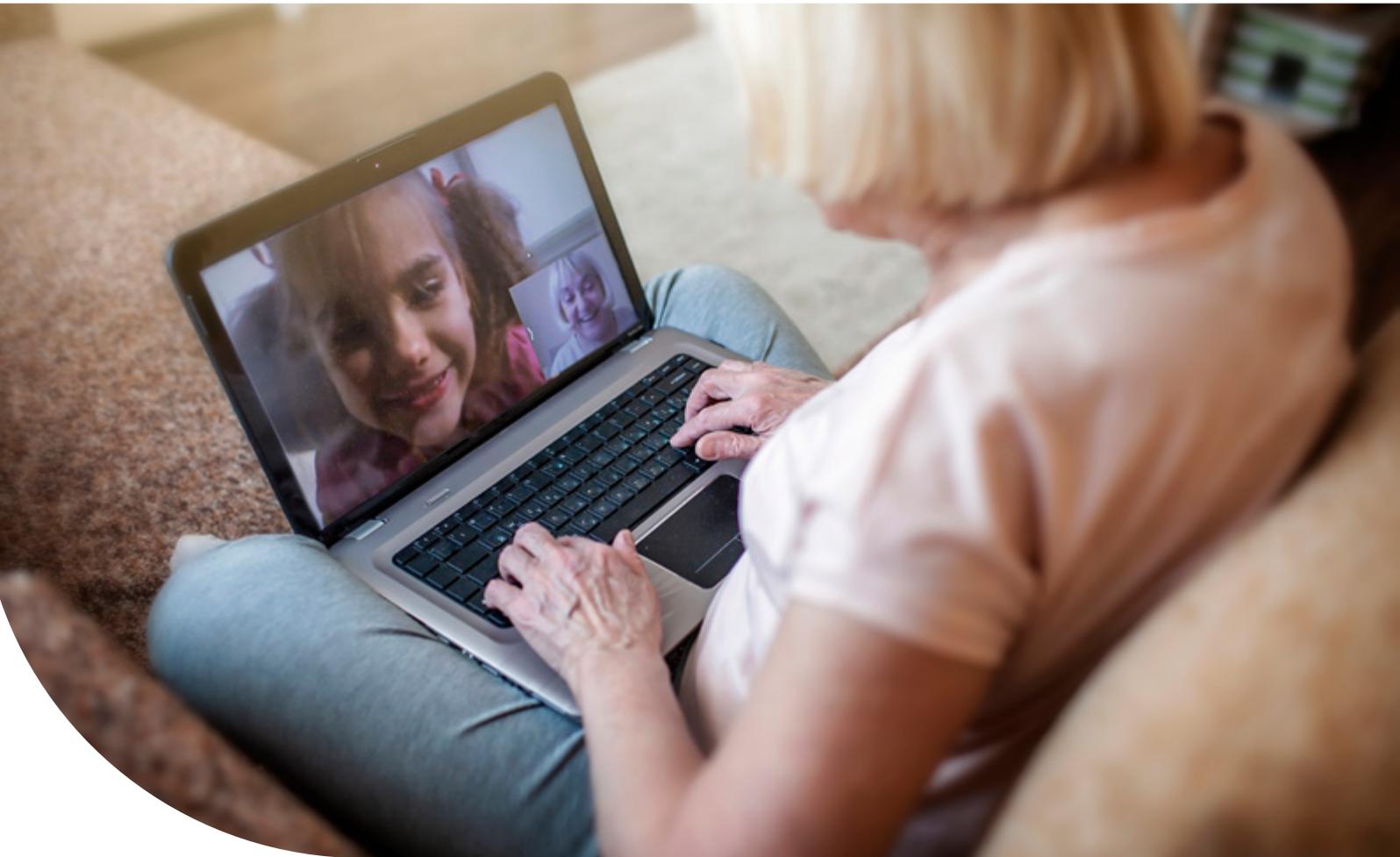
Although the rate of 5G adoption was lower than initially expected in the first half of 2020 because of the pandemic, this is likely to be a blip. North America will reach 100 million 5G connections in 2022, driven by continued network investments from operators and the expanding range of 5G smartphones at varying price points. By 2025, North America will have become the first region where 5G accounts for more than 50% of total connections.



Network innovation on the rise as the 5G era gets underway

Alongside 5G rollouts, operators in North America are pursuing ambitious network transformation strategies. At the heart of these is the use of IT technologies in the network. For example, operators are looking to increase network automation and migrate support for network segments to the cloud. This could provide a chance for new product or technology vendors to gain a foothold.

Network transformation has the potential to reshape the operator cost base and accelerate service innovation. This could prove important as operators seek to capture new revenues in areas such as private networks, in which financial services, healthcare and manufacturing are likely to be among the early target segments for operators.



Mobile industry drives social impact and contributes to economic growth

The mobile industry has engaged with businesses and governments on initiatives to alleviate the impact of the Covid-19 pandemic. Mobile operators and other industry players have supported the most vulnerable in society during the pandemic while also contributing to economic recovery efforts e.g. by providing increased data allowances for customers and giving free equipment to schools and students.

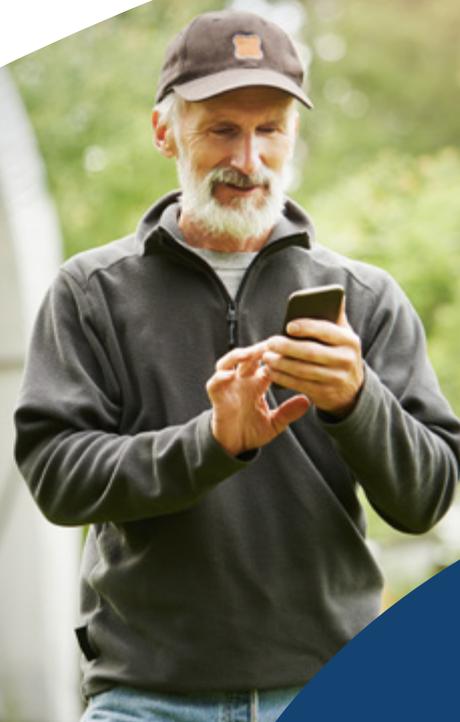
Mobile technologies and services generated 4.8% of GDP in North America in 2019, a contribution that amounted to over \$1 trillion of economic value added. In the same year, the mobile ecosystem also supported more than 2 million jobs (directly and indirectly) and made a substantial contribution to the funding of the public sector, with almost \$100 billion raised through taxation.



Policy actions to accelerate digital development

Mobile connectivity requires continuous investment by operators – whether through densification in cities or extending coverage in rural areas – to keep up with demand and provide the service that consumers and businesses expect. Governments and regulators can take steps to facilitate network deployment and expansion, such as by simplifying and standardising planning procedures and regulations for site acquisition.

Operators also need timely access to the right amount and type of spectrum to encourage long-term investments. In particular, 5G networks need significant amounts of new spectrum across low- (sub-1 GHz), mid- (1–6 GHz) and high-bands (above 6 GHz). Without this, it will not be possible to deliver 5G services that provide widespread coverage and support all potential 5G use cases.



Mobile Economy North America

UNIQUE MOBILE SUBSCRIBERS



↑ 2019-2025
CAGR: 0.9%



2019

324m



Penetration Rate
(% of population)

2025

342m



MOBILE INTERNET USERS



↑ 2019-2025
CAGR: 1.8%



2019

290m



Penetration Rate
(% of population)

2025

323m



SIM CONNECTIONS

Excluding licensed cellular IoT



↑ 2019-2025
CAGR: 0.9%



2019

403m



Penetration Rate
(% of population)

2025

426m



OPERATOR REVENUES AND INVESTMENT



2019

Operator revenues

\$277bn

2025

Operator revenues

\$294bn

Operator capex of \$337 billion for the period 2019-2025

INTERNET OF THINGS

2019

2025



2.8bn

Total connections

5.1bn

Total connections

SMARTPHONES

% of total connections

Excluding licensed cellular IoT



2019



2025



4G

2019

2025



of total connections
Excluding licensed cellular IoT

5G

2019

2025



of total connections
Excluding licensed cellular IoT

PUBLIC FUNDING

2019



\$98bn

Mobile ecosystem contribution to public funding
(before regulatory and spectrum fees)

MOBILE INDUSTRY CONTRIBUTION TO GDP

2019

\$1.01tn



EMPLOYMENT

2019

800,000

jobs directly supported
by the mobile ecosystem

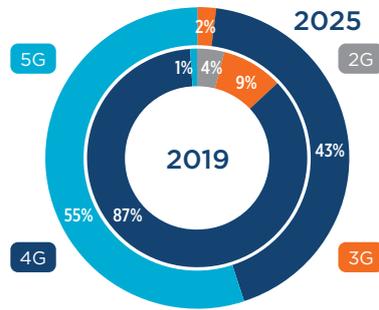


+1.3m indirect jobs

US



TECHNOLOGY MIX*



SUBSCRIBER PENETRATION



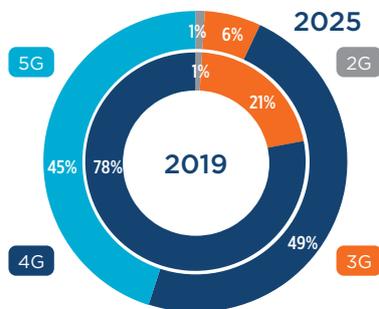
SMARTPHONE ADOPTION



Canada



TECHNOLOGY MIX*



SUBSCRIBER PENETRATION



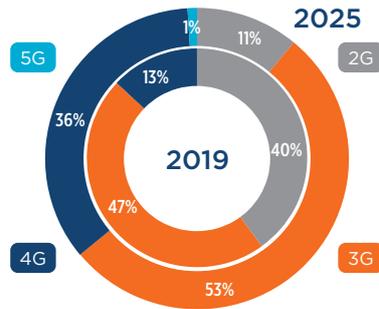
SMARTPHONE ADOPTION



The Caribbean



TECHNOLOGY MIX*



SUBSCRIBER PENETRATION



SMARTPHONE ADOPTION



Defining the Caribbean

Countries included: Anguilla; Antigua and Barbuda; Aruba; Bahamas; Barbados; Bermuda; Cayman Islands; Curacao; Dominica; Grenada; Guadeloupe; Haiti; Jamaica; Martinique; Montserrat; Puerto Rico; Saint Kitts and Nevis; Saint Lucia; Saint Pierre and Miquelon; Saint Vincent and the Grenadines; Trinidad and Tobago; Turks and Caicos Islands; British Virgin Islands; US Virgin Islands

**Percentage of total connections
 Note: totals may not add up due to rounding*





01

The mobile market in numbers

1.1

A new decade of progress

Figure 1

Source: GSMA Intelligence

Milestones for the mobile industry in North America in the next five years

| | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 |
|-----------------------|-----------------------------------------------------|-----------------------------------------------|----------------------------------------|------|---------------------------------|-------------------------------------------------------------|
| MOBILE SUBSCRIBERS | | 330 million mobile subscribers | | | | 85% of the population subscribe to mobile |
| MOBILE INTERNET USERS | | 300 million mobile internet subscribers | | | | 80% of the population subscribe to mobile internet services |
| CONNECTIONS | | 410 million mobile connections | | | 420 million mobile connections | |
| 3G | | 3G accounts for 10% of total connections | | | | 3G accounts for 5% of total connections |
| 4G | 4G adoption peaks at almost 350 million connections | | | | | 4G connections drop below 200 million |
| 5G | 5G debuts in Canada | | Over 100 million mobile 5G connections | | | 5G accounts for over 50% of connections |
| SMARTPHONES | | 350 million smartphone connections | | | Smartphone adoption reaches 90% | |
| IoT | | 200 million licensed cellular IoT connections | | | | 400 million licensed cellular IoT connections |

1.2 Total subscribers to surpass 340 million by 2025

Figure 2

Source: GSMA Intelligence

By 2025, there will be an additional 18 million subscribers in North America

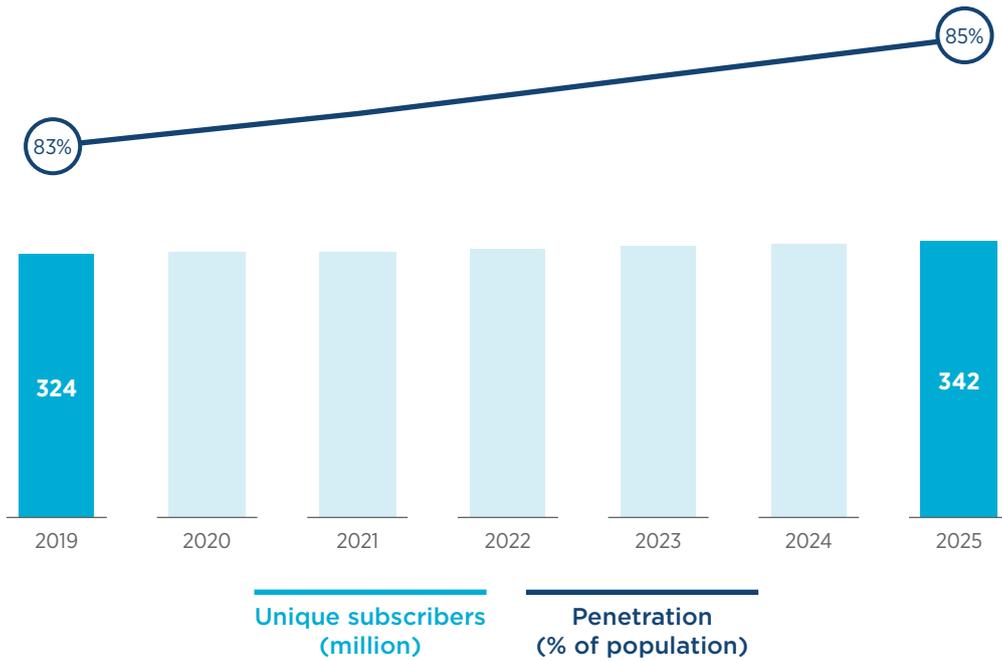
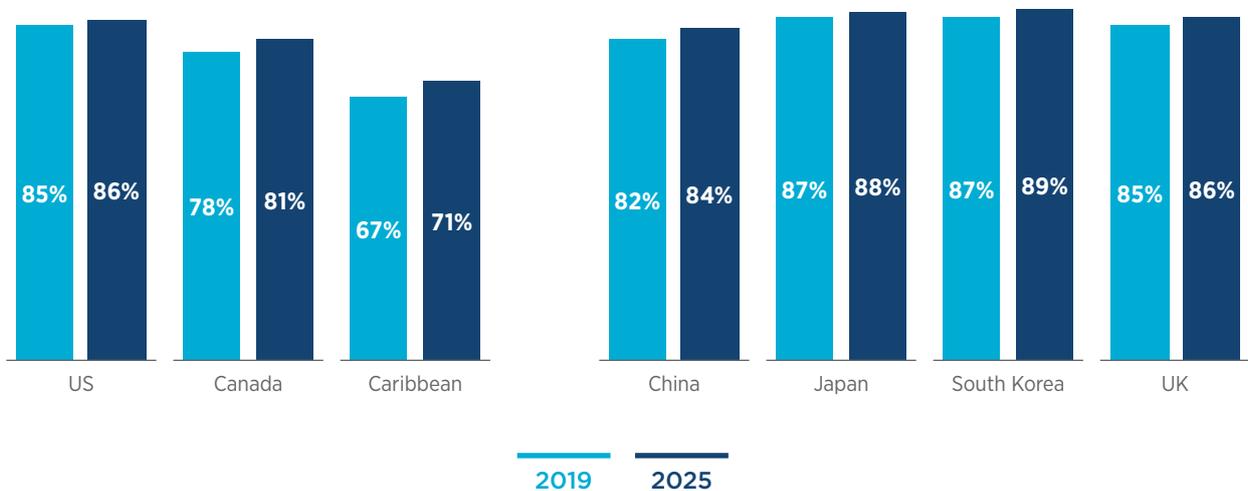


Figure 3

Source: GSMA Intelligence

The US and Canada are among the world leaders in terms of unique subscriber penetration, while mobile adoption will continue to rise in the Caribbean



1.3 The transition from 4G to 5G

Figure 4

Source: GSMA Intelligence

4G will continue to dominate in North America in the early 2020s, before being overtaken by 5G in 2025

% of connections (excluding licensed cellular IoT)

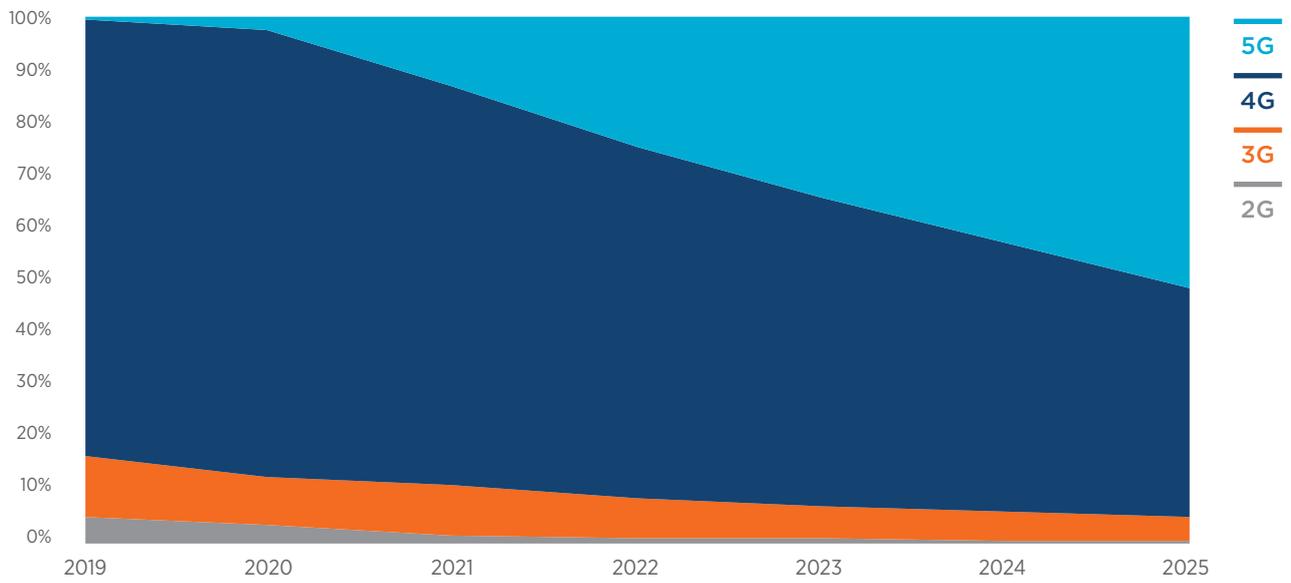
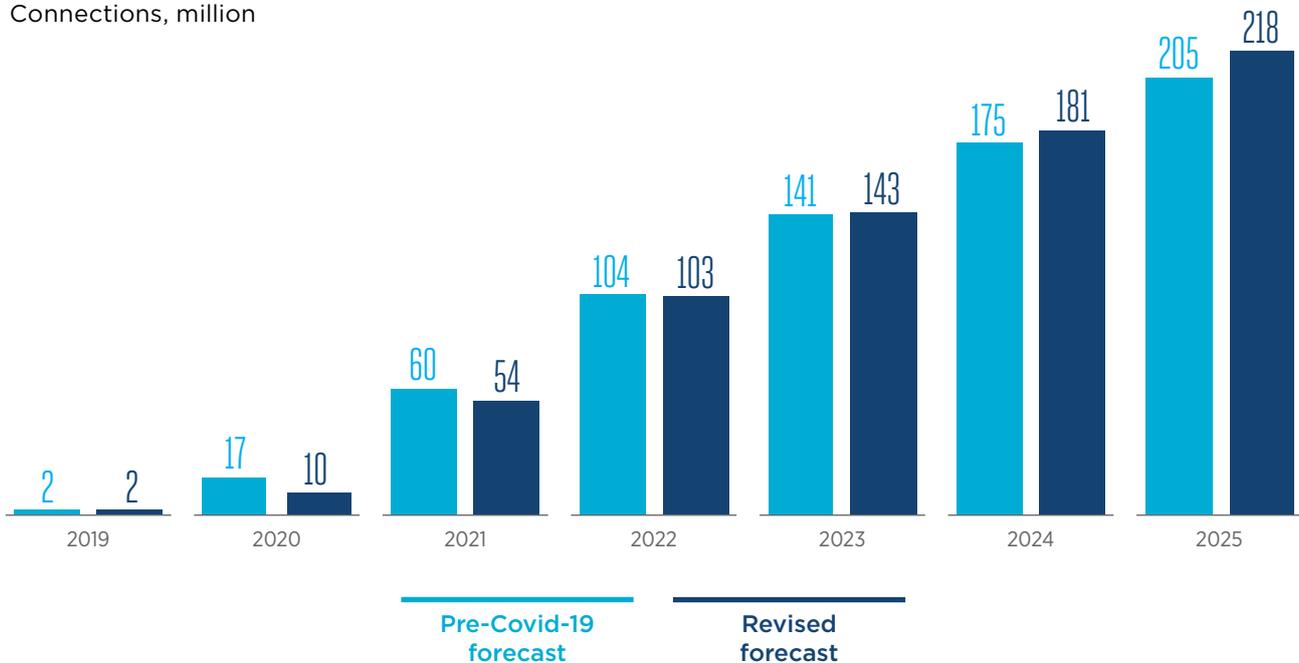


Figure 5

5G adoption in North America is expected to rise faster than before, following a near-term slowdown because of Covid-19

Connections, million



5G take-up is likely to suffer in the short term from slower sales of 5G smartphones due to the shift to larger-screen devices (such as TVs and laptops) during lockdown and the drop in consumer confidence as a result of economic uncertainty.

However, 5G adoption will rebound quickly, driven by the availability of 5G smartphones at different price points and continued network investment by operators.

1.4 Evolution of the digital consumer

Faster networks, combined with rising adoption of unlimited data plans, allow subscribers in North America to access a wide range of entertainment services on their smartphones. For example, 41% of US subscribers watched paid-for online TV subscription services on their smartphones at least once per month in 2019, up from 27% in 2018.¹ This can in part be attributed to the content bundling strategies of US operators. AT&T includes HBO Max as part of selected data plans, and Verizon (Disney+) and T-Mobile (Netflix) offer similar deals as part of their respective packages.

The next wave of partnerships could be between operators and gaming companies. While almost 60% of subscribers in the US and Canada play free games on their smartphones, less than 30% actually pay for mobile games.² Cloud gaming could change that by aggregating content and bypassing the traditional mode of distribution in favour of streaming over the internet. For operators, this presents a chance to form new distribution agreements (seen by Sprint's collaboration with Hatch), which create new revenue sharing opportunities and a chance to showcase a key 5G use case to consumers.³

1. GSMA Intelligence Consumers in Focus Survey 2019
 2. Ibid
 3. [Gaming: up in the air](#), GSMA Intelligence, 2020

Figure 6

Source: Ericsson Mobility Report, 2020

By 2025, mobile data consumption in North America will grow by more than five times

Mobile data traffic per smartphone
(GB per subscriber per month)



Consumers are not only changing what they do on their smartphones but also how they buy smartphones. Although in-store transactions are still the largest channel for smartphone sales, online sales are not far behind. Most operators predict growth in online smartphone sales over the next two

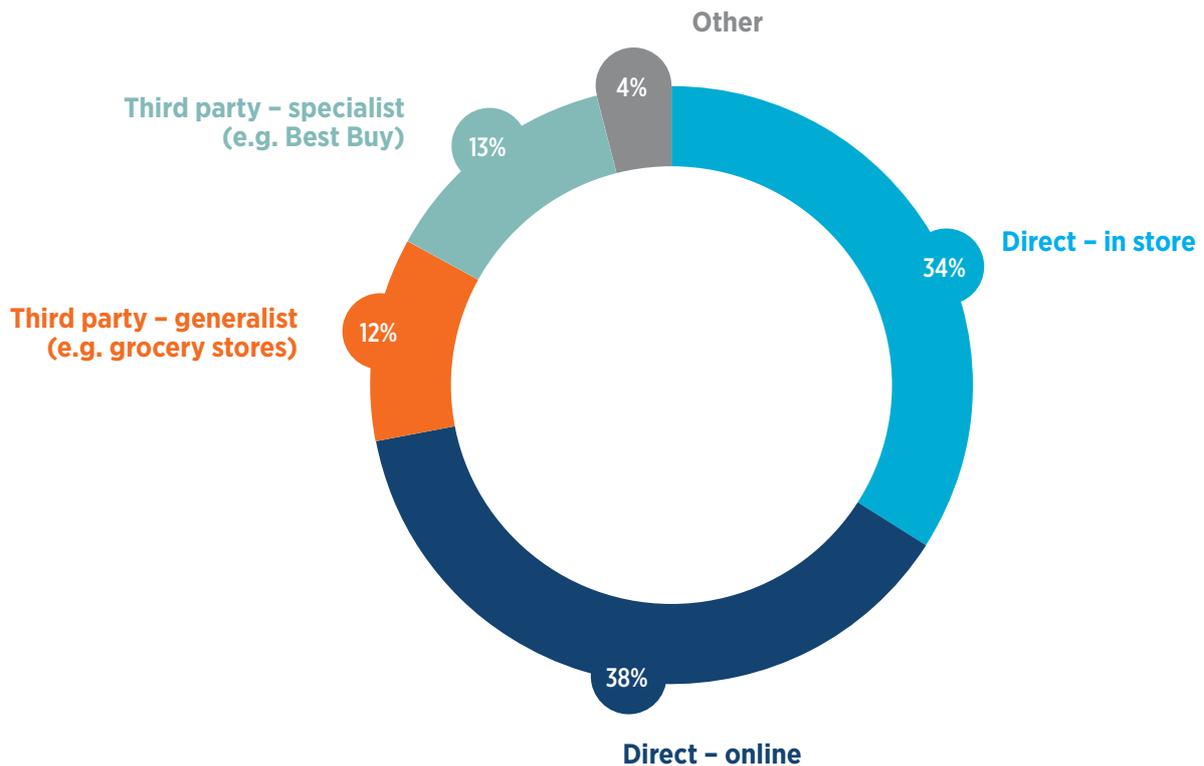
years, with this trend heightened by the temporary closure of retail stores during the Covid-19 pandemic.⁴ The move to online channels could present opportunities for operators to improve margins and develop more effective ways to help consumers with their enquiries.

4. [Device portfolios and strategies in the 5G era](#). GSMA Intelligence, 2020

Figure 7

Smartphone sales moving online in North America

Thinking about your smartphone portfolio, please indicate the approximate proportion sold through each channel (% of respondents)



1.5

Covid-19 adds uncertainty to the financial outlook

The implementation of lockdown measures and the associated pauses in economic activity are projected to push many economies into recession. In its June projections this year, the IMF predicted that GDP for the US and Canada will decline in 2020 by 8.4% and 8.0% respectively. This shows that a high level of uncertainty is likely to remain throughout 2020, which will serve to reduce consumer and enterprise spend.

Financial pressures on the mobile industry will be exacerbated by the pullback in spend, albeit not as deeply compared with some other sectors. Despite the expected decline in mobile revenue in North America for 2020, operators remain committed to network spending. For example, Verizon expects to spend \$17.5-18.5 billion in 2020, up from its prior forecast of \$17-18 billion, as it accelerates 5G investments during the pandemic.⁵ Meanwhile, T-Mobile and Sprint will commence their network integration efforts, and Dish Network will begin its 5G rollout.

5. "Verizon boosts network spend", Mobile World Live, 2020

Figure 8

Source: GSMA Intelligence

Covid-19 will take its toll on operator revenue growth in the short term; 2022 will see a recovery, followed by solid growth out to 2025

Billion

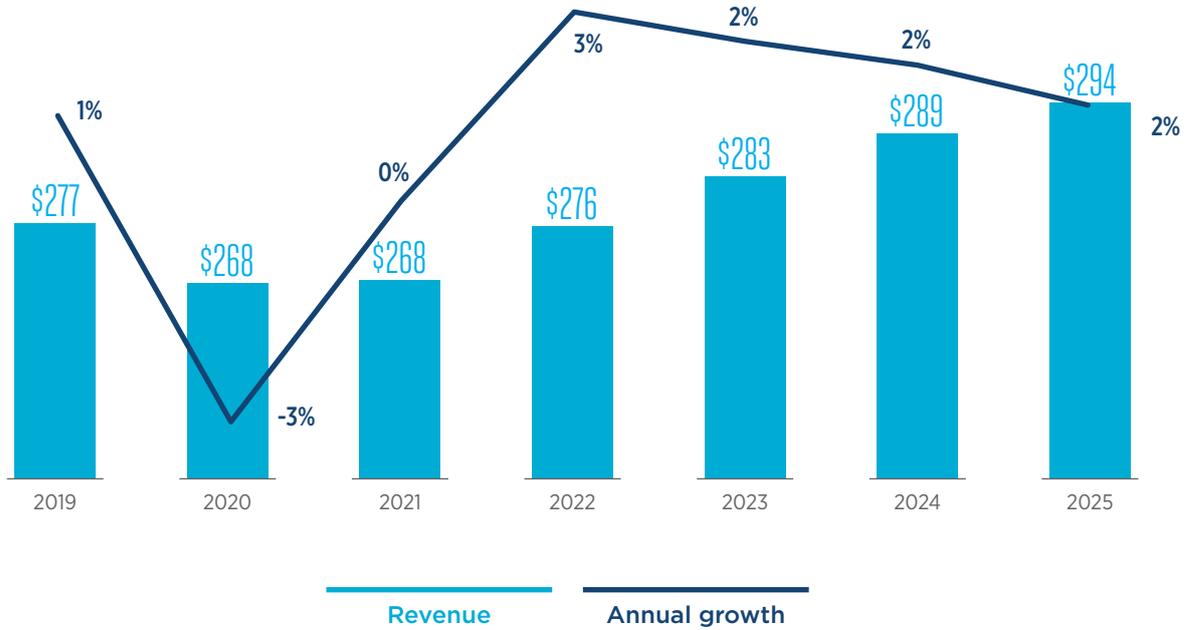
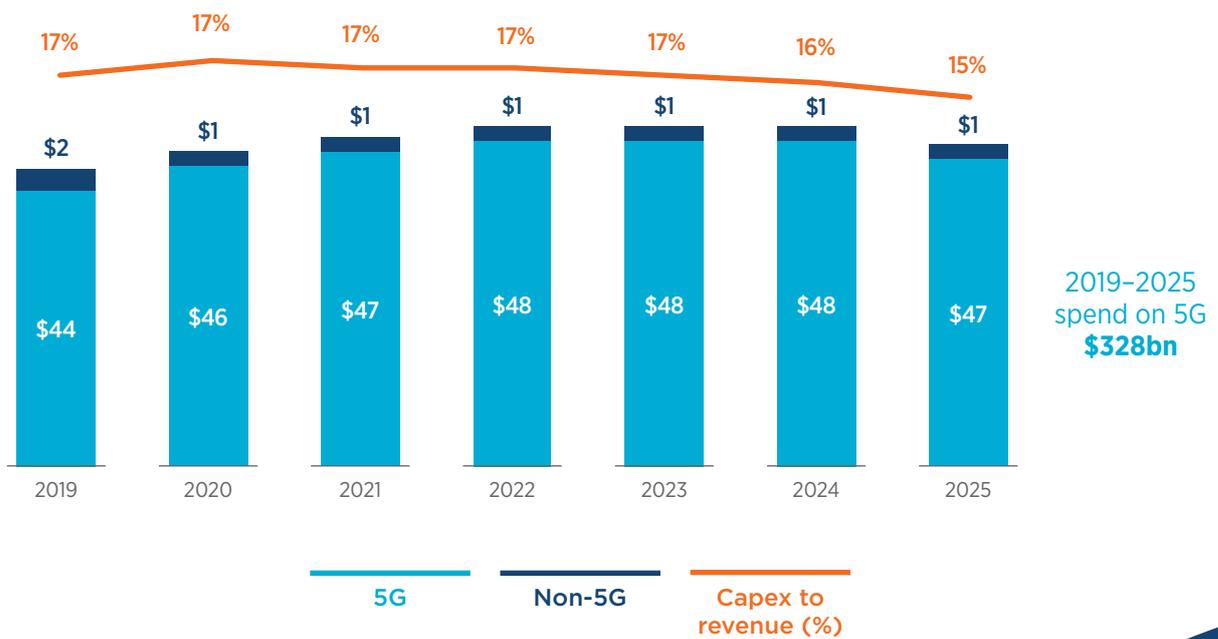


Figure 9

Source: GSMA Intelligence

Operators commit to 5G spending, despite the Covid-19 pandemic

Capex (billion)



02

Key trends shaping the digital landscape

The digital landscape in North America, and elsewhere, is evolving rapidly. The deployment of 5G networks is bringing faster speeds, lower latencies and greater capacity to users. When combined with other innovations, including edge computing and network automation, this is allowing operators to transform their networks. This brings not only substantial cost savings but also the opportunity to capture new revenues in adjacent areas.

2.1 5G: one year on

More than a year after the first 5G launches in North America, operators in the region continue to make strong progress. The rollout of low-band 5G, enabled by spectrum refarming and dynamic spectrum sharing (DSS), has brought nationwide 5G coverage to the US. Meanwhile, US operators are also beginning to deploy standalone 5G, which introduces a dedicated cloud-native core that is not anchored in LTE. This will be crucial to many of the enhanced, latency-sensitive use cases that 5G enables in areas such as immersive reality and smart manufacturing.

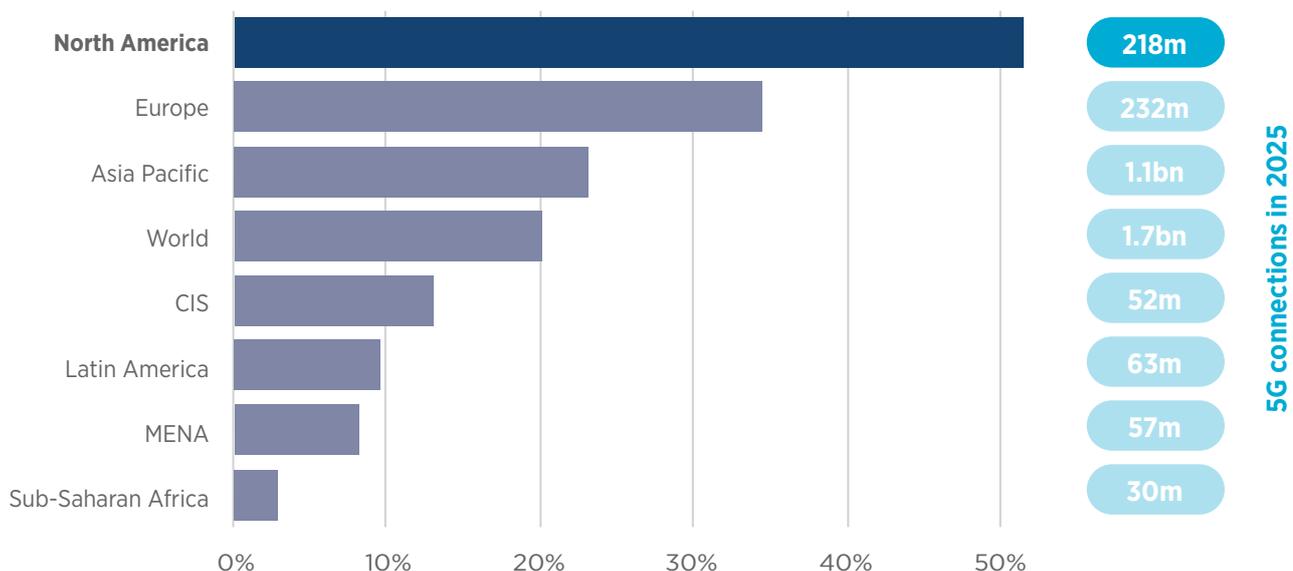
Canada became the second market in North America to introduce 5G services. Rogers led the way with initial mid-band 5G deployments in Vancouver, Toronto, Ottawa and Montreal, preceding a broader commercial launch utilising 600 MHz spectrum later in 2020. Bell Canada and Telus also introduced 5G services in the first half of 2020 across a number of cities. As in the US, Canadian operators are still awaiting the auction of further mid-band spectrum, which will be vital to fulfil the potential of 5G.

Figure 10

Source: GSMA Intelligence

North America to lead the way on 5G adoption

5G adoption in 2025 (% of connections)



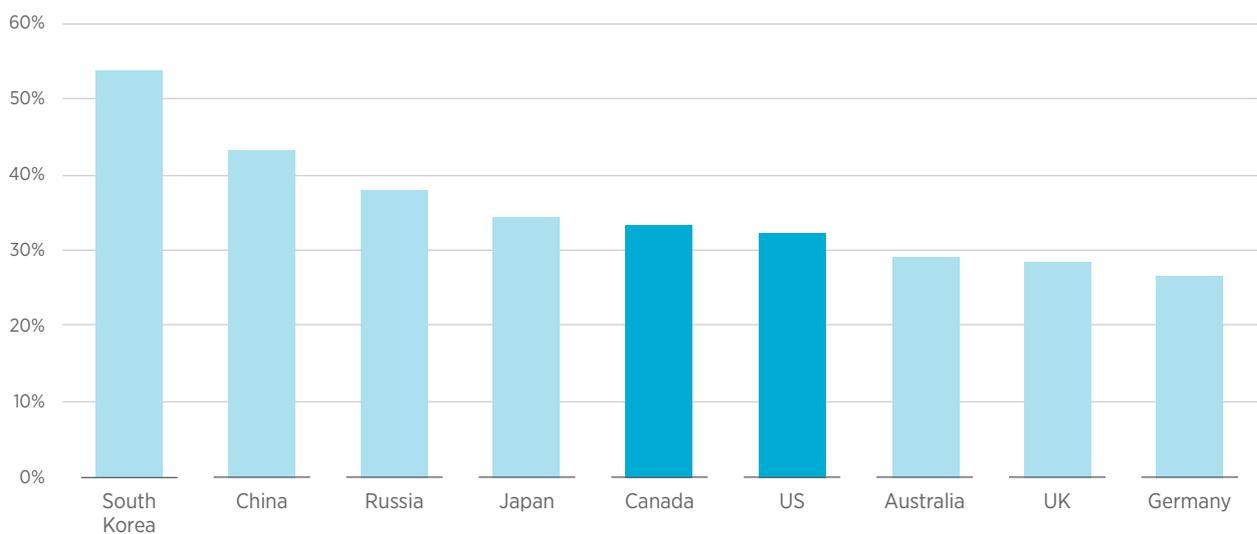
Despite good progress on 5G network deployments, novel 5G applications are still somewhat lacking. This is partly because a number of 5G use cases require edge computing, which lowers latency by placing application support closer to users. Despite operators being at the centre of discussions around edge deployments due to their local real estate, they have struggled to make edge computing a commercial reality, as they lack the application environment and exposure of public cloud providers.

There are signs that this could change, however, as operators in North America have established edge partnerships with public cloud companies. Rogers and Verizon have joined forces with AWS, while AT&T and Microsoft have also teamed up. These partnerships allow developers to access the same capabilities they already use in a centralised cloud environment but at the network edge, helping to bring new 5G applications to market more quickly.⁶

Figure 11 Source: GSMA Intelligence Consumers in Focus Survey 2019

New use cases, enabled by edge computing, can boost consumer expectations

From what you know of 5G, would you expect it to deliver innovative new services?
(% of respondents who said “Yes”)



2.2

Telco of the future: new technologies, new revenues

This is a period of significant network innovation in North America and we are beginning to see what the telco of the future could look like. Operators are embracing a wide range of technologies that have the potential to transform the cost base and accelerate service innovation. In addition to network

automation and edge computing, there is also a move towards migrating support for network segments to the cloud. This is first taking place with the service core and OSS/BSS, with the shift to virtual RAN at scale likely to follow later.

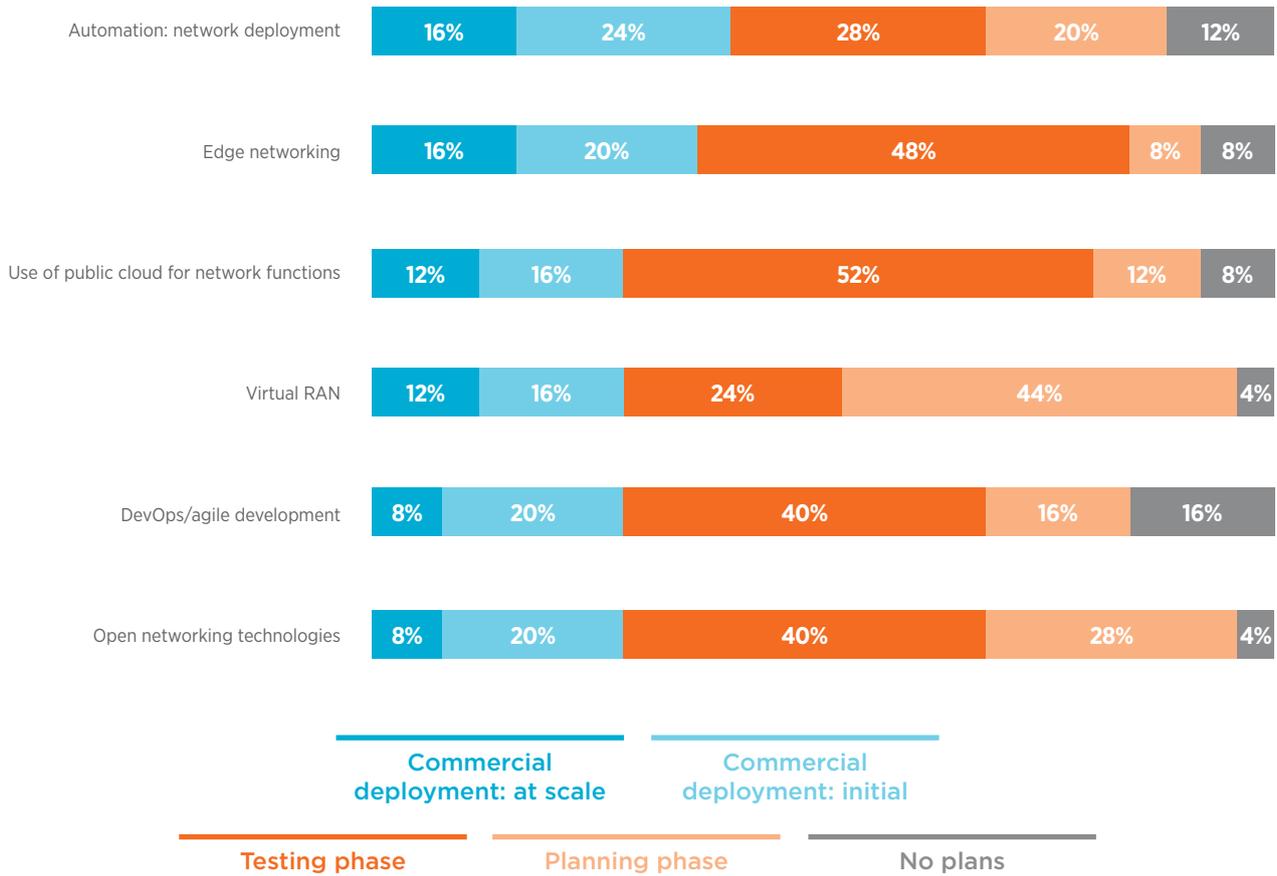
6. [Edge of a breakthrough: operators partner with public cloud companies](#). GSMA Intelligence, 2020

Figure 12

Source: GSMA Intelligence Network Transformation Survey 2019

Proving ROI will be crucial to moving beyond the initial deployment and testing phases of new technologies

Where are you in the process of adopting the following technologies? (% of respondents)



Base: 25 operators in the Americas

As operators undergo network transformation there could be a chance to introduce new product or technology vendors into the network. Over half of operators surveyed think it is likely that they will leverage new vendors (i.e. those they have not worked with in the past) in their 5G deployments. This could provide a boost to US tech companies, whether these are challenger vendors (e.g. AltioStar, Mavenir and Parallel Wireless) or web-scale cloud providers.

Although network transformation is not a panacea to the challenges the telecoms sector faces, the move towards more flexible and agile networks

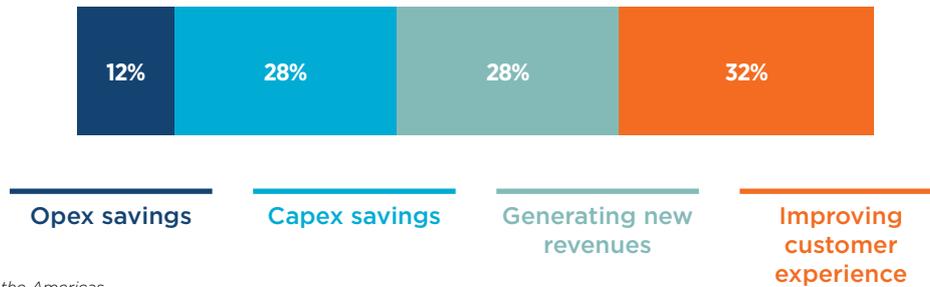
will be vital to developing new services and use cases. This will be critical as future operators seek new revenue streams beyond connectivity to offset stagnating core revenues (from mobile and fixed). Currently, core mobile and fixed services account for 80–90% of revenue for most major operator groups, with non-telecoms at 10–20%. AT&T is an outlier, as non-telecoms revenue accounts for around 40% of its total revenue, driven by the acquisitions of DirecTV and Time Warner. Other operators in the region are also diversifying revenues by expanding into new areas, including healthcare, IoT and enterprise solutions.

Figure 13

Source: GSMA Intelligence Network Transformation Survey 2019

Improved customer experience will help operators to reduce churn and cross-sell services to existing subscribers

What is the primary goal driving your network transformation strategy? (% of respondents)



Base: 25 operators in the Americas

2.3

IoT: honing in on the private networks opportunity

While around two in three US companies claim to have deployed an IoT solution, the coverage needs of these companies vary significantly depending on factors such as sector, mobility needs and type of application.⁷ More than half of the companies

surveyed require national coverage; there is also significant demand for location-specific coverage, highlighting the opportunity for private networks in enterprise connectivity.

Figure 14

Source: GSMA Intelligence Enterprise in Focus Survey 2019

Demand for location-specific networks shows the importance of greater control and increased data isolation

What are the network coverage requirements for your current/planned IoT deployments? (% of respondents)



Base: US enterprises planning a future IoT deployment
 Note: respondent companies could enter multiple responses

7. IoT in business: Enterprise views on solution providers, GSMA Intelligence, 2019

For co-investment in private networks in North America, operators see the most suitable targets as financial services (potentially because of high-frequency trading), healthcare and manufacturing. 5G will be an important enabler here – for instance, as part of the move towards automated production lines with more sophisticated tracking and monitoring in the manufacturing sector.

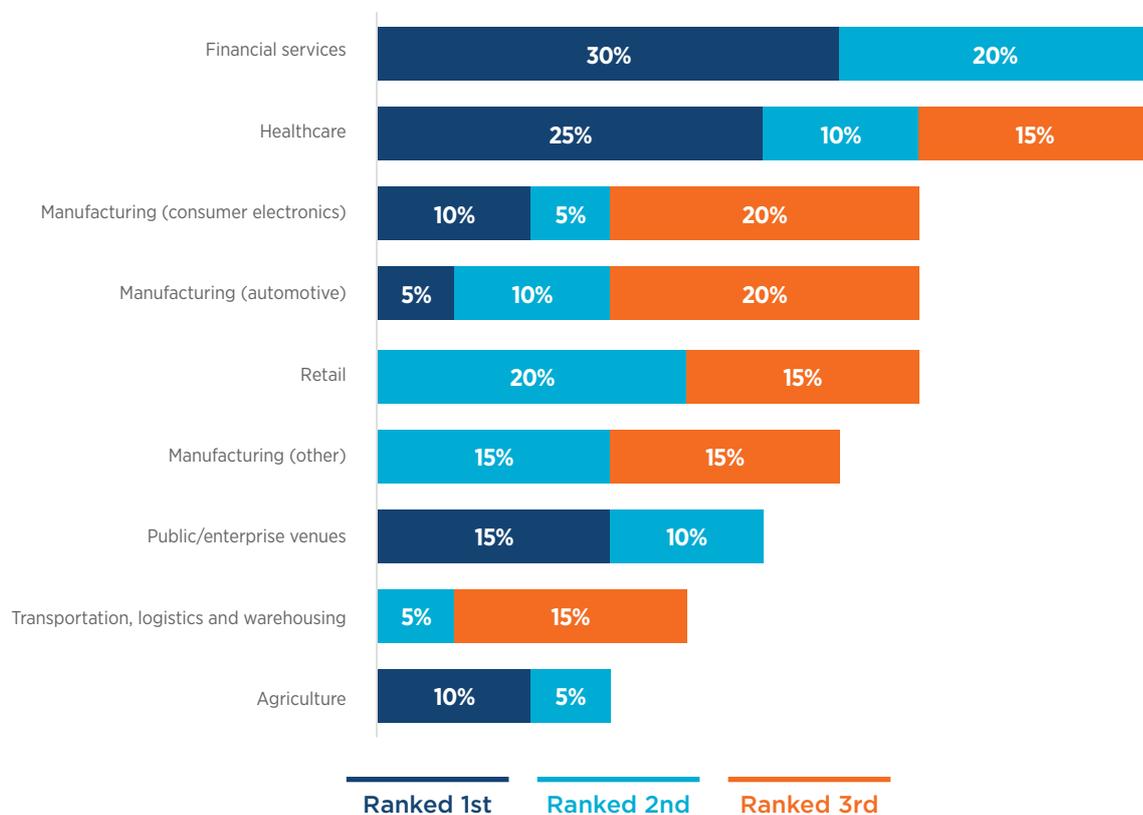
Conversely, operators show a lower preference for sectors with more distributed operations. None of the operators surveyed ranked mining or oil and gas within their top three candidates for private network investment. This partly reflects the more limited activity of these sectors in the region, but it also highlights the heavy capital outlay of deploying private networks in these verticals.

Figure 15

Source: GSMA Intelligence Operators in Focus Survey 2020

Mobile operators’ experiences in deploying and operating networks will be key to appealing to enterprise verticals

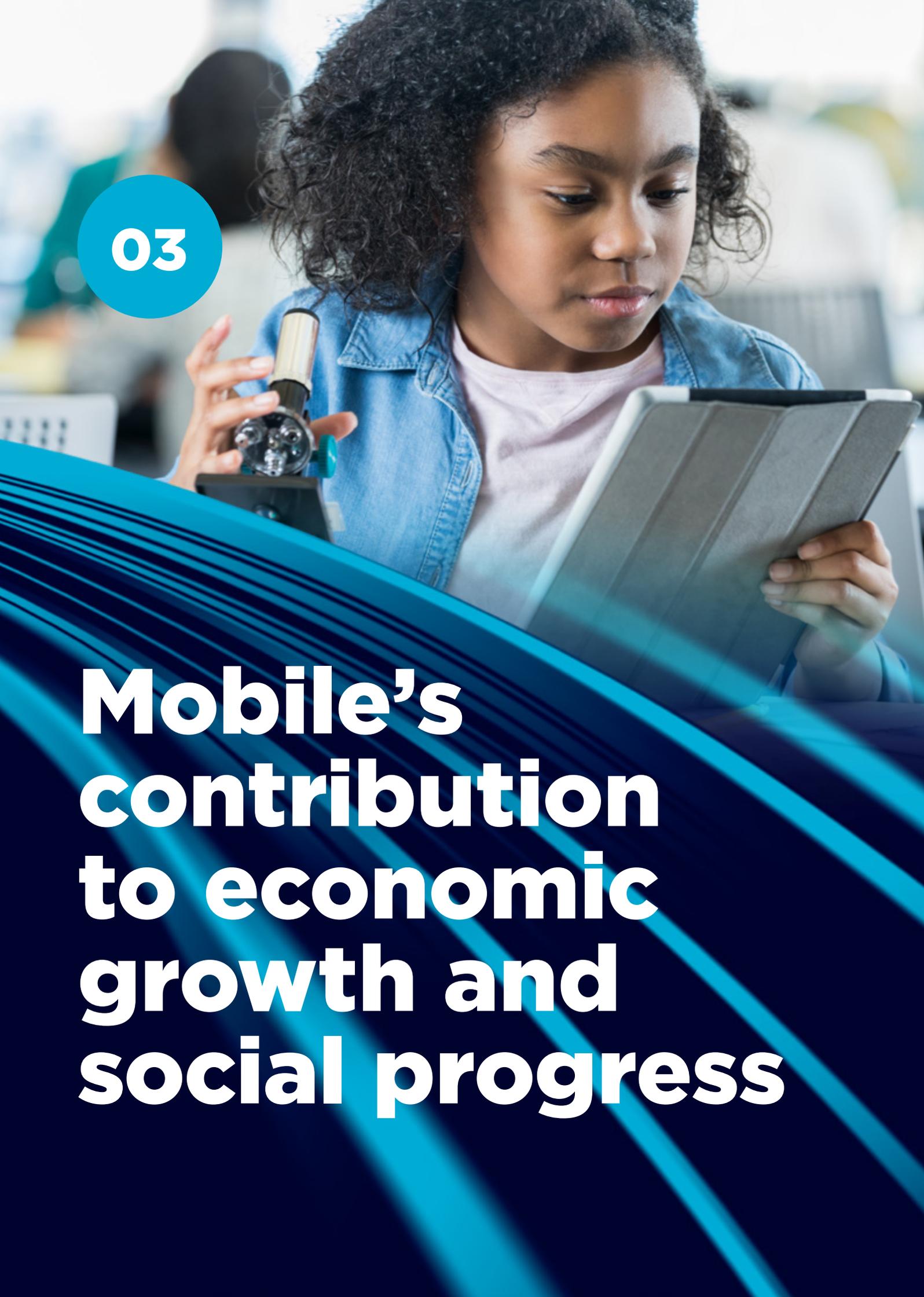
Which industry verticals are the top candidates for co-investment in private networks? (% of respondents)



Base: 20 operators in North America

Alongside the co-investment model, a number of other frameworks are likely to emerge with respect to who owns and manages the network assets and spectrum in private network deployments. In the US, for example, the use of localised spectrum under the Citizens Broadband Radio Service (CBRS) initiative has led to strong interest from businesses

in operating their own private networks, sometimes with support from infrastructure vendors, including web-scale cloud providers. This emphasises that infrastructure competition is becoming tougher, not easier, which is causing operators to spend capex more selectively and form frenemy-style partnerships with adjacent sector competitors.



03

Mobile's contribution to economic growth and social progress

3.1

Mobile's contribution to economic growth

In 2019, mobile technologies and services generated 4.8% of GDP in North America, a contribution that amounted to over \$1 trillion of economic value added. The mobile ecosystem also supported more

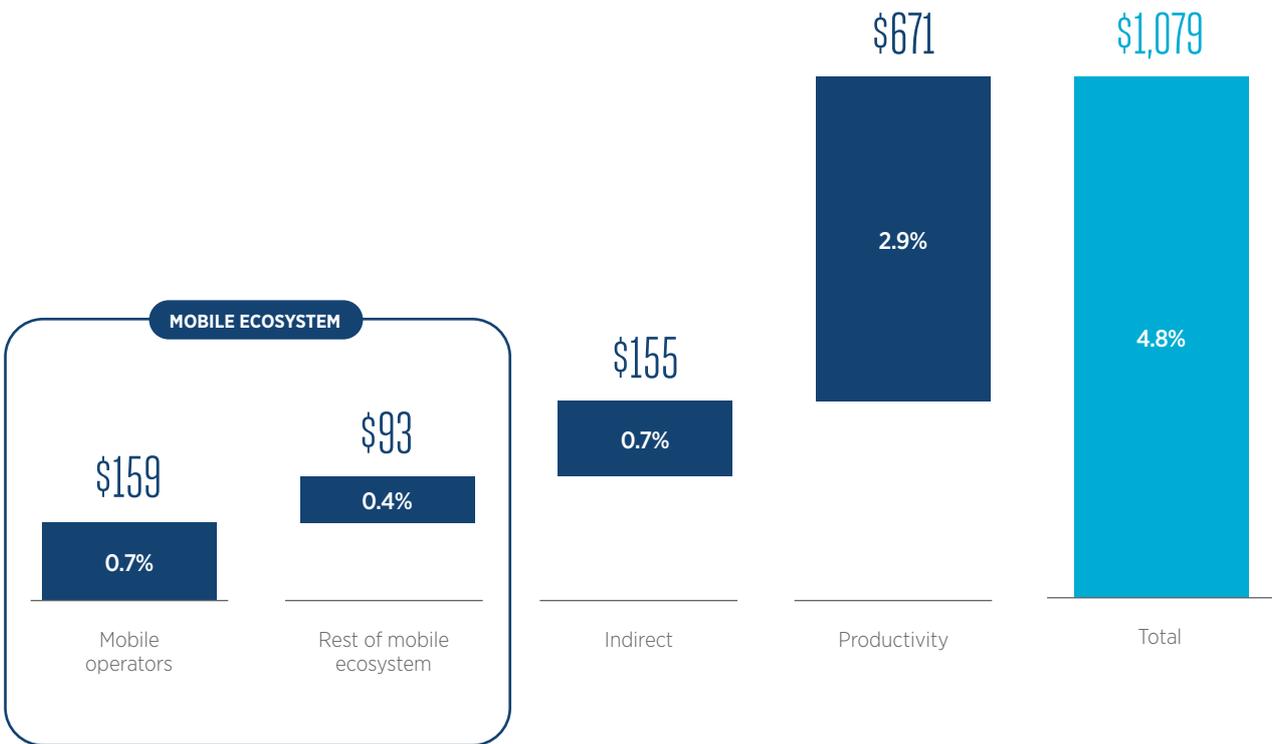
than 2 million jobs (directly and indirectly) and made a substantial contribution to the funding of the public sector, with almost \$100 billion raised through taxation.

Figure 16

Source: GSMA Intelligence

The mobile ecosystem contributed over \$1 trillion to the North American economy

Billion, % of GDP 2019



Note: totals may not add up due to rounding

Figure 17

The direct economic contribution is mainly driven by mobile operators

Billion

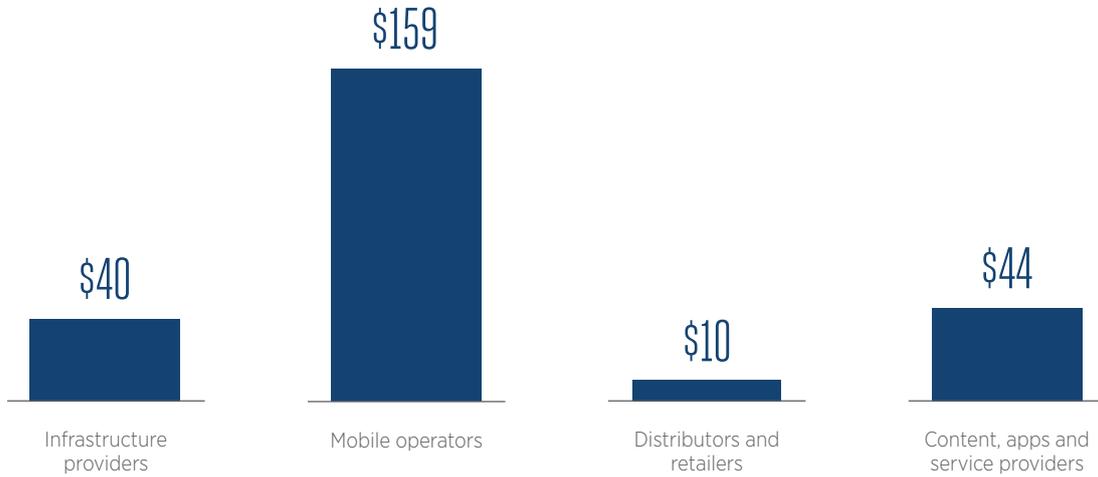
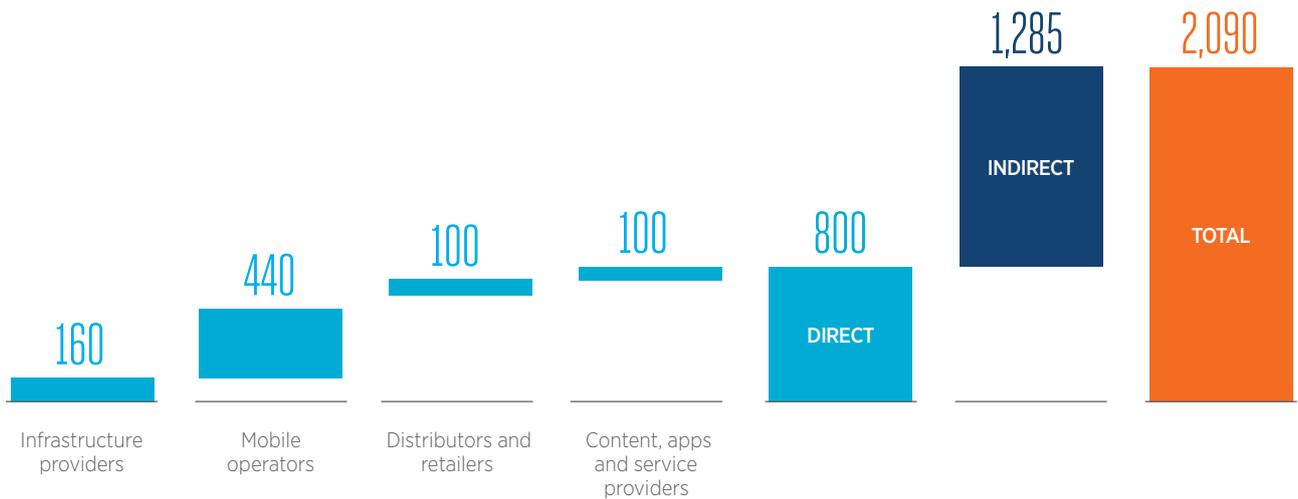


Figure 18

The mobile ecosystem directly employs more than 800,000 people in North America, and supports another 1.3 million jobs indirectly

Jobs (thousands)



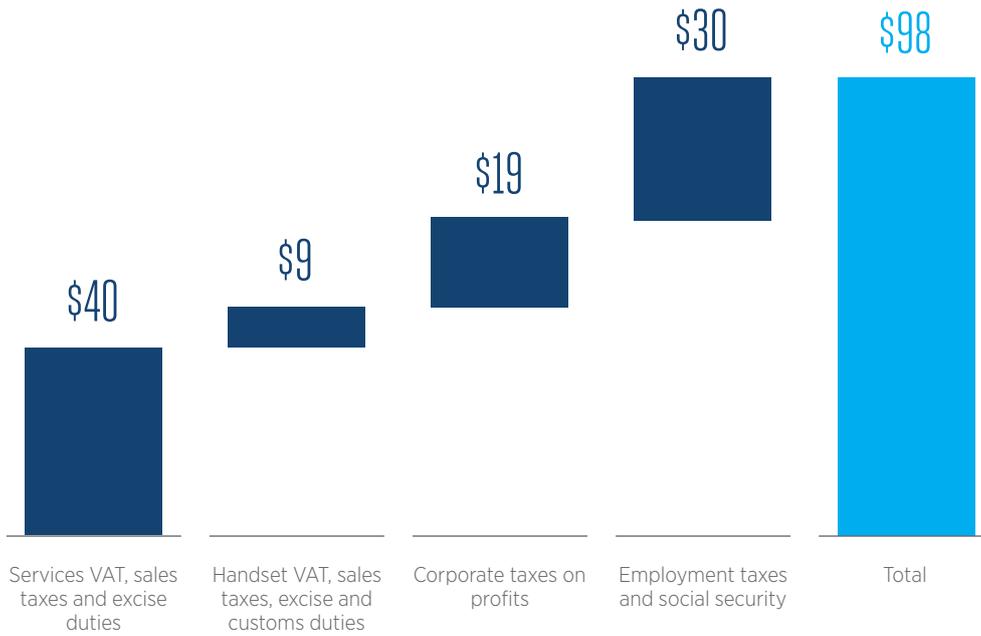
Note: totals may not add up due to rounding

Figure 19

Source: GSMA Intelligence

In 2019, the mobile ecosystem contributed almost \$100 billion to the funding of the public sector through consumer and operator taxes

Billion



3.2

The North American mobile industry's response to Covid-19

Connectivity is of paramount importance, particularly during times of crisis such as the Covid-19 outbreak. Most of North America has been subject to lockdown measures at some point in 2020 because of the pandemic. During this, mobile has played a pivotal role in keeping individuals safe and economies functioning. For example, mobile operators in North America helped to disseminate vital information to keep citizens informed, helped separated families and friends to stay informed and connected, allowed students to learn remotely, and enabled large parts of the workforce to continue working productively throughout the crisis.

These new behaviours resulted in a substantial increase in demand for connectivity. Much of this was shouldered by fixed-line networks; however, mobile networks also experienced a surge in demand during lockdown. According to the Cellular Telecommunications and Internet Association (CTIA), US mobile data traffic increased by nearly

20%, while mobile voice traffic was up by 20–40%. There was also a shift in the location of mobile data traffic, as demand moved from the cities to the suburbs.

Despite these changes, mobile networks have held up well. This reflects the significant investments made by mobile operators over a number of years to provide additional network capacity, which was supported by moves at the start of the pandemic to bolster spectrum holdings. For instance, T-Mobile secured temporary access to unused spectrum from Dish and others, while the Federal Communications Commission (FCC) granted AT&T and Verizon temporary access to unallocated spectrum. These actions epitomise the spirit of collaboration on display during the response to the Covid-19 crisis, and this cooperation must continue over the next decade and beyond in order to maximise the societal impact of mobile technology.

Staying connected during the Covid-19 pandemic

The FCC's Keep Americans Connected Pledge sought to ensure that consumers did not lose connectivity in the early days of the pandemic. US operators pledged not to terminate services in cases where users were unable to pay their bills due to disruptions caused by Covid-19. Operators also pledged to waive late fees and open Wi-Fi hotspots from March to the end of June. Likewise, many Canadian operators also waived roaming and service fees and introduced flexible payment options to keep consumers connected and ease the shift to working from home.



Figure 20

Source: GSMA, CTIA, Canadian Wireless Telecommunications Association (CTWA), company websites

Selected operator responses to the Covid-19 pandemic in North America

| Country | Operator | Selected initiatives |
|----------------|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| US | AT&T | <ul style="list-style-type: none"> Developed an online resource for eLearning Days from the State Educational Technology Directors Association (SETDA) Committed \$1.2 million to small businesses focused on distance learning solutions |
| | T-Mobile | <ul style="list-style-type: none"> Launched T-Mobile Connect ahead of schedule, offering consumers unlimited calls and texts plus 2 GB of high-speed smartphone data for \$15 per month Shifted consumers on metered data plans to unlimited data plus 20 GB of mobile hotspot data |
| | Verizon | <ul style="list-style-type: none"> Waived data overage charges for residential and small business wireless customers whose economic circumstances were impacted by Covid-19 Added 15 GB of 4G LTE data to consumer and small business shared data plans and hotspots |
| Canada | Bell | <ul style="list-style-type: none"> Supported hospitals, shelters and social agencies requiring emergency mobile communication services with complimentary phones and service plans |
| | Rogers | <ul style="list-style-type: none"> Funded free digital educational programmes to fill the gap of cancelled summer camps for children Partnered with smart city platform provider bciti to help individuals access municipal services and information |
| | Telus | <ul style="list-style-type: none"> Donated over 10,000 free devices to Covid-19 patients, isolated seniors and low-income individuals. Devices came with unlimited calls and texts and 3 GB of data per month |
| Bermuda | Digicel | <ul style="list-style-type: none"> Suspended disconnections and late fees for consumers and small businesses that have experienced financial difficulties because of the pandemic |
| Cayman Islands | Digicel | <ul style="list-style-type: none"> Promoted free apps to help individuals stay up to date with news and health information Directed those experiencing mental health issues to the government’s helpline |
| Jamaica | Digicel | <ul style="list-style-type: none"> Posted videos for consumers showing them how to safely clean mobile devices Increased awareness of online services such as bill payment and top-ups |
| Puerto Rico | Liberty Latin America | <ul style="list-style-type: none"> Launched essential service plans Opted in to the FCC’s Keep Americans Connected Pledge |

3.3

Driving social impact through mobile: spotlight on health and education

Mobile played an especially important role during the pandemic for the 17% of US adults who own a smartphone but do not subscribe to fixed broadband services. This figure has roughly doubled since 2013, when only 8% of US adults fell into this category. Although cost is a barrier to subscribing to

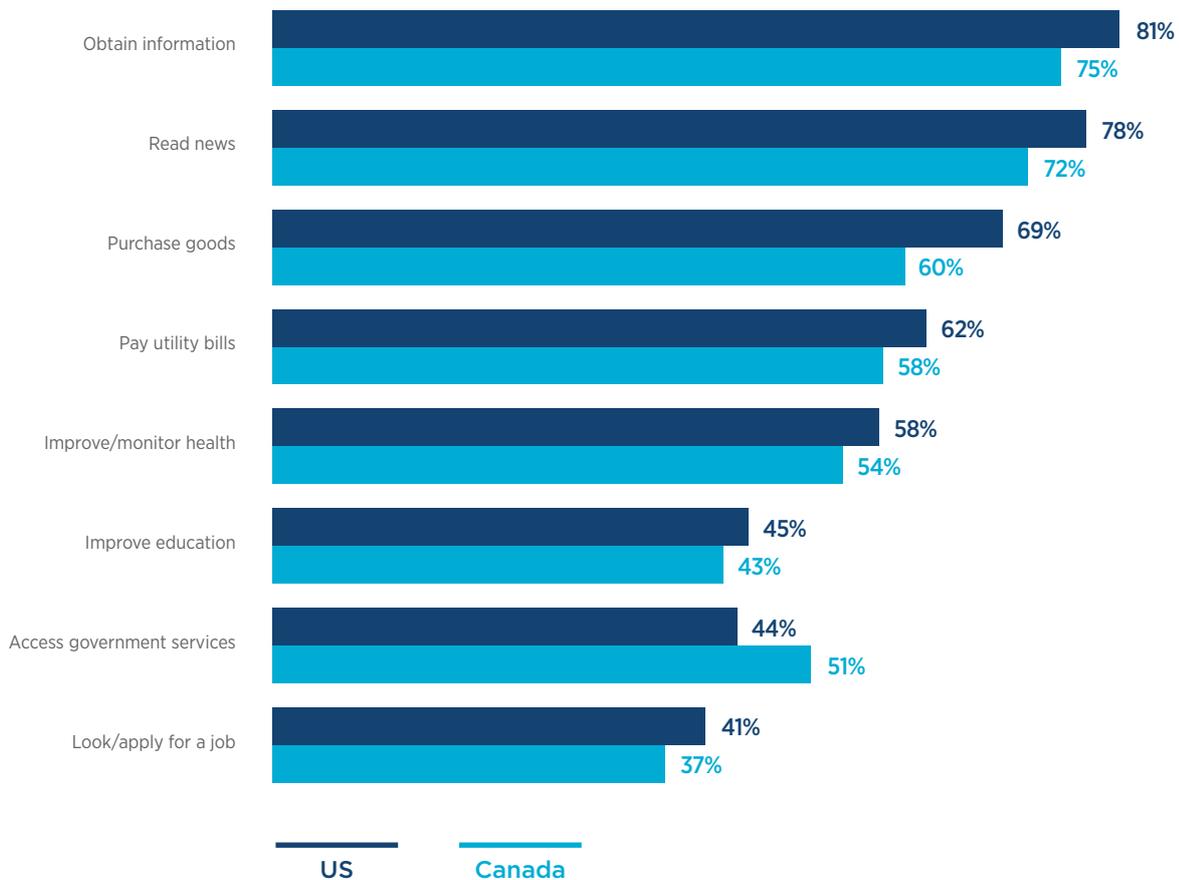
fixed broadband, the most important reason cited by mobile-only users is that the smartphone does everything they need.⁸ This highlights the utility of smartphones, which allow users to access an increasing range of life-enhancing services.

Figure 21

Source: GSMA Intelligence Consumers in Focus Survey 2019

Usage of mobile services is likely to have further increased as a result of new habits formed during lockdown

% of respondents who performed a particular activity



8. Mobile Technology and Home Broadband 2019, Pew Research Center, 2019

More than half of mobile users in Canada and the US use mobile to monitor or improve their health. This is done mainly through health-focused mobile apps on smartphones, which provide basic functions such as step counters and activity trackers. However, there is also scope to increase the usage of more sophisticated mobile health solutions, such as virtual care consultations, which allow individuals to contact health practitioners through voice, SMS and video services. These have become increasingly important, as health systems

have been overwhelmed by Covid-19, which has made in-person consultations difficult. Operators in North America play a myriad of roles in enabling virtual consultations. This includes providing connectivity and equipment to both practitioners and patients, and developing novel solutions, such as the Babylon by Telus Health service. These efforts help to address systemic challenges in healthcare services, improving social outcomes for governments and their citizens.

Telus's long-term commitment to healthcare

Telus entered the Canadian healthcare market over a decade ago and has subsequently become the country's largest healthcare IT provider. In addition to its central role in digitising healthcare through the use of electronic medical records, Telus has made a significant impact in the provision of virtual care. In 2019, it launched Babylon by Telus Health, which offers one-on-one virtual consultations with a licensed physician in British Columbia. The service has become Canada's fastest-growing consumer virtual care service, amassing tens of thousands of users. Such solutions could have a vital role to play in Canada's future, given the combination of an ageing population and limited access to specialist care for the 20% of Canadians that live in rural areas.

Similarly, the education sector has undergone a period of rapid experimentation due to Covid-19. Prior to the pandemic, just under half of mobile users in Canada and the US accessed educational services on their mobile phones. However, due to the closure of schools, students and teachers have been forced to try new learning techniques, with mobile technologies at the centre of this. For

example, communication platforms and video conferencing applications (e.g. WhatsApp, Microsoft Teams and Zoom) have emerged as vital tools to enable real-time learning outside of the classroom. If these tools boost engagement levels among students and result in better learning outcomes, it is likely that digital platforms will play an increasingly important role in education beyond the pandemic.

US operators help to ensure inclusive and equitable quality education for all

Mobile operators have supported the shift to remote learning in numerous ways, such as by providing free devices and increasing data caps for under-resourced students. Verizon tripled its monthly data allowance for Verizon Innovative Learning schools and T-Mobile increased its data allowance to 20 GB per month for free to schools and students using EmpowerED digital learning programmes. Mobile operators are also supporting the creation of educational content for mobile devices. For example, AT&T developed an online resource for eLearning Days from SETDA, in addition to committing \$1.2 million to small businesses focusing on remote learning solutions.



04

Policies to accelerate digital development

4.1

Improving network performance and reach

Mobile connectivity requires continuous investment by operators to keep up with demand and provide the service that consumers and businesses expect. In cities, mobile networks will increasingly consist of small cells — which means deploying antennas far more densely across urban areas.

Under the 5G FAST Plan (Facilitate America's Superiority in 5G Technology), the FCC has streamlined the review of small cell deployment applications by federal, state and local policymakers. Moreover, the US Court of Appeals also recently found in favour of the FCC's move to pre-empt cities and municipalities from charging over a certain amount for use of public areas and equipment for small cells. These developments highlight the need for governments and regulators to find ways to simplify and standardise planning procedures for operators. This can help overcome some of the challenges associated with network densification, which can in turn help operators to introduce new commercial service offerings more quickly.

In rural areas, infrastructure can be significantly more expensive to deploy compared to in urban areas, while revenue opportunities can be much lower due to the smaller population sizes. As a result, the mobile industry is innovating to deliver new solutions to address this problem. One example is open RAN, which uses standardised interfaces and interchangeable networking components. This has the potential to change the cost equation in rural areas while introducing a wider selection of vendors in the network equipment market.

The US is at the forefront of many of the developments in the open RAN ecosystem, with the US government showing increasing interest in these initiatives. So far, a number of US-based vendors have tested small-scale commercial deployments of open RAN in regions around the world. US operators are also actively involved through network trials and membership of groups that inform the future technical and policy needs of open RAN and related technologies. These groups include the Telecom Infra Project (TIP), the O-RAN Alliance and the Open RAN Policy Coalition.

4.2

Setting spectrum policy for 5G

The US remains a leader in allocating high-frequency spectrum bands for 5G networks and applications. Following the mmWave spectrum auctions in 2019, the FCC provided 3,400 MHz of mmWave spectrum in the upper 37, 39 and 47 GHz bands in the first half of 2020. This allowed US operators to continue with mmWave deployments, providing the increased bandwidth and capacity that numerous 5G applications require.

To achieve 5G's full potential, operators also need timely and sufficient availability of mid-range spectrum, which offers a balance of coverage and capacity that is critical to 5G's success. Making this spectrum available has sometimes proved to be a challenge due to incumbent users in prime bands, including government users. Nonetheless, the US has made progress in a number of areas this year:

- The FCC completed its auction for priority access licences (PALs) in the shared 3.5 GHz CBRS band.
- The FCC plans to hold a public auction for 280 MHz of spectrum within the C-band (3.7–4.2 GHz) in December 2020.
- The US Department of Defense announced that it was making 100 MHz of mid-band spectrum available for 5G in the 3450–3550 MHz band. An auction has been tentatively set for December 2021.

In Canada, the auction for 600 MHz spectrum (earmarked for 5G) was held in 2019, but the band is still not entirely cleared from incumbent users. Further, while the 600 MHz band is critical for achieving very wide coverage for future 5G networks, there is insufficient spectrum available in the band to deliver the fastest 5G services in most urban areas. In addition, the 3.5 GHz band is not scheduled to be auctioned until June 2021.

In the absence of 'new' mid-band frequencies, some operators have pushed ahead with deployments in refarmed spectrum. Rogers and Telus launched 5G on their 2500 MHz band used for LTE, while Bell did so using 1700 MHz AWS-3 spectrum. While this lets operators launch 5G more quickly, they require a significant amount of new harmonised mobile spectrum, ideally 80–100 MHz of contiguous spectrum per operator in prime 5G mid-bands (e.g. 3.5 GHz), to deliver the connectivity people need and expect.

4.3

Protecting consumers from nuisance calls

In response to the persistent problem of consumers receiving nuisance calls from automated machines (known as robocalls), the US Congress passed the TRACED (Telephone Robocall Abuse Criminal Enforcement and Deterrence) Act at the end of 2019. This requires operators to adopt call authentication technologies and gives the authorities more tools to pursue bad actors.

US operators continue to implement the FCC-backed authentication frameworks known as STIR (secure telephone identity revisited) and SHAKEN (signature-based handling of asserted information using tokens). Additionally, operators continue to put automatic in-network systems in place, which provide an additional layer of protection against robocalls. These added measures have become vital during the Covid-19 outbreak, during which older consumers have been targeted with health and financial fraud attempts related to the pandemic.







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