Chapter 2

Digitalization throughout Society Driven by 5G

Japan, an advanced nation confronting a host of challenges, has been using ICT as a means to solve problems: from an aging society and a declining birthrate to the concentration of the population in urban centers and frequent natural disasters. In the midst of these circumstances, the spread of COVID-19, reported to the World Health Organization (WHO) by China at the end of 2019, has had a colossal impact on people's lives and economic activities the world over, including Japan. ICT is playing an essential role in the middle of this pandemic, as countries adopt every mechanism to combat COVID-19.

This chapter develops an overview of the current state of ongoing ICT applications to solve social issues and the current state of digitalization promoted in the lead up to the 2020 Tokyo Olympic Games, which have been postponed until 2021. Following this, the chapter arranges the movements driving society's digitalization that the COVID-19 outbreak is accelerating. The chapter closes with a look ahead to 5G implementation in Japan's industries and economic sectors and the benefits it will bring.

Section 1   Issues Facing Japan and ICT as Solutions and Means

1. Current situation in the world and in Japan, an advanced nation confronting multiple challenges

Japan has been called as an advanced nation beset by an array of problems. Japan started a declining population, prompted by a falling birthrate, and an aging society sooner than other countries (Figure 2-1-1-1). The country also faces a shrinking working-age population and the increasing concentration of its population in urban centers. On top of this, Japan has experienced additional challenges in recent years, such as aging infrastructure, more frequent natural disasters stemming from climate change, and large-scale earthquakes.
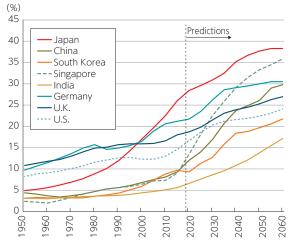
Figure 2-1-1-1   Changes in elderly population rates in countries around the world

Source: Prepared based on "World Population Prospects 2019",[5] United Nations

2. Initiatives in regions to solve issues with ICT

(1) Role played by ICT

The falling working-age population, caused by a declining birthrate and an aging and declining general population, results in ever-smaller labor inputs. Without productivity gains on a per-worker basis, there is bound to be a negative impact on the future economic and labor landscape, including a reduction in the economy's size and more severe labor shortages. If ICT adoption is able

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[5] United Nations "World Population Prospects 2019" (https://population.un.org/wpp/Download/Standard/Population/)
  Figures from 1950 to 2020 use "estimates", and figures from 2025 to 2060 use "medium variant" data.

to increase per-worker productivity, its use should help ease labor shortage problems due to a declining population. Moreover, the adoption of ICT is hoped to improve the population's quality of life (QoL) and, thereby, stem the flow of people from outlying regions to urban centers and help maintain and enhance regional dynamism.

Organizing the expectations for ICT's role in solving social issues allows us to redefine and summarize those expectations into the following four points.

a. Higher labor quality through ICT

Automation of routine operations by adopting RPA and other types of ICT will make operations more efficient and enable organizations to set up working conditions that let workers focus on more productive work.

b. Larger markets through ICT

This point refers to how the Internet, and ICT more generally, can enable businesses to supply products and services matching many needs of consumers in regions all over the world, even in small local markets. ICT is also expected to increase market sizes by expanding business possibilities beyond just the supply of goods. For example, businesses can use the Internet including 5G to connect to remote locations and provide remote teaching, telemedicine, and other online services.

c. Larger regionally engaged populations through ICT

Japan's local regions are dealing with a lack of leaders and supporters due to falling and aging populations and declining birthrates. Regions need to involve people from outside the region as ardent fans of the region and help with community building: in other words, to increase the population engaged with the region. ICT application will aid regional areas in disseminating information and forming relationships that will lead to engagement with more people.

d. More work opportunities through ICT

Telework, crowdsourcing, avatar robots, and other forms of ICT allow people to work from nearly any location. In this way, ICT gives more work opportunities to people who otherwise find it hard to work due to their circumstances, such as childcare, caregiving, or a disability.

(2) Considerations when seeking social issue solutions using ICT

Local governments and private organizations often tailor their measures to the local area's traits and characteristics to solve social issues. Some of these initiatives, on the other hand, are transferrable across regions. If such transferrable initiatives are deployed to regions around the country and not limited to a few areas, they should help spur development across Japan, an advanced nation grappling with multiple challenges. We came up with four key points for successfully directing social issue solutions using ICT. These are presented as suggestions for local regions to facilitate local solutions to issues.

a. Promote projects at a sustainable scale

The key point about project promotion is to start small and expand slowly in order for the project to stay the course. Social issues are not solved with short-term efforts; longer term measures are necessary. It is best to begin with a small project that requires little or no funding. From there, the project can be gradually rolled out across the region while accumulating successful experiences. In this way, a new project will take root in the community organically.

b. Construct ties with residents

Essential to social issue solutions is getting the understanding and cooperation of residents, who are the supporters and leaders of the local area. Also critical is improving user interface and user experience to receive cooperation from residents and making residents understand the reasons for gathering data and how the data will be used.

c. Deploy solutions from other regions

Undertaking projects, such as workcations or e-sports, through information exchanges and collaborations with other local governments can cut costs and improve efficiencies. As local regions face dwindling budgets and fewer supporters, it is important to save on labor by adopting existing technologies and practices instead of constructing systems from scratch on your own.

d. Collaborate with stakeholders

When adopting ICT, the entities that will operate the ICT should get involved in the project from the study stage and discuss and understand the objectives of the project and its necessity. Consider data collection for example. If the entities that will use the data do not collect the truly necessary data in the necessary format, no matter how much data are collected, they will go unused. An additional consideration is most infrastructure data are on paper. This means costs will be incurred to digitalize the paper data and construct the necessary systems to collect and make use of such data. Providing support, therefore, is essential to promote switchovers to digital data.

Local governments working in partnership with private companies and other organizations on projects aiding local creation is expected to produce effective regional activation benefits in an age of declining population.

When it comes to coping with worsening social problems, local governments can achieve effective results by collaborating with local residents and businesses, who are the leaders and supporters of the local area. ICT advances and the Internet's proliferation have simplified the construction of solutions, such as improving efficiencies and providing collaborative platforms. Nevertheless, a diverse slate of entities must join together and get involved in finding solutions using these ICT means effectively.

Section 2   Digitalization Movements Leading Up to 2020

The 2020 Tokyo Olympic Games have been postponed to 2021 due to the COVID-19 outbreak. Prior to this, the country had been pushing ICT deployment and application in many fields ahead of 2020 ever since the 2013 IOC general meeting's decision to grant the 2020 Games to Tokyo, 56 years after the 1964 Tokyo Olympic Games.

For the 1964 Tokyo Olympic Games, the adoption of digital technology was promoted in Japan. Examples include the Olympics' first live satellite broadcasts and the transmission of competition results in real time to the press center using the first-ever online system constructed in Japan by IBM Japan. Similarly for the 2020 Tokyo Olympic Games, the country is pushing ahead with digitalization in nearly every aspect of society, from industrial sectors to areas that are part of people's daily lives. Priorities include the launch of commercial 5G services, cashless payments, telework promotion, and better performing multilingual voice-based translation systems.

This section provides an overview of the current state of the digitalization of society promoted ahead of the 2020 Tokyo Olympic Games. It also examines initiatives to entrench this digitalization in Japan after the Olympics.

1. Past Olympic and Paralympic Games held in Japan and ICT accomplishments

Japan has hosted the Olympic and Paralympic Games three times, including both Summer and Winter Games (Figure 2-2-1-1).

As detailed in the "2015 White Paper on Information and Communications in Japan", some lifestyle changes brought about by ICT emerge gradually with the steady proliferation of new products and services into homes and workplaces. Other changes, however, are achieved in a single stroke, propelled by a landmark event like the Olympic and Paralympic Games.

Plans for the 2020 Tokyo Olympic Games include providing visitors with exceptionally realistic images and experiences using high-definition images delivered via 5G near the venues in tandem with the rollout of commercial 5G services. Also planned is the extensive use and application of AI, the IoT, and other new ICT at all locations in the Games.

Figure 2-2-1-1   Connections between ICT and Olympic and Paralympic Games held in Japan

Year	Host City (summer / winter)	Accomplishments
1964	Tokyo (summer)	· First Olympics held in Asia · Olympics' first live satellite broadcasts · Seiko used a quartz timing mechanism in the official timepieces · IBM Japan constructed Japan's first online system, which tabulated competition results and transmitted the results by teletype
1972	Sapporo (winter)	· First Winter Olympics held in Asia · Introduced new technologies to support the competitions, such as input systems for jumps, electric signage for direct guidance systems, and display devices
1998	Nagano (winter)	· Full-fledged use of the Internet; over 600 million accesses from around the world to the official site during the 16 days of the Games

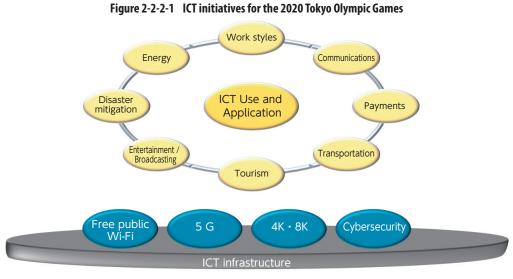Source: Prepared based on "2015 White Paper on Information and Communications in Japan", MIC (2015)

2. Olympic legacy

The International Olympic Committee (IOC) added the mission statement "to promote a positive legacy from the Olympic Games to the host cities and countries" to the Olympic Charter in 2011. Olympic and Paralympic Games held since then have each defined a "legacy" for their competitions.

In this context, "legacy" refers to the intent to use the infrastructure, technology, and services established and built for the Olympic and Paralympic Games as social assets following the Games and not just for the Games themselves. The national government, the Tokyo Organizing Committee of the Olympic and Paralympic Games, and the Tokyo Metropolitan Government are each currently working toward creating a legacy for the Games.

(1) ICT initiatives for the 2020 Tokyo Olympic Games

Organizers are studying how to preserve solutions using ICT constructed for the 2020 Tokyo Olympic Games for future generations and transform them into standards. From these studies, the ICT initiatives for the 2020 Tokyo Olympic Games can be broadly categorized into "ICT infrastructure", which will serve as a social and economic platform, and "ICT application services" constructed on ICT infrastructure (Figure 2-2-2-1).

Figure 2-2-2-1　ICT initiatives for the 2020 Tokyo Olympic Games

a. ICT infrastructure

Just as Japan has made mobile phone services available in virtually all residential areas (a population coverage rate of 99.99 percent), the country has been working to construct ICT infrastructure as a platform for economic and social activities. Leading up to 2020, Japan has also been studying and pushing ahead with the establishment of free public Wi-Fi, which inbound tourists had been disappointed with, the expansion of 5G commercial services that first launched in the country in the spring of 2020, the deployment of 4K and 8K technology for the enjoyment of sports and entertainment in ultra-high definition, and the assurance of "cybersecurity" so these technologies can be used securely.

The establishment of free public Wi-Fi, for instance, is a key ICT infrastructure platform to promote inbound tourism. Wi-Fi establishment, however, is equally important for Japanese residents as a platform for sending and receiving information during the emergencies and disasters that frequently befall Japan.

The lack of free public Wi-Fi was the most frequent complaint of visitors to Japan in FY 2015 (46.6 percent). However, the situation is improving, with MIC promoting the installation of Wi-Fi locations, targeting approximately 30,000 disaster protection centers by FY 2021. The improvement is exemplified by the rate of dissatisfaction with Wi-Fi among visitors falling to 11.0 percent in 2019.

b. ICT services

ICT infrastructure already established allows the creation of more convenient and comfortable ICT services, as well as brand-new businesses and experiences, in many different fields.

i. Work styles

Congestion on transportation links during the 2020 Tokyo Olympic Games is expected to be a problem. Telework is a means of easing transportation congestion during the Games. Telework holds promise because it also eliminates the need to commute to work and enables flexible working arrangements to suit the needs of people who live outside major urban centers. Beyond this, a variety of measures are in place, such as Telework Days,[6] to entrench telework as a new style of work in Japan.

Moreover, the introduction of robots, avatars, and power-assisted suits has made it possible to work from any location and to reduce workloads. For example, considerable attention has been paid to providing work opportunities across distances to people who have problems of commuting, because of a disability or because of pregnancy, childcare, or caregiving, using avatar robots that humans control remotely instead of autonomous robots powered by artificial intelligence (AI).

There are more instances of avatar robots being installed in airports and train stations to provide directions and information conveniently to the increasing number of tourists from overseas. It is hoped this type of new ICT, which helps offset labor shortages, will be applied in more situations.

ii. Communications and disaster mitigation

Although the number of overseas tourists is on the rise, "language barriers" remain a problem in receiving inbound tourists. According to a survey by the Japan Tourism Agency,[7] 17.0 percent of survey respondents said "infeasible to communicate with staff members at various sites" was an inconvenience during their stay in Japan. Furthermore, 11.1 percent found "few or difficult to understand multilingual signs (on tourism informa-

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[6] July 24, the scheduled day for the 2020 Tokyo Olympic Games' opening ceremony, was designated as Telework Day. Telework Days call for the implementation of telework by companies and other organizations nationwide, both to promote national work-style reforms and to help ease traffic congestion during the Games.

[7] Japan Tourism Agency (https://www.mlit.go.jp/kankocho/content/001333861.pdf)

tion boards, maps, etc.)" to be an inconvenience.

The accuracy of multilingual voice-based translation has improved over the past few years with advancements in AI deep learning, making more practical communications possible. MIC and the National Institute of Information and Communications Technology (NICT) operate the "Translation Bank", which collects and uses translation data on an all-Japan system. The Translation Bank is able to collect translation data in fields that previously suffered from a lack of translation data. In the medical field, for example, because of the increase in tourist injuries (Figure 2-2-2-2), "Emergency VoiceTra" apps are being installed at fire departments around the country. As of January 1, 2020, 507 of 726 fire departments (69.8 percent) were using the Emergency Voice-Tra app (Figure 2-2-2-3).[8]

The current goal is to achieve practical translation ac-

curacies in 12 languages.[9] Multilingual voice-based translation will allow for smooth communications across language barriers in many situations, including sightseeing, public transportation, healthcare, and shopping.

iii. Payments

In the 2014 revision of the "Japan Revitalization Strategy", the national government pointed to improving the convenience and efficiency of payments through the expansion of cashless payments. Later, the "Growth Strategy 2017", as a KPI,[10] aimed to raise the percentage of cashless payments to around 40 percent of all payments by 2027.[11] The "Follow-up on the Growth Strategy", endorsed by the Cabinet in June 2019, moved the target forward, aiming to double the percentage of cashless payments to around 40 percent by the end of June 2025.
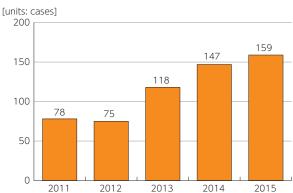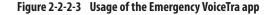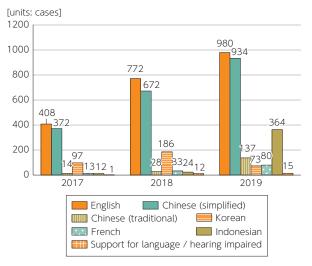
Figure 2-2-2-2   Number of injured tourists transported

[units: cases]

Figure 2-2-2-3   Usage of the Emergency VoiceTra app

[units: cases]

Source: Prepared by MIC based on "Introduction to Emergency VoiceTra, the
Multilingual Voice-Based Translation App for Emergency Response Personnel",
Fire and Disaster Management Agency, MIC (2020)

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[8] From the website of the Fire and Disaster Management Agency, Ministry of Internal Affairs and Communications
https://www.fdma.go.jp/mission/enrichment/gaikokujin_syougaisya_torikumi/torikumi.html

[9] Japanese, English, Chinese, Korean, Thai, Indonesian, Vietnamese, Burmese, French, Spanish, Brazilian Portuguese, and Filipino.

[10] Short for Key Performance Indicator.

[11] The numerator for this calculation is the total value of payments made by credit card and e-money in 2017. The denominator is all private consumption for 2017 (nominal value, second preliminary figures).

A. Cashless payment trends in Japan

Since credit cards were introduced in Japan in the 1960s, the credit card has been the main form of cashless payment. In the 2000s, however, FeliCa, an NFC standard, was adopted as e-money for transportation and distribution systems and became widely used. Mobile wallets appeared in the 2000s with embedded FeliCa chips, but using FeliCa for cashless payments was mainly confined to Japan. After the arrival of China's Alipay and WeChat Pay in Japan in the latter half of the 2010s, code payments using smartphones has taken off.

Many new payment businesses entered the domestic mobile payment market by 2019 from non-financial sectors, although gradual market consolidation has begun in 2020. On the other hand, the diversification of code payment businesses has prompted concerns of rising installation costs at stores and lowering convenience to users. Therefore, MIC, in partnership with METI, is working to promote "JPQR", a QR code / barcode standard that unifies multiple QR code standards. As of June 5 in 2020, 17 payment services planned to join JPQR, and applications from participating stores started being taken on June 22 in 2020. Wide acceptance of JPQR is expected to reduce installation costs at stores and increase the convenience of QR and barcode payments to users. Synergy among competing payment services is expected to enlarge the mobile payment market.

B. Why cashless payments have difficulty in gaining wide acceptance

Several social reasons are thought to explain why cashless payments have not diffused yet in Japan. These reasons include: (1) "good public security", where theft is rare and even dropped cash will be returned; (2) "high confidence in cash", as the notes in circulation are in good condition and very little counterfeit money is circulated; (3) "POS (cash register) processing in stores is fast and accurate", and handling cash is not hard for stores; and (4) "ease of obtaining cash", as ATMs are very convenient.

Moreover, another reason is thought to be the adoption of cashless payments by stores and other commercial businesses being complicated by the cost to install terminals, operation and maintenance costs, and cash-flow problems due to the time lag in receiving funds after payment.

The cost to maintain the cash payment infrastructure, however, is estimated at over one trillion yen a year just for the direct costs of printing, transportation, store installations, ATM costs, and labor costs.[12] There are mounting pressures to reduce the cost of cash in the interest of making all of society more efficient and to offset labor shortages at stores caused by the falling population.

C. Promoting cashless payments through a cashless point return program

The rate of cashless payments in Japan is on the rise, partly due to a program that returned points to users for cashless payments, in conjunction with the October 2019 consumption tax increase.

Around 70 percent of stores participating in the point program said they had either introduced cashless payments or increased payment options because of the point program.

3. 2020 as an opportunity for change

The use of ICT for productivity gains and work-style reforms is essential for our country to continue to grow in the future. What will enable sustainable national growth and achieve digitalization throughout society is not one-time measures to introduce new forms of ICT such as 5G, AI, the IoT, robotics, and 4K / 8K, as have been promoted leading up to 2020, but the entrenchment of ICT as an effort to create a legacy in Japan.

Section 3   COVID-19's Impact on Society

After COVID-19 was identified in December 2019 as "a viral pneumonia of unknown cause" in Wuhan, Hubei, People's Republic of China, COVID-19 infections spread worldwide, leading Director-General Tedros Adhanom of the World Health Organization (WHO) to declare the COVID-19 outbreak a pandemic on March 11, 2020. In Japan, the government established a basic policy on COVID-19 responses on February 25, set up the Novel Coronavirus Response Headquarters on March 26, and declared a state of emergency on April 7 based on the Special Measures Act to Counter New Types of Influenza. Although the state of emergency was lifted in all parts of the country on May 25, the global pandemic is ongoing and no resolution is in sight.

MIC took measures to counter COVID-19 on March 28 in recognition that the pandemic was a grave crisis management matter. To protect the lives of citizens, the ministry ascertained the precise circumstances surrounding COVID-19 and, in coordination and cooperation with local governments and relevant designated public corporations, established policies to promote measures to get through the crisis.

As for business activities and civic life, both the national government and local governments around the country made appeals to avoid peak commuting times, close schools, postpone events, and avoid going outside for non-essential trips. The COVID-19 pandemic is having a huge impact on the digital economy too, particularly the circulation of information.

This section provides an overview primarily of the cir-

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[12] https://www.meti.go.jp/policy/mono_info_service/cashless/image_pdf_movie/about_cashless.pdf

culation of information and moves to deploy digital technology due to COVID-19 as of about mid-May. This section also summarizes challenges that have surfaced due to the pandemic and looks ahead to the post-COVID-19 society.

1. State of information in circulation concerning COVID-19

The prevalence of the Internet and social media has made it possible for everyone to readily post and gather information. At the same time, the volume of information has increased tremendously and grown in complexity. Given this freedom, various groups have posted all kinds of information, regardless of its veracity, concerning COVID-19. The WHO issued a warning in February about an infodemic — even before it declared COVID-19 a pandemic — and stated it would initiate 24-hour monitoring for false rumors and take measures to refute them.[13]

Infodemic is a portmanteau of *information* and *epidemic* and refers to a situation in which trustworthy information and untrustworthy information intermix and spread rapidly along with anxiety and fear, creating confusion in society.

The national government and local governments, along with broadcasters, platform operators, and other private businesses, are working together on technology and data-driven initiatives to find ways to quickly gather accurate COVID-19 information and deliver the information in easily understood formats.

(1) Dissemination of erroneous information and fake news

The world has experienced a number of infectious disease outbreaks in the past, such as SARS. These outbreaks have been accompanied by speculation, discrimination, misinformation, and other social problems born out of anxiety and fear of an unknown and mysterious pathogen. Similarly, the COVID-19 pandemic has been accompanied in all corners of the world by discrimination and other problems, such as the dissemination of erroneous information on scientifically groundless preventions or cures.

Numerous rumors have been spread on social media and other platforms in Japan. In particular, erroneous information about toilet paper at the end of February caused people to panic and buy up toilet paper and other paper products across the country. This became a significant social problem that was covered by the news media.

(2) Collaborations among government, civic tech, and private businesses

a. Enhancement of information provision

i. Information provision by government

To enhance the provision of COVID-19 information, the national government has been beefing up its delivery of information on websites and social media to quickly disseminate accurate and easily understood information that truly accounts for the citizen's point of view.

The Cabinet Secretariat organized a COVID-19 tech team consisting of relevant ministries and agencies. The team's objective is to take steps to counter COVID-19 using technology and data and quickly develop and implement technologies with the cooperation of private companies and engineers. The Cabinet Secretariat launched a COVID-19 information and resources website on April 9.

The website, in addition to providing various support information and measures to prevent the spread of COVID-19, also makes visible the effects of calls on people to stay at home.[14] It does this by publishing data on people's movement patterns using big data of subscribers' locations provided by mobile communication carriers.

Information is also provided using the government Internet TV channel and the YouTube video-sharing service. MIC also requested digital signage industry organizations to broadcast TV ads on COVID-19 measures produced by the Office of Public Relations, Minister's Secretariat, Cabinet Office. The TV ads began being broadcast on outdoor and indoor signage across the country on March 17.

ii. Collaborations between government and civic tech

• Efforts by the Tokyo Metropolitan Government

The Tokyo Metropolitan Government opened a site dedicated to COVID-19 measures on March 3. The site publishes the number of people who have tested positive for the coronavirus in the metropolitan area, the number of people tested, the number of calls received by the COVID-19 hot line, and other statistics. The statistics are presented as graphs for easy visual understanding. The site is updated daily along with links to open data.

The site is unique in that its source code is made public on "GitHub", a platform for hosting software development, and that it was developed using open source methods. This is an unprecedented effort for a local government. Other local governments can build similar sites quickly by using the same source code.

• The #PrivateSectorSupportInformationNavi Project

The Cabinet Secretariat's IT Comprehensive Strategy Office, MIC, and METI, in partnership with industry and civic tech organizations, launched the "#PrivateSec-

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[13] WHO (February 2, 2020) "Novel Coronavirus(2019-nCoV) Situation Report – 13" (https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200202-sitrep-13-ncov-v3.pdf)

[14] In a majority of cases, people infected with COVID-19 do not pass it on to anyone else. There are, however, cases where it is suspected a specific individual has infected a large number of people, forming a small cluster of infected people in a localized area. Measures have been taken to slow the spread of the disease by ascertaining the outbreak of such clusters from the very start and immediately taking steps to isolate the cluster.

torSupportInformationNavi Project" on March 9. The project standardizes and releases data on COVID-19 support services offered by private-sector companies and organizations.[15]

Under the project, the government provides a standard data format for entering support information and asks industry organizations to provide information using the standard format. Companies belonging to the organizations fill in data about their COVID-19 support services and submit them to the project. The government assembles the submitted data in a Google spreadsheet and releases the data in order as open data. An example of how these data are being used is a search site released by the organization, Code for Japan. The site allows people to transversely search by field or keyword through the COVID-19 support services offered by companies for free or for low fees.

The government "recommends all kinds of organizations to take advantage of these open data and develop various applications using their ingenuity and additional collected information".

b. Efforts to use data

Stopping the spread of COVID-19 necessitates keeping the number of infected people, the number of seriously ill people, and the number of deaths as low as possible to prevent a spike in infections. This involves taking such measures as ascertaining the state of infections and their risks in each area, providing accurate information, calling for social distancing, and isolating clusters.

National and local governments in Japan and other countries are launching initiatives to use technology and digital data to ascertain the state of COVID-19 infections and other statistics.

i. Contact tracing / exposure notification apps

An increasing number of countries are introducing "digital infection trackers", given the prevalence of smartphones today, that use location information and other digital data to trace infected people and people who have been in contact with an infected person.

ii. Initiatives in Japan

The Cabinet Secretariat organized a COVID-19 tech team consisting of relevant ministries and agencies. The team studied the development and deployment of a smartphone app that would (1) enable users to verify changes in their own actions and (2) should the user discover he or she is infected, alert people who have been in close contact with the user so those people can take appropriate actions, premised on privacy protection and user consent. Another goal is the hope that the app can be transitioned smoothly to health observations.

Starting in March, Code for Japan began developing an app, on the premise of a common Apple / Google standard, with a mechanism to deliver messages with appropriate information and measures to people who made close contact with an infected person. The app was based on an app used in Singapore. On May 8, however, the tech team decided to introduce an official national app based on Apple and Google terms of service. An expert panel working under the tech team studied specifications and assessment documents on privacy and other factors. MHLW decided to lead the actual app development and operation. In response, Code for Japan announced it would cooperate with the development and promotion of the official app by releasing the specifications and sample code of "Mamoriai JAPAN", the contact identification app it had developed.

After studies by the expert panel, the app specification and assessment documents were published on May 26. COVID-19 Radar Japan, in partnership with MHLW, began developing the app based on the specification document and released the "COVID-19 Contact-Confirming Application", or COCOA for short, on June 19. The methodology used by Japan's contact-tracing app is a distributed management methodology that checks whether users have a history of contact with an infected person within their smartphones. The app connects via an API with the common standard developed by Apple and Google.

(3) Efforts by platform operators

Besides directing users to reliable information and deleting erroneous information, platform operators have been responding to requests from the government and other organizations to provide information and making statistical data available to the general public.

For instance, NTT Docomo provides daily updates of statistical data on population trends in the country's chief areas based on its internal data. The objective is to analyze the effects of people voluntarily refraining from travelling to or from Tokyo and its adjacent prefectures as a measure to counter COVID-19 (Figure 2-3-1-1).

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[15] Ministry of Internal Affairs and Communications (March 9, 2020)
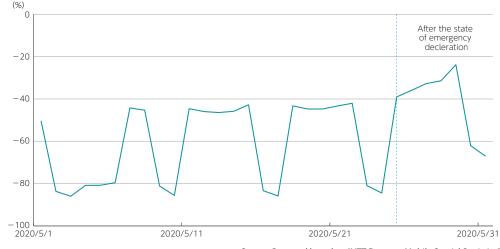(https://www.soumu.go.jp/menu_news/s-news/01ryutsu02_02000267.html)

Figure 2-3-1-1 Population trends in the Tokyo Station area compared to before the state of emergency declaration (3 p.m., April 7, 2020)

Source: Prepared based on "NTT Docomo Mobile Spatial Statistics"

2. State of initiatives for operational continuity using ICT

(1) Promotion of telework

MIC and other related ministries and agencies have long promoted the adoption of telework, which realizes work styles that make better use of time and location. The benefits of telework for companies are enhancing competitiveness as well as generation of new businesses, work pattern reforms, and improved business continuity. Telework also helps achieve flexible and balanced work styles that suit the individual lifestyles of a diverse range of people. The government has supported telework adoption through telework managers, who are experts on telework, subsidies, and other measures.

Japanese companies started asking employees to work from home as early as the end of January, in the initial phases of the outbreak, as a measure to avoid CO-VID-19 infections. Companies that had already introduced off-peak commuting, telework, and other programs as well as companies that had participated in "Telework Days", which the government has run as a national movement to increase telework awareness

since 2017, were some of the first to ask employees to work from home.

(2) Measures taken in the education field

According to a survey by MEXT,[16] as of May 12, 86.9 percent of the technical colleges and universities from across the country that replied to the survey postponed classes due to start from April. Nearly all schools that were holding classes on their normal schedule had instituted or were considering instituting remote teaching (10.7 percent). Only one school said it had started classes as normally scheduled after taking other measures to prevent infections.

Nearly all universities and technical colleges said they had plans to institute or to study the institution of classes for students outside the classroom (i.e., remote teaching) using advanced media formats and systems in the future, and not just as measures for the current COVID-19 crisis. From this, it is predicted that post-COVID-19 approaches to education will change (Figure 2-3-2-1).

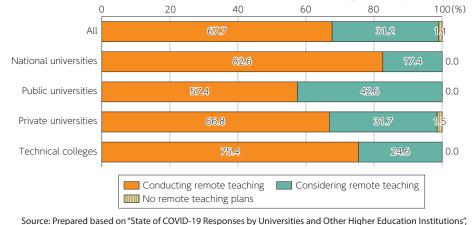**Figure 2-3-2-1 Future remote teaching plans at universities and technical colleges (as of 8 p.m., May 12, 2020)**

Source: Prepared based on "State of COVID-19 Responses by Universities and Other Higher Education Institutions", MEXT (2020)

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[16] Ministry of Education, Culture, Sports, Science and Technology (2020)
 (https://www.mext.go.jp/content/202000513-mxt_kouhou01-000004520_3.pdf)

3. Issues and initiatives for the post-COVID-19 society

Every location has been taking measures to avoid the 3Cs and practice social distancing to stop the spread of COVID-19. These moves are making tremendous changes to our lives and social systems.

The rapid and forced digitalization of society, while ordinary social activities are severely curtailed, has led to many people experiencing first-hand the possibilities of lives and work styles not tied to a particular place except for some services. This includes telework and other types of work not premised on face-to-face meetings as well as approaches to many services. These irreversible changes are disrupting approaches to work and offices along with every relationship, including those between workers and companies. At the same time, these abrupt changes have revealed a variety of challenges in addition to the need to change people's mindsets. Most of these challenges existed before, as fundamental factors inhibiting the realization of telework and many other work styles. The current pandemic, however, has brought these issues to the fore. It is critical for a society undergoing advanced digitalization to review and solve these problems.

(1) Measures to address growing security risks

As more companies implement work from home and telework, more companies need to take cybersecurity measures to deal with the increasing cyber attacks, phishing emails, and malicious apps.

MIC requests businesses to implement appropriate security measures and has published the "Telework Security Guidelines". The ministry also recommends information security diagnoses using check lists.

(2) Necessity of raising literacy levels

At the same time, the literacy of people using these tools is important. Improving information literacy is also important, given the flood of information about COVID-19. The risk of a global infodemic as social media's clout grows has been pointed out. Therefore, individuals need to view the information they receive from among the vast amount of information critically and determine which information is credible.

(3) Issues with data handling
a. Personal data

China and other countries around the world collect and analyze data on the activities and contact histories of their citizens using smartphones, in order to address threats to global health. Unquestionably, these measures can alert people and help prevent the spread of further infections. On the other hand, the debate on obtaining location data and activity histories of users for public health reasons has again opened up the issue of balancing public welfare with the privacy and other rights of individuals in the use and handling of personal data.

b. Collection of big data by the government and use of open data by private companies

In Japan, the national and local governments have been relying on the cooperation of private companies in their efforts to stop the spread of COVID-19. Governments use statistical data from private companies for capturing the flow of people in specific areas and for early cluster detection. With the opportunity provided by these efforts, it is hoped even in normal times the use of such data will aid policy decisions. Clarification, however, is needed on the rules and conditions when the government requests private companies to provide data.

Open data problems being mentioned more often than in the past are inconsistent data formats of information released by national or local governments and the difficulty for computers to process such information. Governments, therefore, should set up common specifications usable across different fields and ensure data are released in formats computers can easily process.

(4) Impact of traffic increases on communications infrastructure

Communication traffic has soared as more people work from home and more schools are closed, which has resulted in an increase in remote meetings and watching online videos. In response to this situation, on April 3rd, the MIC requested four telecommunications carrier-related organizations to secure communication environments for students learning at home.

Technically speaking, the traffic levels have not yet become a serious problem. However, the impact of COVID-19 will be long-lasting, and it is very likely Internet use, particularly demand for online videos, will rise. This will require even more resilient communications infrastructure in the future, in tandem with 5G expansion and deployment.

(5) Reconsidering business operations and practices based on digitalization

The government provided practical examples of "new lifestyles" on May 4, based on recommendations from the Expert Meeting on the Novel Coronavirus Disease Control. For everyday living, the suggestions included the "use of online shopping", "use of electronic payments", and "use of online entertainment and sports". New recommended work styles included "telework", "holding online meetings", and "exchanging business cards online".

• Harmful effects of the culture of seals and paper documents on telework

A challenge unique to Japan for telework adoption — and a reason given for why telework has not taken off at government and municipal offices — are procedures requiring stamped seals on paper documents. Even at private companies, there have been instances where employees had to go to work instead of teleworking to stamp documents or prepare contract documents.

• Digitalization of administrative procedures

At a joint meeting of the IT Strategic Headquarters and the Strategic Conference for the Advancement of Public and Private Sector Data Utilization on April 22,

Prime Minister Abe requested the acceleration of studies into the digitalization of administrative procedures and a reconsideration of administrative operations premised on the use of physical documents and seals. The Prime Minister instructed that a "Digital Resiliency Strategy" be formulated as quickly as possible to promote online operations by administration and the private sector, given the concerns about economic stagnation due to the spread of COVID-19.

The realization of digital government would prevent forming lines before the counter desks at local government offices and elsewhere, where crowds of people form in close proximity with each other. Digital government would also help achieve a highly resilient digital society enabled to cope with disasters and infectious diseases that is prepared for large-scale disasters. Digital government is expected to improve procedural efficiency in normal times too. The realization of an inclusive society is needed in which everyone can benefit from digitalization, including older people, people with disabilities, and people not proficient with ICT, through the use of 5G and other technologies on the premise of assured security.

Section 4   Changing to Wireless in Industry Driven by 5G

In the post-COVID-19 society, the trend toward "digitalization throughout society" will further accelerate, and even fields where digitalization has not yet progressed will be forced to adapt to digital transformations.

The start of commercial 5G services in these circumstances is expected to play a decisive role as a driver of "digitalization throughout society".

This section looks at what form 5G social implementation will take in various industries and economic sectors and what benefits it will generate. This outlook to the future is based on the findings of MIC's previous comprehensive 5G demonstration experiments and on the details of private-sector initiatives.

1. Social implementation of 5G

5G technology is expected to become a platform for industry and society. The question is how 5G's implementation will advance in society. In the short term after 5G's commercial rollout, core mobile communication networks will continue to use 4G and will operate in NSA mode, which uses 5G NR base stations as wireless access networks together with 4G / LTE base stations. At this stage, ultra-high-speed services are anticipated to be provided mainly in areas of high communications demand. After this, the social implementation of 5G is anticipated to proceed from video applications (such as live videos and video surveillance) that take advantage of the ultra-high-speed and large-capacity features of 5G.

Following this, 4G core networks will be replaced with 5G core networks that support network slicing and other architectures. Once the stage is reached where NR base stations operate in SA mode, the provision of services supporting not only ultra-high speeds but also ultra-low latencies and multiple simultaneous connections is anticipated to take off further. More to the point, the true value of 5G will come to light with the widespread implementation of IoT-related applications, such as remote control, connected cars, and robots.
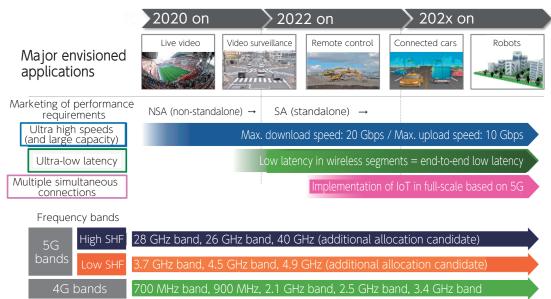
Figure 2-4-1-1   5G social implementation roadmap

Source: "Survey on Economic and Social Transformations Brought on by 5G Mobile Communication Systems", MIC (2020)

2. User attitudes toward 5G
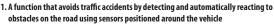
(1) Individual user attitudes toward 5G

5G adoption will make available new services and will make existing services with 4G work more smoothly. We asked users about their intention to use these services as well as their intention to use them even if these are paid services (services that require usage charges or fees separate from communication charges). The results are given in Figure 2-4-2-1.
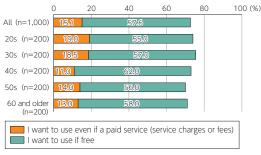
In general, the intention to use all the example ser-

vices given in the questions was high, with an average over 50 percent. The intention to use paid services, however, was significantly lower. This suggests a tendency among users to be careful concerning paying additional charges over the above communication charges.
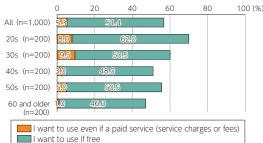
A key point for mobile carriers promoting 5G to individual users is whether they can dispel concerns about charges and whether they can provide attractive services and applications.

Figure 2-4-2-1   Intention to use 5G services

1. A function that avoids traffic accidents by detecting and automatically reacting to obstacles on the road using sensors positioned around the vehicle

	Paid	Free
All (n=1,000)	15.1	57.6
20s (n=200)	19.0	55.0
30s (n=200)	18.5	57.0
40s (n=200)	11.0	62.0
50s (n=200)	14.0	56.0
60 and older (n=200)	13.0	58.0

■ I want to use even if a paid service (service charges or fees)
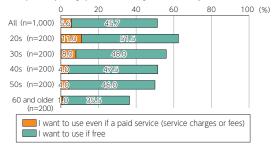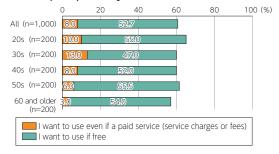■ I want to use if free

2. A function that shares videos and images taken by spectators in real time so you can enjoy from a remote location the sense of oneness at a stadium or hall
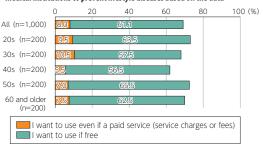
	Paid	Free
All (n=1,000)	5.3	51.4
20s (n=200)	8.0	62.0
30s (n=200)	9.5	50.5
40s (n=200)	3.0	48.0
50s (n=200)	5.0	50.5
60 and older (n=200)	1.0	46.0

■ I want to use even if a paid service (service charges or fees)
■ I want to use if free

3. A function for watching sporting events using a VR headset or other device that lets you freely change your view from high-definition 3D panorama video
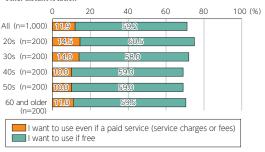
	Paid	Free
All (n=1,000)	5.6	45.7
20s (n=200)	11.0	51.5
30s (n=200)	8.0	48.0
40s (n=200)	4.0	47.5
50s (n=200)	4.0	46.0
60 and older (n=200)	1.0	35.5

■ I want to use even if a paid service (service charges or fees)
■ I want to use if free

4. A function that continuously monitors children, older people, or pets via high-definition cameras and detects signs of abnormal behavior with AI and sends you an alert so you can prevent dangerous situations

	Paid	Free
All (n=1,000)	8.0	52.7
20s (n=200)	10.0	55.0
30s (n=200)	13.0	47.0
40s (n=200)	8.0	52.0
50s (n=200)	6.0	55.5
60 and older (n=200)	3.0	54.0

■ I want to use even if a paid service (service charges or fees)
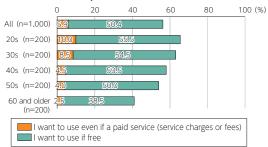■ I want to use if free

5. A function that detects your vital signs (blood pressure, heart rate, blood sugar levels, etc.) and your emotional state at the time and provides services from medical institutions to prevent lifestyle diseases based on the data

	Paid	Free
All (n=1,000)	8.0	61.1
20s (n=200)	9.5	63.5
30s (n=200)	10.5	57.5
40s (n=200)	5.5	56.5
50s (n=200)	7.0	65.5
60 and older (n=200)	7.5	62.5

■ I want to use even if a paid service (service charges or fees)
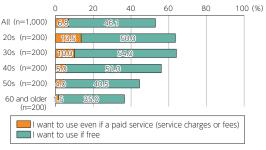■ I want to use if free

6. A function that forwards your medical and clinical records from your local regular hospital when you are being examined by a doctor at a holiday destination or other distant location

	Paid	Free
All (n=1,000)	11.9	59.2
20s (n=200)	14.5	60.5
30s (n=200)	14.0	58.0
40s (n=200)	10.0	59.0
50s (n=200)	10.0	59.0
60 and older (n=200)	11.0	59.5

■ I want to use even if a paid service (service charges or fees)
■ I want to use if free

7. A function that lets you attend lectures or take realistic foreign language lessons in real time from a remote location by means of bidirectional video with high definition and low latency

	Paid	Free
All (n=1,000)	5.9	50.4
20s (n=200)	10.0	55.5
30s (n=200)	8.5	54.5
40s (n=200)	4.5	53.5
50s (n=200)	4.0	50.0
60 and older (n=200)	2.5	38.5

■ I want to use even if a paid service (service charges or fees)
■ I want to use if free

8. A function that sends teaching materials (including videos) for correspondence courses or classes for children from a school or private tutor

	Paid	Free
All (n=1,000)	6.8	46.1
20s (n=200)	13.5	50.0
30s (n=200)	10.0	54.0
40s (n=200)	5.0	51.0
50s (n=200)	4.0	40.5
60 and older (n=200)	1.5	35.0

■ I want to use even if a paid service (service charges or fees)
■ I want to use if free

Source: "Survey on Consumer Attitudes on Data Usage Environments", MIC (2020)

(2) Company attitudes toward 5G

Figure 2-4-2-2 shows the results of a question to companies about their interest in 5G. Of the companies that replied, over 60 percent said they were interested, and this rate was over 50 percent in all industries. A gap was seen, however, in attitudes between large companies, of which more than 85 percent said they are "interested" in 5G, and SMEs, about half of which said they were "interested".

Figure 2-4-2-3 indicates the results of a question, asking the operational domains where companies envision using 5G. The top answer among manufacturers was "indoor production and manufacturing workplaces" and the top answer among companies in ICT and the service industry was "service development". Companies in the energy and infrastructure sector also frequently mentioned "outdoor production and manufacturing workplaces".
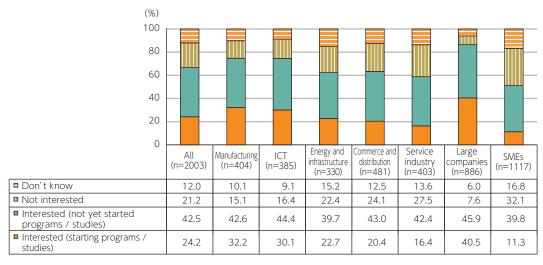
Figure 2-4-2-2   Company interest in 5G

	All (n=2003)	Manufacturing (n=404)	ICT (n=385)	Energy and infrastructure (n=330)	Commerce and distribution (n=481)	Service industry (n=403)	Large companies (n=886)	SMEs (n=1117)
Don't know	12.0	10.1	9.1	15.2	12.5	13.6	6.0	16.8
Not interested	21.2	15.1	16.4	22.4	24.1	27.5	7.6	32.1
Interested (not yet started programs / studies)	42.5	42.6	44.4	39.7	43.0	42.4	45.9	39.8
Interested (starting programs / studies)	24.2	32.2	30.1	22.7	20.4	16.4	40.5	11.3

Source: "Survey on Economic Value Measurements and Current Usage of Digital Data", MIC (2020)

Figure 2-4-2-3   5G usage business scenes

	All (n=1337)	Manufacturing (n=302)	ICT (n=287)	Energy and infrastructure (n=206)	Commerce and distribution (n=305)	Service industry (n=237)	Large companies (n=766)	SMEs (n=571)
Service development (entertainment, etc.)	48.2	36.4	66.6	40.8	43.9	52.7	53.0	41.7
Indoor production and manufacturing workplaces	36.9	58.9	30.7	29.1	32.5	29.1	43.6	28.0
Outdoor production and manufacturing workplaces	32.2	39.4	30.3	41.3	24.9	26.6	39.7	22.1
Logistics	17.8	23.5	12.5	13.6	23.3	13.5	21.9	12.3
Servicing and maintenance	28.3	26.2	35.9	30.1	25.6	24.1	30.3	25.7

Source: "Survey on Economic Value Measurements and Current Usage of Digital Data", MIC (2020)

3. Expected benefits of 5G implementation in specific industries and fields

(1) Agriculture fields

One of MIC's comprehensive 5G demonstration trials in FY 2019 was a test of remote monitoring of cattle in a cattle barn. The objective was to reduce the labor required for diary-farming and increase the efficiency of farm operations. The 5G system used image recognition to track the position of cattle from among a herd with ear tags (identification numbers attached to their ears) and send real-time video of cows that were producing less milk. In the experiments, ear tags were read with up to 90 percent accuracy, thereby reducing the time spent locating specific cows.

Smart agriculture makes use of robots, AI, the IoT, and other cutting-edge technologies. Adding 5G to smart agriculture for real-time remote monitoring, remote instructions and support, and remote surveillance of agricultural equipment and facilities is expected to further boost productivity through automation of agricultural operations and application of data. The use of 5G is expected not only to improve productivity through smart agriculture but also to maintain and rejuvenate communities in underpopulated areas by improving living conditions and attracting more permanent residents.

What's important when applying 5G in agriculture and agricultural communities is ensuring use cases take shape on the ground, while keeping in mind installation costs and the status of establishing conditions for 5G usage.

(2) Infrastructure and construction fields

Remote operation and control of construction equipment and machinery requires building wireless communication systems that can send and receive lots of information, such as image data and control signals to operate machinery. When large amounts of video are needed, for example, conventional Wi-Fi and other wireless systems face the problem of communication latency and insufficient speeds and capacities. 5G, however, permits the transmission of high-definition video with low latency and allows for the remote operation and control of multiple pieces of construction equipment simultaneously. Although technical problems remain, such as suppression of delays occurring throughout the system, the level of technology for remote machine operation and control is improving.

Another of MIC's comprehensive 5G demonstration trials in FY 2019 tested the use of 5G to ensure safety during slinging operations by a crane in the shipbuilding industry.

Normally during a slinging operation, the operator has many blind spots and, therefore, operates the crane following voice instructions. 5G, however, can eliminate blind spots for safer crane operations, by sending high-definition 4K video of blind spots to the operator's cab. 5G offers services creating conditions in which the operator can safely operate the crane while monitoring video.

5G can be used for emergencies and disasters to remotely operate and control construction equipment and machinery and transmit high-definition video. Such applications can help accelerate the implementation of more advanced technology, ensure the quality of construction, and make construction more efficient. It can also help transform work styles by, for example, reducing working hours on construction sites. In the future, the realization of automated construction equipment and machinery will enable remote operation and controls to be used in non-emergency times and move a major step closer to solving problems stemming from labor shortages. 5G can operate machinery for long hours at constant quality levels. This could potentially pave the way for new business models that dramatically reduce construction times and give rise to new construction techniques, thereby cutting costs and generating additional value.

(6) Safety and security field

Another MIC comprehensive 5G demonstration trial in FY 2019 tested a 5G system that simulated assisting the rescue of a climber lost in a mountainous area. A
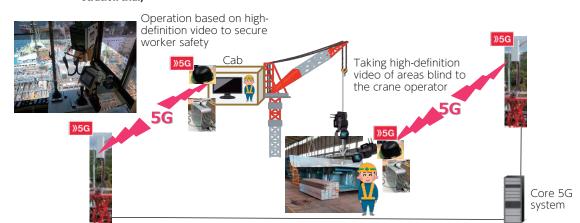
Figure 2-4-3-1   Using high-definition video to ensure the safety of cranes and other machinery (MIC comprehensive 5G demonstration trial)

Operation based on high-definition video to secure worker safety

Cab

Taking high-definition video of areas blind to the crane operator

Core 5G system

Source: Prepared from MIC materials

drone transmitted high-definition 4K video in real time via 5G to the rescue headquarters and to the rescue team in the field. This enabled rescuers to verify the conditions at the site and the condition of the climber and let them call to the climber using a loudspeaker attached to the drone. Multiple rescuers also transmitted high-definition 4K video in real time to the headquarters.

Another test simulated giving evacuation instructions during a disaster. The test was conducted at the Kitakyushu Science and Research Park, where the features of 5G — ultra-high speeds, large capacity, and ultra-low latency — were taken advantage of to create smart traffic light intersections. The system controlled traffic lights that determined where the disaster happened and broadcast evacuation instructions and information to devices of people in the disaster area (Figure 2-4-3-2).

In the disaster-mitigation field, it is hoped that the establishment and dissemination of hardware and software that take advantage of 5G's features will lead to the development of next-generation disaster-mitigation systems. It will connect a series of processes from information collection to information transmission along a time axis, starting with the initial disaster response and recovery to the return to normal conditions. This is expected to enable fast and accurate provision of information and evacuation instructions given limited personnel and time and help mitigate damages, including saving human lives.

The crime prevention field, by incorporating faster and larger capacity communications, mobilization, and technological advances in sensing devices, will evolve to a more advanced level using image analytics and AI.

5G will fuel development toward advanced monitoring and surveillance with high-definition video and AI and pivot away from human-based monitoring (security guards and observers).

(7) Mobility field

Adaptive cruise control (ACC), which adjusts vehicle speed to maintain a safe distance between vehicles, is now becoming practical. Because ACC is based only on distance information between vehicles, there is a delay between when the leading vehicle begins to decelerate until the interval distance changes and the trailing vehicle begins to decelerate. Consequently, to avoid rear-end collisions, a long distance between vehicles is necessary. In order to achieve better fuel economy and greater traffic volumes on roads while using vehicle-to-vehicle communications that send the leading vehicle's speed and acceleration information to the trailing vehicle and adjust its speed, it is needed to shorten interval distances while ensuring safety. Potential applications of 5G, therefore, are expected in remote operation of vehicles and autonomous driving, such as truck platooning that takes advantage of 5G's ultra-low latency.

A MIC comprehensive 5G demonstration trial in FY 2019 tested the transmission of monitoring video with handover among four 5G base stations in a vehicle-to-network (V2N) system that communicates between vehicles. Another test of direct vehicle-to-vehicle (V2V Di-
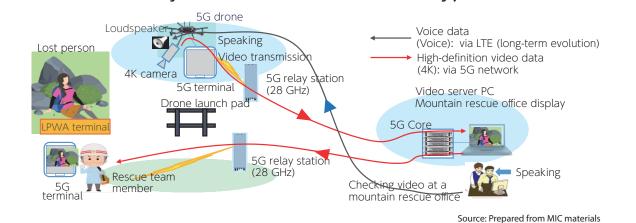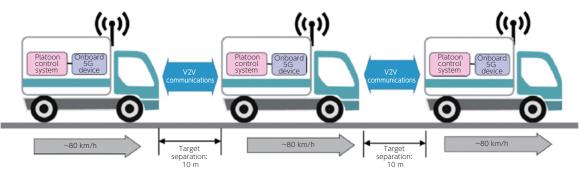
Figure 2-4-3-2   Overview of the mountain-climber monitoring system

Source: Prepared from MIC materials

Figure 2-4-3-3   Example of an advanced vehicle control project (MIC comprehensive 5G demonstration experiment)

Source: Prepared from MIC materials

rect) communications demonstrated cooperative adaptive cruise control (CACC) for a platoon of trucks on the Shin-Tomei Expressway. Using ultra-low latency 5G communications, the test successfully controlled and steered the trucks with a separation of 10 meters (Figure 2-4-3-3).

4. Local 5G as a means of solving regional issues

(1) Establishment of the Master Plan on the Regional Development of ICT Infrastructure

When approving the "Establishment Plans for Specified Base Stations to Deploy 5G Mobile Communication Systems" on April 10, 2019, the Minister for Internal Affairs and Communications obliged the four carriers that will provide nationwide 5G services to launch 5G services in all prefectures within two years and imposed a condition requiring the carriers to roll out 5G services broadly and steadily nationwide.

Unfortunately, the plans submitted by the carriers varied greatly in the number of 5G base stations to be installed. Furthermore, the plans did not mention the installation of 5G base stations evenly throughout all parts of the country, including areas with less favorable conditions and tunnels and other areas where radio signals are blocked, over their five-year term. This created the need to take measures to accelerate the early installation of 5G base stations and the optical fiber that support them in regional areas, in order to move the carriers' plans forward as much as possible.[17]

Aware of these issues, MIC established the "Master Plan on the Regional Development of ICT Infrastructure" on June 25, 2019. The plan was established to make unified and effective use of ICT infrastructure development assistance measures, including 5G, and 5G use and application promotion policies and to develop ICT infrastructure nationwide as soon as possible, with the target date of the end of FY 2023.

The master plan sets targets for each policy. These include area development (base station installations) in disadvantaged regions, the advanced installation of 5G base stations, the promotion of measures to deal with radio signal blocking in train and road tunnels, and the acceleration of area expansion and the promotion of optical fiber installation with Local 5G.

(2) Introduction of Local 5G

There are high expectations for the implementation of 5G, not only to generate new businesses in many fields but also to be a secret weapon in solving various social issues faced by regional areas. For this reason, the New-Generation Mobile Communications System Subcommittee under the Information and Communications Council, MIC examined technical requirements for the introduction of Local 5G. Local 5G are new mobile communication systems that a variety of entities can construct and use flexibly to suit the local region's needs or specific needs of an industrial field. Local 5G is separate from the nationwide services provided by mobile carriers.

a. Basic concepts of Local 5G

Local 5G has three basic concepts: (1) the use of 5G; (2) relatively small communication environments constructed tailored to local regional needs; and (3) ability to either obtain a radio station license yourself or to use the systems of another party that has obtained a license. The reason for this third concept is that Local 5G is assumed to be generally used for private business purposes. It is also assumed that users and local businesses without specialist knowledge about wireless technology

Figure 2-4-4-1 State of Local 5G license applications received (as of April 30, 2020)

	Primary Purpose	Main Businesses
Vendors / manufacturers	For smart factories and the IoT Note: Install first at own factories	・Fujitsu Note: Full license granted on March 27 ・NEC ・Hibiki Seiki (Yamaguchi)
Cable TV	Cable TV Note: To replace wired last one mile	・Cable Networks Akita ・JCOM ・CableTV (Tochigi) ・ZTV (Mie) ・Tonami Satellite communications Television (Toyama) ・Ehime CATV ・Community Network Center (Aichi)
Telecoms	Construction of demonstration tests with a focus on smart agriculture and esports use	・NTT East Japan Note: Full license granted on April 10
Telecoms	Plan demonstration tests in conjunction with the Kyushu Institute of Technology	・QTnet (Fukuoka) Note: Full license granted on March 30
Universities	Construction of demonstration tests	・University of Tokyo
Local governments	Construction of demonstration tests for SMEs	・Tokyo Metropolitan Government ・Tokushima Prefectural Government Note: Preliminary license granted on March 30

Source: Prepared from MIC materials

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[17] The total number of 5G base station installations in the companies' plans is about 70,000. The measures aim to move the installation forward of 20 percent of the base stations expected to be installed after the five-year plan terms.

or network technology are precisely the parties with many unfilled needs. Consequently, Local 5G must respond on a granular scale to these needs. For the smooth dissemination of Local 5G, it is thought, there are some situations that regional communication businesses could better identify the specific needs of that region, construct networks adapted to those individual needs, and provide the networks as telecommunication services.

b. Systemizing and licensing Local 5G

Local 5G was made into a system on December 24, 2019, based on a report by the New-Generation Mobile Communications System Subcommittee under the Information and Communications Council., MIC The "Guidelines for Local 5G Implementation" were established and released on December 17, 2019, to clarify an overview of Local 5G, the license application procedure, and approaches to connectivity with other businesses. Regional Bureaus of Telecommunications began accepting applications for Local 5G licenses on December 24, 2019. Fifteen companies had applied as of April 30, 2020 (Figure 2-4-4-1), and as of that same date, three companies had been granted Local 5G licenses, following examinations of their application particulars.

(3) Development and demonstration experiments to promote the implementation of Local 5G to solve regional issues

Development and demonstration experiments are planned to start from the summer of this year in order to implement solutions to regional issues using Local 5G and other technologies by local companies and other entities. The demonstrations will perform technical tests on Local 5G radio transmissions for use cases that assume Local 5G base stations will be installed in a great variety of locations and used under various conditions. Another purpose of the demonstrations is to construct a model for solving regional issues using Local 5G and other technologies.

The technical tests will in principle use the frequency bands (4.6 to 4.9 GHz and 28.3 to 29.1 GHz) under consideration for Local 5G systemization. It is possible, however, that technical tests will be conducted corresponding to the 5G frequency bands used by mobile carriers and the frequency bands already systemized for Local 5G (28.2 to 28.3 GHz).