Chapter 2

Digitalization Accelerated by the COVID-19 Pandemic

This chapter describes the state of digitalization accelerated under the COVID-19 Pandemic while citing various data, and sorts the issues that are highlighted during the process.

Section 1 Digital Utilization Expansion under COVID-19

This section looks back the impact of the COVID-19 pandemic on the society and economy of Japan based on various indicators, and examines the impact of the expanded use of digital technologies on consumption activities when consumers were forced to stay at home, using the results of questionnaire surveys, etc.

1. COVID-19 Pandemic

Since the COVID-19 infection was identified in December 2019, the infection spread around the world. COVID-19 is still strongly influencing our life and society.

2. Impact of the COVID-19 Pandemic on Society and Economy

COVID-19 pandemic greatly influenced the global and Japanese economies and exposed social and economic issues facing the country. Here, we outline the specific impacts based on various economic indicators

(1) Decreased GDP Due to the COVID-19 Pandemic

The Japanese economy had been gradually recovering from the trough of November 2012, but greatly slowed down due to the COVID-19 pandemic.

Since the spread of the COVID-19 infection, GDP in the major countries of the world significantly dropped in the April-June quarter of 2020, but began to recover in the July-September quarter. We can say that movement to resume economic activities while taking infection control measures has been observed in these countries.

Overall the global economy is recovering, but the level of recovery greatly varies depending on the country.

(2) Restriction of Going Out and Changes in Consumption

Regarding changes in going-out activities and in consumption in major countries, going out was greatly restricted and consumption dropped in the United States, Europe and Japan in the second quarter (April – June) of 2020. Later, consumption has been changing according to the changes in the level of going out in Europe and Japan. In the United States, however, the range of the downturn in consumption has greatly decreased even under the restriction of going out.

3. Changes in Consumption Behavior through Utilization of Digital Technologies

Below, we look at changes in consumption behavior through utilization of digital technologies and examine the influence of the changes.

(1) Increased Online Consumption

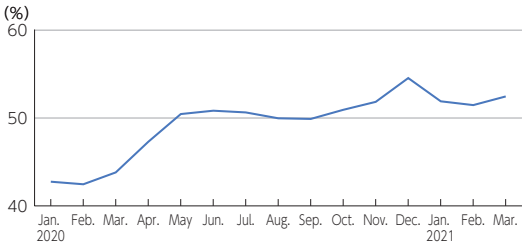
Spread of COVID19 infection increased “stay-at-home consumption” and changed consumption behavior. The proportion of households using Internet shopping rapidly increased after March 2020 and more than half of the households with two or more members have been using Internet shopping (Figure 2-1-3-1).

(2) Increase in Online Video Program/Event Distribution

As a result of increased hours at home, viewing of programs and events via the Internet has increased. The utilization rate of paid video distribution services had been increasing year by year but the increase in 2020 was larger than in other years partially owing to stay-at-home demand.

Regarding sports/program distribution, Netflix and other OTT (over-the-top) businesses in Japan and abroad made a leap forward, sharply increasing their

Figure 2-1-3-1 Household share for Internet shopping



(Source) Prepared from Ministry of Internal Affairs and Communications “Survey of Household Economy”

subscribers worldwide.

In the event/entertainment industry, online distribution of live concerts, movies, festivals, etc. has expanded.

(3) Online Sightseeing

As a result of restriction of long-distance traveling by the issuance of declaration of a state of emergency, there are more occasions setting up virtual visits using AR and VR, avatar robots or remote-control technologies, instead of actually visiting the place.

(4) Present State of Digital Technology Utilization Read from a Consumer Questionnaire

a. Digital services used under the COVID-19 Pandemic

What kind of services usage has increased as a result of the COVID19 pandemic? Respondents were asked what services they used when the first (April to May 2020) and the second (January-March 2021) declarations of a state of emergency were issued (Figure 2-1-3-2).

The most often used services during the first declaration of a state of emergency were Internet shopping, electronic money/electronic payment/QR-code payment, Internet video distribution and noncontact temperature measurement in this order.

The most often used services during the second declaration are broadly similar to those during the first declaration: Internet shopping, electronic money/electronic payment/QR-code payment, noncontact temperature measurement and Internet video distribution in this order.

b. Intention to use services after containment of COVID19

Next, the respondents were asked what services they want to use after containment of the COVID19 infection (Figure 2-1-3-3).

The most common answer was Internet shopping. However, considering that the utilization rate of Internet shopping that was 57.1% during the first declaration fell to 42.1% during the second declaration, a certain number of people may use the service only temporarily.

The usage retes of electronic money/electronic payment/QR-code payment and Internet video distribution, which follow Internet shopping also were declining and showed a similar tendency.

c. Services used more frequently with the progress of digitalization

The next question was about services that will be used more frequently with the progress of digitalization of society (Figure 2-1-3-4). Top ranking answers were "Cashless payment," "Internet shopping" and "online meeting."

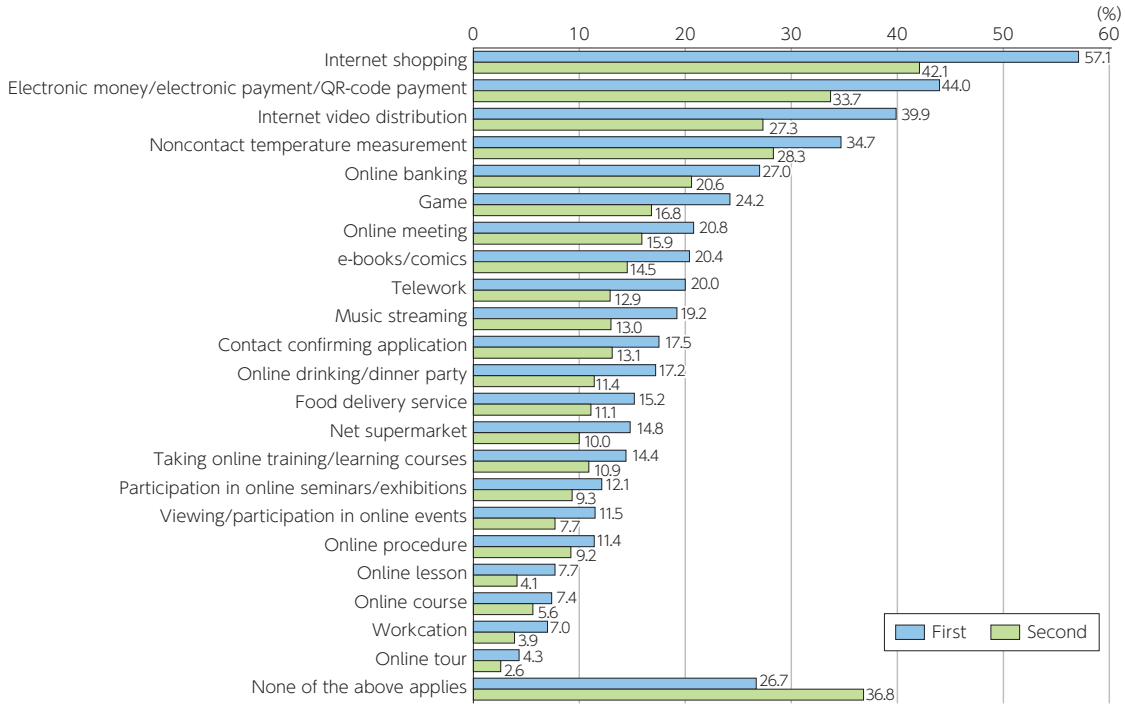
(5) Changes in Consumption Activities and Their Impacts

a. Changes in consumption activities

Regarding the changes in consumer activities based on economic indicators of the Bank of Japan, compared to the consumption activity index of durable and nondurable goods in the Oct-Dec quarter of 2019, this year was higher than and the same as the level of the previous year respectively, but the same index of services remained about 90% of the previous year. Service consumption of the items that are especially subject to influence of refraining from going out continues to be at a significantly low level. While retail businesses are enduring, the drop in the service industry is significant.

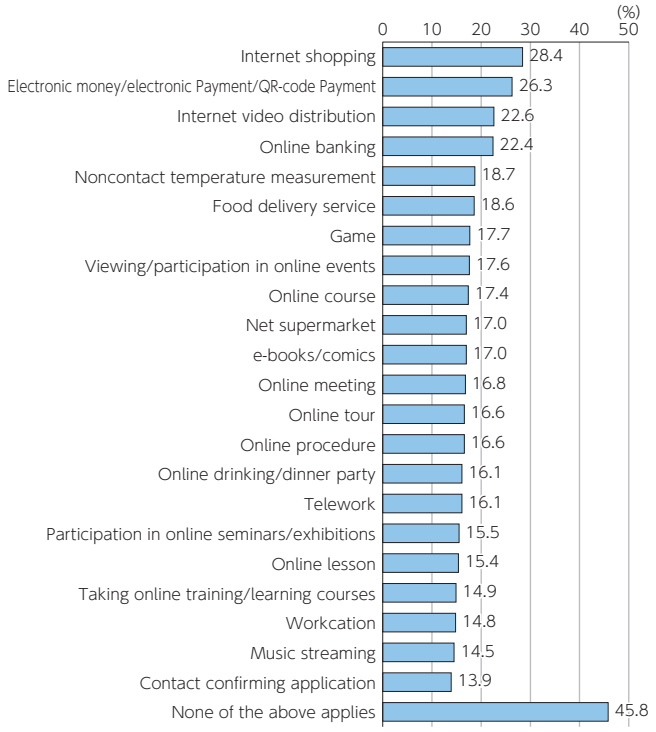
In year-to-year comparison of consumer spending in retail businesses of the first half of January 2021 in Japan

Figure 2-1-3-2 Services Used Under Declaration of a State of Emergency



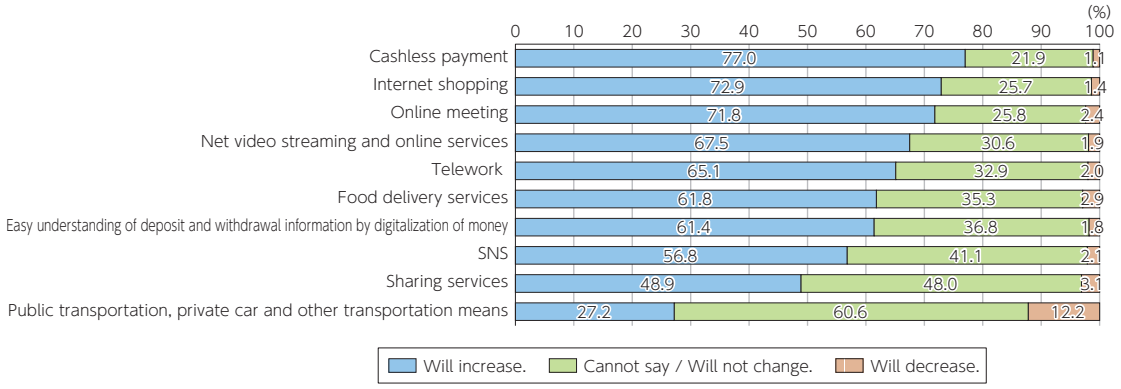
(Source) MIC (2021) "Research on actual state of digital technology utilization during the COVID-19 pandemic and changes in user awareness"

Figure 2-1-3-3 Services People Want to Use after Containment of COVID19 Pandemic



(Source) MIC (2021) "Research on the actual state of digital technology utilization during the COVID-19 pandemic and changes in user awareness"

Figure 2-1-3-4 Digital Services that Are Thought to Be Used More Frequently with the Progress of Digitalization



(Source) MIC (2021) "Research on actual state of digital technology utilization during the COVID-19 pandemic and changes in user awareness"

based on credit card purchase data, online sales increased across the board, whereas face-to-face sales decreased in all retail businesses. In this manner, while overall consumption decreased, online consumption expanded.

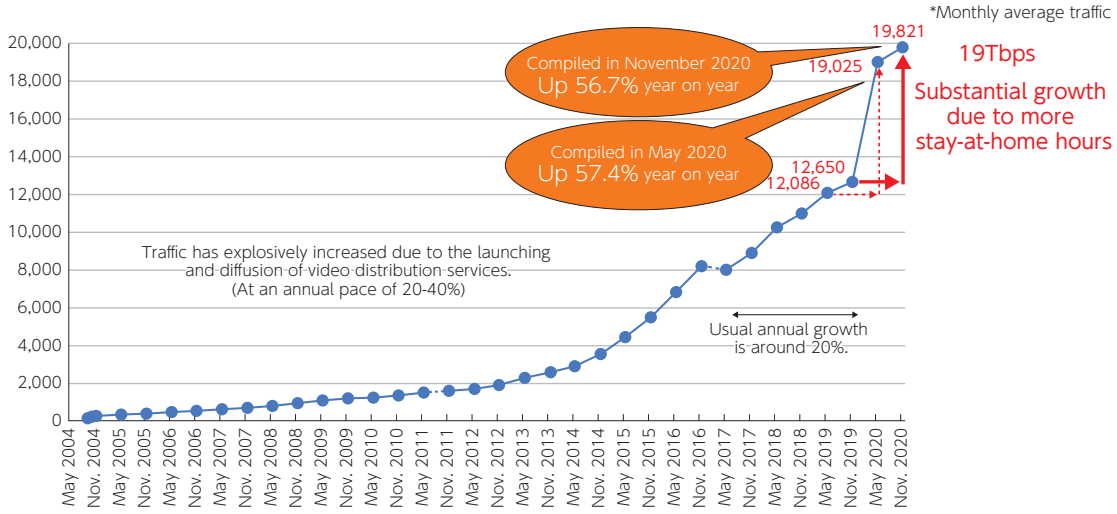
b. Increase in Internet traffic

With the increase in hours of being at home under the COVID-19 pandemic, Internet traffic has sharply increased. Traffic had been increasing around 20% annually, but in 2020 it increased more than 50% over the previous year (Figure 2-1-3-5).

c. Effects on corporate performance

Changes in consumer behavior have made a major impact on corporate performance. At the initial stage of the spread of COVID19 infection, economic activities were restricted for prevention of the spread of the infection and corporate performance deteriorated in many industries. Later, with the establishment of new lifestyles (New Normal) based on non-contact /non-face-to-face principles, use of online services increased and exports to countries that had recovered from the COVID19 woes also increased. As a result, there progresses a polarization between the industries favored by these factors and the industries affected by restriction on movement, etc.

Figure 2-1-3-5 Internet traffic growth



(Source) Ministry of Internal Affairs and Communications (February 5, 2021) "Aggregation and Provisional Calculation of Internet Traffic in Japan"

Section 2 Public Sector's Digital Utilization under the COVID-19 Pandemic

This section looks back on utilization of digital technologies in the public sector (administration, education and healthcare) under the COVID-19 Pandemic.

1. Public Administration

This part summarizes the results and issues of utilization of digital technologies in public administration under the COVID-19 pandemic, and compiles the status of study toward formation of a resilient digital society in the future.

(1) Results and Challenges of Utilization of Digital Technologies in Public Administration

In order to provide promptly financial support for citizens and also to understand the pandemic status and risks of each region, the central and local governments made various efforts utilizing digital technologies. While these efforts were appreciated as results of the past infrastructure development at e-government and local e-governments and as symbolic use cases of introduction of new development methods, they also exposed restrictions due to institutions, rules and customs as well as challenges in procurement and project management.

a. Procedures of application for cash benefit, etc.

(a) Special Cash Payments

Application for Special Cash Payments using Myna Portal was enabled, which significantly reduces the period of acceptance of the application and the time required for application compared with the previous granting of Special Cash Payment (in 2009). However, there are challenges including the need of digitalization of not only application but also the entire procedure up to payment, institutional restrictions concerning use of individual numbers and spread of individual number cards. There were also cases where prompt payment was hindered due to failure to use digital technologies as a result of insufficient preparation for actual operation or management assuming face-to-face and paper-based operations.

(b) Employment adjustment subsidy

Operation of the online reception system of employment adjustment subsidy, etc. was stopped due to multiple system failures at the start of operation, but resumed on August 25, 2020 after necessary improvements.

b. Development/introduction of information systems

(a) Support for medical institutions, public health centers, etc.

In order to collect information on the situation of the medical sites involved in COVID-19 infection as fast as possible, the Ministry of Health, Labour and Welfare (MHLW) and the Cabinet Secretariat started construction and operation of an information gathering system covering about 8,000 medical institutions across the country (G-MIS: Gathering Medical Information System) in May 2020.

In addition, the MHLW hurriedly constructed a system to digitalize the report of the occurrence of COVID-19 infected persons from medical institutions to public health centers for unified management of information of infected persons (HER-SYS: Health Center Real-time Information-sharing System on COVID-19) and started its full-scale operation on May 29, 2020 in health centers across the country in order.

(b) COVID-19 Contact-Confirming Application: COCOA

COVID-19 Contact-Confirming Application "COCOA" uses Bluetooth of smartphones to notify the possible

contact with a COVID-19 infected person. The application was developed by the MHLW and the Anti-COVID-19 Tech Team of the Cabinet Secretariat with cooperation of "COVID-19 Radar", an open-source community of private-sector volunteer engineers, in a short period of about two months after starting consideration. As of April 30, COCOA was downloaded 27.34 million times and the number of registered infections reached 14,324.

After an update on September 28, 2020, a problem that notification was not sent to Android users who had a contact with a COVID19 infected person was disclosed on February 3, 2021. A report was published on April 16, 2021, compiling the recurrence prevention measures of the problem, with disclosure of a problem of unwanted initialization of the iOS version of the application.

(c) Vaccination record system and digital certificate

COVID19 vaccination for medical workers started in Japan in February 2021. Vaccination for the elderly started on April 12, 2021 in some municipalities, followed by other municipalities since May of the same year. For unified management of the vaccination information, the Vaccination Record System (VRS) has been developed.

c. Telework of administrative officers

(a) Telework in central government offices

Telework had been increasingly introduced in the central government offices and local governments even before the COVID-19 pandemic. According to a survey of the central government offices conducted jointly by the Cabinet Secretariat National Strategy Office of ICT and the Cabinet Personnel Bureau[8], the proportion of officials doing telework in the total number of officials was as low as 1.2% in FY 2014, but rose to 47.4% in FY2019.

When declaration of a state of emergency was issued in April 2020, offices were required to reduce attendance of workers by at least 70%. In January 2021, when the second declaration of a state of emergency was issued to four prefectures, the ministries were required to reduce attendance of government officials by 70% in these prefectures. However, the overall telework implementation rate of 13 central ministries and agencies was about 60%[9].

(b) Telework in local governments

According to a survey by the MIC, 95.5% of prefectures and government-designated cities (100% of prefectures and 85.0% of government-designated cities) had introduced telework as of October 2020. However, the rate of municipalities remained at 19.9%.

d. Data utilization

(a) Consideration of countermeasures based on macroscopic understanding of information

Amid the spread of COVID-19 infection, macroscopic understanding of the flow of people was made available by using statistical data held by mobile operators and platform operators. This enabled the central and local governments to understand the effects of their request to residents to refrain from going out and to take further countermeasures as needed.

On the other hand, these initiatives exposed again the challenge of balancing the public welfare and individuals' rights in data utilization including use of users' location information for the purpose of public health.

(b) Utilization of open data

There were initiatives by Civic Tech and private enterprises to deliver information related to the COVID-19 infection in an easily accessible form in many places by using open data provided by the central and local governments. On the other hand, a problem surfaced that information made public by the central and local governments is not always machine-readable or the data formats are not unified. This exposed the need to ensure disclosure in a common and highly machine-readable data format by different organizations.

2. Educational Field

With the spread of the COVID-19 infection, elementary, junior-high and high schools were temporarily closed all over Japan in March 2020 in preparation for the infection risk from gathering a large number of students and teachers for a long period of time on a daily basis. In order to guarantee learning during the closure, remote/online education was provided using ICT. The GIGA School Vision, describing the plan to develop a high-speed and large-capacity communication network integrally with provision of a terminal to every student, originally scheduled in 4 years by FY2023, but the schedule was significantly moved forward to cope with the spread of the COVID-19 infection.

(1) Status of Implementation of Remote/Online Education under the COVID-19 Pandemic

a. Implementation in elementary, junior-high and high schools

On February 28, 2020, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) requested simultaneous temporary closure of elementary, junior-high and high schools across the country. Temporary closure started sequentially in March 2 of the same year. In order to ensure learning during the temporary closure, schools made preparation for home learning based on textbooks and paper learning materials, while some schools implemented home learning using learning videos and simultaneous two-way online teaching.

[8] The Cabinet Secretariat National Strategy Office of ICT and the Cabinet Personnel Bureau "Result of Telework Implementation for Government Officials"

[9] Nihonkeizai Shimbun - "Telework is implemented 60% in ministries: the government survey in January under declaration of a state of emergency" (2021.2.23)

b. Implementation in universities and technical colleges

The MEXT issued a notice regarding points of attention when starting classes of FY2020 on March 24, 2020. According to a survey by the MEXT, as of April 23, 2020 about 90% of universities responded to the notice by postponing the start of regular classes to be attended by students. As of May 20, 2020 about 80% of universities conducted (face-to-face and remote) classes. As of July 1, 2020 all universities conducted (face-to-face and remote) classes.

According to the "Survey on Latter Half Semester Implementation Policies at Universities" almost all universities answered that they would give face-to-face classes for the second semester of 2020 and 80% of them answered that they had parallel use of face-to-face and remote classes in view (Figure 2-2-2-1). As to the proportion of face-to-face and remote classes, about 60% of the universities answered that more than half of the classes would be face-to-face (Figure 2-2-2-2).

(2) Status of Remote/Online Education Viewed in Data

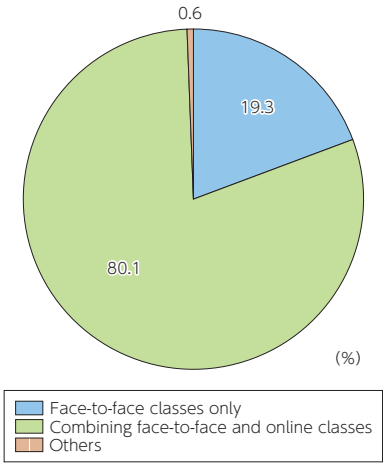
This part overviews the actual attendance state of online education (classes) based on the surveys conducted by the Cabinet Office (the first survey in May 2020; the second survey in December 2020).

a. Attendance state of online education (classes)

Attendance state of online education (classes) at high school, undergraduate and graduate students is shown in Figure 2-2-2-3.

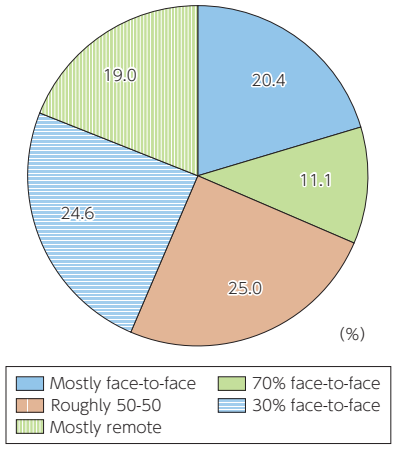
Proportion of high school students who attended remote/online education[10] was 50.0% in the first survey

Figure 2-2-2-1 Policy for the Latter Half Semester Classes of the FY2020 (Universities, etc.)



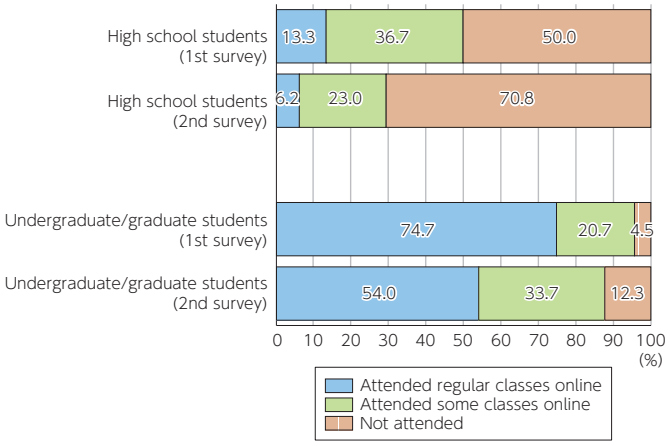
(Source) Prepared by the Ministry of Internal Affairs and Communications from the Ministry of Education, Culture, Sports, Science and Technology (2020) "Survey on Latter Half Semester class Implementation Policies at Universities, etc."

Figure 2-2-2-2 Proportion of Face-to-face and Remote Classes (Universities, etc.)



(Source) Prepared by the Ministry of Internal Affairs and Communications from the Ministry of Education, Culture, Sports, Science and Technology (2020) "Survey on Latter Half Semester class Implementation Policies at Universities, etc."

Figure 2-2-2-3 Attendance State of Online Education (Classes) (High School, Undergraduate and Graduate Students)



(Source) Cabinet Office (2020) "the Second Survey of Changes in Lifestyle Attitude and Behavior under the Influence of COVID-19 Infection"

[10] Sum of the answeres "attended regular classes online" and "attended some classes online."

and decreased to 29.2% in the second survey.

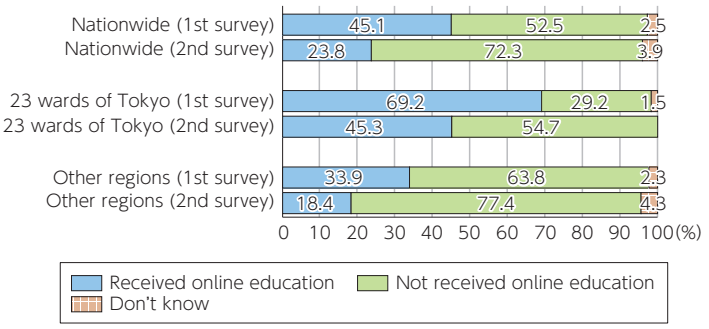
Proportion of undergraduate and graduate students who attended remote/online education was 95.4% in the first survey and remained high at 87.7% in the second survey.

b. Remote/online education of elementary and junior high students

Attendance state of remote/online education by elementary/junior high students[11] is shown in Figure 2-2-2-4.

The proportion of students receiving remote/online education was 45.1% in the first survey, but fell to 23.8% in the second survey.

Figure 2-2-2-4 Remote/Online Education of Children (Survey of Parents of Elementary/Junior-high Students)



(Source) Cabinet Office (2020) "the Second Survey of Changes in Lifestyle Attitude and Behavior under the Influence of COVID-19 Infection"

3. Medical Field

COVID-19 pandemic increased the burden on medical institutions responding to COVID-19 patients and is overstraining the healthcare delivery system. There is also a risk of patients' infection through their hospital visits. Further utilization of ICT is considered to be one of the effective solutions of these issues.

(1) Online Medical Care under the COVID-19 Pandemic

MHLW relaxed the requirements to allow telephone and online medical care from initial consultation as a special provision with a time limit until containment of the COVID-19 infection.

(2) State of Online Medical Care as Seen in Data

Let us see the state of online medical care after the relaxing of the requirements based on the data compiled by the MHLW.

a. Number of medical institutions providing online medical care and the number of the cases

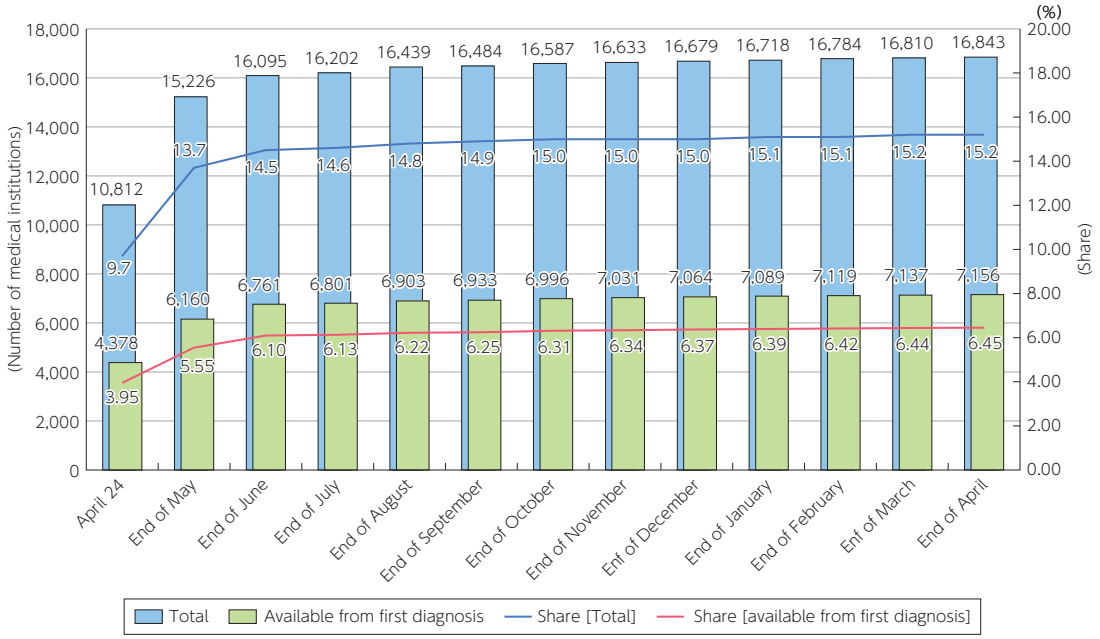
Figure 2-2-3-1 shows the changes in the number of medical institutions registered for telephone/online medical care. After the relaxing of the requirements on April 10, 2020, the number of registered institutions increased but the increase slowed since June of the same year.

b. Background of the patients

Looking at the number of patients receiving telephone/online medical care for the period from January to March 2021 by age group, we find that age 40 and under account for about three fourths.

[11] Including online teaching by private school or after-school lessons and provision of online learning materials outside of school

Figure 2-2-3-1 Number of institutions registered for telephone/online diagnosis (from April 2020 to April 2021)



(Source) Ministry of Health, Labor and Welfare (2021) document for "the 15th meeting of the council on revisions to guidelines regarding adequate online diagnosis implementation"

Section 3 Corporate Activity Changes under the COVID-19 Pandemic

After the section of the state of utilization of digital technologies by consumers and in the public sector under the COVID-19 pandemic, this section examines changes in corporate activities. COVID-19 infection hit the global economy and exerted a potent influence on corporate activities. We examine the extent of the influence based on various economic indicators, and overview the progress of supply chain fragmentation on a global scale due to the COVID-19 pandemic and its impact on corporate activities in Japan.

While some industries are still struggling under the COVID-19 pandemic, other industries improved performance. The section describes the situation that ICT-related enterprises are doing well both in Japan and in the United States thanks to the expansion of online consumption and are leading business recovery.

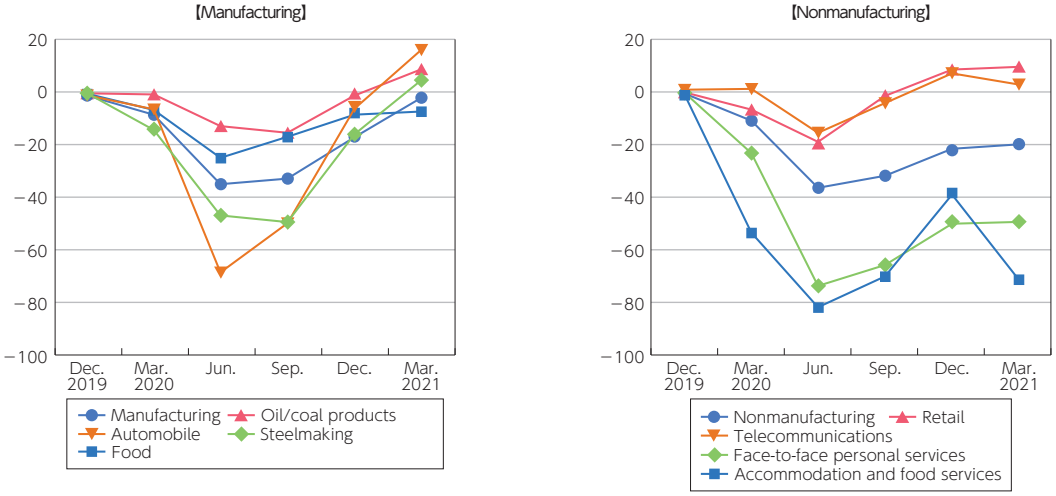
Lastly, because telework is a typical example of changes in corporate activities under the pandemic, we clarify the actual state of telework in Japan based on questionnaire results.

1. Corporate Activities under the COVID-19 Pandemic as Seen in Economic Indicators

Overall corporate activities in Japan were affected by the spread of COVID-19 infection: production, services and exports sharply dropped in the second quarter (Apr-Jun) of 2020. Later, with the cancelling of the first declaration of a state of emergency, corporate activities showed a recovery. Exports to China and the United States, in particular, increased and exceeded the level of the same period last year in the 4th quarter (Oct-Dec) of 2020. Corporate performance is recovering supported by the recovery of external demand.

However, the degree of corporate performance recovery varies depending on the industry. There is a polarization between the industries favored by the increase in online service use and export to the countries that have recovered from the COVID19 pandemic on one hand, and the industries affected by restriction on movement on the other. According to the short-term economic survey of the Bank of Japan, activities of private enterprises were at a low level with business conditions DI (all sizes, all industries) at -8 points in the survey of March 2021 but recovered from -31 point of the survey in June 2020 (Figure 2-3-1-1).

Figure 2-3-1-1 Business Conditions DI by Industry



* Changes in percentage points from the December 2019 survey

(Source) Prepared by Ministry of Internal Affairs and Communications from Bank of Japan Tankan Survey (Business condition diffusion index by industry)

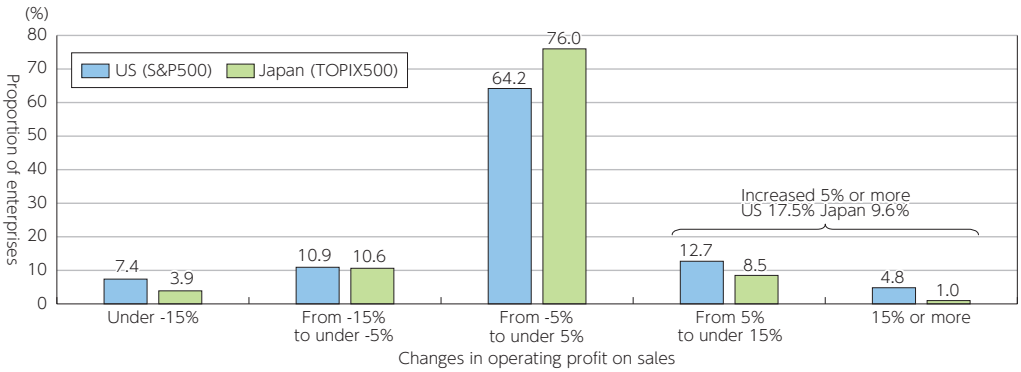
2. Relocation of Production Bases in Response to Fragmentation of Supply Chains

China rapidly gained power, bringing about confrontation (decoupling) with the United States in wide-ranging fields including trade, technologies and economic security. This caused fragmentation of supply chains on a global scale with a major influence on the activities of Japanese enterprises. Later, as a result of immigration restriction imposed by many countries to address the COVID-19 pandemic, fragmentation of supply chains is expanding on a global scale. In this context, reconsidering supply chains may influence the production of the goods for which the final destination is not the United States and China but Europe, Japan and other countries. There is also a concern that stagnant economic activities under the pandemic may affect employment and society may be divided due to income disparities.

3. Trends of Listed Enterprises in Japan and the United States – ICT-related Enterprises Are Driving Performance Recovery

This part examines what enterprises are driving performance recovery, comparing Japan with the United States, which is considered to be ahead of Japan in recovery. First, let us look at the changes in profit ratios of Japanese and U.S. listed enterprises. The proportion of enterprises whose operating profit on sales of the last quarter increased more than 5% from the previous year is 9.6% in Japan and 17.5% in the United States (Figure 2-3-3-1).

Figure 2-3-3-1 Distribution of Changes in Operating Profits on Sales of Japanese and the U.S. listed Enterprises (Changes of the Last Quarter of FY2020 from the Same Period Last Year)

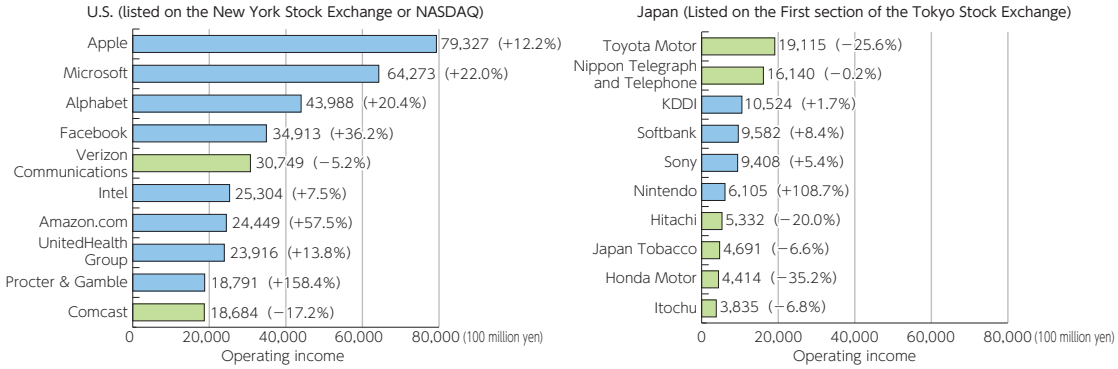


* TOPIX500: Category of the top 500 enterprises listed on the First Section of the Tokyo Stock Exchange in terms of stock trade amount and market capitalization
* S&P500: Category of the top 500 enterprises listed on the U.S. stock exchanges (New York Stock Exchange, NASDAQ, etc.) in terms of stock trade amount and market capitalization
* Aggregation of the samples with available data from the components as of the end of January 2020 (492 Japanese and 497 U.S. enterprises)
* Last quarter: operating profit on sales available as of the end January 2021 (309 Japanese and 271 U.S. enterprises for Jul-Sep quarter of 2020; 150 Japanese and 167 U.S. enterprises for Oct-Dec quarter of 2020)

(Source) material of the Committee on Growth Strategy (Feb. 17, 2021)

Regarding operating profit of Japanese and U.S. listed enterprises in 2020, "TECH enterprises" including GAFA and Microsoft produced high performance across the board in the United States. In Japan, the automotive industry suffered a profit drop, whereas the ICT and game industries increased profits thanks to the expanded online consumption (Figure 2-3-3-2).

Figure 2-3-3-2 Top 10 U.S. and Japanese operating profits of listed enterprises in 2020



* Prepared based on the data (consolidated basis) available as of February 10, 2021. Enterprises not publicizing operating profit on their financial statements (e.g., financial/insurance, holding companies) are excluded. Operating profits of the United States were converted to Japanese yen at the average rate of 2020 (one dollar to 106.8 yen). Year-to-year comparison is based on the dollar.

(Source) Document for the Growth Strategy Council (February 17, 2021)

4. Working Style (Telework)

Telework that does not require commuting to the workplace is actively used because it is effective for business continuity in the age of COVID-19.

(1) Actual Situation of Telework as Seen in a Questionnaire Survey of Individuals

Let us look at how people did telework and what impression they had based on the results of a survey conducted for this white paper.

a. Experience of telework

The first question is about the experience of telework via the Internet in the last twelve months (Figure 2-3-4-1). 38% of the respondents did telework: 34.8% at home, 4.1% at a satellite office and 4.8% at visiting destinations (mobile work). Telework is mostly done at home.

b. Frequency of telework

Respondents with experience of telework were asked about the frequency of telework during the declarations of a state of emergency (Figure 2-3-4-2). During the first declaration, "5 to 6 days a week" was 32.9%, "3 to 4 days a week" was 21.3% followed by "about 2 days" at 17.1%. Many people did telework most days of a week. During the 2nd declaration, the most common answer was "3 to 4 days a week" at 24.5% followed by "5 to 6 days a week" at 21.0% and "about 2 days" at 17.1%.

c. Intention to continue telework

Respondents with experience of telework were asked whether they want to continue telework (Figure 2-3-4-3).

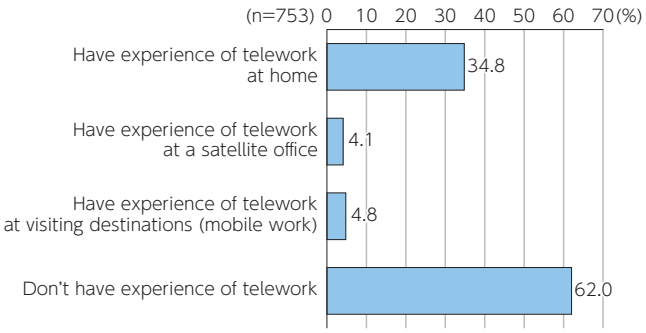
Respondents who want to continue telework account for more than half both overall and by company size.

d. Advantages of telework

Respondents with experience of telework were asked about the advantages of telework (Figure 2-3-4-4).

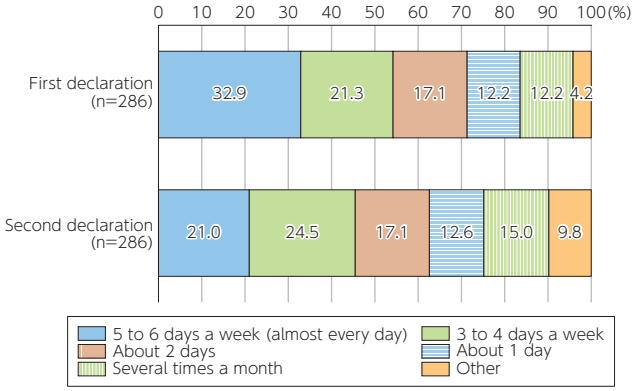
Most common answers were "can reduce commuting time," "can work in the favorite places" and "easier to make time for myself and family" in this order.

Figure 2-3-4-1 Experience of Telework



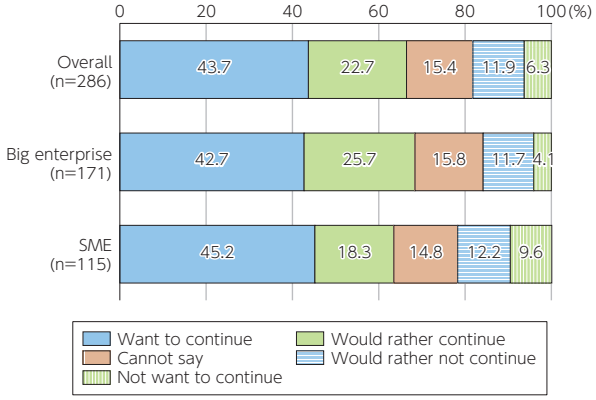
(Source) MIC (2021) "Research on actual state of digital technology utilization during the COVID19 pandemic and changes in user awareness"

Figure 2-3-4-2 Frequency of Telework



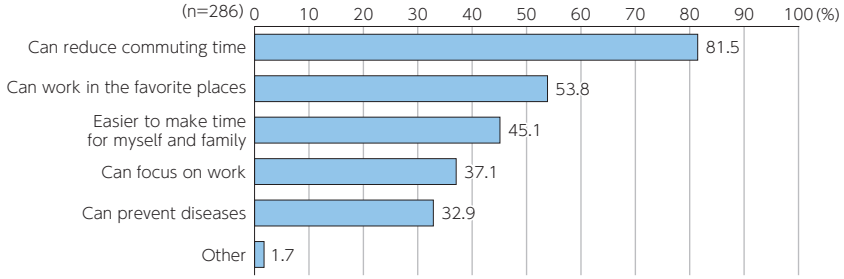
(Source) MIC (2021) "Research on actual state of digital technology utilization during the COVID19 pandemic and changes in user awareness"

Figure 2-3-4-3 Intention to Continue Telework



(Source) MIC (2021) "Research on actual state of digital technology utilization during the COVID19 pandemic and changes in user awareness"

Figure 2-3-4-4 Advantages of Telework



(Source) MIC (2021) "Research on actual state of digital technology utilization during the COVID19 pandemic and changes in user awareness"

e. Challenges and barriers for telework

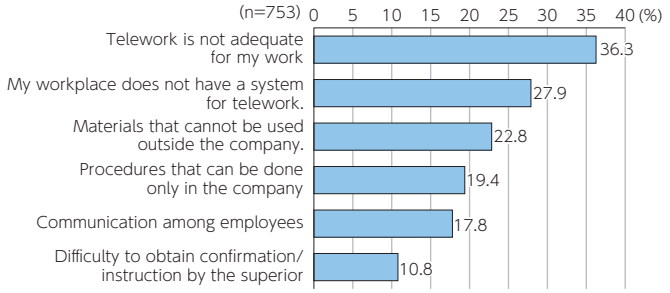
Respondents with and without experience of telework were asked about challenges and barriers for telework (Figure 2-3-4-5).

Most cited challenges and barriers were: "Telework is not adequate for my work"; "My workplace does not have a system for telework"; "Materials that cannot be used outside the company"; "Procedures that can be done only in the company"; "Communication among employees", and "Difficulty to obtain confirmation/instruction by the superior", in this order.

(2) Changes in Work Procedure (Expansion of Use of Communication Tools)

Because the increase in telework made the conventional face-to-face meeting difficult, use of communication tools to implement teleconference has diffused, for example.

Figure 2-3-4-5 Challenges/Barriers for Telework (upper ranking choices)



(Source) MIC (2021) "Research on actual state of digital technology utilization during the COVID19 pandemic and changes in user awareness"

Section 4 Challenges Surfaced through Utilization of Digital Technologies Under the COVID-19 Pandemic

Digitalization rapidly advanced throughout the entire society under the COVID-19 pandemic. In this process, formation of a digital society surfaced challenges in various aspects. Most of the issues had existed also in the past but surfaced or worsened through utilization of digital technologies throughout the entire society under the COVID-19 pandemic. Solution of these issues is increasingly important because otherwise more people would become negative about the digitalization they experienced under the COVID-19 pandemic and digitalization would not continue.

1. Response to Security Risk

In response to the COVID-19 pandemic, digitalization advanced also in the fields where utilization had been insufficient (e.g., telework and online classes).

(1) Security Damage

Because telework is not always limited to certain employees but can become a common business/working form which includes web conferences, security damages are increasing. For example, there are incidents of unauthorized accesses exploiting vulnerability of the VPN equipment that is often used during telework to connect to the enterprise system from outside of the office.

Security problems that were found in online education include: more than 100,000 students could not receive online lessons due to a ransomware attack; inappropriate images were shared during a new school term guidance due to an attack exploiting a vulnerability of the video conference application and; improper sharing of personal information by teachers.

(2) Importance of Security Measures

In order to prevent these security damages, it is important to take basic security measures that include always applying the latest security update and setting difficult passwords that cannot be easily guessed by a third person.

2. Need for Literacy Improvement

Toward a digital society, there are applications that can be used not only for smartphones, tablets and other terminals but also for various purposes including web conferences. These diversifying ICT tools require different manners of use and necessary security measures. It is important for users to master their basic operating method.

3. Handling of Digital Data

(1) Handling of Personal Data

In order to address the global threat to health under the COVID-19 pandemic, countries around the world collected and analyzed data including citizens' action/contact history through smartphones, which enabled preventive actions and alerts against further spread of the infection. However, discussions on acquisition of position information and action history of users exposed the issue of balancing public welfare and individuals' rights including privacy in use of personal data.

Utilization of these data is useful in emergencies such as the COVID-19 pandemic but also would significantly improve convenience of life in normal periods. Therefore, it is necessary to consider balancing these benefits with the protection of privacy and personal information, which will require considerable discussion.

(2) Data Collection by the Government and Utilization of Open Data

In order to prevent the spread of the COVID-19 infection, the central and local governments of Japan in cooperation with private enterprises have been using statisti-

cal data to grasp the flow of people in individual regions. It is important to define rules and conditions when the government asks private enterprises to provide data.

Regarding open data, it may be necessary to set up common specifications for cross-cutting use and ensure disclosure in highly machine-readable data format.

4. Enhancement of Communication Infrastructure

Because data circulation increases in a digital society, it is important to enhance the communication infrastructure that supports the circulation. According to a report of the MIC[12], Internet traffic rapidly increased by about 60% per year under the "stay at home"[13] phenomenon. Nevertheless, the quality of Internet service was maintained thanks to the design to ensure sufficient capacity for peak-time traffic and sufficient equipment investment toward the Tokyo 2020 Olympic and Paralympic Games.

However, because an increase in large-volume communication including video transmission is expected as a result of the spread of telework and online education toward formation of a digital society, efforts including further infrastructure enhancement to handle increased Internet traffic in a digital society and reduction of burden on Internet traffic will increase in importance.

5. Correction of Disparities due to Geographical Conditions, etc. and Securing of Accessibility

There are differences in actual use of digital technologies by region, age and other factors. Possible reasons may include regional differences in telecommunication infrastructure that is the foundation of utilization of digital technologies and differences in the possession of necessary terminals due to economic situations.

In order to ensure that everyone can enjoy benefits of digital technologies not only in emergencies like the COVID-19 pandemic but also in normal periods, it is important to correct disparities due to geographical conditions, etc. through nationwide development of telecommunication infrastructure including 5G and optical fiber.

There is also an opinion that difficult operation and complicated procedures for use of digital services are barriers to digitalization. It is an important challenge for service providers to ensure access to ICT equipment and services by everyone through provision of user-friendly services with consideration of UI/UX and age, disabilities, language and other differences.

6. Reviewing Operations/Customs on the Premise of Digitalization

Procedures assuming sealing and paper documents are pointed out as obstacles unique to Japan for introduction of telework and one of the factors preventing telework in government offices, in particular. Among private enterprises, there are also cases where telework is not possible due to need for attendance for preparation of contract documents, etc.

Under the prolonged influence of the COVID-19 infection, in order to maintain socio-economic activities while at the same time preventing the spread of infection, it is necessary to establish new ways of operation and service provision on the premise of digitalization. For this purpose, we need to review our customs and promptly move into a new lifestyle.

[12] MIC (2021) "Report of the Internet Traffic Study Group"

[13] According to MIC "Aggregation and provisional calculation of Internet traffic in Japan," the aggregation in May 2020 increased 57.4% from the same month the year before.