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# 5G: Bringing “smart everything” to life



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The advent of 5G technology holds great promise. With enhanced speed, functionality, and data processing, it could transform productivity and performance in almost every sector and serve as the digital nervous system of “smart everything”. As such, 5G is an indispensable component of the secular trend of digitalization and an important investment thematic that could provide tailwinds for investment portfolios for years to come.

## INTRODUCTION

The evolution of wireless technology has fuelled a host of new mobile applications and has greatly enhanced our daily lives. Already, getting lost on car journeys while scrutinising a paper map is a thing of the past, thanks to digital navigation systems that track our location and tell us the quickest way to our destination. Such innovation had a halo effect on numerous industries, for example, travel and airlines, with foreign trips becoming much less daunting.

5G, the next iteration of wireless technology extends mobile connectivity beyond



traditional mobile devices, like cell

phones and tablets, paving the way for a connected world - one in which people can collaborate with each other, no matter their location, one which encapsulates features like machine-to-machine communication, smart technology, the internet of things (IoT) and artificial intelligence (AI). In this new reality, maybe driving will join map-reading as an ancient art, with 5G enabling autonomous cars that are aware of their surroundings and that can communicate with other vehicles. In turn, accidents resulting from human error could be completely eliminated. This is just one example of 5G's potential to disrupt ingrained habits or norms. In reality, it could catalyse profound changes across an array of sectors. The European Commission expects that 5G will have the biggest impact on healthcare and manufacturing, as well as travel, with a benefit exceeding €500 billion worldwide per year for 5G-enabled service providers.[1]

Each of us, as consumers, will be able to enjoy a smarter, more connected world with, among other things, enhanced entertainment. But what is at stake is bigger. In a future powered by silicon and software, we expect the productivity improvements brought by 5G to be transformative, bringing "creative destruction", otherwise known as Schumpeter's gale of industrial mutation, revolutionising the economic structure, while destroying the old one.

#### A History of Wireless Data Networks

Generation	Inception date	Features
1G	1980s	Pioneered wireless telecommunications, bringing us mobile voice calls
2G	1990s	Enabled short message service (SMS) and text encryption
3G	~1998	Gave mobile internet access and video calling
4G	~2009	Brought faster data speed allowing US to book an Uber, to access HD streaming, video conferencing and gaming. It is said that without 4G, FANG would not be an acronym.
5G	Began deployment in 2019	Is ushering in a completely new interconnected world by delivering enhanced broadband cell phones, super-fast communication, and machine-to-machine communication

## 5G FEATURES

5G has three key features that differentiates it from 4G technology:

**Negligible latency:** Latency is the time it takes for data or a signal to be transferred between its original source and its destination. The lower the latency, the lower the delay in communications. 4G suffers from around a hundred milliseconds in response delay or latency. The 5G reaction time can be as low as 1 millisecond, meaning it is almost instant. This capability is essential for many use cases such as autonomous driving, industrial automation, and remote medical assistance.



**Dense connections:** in a given square kilometre, 4G can only manage to connect about 1/10 of the amount of devices that 5G can. This capability is essential for the development of connected smart cities of the future, connecting all kinds of devices and sensors through the internet and allow them to communicate without any human involvement.

**Wider bandwidth:** 4G could only muster about 200 megabits per second of data while 5G can handle up to 1 gigabit (or 1000 megabits) per second, meaning ultra-fast data sharing is possible. The increased speed is achieved partly by using additional higher-frequency radio waves in addition to the low and medium band frequencies used in previous cellular networks (collectively referred to as the 5G spectrum).

It is worth noting that the higher frequencies can't carry data as far, which is where small cells come in. These are small versions of the large cellular towers we all know, which will use processes such as beamforming to efficiently aim transmissions, rather than spraying signals everywhere. We will need new phones, tablets, portable hot spots and so on with 5G receptors in order to connect to the new networks that current generations can't tap into it.

### What is a smart city?

A smart city is an urban area that uses different types of electronic methods and sensors to collect data. Insights gleaned from that data are used to manage assets, resources and services efficiently; in return, that data is used to improve the operations across the city.

Smart cities based on 5G can make almost anything that is electric connected and aware; When a road needs repair why can't it tell someone? With a mesh of 5G connected sensors it could. Other features of a smart city may include lights that illuminate only when needed, automated traffic management, efficient utility usage, heightened surveillance...

## 5G USE CASES

5G is not about meeting the needs of existing mobile customers, it's about meeting the needs of machines and systems with virtually limitless data growth. While we as consumers will experience the benefits with almost-instant downloads and streaming and upgrades to our homes and cities, the industrial benefits are potentially even more interesting. 5G is the enabler of what is described as the 4th Industrial Revolution, the automation of manufacturing and industrial practices by using smart technology, machine-to-machine communication and the internet of things (IoT) for increased automation, improved communication and self-monitoring.

### Examples of potential 5G application in industry verticals

Manufacturing	Smart factories (where physical production processes and operations are combined with digital technology, smart computing and big data to create a more opportunistic system for companies that focus on manufacturing and supply chain management), precision monitoring and control, collaborative robotics, advanced predictive maintenance...
Transport	Autonomous driving, airborne taxis, fleet management and tracking, car-sharing, mobility on demand... Upgraded infrastructure (think road systems that automatically divert traffic if there's an accident, or when air pollution levels reach a certain level)
Entertainment	Collaborative / immersive gaming, 3D calls/ holograms, smart wearables
Healthcare	Remote patient monitoring, virtual consultations, remote diagnosis, robotic surgery and nursing, surveillance, fall detection... 5G will increase the availability of healthcare, even in the most remote corners of the world
Agriculture	Smart farming equipment, AI-enabled farming drones, crop yield monitoring, soil/ nutrient monitoring
Logistics	The IoT will be a game changer for the logistic industry, allowing route optimization, more efficient capacity allocation, warehouse management preventing out of stock or over-stock situations, last kilometer delivery solutions (using robots or drones) or smart delivery boxes.
Utilities / Energy	Smart grid technology will enable utility companies to detect, react to and intuit changes in usage and issues. It will also allow digital technologies that link up privately owned energy assets — such as solar panels, thermostats and batteries — aggregating energy to relieve the pressure on the grid, essentially creating decentralized “virtual power plants”. 5G will also enable equipment and vehicles to be controlled remotely, making operations like mining and inspections safer.

In all, 5G networks are set to become the digital nervous system of “smart everything”, enabling a variety of use cases in multiple domains.

## Rollout status

Initially, the pandemic slowed the progress of 5G, but it soon turned into a catalyst. As people became reliant on communications networks for leisure, work and education, the need for high-speed, high-bandwidth connectivity became acute and many operators doubled down on their 5G deployment efforts.

*“Since the industry last met in Barcelona in February 2019, the number of 5G networks increased from three in South Korea; to 165 networks in over 65 countries worldwide” - Mobile World Congress 2021*



So far, Asia has led the way in the rollout of 5G technology, helping us to understand the implications and importance of it. South Korea was the first country in the world to launch 5G services in April 2019. According to Statista, the country now boasts approximately 15 million users, already more than 20% of mobile subscriptions - not a surprise for a country that is home to smartphone giant Samsung and where smartphones are an integral part of the lives of many of its tech-savvy citizens. Moreover, and since the rollout of commercial 5G services in October 2019, the combined number of 5G subscribers of China's top 3 telecoms reached 420 million in April 2021.

In Europe and the US, we appear to be on the cusp of a major 5G upgrade cycle and widespread adoption seems highly likely with Apple scaling up its production of its 5G equipped iPhone 12 and other players launching more mass-market versions of their 5G smartphones.

Recently, France announced that it will invest roughly €1.7 billion to expand and grow the country's 5G market by 2025. Between now and 2022, the government will spend €480 million

to support priority project and the country has begun auctioning off 5G frequencies. It is thought that an increase in 5G frequencies will greatly benefit the country's agriculture, automotive, transportation and hospitality industries and create 20,000 new jobs.

Meanwhile, the UK government has announced a £28 million investment in nine nationwide projects that will trial innovative uses of 5G networks, including trailing 5G-powered cargo ports.

## 5G WINNERS

The adoption of 5G technology will have far-reaching consequences for many companies and it is expected that there will be far more winners in the 5G story than losers, meaning that for investors, opportunities are abound. Research conducted by Nokia Bell Labs finds that 5G has the potential to contribute \$8 trillion to global GDP by 2030. [2]

To upgrade network infrastructures and end-devices from 4G to 5G, many critical components are needed. IT names, communications equipment providers, fiber providers, semiconductor manufacturers, cloud providers and software developers all stand to benefit from this advancement. We are still in the early stages of piloting 5G in factories and while we believe adoption will be gradual, we also believe that it will be ubiquitous, bringing efficiency, cost savings and greater control for manufacturers.

Communications service providers have a key role to play. As well as providing and managing the networks, there are many opportunities for them to advise governments and industry to ensure that we exploit 5G to its full potential. Skeptical investors argue that the costs of deployment will tally in the billions for most telco operators, while the near term opportunities to monetize this appear low, thus creating a drag on return on invested capital. This is probably true but is definitely only valid in the short-term. The long-term benefits for telco and other sectors will be transformative. Even for telco, the long-term model will move from being subscriber driven to connected-devices driven and on aggregate 5G should open up additional revenue streams from connected factories, cities, cars, devices, etc. As famously predicted by Masayoshi Son, the founder of SoftBank, we might expect one trillion connected devices by 2035.

Platforms offering digital services also stand to benefit as 5G will greatly enhance their offering. For example, online shopping will become faster and more convenient by facilitating instant purchases on-the-go and 5G will be used to provide a more immersive experience for the customer. Likewise, streaming services may soon offer immersive viewing using AI.

## CONSIDERATIONS

But 5G is not exempt from controversies, from security concerns (cybersecurity as well as espionage), fear and anxiety about the health effects of wireless signals, and even Covid-19 conspiracy theories linking the pandemic with 5G technology.

Since 5G is a new technology, its long-term effects on the environment are unknown. Energy usage is also on the list of controversies; according to estimates from telecom operators, energy consumption could double to meet increasing traffic demands, network improvements and the overall 5G rollout.

But breaking the energy curve is feasible. While denser 5G networks coupled with increasing data traffic volumes is going to increase energy consumption, telecommunications networks are becoming more energy efficient and relying more and more on renewable energy.

We believe that the final outcome will be net positive, with 5G improving our overall energy efficiency, helping us to reduce greenhouse gas emissions, minimize waste, and even protect wildlife by enhancing our understanding and therefore decision-making about the weather, agricultural matters, diseases, and industry,.. Unsurprisingly, 5G is one of the key areas of investment identified by the EU Commission for a digital and green recovery.

5G will also support the usage of smart contracts, allowing embedded and automated control systems. In the domain of sustainable development, the perspective of having embedded certification should definitely be a game changer, forcing companies to “walk the talk”.

However, we should not only consider energy consumption but also life cycle impacts. New infrastructure, new mobile phones, manufacturing devices and sensors means more mining and the use of many non-renewable metals. There are strategies that can and should be deployed to lessen the environmental impacts of 5G. From an investor lens, ESG integration will be key to identify sustainable disruptors in the sphere.

With regard to health concerns around the micro frequencies emitted by 5G technology, these are classified by scientists as non-ionizing radiation. You have to move up to x-rays, gamma rays and cosmic radiation to find the kind of emissions that will harm human cells, and 5G is far below those. It is good to know that 5G follows the inverse square law, losing power rapidly at even a small distance from the small cell.

## IMPLICATIONS FOR INVESTORS

5G will take years to rollout and significant investments, but the complexity of that deployment and debugging should be worth the wait, as it will usher in a world where everything is connected, aware and responsive.

5G will be one of the most critical building blocks of our digital economy and society in the next decade, and investors should be prepared for the take-off of this promising technology. It is and will be a source of revenue growth for many companies and these companies deserve to be on the radar of investors for the coming years.

But again, the real disruption will come from new use cases for the technology, fostering new

ways for businesses to operate. The technology is here but it will take many years for infrastructure providers and platform providers to fully deploy their services and capabilities, generating many years of benefits. While encouraging investors to capitalize on 5G's significant growth potential in their portfolios, investors should also understand that this is a long-term growth story, not a guarantee on returns for the months or quarters to come.

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