

Introduction, Importance and Impact of

5G Technology

A Glimpse into the Wireless Future

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Rapid evolution of digital technologies and widespread adoption of Cloud, Internet of Things (IoT) and Artificial Intelligence (AI), alongside an increasing dependence on smartphones, has eventually prepared the world for a race towards a wireless future.

The one thing that has facilitated the acceleration of digital world is **'Speed'**.

Speed is everything in the world of clustered and convoluted network connections.

High speed wireless technologies such as 4G LTE played a prominent role in the propagation of transitional technologies including IoT, AI and real-time analytics that require the fast transmission of bulk volumes of data.

With the successful exploitation of every possible opportunity provided by the 4G space, the world is all set to embrace the benefits of fifth generation of wireless networks and technologies.

Though **5G Technology** is still a work in progress, many experts consider 2020 as the year where 5G technology will be consolidated.






Introduction to 5G Technology

5G Technology refers to the ‘fifth generation’ of mobile connectivity. It is the latest iteration of cellular technology with an aim to boost the speed and responsiveness of wireless networks.

With the introduction of the first standardized cellular network (1G) in 1982, the world has witnessed the adoption and deployment of 4 technology standards in total till date.



Other cellular technologies that include 2G, 3G and 4G LTE are deployed in 1992, 2001 and 2010, respectively.

The 4G LTE wireless technology is playing a significant role in the development of 5G.

Now, cellular network operators and technology companies around the world are actively involved in preparing themselves for adopting and deploying 5G technologies for new cellular devices.

The 5G data networks promise to usher in a new era of drastically high-speed wireless connectivity.

It is expected that 5G networks could deliver data at a speed of 10 gigabits per second, at least 100 times faster than the current 4G technology with the highest speed of 100 megabits per second.

Moreover, 5G is not only higher speeds and higher throughputs, but it promises a host of opportunities to businesses as well as individuals.

The technology will disrupt various business operations ranging from communicating with consumers to storing and analyzing data.

Each generation of cellular network is separated not only by the data transmission speed, but also by several other factors. Let's have a look at what makes them different...

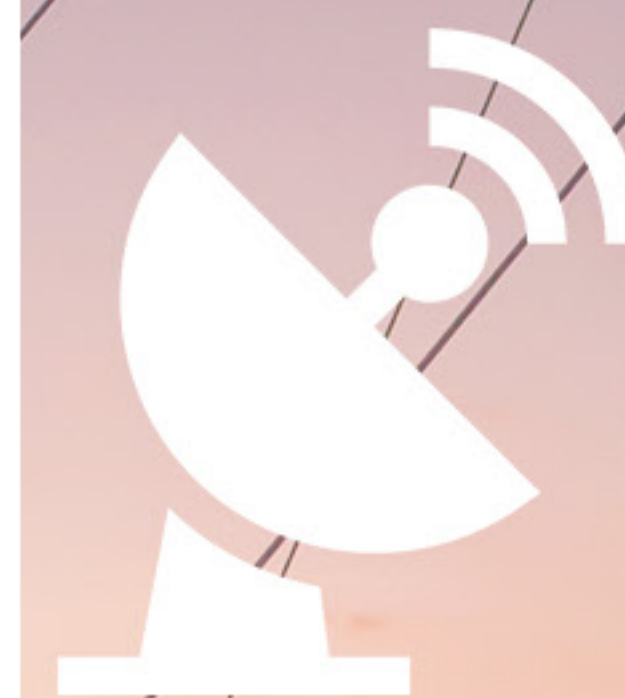
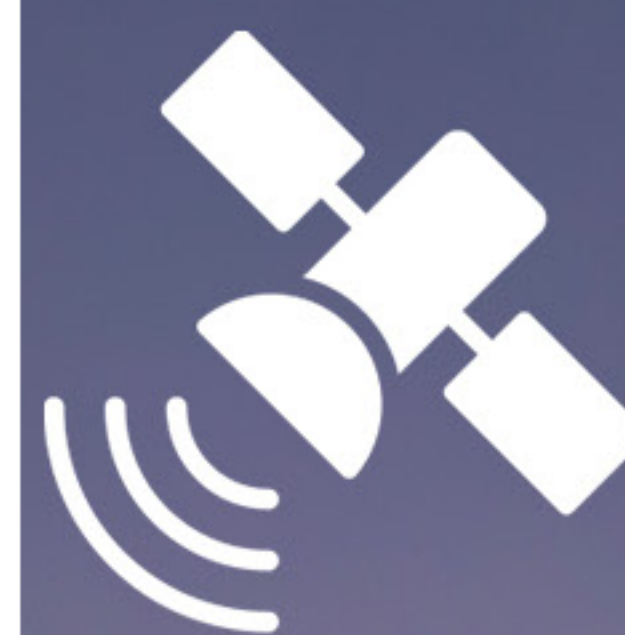
Differences: 1G vs 2G vs 3G vs 4G vs 5G

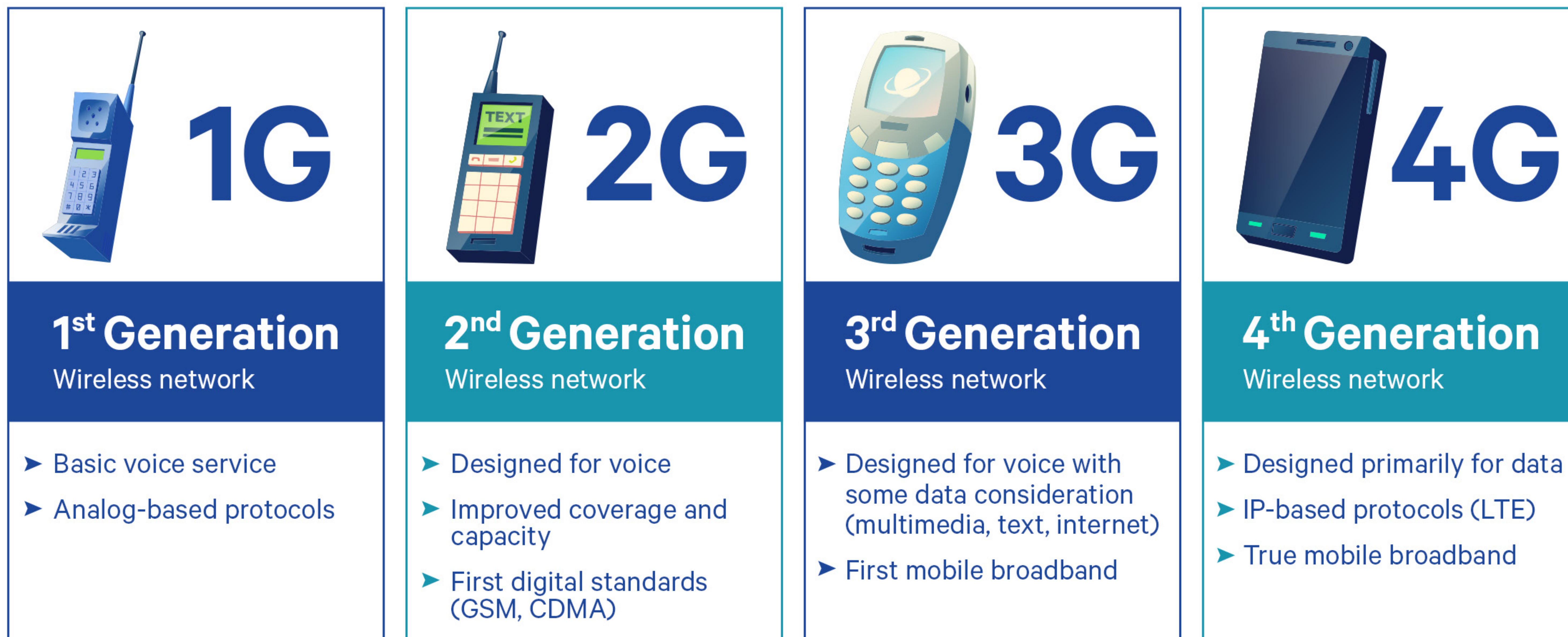
1G Technology: This is the first generation of cellular networks. Analog telecommunication standards are introduced with Advanced Mobile Phone System (AMPS) technology. The maximum speed of data transfer is 2.4 Kbps. It is only used for voice calls.

2G Technology: This is the second generation of cellular networks. Digital communication standards are introduced with Global System for Mobile Communications (GSM) technology. The 2G mobile phones are used for voice calls, SMS, MMS and internet. The maximum data speed is 64 Kbps.

3G Technology: This is the third generation of cellular networks. It combines 2G network with the Universal Mobile Telecommunications System (UMTS) technology. Web browsing, video call, conference call and multimedia sharing are some of the smart features introduced in this generation. The maximum data speed is 3 Mbps.

4G Technology: This is the fourth and the on-going generation of cellular networks. High speed data transfer is the special feature of this generation. Maximum data speed is 100 Mbps. Technologies such as MIMO (Multiple Input Multiple Output) and OFDM (Orthogonal Frequency Division Multiplexing) are introduced in this period. Mobile applications include gaming, IP telephony, video conferencing, mobile TV and wearable devices.





5G Technology: This is the fifth generation of the cellular networks which is currently under development. Extremely high-speed data transfer with low latency is the important feature of 5G. The maximum data speed is expected to be 10 Gbps. IoT, HD multimedia streaming, autonomous driving and smart homes are some of the expected applications.

Comparison	2G	3G	4G	5G
Introduced in year	1993	2001	2009	2018
Technology	GSM	WCDMA	LTE, WiMAX	MIMO, mm Waves
Access system	TDMA, CDMA	CDMA	CDMA	OFDM, BDMA
Switching type	Circuit switching for voice and packet switching for data	Packet switching except for air interference	Packet switching	Packet switching
Internet service	Narrowband	Broadband	Ultra broadband	Wireless World Wide Web
Bandwidth	25 MHz	25 MHz	100 MHz	30 GHz to 300 GHz
Advantage	Multimedia features (SMS, MMS), internet access and SIM introduced	High security, international roaming	Speed, high speed handoffs, global mobility	Extremely high speeds, low latency
Applications	Voice calls, short messages	Video conferencing, mobile TV, GPS	High speed applications, mobile TV, wearable devices	High resolution video streaming, remote control of vehicles, robots, and medical procedures

With the growing reality of the 5G wireless telecommunications, the IT businesses are looking forward to leverage the host of benefits associated with it. Let's have a look at the promising benefits of the 5G technology.

Business Benefits of 5G Technology

High speed data transfer, seamless internet services and low latency are just a few business benefits.

Here are few more prominent benefits of 5G technology that can boost the business.

1) Smart IoT:

Internet of Things (IoT) have already opened the doors for new business opportunities and aided companies by developing innovative business models and services. Increased asset utilization, seamless processes, enhanced productivity are some of the benefits of IoT. So, with the higher data speeds of 5G, enterprises can adopt an entire IoT ecosystem with higher intelligence and increased capacity.

2) Seamless Remote Working:

The BYOD and remote working have secured prominent place in the business world with the benefit of allowing employees to work from anywhere. But it hasn't quite taken off as much as it is expected due to the limited features of 4G technology. So, with the reliable and fast internet promised by 5G, the remote work can be accomplished without any interruption.

3) Strategic Network Slicing:

The businesses are continually adopting emerging technologies to provide multifarious services on par with the growing consumer demands. But in order to provide better user experience, it is essential for the enterprises to deploy flexible networks.

With 5G, the businesses can adopt network slicing technology that facilitates in creating multiple virtual networks from a single physical network. Network slicing allows the businesses to provide optimal support for myriad of services for multifarious customer segments.

4) Cost Savings:

The 5G technology is anticipated to enhance the battery life of devices by up to 10 times. It also relieves the businesses from the financial burden of equipment deployment, maintenance and monitoring by enabling a shift from a hardware-based infrastructure to cloud environment. So, businesses can incur prompt cost savings in terms of hardware and infrastructure.

While 5G may, in fact, enhance business outputs and enrich user experience for certain business applications, its biggest impact will be on productivity and economic growth.



Impact of 5G on Productivity and Economic Growth

The 5G technology will improve the consumer experience and business utility through reliable and high-speed internet connections. Moreover, it will impact the productivity and economic growth of every country in the world.

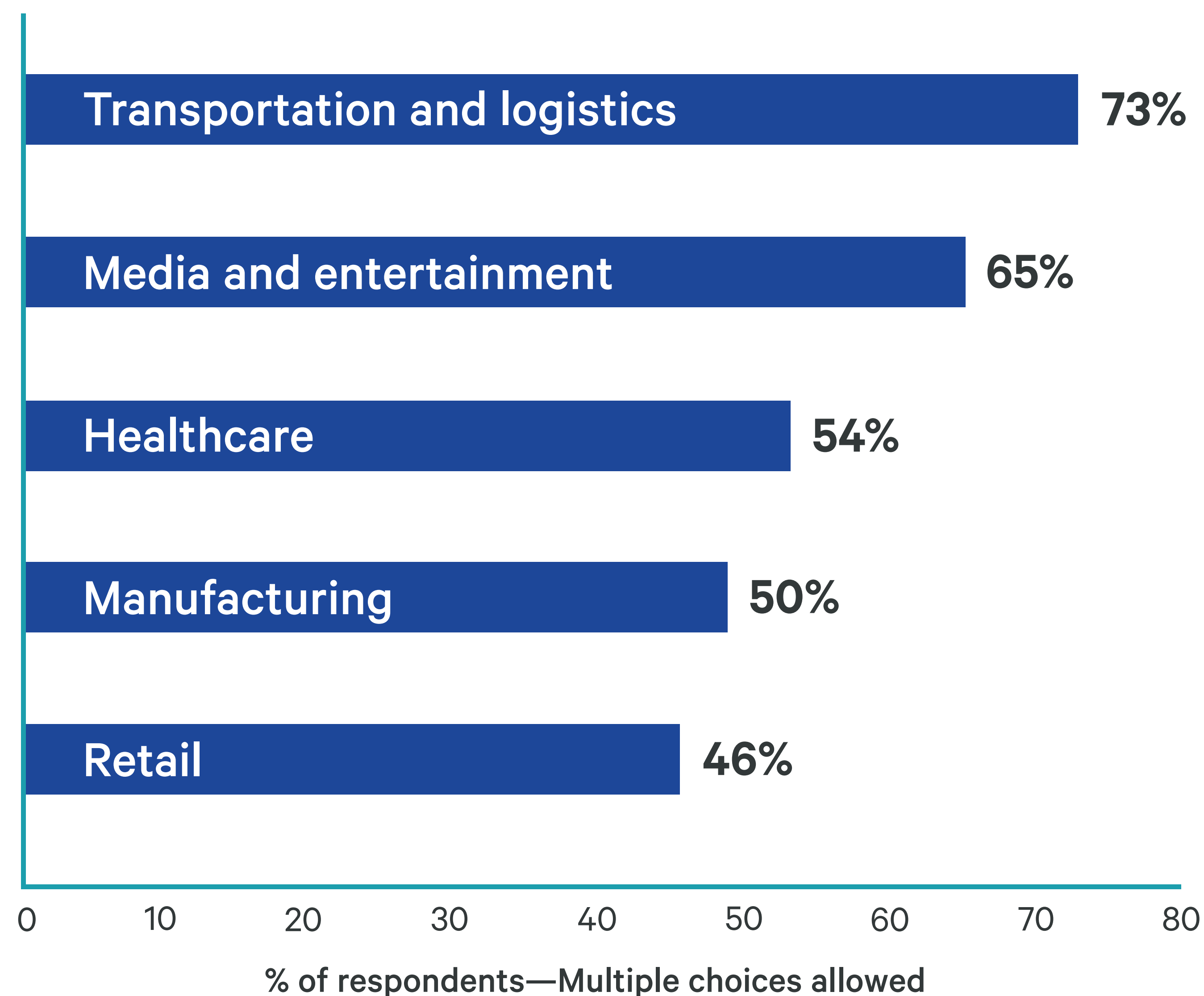
5G promises to provide positive implications on the productivity growth across the world. It is estimated that 5G could significantly augment the GDP per capita of the countries within the decade after adoption.

In 2035, 5G will enable USD 12.3 trillion of global economic output.

The global 5G value chain will generate USD 3.5 trillion in output and support 22 million jobs in 2035.

(Source: IHS Markit)

Impact of 5G on Industries



The pervasive adoption of 5G technology across multiple industries will positively impact the human and machine productivity and eventually uplifts the living standards of the people, globally.

Industries depending on current 4G networks, including Telecommunications, Entertainment, E-commerce, Education and Energy will leverage the host of benefits offered by the 5G technology.

Moreover, apart from business benefits, the 5G technology will provide consumer and society-wide benefits. It will facilitate the implementation of smarter cities and enriched health services and thereby improves the wellbeing of the consumer and households.

While 5G develops the stage for innovative opportunities across many aspects, it also will bring disruption to many industries.

With major 5G network deployments to take place in 2020, many industries are expected to witness a positive transformation due to the host of benefits promised by the technology.

Here are the few industries that will be most impacted by the emergence of 5G technology:

1) Transportation:

Emergence of Industry 4.0 revolution has led to the perpetual growth in the automotive and transportation industries. Now, in the brink of 5G evolution, these industries are looking forward to leverage the benefits of the 5G technology to deploy the autonomous/self-driving cars on the road. The low latency, high speed data and wider network coverage will aid the OEMs in developing active, advanced driver-assistance systems and a lot more autonomy in cars.

2) Health care:

The 5G technology will aid the healthcare sector by enabling remote monitoring systems, like wearable technology and remote robotic surgery procedures. The technology will facilitate a virtual, real-time interaction between patient and doctor. The telemedicine will gain significant momentum with the integration of 5G technology.

The global telemedicine market will increase at a CAGR of 16.5% from 2020 to 2023

5G technology in healthcare is estimated to develop a USD 76 billion revenue opportunity in 2026.

3) Manufacturing:

The 5G technology also promises significant impact on the manufacturing industry. It will bring greater safety and efficiency to the industry. The high-speed internet, low latency and greater network coverage will facilitate smart factory equipment, thus enhancing the performance of robots, IoT devices, machine learning, monitoring sensors and more. Moreover, it enables enterprises to implement remote operations including inspections, tracking goods and monitoring machines – in real-time.

4) Energy:

Energy and utilities industry will benefit from the 5G technology, which would set the stage for next wave of smart grid features and efficiency. 5G will enable seamless connection and interaction between smart grids and enhances the efficiency of energy management. It will further facilitate innovative and smart solutions in energy production, transmission, distribution and usage.

5) Agriculture:

The 5G technology could facilitate smart farming by enabling increased adoption of IoT devices for irrigation system management, fertigation, crop communication, seed monitoring and cattle safety monitoring. The technology could help the farmers by providing real-time data for smart monitoring, tracking and automating agricultural systems.



Impact of 5G on Digital Transformation and Trending Technologies

With the rapid evolution of digital technologies, the Communications Service Providers (CSPs) have successfully transformed their businesses into Digital Service Providers (DSPs) and are looking ahead to leverage new 5G innovations.

Even though 5G is still a work under progress, the entrepreneurs have already started developing and deploying digital services and applications that will make the most of the benefits of 5G networks.



Most of the leading telecom firms have gained a lot from adopting digital technologies such as Augmented Reality (AR) and Virtual Reality (VR) in the era of 4G.

But it's been a challenge for most, mainly because applications used for serving AR and VR environments are obliged to be capable of accessing and handling bulk amounts of data.

The limitations of 4G are considered to be the prime dynamics for the slowdown of the growth of digital technologies.

So, it is anticipated that the AR and VR are poised to hit mainstream with the low communication latency and increased network speeds of 5G.

It is estimated that the value of the AR market will rise from USD 5.91 billion in 2018 to USD 198.17 billion in 2025 with the rollout of 5G networks.

Moreover, cloud computing, edge computing and real-time data, which are in play, are going to experience tremendous growth with the interconnectivity of 5G.

Even though 5G technology sports an impressive benefit list, it's imperative to know that many security concerns are anchored to it. Let's have a look how 5G is impacting security!

Impact of 5G Technology on Security

As 5G technology becomes a reality, this will further boost the evolution of digital ecosystems. But a seamlessly interconnected digital infrastructure also portrays greater security challenges. Extremely high-speed data is a proven advantage for users, but it's also a boon for malicious hackers.

5G, which promises to enhance the implementation of IoT devices in real-time business operations, could increase Distributed Denial of Service (DDoS) attacks by enabling faster, data-dense attacks.

Likewise, the high speeds and increased capacity will give rise to extremely higher amounts of exchanged data. So, there will be higher pressure on the IT infrastructure capacity and ability to secure the data traffic on par with the speed of data transfer.

Moreover, IoT is developed on 4G infrastructure models with old security procedures. So, it will take significant amount of time to upgrade the security mechanism for 5G infrastructure.

Apart from the security concerns of 5G technology, there are many allegations related to health and environment.



Impact of 5G on Health and Environment

The telecom industry is trying to rollout 5G technology, but the scientists and doctors are exclaiming that the technology will bring real, unintended potential hazards for human health and environment.

5G network uses extremely high frequency signals which lies between 30GHz to 300GHz. So, in order to provide adequate network coverage, a large number of antennas must be installed. This leads to the significant rise in **radiofrequency electromagnetic fields (RF-EMF)** on top of the 2G, 3G, 4G and Wi-Fi radiation.

The RF-EMF radiation has been proven to be hazardous for humans, plants and environment and so, the increase in radiation exposure by 5G will lead to unintended harmful effects.

So, it's imperative to know that 5G is going to enhance our lives, but likely at expense of our own wellbeing in the long run.

As we are at the brink of 5G technology, we are obliged to understand the EMF better and shield ourselves from the festering effects of the radiations through proper choice of electronic products.

How Long will it Take to 5G Technology to Arrive?

The first high profile 5G was deployed by KT, Samsung and Intel at the 2018 Winter Olympic Games in South Korea. They have installed 100 cameras inside the Olympic Ice Arena to capture the games and used 5G SIG equipment to transfer gigabit-speed wireless broadband and low-latency live streaming video content to the 5G-connected tablets for viewing.

Similarly, many companies including NTT Docomo, Ericsson, Huawei and Verizon have demonstrated 5G technology. And, even some smartphone manufacturers have launched 5G-enabled devices.

Moreover, many internet and telecommunication provider have already started construction of 5G infrastructure. But it is expected that 5G will not be widespread until at least 2020, followed by a five-year period to expand across the world. During this period, 4G will be still in high demand.

IT is anticipated that 5G use cases will begin to rollout between 2020 and 2025 and will become mainstream by 2030.

USA 5G Market – An Overview

In the US, there are already some carrier networks that have deployed 5G in 2019. Four major network carriers, namely, AT&T, Sprint, T-Mobile and Verizon have started offering 5G services in major metropolitan cities.

Atlanta became the first city to witness 5G from all the four on July 31, 2019.

Currently, Verizon is offering 5G at major locations including Atlanta, Boston, Chicago, Dallas, New York and Washington and are planning to deploy 5G at Cincinnati, Kansas City, San Diego and Little Rock.

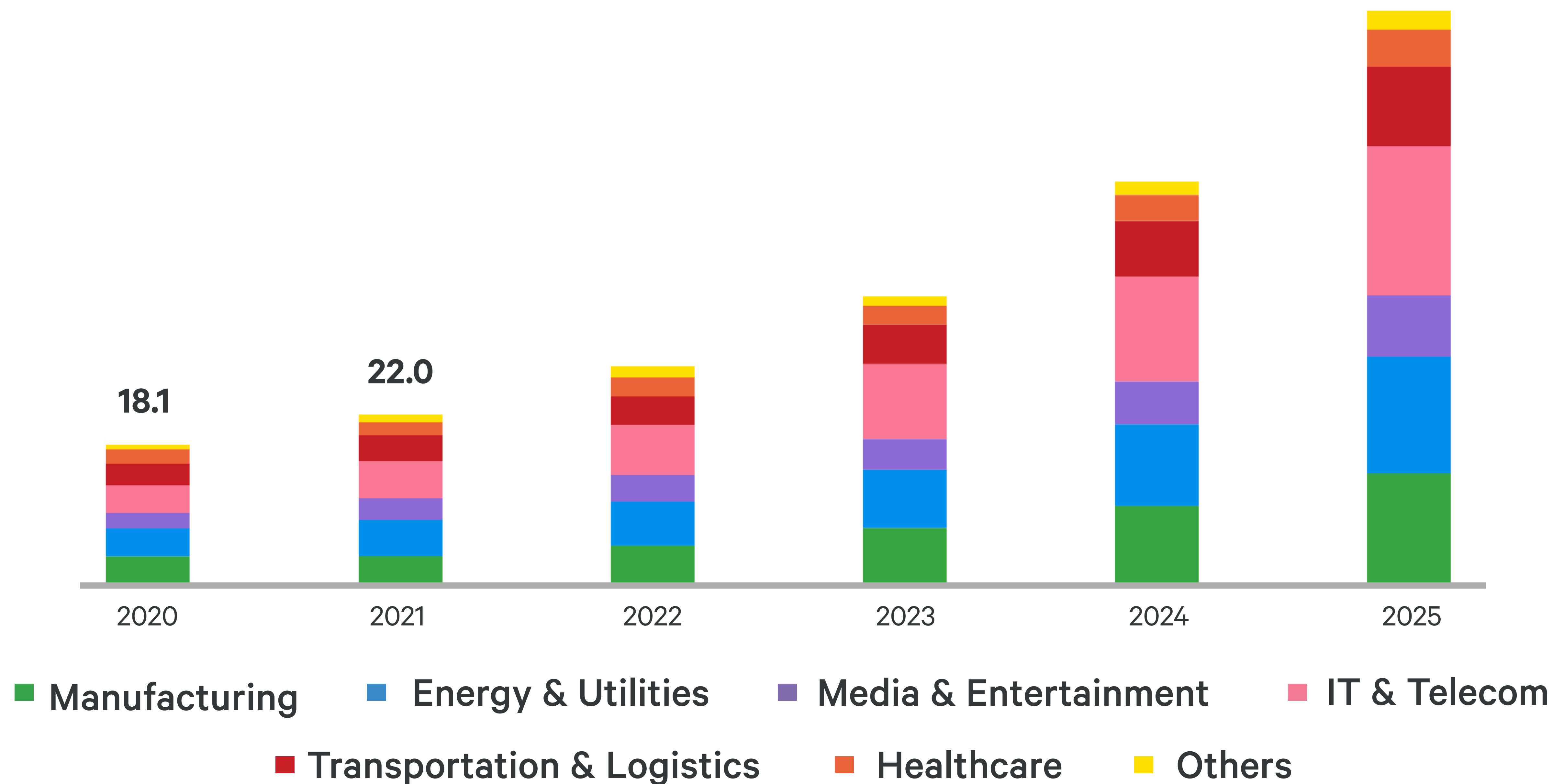
AT&T has deployed 5G at Atlanta, Austin, Dallas, Houston, San Antonio, and Las Vegas, Los Angeles, San Diego, San Francisco, San Jose and New York, to name a few. The company is planning to start 5G services at Chicago, Cleveland, and Minneapolis.

Sprint has deployed 5G Dallas, Atlanta, Chicago, Houston, TX, Kansas City, Los Angeles, New York, Phoenix and Washington, D.C.

T-Mobile has deployed 5G across the US nation on December 2, 2019.

US 5G Services Market, By Vertical, 2020 - 2025 (USD Billion)

The global 5G services market size is estimated to reach USD 45.7 billion by 2025 and register a CAGR of 32.1% from 2021 to 2025.



Source: www.grandviewresearch.com

Conclusion

With the expected progress in 5G technology and implementation of 5G deployments, the 5G capabilities are set to be a reality in the next few years, helping reshape industries and improve people's lives.

But, for successful implementation of 5G technology into market, many technical challenges and various health concerns are needed to be answered. Moreover, 5G has to minimize the problems that observed in the previous technologies.

Looking ahead, at the brink of 5G roll out , the buzz about 6G is starting up. Though 6G is still in the basic theoretical research phase, the speed-driven telecom industry is eagerly anticipating to prepare themselves for the higher connectivity speeds, ultra-dense cell networks and millimeter waves.

It is expected that the upgradation to 6G will be easier than the journey from 4G to 5G as the 6G is promising an intelligent networking system.

Moreover, it is predicted that it will take around 15 to 20 years for 6G to become mainstream, given that the world has just witnessed 5G.



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