



# The 5G edge computing value opportunity

A key pillar in the global economic recovery

June 2020

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[home.kpmg/5G](https://home.kpmg/5G)







# 5G and edge computing technologies are key to the global economic recovery

5G was one of the most exciting prospects as we entered 2020, but the world has now changed forever. COVID-19 has delivered a terrible blow causing loss, pain and heartache, and an economic downturn. An indisputable fact is that the need for organizations to be digital has never been greater, and 5G along with edge computing will likely play a key role in the global economic recovery.

Across all industries, our clients are telling us about the imperative to accelerate their digital transformation. Prior to COVID-19, digital had momentum – everyone could see the potential. Now the need is greater, perhaps even one of survival. Connectivity plays a vital role in the evolution of digital, and this has been seen in both fixed and wireless over the last decade. While the 5G business case was strong before, it's even stronger now.

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# The enterprise value

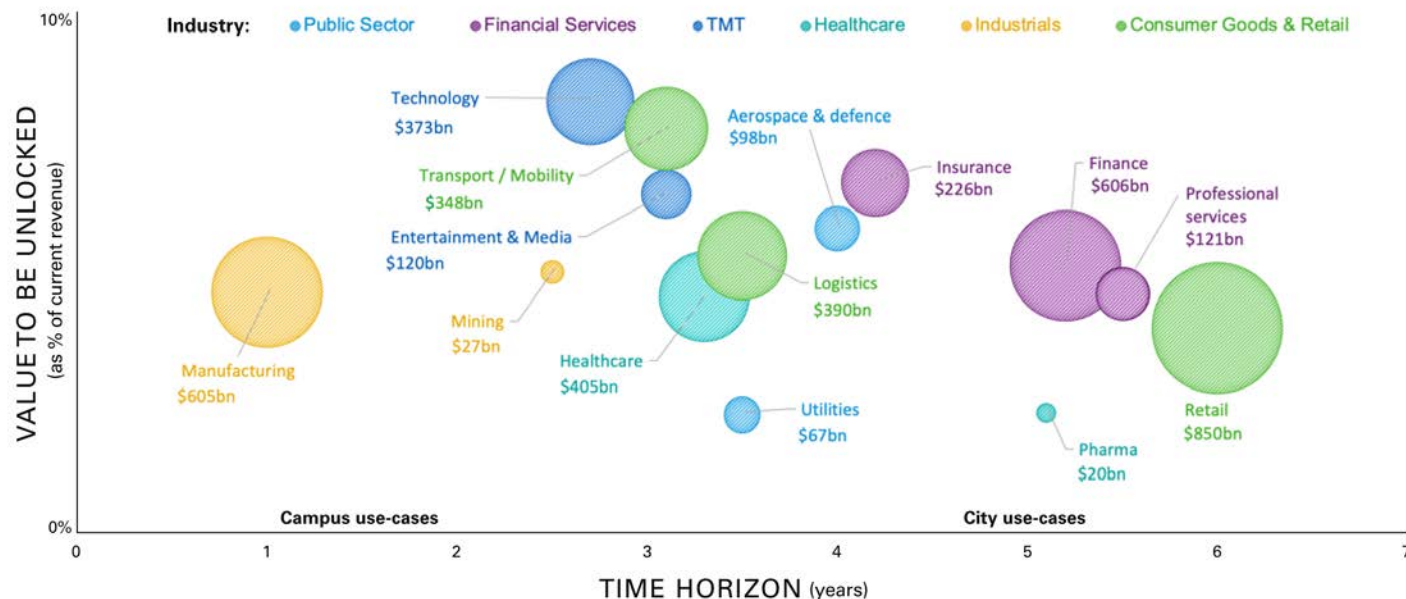
The deployment of 5G technology can help companies solve business challenges, reshape value chains, enhance revenue models, and optimize operations across many industries.

At Mobile World Congress 2019 KPMG International presented its research from *Unlocking the benefits of 5G for enterprise customers*. Our messages were clear and simple:

- The business case for 5G is far stronger in B2B than in B2C, with US\$4.3 trillion of upside identified
- Consumers won't pay enough incrementally for 5G to cover the cost of the new networks (like we saw in 3G and 4G), therefore telcos should focus their attention on B2B
- The global trajectory for roll-outs will be gradual through the twenties, with private networks going first, followed by cities and then some nationwide coverage
- KPMG analysis by sector showed that those industries that are most geographically centralized will benefit from 5G first (e.g. manufacturing)

At MWC we said to be a leader you need to pay attention to the following five things:

- *Think past the limitations of 4G and look at the new capabilities 5G will bring*
- *Understand 5G enterprise DNA and its ability to enable new business models*
- *Recognize timing of roll-outs will vary, and so will the creation of value*
- *Enterprise divisions need to be insight led and agile in their product creation*
- *Collaboration will be required to unlock the value drivers*



Source:  
KPMG International (2019).  
*Unlocking the benefits of 5G for enterprise customers*



# The relevance of 5G+Edge

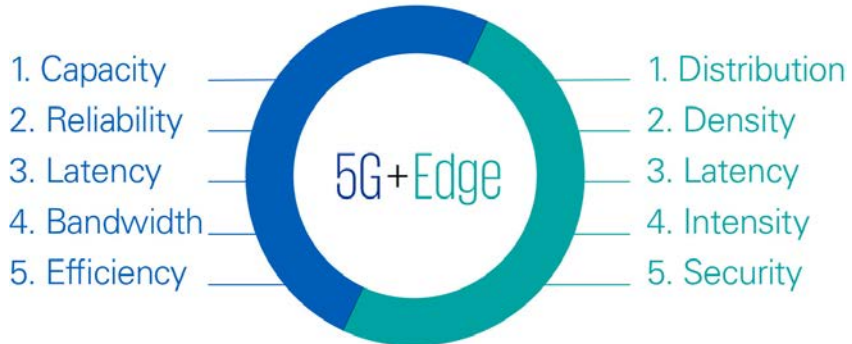
Edge computing is key to unlocking the financial benefits of 5G, and in thoughtful combination 5G+Edge can create significant incremental economic value for those in the ecosystem.

KPMG completed in-depth industry research with plans to launch our findings at MWC Barcelona 2020. With the event cancelled and governments, businesses, and society as a whole responding to COVID-19, we paused to reflect on the hypothesis to determine if it was still relevant.

As a result of this analysis, our view is that the imperative is perhaps greater now, and the power of 5G together with edge computing will play a key role in economic recovery.

## Key Drivers of Value

The intersection of 5G and computing at the edge versus the cloud is core to innovative value creation and critical to the successful implementation of 5G.



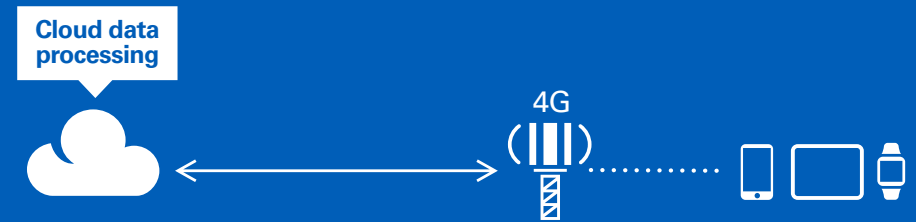
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## What is edge computing?

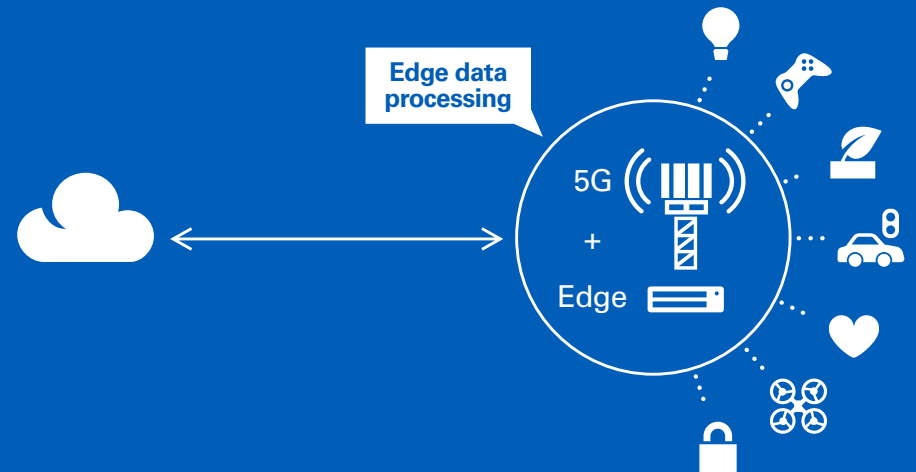
### 4G+Cloud

Processing and storage in a single, centralized location



### 5G+Edge

Primary processing and storage moves closer to support high bandwidth devices and time-sensitive data



# Everywhere, anytime communications

Few doubt the incredible potential of 5G. It's set to unleash the power of digital across multiple sectors, making factories, warehouses, workplaces, hospitals and homes more efficient, transportation faster and more convenient, and cities smarter.

5G provides the capability to support billions of connected devices transmitting huge volumes of data. Autonomous vehicles, manufacturing, transport, healthcare and many other sectors and activities will depend upon instant data transfer. At the same time, we're seeing the emergence of edge computing, which is moving processing power ever closer to the user, delivering the benefits of speed and latency to applications we will likely come to rely on.

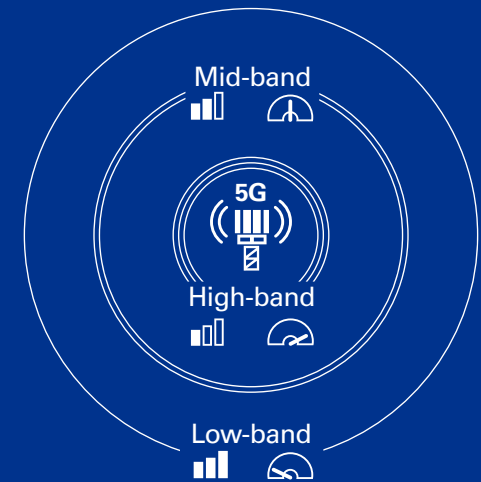
On current wireless networks, most data is moved to central data centers to be processed, which slows down the process. And while today most applications being used aren't really impacted, with the advent of emerging technologies such as autonomous vehicles, any delay in the AI being used could be problematic. Stepping into the future to find the economic benefits is key.

The potential to dramatically improve bandwidth and latency, delivering the 'everywhere, anytime' communications the world has been promised is here with the combination of 5G and edge computing. [Gartner research](https://www.gartner.com/smarterwithgartner/what-edge-computing-means-for-infrastructure-and-operations-leaders/)\* shows the proportion of enterprise-generated data processed outside a 'traditional' centralized data center or cloud will leap from 10 percent in 2018 to 75 percent by 2025. This is an exciting prediction showcasing the benefits of the low latency of edge computing, and the lightning speed of 5G that makes 5G and edge computing one of the most powerful technology synergies – ever.

\*<https://www.gartner.com/smarterwithgartner/what-edge-computing-means-for-infrastructure-and-operations-leaders/>



## The 5G spectrum



There are three distinct spectrum groupings that are relevant for 5G, and each has benefits and drawbacks:

**Low-band spectrum** (Nationwide)  
(sub 1GHz)

Wide coverage, limited speed  
*Ideal for extending reach (inside/around buildings) and reliability as a coverage layer in 5G deployments*

**Mid-band spectrum** (Metro Area)  
(between 1GHz and 6GHz)

Good balance of coverage/speed  
*Ideal for delivering Gbps data speeds to mobile users with wide RF channel bandwidth*

**High-band spectrum** (Dense Urban)  
(24Ghz-100Ghz known as Millimeter Waves or mmWave)

High speed, limited coverage, poor indoor penetration  
*Ideal for delivering high bandwidths and traffic density using small cells*

# 5G+Edge ecosystem

When it comes to the intersection between 5G and edge computing, telcos once more have to look beyond mere connectivity and identify new ways to realize value.

To bring all this to life we looked at **who** is in the emerging 5G edge computing ecosystem, examined the main players, and determined **how** telcos can best position themselves and **what** they need to do to gain a larger share of the revenue.

The 5G+Edge ecosystem is built on the four pillars of connectivity, hardware, software and services. A number of players are involved in developing and delivering these products and services to customers.

They will work together, but also compete for a share of the revenue.

## Services



Managed services and subscription-based offerings, to businesses and consumers, is a significant and growing market, as organizations digitize and technologies converge.

### Key players:

System integrators, streaming and cloud services providers.

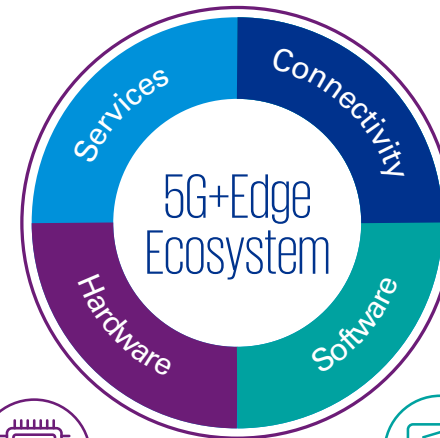
## Connectivity



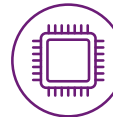
Connectivity is the area of most obvious interest to telcos, providing fixed and wireless infrastructure and service on either public or private networks.

### Key players:

Telcos



## Hardware



There is an increasing range of hardware in the 5G+Edge ecosystem, much of it a part of the internet of things (IoT), including sensors, mobile devices and cloud infrastructure.

### Key players:

Network equipment manufacturers, autonomous vehicle/robot manufacturers, AR/VR device and platform vendors, IoT producers and semiconductor companies.

## Software



Software providers offer software licenses to customers, as well as embedded analytics capabilities for many hardware components.

### Key players:

Cloud providers, ERP and software vendors, remote monitoring solution providers and specialists in analytics and big data.

# The 5G+Edge opportunity

While every sector is likely to benefit from 5G and edge computing, we wanted to highlight the sectors where the new services delivered as a result of their combination was most illuminating.

The intention wasn't just to go after the biggest dollar signs, but capture the imagination of those in the ecosystem to see the art of the possible.

Together with global market intelligence firm IDC, we estimated the value from 5G+Edge that can be gained through five key sectors by providing connectivity, hardware, software and services. Importantly, we kept the analysis to the next 3 years, to really bring to life that the opportunity is here and now.

## The 5G+Edge difference: an industry perspective

Analysis from KPMG and IDC estimates the combined market across these five sectors for connectivity, software, hardware and services to be worth more than US\$500 billion by 2023. The five industries are forecast to enjoy impressive growth over the next few years, driven in part by the vastly improved connectivity arising from the intersection of 5G and edge computing.

## The five industries are:



**Industrial manufacturing**



**Connected healthcare**



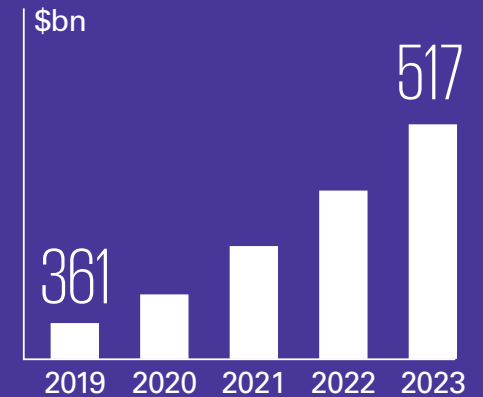
**Intelligent transportation**



**Environmental monitoring**



**Gaming**



Total addressable revenue in these five industry use cases is expected to rise from **US\$361 billion** in 2019 to **US\$517 billion** in 2023.

This presents an ecosystem opportunity of **US\$517bn** in 2023.

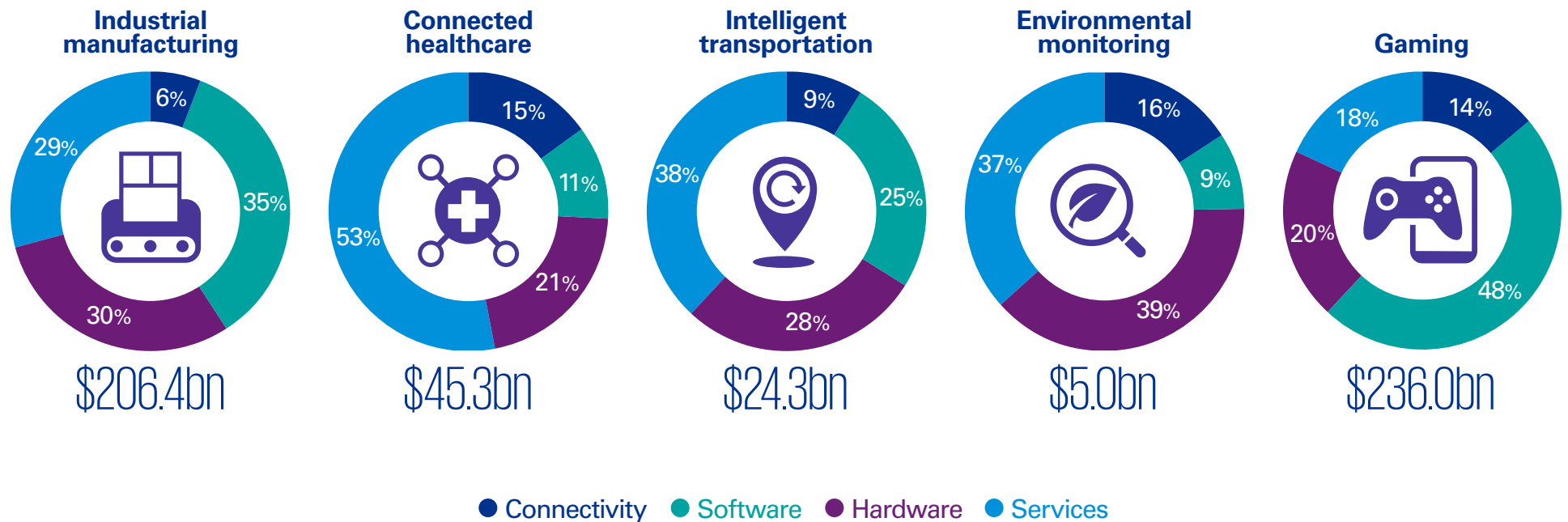
# Expanding the core

Connectivity alone may not be enough. Telcos' traditional revenue sources are barely tapping into the huge potential of 5G and edge computing.

By 2023, with an uptick in the adoption of 5G and edge computing, the five target industries are forecast to drive more than US\$500 billion in annual revenue into the entire ecosystem that includes connectivity, hardware, software and services.

Connectivity alone is only a modest fraction of this total – approximately 11 percent, or US\$55 billion. It's a sobering prospect for telcos. The dire economic impact of becoming a 'dumb-pipe' is real and requires immediate action for those not already positioned to benefit.

## The US\$517bn 5G+Edge ecosystem across just five industries







## Industrial manufacturing

The world is moving towards highly autonomous factories, where sensors analyze data from every corner and AI continuously adjusts production to meet demand. Through predictive maintenance, 24/7 asset monitoring, minimized downtime and improved safety, performance in manufacturing can be truly transformed. The end products are assessed throughout the process, to help assure the highest quality, reducing the cost of errors and helping ensure happy end-customers.

The result? Higher quality products that can be produced faster and at lower cost, with less waste, lower maintenance, material and energy costs, and a more sustainable, low-emission environment.

### The COVID-19 effect

Many factories may have been forced to close during the pandemic, but the benefits of 5G and edge computing to the manufacturing environment are so compelling, that it could hold the key to accelerate recovery for manufacturers. By accelerating digitization, manufacturers can reduce costs and improve the speed and quality of products.

We're not suggesting that the cost of a 5G upgrade will be an option for all, but the harsh reality is that those able to make the upgrade are likely to leave the rest of their peers behind as markets recover.

## 5G+Edge

*is expected to create an incremental 51% addressable market in manufacturing, growing from US\$136 billion to US\$206 billion by 2023.*



## Connected healthcare

Healthcare is arguably the biggest beneficiary of better data and AI over any other sector. Whether in the hospital or out in the community, patients can be monitored constantly via sensors that collect and analyze health information and alert physicians and caregivers. Devices may include glucometers, blood pressure cuffs, heart monitors, oximeters and other wearables. The hospital of the future can also track location and performance of its high-value medical equipment.

The outcome of such advances can include improved care, better quality of life, at lower cost. Hospitals and clinics meanwhile can get better value from expensive assets with less downtime.

### The COVID-19 effect

The healthcare sector has done an astonishing job during this pandemic. There's no doubt that a more digitized healthcare sector, through virtualized and remote care, would help both patients and providers.

We believe 5G and edge computing will help track infections across the population and provide real-time insights that can minimize spread and protect health workers.

## 5G+Edge

*is expected to create an incremental 66% addressable market in the healthcare market growing from US\$27 billion to US\$45 billion by 2023.*

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## Intelligent transportation

There's a lot of buzz around the potential for smart cities. Data from sensors can tell transit operators and passengers about performance and problems as well as keep passengers up-to-speed on schedule times and delays. Out on the streets, traffic management is made easier with real-time updates of hotspots, roadwork, and accidents, which in turn informs travelers and their navigation systems. Parking also becomes less of a hassle with instant identification of free spaces.

Consequently, travelers can enjoy a vastly improved experience, with fewer delays, faster journeys and safer public transport.

### **The COVID-19 effect**

With a global lockdown, the volume of home deliveries has massively increased, and it's likely that much of that demand will remain as customer behaviors could change forever. There's no doubt that 5G and edge computing can help usher in contactless – and ultimately autonomous – deliveries of food and other products. Cities need advanced connectivity to incorporate such changes and meet the demand of businesses and citizens.

## 5G+Edge

*is expected to create an incremental 100% addressable market in the intelligent transportation market from US\$12 billion to US\$24 billion by 2023.*

## Environmental monitoring

As 2020 began, the biggest topic at Davos was the need to address the serious issues impacting the environment. Urban and rural landscapes are under threat from extreme weather and pollution, and governments must also protect their citizens from potential terror threats or chemical attacks. Effective monitoring helps detect signs of harm and enables quick mitigation. Environmental and healthcare agencies as well as local authorities need to access and analyze complex data from multiple sources, in order to make informed decisions like diverting traffic, limiting access to geographical areas or acting against harmful substances.

Increasingly, the world will rely on monitoring and detection to keep citizens, organizations and supply chains safe and secure as well as help minimize interruptions to daily life.

### **The COVID-19 effect**

COVID-19 has reduced pollution across the world. Effective monitoring in a post-COVID world could help ensure that pollution doesn't go back to pre-COVID-19 levels. What we know is that to do it effectively, it involves vast amounts of data from millions of sensors.

## 5G+Edge

*is expected to create an incremental 78% addressable market in government environmental monitoring from US\$2.8 billion to US\$5 billion by 2023.*



## Gaming

Cloud-based gaming is a massive worldwide phenomenon that is growing in popularity at a breathtaking pace. The emergence of AR/VR is creating incredibly vivid and realistic experiences that require world class connectivity to function at the highest level. Gamers require ultra-fast connectivity and very low latency to support advanced graphics and content streamed to multiple players simultaneously. 5G and edge computing will literally take gamers into a new reality, and it's one that has all those in the ecosystem excited.

While the majority of gamers today are using a console, it wasn't that long ago that we all had DVD players under our TVs. Now very few have them as we've moved to a streaming environment for content. The same will likely happen for gaming, and it may happen faster than we think. 5G and edge computing together enable the transition to cloud-based gaming.

### **The COVID-19 effect**

Use of gaming is increasing significantly during the lockdown. While some of that may fall back once the lockdowns end, many gamers will happily continue to play online with friends in a post COVID-19 environment. As 5G networks go live, gamers will be able to take advantage of new functionality and gaming experiences, using technologies such as AR/VR.

## 5G+Edge

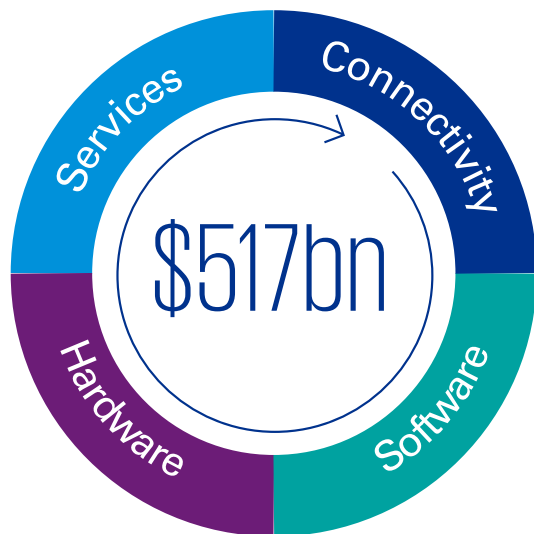
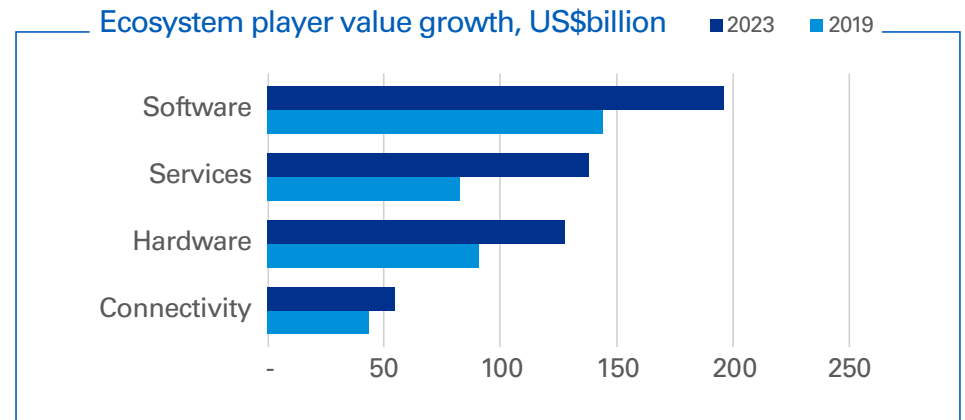
*is expected to create an incremental 30% addressable market in gaming from US\$180 billion to US\$236 billion by 2023.*



# Changing roles for telcos

There are a number of things that telcos can do to enhance their position in order to capture the maximum amount of value through the ecosystem.

Proactively investing in capabilities within, and beyond, connectivity will be vital to securing a greater portion of the value. The prospects for 5G and edge computing are exciting, but to make the most of the opportunity, we believe telcos should consider taking the important steps shown below.



## 1. Protect the core

- Cultivate the ecosystem around the use cases
- Build multi-service propositions (fixed and mobile)
- Invest in 5G capabilities utilized in the use cases

## 2. Diversify capabilities

- Invest in skills and capabilities
- Platform enablement opportunity in bringing multiple players together

## 3. Embedded connectivity

- Seek M&A targets to capture strong hardware / connectivity plays in large use cases

## 4. Verticalize around use cases

- Verticalize capabilities to provide more end-to-end services for particular use cases
- Consider strategic M&A targets





# Outpacers can capture more

At KPMG we believe that 5G and edge computing represent the platform on which the next industrial revolution will be delivered. We call companies that lead in digital the 'Outpacers.'

Outpacers are organizations with ambitious visions and disruptive models that seem to glide effortlessly through the digital economy, achieving astounding earnings, customer growth rates and market share targets time and time again.

## **Emerging from COVID-19**

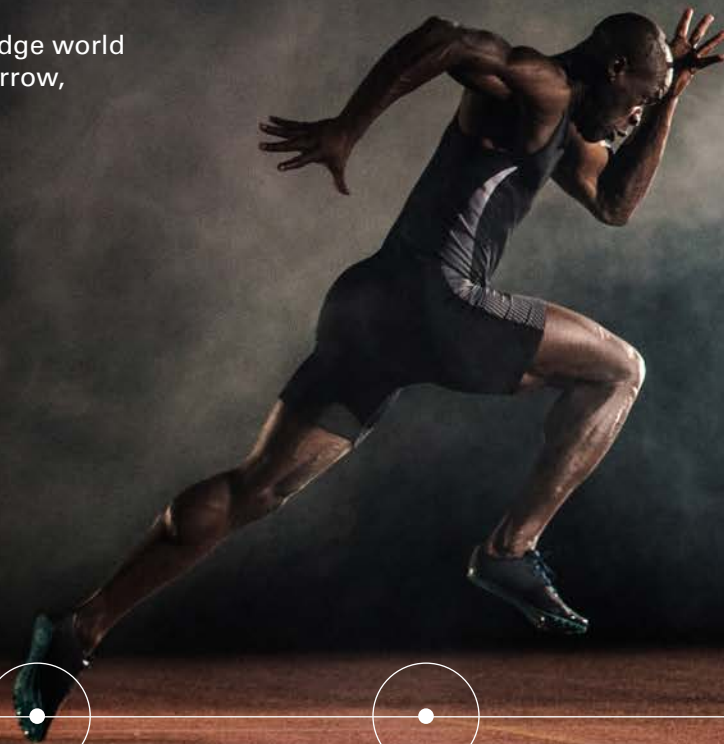
How deep and how long the COVID-19 economic downturn lasts will depend on a variety of complex moving parts. Some are out of business' control, others are not.

Those that have become today's big tech players invested in and focused on becoming amazing digital organizations while others hunkered down and waited for the 2008 Financial Crisis to finally relent. When it did, the tech giants were poised and ready to deliver an exceptional digital experience for their customers and have continued to grow at an amazing pace quarter after quarter.

Telcos now have the opportunity to do the same by investing in 5G and edge computing.

# How to be an Outpacer

If you want to be an Outpacer in the 5G+Edge world that's here today and will define our tomorrow, we suggest the following five steps.



## Be in the future

The total 5G+Edge ecosystem opportunity for the industries outlined in this paper is over US\$500bn through 2023.



## Make new friends

We can't over-emphasize the importance of close partnerships, particularly between the telcos and cloud providers. Cultivate and nurture strong relationships.



## Invest BIG

Deploying 5G+Edge is not cheap, but the rewards are significant. With the massive push to digital, the cost of being left behind is arguably greater.



## Create your future

We've only covered five industries; there are many more. Stay ahead by finding a distinctive market position, which means a willingness to experiment and take risks.



## Start doing

COVID-19 and the subsequent economic impact will place a strain on long-term strategies. But strong leadership can move you forward and embrace the risks and opportunities.

In today's increasingly digital environment, the time to act is now.

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