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WORLD ECONOMIC FORUM

5G Outlook Series:
The Impact of Mobile Technology on the Response to COVID-19

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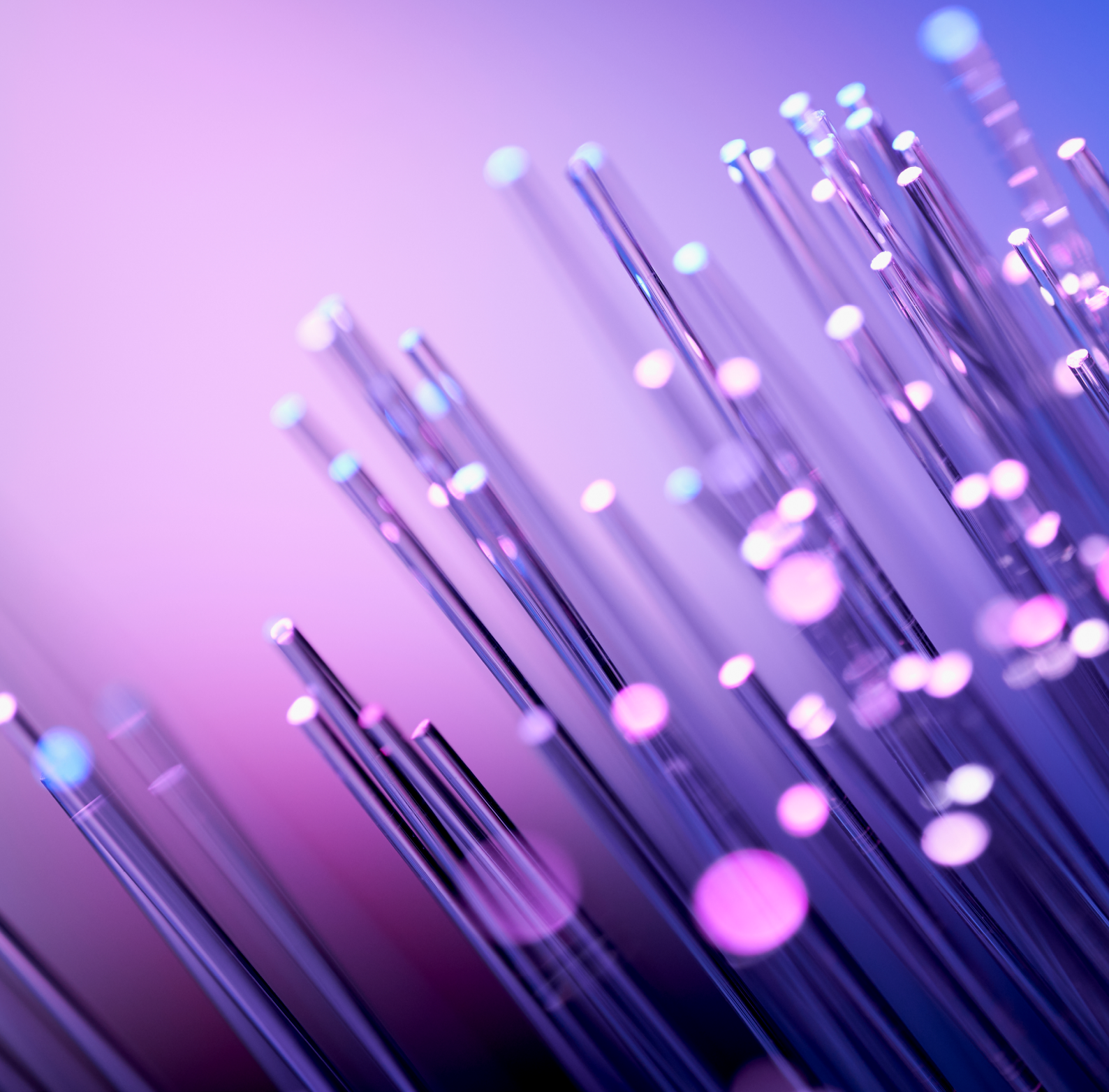

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Executive summary

As the COVID-19 pandemic has swept the globe, putting immense pressure on healthcare systems and economies around the world, connectivity needs have changed abruptly. The response to COVID-19 has significantly affected connectivity trends, mobile technology use cases and the outlook for 5G deployment and adoption.

This paper, the first in a series that examines the effects of mobile technology on the response to COVID-19, highlights early examples of 5G technology being used during this time and assesses the outlook for the expanded use of 5G in an era when ubiquitous, high-bandwidth connectivity has become more critical than ever.

Definitions of key terms

Fixed wireless access
Fixed wireless access (FWA) is high-speed, wireless broadband internet access that can be provided without a fixed-line connection to the access point. It is typically delivered over licensed 4G LTE or 5G connections, but can also be delivered using unlicensed or shared spectrum.

Mobile technology
For the purpose of this publication, mobile technology is defined as any mobile device or endpoint connected to the internet, regardless of the source of that internet connection. Note that, by this definition, mobile technology is not limited to connections using licensed spectrum (e.g. 3G, 4G, 5G), but also includes devices and endpoints connected via Wi-Fi.

4G LTE
4G LTE is the fourth-generation technology for cellular communications. LTE is defined as long-term evolution.

5G
5G is the fifth-generation technology for cellular communications. Compared to 4G, its primary benefits include improved bandwidth, latency, reliability, connection density and security.

1 Connectivity trends and mobile technology use cases arising from COVID-19

Global analysis of connectivity during the COVID-19 pandemic has found that connectivity trends have been affected by COVID-19 in five key areas:

- A massive, global shift to remote working
- Replacement of classroom learning with remote schooling
- Substitution of in-person gatherings for online socialization
- Shifts in commerce and retail in response to sudden changes in consumer behaviour
- The global public-health crisis response

As a direct result of these rapidly changing connectivity trends, many new and existing mobile technology use cases have grown quickly. 5G roll-outs have the potential to further enable mobile technology use cases, through increased mobile adoption and expanded high-speed broadband internet access via fixed wireless access (FWA). 5G will also enhance many of these use cases and enable the creation of countless new ones.

In addition to the key use cases directly tied to current connectivity trends, the World Economic Forum is compiling a growing compendium of mobile use cases related to COVID-19.[1]

FIGURE 1 **Mobile technology use cases arising from COVID-19**

	Remote work	Remote education	Online socialization	Commerce and retail	Public health
Key trends	57% of US workers working from home[2] 22% increase in AT&T core network traffic[3]	Increased bandwidth requirements 41% of people globally without reliable internet access[6]	Online gaming up 75% vs. pre-COVID levels[9] Houseparty downloads up 2360x in Spain in March 2020[10]	Online retail transactions[13] up 74% globally UberEats global revenue up 54%[14]	Telemedicine urgent care visits up 490%[17] Contact tracing helping contain COVID-19 in some countries
Future outlook	Twitter employees can work from home indefinitely[4] 50% of Facebook's workforce will be remote by 2030[5]	California State University (~500k students – largest in US) remote for autumn 2020[7] Schools globally allocating 15.9% of budget to EdTech in 2020, vs. 3.9% in 2018[8]	Physical distancing measures globally will continue until at least mid-2021[11] Mobile gaming revenue up 11.4% globally in 2020 (vs. 6.3% growth in 2019)[12]	Apparel chain Gap speeding automation roll-out[15] Increased mobile data use in Myanmar catalysing digital economy[16]	Medical delivery drones being tested in Holland, Switzerland and US[18] In UK, Samsung and O2 testing 5G connected "smart" ambulances[19]
Key use cases	Video conferencing Augmented reality (AR) and virtual reality (VR) training Remote asset access	Virtual classrooms AR and VR education content	Group video chats Online gaming Virtual exercise classes	Online retail Food delivery Smart warehouses	AI for public health Telehealth Connected hospitals Connected transport / drones

Source: World Economic Forum, January 2020[20]

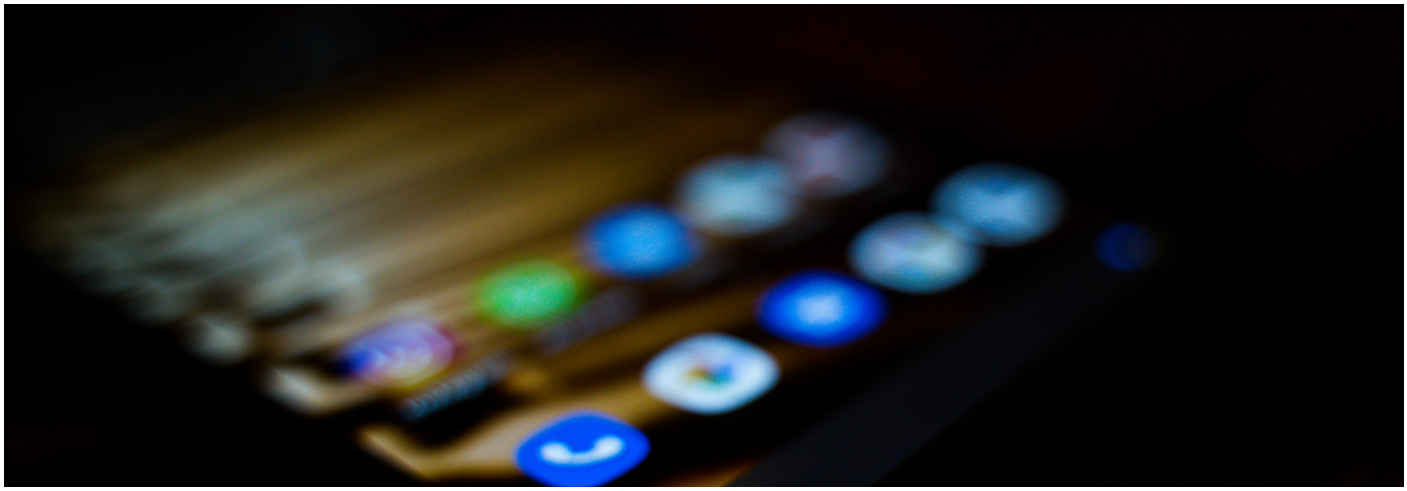
2 New capabilities enabled by 5G

COVID-19 has caused many existing and emerging mobile technology use cases to gain prominence, but the vast majority simply do not require the advanced capabilities of 5G. However, these use cases are still accelerating the need for 5G to expand broadband access and further enable new applications and services.

Some of the key functionalities enabled by 5G are outlined below.

FIGURE 2 **Key functional drivers of 5G**

Functional driver	Description	Added value	Use cases
Enhanced mobile broadband (eMBB)	Faster connections, higher throughput and greater capacity (up to 10 Gbps)	Allows for an extension in cellular coverage into diverse structures (large venues) and the ability to handle a larger number of devices using high amounts of data	Fixed wireless access service, enhanced in-building broadband service, real-time augmented reality service, real-time virtual and mixed reality service, crowded or dense area service, enhanced digital signage, high-definition cloud gaming, public protection and disaster response services, massive content streaming services, remote surgery and examination
Ultra-reliable low latency communication (uRLLC)	Reduced time for data from device to be uploaded and reach its target (1ms compared to 50ms for 4G)	Enables time-sensitive connections wirelessly	Autonomous vehicles, drones and robotic applications, health monitoring systems/telehealth, smart grid and metering, intelligent transportation, factory automation, remote operation, self-driving cars, mission-critical services (security and safety), high-definition real-time gaming
Security	Robust security properties, leading to high reliability and availability	Creates an ultra-reliable connection to support applications where failure is not an option	
Massive machine-type communications (mMTC)	Increased spectral efficiency plus small cell deployment	Allows for a large number of connections to support data-intensive applications	Asset tracking and predictive maintenance, smart cities/buildings/agriculture, internet of energy/utility management, industrial automation, smart logistics (advanced telematics), smart grid and metering, smart consumer wearables, environmental management, intelligent surveillance and video analytics, smart retail
Power efficiency	Efficient power requirements for massive multiple-input, multiple-output (MIMO), small cell implementation	Leads to lower costs and enables massive internet of things	



3 The outlook for 5G

3.1 The effect of industry and economic disruption on 5G roll-outs

5G roll-outs were always expected to occur in stages. However, COVID-19 trends are changing the relative importance of these stages. While the impact on 5G roll-outs varies by country, depending on the severity of the outbreak and the economic consequences felt by the country, the need to prioritize targeted roll-outs for fixed wireless access and enterprises is increasing in many regions. Blanket coverage enabling new consumer services will come later.

Targeted fixed wireless access roll-outs can bridge the growing digital divide and enable new use cases

Access to jobs, education and medical care has become increasingly dependent on high-speed broadband, as highlighted by the trends and use cases above. The trend towards remote working is highlighted by major companies such as Twitter, which announced permanent remote working policies.[21] As a result, bridging the digital divide for countries or regions without high-speed broadband internet access has become an increasingly critical societal issue. Using 5G for fixed wireless access, particularly for rural areas with low fibre penetration and where fixed-line installation costs can be high, can help bridge this gap.

Advanced use cases at work and school are also driving demand for enhanced network capacity, bandwidth and latency at home. Primary use cases highlighting these needs include multiple concurrent live video chats in the same home, as well as augmented reality (AR) and virtual reality (VR) for work, school, live gaming and virtual travel/leisure experiences – for instance, online safaris or virtual museum tours.

> **Last week, I went from a meeting about augmented reality and virtual reality for students to one about students struggling to download PDFs.**
>
> John Mitchell, Vice-Dean and Engineering Professor at University College London

Targeted enterprise roll-outs will bring economic and societal benefits

COVID-19 is accelerating 5G demand in some industries, while delaying demand in others. 5G demand for in-person retail, venues and airports has fallen off considerably as a direct result of the drop in the foot traffic these industries generally rely on – a trend that will likely last until COVID-19 vaccines are widely available.

Despite these slowdowns, 5G demand in several industries is accelerating. Online and essential retail, manufacturing and healthcare (including physical, mental and elderly care) will need 5G earlier than previously thought. While the enhanced capabilities of 5G, particularly private 5G networks for manufacturing and healthcare, will be needed to enable these use cases, Wi-Fi and private LTE will also address a portion of this demand.

For online and essential retail, an in-person workforce is still required, particularly in warehouses. As workers strive to adhere to physical distancing guidelines, the need for automation and massive internet of things

> **We've accelerated our capital investment and are expanding our 5G home broadband service to 10 cities this year so telehealth, digital education and remote work can thrive.**
>
> Christian Guirnalda, Director of 5G Labs and Innovation Centers at Verizon

(MIoT) to enable smart warehouses is accelerating. Once implemented – through Wi-Fi and, increasingly, 5G technologies – smart warehouses will allow workers to perform their duties at a safe distance from each other without losing productivity.

Like retail warehouses, an in-person workforce is required to keep manufacturing facilities running. As such, the need for technology to enable physical distancing has become critically important for worker safety. Enhanced automation through MIoT, VR/AR and artificial intelligence (AI) for remote machine servicing and remote training are enabled by mobile technologies and can facilitate physical distancing in manufacturing facilities. All of these require enhanced connectivity that can be provided by 5G.

Physical distancing and spikes in patient volumes in hospitals due to COVID-19 are driving the need for advanced connectivity in healthcare. With the help of video conferencing and many cloud-connected IoT endpoints, 5G-enabled telemedicine, including remote patient monitoring, allows access to medical care without potential exposure to COVID-19 and reduces hospital bed demand. In addition, 5G provides functionality to enhance contact tracing, and the enhanced security from 5G network slicing can enable the rapid scaling of temporary healthcare facilities and use cases such as autonomous medical cleaning robots that can reduce worker exposure.

New services outside the home will drive blanket coverage

While current 5G networks are driving more bandwidth usage for existing use cases, new direct-to-consumer services outside the home will continue to evolve as the global penetration of 5G-enabled devices grows.

This will require some combination of low latency, high bandwidth and high connection density, thereby driving blanket 5G coverage. One such application is the livestreaming of concerts or sports events via VR from anywhere, using MIoT to provide an experience like the real event. The use of autonomous drones for retail delivery is another application, which would require MIoT and low latency to function properly.

Since most of these services have yet to be conceived and may require other technological advances, the need for blanket roll-outs is less immediate than the previously described targeted roll-outs.

> **Bandwidth usage per consumer has nearly tripled since we launched 5G, mostly coming from video streaming. As technologies like augmented reality mature, we have high hopes for major growth in other advanced 5G use cases.**
>
> Hoerim Choi, Manager at Korea Telecom

Some 5G roll-outs may be delayed, while others will come sooner than expected

The combination of increasing demand and disrupted supply chains will change the timeline for 5G roll-outs in some developed countries. 5G roll-outs and spectrum auctions in Europe and elsewhere were already delayed as of early April 2020 due to COVID-19 prevention measures.[22] However, increasing demand and competitive pressures have kept US roll-outs at a rapid pace.

As COVID-19 restrictions ease, increased demand may accelerate other roll-outs already in progress and move up timelines for 5G roll-outs in countries where economics or regulations have been holding them back.

In developing countries, while 5G roll-outs have mostly not begun, telcos largely dependent on prepaid mobile plans are seeing short-term negative impacts on the availability of capital for network builds. However, COVID-19 has increased the appetite for increased digital infrastructure.

> **We have not seen our 5G roll-outs slow down as a result of COVID-19 and expect nationwide coverage by this summer.**
>
> Jay Cary, Vice-President of 5G Marketing & Development at AT&T

3.2 A path forward: the need for collaboration between governments and industry

While telcos have traditionally led new spectrum deployments, other industry players are also driving 5G. Private-sector entities and governments, including regulators, national governments and local governments, are playing major roles. The World Economic Forum has also been compiling additional details on how local governments and industry can collaborate to enhance 5G infrastructure investments in cities.[23]

Without collaboration between industry and government, 5G may increase the digital divide

If 5G is rolled out based only on market forces, telcos and original equipment manufacturers (OEMs) will first target enterprises and wealthy, densely populated areas to maximize the return on investment, as they have done with current networks; this is already beginning with 5G. Despite addressing some 5G use cases, this will accentuate inequalities in terms of accessing jobs, medical care and education – as these wealthy areas gain access to use cases such as advanced telemedicine, remote working and education through augmented and virtual reality and more – even as others continue to struggle with basic internet access.

> **In the United States, the government will drive 5G roll-outs as a potential means for investing in education, hospitals and domestic manufacturing.**
>
> Iyad Tarazi, Chief Executive Officer of Federated Wireless

COVID-19 has caused governments and societies to recognize the value of advanced connectivity

Governments globally have recognized the value of 5G and the advanced connectivity it brings. Developing countries that lagged in previous network deployments are making 5G network development a national priority, even as they struggle with near-term affordability.

> **Developing countries worry about being left behind in the 5G era. They recognize the consequences of the digital divide, as well as the greater implication of 5G on future economic growth.**
>
> Je Myung Ryu, Senior Digital Development Specialist at World Bank

Collaboration can maximize economic and social benefits

If governments and industries collaborate, 5G's promise of economic and social benefits can be realized. Government assistance can redirect market forces to ensure equal access during roll-outs and accelerate 5G network roll-outs. This assistance will be needed across local and national governments, as well as regulators.

4 What does the future hold?

COVID-19 has disrupted work, education, social activities, retail and healthcare. Changes to connectivity trends may remain after the crisis subsides, particularly in the next nine to 12 months as mobility increases, even though physical distancing guidelines remain in place.

Mobile technology use cases, most of which are dependent on high-speed broadband internet, are helping address these challenges. As a result, access to high-speed broadband internet is becoming ever-more important, especially in cities, which increasingly have an intertwined physical and virtual presence, and in rural areas, where demand for remote healthcare, education and retail services is growing.

In the near term, 5G can help address gaps in broadband availability through fixed wireless access, and enable safe working conditions in warehouses, manufacturing facilities and hospitals. Looking further ahead, blanket 5G coverage will enable many direct-to-consumer use cases that have yet to be imagined.

The next article in this series will look at the future of 5G against the backdrop of a global transition to a “new normal” involving an ongoing need for physical distancing, changed working patterns and the requirement for many business models to adapt. It will explore issues arising from the easing of lockdown restrictions, the potential market opportunities, and recommendations for how public- and private-sector organizations can make use of 5G technology.

Contributors

This White Paper is the result of a collaborative effort coordinated by a project team under the strategic guidance of the 5G Global Accelerator community. The contribution of a multistakeholder working group was fundamental to the development and validation of the findings presented in this paper and contributing to the broader agenda of the Shaping the Future of Digital Economy and New Value Creation Platform. Additionally, expert interviews and workshops provided invaluable insights.

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Jay Cary, Vice-President, 5G Marketing and Development, AT&T; **Aileen Chia**, Director-General, IMDA; **Hoerim Choi**, Manager, Korea Telecom; **Randi Reich Cosentino**, President, Naval Community College; **Izzat Darwazeh**, Chair of Communications Engineering, University College London; **Christian Guirnalda**, Director, 5G Labs and Innovation Centers, Verizon; **Kazuhiko Harasaki**, Deputy General Manager of Service Provider Solutions, NEC; **John Mitchell**, Vice-Dean and Engineering Professor, University College London; **Je Myung Ryu**, Senior Digital Development Specialist, World Bank; **Iyad Tarazi**, Chief Executive Officer, Federated Wireless.

More details about this community and the activities of the programme can be found on weforum.org/projects/5g-global-accelerator

World Economic Forum

Rodrigo Arias
Lead, 5G and Digital Transformation, United States

Jonathan Bahmani
Platform Curator, Digital Communications Industry, United States

Isabelle Mauro
Head, Digital Communications Industry, United States

PwC

Daniel Hays
Principal – Technology, Media & Telecommunications Advisory, United States

Darren Shea
Director – Technology, Media & Telecommunications Advisory, United States

Samuel Kishinevsky
Senior Associate – Technology, Media & Telecommunications Advisory, United States

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World Economic Forum
91–93 route de la Capite
CH-1223 Cologny/Geneva
Switzerland

Tel.: +41 (0) 22 869 1212
Fax: +41 (0) 22 786 2744
contact@weforum.org
www.weforum.org