

# Overview of the 2020 Information and Communications White Paper

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## 1. Introduction

The first part of the 2020 Information and Communications White Paper has adopted the special theme, “Digital Transformation and New Lifestyles Promoted by 5G,” looking at two issues: 5th generation mobile communication systems (5G), which began commercial services in Japan in 2020, and the global spread of the new coronavirus disease (COVID-19). It summarizes current conditions, how they have affected society, the economy, and the digital revolution in Japan, and the outlook for Japanese society into the 2030s. The second part of the white paper provides the latest data indicating the state of information and communications in Japan and discusses policy trends, mainly related to initiatives of the Ministry of Internal Affairs and Communications (MIC). This article gives an overview of the First part of the white paper.

## 2. 5G: Infrastructure for the New Era (Reiwa Era)

### (1) Evolution of mobile communication systems

Since the 1st Generation mobile communication system (1G) was introduced in Japan in 1979, performance improved with each successive generation approximately every ten years, and it has now grown to be essential infrastructure for everyday life and for corporate economic activity. Now, commercial 5G services began in Japan in 2020, and it is expected to have even more impact on society than before, being implemented as infrastructure for the IoT era in various fields and industries. This is because, in addition to enhanced Mobile Broadband (eMBB), which

increases the speed and capacity of earlier mobile communication systems, it can also fulfill requirements for Ultra-Reliable Low Latency Communications (URLLC) and massive Machine Type Communication (mMTC). These are expected to be used as infrastructure, creating new value by improving efficiency and convenience in industry and society.

With the appearance of 5G, mobile communications systems are evolving further, from lifestyle infrastructure to industrial and societal infrastructure, and we expect it to contribute to economic growth and finding solutions to societal issues in Japan.

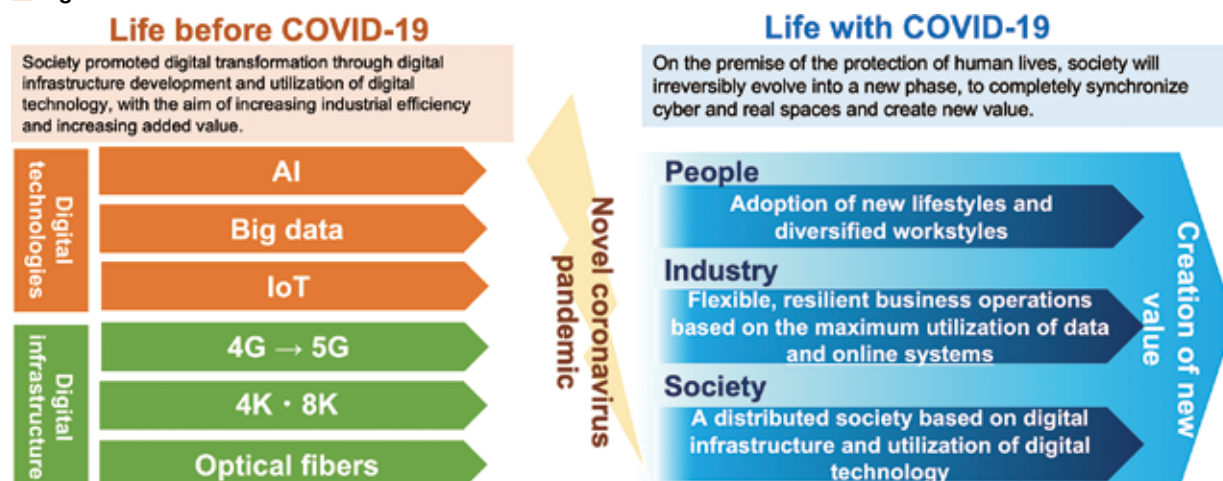
### (2) 5G Trends in various countries

5G commercial services were started earlier in the USA, Europe, China, and South Korea than in Japan. After three carriers in South Korea simultaneously initiated mobile 5G services for smartphones on April 3, 2019, Verizon started a mobile 5G service in the USA. China started their service in November, 2019, approximately one year earlier than originally planned, and 11 countries in Europe had started commercial 5G services as of March, 2020.

On April 10, 2019 in Japan, the MIC approved plans by NTT DOCOMO, KDDI/Okinawa Cellular, SoftBank, and Rakuten Mobile, to deploy specified base stations, and commercial services started in March, 2020.

As described in detail in Section 4 of Chapter 2 of the white paper, Japan has created a “Local 5G” system, separate from the nation-wide services provided by mobile phone operators. The system provides flexibility for various entities to build mobile

Figure 1: Life before COVID-19 and with COVID-19



communication systems that can be used to meet the needs of individual regions or industries, and currently various development demonstration tests are in progress. Similar systems are also being implemented in Germany and the UK.

### (3) Structural changes in the telecommunications market

As commercial 5G services have started and with the spread of IoT and AI technologies, the number of IoT devices in the world is expected to increase dramatically, particularly in industrial applications and consumer information appliances. On the other hand, according to the GSM Association (GSMA), an industry association of mobile phone operators from various countries, 5G lines will make up only 20% of all mobile lines by the year 2025. Although the ratio will exceed 30%, particularly in North America, Greater China, and Europe, it is expected to remain in the single digits or teens in other regions. This is because the higher frequency bands used by 5G require more base stations than 4G, to cover an equivalent area. Although the telecommunications operators in Japan share their networks, it will take time to expand the 5G area, so building up the market is expected to proceed at a relatively leisurely pace.

In the past ten years, companies in South Korea and China have greatly expanded their shares of the global mobile phone devices market, and there have been great changes in the structure of the ICT industry ecosystem in Japan, as the GAFA companies and other platform providers have joined the conventional telecommunications operators. These changes in the structure of ICT industries may continue in the future, with the implementation of 5G in various industries and fields.

## 3. Digitalization of all of society prompted by 5G

### (1) ICT as a means to solve issues and initiatives anticipating the 2020s

Japan is known as one of the leading nations on issues, and also leads in population decrease and aging, so for some time, there has been a need to actively introduce and use ICT to improve quality of life and employment, and to increase work productivity. Regional governments have had various initiatives using ICT to find solutions to societal issues, and the white paper introduces several cases including a “workation” initiative in Nagano Prefecture, an e-sports initiative in Arima Onsen, and an initiative to introduce a residents’ collaboration application in Chiba City.

Among digitalization initiatives being conducted with an eye to completion in 2020, new technologies are being introduced such as cashless transactions, multilingual translation, and facial recognition, and there are measures to reform work styles with telework, and to reduce and prevent disaster.

As for cashless transactions, Japan has not made progress because of the convenience and reliability of cash, but prompted by cashless point-return programs and measures against COVID-19, settlement using QR codes or barcodes has become more common, particularly on smartphones. With this development, JPQR, which is a standard integrating both QR codes and barcodes, is also being introduced. High quality translation is also becoming possible with improvements in AI deep-learning technology, so multilingual translation is also becoming practical.

■ Figure 2: Ecosystem transitions in Japan’s mobile industry

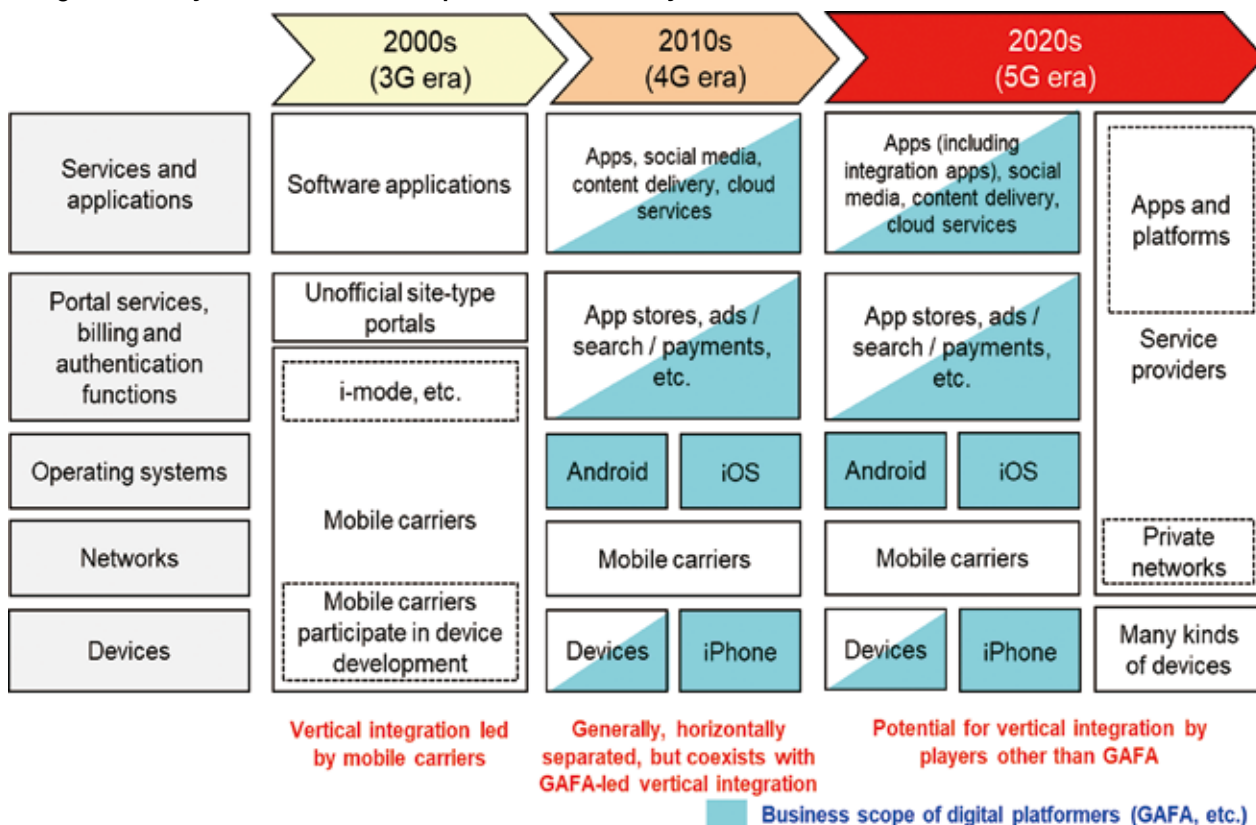
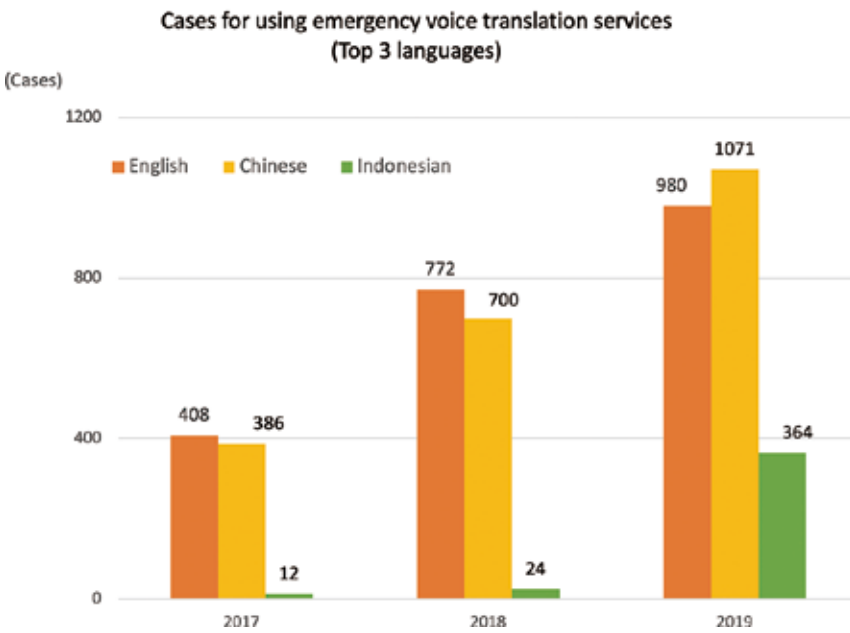


Figure 3: Multilingual translation used by local fire department



(2) Migration of industry to wireless, driven by 5G

In the future, 5G will be implemented as infrastructure for industry and society in Japan in various industries and fields. It is expected to improve business efficiency and creating new added value by contributing to solving issues in these industries and fields.

According to a survey conducted by the MIC in 2020, before commercial 5G services commenced, corporate interest in 5G is high in all fields, particularly in manufacturing, and large enterprises have more interest than medium and small enterprise.

Individual users are looking forward to higher communication

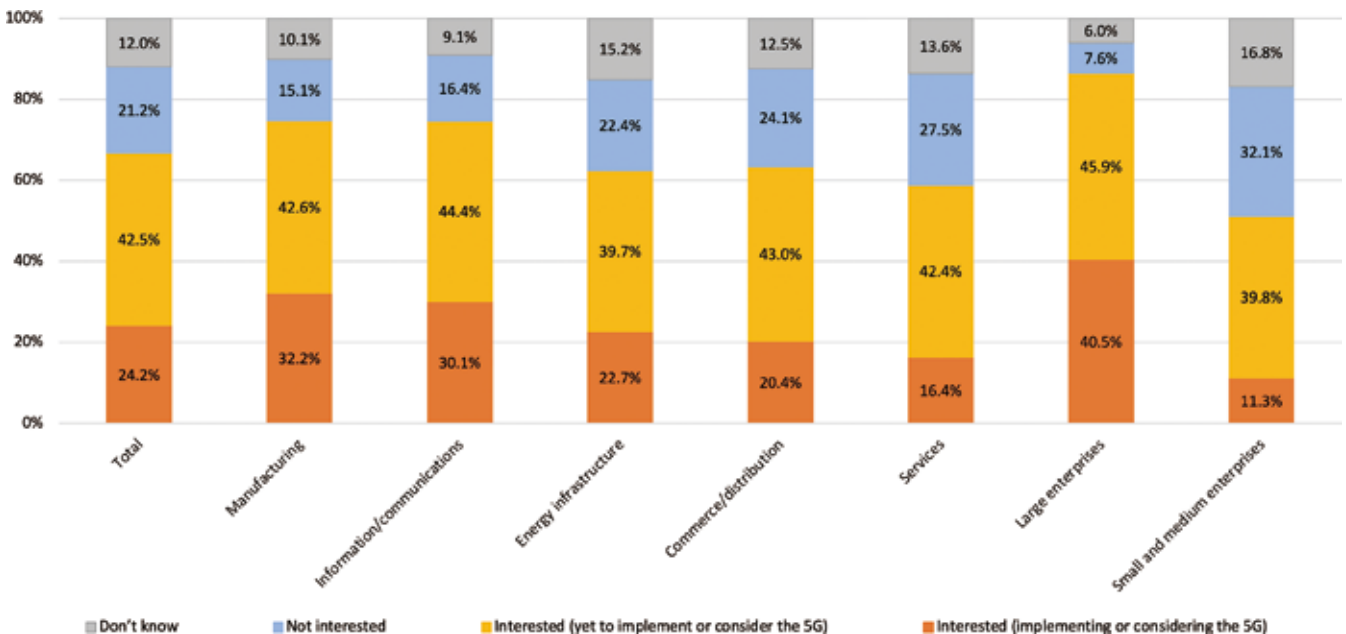
speeds, but there is concern that fees will increase, so it will be important to eliminate these concerns and to provide enticing services and applications, in order to spread 5G to ordinary users in the future.

(3) Effects on society of the spread of COVID-19

The global spread of COVID-19 has had huge effects on the flow of information and the digital economy in Japan, and is requiring transition to new ways of life in all kinds of scenarios. In such conditions, initiatives such as actively distributing accurate information to prevent the spread of infection, and introducing ICT to ensure social distancing, including data analysis and utilization, are increasingly important.

In the short term, various initiatives are expanding, such as visualization of human-contact risk through collaboration among administration, civic tech and private enterprise; telework in enterprise; introduction of remote lectures in schools; and relaxation of requirements on remote medicine for special cases and limited times. However, various other issues are also materializing due to the sudden increase in ICT use. Many issues are not new, such as increasing traffic, insufficient measures against security risk, the need to review business details such as moving to paperless workflows and digital contracts; and finding balance between public health and utilization of personal data, but this “COVID-19 Era” requires introduction of irreversible new ways of life at all levels: personal, industrial, and societal; and these issues must absolutely be dealt with.

Figure 4: Enterprise interest in 5G



#### 4. Data flow in the 5G era and security

##### (1) Current state and issues with utilization of digital data

The spread of IoT devices and the increase in the amount of video and other content, mainly because of the proliferation of smartphones has increased the flow of data in recent years, and this is expected to accelerate and become more important as 5G spreads, particularly with applications in industry.

Currently in Japan, the proportion of all data used by enterprise for analysis that is obtained from IoT devices is growing quickly, at four to seven times that of 2015 levels, but this is still low compared with use of digital data by enterprises in the USA and Germany.

The amount of data crossing national borders is also increasing because it is becoming normal for enterprises to act globally,

and to provide services in other countries through the Internet. According to the Japan External Trade Organization (JETRO), a total of 1,608 Gigabits crossed the Japanese border every second in 2001, and this had increased by 165 times, to 265,000 Gigabits in 2016.

With this increase in cross-border data, the flow of personal data has also increased, and according to a survey conducted by the MIC in 2020, approximately 20% of enterprises in Japan transfer personal data across borders. This figure is approximately 40% in the USA, and up to 50% in Germany. The white paper introduces several concrete examples of how data is being utilized by enterprises in Japan.

##### (2) Use of personal data in the future

As is shown by the growth of digital platform providers, this growth in digital data is a promising new source of value. However, concern among consumers in Japan regarding use of personal data has increased, and enterprises have not exploited it to the extent they have in some other countries. More recently, compared with the results of a survey conducted in 2017, this trend has decreased slightly, possibly due to authorization of so-called personal data trust banks and the appearance of Personal Data Store (PDS) services. For example, regarding their intention to use services such as a personal data trust bank, the proportion of consumers responding that they would like to use one has increased compared to 2017, and this is similar to other countries.

However, concern regarding information leaks remains high relative to other countries, and the use of anonymized

Figure 5: Enterprise utilization of digital data

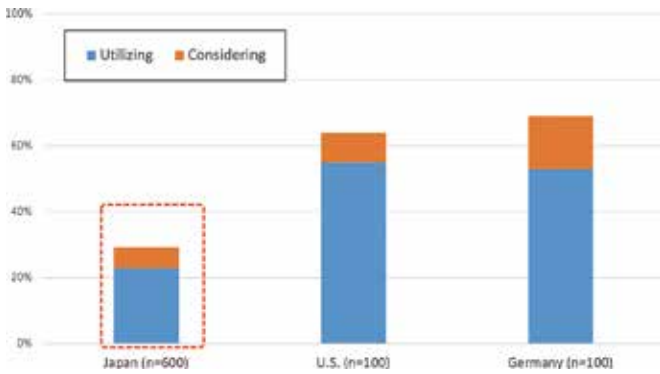
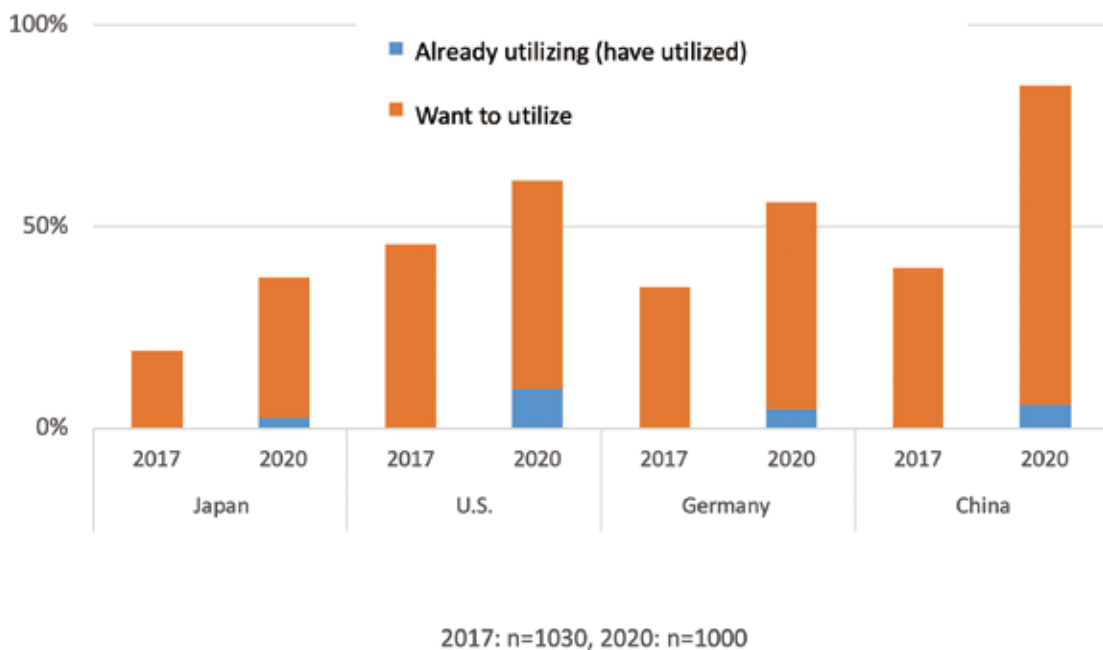


Figure 6: Consumer intention to utilize personal data trust banks or personal data stores





data is expected to expand utilization of personal data in Japan. Anonymized data is data that has been processed so that specific individuals cannot be identified and the original data cannot be recovered, providing a safe and secure way to use personal data.

**(3) Cyber security in the 5G era**

With increasing activity utilizing data, society as a whole is becoming much more digitized, and it is becoming more important to deal with cyber-security risk. “Ten Information Security Threats in 2020,” from the Information-Technology Promotion Agency (IPA) stated that the number-one threat to individuals is smartphone settlement fraud, suggesting that cyber attacks on smartphones are also increasing.

With the introduction of 5G services, installation and operation of IoT devices for industrial applications will also increase, and the potential for industrial equipment and infrastructure that was previously isolated from the Internet to be connected will increase. It has been pointed out that security measures for these sorts of cases will be much more important in the future. Security risks related to use of IoT devices have often been overlooked, but it will be even more important to foster awareness of security issues with IoT users in the future.

**5. Beyond 5G**

The fourth chapter discusses the prospects for society in Japan

in the 2030s, in light of innovations such as 5G, IoT and AI, and introduces domestic and international trends surrounding “Beyond 5G,” which will be needed to realize such a society.

With the implementation of 5G in society, exchange of data between physical space and cyber space will take place faster, at higher-volume, and with less delay. This will lead to realization of cyber-physical systems (CPS) that further integrate these two spaces in the 2030s, and will help realize a vigorous and resilient society where cyber space can enable economic activity and the lives of citizens to continue smoothly, even when new contagions or disasters occur in physical space.

To realize the extremely high level of synchronization required for such CPSs in the 2030s, communications infrastructure that is faster than 5G and able to deliver large amounts of data, safely, reliably and without delay to anywhere, will be needed.

Initiatives for the successor of 5G, or “Beyond 5G,” are already in progress in advanced countries. Japan also created a “Beyond 5G Promotion Strategy” in June, 2020, as a strategic initiative to bring people and government together based on international collaboration. To ensure Japan’s competitiveness in the future, we will take our strengths and focus on reinforcing our R&D capabilities on technologies with which we are already actively engaged, such as tera-hertz waves, all-photon networks, quantum cryptography, sensing, and low-power consumption semiconductors.

■ Figure 7: Beyond 5G Promotion Strategy — Basic Principles —

