Introduction

This is the 50th edition of the White Paper on Information and Communications in Japan, which has been published by the Ministry of Internal Affairs and Communications (MIC) annually since 1973. The White Paper's objective is to introduce the current state of information and communications in Japan and related policy trends.

The White Paper consists of two parts. The first part, under the special topic of "50 years since the publication of the first Information and Communications White Paper – changes in ICT and digital economy," looks back at changes in systems, services and technologies in the ICT field over the past 50 years, and analyses the role that ICT will play in Japanese society in the future. The second part describes the current status and challenges surrounding ICT. This part consists of Chapter 3 with statistical information on domestic and overseas market trends surrounding ICT, and Chapter 4 with a summary of the status of ICT policy at MIC.

The data of this White Paper can be downloaded from the following page of the MIC website.
https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/2022-index.html

Past white papers can be downloaded from the following pages.
https://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/whitepaper/index.html

Legend

- "Year" refers to a calendar year from January to December, while "fiscal year" refers to a "budget year" from April to March of the following year.
- "Inc.," "CO., Ltd." etc. are omitted from the name of enterprises in principle.
- The following symbols are used for supplementary units:

  10 hundred quintillion (10^{21}) fold …Z (Zetta)
  1000 quadrillion (10^{18}) fold …E (exa)
  1,000 trillion (10^{15}) fold …P (peta)
  1 trillion (10^{12}) fold …T (tera)
  1 billion (10^{9}) fold …G (giga)
  1 million (10^{6}) fold …M (mega)
  1,000 (10^{3}) fold …k (kilo)
  One tenth (10^{-1}) fold …d (deci)
  One hundredth (10^{-2}) fold …c (centi)
  One thousandth (10^{-3}) fold …m (milli)
  One millionth (10^{-6}) fold …µ (micro)
- Units are rounded up to the nearest whole number in principle. The total of the breakdown and the value of the total column may not agree due to rounding.
- Total of composition ratios (%) may not be 100 due to unit rounding.
- Maps in these materials do not show the entire territory of the country.
- Figures, etc., without attribution are MIC materials.

Overview of the 2022 White Paper on Information and Communications in Japan

Part 1 Special Topic (50 years since the publication of the first Information and Communications White Paper – changes in ICT and digital economy)

Part 1 overviews the evolution of ICT services/technologies and changes in the international situation surrounding ICT in the 50 years since the publication of the first white paper, and looks over the current state and challenges facing Japan in the ICT field, as well as future prospects.

Introduction Changes in the Environment from the Time of the Publication of the First White Paper up to Now

- **Diversification and sophistication** of ICT service and utilization

Chapter 1 Review of Changes over the Past 50 Years in Chronological Order

- This chapter divides the 50 years since the first White Paper publication into five periods from the point of views such as ICT advancement, service diversification, and **summarizes changes in the systems, services, technologies, etc.** in each period.
  1. Around 1973 to 1985: **Age of Analog Communications and Broadcasting**
  2. Around 1985 to 1995: **Development of Communications and Broadcasting Markets and Appearance of New Services**
  3. Around 1995 to 2005: **Spread of Internet and Mobile Phones**
  4. Around 2005 to 2015: **Expanding Broadband and Mobile Phone Usage**
  5. From 2015: **ICT as Social and Economic Infrastructure**

Chapter 2 Future Prospects of Japanese Society

- While **taking a view of the future roles of ICT** in Japan with various social challenges, this chapter takes an **overview of responses to the challenges that have been appearing with the development of ICT into social and economic infrastructure**.

Part 2 Current Status and Challenges for Information and Communications

Part 2 overviews market trends in the information and communications field and the current status of digital technology utilization, and summarizes the current status, challenges and future directions of information and communications policy.

Chapter 3 Trends in the ICT Market

- Analysis of <u>**the overall status of Japan's ICT industry**</u> (e.g., GDP of the information and communications industry, investments in computerization by private companies and imports/exports of ICT goods/services)
- Analysis of the current status of **each ICT sector (e.g., telecommunication, usage status of radio waves, equipment/terminal-related businesses)**
- Analysis of the current status of <u>**digital technology utilization**</u> in Japan and abroad

Chapter 4 Status of ICT Policy at MIC

- Summary of <u>**cross-departmental initiatives**</u> (e.g., "Promotion Headquarters of the Vision for a Digital Garden City Nation, MIC", "Desirable information and communications policies toward 2030") and <u>**the policies implemented by MIC and future directions**</u> in <u>each policy area</u> (e.g., telecommunication, radio, broadcasting policies)

Key Points of the 2022 White Paper on Information and Communications in Japan

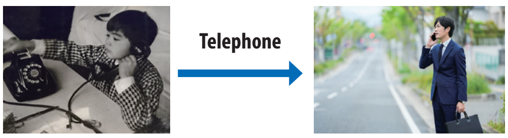
Part 1 Special Topic (50 years since the publication of the first Information and Communications White Paper – changes in ICT and digital economy)

Introduction Changes in the Environment from the Time of the Publication of the First White Paper up to Now

(1) Advancement of ICT and Diversification of Services

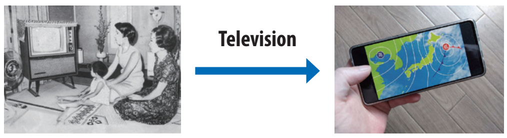
- In 1973, the major communication tool was **subscription telephones**.
  Today, the major communication tool is **mobile phones**. Diverse communication tools and services using ICT, including **e-mail and social media (SNS),** have also become widely spread.
- Regarding videos, in 1973 people **viewed analog terrestrial broadcasting on television**.
  Today we can view **satellite broadcasting and CATV broadcasting** and enjoy super-high picture quality **4K/8K** videos thanks to the advancement of imaging technologies. We can also enjoy **internet video distribution services in mobile terminals**.

[Telephone]



(Source) cocolog "a child making a call in the 1970s", Photo AC

[Video viewing]



(Source) Kamijima Digital Archive, InfoCom Research, Inc.

(2) Penetration of ICT Use in Social and Economic Activities

- In 1973, enterprises processed information mainly by using **general-purpose computers (mainframes)** constructed within their premises.
  Today, enterprises can share data and expand functionality without constructing internal information systems, thanks to **the development and spread of cloud technologies.**
- **ICT utilization has permeated across various fields** including disaster prevention/mitigation and medical care.
  a) **Disaster prevention/mitigation:** Remotely confirming damage at sites by using sensors and drones
  b) **Medical care:** Sending cardiogram data from ambulances to a cloud server so that doctors can view the cardiogram before the patient arrives at the hospital.
  c) **Education:** Spreading use of personal computers and tablets in classrooms based on the GIGA School concept
  d) **Agriculture:** Smart agriculture through growth management using information from various sensors and pesticide spraying using drones.

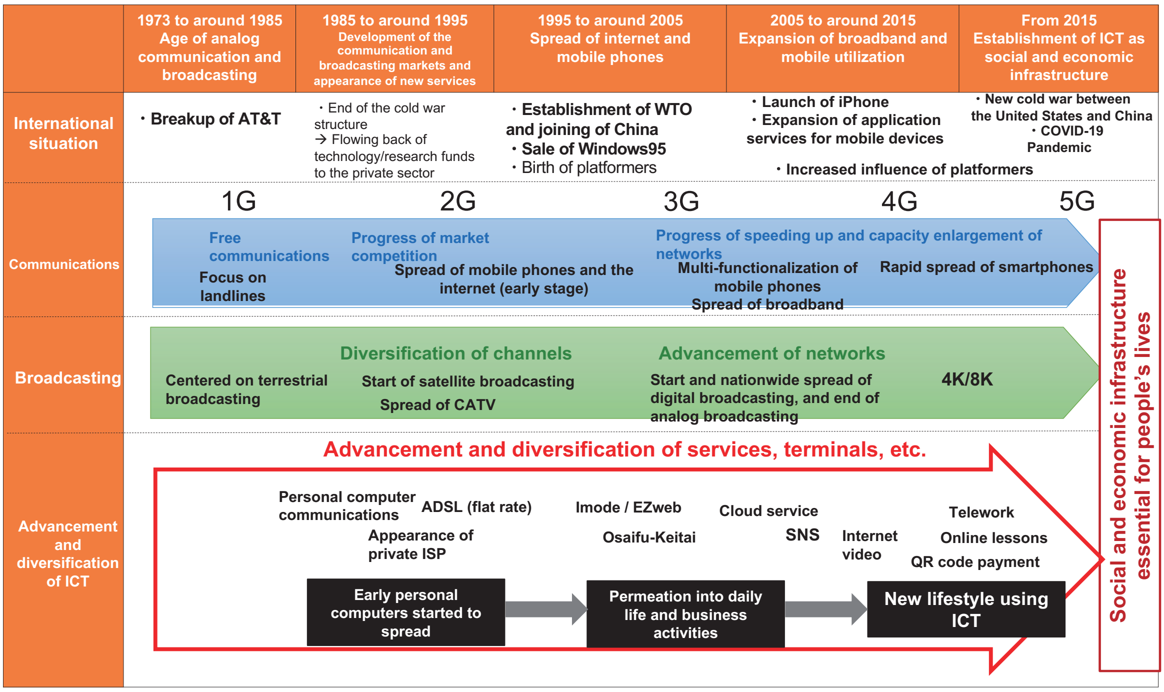
Medical care

Education

Agriculture

(Source) Chiba City Fire Bureau, Niigata City Konan Elementary School, Photo AC

Chapter 1 Review of Changes over the Past 50 Years in Chronological Order

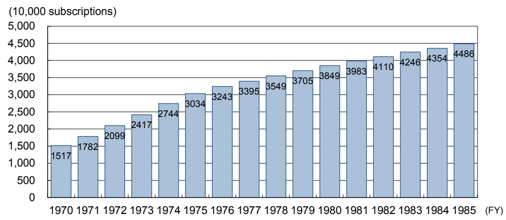


(Source) MIC (2022) "Research Study on Economic Security in Digital Society"

(1) Around 1973 to 1985: Age of Analog Communications and Broadcasting

- In 1973 when the first White Paper was published, the number of subscribers with subscription telephones was 24.17 million. **The waiting list for subscription applicants was eliminated** in 1978, **nationwide automation was completed** in 1979 and the number of subscribers with subscription telephones exceeded 40 million.
- In 1985, **Nippon Telegraph and Telephone Public Corporation was privatized,** and Nippon Telegraph and Telephone Company (NTT) was established. **Competition was introduced to the communications market.**
- In the broadcasting market, **television broadcasting spread widely** and became an indispensable part of people's daily life.

Transitions in the number of subscribers with subscription telephones

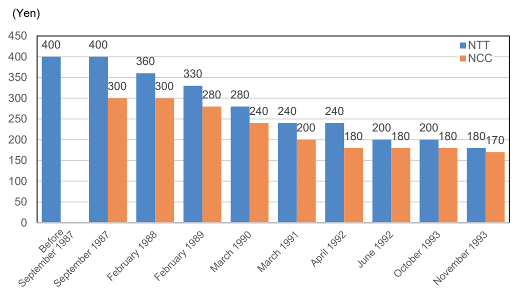


(Source) Prepared from History of the Nippon Telegraph and Telephone Public Corporation

(2) Around 1985 to 1995: Development of Communications and Broadcasting Markets and Appearance of New Services

- New entries **reduced service prices**, especially for **long distance calls**.
- **Competition gradually promoted** in the mobile communication market as well. The size of mobile phones became smaller and **digital services (2G)** started in 1993.
- **Rapid spread of communications through personal computers** connected to carrier computers via telephone lines or ISDN.
- **BS and CS broadcasting started** to diversify services in the broadcasting market as well.

Transitions in charges for the longest distance telephone calls

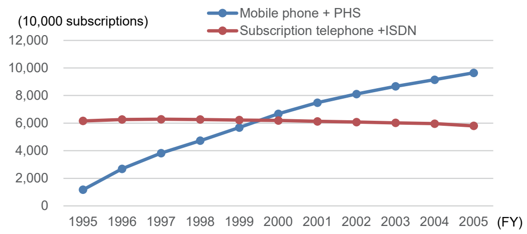


(Source) Prepared from NTT (1996) "10 years of NTT from 1985 to 1995: an overview of its history"

(3) Around 1995 to 2005: Spread of Internet and Mobile Phones

- **Internet rapidly spread** to households and enabled viewing of photographs and other images. **New businesses** (e.g., EC malls, portal sites) **using the internet** expanded.
- Lower rates and other factors promoted the spread of **mobile phones** and **the number of the mobile telephone service subscribers exceeded the number of fixed telephone subscribers** in 2000.
- With the expansion of **the negative aspects of the internet,** including the spread of illegal/harmful information, various **rules related to the internet established**.
- **Digitalization of broadcasting media progressed.** Terrestrial digital broadcasting started in 2003.

Number of subscribers of communication services

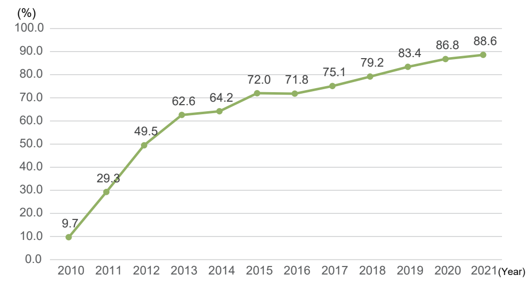


(Source) MIC "Information & Communications Statistics Database"

(4) Around 2005 to 2015: Expansion of Broadband and Mobile Phone Utilization

- With the advances in the **speed and bandwidths of fixed and mobile network infrastructures**, the number of subscribers to **FTTH and LTE** rapidly increased.
- With the launch of iPhone in 2008, **smartphones** rapidly spread. **Diverse application services** including social media, maps and search engines **expanded the use of mobile terminals**.
- With the advancement of network infrastructures and technologies including sensors, **IoT connecting everything to networks** progressed.
- In order to deal with **troubles associated with the spread of the use of the internet and mobile phones among juveniles**, relevant laws were developed, filtering services were provided and enlightenment activities started.
- In 2012 **terrestrial analog broadcasting ended** in all 47 prefectures and **the shift to digital broadcasting was completed**.

Changes in the ratio of households with smartphones



(Source) Prepared from MIC "Communications Usage Trend Survey"

(5) From 2015: Establishment of ICT as Social and Economic Infrastructure

- **Network infrastructure has advanced further. 5G service** started in March 2020. **"Local 5G"** system available for various entities was established, and demonstration experiments were implemented to **promote 5G utilization in various fields** including medical care and manufacturing (factories).
  Technological strategies toward **6G/Beyond 5G** are under consideration.
- **Internet video distribution services** have prevailed.
  Broadcasters provide rerun TV program and **real-time program distribution services**.
- With the spread of COVID19, telework, online learning, online diagnosis and other **ICT utilization that enables noncontact/non-face-to-face lifestyles have further progressed**. ICT has become **key infrastructure** supporting all social and economic activities.
- **Market power of global platformers** has further increased exposing the issue of **data oligopoly and handling**.

Chapter 2 Future Prospects of Japanese Society

(1) Prospects of ICT's Role in Future Japanese Society

1. Improvement of labor productivity and expansion of participation in the labor market through ICT
- While **labor shortages are expected due to the shrinkage of the working-age population**, it would be possible to **increase work productivity by** speeding up and improving the accuracy of operations and **further improve efficiency of production and distribution processes** by taking advantage of AI and big data analysis.
- Workers will be able to choose **diverse and flexible working styles** thanks to telework, etc., which will contribute to an **improvement in the labor force participation rate**.

2. Regional revitalization through ICT
- **While local economies are expected to shrink**, the trading area of local enterprises would expand as usage of ICT expands markets without limits on time and location.
- **Working styles not limited by geographical conditions** and use of online medical, education and other services would **contribute to the expansion of local resident populations**.

3. Prompt and efficient information collection and communication using ICT
- In order to cope with **increasingly fierce and frequent disasters, use of ICT including a wide variety of sensors and drones** would enable prompt and accurate **collection of disaster-related information** and provision of **evacuation information,** which would **contribute to disaster prevention/mitigation**.

4. Maintenance and management of social infrastructure using ICT
- Amid the rapid **aging of social infrastructure**, use of ICT would contribute to the **long life of social capital** and **reduction/leveling of total infrastructure costs** including maintenance and renewal.

5. Contribution to Green Society
- As **aggravation of global warming** is expected, **greening ICT itself (green of ICT) and greening by ICT would realize a green society.**

(2) Responses to Already Apparent Challenges

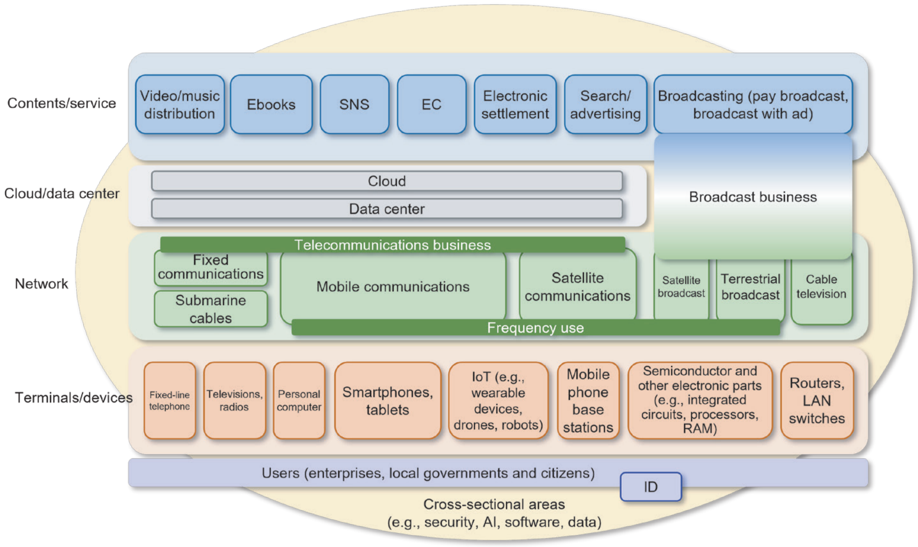
1. Response to risks involved in changes in the international environment
- ICT has become **one of the most critical infrastructures** supporting every socio-economic activity. With increasingly complicated international situations, the **strengthening of communication networks and the supply chain of ICT-related equipment/components** is an important task.
- In May 2022, the **"Economic Security Promotion Act" was enacted**. Key features of the Act include the establishment of (i) a system to ensure stable supplies of critical materials, (ii) a system to ensure the stable provision of services using critical infrastructure, (iii) a system that supports the development of critical technologies and (iv) a secret patent system.
- In June 2022, MIC formulated **a new technology strategy to accelerate the research and development** of cutting-edge technologies that will lead the world **by concentrating state investment** on them. In addition, the ministry formulated a **comprehensive strategy** in order to **ensure strategic independence and essentiality of the information communications industry** which is increasing in importance as a strategic core industry.

2. Data governance
- While the economic value of data is increasing, concerns are growing about the concentration of data among global platforms and about the handling of data.
- In June 2021, the cabinet approved the **"Comprehensive Data Strategy**" toward the **proper use of data**.
- In June 2022, **the revised Telecommunications Business Act** was enacted to require telecommunication carriers with a significant impact on the interests of users to formulate and provide notification on rules for the handling of user information they would collect.

3. Responses to illegal/harmful information
- The spread of social media, video distribution and other ICT services has increased concerns about the spread of illegal/harmful information and misinformation, including slander, libel and contents infringing intellectual property rights.
- The government has taken institutional measures, including a **revision of the Provider Liability Limitation Act,** to establish a new judicial system (non-contentious procedure) regarding sender information disclosure.
- Diverse stakeholders in the private sector are also promoting various initiatives including **enhancing the ICT literacy of users, and establishing consultation offices and fact checkers.**

Part 2 Current Status and Challenges for Information and Communications

Chapter 3 Trends in the ICT Market



(Source) MIC

(1) Trends in Japan's ICT Industry

Gross Domestic Product (GDP) of the ICT industry

- **The nominal GDP** of the ICT industry **fell** in 2020 **by 2.5 percent** year-on-year **to 51.0 trillion yen**.

IT investment

- In 2020, **investment in computerization** by private companies was **15.2 trillion yen (0.4 % decrease year-on-year)** in terms of 2015 prices. **The percentage of computerization investment** in capital investment by private companies was **17.8 (increase of 1.1 percent points year-on-year)**.
- In a breakdown of computerization investment, **software (entrusted development and package software)** accounted for about 60% at **8.9 trillion yen**.

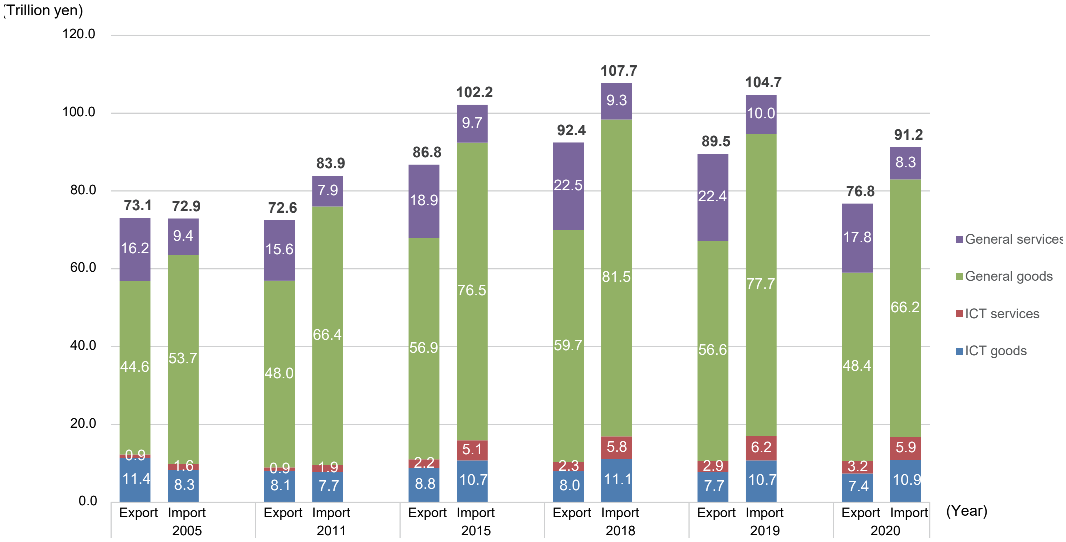
Exports and imports in the ICT field

- In 2020**, exports** of ICT goods/services (nominal) was **10.6 trillion yen (13.7% of all exports),** while **imports** (nominal) was **16.8 trillion yen (18.4% of all imports)**.
- Import surplus of ICT goods was 3.5 trillion yen (16.6% increase year-on-year) and import surplus of ICT services was 2.7 trillion yen (20.0% decrease year-on-year). The **increase of the import surplus is significant for ICT goods**.

Trend of ICT R&D

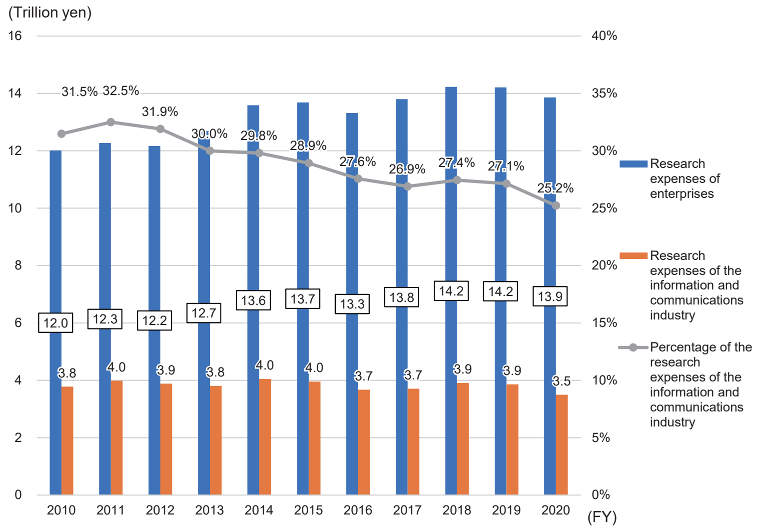
- In fiscal 2020, **research expenses of the ICT industry were 3.497 trillion yen (25.2% of research expenses of all industries)**. These expenses have been declining or flat in recent years.
- **The number of researchers in the ICT industry was 167,283 (32.5% of all industries)** in fiscal 2020. The number has remained almost unchanged in recent years.

Changes in exports/imports of goods/services



(Source) MIC annual "Input-Output Table of the Information Communications Industry"

Changes in research expenses of enterprises



(Source) MIC, annual "Survey of Science and Technology Research"Communications Industry"

(2) Trends in the Telecommunication Sector

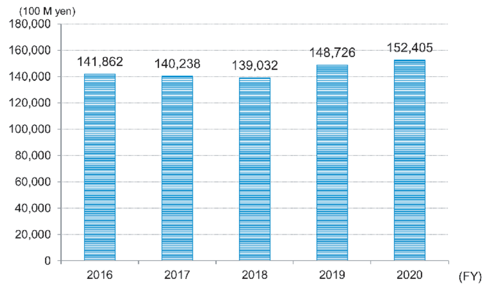
Trends of the domestic and overseas communications markets

- In regard to RAN (Radio Access Network) of carriers, there is progress in the reform of network equipment composition including **OpenRAN** that realizes multiple vendors and **vRAN that realizes virtualization**.
- In Japan mobile phone operators have led progress in initiatives for the construction of **NTN (Non-Terrestrial Network).**

Current status of telecommunications in Japan

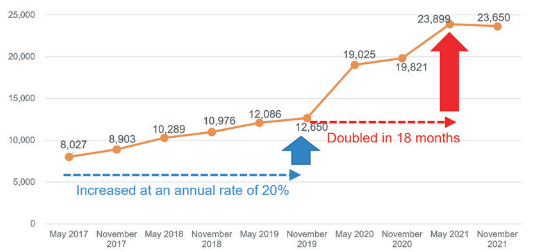
- In fiscal 2020 **sales in the telecommunication sector** continued to grow to **15.2405 trillion yen (2.5% increase year-on-year)**.
- **The Development rate of optical fiber** (household coverage) was **99.3**% at the end of fiscal 2021.
- The download **traffic** of fixed-line broadband **increased rapidly** after the appearance of COVID-19.
- At the end of fiscal 2021, the number of fixed-line broadband subscriptions reached 43.83 million (2.7% increase from the previous fiscal year) and the number of ultrafast broadband mobile subscriptions fell to 139.05 million (9.9% decrease) for 3.9/4th generation mobile phones (LTE), while increasing to 45.02 million (compared to 30.83 million the year before) for 5th generation mobile phones and 79.71 million (5.3% increase) for BWA.
- In recent years, while **the number of fixed communication subscriptions has been declining**, the number of subscriptions with mobile communication and 0ABJ IP telephones has been steadily increasing. **The number of mobile communication subscriptions was about 12.8 times the number of fixed communication subscriptions** in fiscal 2021.
- Smartphone bills in Tokyo (new 4G contracts with a top MNO share operator) are at a medium level for plans with a monthly data volume of 2GB and 5GB, and at a low level for plans with 20GB.
- **The number of complaints/requests for consultation** sent to MIC increased to **18,331** in fiscal 2021 from the previous year. **The number of consultations provided at the Illegal Harmful Hotline** operated by MIC was **also increasing**: the number increased about fivefold for the period from fiscal 2010 to 2021.

Changes in telecommunications sector sales



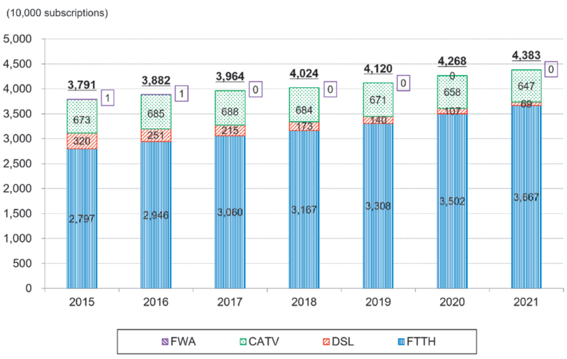
(Source) Prepared from MIC / METI "Basic Survey on the Information and Communications Industry"

Changes in internet traffic

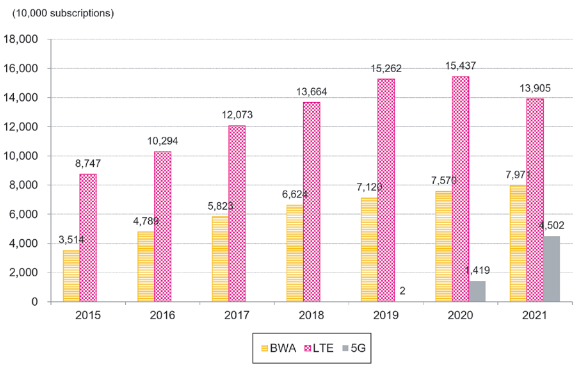


(Source) MIC (2022), "Aggregate results of Internet traffic in Japan (in November 2021)"

Changes in the number of fixed-line broadband subscriptions



Changes in the number of mobile ultra-high-speed broadband subscriptions



(Source) MIC, "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"

Example of new technology development

- **IOWN (InnovativeOpticalandWirelessNetwork) Concept**

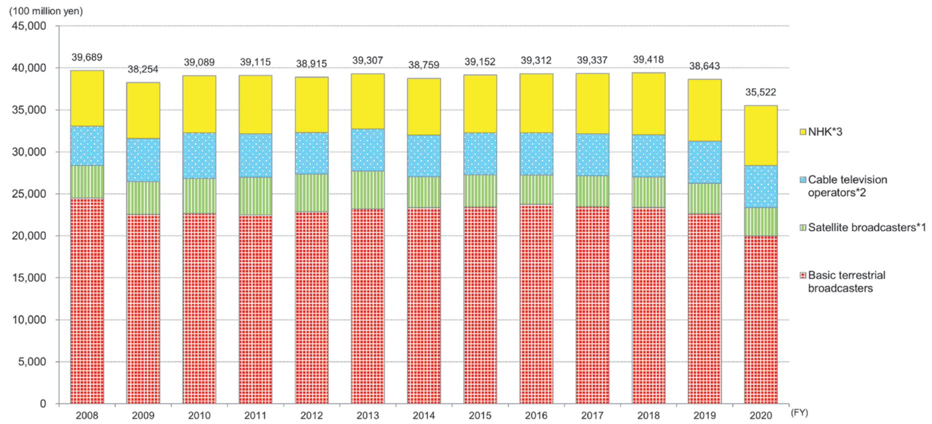
  An initiative led by NTT toward **technical innovation to introduce optical technologies to all** networks, computing and **semiconductors**.

(3) Trends in the Broadcasting and Content Sectors

Broadcasting

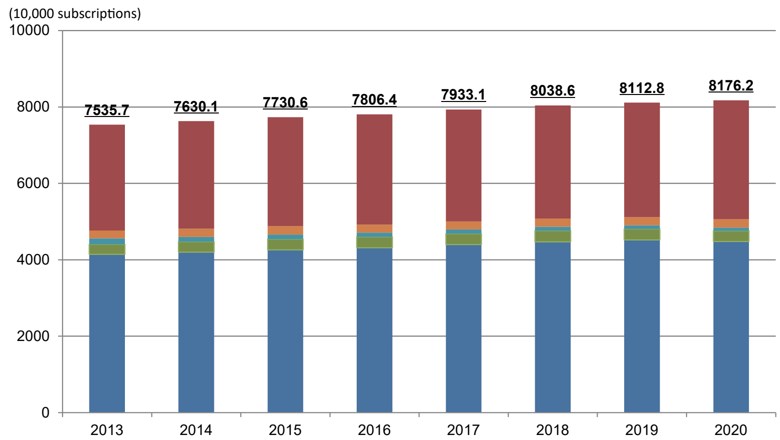
- In fiscal 2020, total sales of all broadcasters fell to **3.5522 trillion yen (8.1% decrease year-on-year)**.
- As of the end of fiscal 2021, **127 private terrestrial television broadcasters (nationwide operation)** (31 of them operate additional broadcasts), **22 BS broadcasters, 20 110 degrees east longitude CS broadcasters and four general satellite broadcasters** were in operation.
- At the end of fiscal 2020, **the number of cable TV broadcasters was 464.**
- At the end of fiscal 2021, **the number of domestic NHK broadcasting channels** was 9: **two channels for terrestrial television broadcasting**; three channels for radio broadcasting; and four channels for satellite television broadcasting.
- In fiscal 2020, **the number of subscribers** with broadcasting services was **81.762 million**. Among them, **subscribers with 110 degrees east longitude CS and cable television broadcasting increased from the previous year, whereas subscribers with other broadcasting services decreased**.
- In fiscal 2020, **the number of off-the-air accidents was 384, of which 24** (about 6%) were **serious**.

Changes in and breakdown of the size of the broadcasting sector market (total sales)



(Source) Prepared from MIC "Income and Expenditure of Private Broadcasters "of each fiscal year and NHK financial statements for each fiscal year

Number of subscribers with broadcasting services

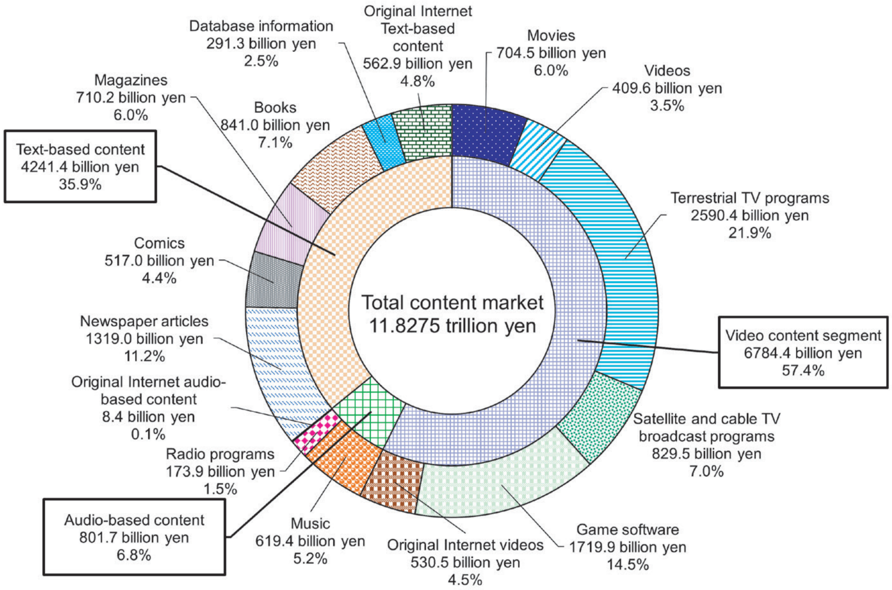


(Source) Prepared from materials of the Japan Electronics and Information Technology Industries Association, the Japan Cable Laboratories, NHK and MIC "Current State of Satellite Broadcasting" and "Current State of Cable TV"

Content Market

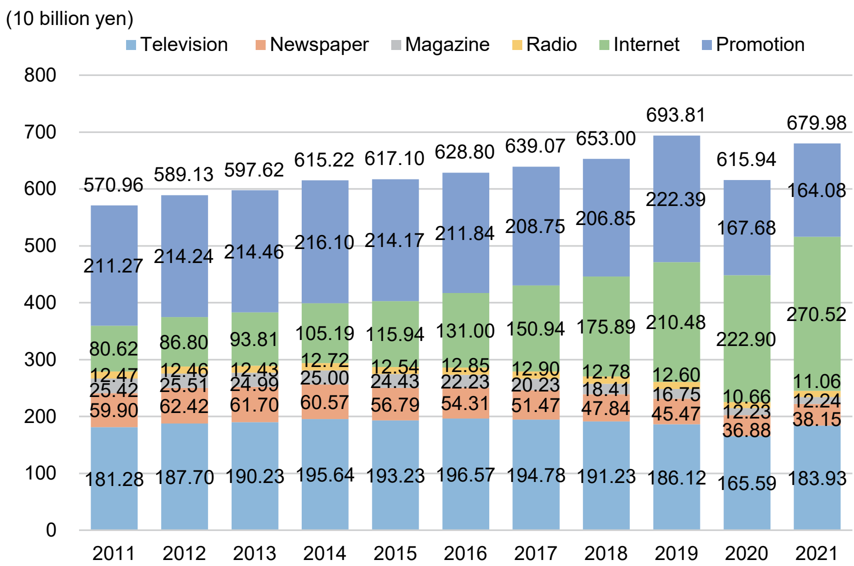
- The Japanese **content market** was valued at **11.8257 trillion yen** in 2020. By content segment, **video content accounted for nearly 60 percent** of the market.
- **Digital advertisements** led the entire **advertising market of the world** and grew to **39.0396 trillion yen (32.7% increase year-on-year)** in 2021. In Japan, **internet advertisements (2.7052 trillion yen)** exceeded **the advertisements of the four biggest mass media companies (2.4538 trillion billion yen)** for the first time in 2021.

Breakdown of Japan's content market (2020)



(Source) Institute for Information and Communications Policy, MIC "Survey on the Production and Distribution of Media Content"

Changes in advertising expenditures by media in Japan

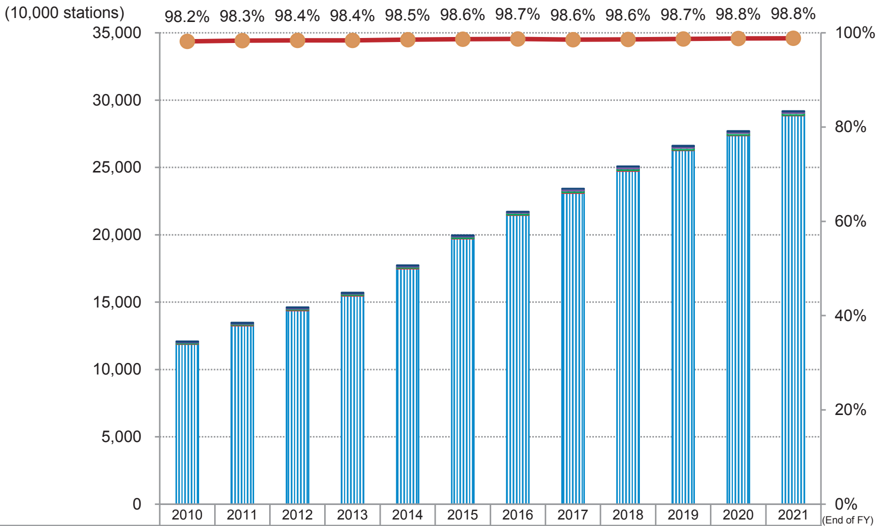


(Source) Prepared from Dentsu, "Advertisement Expenses in Japan (annual)"

(4) Trends of Radio Spectrum Use in Japan

- **The number of radio stations** at the end of fiscal 2021 was 291.98 million, an **increase by 5.4% from the previous year**, including 288.59 million mobile phones and other land mobile stations (increase by 5.2% from the previous year).
- In fiscal 2020, **there were 2,039 reports of radio interference or obstructions (increase by 8.1% from the previous year)**.

Changes in the number of radio stations



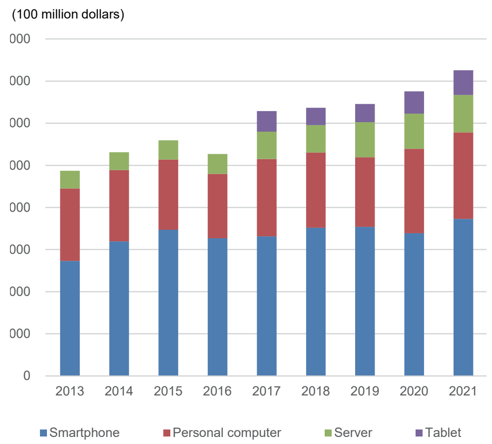
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Other	46	43	46	50	50	55	49	49	55	59	61	51
Base stations	54	58	63	68	71	70	73	125	132	117	95	108
Convenience stations*2	74	77	84	90	97	105	112	118	125	132	137	142
Amateur stations	45	44	44	44	44	44	43	43	41	40	39	38
Land mobile stations*1	11,879	13,266	14,388	15,472	17,493	19,711	21,457	23,109	24,748	26,278	27,379	28,859
Percentage of land mobile stations	98.2%	98.3%	98.4%	98.4%	98.5%	98.6%	98.7%	98.6%	98.6%	98.7%	98.8%	98.8%

(5) Trends Related to Equipment and Terminals

Trends in the Information Terminals Market

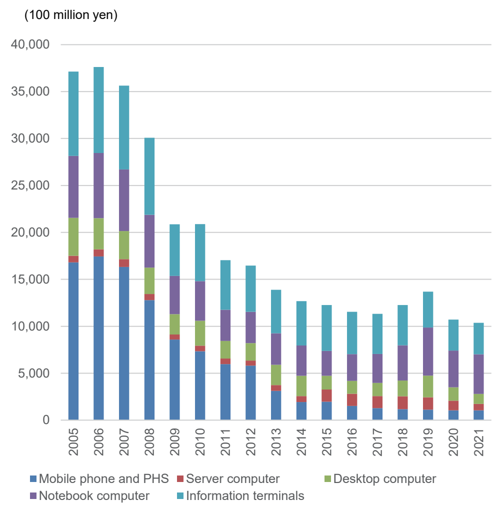
- **World shipments of information terminals** reached 79.6625 trillion yen **(10.4% increase year-on-year)** in 2021.
- **Japan's production of information terminals fell to** 1.0370 trillion yen **(3.2% decrease year-on-year)** in 2021.

Changes in shipment of information terminals in the world



(Source) Omdia

Changes in Japan's production of information terminals

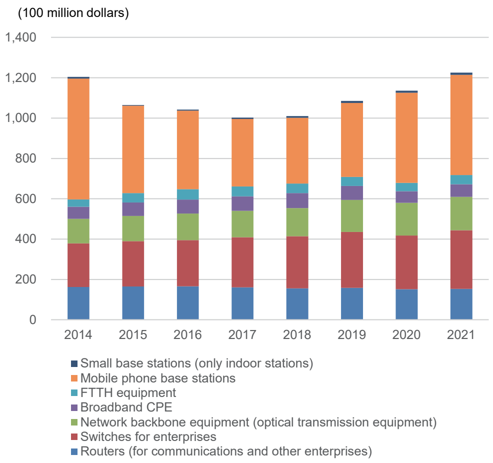


(Source) METI "Current Survey of Production – Machinery"

Trends in the network equipment market

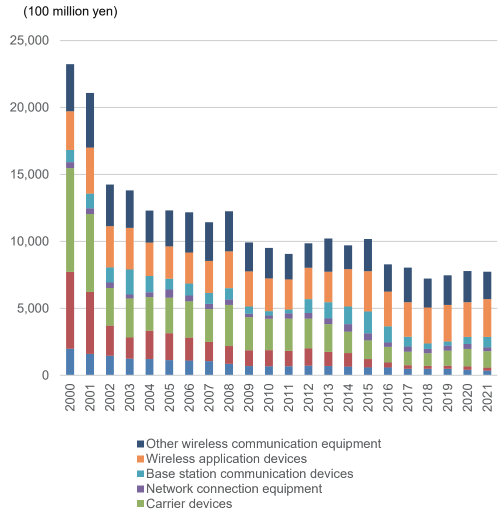
- **World shipments of network equipment** reached 13.4520 trillion yen (**10.9% increase year-on-year)** in 2021. Mobile phone base stations and switches for enterprises accounted for a major part of this.
- **Japan's production of network equipment** slightly decreased to 774.3 billion yen (**0.5% decrease year-on-year**) in 2021. A major segment of this was wireless application devices and other wireless communication equipment.

Changes in the global shipments of network equipment



(Source) Omdia

Changes in Japan's production of network equipment

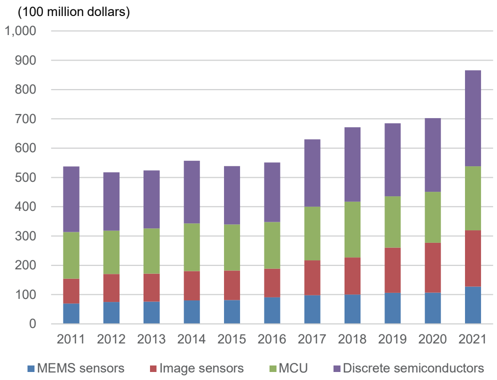


(Source) METI "Current Survey of Production – Machinery"

Trends in the semiconductor market

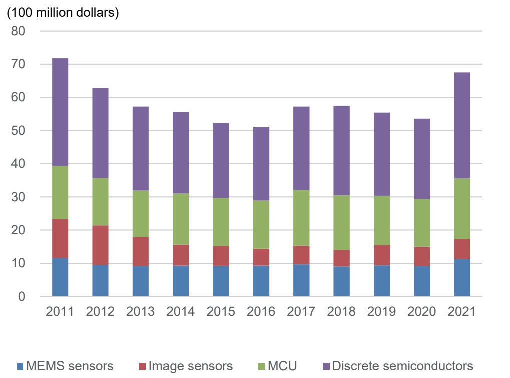
- The global shipment of semiconductors was **9.4999 trillion yen (26.7% increase year-on-year)** in 2021. Discrete semiconductors accounted for the largest part of these shipments, while **image sensors have grown greatly in recent years**.
- Japan's production of semiconductors increased to **741.2 billion yen (29.6% increase year-on-year**) in 2021. **Discrete semiconductors accounted for the largest part of this production (a little less than half)**.

Changes in global semiconductor shipments



(Source) Omdia

Changes in Japan's semiconductor shipments

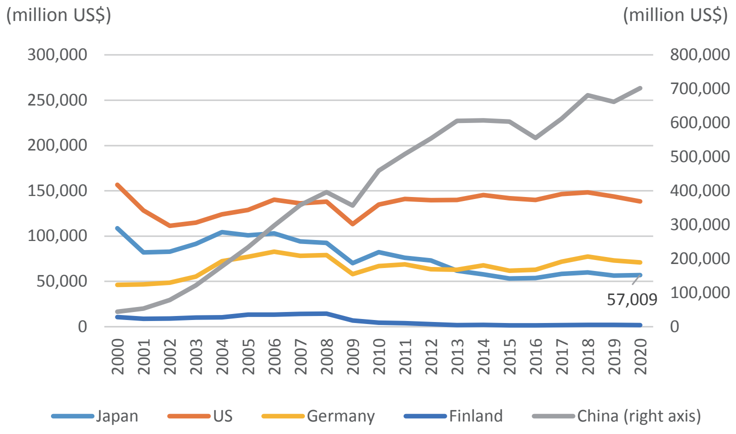


(Source) Omdia

Changes in exports/imports of ICT equipment of Japan

- In 2020, Japan's exports of ICT equipment fell slightly to 6.0871 trillion yen (1.1% decrease year-on-year), while imports fell slightly to 9.5804 trillion yen (0.5% decrease year-on-year), resulting in a **3.4932 trillion yen import surplus "0.5% increase year-on-year**). The excess of imports over exports of the United States was 22.3201 trillion yen (8.8% increase year-on-year), while the excess of exports over imports of China was 19.8044 trillion yen (7.8% decrease year-on-year).

Changes in ICT equipment exports of various countries

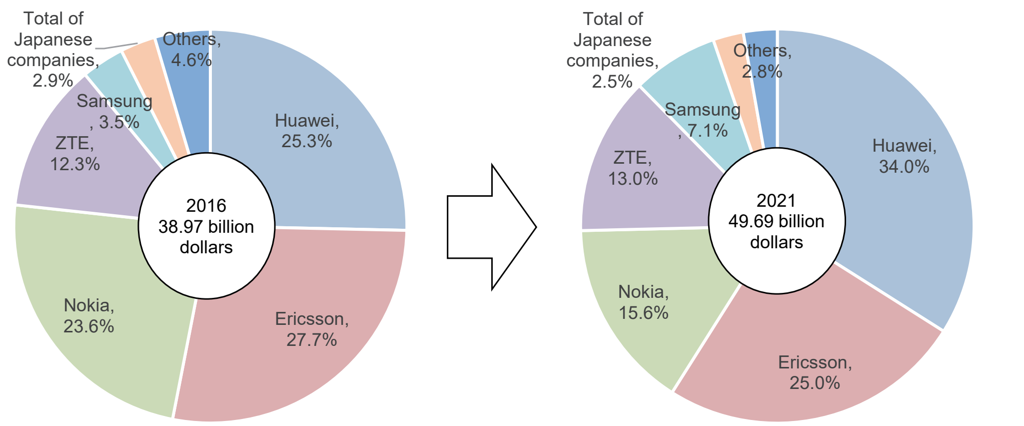


(Source) UNCTAD, "UNCTAD STAT"

Global and Japanese market share by business operator

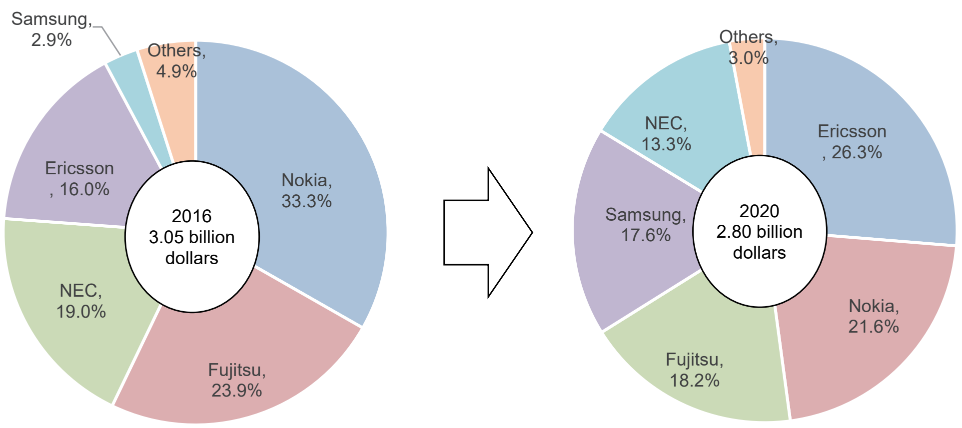
- In the 2021 **global market, Huawei** (34.0%) **had the top share in macro cell base stations and Cisco (64.6%) had the top share in and routers for enterprises** (in value of shipments). **Samsung** had the top **smartphone market** share (20.3%: number of sales) ,followed by Apple (17.5%).
- In the 2021 **Japanese market, Ericsson** (26.3%) had the top share in **macro cell base stations** and **Cisco** (28.8%) had the top share in **routers for enterprises** (in value of shipments). **Apple had the top smartphone market** share (67.4%: number of sales) followed by Samsung (9.4%).

Macro cell base station share in the global market (2021)



(Source) Omdia

Macro cell base station share in the Japanese market (2020)



(Source) Omdia

(6) Trends of Services and Applications

Platform trends

- In terms of market capitalization of the major players of the global ICT market, GAFAM took the top positions. In comparison with the 2020 sales of the biggest platforms, Amazon's sales were the largest (41 trillion 221.4 billion yen), increasing 5.2 fold from its sales in 2013.

Changes in the top 15 companies in terms of market capitalization in the global ICT market

2017

Company name	Major business	Country	Market capitalization (100 million dollars)
Apple	Hardware, software, services	US	8,010
Alphabet/Google	Search engine	US	6,800
Amazon.com	e-commerce	US	4,760
Facebook	SNS	US	4,410
Tencent	SNS	China	3,350
Alibaba	e-commerce	China	3,140
Priceline Group	Online booking	US	920
Uber	Mobility	US	700
Netflix	Media	US	700
Baidu China	Search engine	China	660
Salesforce	Cloud service	US	650
Paypal	Payment	US	610
Ant Financial	Payment	China	600
JD.com	e-commerce	China	580
Didi Kuaidi	Mobility	China	500

2022

Company name	Major business	Country	Market capitalization (100 million dollars)
Apple	Hardware, software, services	US	28,282
Microsoft	Cloud service	US	23,584
Alphabet/Google	Search engine	US	18,215
Amazon.com	Cloud service, e-commerce	US	16,353
Meta Platforms /Facebook	SNS	US	9,267
NVIDIA	Semiconductor	US	6,817
Taiwan Semiconductor Manufacturing	Semiconductor	Taiwan	5,946
Tencent	SNS	China	5,465
Visa	Payment	US	4,588
Samsung Electronics	Hardware	Korea	4,473
Mastercard	Payment	US	3,637
Alibaba	e-commerce	China	3,589
Walt Disney	Media	US	2,811
Cisco Systems	Hardware, security	US	2,578
Broadcom	Hardware, semiconductor	US	2,557

(Source) for 2017, MIC (2018) "Current State and Challenges of Platform Services"; for 2022, Wright Investors' Service, Inc (as of January 14, 2022)

Social media

- As of January 2022, the monthly number of active **Facebook** users was **approximately 2.9 billion, the largest number in the world**.

EC

- **Total sales in the global EC market** were **42.0 trillion yen (19.5% increase year-on-year)** in 2021. By country, China accounted for the largest share at 178.4 trillion yen followed by the United States at 101.7 trillion yen, Japan at 28.0 trillion yen and Germany at 17.2 trillion yen.

Electronic payments

- **Total global mobile transactions** reached **214.4 trillion yen** in 2020. By country, China has an overwhelming share followed by the United States. Japan is at the same level as some European countries.

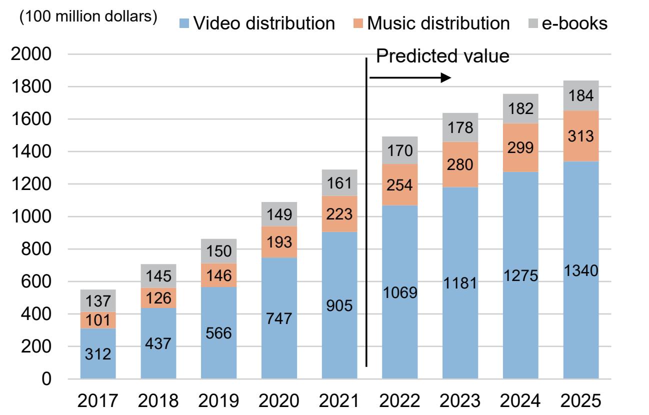
Search services

- In the global search engine market, **Google's share is at over 85%**. In Japan, Google has the top share both for personal computers and smartphones. Yahoo! has around a 20% share for smartphones.

Video distribution, music distribution and e-books

- In 2021, the global market of video distribution, music distribution and e-books was **14.1452 trillion yen (21.7% increase year-on-year)**. In Japan, the market was **1.0171 trillion yen (18.4% increase year-on-year)** in total.

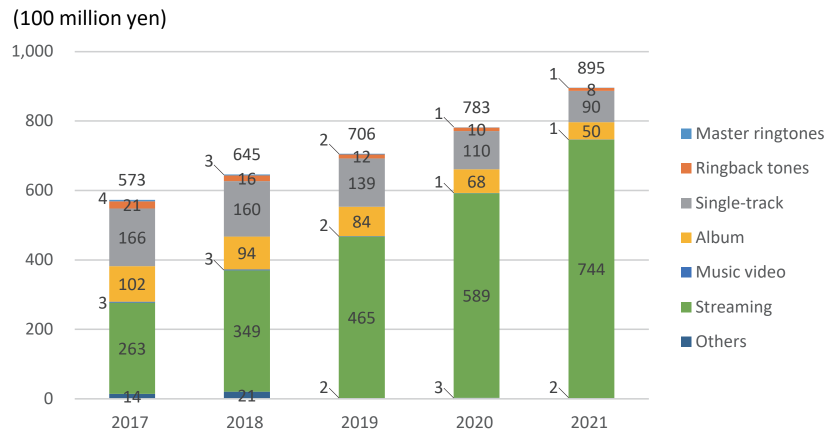
Changes and forecasts for the size of the global video distribution, music distribution and e-book markets



(Source) Omdia, Statista "Digital Market Outlook"

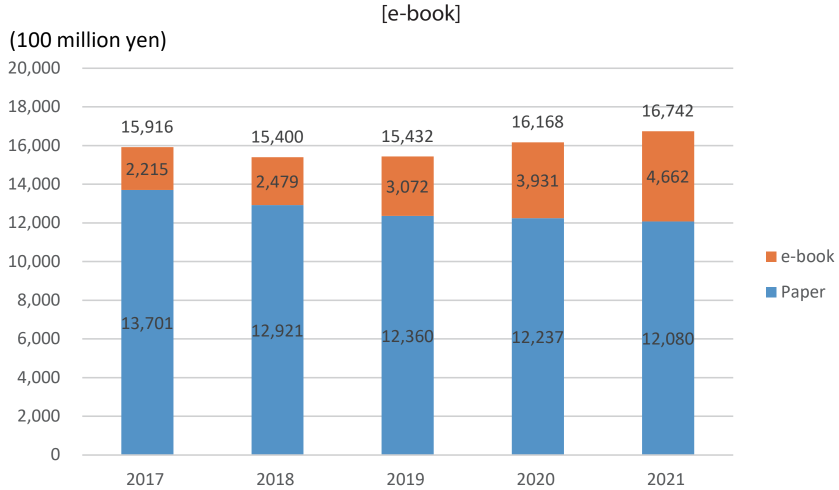
Changes and forecasts for the size of the music distribution and e-book markets in Japan

[Music distribution]



(Source) Recording Industry Association of Japan

[e-book]



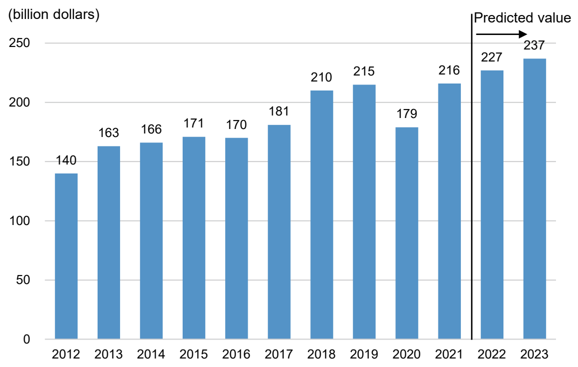
(Source) Research Institute for Publications, All Japan Magazine and Book Publishers' and Editors' Association

Key Points

Trends in the data center market

- The global market size (expenditure) of data center systems was 23 trillion 706.9 billion yen **(24.0% increase year-on-year)** in 2021.
- The market size (sales) of data center services in Japan was 1 trillion 734.1 billion yen **(11.6% increase year-on-year)** in 2021.

Changes and forecasts for the size (expenditure) of the global data center system market

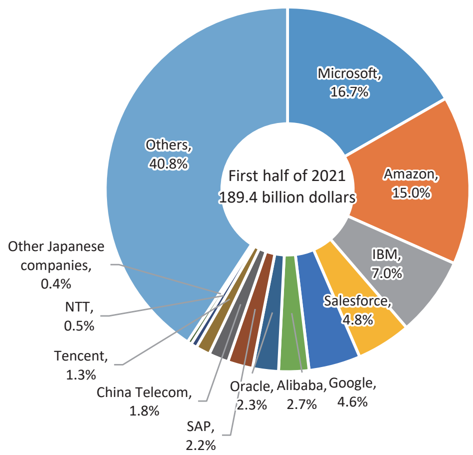


(Source) Statista (Gartner)

Trends in the cloud service market

- The size of the global public cloud service market (sales) was 35 trillion 31.5 billion yen in 2020 (27.9% increase year-on-year). In the first half of 2021, **the top five companies** (Microsoft, Amazon, IBM, Salesforce and Google) accounted for **48.1% of the market**. It remains as an o**ligopoly**.
- In 2021, the size of Japan's public cloud service market (sales) was 1 trillion 587.9 billion yen (28.5% increase year-on-year).

Share of the global public cloud service market



(Source) Omdia

AI

- The global market of AI-related software is expected to increase 55.7% from 382.7 billion yen of 2021 to 595.7 billion yen in 2022.
- Sales of **Japan's eight major AI markets** reached **51.3 billion yen (19.9% increase year-on-year)** in fiscal 2020 and are expected to top 120 billion yen in fiscal 2025.

Virtual space, etc.

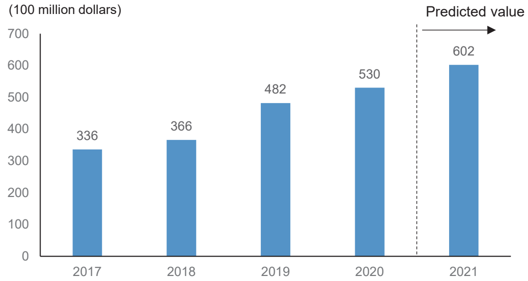
- **Sales of the global metaverse market** reached 4.2640 trillion yen in 2021 and are expected to rapidly increase to **78.8705 trillion yen by 2030**.
- In recent years, there is a new digital economy being built in which users can directly connect to each other on decentralized networks based on **blockchain**, without depending on a specific platform. This is called **Web 3.0**, a next-generation frontier after Web 2.0.

(7) Cyber Security Trends

Overall condition of the global market

- Due to the rapid increase of targeted cyber-attacks including ransomware and other factors, the global cyber security market increased to **5.6591 trillion yen in 2020** and is expected to reach 6.6072 trillion yen in 2021 (16.8% increase year-on-year).
- Five major players - Cisco, Palo Alto Networks, Check Point, Symantec and Fortinet - have ranked high in market share since 2017.

Changes and forecasts for the size of the global cyber security market



(Source) Prepared from Estimation by Canalys

Major global cyber security operators

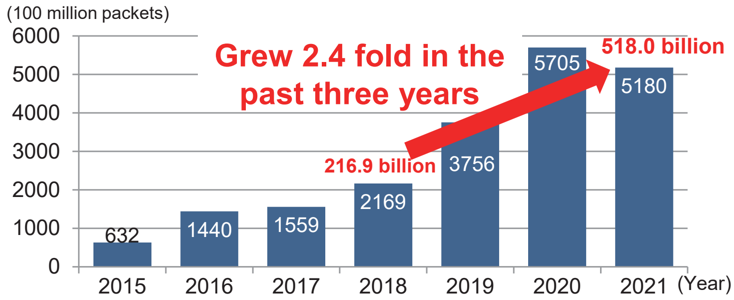
Operators	Global market share			
	2017	2018	2019 (Q1)	2020 (Q1)
Cisco	9.4%	9.9%	10%	9.1%
Palo Alto Networks	5.9%	6.9%	7%	7.8%
Check Point	6.4%	6.1%	6%	5.4%
Symantec	7.5%	6.1%	6%	4.7%
Fortinet	5.1%	5.5%	5%	5.9%

(Source) Prepared from Estimation by Canalys

Present state of cyber security in Japan

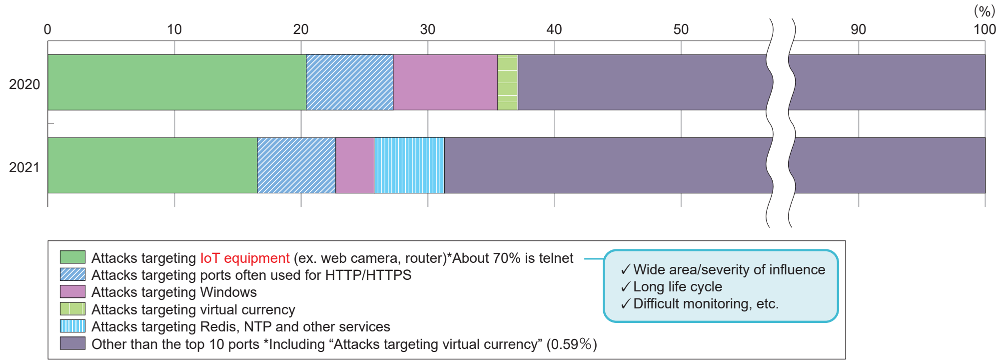
- **The number of cyber-attack-related communications as observed by NICTER** (approximately 518.0 billion packets) **increased 2.4-fold** in 2021 **compared with three years ago**.
  Attacks targeting IoT equipment continued to be most frequent.
- **Foreign enterprises have a large share** of sales **of information security products in Japan,** both in 2019 and 2020. Japan continues to rely on overseas operators.

Changes in the number of cyber-attack-related communications detected by NICTER



(Source) NICT, NICTER Observation Report 2021

Content of cyber-attack-related communications observed by NICTER



※Analysis of the top 10 target ports of the attacks detected at NICTER in 2020/2021 (excluding large-scale scan communications for the purpose of survey)

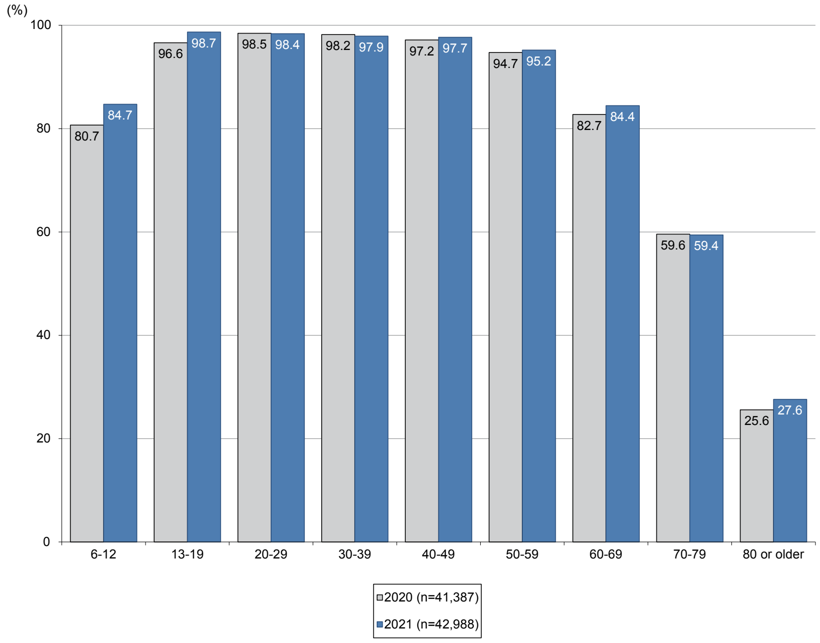
(Source) NICT, NICTER Observation Report 2021

(8) Digital Usage Trends

Digital usage trends in the daily life of the public

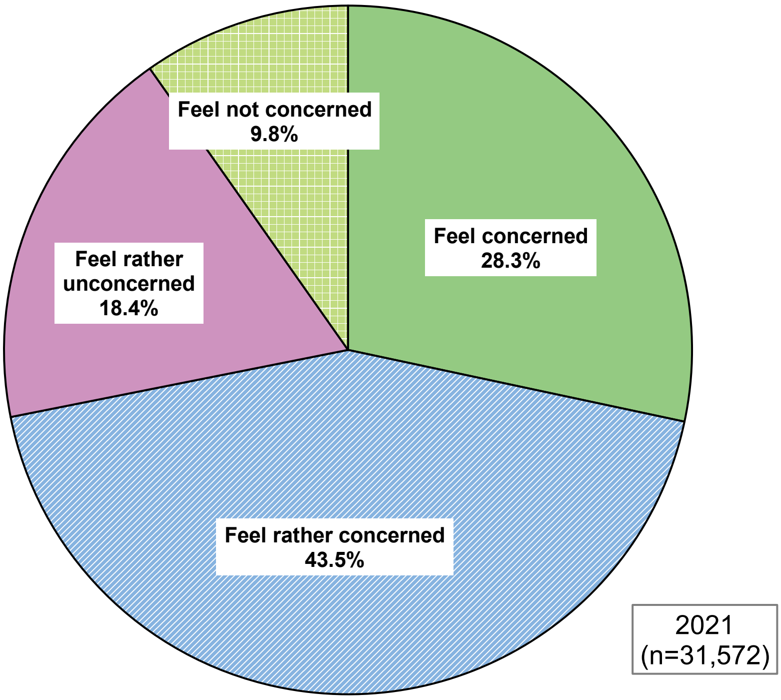
- The internet usage rate (individuals) is **over 90% in every age group from 13 to 59**, while the rate tends to decline as the age rises in age groups starting from 60 or older.
- **About 75% of internet users** aged 12 or older **have concerns about using the internet**. The most common concern is in relation to **"leaks of personal information, etc."**

Internet usage rate by age group



(Source) MIC "Communications Usage Trend Survey"

Responses of individuals regarding concerns about using the Internet



(Source) MIC "Communications Usage Trend Survey"

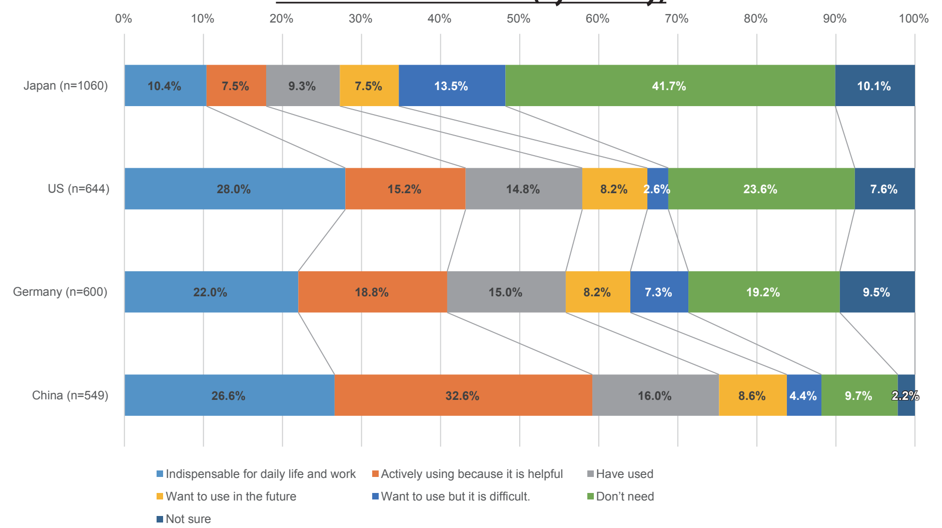
Trends in utilization in corporate activities

- As challenges and barriers for digitalization, the percentage of Japanese enterprises that answered "**shortage of human resources**" **(67.6%)** is by far larger in comparison to enterprises of the United States, China and Germany.
- Slightly under 60% of people in the United States and Germany, and over 70% of people in China have experienced telework, while the rate is **around 30% in Japan**.

Trends in regard to digital usage in administration

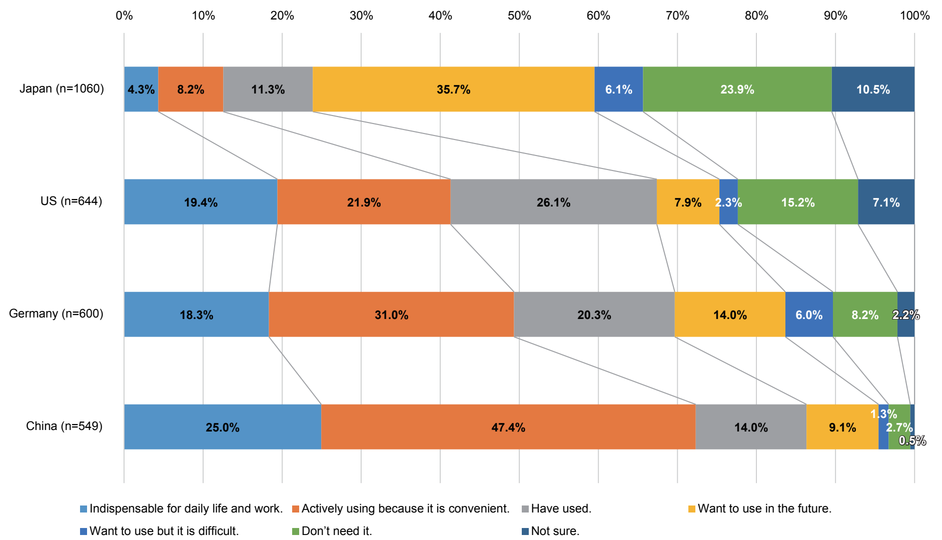
- The percentage of respondents that answered that they have used electronic administrative services (electronic applications, filing and notifications) is **over 60% in foreign countries**, whereas **the percentage is as low as 23.8% in Japan**.

Telework use situation (by country)



(Source) MIC (2022) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

Use situation of electronic administrative services by country

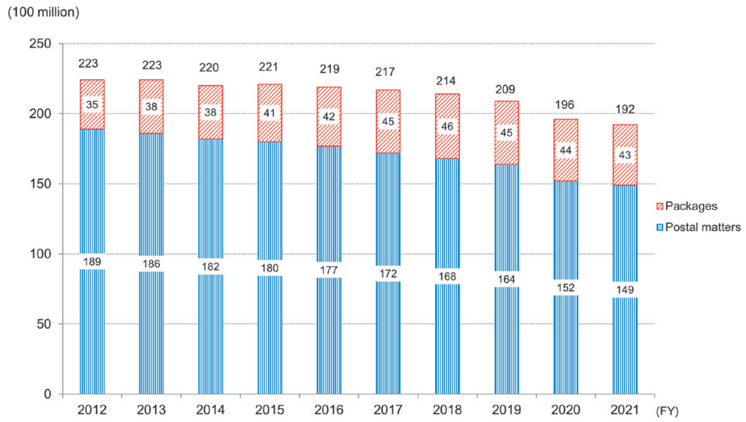


(Source) MIC (2022) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

(9) Trends in Postal Service and Correspondence Delivery Business

- In the fiscal 2021 consolidated statement of the Japan Post Group, ordinary revenue was about 11.3 trillion yen, while current profit was 501.6 billion yen.
- The total post volume was 19 billion 192.73 million in fiscal 2021. This volume has been declining year by year.

Changes in the total number of accepted postal matters



(Source) Japan Post material, annual "Number of accepted postal matters, etc."

Chapter 4 Status of ICT Policy at MIC

(1) Promotion of Comprehensive ICT Policies

Promotion of initiatives toward the Digital Garden City Nation

- The **Vision for a Digital Garden City Nation** is a plan to connect to the world by digitalizing rural areas, creating new waves of change and narrowing the gap between rural and urban areas. In November 2021, the Council for the Realization of the Vision for a Digital Garden City Nation chaired by the prime minister was set up in order to achieve the vision while promoting regional vitalization through digital transformation.
- In that same month, MIC set up the **Promotion Headquarters of the Vision for a Digital Garden City Nation** and has been promoting initiatives based on the three pillars behind the vision: (1) **development of digital infrastructure; (2) development and securing of digital human resources and initiatives to leave no one behind; and (3) digital implementation to solve regional challenges**.

Consideration of information and communications policies toward 2030

- In September 2021, MIC consulted the Information and Communications Council regarding "desirable information and communications policies toward 2030." In response, the council has been conducting research and investigations on the **direction and urgent matters of information and communications policies in order to achieve the realization of Society 5.0 and ensure economic security.**
- The Report of the Council (June 2022) presented the direction of future initiatives to ensure strategic autonomy and to acquire strategic indispensability of the ICT industry. It also presented eight priority fields including (1) advancement of 5G and its overseas expansion and (2) expansion of broadband.

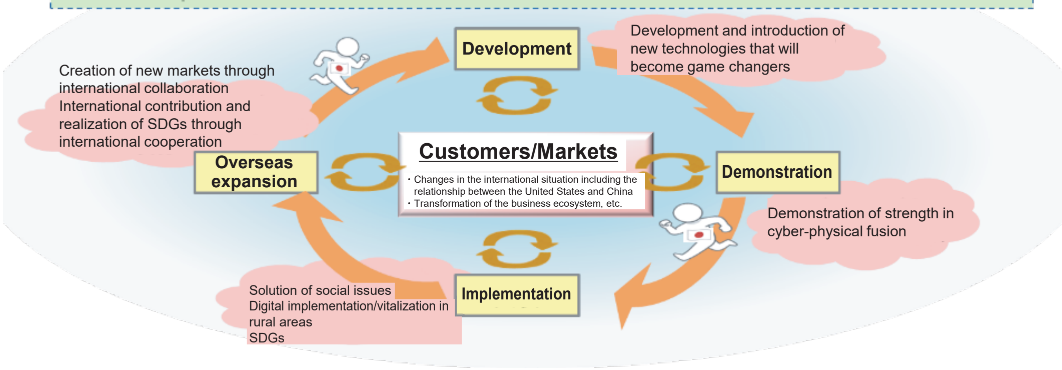
Basic approach toward the realization of Society 5.0

Information and communications policies to support Society 5.0 and economic security

In order to ensure the independence, existence and prosperity of Japan, we aim to ensure strategic autonomy and to acquire strategic indispensability of the information and communications industry which is playing an increasing role as a strategic core industry.
(1) Advancement and maintenance of information and communications infrastructure that supports Society 5.0
(2) Maintaining and strengthening of international competitiveness of the information and communications industry (R&D, solutions, human resources)
(3) Construction of a free and highly reliable information space

Resilient and vigorous society in the 2030s (Society 5.0)

- ✓ Inclusive: society where everyone can be active
- ✓ Sustainable: society which sustainably growing
- ✓ Dependable: society that enables activities with security



(2) Trends in Telecommunication Policy

Initiatives so far

- In recent years, Japan's telecommunication market has experienced major changes, including the popularization of mobile phones and the rollout of broadband, and the progress of competition between groups of players, mainly mobile communication carriers. Considering these changes, MIC developed rules to ensure a fair competition environment, and took measures for enabling people to access low-price and diverse mobile phone services.
- MIC also developed rules to cope with growing and diverse problems in the use of telecommunication services caused by information gaps between users and carriers, or inappropriate solicitation by business; and the growing global risks of complication and sophistication of cyber-attacks.

Future challenges and direction

- It is extremely important for individuals and Japan's socio-economy to ensure the benefits for telecommunication service users and to develop digital infrastructure as the foundation to promote innovations in the entire society and to support digitalization/digital transformation.
- It is expected that not only the telecommunications market, but even Japan's social structure, would further drastically change and the existing social/economic models that have been assumed would no longer apply. There is an increasing need to solve social challenges and create values by using advanced information and communications technologies.
- For this purpose, it is necessary to create an environment where all entities in Japan can use safe, secure and reliable information and communications services.

Specific policies/initiatives

(1) **Development of a Fair Competitive Environment** (Analysis/validation of the telecommunications market and development of connection rules)

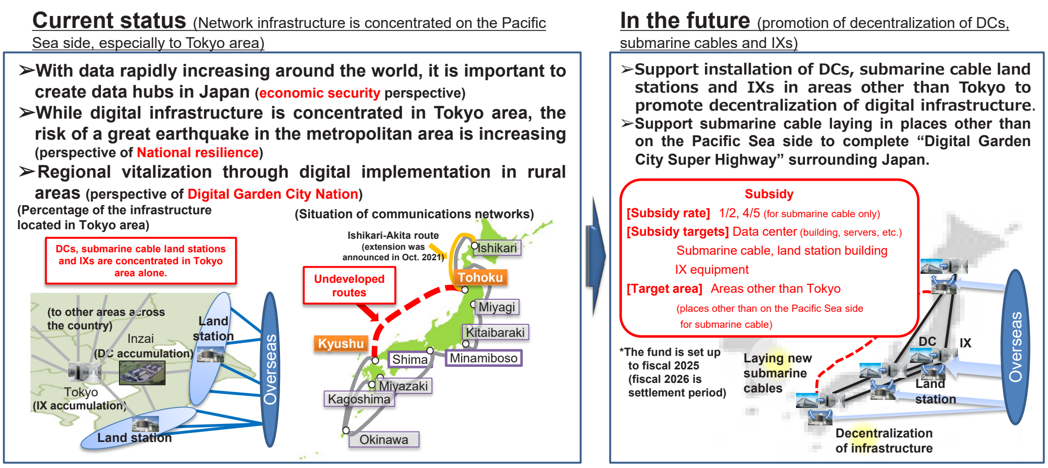
(2) **Development and Maintenance of Digital Infrastructure** (Promoting optical fiber development, decentralization of data centers, submarine cables, etc., securing broadband services)

(3) **Ensuring Safe and Reliable Telecommunications Infrastructure** (Establishing systems for technical standards on telecommunications facilities; Securing communication services in disasters; Analysis and verification of telecommunication accident)

(4) **Developing Safe and Secure Environments for Use of Telecommunications Services** (Ensuring governance of telecommunications businesses, Developing consumer protection rules, Protecting privacy of communications and user information, Dealing with illegal/harmful information, Development of a secure internet usage environment for young people)

(5) **Mediation and arbitration by the Telecommunications Dispute Settlement Commission**

Outline of the project for resilient digital infrastructure through decentralization of data centers, submarine cables, etc.



(3) Radio Policy Trends

Initiatives so far

- Since the Radio Act was enacted in 1950, Japan has promoted the private sector use of radio waves that are a common property of the public. Today, radio waves have become essential for people's daily lives.
- MIC has allocated frequencies under international cooperation and licensing radio stations, and has been making efforts that include: radio wave supervision for good radio use in an environment that is free of interference/jamming; R&D to expand radio resources; and technical examination work for effective radio use.

Future challenges and direction

- The trend of increasing the number of land mobile radio stations, including mobile phones will continue in the future, and traffic will increase accordingly. Traffic is also expected to increase due to the spread of new services such as subscription services. In order to maintain the comfortable radio wave use environment for mobile phones, etc., it is necessary to promote further effective use of the frequencies currently in use, to share the frequencies used for other purposes and to develop terahertz and other unused frequencies.
- It is also important to maintain a good radio use environment while handling changes in the circumstances of radio use. To this purpose, it is necessary to make further progress in radio wave monitoring, radio equipment trial purchase and other measures, while handling new radio use and changes in radio equipment distribution.

Specific policies/initiatives

(1) **Consideration of Promotion of Effective Radio Utilization in the Age of Digital Transformation** (Progress of digital transformation across society, consideration at the Round-table Conference on Radio Policy in the Age of Digital Transformation, partial amendment of the Radio Act measures, projects for effective use of frequencies for public use, consideration of allocation method of new mobile phone frequencies)

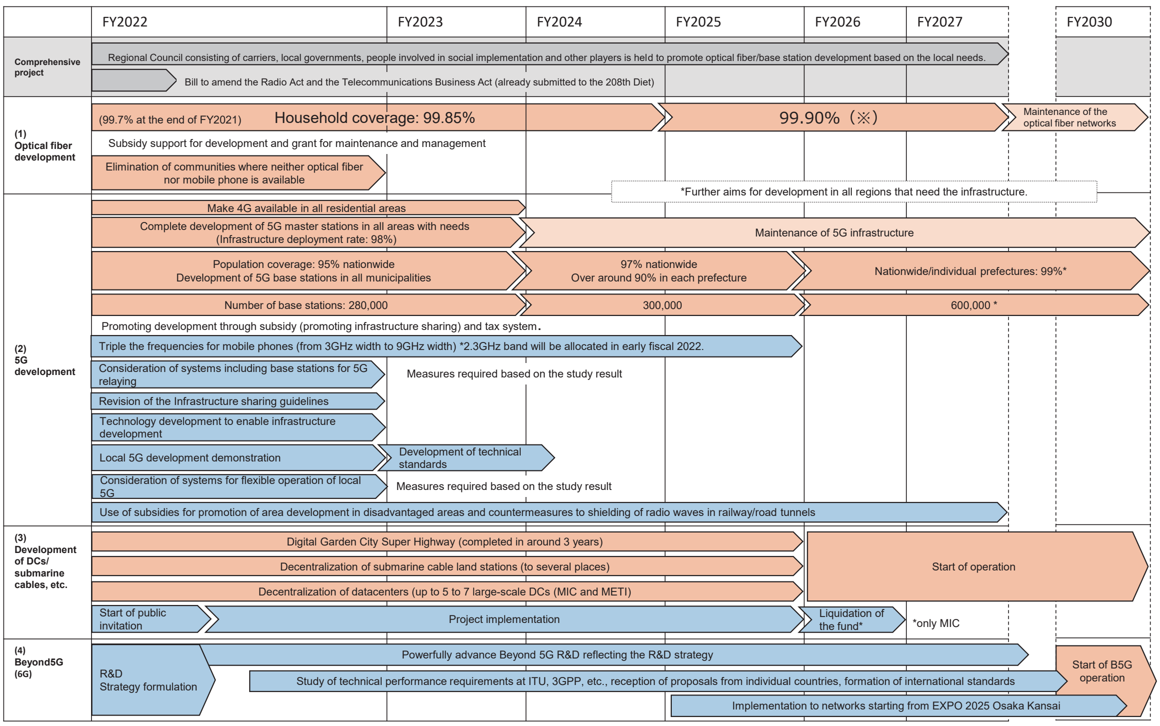
(2) **Spread/development of 5G/B5G** (spread/development of 5G based on the Infrastructure Development Plan for a Digital Garden City Nation, Beyond 5G)

(3) **Promotion of advanced radio use systems** (Intelligent Transport System, Public safety LTE, satellite constellation, space-transmission-type wireless electric power transmission system)

(4) **Promoting Overseas Deployment of Radio Wave Systems**

(5) **Establishment of Radio Usage Environments** (Promoting measures for the electromagnetic environment of living organisms; Promoting countermeasures against electromagnetic interference; Preventing radio wave interference/jamming)

Infrastructure Development toward a Digital Garden City Nation (road map)



(4) Trends in Broadcasting Policy

Initiatives so far

- MIC, in cooperation with broadcasters, home appliance manufacturers and others, promoted 4K/8K broadcasting services with higher-definition and picture quality compared with high vision. MIC also promoted the overseas deployment of broadcasting contents in cooperation with relevant government agencies.
- Furthermore, MIC has promoted initiatives that contribute to the resilience of broadcasting networks, which includes countermeasures against radio broadcasting with poor reception so that broadcasting can appropriately provide people with disaster information or other information. In order to equalize information access opportunities through broadcasting, MIC promoted the spread of broadcasting for people who are visually challenged or have hearing impairments through subsidies, etc. for private broadcasters that have production costs for programs with subtitles and subsidies for the equipment needed to add subtitles to live programs.

Future challenges and direction

- The environment surrounding broadcasting is rapidly changing, such as spread of video distribution via the internet and a loss of interest in television. In response to these changes, it is necessary to tackle tasks such as strengthening the foundation of broadcasting businesses, promoting the distribution of broadcast content, strengthening the resilience of broadcasting networks and their disaster resistance, while at the same time studying a future vision for broadcasting and a desirable state for the broadcasting system from a medium- to long-term perspective.

Specific policies/initiatives

(1) Considering desirable state of public broadcasting
(2) Considering desirable state of restrictions on foreign investment
(3) Strengthening the Foundation of Broadcasting Businesses (e.g., study on desirable state of the broadcasting system from a medium- to long-term perspective; initiatives regarding AM radio broadcasting; strengthening the efforts to spread the new 4K8K satellite broadcasting)
(4) Promoting Broadcast Content Circulation (Promoting production and circulation of broadcast content; Overseas deployment of broadcast content)
(5) Promoting the spread of broadcasting for the visually challenged and those with hearing impairments
(6) Improving the Resilience of Broadcast Networks and Enhancing Their Disaster Resistance (supporting conversion of cable networks to fiber optics and initiatives by broadcasters)

(5) Trends in Cybersecurity Policy

Initiatives so far

- MIC has held a Cyber Security Task Force consisting of security experts since 2017. The task force has successively compiled a list of challenges and measures to be tackled by the ministry. Recently, the task force formulated the "Comprehensive ICT Cybersecurity Measures 2021," which includes measures regarding ICT infrastructure/services. Based on the above, the ministry implemented measures to promote cybersecurity in the ICT field.

Future challenges and direction

- A large number of cyber-attack-related communications are still being observed. Because the ratio of the attacks targeting IoT equipment remains the highest, it is necessary to continue to strengthen security measures for IoT equipment.
- For introducing telework and wireless LAN which are necessary for digitalization of society as a whole, it is necessary to ensure security and deal with anxiety concerning security.
- In order to avoid or grow out of excessive dependence on security technologies provided by overseas players, and to enhance the ability to independently respond to cyber-attacks as well as develop a cybersecurity workforce, it is necessary to create an ecosystem that will accelerate domestic generation of cybersecurity information and workforce development.

Specific policies/initiatives

(1) **Securing safety and reliability of information and communications networks** (Initiatives pertaining to IoT, initiatives related to active measures taken by telecommunications carriers)
(2) **Initiatives related to Telework Security**
(3) **Initiatives related to Trust Services** (study by the Working Group on Trust Services, establishment of time-stamp authorization system by the state, formulation of the guidelines on e-seals, study at the Digital Agency)
(4) **Initiatives related to wireless LAN security**
(5) **Initiatives related to ensuring safety of cloud services** (assessment of safety of cloud services for government information systems, formulation of guidelines on information security measures in cloud service provision)
(6) **Initiatives for development of security human resources** (Cyber Defense Exercise with Recurrence (CYDER), program for cultivating young security innovators (SecHack365)
(7) **Constructing the integrated cybersecurity knowledge/human resource development foundation (CYNEX)**
(8) **Promoting formulation of security communities rooted in the area (regional SECUNITY)**
(9) **Initiatives related to international cooperation**

(6) Promoting ICT Use

Initiatives so far

- MIC has promoted ICT use in various sectors such as medical care/health and regional revitalization in order to deal with Japan's social/economic challenges including the declining birthrate and aging society and associated labor shortages, increases in medical/care expenses, and intensified natural disasters.

Future challenges and direction

- ICT use by enterprises can create new business models, such as Personal Data Trust Bank, and both enterprises and people can obtain the benefits from the progress of cashless payments and cloud services. In this way, ICT use will contribute to the revitalization of Japan's economy.
- Overall, ICT use has been progressing, while there are some differences in Internet use rate depending on age and geographical conditions. In order to realize digitalization that "leaves no one behind," it is necessary to narrow the digital divide caused by age/geographical and other conditions by eliminating anxiety/resistance to digitalization among the public, including the elderly, and by advancing initiatives to improve people's ability to use digital technologies, for example.
- It is essential to improve the digital literacy of the whole of society, including kids, their guardians and teachers, so that young people can safely and securely use smartphones and social media by understanding the risks associated with use and countermeasures against such risks.

Specific policies/initiatives

(1) **Promoting ICT use that will contribute to solving social/economic problems** (Promoting local 5G, promoting telework, promoting Smart City vision, promoting ICT use in education, promoting ICT use in the medical field, developing disaster prevention information systems, promoting the use of personal number card/public personal authentication services)

(2) **Promoting data distribution/use and new businesses** (Social implementation of the Personal Data Trust Bank, promoting cashless payment, promoting introduction of cloud services, discovery/fostering of ICT ventures, promoting/spread of AI)

(3) **Creating Environments Where Everyone Can Obtain Convenience through ICT** (Supporting R&D for barrier-free information, providing phone relay service as public infrastructure, improving accessibility of the websites of public organizations, supporting digital use by the elderly and other people, improving media information literacy among youth)

(7) ICT Technology Policies

Initiatives so far

- While promoting Beyond 5G R&D strategies and IP/international standardization based on the Beyond 5G Promotion Strategy formulated in 2020, MIC has promoted R&D and international standardization of cutting-edge technologies in the ICT field based on the Growth Strategy, the Science, Technology and Innovation Basic Plan, the Integrated Innovation Strategy (AI Strategy and Quantum Technology Innovation Strategy), the Intellectual Property Strategic Program, the Basic Plan on Space Policy, etc. of the entire government.

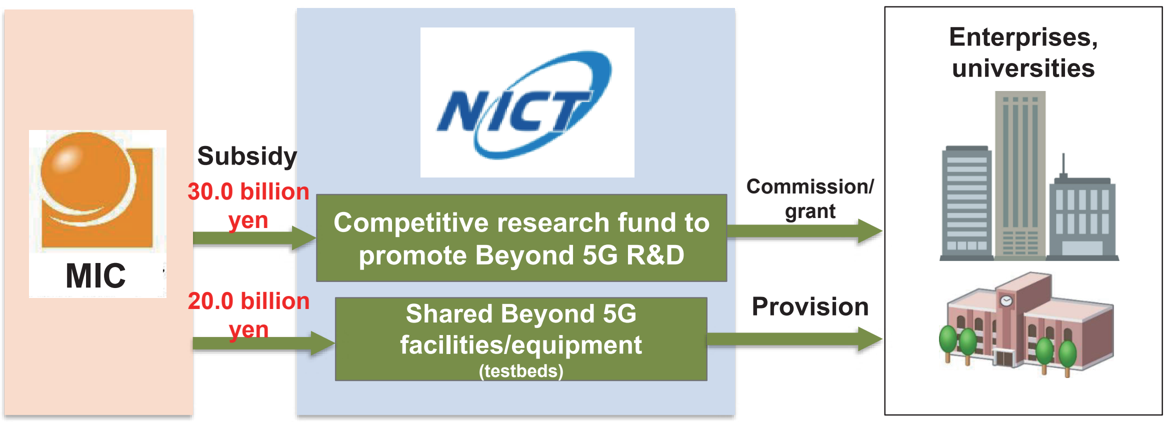
Future challenges and direction

- It is necessary to realize the social implementation of development results and market gain, strengthen Japan's international competitiveness and ensure its economic security by promoting existing R&D, IP and international standardization strategies in close coordination between industry, academia and government, after further crystallizing such strategies.
- In addition, after tackling the challenge of economic growth and the solution of social issues after COVID-19, and with consideration for future technology trends in the information and communications field and the innovation policy of the entire government, it is necessary to strategically promote development of cutting-edge technologies, IP and international standardization while advancing the study/formulation of ICT technology strategies toward a resilient and vigorous society in the 2030s.

Specific policies/initiatives

(1) **Beyond 5G** (international trends surrounding Beyond 5G, potential competitiveness toward Beyond 5G, policy trends)
(2) **Quantum technology** (trends of the quantum security network policy, R&D on quantum cryptographic communication technologies)
(3) **AI technologies**
(4) **Remote sensing technologies**
(5) **Space ICT**

Schema of the Beyond 5G R&D Promotion Project (Fund)



(8) Promoting International Strategies for ICT

Initiatives so far

- MIC has energetically worked for the overseas deployment of ICT infrastructure systems through total support for enterprises, which includes human resource development, and maintenance and finance in accordance with the deployment stage (project identification, proposal and formation).
- MIC has also contributed to the formation of international frameworks through active participation in discussions on digital economy toward the establishment of international rules, and discussions on the establishment of international rules, by taking advantage of opportunities for bilateral policy dialogues with the United States and other countries, and multilateral talks including the G7 and the G20.
- While digital infrastructure, including submarine optical cables and 5G networks, has become essential for all social and economic activities, this has given rise to concerns about economic security. To address these concerns, MIC has also, for example, worked toward economic security through international cooperation.

Future challenges and direction

- Amid intensifying competition for developing digital technologies, it is important for Japan's economic development to create environment for development and spread of digital technologies and to improve our international competitiveness and show Japan's presence to the world through bilateral and multilateral collaboration.
- With the aim of strengthening the international competitiveness of Japan's digital technologies and solving the social challenges of the world, MIC will work for overseas deployment in various fields including digital and for the formation of international frameworks through international cooperation.

Specific policies/initiatives

(1) **Overseas deployment of digital infrastructure, etc.** (overseas deployment support tools at MIC, Fund Corporation for the Overseas Development of Japan's ICT and Postal Services (JICT), initiatives toward overseas deployment for each field)

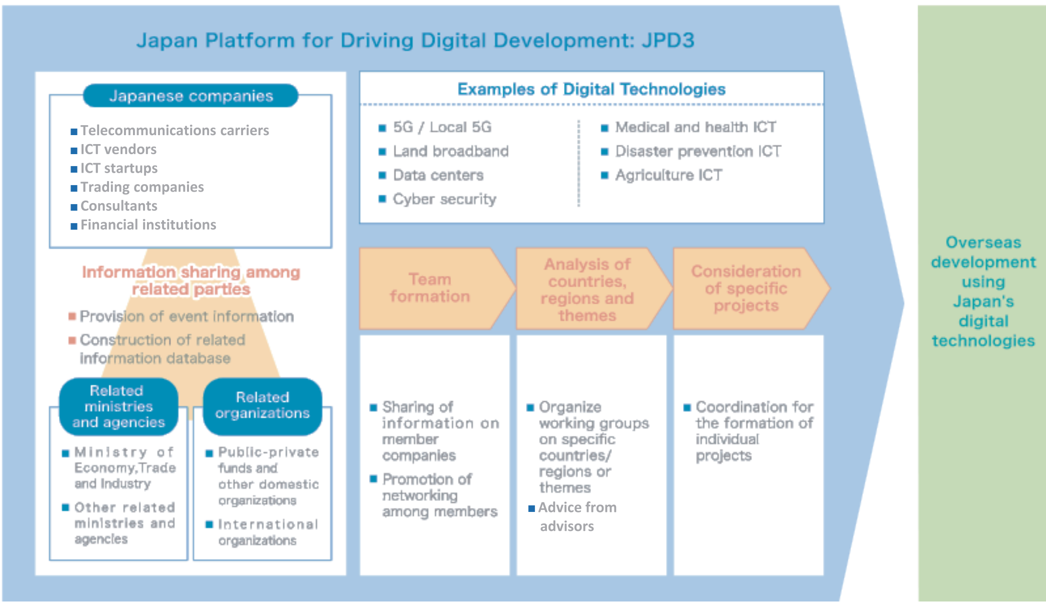
(2) **Contribution to international rule formation on digital economy** (Data Free Flow with Trust (DFFT), response to discussions on international rules of cyber space, promotion of trade liberalization in the ICT field, promotion of strategic international standardization)

(3) **Securing economic security in the digital field**

(4) **International cooperation in multilateral frameworks** (G7/G20, Asia Pacific Economic Cooperation (APEC), Asia-Pacific Telecommunity (APT), Association of South-East Asian Nations (ASEAN), International Telecommunication Union (ITU), United Nations, World Trade Organization (WTO), Organization for Economic Cooperation and Development (OECD), ICANN)

(5) **International cooperation in bilateral relationships** (Policy cooperation with the United States, cooperation with European, Asia-Pacific, Latin American and other countries)

Japan Platform for Driving Digital Development



(9) Promoting Postal Service Administration

Initiatives so far

- Postal services, which began in 1871, have provided universal service to every corner of Japan through post offices that step forward in line with the growth of Japan, while at the same time it has changed its form from a government enterprise to a public corporation and then to a private enterprise according to the change of time.
- MIC implemented measures to secure the soundness of the management of the Japan Post Group and to ensure fair and free competition, to secure the universal services provided by post offices, and to promote utilization of the post office network in communities, for example.

Future challenges and direction

- In the changing social environment surrounding the Japan Post Group, it is important that the group ensures necessary performance as a private enterprise and maintains its post office network and universal services in the medium- to long-term, and at the same time post offices and their services contribute to the improvement of convenience for people/users and for communities.
- MIC continues to secure the soundness of the management of the Japan Post Group and fair and free competition, and ensures the stability of universal services provided by post offices. At the same time, it is necessary to effectively use the network of about 24,000 post offices to improve convenience for people/users and to contribute to communities through diverse and flexible services adapted to the new age, while improving operational efficiency and responding to the progress of digitalization.

Specific policies/initiatives

(1) **Promoting postal service administration** (ensuring universal postal services, securing sound management of the postal services, contributing to regional vitalization)

(2) **Promoting Postal Service Administration in the International Field** (Response to Universal Postal Union (UPU), support for overseas development of Japanese-style postal infrastructure)

(3) **Correspondence Delivery Business**

Content of the partial review of postal services since October 2021

(1) No delivery on Saturdays

Implemented from Saturday, October 2, 2021

*Limited to ordinary mail. Normal post cards for election campaign are delivered on the day before the voting day.

(2) Later delivery (on the following day -> the day after next)

Stepwise implemented from Friday, October 1, 2021

*Limited to ordinary mail. No change to express, registered mail, Letax, Yupack, etc.)

<To destinations where mail used to be delivered on the following day if the mail was posted before 17:00>

Date of acceptance	Delivery day of week: Past	From October 2021	From January 22, 2022
Mon	Tue	Tue	Wed
Tue	Wed	Wed	Thu
Wed	Thu	Thu	Fri
Thu	Fri	Fri	Mon
Fri	Sat	Mon	Mon
Sat	Mon	Mon	Tue
Sun	Mon	Tue	Tue

(3) Expansion of the offices accepting special mails within the ward (quantity discount)

Mail needed to be brought to their delivery office in order to obtain discount. Discount is given also to mail brought to local dividing offices in charge of the delivery office.

<Commencing time>

-Bringing more than 100 pieces of mail at one time: from October 2021

-Bringing more than 1,000 pieces of mail at one time: from April 2022

(4) Lowering express delivery fee

Express delivery fee is lowered about 10% from Friday, October 1, 2021

*The fee is lowered considering the change in the delivery days of ordinary mail.

Weight	Fee up to Sep. 30	Fee from Oct. 1
Up to 250g	290 yen	**260 yen**
Up to 1kg	390 yen	**350 yen**
Up to 4kg	660 yen	**600 yen**

Note: from (1) to (3) above are implemented based on the partial revision of the Postal Act (enacted on November 27, 2020 and enforced on May 1, 2021)

2022 White Paper on Information and Communications in Japan

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Part 1 Special Topic: 50 years since the publication of the first Information and Communications White Paper
– changes in ICT and digital economy

Introduction

Developments of ICT Since 1973, the Year of First Publication of White Paper on Information and Communications

The Introduction compares the year 1973, when the first White Paper on Information and Communications[1] was published, with today, a time when information and communications technology (hereinafter "ICT") has become an indispensable social and economic infrastructure, from the viewpoint of advancement of ICT in various areas, such as education and medical care.

1. Advancement of ICT and Diversification of Services

In the 50 years since the first publication of the White Paper, **ICT has continued to develop, and various ICT services and businesses have appeared.**

In 1973, **the most essential communication tool was the subscription telephone**, while pay phones fulfilled an important role as a means of communication when one was away from home. Communications at the time were mostly voice calls **(Figure 0-1-1-1)**. Since then, the numbers of fixed phone subscriptions and pay phones have significantly decreased, and today's **major communication tool is** the **mobile phone**. In addition, **e-mail and social media (SNS) also prevail, and other** diverse communication tools and services using the alphabet and visual imagery in addition to voice have become widely used.

In 1973 people **viewed analog terrestrial broadcasting on televisions (Figure 0-1-1-2)**, **while** today the development of imaging technologies has made it possible to view **satellite broadcasting and CATV broadcasting** in addition to **terrestrial broadcasting,** and also to enjoy super-high picture quality **4K/8K** videos. We can also enjoy online streaming services (**internet video distribution services) to view television programs on personal computers and mobile devices**.

Figure 0-1-1-1　1973 and today: changes in communication tools

Telephone

(Source) cocolog "a child making a call in the 1970s", Photo AC

Figure 0-1-1-2　1973 and today: changes in video viewing means

Television

(Source) Kamijima Digital Archive, InfoCom Research, Inc.

[1] The title was "Communications White Paper" in 1973 and has been "Information and Communications in Japan, White Paper" since 2001.

2. Penetration of ICT Use in Social and Economic Activities

With the advancement of ICT and the diversification of services, ICT has penetrated various areas of social and economic life.

In 1973, enterprises mainly processed information using general-purpose computers (mainframes) constructed within their own premises. Today, enterprises can share data and expand functionality without constructing internal information systems thanks to the development and spread of cloud technologies. The percentage of enterprises using cloud services, even if only partially, reached 70.4%[2] in 2021, and it is expected to further grow in the future.

The use of ICT in the field of disaster prevention/mitigation include the remote confirmation of damage at disaster sites through sensors and drones, and the use of GPS location information obtained through smartphones to grasp the status of local residents at the time of a disaster. For example, the Disaster Information for Rivers[3] website of the Ministry of Land, Infrastructure, Transport and Tourism enables website visitors to view footage from river cameras that are installed at about 6,000 sites across the country by using their smartphone, etc. Furthermore, people including victims of a disaster can post the damage situation in text, location information or photos through SNS and check the posting that is organized and visualized on a map by artificial intelligence (AI).[4] Location information from the smartphones through GPS is connected with the subscribers' attribute information including age and sex to visualize the flow and stay of people on a map.[5]

In the field of education, an in-school communication network environment has been rolled out in almost all elementary and junior-high schools across Japan and the use of personal computers or tablets in classrooms has spread under the GIGA School Program **(Figure 0-2-1-2)**. Private service provider initiatives include a solution named EdTech (Education × Technology) for educational institutions to reduce the burden on teachers through the streamlining of school affairs, online learning applications for individual users to provide education tailored to their learning and comprehension level, and applications and services that incorporate adaptive learning with AI to provide optimal learning opportunities.

Applications in the field of medical care include cloud servers through which cardiogram data is sent from ambulances so that doctors can view the data before patients arrive at hospital, and video call or other communication applications through which patients can remotely receive diagnosis and medication prescriptions from a physician. Telemedicine initiatives have been promoted to improve the quality of medical care and provide advanced medical care at isolated islands and remote areas. For example, a remote image diagnosis system has been installed in 1,486 hospitals and 1,820 clinics.[6]

Figure 0-2-1-2 1973 and today: fields where ICT has come to be used

Education

Medical care

Agriculture

(Source) Chiba City Fire Bureau, Niigata City Konan Elementary School, Photo AC

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[2] Sum of the respondents answering using cloud services "across the company" and "in some offices or departments" in MIC Communications Usage Trend Survey (survey as of the end August 2021) https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

[3] Disaster Information for Rivers , MLIT: https://www.river.go.jp/index

[4] LINE, SOCial-dynamics observation and victims support Dialogue Agent

[5] KDDI, "KDDI Location Analyzer"

[6] MHLW, 2020 Static/Dynamic Surveys of Medical Institutions https://www.mhlw.go.jp/toukei/saikin/hw/iryosd/20/

The agricultural field has seen the further development of smart agriculture with growth management using information from various sensors,[7] harvest robots using AI and pesticide spraying using drones.[8]

Damages to agriculture, forestry and fisheries caused by wild birds and animals have been serious issues. In fiscal 2020[9] the nationwide total of such damages was16.1 billion yen. Effective and efficient countermeasures taken by using ICT include sensor cameras to survey habitats and monitor damage, trapping using remote monitoring/control systems, and management of trapping data using smartphones or personal computers.[10]

Use of ICT has penetrated every corner of daily life, including using IC ticket Suica or PASMO based on Felica that is contactless IC card technology at automatic ticket gates and cashless payments using electric money through applications such as Rakuten Edy, WAON and nanaco.

As described above, compared with 1973, we can see that ICT has significantly developed, penetrated various areas of daily life, and become an indispensable social and economic infrastructure.

[7] For example, NTT DOCOMO provides a service named ICT Buoys where users can check water temperature, salinity and other oceanographic data from sensors through smartphones and mobile phones. https://www.docomo.ne.jp/biz/service/ict_bui/

[8] https://www.affrc.maff.go.jp/docs/smart_agri_pro/smart_agri_pro.htm

[9] https://www.maff.go.jp/j/seisan/tyozyu/higai/hogai_zyoukyou/index.html

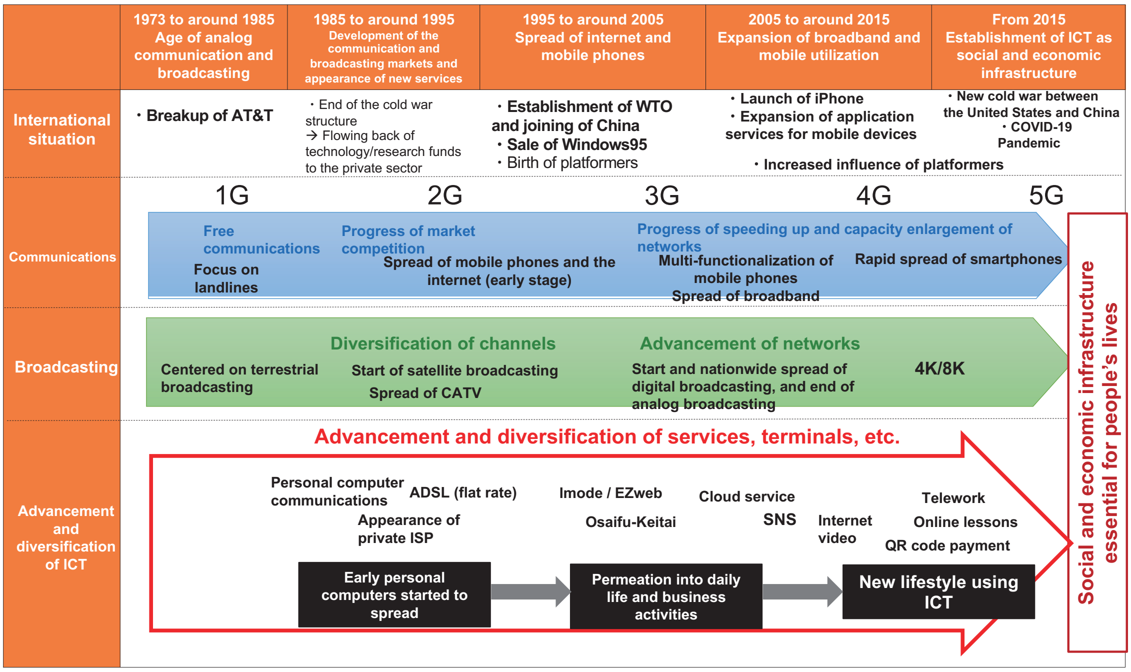
[10] https://www.maff.go.jp/j/seisan/tyozyu/higai/kikijouhou/kikijouhou.html

Chapter 1

Review of Changes Over the Past 50 Years in Chronological Order

In Chapter 1, we divide the 50 years since the first publication of the White Paper into five periods from the viewpoints of ICT advancement, service diversification, and international changes regarding ICT, summarize changes in systems, services, technologies, etc., in each period while mentioning turning points, and provide an overview of the processes where ICT has come to play an important role in social and economic activities **(Figure 1-0-1-1)**.

Figure 1-0-1-1 Trends in the information and communication field in the past 50 years



(Source) MIC (2022) "Research Study on Economic Security in Digital Society"

Section 1 1973 to 1985: Age of Analog Communications and Broadcasting

From 1973 to 1985, the foundation for the spread of ICT was fostered mainly in developed countries, and nations like the United States and the United Kingdom saw progress in the liberalization of the telecommunication industry. Changes for the basis of today's information society were seen also in Japan, as exemplified by the spread of fixed telephone, television broadcasting and privatization of Nippon Telegraph and Telephone Public Corporation (hereinafter "NTT Public Corporation"). We name the period from 1973 to 1985 as the **"Age of Analog Communications and Broadcasting"** and provide an overview for the status of the ICT sector during this period.

1. International Events and Trends

In 1973, when the first White Paper was published, the 4th Arab-Israeli War triggered the first oil crisis. In 1979 the world experienced a second oil crisis that was triggered by the Iranian Revolution. The experience of the tough economic situation brought about by the oil crises led to the direction to break away from mass consumption of resources and energy and **shift to a resource-conserving and knowledge-intensive industrial structure**. The **Information and communications industry** was widely expected to become **the**

core of the movement.[1]

The United States is notable for the development of the military use of radio communication and electronic applied equipment. Military use of integrated circuits (IC) components developed during the Vietnam War in the latter half of the 1960s. As a result, the U.S. electronic equipment industry grew rapidly. In addition, advances in the development of memory and microprocessors, through support by the Department of Defense and the National Aeronautics and Space Administration (NASA),[2] helped the **growth of the information and communications industry** in the country.

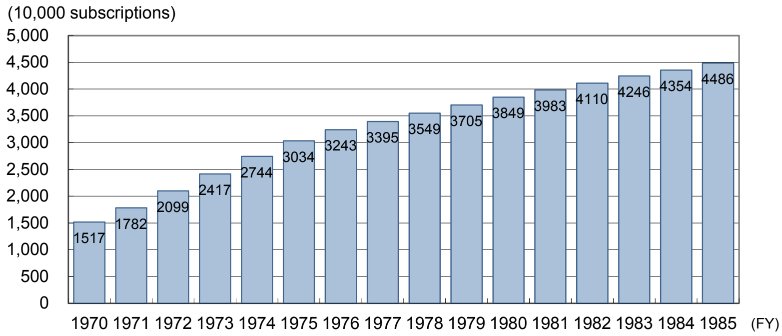
Furthermore, in the 1980s, the principle of competition was introduced into the telecommunications market of the United States and the United Kingdom. Liberalization of the telecoms sector in the United States progressed around the antitrust suits of the Department of Justice against the monopoly by AT&T (The American Telephone & Telegraph).[3] After several suits, AT&T was broken up in 1984. In the United Kingdom, after the inauguration of the Thatcher administration in 1979, a wide range of state enterprises were privatized in order to restore the national finances and the economy of the country. In 1982, a license for telecommunication business, a sector that had been monopolized by British Telecommunications, was given to a competitor, and this was followed by the privatization of British Telecommunications in 1984.

2. Trends in Japan's ICT sector

In Japan, fixed landline telephones rapidly spread from 1952, when the NTT Public Corporation was established with the aim of promoting the development of the telephone network. The number of fixed landline telephone subscribers, which was 1.40 million at the time of the establishment of NTT Public Corporation, reached 24.17 million in fiscal year 1973, when the first White Paper was published. **Voice calls using fixed landline telephones** became the main means of communication **(Figure 1-1-2-1)**.

Around this time there was a problem of the long waiting period from application to telephone subscription and it took several hours to make a long-distance call because telephone operators had to connect the line manually. As a result of the efforts made by NTT Public Corporation, the waiting list was eliminated in 1978, automated immediate connection was completed nationwide in 1979, and the number of subscribers with telephones exceeded 40 million in 1981.[4] It is thought that communication services reached a turning point through the elimination of the waiting list and the nationwide immediate connection, which gave rise to discussions on new technologies and media. Much attention was paid to these new technologies, including integrated circuits, optical fiber communication, and space communication, while media such as image communication, data communication and other media also attracted attention.[5]

Figure 1-1-2-1 Transitions in the number of subscribers with subscription telephones



(Source) Prepared from History of the Nippon Telegraph and Telephone Public Corporation

[1] "Upon the Publication of the First Communications White Paper" of the 1973 White Paper states: "the current tough situation brought about by the oil crisis calls for sincere reflection on our economic society based on mass consumption of resources and energy and urges us to shift to a resource-saving or knowledge-intensive industrial structure. Under the circumstances, the role of communications will become more crucial by very effectively contributing to conservation of resources and energy and being at the very core of the knowledge and information industries." https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/s48/index.html

[2] Inoue (1992) "Defense expenditures and the development of US semiconductor industry under the Vietnam War", Keio University, Mita Journal of Economics, Volume 85 No.2

[3] Here, AT&T is not the current AT&T (https://www.att.com/). The current AT&T was established by a merger of Southwestern Bell Corp, one of the seven RBOC companies established in 1984 as a result of a split with three other RBOC companies (BellSouth, Ameritech and Pacific Telesis), and the AT&T long distance division.

[4] The number of subscribers with subscription telephones exceeded 60 million in fiscal 1995.

[5] See the 1978 Communications White Paper, Part 1, Chapter 2, Section 1 https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/s55/pdf/S55_05_C2E81C9F4C2E82BECF.pdf

In the field of mobile communications, NTT Public Corporation launched the first-generation mobile telephone service using a cellular system in 1979 as the first commercial service of this kind in the world. A shoulder-type device that enabled calls outside of cars appeared in 1985. However, this had limited users and did not spread widely due to its high cost: the price of the device itself required a security deposit of about 200,000 yen, the monthly basic charge was over 20,000 yen and the communication fee was as high as 100 yen per minute.

Telecommunication services during this period were operated as a **monopoly by NTT Public Corporation** under the supervision of the Ministry of Post and Communications. Monopoly by a public corporation was adopted because a monopoly was favored in light of the public nature,[6] natural monopoly and technical consistency[7] of telecommunication services, and also because a public corporation with a certain degree of independence in management, rather than one under government management, was thought to be desirable in order to achieve network expansion through efficient management.

Around this time, the government discussed administration and public finance reform for the purpose of "fiscal reconstruction without tax increases." Besides NTT Public Corporation, problems were also pointed out with the Japan National Railway and the Japan Tobacco & Salt Public corporation, such as inefficient management of such huge organizations and insufficient response to technological innovation. In 1985, **competition was introduced to the telecommunications market through the privatization of NTT Public Corporation and the establishment of the Nippon Telegraph and Telephone Corporation (hereinafter "NTT").**[8] This marked a turning point for Japan's telecommunications policy.

At the end of the 1972 fiscal year there were 105 private broadcasters in addition to Japan Broadcasting Corporation (NHK) and the number of NHK subscriptions had reached 24.43 million. **Television broadcasting continued to spread further thereafter**. According to a national audience survey conducted by NHK in November 1985, the ratio of people who watched television broadcasting (NHK and private), even a small amount, was 90% on weekdays. This means that almost all members of the public watched television every day in some way.[9] Television became an indispensable part of people's daily lives and the influence of television broadcasting on public opinion increased. For example, it is suggested that the broadcasting of war zones as news amplified the spread of anti-war movements, later civil movements and counterculture.[10]

While terrestrial broadcasting spread, the Cable Television Broadcast Act (Act No.114 of 1972) was enforced in 1973. Cable television that had spread as joint community reception facilities, mainly in mountainous regions and other areas where radio waves do not reach, became widely used to eliminate reception difficulties for television broadcasting caused by tall structures, etc.[11]

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[6] Communications as a public service were thought to be indispensable for people's lives and economic activities. For this reason, it was believed that service providers were obliged to provide their services universally at reasonable prices. Because communication services were used between users, a monopoly was thought desirable in order to prevent regional differences in service quality, charges, etc.

[7] In the case of communication services that are possible by connecting a large number of users through a communication network, connection of equipment of different technical specifications would involve costs to maintain service quality across the network. A monopoly was thought desirable to prevent this.

[8] The Act on Nippon Telegraph and Telephone Corporation, etc. (Act No.85 of 1984) and the Telecommunications Business Act (Act No.86 of 1984) were enacted in 1984, and were followed by the establishment of the NTT Corporation and enforcement of the Telecommunications Business Act on April 1, 1985.

[9] See 1986 Communications White Paper, "Part 4 Broadcasting" https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/s61/html/s61b0401.html

[10] https://www6.nhk.or.jp/special/detail/index.html?aid=20160221

[11] See 1975 Communications White Paper, Part 2 Chapter 5 Section 1 https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/s50/pdf/S50_09_C2E82C9F4B3C6CFC0C2E85BECFC2-5.pdf

Section 2 1985 to 1995: Development of Communications and Broadcasting Markets and Appearance of New Services

From 1985 to 1995, the foundation of the information society was built around the Internet thanks to the flow of technologies, human resources and funds from the military sector to the private sector as "peace dividend" of the end of the cold war and the opening of the Internet to the private sector. In Japan too, there were activities toward the provision of diverse telecommunication and broadcasting services through increased competition in the telecommunications market and the advancement of broadcasting services. We name the period from 1985 to around 1995 the "Development of Telecommunications and Broadcasting Markets and Appearance of New Services" and give an overview of the situation of the ICT sector during the period.

1. International Situation and the Trends Outside of Japan

In 1989 the Berlin Wall, a symbol of the cold war, fell, and the cold war structure based on east-west confrontation that had dominated the international community since the Second World War ended, and the world entered a new era. The European Union (EU) was established in 1993 and the strengthening of telecommunications in EU was recognized as one of the important requirements to complete a market where people, goods, services and capital move freely.[12] The 1994 termination of the Coordinating Committee for Multilateral Export Controls (COOM),[13] which had restricted economic activities between the East and West, developed an environment to globally enable free transactions in various sectors including ICT. Furthermore, China transitioned to a market-oriented economy and actively promoted the introduction of foreign investments. This nurtured an environment for China to become a major force in the global economy later.

The end of the cold war made it easier to divert the results of R&D by defense expenditure to the private sector. In addition, it was notable, particularly in the United States, how human resources and funds of the military sector flew into the private sector and such flow gave rise to **innovation** through vigorous R&D investment. The **development of information technologies,** including computers and the Internet, first triggered by R&D in the military sector, can be regarded as a peace dividend that was brought about by the shift of technology resources to the private sector following the end of the cold war structure.[14]

The Internet originated from the Advanced Research Agency Network (ARPAnet), the research for which started in 1967 with funds provided by the U.S. Defense Department during the cold war. At first, it was a connection tool used by computer scientists, but it was later made open to researchers in general and its convenience came to be known to private businesses as well. At that time, the US government presented the direction of commercial use of Internet in the NII (National Information Infrastructure)[15] Program, **and the Internet was opened to the private sector**. Thanks to the resulting general commercial use of the Internet, together with the technology innovations of personal computers and the Internet, **informatization progressed rapidly**.

2. Trends in the ICT sector of Japan

During this period, competition developed in the fixed landline communication market of Japan, while mobile phone services started to gradually spread. In addition, communication using personal computers, whereby data is exchanged over telephone lines, started to rapidly spread.

With the opportunities offered by the liberalization of the telecommunications market in 1985, long-distance, regional, satellite and international telecommunications markets became competitive with the entry of new operators into those markets. For example, three companies entered the long-distance telecommunications market, and this led to fierce price-cutting competition, especially in the Tomeihan Market, which connects Tokyo, Nagoya and Osaka, and was the largest market in Japan. Active new entries into the market saw the lowering of charges, **especially in long-distance call services**: charges for long distance telephone calls, which were 400 yen for three minutes in 1985, fell to 170 yen in November 1993 **(Figure 1-2-2-1)**.

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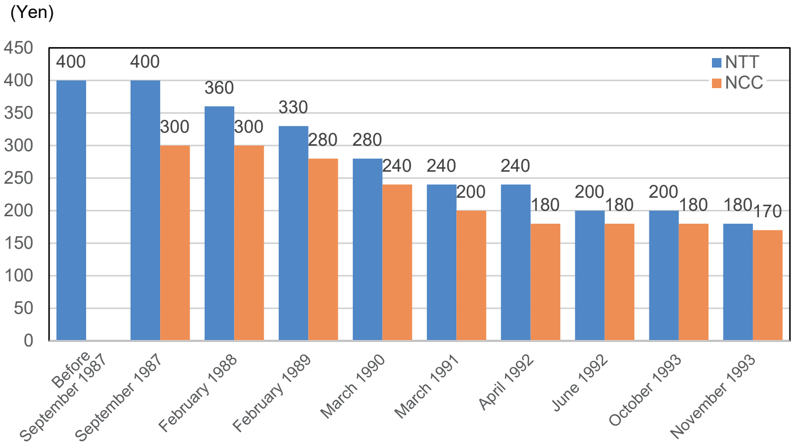
[12] See 1995 Communications White Paper, Part 3 Chapter 1 Section 2. https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h07/html/h07a03010201.html

[13] The committee was established by capitalist countries in Autumn 1949 and started its activities in January 1950 with the aim of regulating exports of high-tech goods to communist countries in order to establish a technology gap with communist countries to address security threats by the Soviet Union and the Warsaw Treaty Organization during the cold war.

[14] SHINOZAKI, Akihiko (2003) "Economic Impact of the Information Economy: Comparative Studies of Japan and the U.S." Chapter 4 Sections 4 and 5, and Internet Association Japan, "Internet White Paper 1996" Section 1 https://iwparchives.jp/files/pdf/iwp1996/iwp1996-ch02-01-p036.pdf

[15] In the United States, the Clinton administration promoted informatization. The initial "Information Super Highway Concept" advocating construction of an optical fiber network by the government was changed to the promotion of private investment and market competition, which pushed the spread of the internet open to the private sector. In the background there was criticism by the communications industry toward government interventions and difficulties with measures involving huge government spending when the 1993 Gramm-Rudman deficit-reduction law was enacted. The National Information Infrastructure: Agenda for Action paper, which was released in 1993, assigned the government a complementary role including cutting-edge experiments, securing of fair competition and infrastructure development.

Figure 1-2-2-1 Transitions in charges for long distance telephone calls[16]

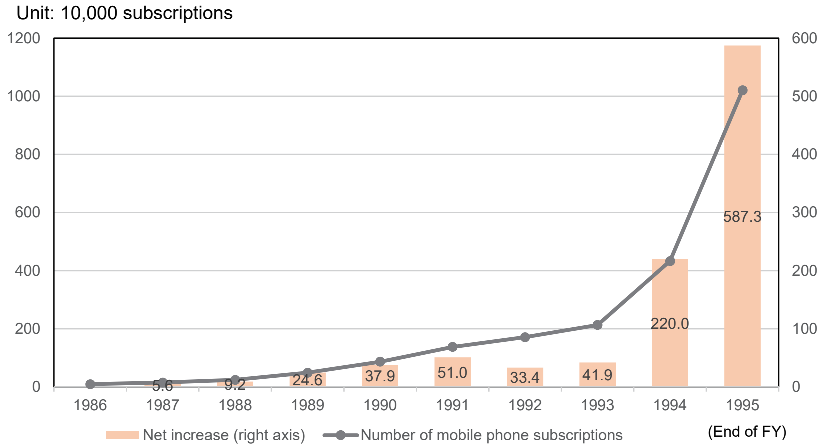


(Source) Prepared from NTT (1996) "10 years of NTT from 1985 to 1995: an overview of its history"

While competition intensified in the fixed-landline communication market, **competition gradually progressed in the mobile communication market**. Mobile phone services were only provided by NTT for a while after communication liberalization,[17] but two new business operators (mobile NCCs) entered the market and NTT was in competition with one or the other in each region. Specifically, IDO Corporation started to provide services in the Kanto/Tokai regions in 1988 and DDI Cellular Group gradually began to provide services in other regions, starting from Kansai in 1989 to Okinawa in 1992.[18] Mobile phones continued to be miniaturized. In 1991, NTT launched the "mova" series, the smallest mobile phone in the world at that time, and digital services (2G) started in 1993.

The number of mobile phone subscribers increased after communication liberalization partially due to the effect of new entries into the market, but hit a ceiling for a while in the early 1990s **(Figure 1-2-2-2)**. However, the Ministry of Posts and Telecommunications introduced a system allowing people to purchase and own mobile terminals (previously they were only rented) in 1994, and manufacturers competed to offer terminals attractive for users, the number of subscriptions exceeded 10 million in 1995, and this prepared the way for the rapid growth of mobile phone services.

Figure 1-2-2-2 Transitions in the number of mobile phone subscribers



(Source) Prepared from 1997 Communications White Paper[19]

[16] NCC (New Common Carrier) is the generic name for former Type 1 Telecommunications Operators who entered the market following communication liberalization in 1985.

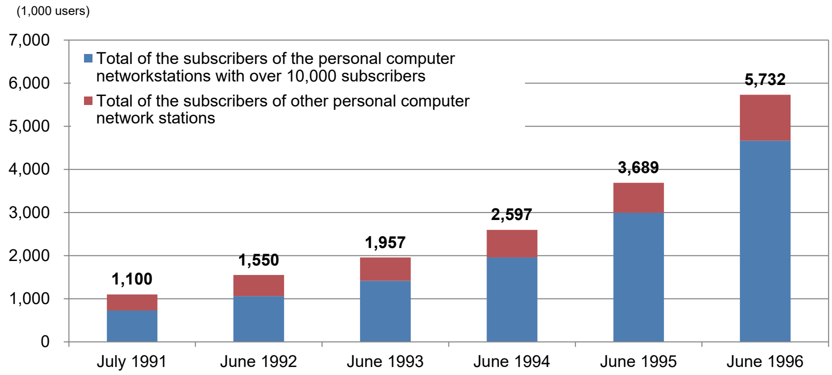
[17] Mobile communication services were separated from NTT in 1992 and a new company named NTT Mobile Communication Network Inc. (currently NTT DOCOMO) started operations.

[18] In 2000, IDO Corporation (IDO), DDI Group and Kokusai Denshin Denwa Co. Ltd. merged to establish KDDI. Digital Phone Group and TU-KA Group launched mobile phone services (in Kanto Koshinetsu, Tokai and Kansai) in 1994, established a joint venture (Digital TU-KA Group) in 1996 and started mobile phone services in other regions. Later, the venture was acquired by SoftBank in 2006 after the acquisition by J-Phone and Vodafone. Through these processes, the 3-company structure of NTT DOCOMO, KDDI and SoftBank was established. Later, the entry of Rakuten Mobile into the mobile phone market in 2020 created more competition in the market.

[19] https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h09/html/h09a01010101.html

In the first half of the 1990s, before the Internet became widespread, a large number of people used **personal computers communication services** connected to carrier computers via telephone lines or ISDN. The number of users rapidly increased from 1.10 million in 1991 to 5.73 million in 1996 **(Figure 1-2-2-3)**. Personal computer communication was mostly text-based, including emails, forums and chat, but this paved the way to data communication in addition to voice communication. It represented a big turning point for the communications industry, which had once focused on voice calls, to shift to the Internet, which spread later. In Japan, Internet Initiative Japan Inc. (IIJ) had already started business as an internet service provider in the first half of the 1990s.

Figure 1-2-2-3 Changes in the number of users of personal computer communication



(Source) Prepared from the 1997 Communications White Paper[20]

During this period, the **diversification of services** progressed in the broadcasting market. NHK **started BS broadcasting** using Broadcasting Satellites in 1989, and this was followed by Japan Satellite Broadcasting Inc. (currently WOWOW) in 1990. In 1992, **CS broadcasting began** using Communication Satellites (CS).

The government also implemented policies to encourage media companies to move toward multi-channels. For example, toward the 21st century, the **High-Vision City Concept**[21] was promoted to build cutting-edge cities full of energy and charm while taking advantage of regional characteristics by pioneering the introduction of advanced video media in urban living spaces. The Ministry of Posts and Telecommunications designated 13 regions as model cities in March 1989, and a further 35 regions were designated at the end of fiscal 1992.[22]

[20] https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h09/html/h09a01010502.html
[21] See 1989 Communications White Paper, Chapter 1 Section 4
https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h01/html/h01a01040501.html
[22] See 1993 Communications White Paper, Chapter 2 Section 3
https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h05/html/h05a02030102.html

Section 3 1995 to 2005: Spread of Internet and Mobile Phones

During this period Internet access rapidly spread to the public, especially in developed countries, and a shift to digital broadcasting started in Europe and the United States. In Japan too, the expansion of broadband and mobile communications significantly progressed in the information and communications field, and digitalization started in the broadcasting field. While ICT spread and developed, the negative aspects of ICT gradually surfaced, including the digital divide. We name the period from 1995 to around 2005 as "Progress of ICT – Spread of Internet and Mobile Phones" and provide an overview of the situation of the ICT sector during this period.

1. International Situation and Trends Outside of Japan

With the establishment of the World Trade Organization (WTO) on January 1, 1995, in addition to the enhancement of existing trade rules,[23] rules in the new field (service trade) were established and a more multilateral trade system was fostered compared with the era of the General Agreement on Tariffs and Trade (GATT). In 2001, China became a member of WTO, which raised the momentum of free trade worldwide. For the communications sector, WTO formulated "Annex on Telecommunications" to provide rules on access to and use of public telecommunications networks and services under its "General Agreement on Trade in Services (GATS). Negotiations on basic telecommunications started in 1994 toward liberalization in the field of basic telecommunication services including voice telephony.

In addition to the rise of free trade in the ICT sector, the "New Economy" theory, which appeared in the United States in the latter half of the 1990s, increased **expectations for active ICT investments and the role of ICT as a source of economic growth.**[24]

After the commercialization of the Internet and the **launch of Microsoft Windows 95** equipped with a TCP/IP protocol in the initial state, which provided a dial-up connection to a preinstalled Web browser in personal computers, use of the **Internet rapidly spread to the public**. Furthermore, the spread of Netscape Navigator, Internet Explorer and other web browsers **enabled users to view photographs and other images and to browse text-based information over the Internet**.

The spread of the Internet with a hierarchical model enabled the separation of communication equipment and services, and made the **vertical separation of layers** apparent. As a result, many services were individually provided in each layer, and businesses dedicated to such services emerged. The upper layers saw the birth of diverse content/application businesses and global platformers represented by GAFA which have a big market share today.[25] In the lower layers, the progress of IP use and other factors gave rise to the emergence of manufacturers of routers, servers, switches and other network equipment in addition to manufacturers of conventional communication equipment.

With the rapid spread of the Internet, **institutional responses to the negative aspects of the Internet progressed** in developed countries. In the United States, the Communication Decency Act (CDA) Section 230 was enacted in 1996. It established that providers, etc., are in principle not responsible for the information transmitted by third parties. The Child Online Protection Act (COPA) and the Digital Millennium Copyright Act (DMCA) were enacted in October 1998. The former aims to prevent children from viewing pornography over the Internet, while the latter aims to effectively protect the copyright of digital images, sounds, text and other productions exchanged on the Internet. The EU adopted an action plan on promoting *safer* use of the *Internet* by combating illegal and harmful content on *global* networks in 1999. The EU Council also adopted and approved the e-Commerce Directive stipulating that providers, etc., are not in principle responsible for information transmitted by third parties.

While the Internet continued to spread, mostly in developed countries, a gap in the ICT usage environment between developed and developing countries came to surface as a global issue. In this context, the issue of the **widening information gap between developed and developing countries** was presented at the ITU Plenipotentiary Conference of the International Telecommunication Union in 1998. Further, in 2000 the Kyushu-Okinawa Summit (G8 summit meeting) adopted the "Okinawa Charter on Global Information Society," which stipulates that **bridging the "digital divide"** is a common challenge for the international community.[26]

[23] https://www.mofa.go.jp/mofaj/gaiko/wto/gaiyo.html
[24] Regarding the long economic growth led by the United States at the time, "2000 White Paper on World Economy" (Cabinet Office) reads as follows: There are three viewpoints among the economists in the world. One of them is "rapid development of the information and communication technologies (IT) generated new industrial forms and social conditions and created a new economy that cannot be explained by the existing economic theories and experiences. For this reason, we expect a long and continuing boom in the future." (snip) The rapid growth and spread of information and communication technologies are called "IT Revolution." Japan, lagging behind these countries, needs to accelerate drastic deregulation and structural reform in order to accomplish dramatic "IT revolution." The analysis above also found this need.
[25] Amazon.com started in 1995. Google started in 1997. Apple launched iMac in 1998 and Facebook was established in 2004. Major platformers - Baidu (2000), Alibaba (1999) and Tencent (1998) - were also established in China.
[26] Ministry of Foreign Affairs "Kyushu-Okinawa Summit" https://www.mofa.go.jp/mofaj/gaiko/summit/ko_2000/outline/jp/overview.html

2. Trends in the ICT sector of Japan

During this period, **the Internet and mobile phone use rapidly spread**[27] in Japan as well.

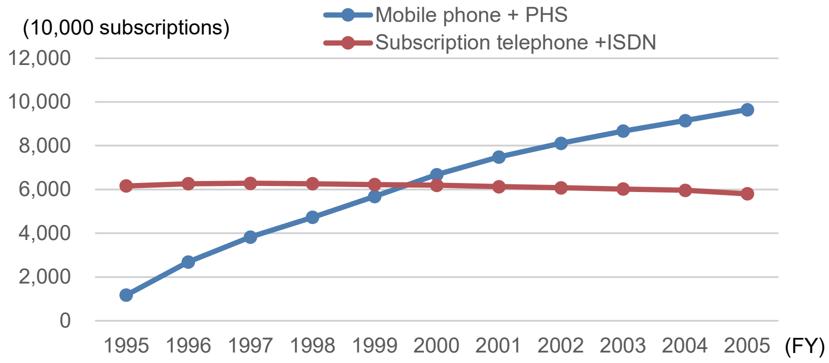
The dial-up connection for accessing the Internet, predominant when the Internet first started to spread, could not handle voice calls and Internet connection simultaneously, and users needed to create a connection each time they wanted to use the Internet. However, ADSL internet connection services, launched in 2000, enabled simultaneous voice calls and an Internet connection and provided **continuous Internet connection**, which fueled the spread of Internet use. New rules on connections of communication equipment/networks among business operators were established in the same year[28] for ADSL Internet connection services. As a result, new entrants to the market, including Yahoo!BB, started to provide low-price services in 2001, and charges went down, including the fees charged by NTT East, which had been providing services from the beginning. In addition, line speeds increased from an initial 1.5Mbps to 50Mbps by 2004. Thanks to lower prices and increased line speeds, the number of subscriptions rapidly grew to over 10 million by 2003, just three years after the launch of services.

A feature of the communication services in this period was the viewing of **images, including photographs,** in combination with text-based information through the Internet thanks to the spread of web browsers as described above.

In parallel with the above, **businesses and services using the Internet also expanded** in Japan around this time.[29] For example, in 1997 Rakuten promptly launched a shopping mall on the Internet called Rakuten Ichiba, which rapidly expanded as an EC mall where online shops could be opened with a small initial investment. In 1996, Yahoo launched its search service called Yahoo! Japan, a representative portal site for internet users in Japan. Later, Yahoo developed diverse services including news distribution, bulletin boards, shopping and auction services in order to increase traffic.

The number of mobile phone service subscriptions increased by about 10 million every year from 1996 to 2002 thanks to the introduction of device sales in 1994, which enabled users to own their mobile phones, and also because of lower costs as a result of the **termination of the charge approval system** in 1996. The number of mobile telephone (mobile phone and PHS) service subscribers exceeded the number of fixed landline telephone subscribers in 2000 **(Figure 1-3-2-1)**. In addition, the launch of i-mode by NTT DOCOMO in 1999 triggered the **full-fledged development of access services to diverse sites** (e.g., e-mail, bank transfer, ticket purchase) for **mobile phones**. At the end of 2005, the number of internet users via mobile devices exceeded the number of Internet users using personal computers.

Figure 1-3-2-1 Number of subscribers of communication services



(Source) MIC "Information & Communications Statistics Database"[30]

During this period, the Ministry of Posts and Telecommunications took various measures aimed at the **further promotion of fair competition in the telecommunications market**, **and the creation of an environment for information and communication use** in response to the rapid spread of the Internet and mobile phone services. For example, **in order to further promote fair competition in the long-distance telecommunication market and NTT's business improvement, NTT** was **reorganized** into one long-distance/international telecommunication company and two regional telecommunication companies under a

[27] 2001 Information and Communications White Paper considers 2001 to be the "First Year of Broadband"
[28] In 2000 rules were established on connection charges and conditions for unbundled connection of metallic subscriber lines, etc. (so-called dry copper and line sharing), and on conditions and procedures for the installation of connection equipment by competing businesses in NTT East/West stations. In 2001, rules were established for the opening of unbundling of subscriber system optical fiber (so-called dark fiber).
[29] In its introduction, the 2000 Communications White Paper states "Internet businesses are expanding. IT is not only generating new businesses but also is used as an effective tool for streamlining of enterprises. It has become rooted also in people's daily lives, expands their communication and influences their time management and lifestyles." The white paper compiled a special topic titled "The 21 Century Opened by IT – A Frontier Expanded by the Internet and Mobile Communication."
[30] https://www.soumu.go.jp/johotsusintokei/field/tsuushin02.html

holding company.[31] These companies became NTT (Nippon Telegraph and Telephone Corporation: holding company), NTT Communications Corporation (long-distance/international telecommunication company), Nippon Telegraph and Telephone East Corporation (regional telecommunication company) and Nippon Telegraph and Telephone West Corporation (regional telecommunication company)

Amid growing competition in the regional telecommunications market, a fund was created where a part of costs was paid by individual carriers (the **Universal service subsidy program**)[32] in order to ensure **universal services (fixed telephones, pay phones, emergency calls** and other telecommunication services that should be provided all over Japan because these services are indispensable for people's lives).Moreover, the **prior notification of communication charges was abolished in principle** and replaced by ex post facto remedial actions, including orders for business improvement, in order to **lower communication charges**. For the **safe and secure use of communication services**, carriers were obliged to provide an outline for charges and other conditions when concluding contracts, so as to appropriately and promptly process complaints and inquiries from users and to notify users before the termination of all or part of the business.[33]

A new development in mobile communications in 2001 was the entry **of Mobile Virtual Network Operators (MVNOs),** who provide mobile communication services to end users by procuring mobile communication networks from Mobile Network Operators (MNOs), who in turn provide mobile communication services using the frequencies allocated to them. In 2002, MIC published its "*Guidelines* on the Application of the Telecommunications Business Act and Radio Act related to MVNOs."

On the other hand, as the rapid spread of the Internet made it easy for anyone to disseminate information online, there was an expansion in the **negative aspects** of the internet, including **the spread of illegal/harmful information**. Accordingly, measures were taken by industry groups, and laws were developed to address this problem. Specifically, in 1998, the Telecommunications Services Association formulated and released its "Guidelines on responses by business operators pertaining to internet access services," which stipulated responses by providers who discover that illegal/harmful information is being disseminated. The Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers and the Right to Demand Disclosure of Identification Information of the Sender (Act No. 137 of 2001) was enacted in 2001 to specify the requirements for the limitation of liability for damages of service providers and the right to demand disclosure of identification information of a sender, when the rights of others are violated through distribution of information. In addition, in response to personal information leak cases that occurred around 2000, the expansion of electronic commerce and other issues, the Act on the Protection of Personal Information (*Act No. 57 of 2003*) was enacted in 2003.

In the broadcasting market during this period, the **digitalization of broadcasting media (terrestrial broadcasting, satellite broadcasting and cable television) continued to develop**, which formed the foundation for today's digital broadcasting. Advantages of broadcast digitalization include: (1) higher audio and video quality and increased channels; (2) upgrading of broadcasting services including data broadcasting and service cooperation with the Internet and other communication networks, and; (3) services friendly to the elderly and people with disabilities.

CS digital broadcasting started in 1996 as the first digital broadcasting service in Japan, and this was followed by digital broadcasting of cable television in 1998 and BS digital broadcasting in 2000. For terrestrial broadcasting, which had attracted widespread popularity among the public, digital broadcasting started in the three metropolitan areas (Kanto, Kinki and Chukyo) in 2003. Through digitalization, broadcasting programs started to provide high-definition[34] videos. Old CRT televisions were replaced by liquid crystal and plasma televisions as a result of technical innovations in flat displays, and the price per inch was lowered.

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[31] Based on the 1997 amendment of the Act on Nippon Telegraph and Telephone Corporation
[32] Based on the 2001 amendment of the Telecommunications Business Act. The subsidy program started in 2006.
[33] Based on the 2003 amendment of the Telecommunications Business Act.
[34] Refers to a television method that provides clear images and high-quality sound on a wide screen by changing the aspect ratio from 3:4 of a conventional television to 9:16, the number of scanning lines from 525 to 1,125 and the method from analog to digital. https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h01/html/h01a01040501.html

Section 4 2005 to 2015: Rapid Penetration of ICT - Expansion of Broadband and Mobile Phone Utilization

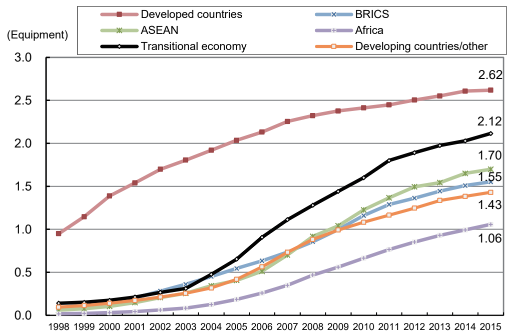
The launch of iPhones spread worldwide, and both Apple and Google, providing OS for smartphones, established their position as global platformers. In Japan too, networks were further upgraded, smartphones spread rapidly and the use of mobile devices expanded widely, which was partially because various services were developed and provided as applications on smartphones. We name the period from 2005 to around 2015 as the **"Rapid Penetration of ICT - Expansion of Broadband and Mobile Phone Utilization"** and provide an overview of the situation of the ICT sector during this period.

1. International Situation and Trends Outside of Japan

From the latter half of the 2000s, emerging countries began to rapidly increase their presence as exemplified by the increasing share of China and South American countries in the world's GDP. In particular, the fall of Japan's GDP to third place in the world behind China in 2010 symbolized the rise of emerging countries.[35]

In the mid-2000s, the **spread of mobile phones accelerated in emerging and developing countries as well (Figure 1-4-1-1)**. The Internet diffusion rate, which in 2000 was 6.5% worldwide and under 10% in more than half of all countries, reached 38.5% in 2013. The number of subscriptions increased 3.1-fold in Japan, the United States, Canada and Europe from 2000 to 2013 and 16.6-fold in emerging/developing countries in the same period.[36] The internet spread rapidly in emerging/developing countries.

Figure 1-4-1-1 Changes in ICT equipment amount per capita by region



*ICT equipment amount is the sum of the number of fixed landline telephone lines, mobile phone subscribers, fixed broadband internet connections, internet users and households owning computers divided by the population.

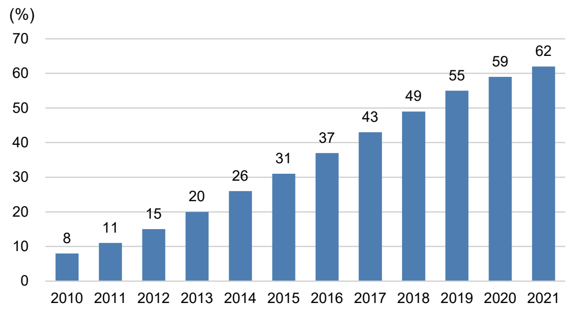
(Source) Noguchi et al. (2018)[37]

The upgrading of mobile networks (the expansion of broadband) expanded the use of the Internet via mobile phones.

In 2007, **sales of iPhones** started in the United States. The potential of smartphones to enable the use of various contents and applications attracted global attention, and manufacturers followed suit by introducing their products one after another. As a result, **smartphones came to take the principal position in the mobile phone market (Figure 1-4-1-2)**.

[35] https://www5.cao.go.jp/j-j/wp/wp-je11/h02_01.html
[36] See 2015 Information and Communications White Paper Chapter 2 Section 3 https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h27/html/nc123210.html
[37] NOGUCHI Masato, WASHIO Satoshi, SHINOZAKI Akihiro (2018) "Global transformation from digital divide to digital dividends – Long-term observation using 2015 global ICT data base", InfoCom Research Inc., Infocom Economic Study Discussion Paper Series, No. 6 https://www.icr.co.jp/service/infocom-ict/download/discussion-paper/pdf/2018/DP_06_201806.pdf

Figure 1-4-1-2　Transitions in the spread of smartphones in the world



(Source) Prepared based on Statista[38]

In tandem with the global spread of smartphones, **the marketing of content and applications** for end users (e.g. games, video/music streaming, maps, social media, search apps) **rapidly expanded.** As a result of this expansion, platform services that gather these contents/applications also rapidly emerged. Within this process, a few **global platformers** who succeeded in gathering important contents/applications **started to increase their market power**.

2. Trends in the ICT sector of Japan

During this period, Japan also saw the **further upgrading of network infrastructure and progression in the diversification of services.** and **smartphone use rapidly spread.**

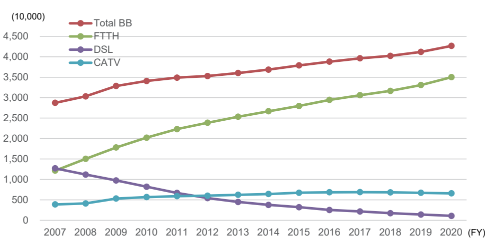
In the fixed telecommunication network sector, the spread of **faster FTTH** using optical fiber **progressed**. The total number of FTTH subscriptions reached 13.76 million in 2007, overtook DSL in fiscal 2007 and reached 28.79 million in fiscal 2015 **(Figure 1-4-2-1)**. Areas where broadband is available also expanded during this period. The ratio of households that can use FTTH or other fixed ultrafast broadband[39] was 83.5% at the end of March 2007, and reached 99.0% at the end of March 2015.

The upgrading and expansion of mobile communication networks also continued: LTE services were launched in 2010 and the number of subscribers with 3.9-4th generation mobile phones (LTE) reached 87.39 million at the end of fiscal 2015.[40]

With the speeding up and capacity enlargement of communication networks, an environment was gradually developed to post and view videos and other large volume contents, and services on the Internet were further diversified.

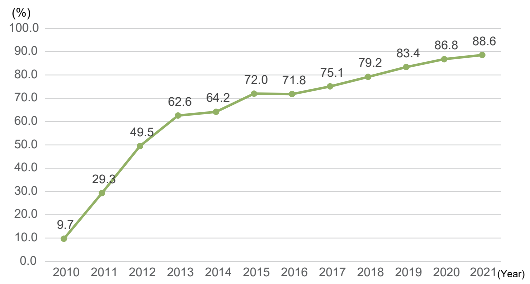
In 2008, iPhone was also launched in Japan and there was a remarkable **shift to smartphones (Figure 1-4-2-2)**. As described above, a smartphone enables use of various original content and applications via a mobile OS. Users can select services from among diverse content/applications including games, video/music streaming, maps, social media and search services regardless of hardware**, which greatly expanded the uses of mobile devices.**

Figure 1-4-2-1　Changes in the number of fixed broadband subscriptions in Japan



(Source) MIC "Information & Communications Statistics Database"[41]

Figure 1-4-2-2　Changes in the ratio of households with smartphones



(Source) Prepared from MIC "Communications Usage Trend Survey"[42]

[38] https://www.statista.com/forecasts/1146202/smartphone-penetration-forecast-in-the-world
[39] Here, "fixed ultrafast broadband" refers to "FTTH, CATV Internet (downlink speed over 30Mbps)" as of the end of March 2007, and "FTTH, CATV Internet, FWA (downlink speed over 30Mbps except FTTH)" as of the end of March 2015.
[40] https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h28/html/nc252210.html
[41] https://www.soumu.go.jp/johotsusintokei/field/tsuushin02.html
[42] https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

Around this time, **vertical separation and horizontal integration of layers** further progressed in the communications market of Japan as well. While amid the diversification and globalization of the markets, domestic businesses were also providing various online services, including search and internet shopping services, in the upper layers as mentioned above, Google, Amazon and other **global platformers** that provide various application services and functions for smartphone users **increased their influence** in the Japanese market as well.

In addition, against the background of the expansion of broadband as well as the downsizing, lower prices and high functionality of sensors, IoT started to spread during this period. Beyond conventional communication equipment, such as personal computers and smartphones, the concept of connecting **everything,** including equipment and daily necessities that had never been equipped with communication functionality before, such as cars, televisions, air conditioners, refrigerators, buildings and factories, **became connected to networks**.

The rapid spread of advanced and diversified ICT services brought about significant convenience in people's lives. However, the use of Internet and mobile phones by young people in this period gave rise to new problems, such as young people becoming involved in crime through the use of online dating services mainly from mobile phones and cyber bullying via underground websites, and this led to growing calls over the need to strengthen countermeasures.

To address this situation, MIC conducted R&D on filtering in cooperation with mobile carriers, and the mobile carriers **started filtering services in 2005**. The Act on the Establishment of an Enhanced Environment for Youth's Safe and Secure *Internet* Use (Act No. 79 of 2008) was enacted in 2008 and enforced in 2009. The act obliges mobile carriers to set a filtering function in mobile phones that are to be used for internet access by young people (younger than 18) before providing the phones in principle.

With increasing phone fraud and other crimes using mobile phones, the Act on Identity Confirmation, etc. Performed by Mobile Voice Communications Carriers for their Subscribers, etc. and Prevention of Wrongful Use of Mobile Voice Communications Services (Act No. 31 of 2005) was enacted in 2005 and fully enforced in 2006 in order to promote subscriber management systems of mobile carriers and to prevent the wrongful use of mobile voice communication services. This act obliges mobile carriers to confirm the identity of subscribers when concluding a contract and at the time of contract transfer.

Furthermore, MIC in cooperation with the Ministry of Education, Culture, Sports, Science and Technology and carriers started **"e-net Caravan" for children to promote the safe and secure use of the Internet**.

With the transition to digital broadcasting, **1seg** for receiving television broadcasting with mobile devices **started** in 2006, and this enabled the viewing of digital broadcasting both outside of home and at home.[43]

In 2008, NHK was allowed to distribute already broadcasted programs via the Internet for a fee as a "complemental use of broadcasting"[44] and it started "NHK on Demand" in December of the same year.

In 2011, BS analog broadcasting ended and BS broadcasting fully moved to digital. With **the end of terrestrial analog broadcasting** in all 47 prefectures in 2012, terrestrial broadcasting also **moved to digital broadcasting**.[45]

In addition, in September 2013 NHK started **"hybrid casting,"** a new broadcasting service to provide applications and content via the Internet in conjunction with broadcast programs,[46] and private broadcasters followed suit from 2014.

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43 The 2007 amendment of the Broadcasting Act allowed broadcasting of programs different from ordinary television programs (independent use).

44 Based on the 2007 amendment of the Broadcasting Act

45 "Provisional project to eliminate poor terrestrial digital television reception through satellite" ended in March 2015. "The digital-analog conversion service" provided by cable TV broadcasters for smooth transition to terrestrial digital broadcasting also ended at the end of April of the same year.

46 Use of hybrid cast realizes new broadcasting services fully taking advantage of communication services (bidirectional information exchange, distribution of large-volume contents, etc.) by using Web technologies, which include coordination with smartphones and other mobile terminals and provision of high-definition videos including 4K in addition to the conventional data broadcasting news, weather forecast, program-related information (program summary, etc.) and simple games (questionnaire, quiz, etc.)

Section 5 From 2015: Establishment of ICT as a Social and Economic Infrastructure

With the appearance and rapid spread of new ICT services including the sharing economy, such as ride sharing, private accommodation and crowdfunding, drones, AI, online lessons and online diagnosis, ICT has become a social economic infrastructure that is indispensable for people's lives. We name the period from 2015 as the "Establishment of ICT as Social and Economic Infrastructure" and provide an overview of the situation of the ICT sector in and outside of Japan during this period.

1. International Situation and Trends Outside of Japan

In various fields including ICT, China further grew as an economic power and achieved the second largest GDP in the world. China also took the number 1 spot, followed by the United States and Japan, in terms of the output of information and communication industries in 2014. Originally the United States had been number 1 in 2000.[47] In this context, criticism of China mounted in the United States for its violation of intellectual property rights and its demands for forced technology transfers. Amid a technology leadership competition between the United States and China, the United States enacted the 2019 National Defense Authorization Act, followed by The Foreign Investment Risk Review Modernization Act (FIRRMA) in August 2018, and the screening of foreign investments in the United States by the Committee on Foreign Investment in the United States (CFIUS) was strengthened. At the same time, the Export Control Reform Act (ECRA) was enacted to strengthen export controls.[48] The **relationship between economic activities and security** with a focus on high-tech industries achieved recognition as a real policy theme[49] **(Figure 1-5-1-1)**.

Figure 1-5-1-1 Trends in the initiatives for economic security in the United States and China

Country	Trends of initiatives for economic security
The U.S.	"The National Strategy for Critical and Emerging Technologies" was released in October 2020. Pillars of the strategy include promoting National Security Innovation and Industrial Base (NSIB) and to protect the country's tech advantages in critical and emerging technologies in order to lead the world in these technologies. The strategy identifies 20 technology area priorities, which include: "Communication and Networking Technologies," "Quantum Information Science," "Semiconductors and Microelectronics" and "Space Technologies." The 2021 Innovation and Competition Act that passed the Senate in June 2021 includes the Endless Frontier Act, the Strategic Competition Act, the Securing America's Future Act (provisions related to the Committee on Homeland Security and Governmental Affairs of the Congress) and the Meeting the China Challenge Act.
China	U.S. sanctions against China (high-tech cold war) made China face the vulnerability of its own supply chains. Starting with Huawei in May 2019, one Chinese high tech company after another were placed on the trade restriction "Entity List", which was designated by the U.S. Department of Commerce under the Export Administration Act, and became unable to procure American products. In order to overcome this weakness, the country announced a policy to upgrade industrial infrastructure, modernize industry chains and promote digitalization in "the 14th Five-year Plan."
Reference Japan	The government held expert meetings for economic security legislation to discuss economic security legislation from technical viewpoints. A bill for ensuring security by integrally taking economic measures with the four pillars of "supply chain," "critical infrastructure," "public-private technical cooperation" and "patent non-disclosure" was submitted to the 2022 ordinary session of the Diet and enacted in May of the same year.

(Source) MIC (2022) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

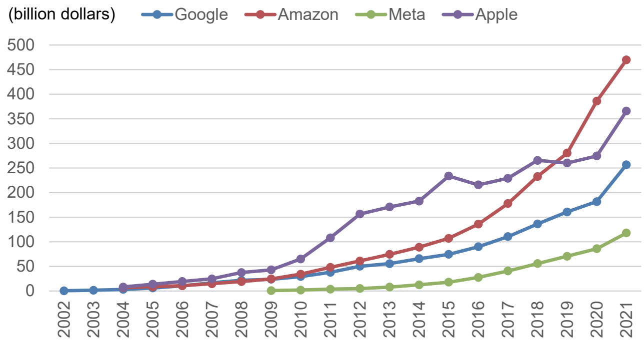
[47] ONOZAKI, Ayako (2021) "The impact of ICT progress at the inter-industry structure: A comparative study of Japan, the U.S., and China using IO tables," InfoCom Research Inc., InfoCom Economic Study Discussion Paper Series, No.16.
https://www.icr.co.jp/service/infocom-ict/download/discussion-paper/pdf/2021/DP_16_202101.pdf
She calculates and analyzes the output, added values, etc. of the information and communication industries (ICT hardware, communications, information services and contents) of the world and by major countries in 2000 and 2014, which was the latest year with available data by using the World Input Output Database (WIOD 2016).

[48] MIC, "Summary of the White Paper on International Economy and Trade"
https://www.meti.go.jp/report/tsuhaku2019/2019honbun/i0110000.html

[49] SHINOZAKI, Akihiko, "Cases to consider for Japan's economic activities and security in the face of Ukraine Crisis" Business + IT (March 15, 2022) https://www.sbbit.jp/article/cont1/82774?page=2

Since the mid-2010s, **big data analysis using AI, etc., has grown** and the services provided by global platformers have been further upgraded. Specifically, global platformers collect and analyze personal data including end users' attributes, locations, e-commerce purchase history, and video/music viewing history, and provide value-added services to present advertisements and other information according to the preferences of individual end users. On the other hand, as the market power of the global platformers in online businesses has further grown **(Figure 1-5-1-2)**, issues have been pointed out with respect to **data oligopoly and handling** by the global platformers and rule setting on platforms. Specifically, concerns are increasing about the situation where actions and preferences are managed by specific enterprises as a result of the concentration of data with enormous economic value to a few global platformers. In addition, as enormous amounts of data are transferred across borders, privacy and security risks have become apparent when transferred data are not appropriately managed. Concerns are rising about data management by the global platformers who are the recipients of especially great amounts of data.

Figure 1-5-1-2 Changes in the sales of GAFA



(Source) Prepared based on Statista data

Amid the rapid spread of smartphones and the evolution of mobile communication systems into local/social infrastructure, countries all over the world are investing in 5G networks and allocating frequencies to 5G. Starting with the **launch of 5G services** for smartphones in the United States and ROK in April 2019, 5G services have since started in countries around the world.

Against the background of the COVID-19 pandemic, which started in 2020, the role of ICT further expanded as it enables non-contact/non-face-to-face activities in social/economic activities. On the other hand, as exemplified by the Russian invasion of Ukraine in February 2022, ICT is also being abused as a means of assault, such as cyberattacks and the spreading of false information.[50]

[50] YONETANI, Nami (2022) "Russian Invasion of Ukraine and Trends in the ICT Sector," FMMC Researcher Report, March 2022, No.1. https://www.fmmc.or.jp/Portals/0/resources/ann/report_ru_220315_zenpen.pdf

2. Trends in the ICT sector of Japan

With the increasingly complicated international situation and rising influence of the global platformers, Japan is taking various actions to deal with these issues, including upgrading and increasing the resilience of ICT infrastructure and promoting data governance (See Chapter 2 for the details).

Considering that the number of telephone subscriptions has decreased and that transit switches and signal switches will reach their maintenance limit around 2025, NTT announced a plan in 2015 to **change the Public Switched Telephone Network (PSTN) of NTT East and West to an IP network** by 2025 and began this change in 2021.

While Communication infrastructure continues to be further upgraded, NTT DOCOMO, KDDI and SoftBank launched 5G services in March 2020. 5G has special features, such as high speed/large capacity, high reliability/low delay and multiple simultaneous connections. Its use cases include 4K/8K live streaming, highly immersive VR/AR experiences, multifaceted sports viewing, remote surgery and automatic driving. In addition, a **Local 5G** system has been established in Japan. Local 5G is available for various entities beyond carriers, and can be adapted according to local or regional needs. Demonstration experiments that are conducted to promote the utilization of 5G in diverse fields include medical/health care, agriculture, fisheries and manufacturing (in factories).

Discussions toward **6G/Beyond 5G, which will be the communication standard to follow** 5G, have started in many countries. In Japan, too, discussions have started on technical strategies for the construction of next-generation networks toward the 2030s.

Upgrading of broadcasting networks are also continuing to progress: new full-fledged **4K8K satellite broadcasting** for homes started in BS in 2018 and the number of televisions with which new 4K8K broadcasting can be viewed reached 12.64 million in April 2022.[51]

As the upgrading of ICT progresses in this way, various services that take advantage of ICT have appeared and ICT use has spread in various fields of social/economic activities.

For example, there continues to be progress in the **sharing economy,** that is to say economy vitalization activities to make assets (including intangible assets such as skills and time) held by individuals available for other individuals via matching platforms on the Internet.[52] Various share services have appeared and grown since the mid-2010s, such as the sharing or sale of "goods" (e.g. Mercari), "space/place" (e.g., Airbnb), and "means of transportation" (e.g., Uber), and the sharing of "money" whereby participants lend money to other people and organizations (e.g., READY FOR), and the sharing of "skills/human resources" including housekeeping and childcare (e.g., AsMama).

Video streaming over the Internet has rapidly grown since 2015, the year that Netflix and Amazon Prime Video started **video streaming services** in Japan. Information providers have further diversified because anyone can easily distribute or provide content with YouTube, TikTok, etc.

In addition to investments in and content provision to video streaming services, some broadcasters have constructed their own platforms to provide VOD (Video On Demand)[53] services and streaming services based on program organization.[54] For example, TVer was launched in 2015 through a common portal to make free internet video streaming available (missed-program webcasts) and it has been implemented individually by five private key stations in Tokyo.[55] Its reproduction number is steadily increasing.[56] In addition, **real-time program streaming services started being provided** by Nippon Television from October 2021, and by Television Asahi, TBS, Television Tokyo and Fuji Television Network from April 2022.

Use of AI has progressed with its incorporation in various goods and services. Examples close to daily life include internet search engines, audio response application of smartphones, voice search/input functions and cleaning robots. Humanoid robots equipped with AI are also being put into practical use as exemplified by Pepper of SoftBank Robotics.

As described in the Introduction, the utilization of ICT has grown in various fields of the public's socioeconomic lives, including disaster management and medical care, and the COVID-19 pandemic has further pushed **ICT utilization in terms of enabling a non-contact/non-face-to-face lifestyle** that incorporates telework, online learning and online medical care.

As a more specific example, the COVID-19 pandemic has led to the rapid introduction of telework by private enterprises. According to the Communications Usage Trend Survey of MIC, telework implementation rate among enterprises greatly increased from 20.2% in 2019 to 51.9% by the end of August 2021.[57]

In the education sector, **online lessons** were implemented due to the temporary closure of elementary, junior-high and high schools and universities. According

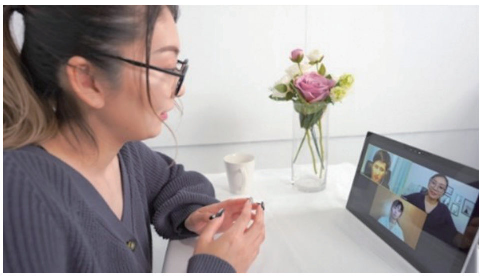
[51] The Association for Promotion of Advanced Broadcasting Services: https://www.apab.or.jp/
[52] Government CIO Portal Sharing Economy Promotion Office website: https://cio.go.jp/share-eco-center
[53] Video services to allow users to view already broadcasted programs and movies when they want to view the program after the end of release
[54] Unlike VOD, the service distributes video contents according to a predetermined program (timetable)
[55] VOD services through which already broadcasted programs can be viewed for a fixed period (e.g., a week) just after their broadcasting
[56] https://www.soumu.go.jp/main_content/000808154.pdf
[57] MIC "Communications Usage Trend Survey" (survey at the end August 2021) covering enterprises with more than 100 full-time employees https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

to a survey conducted by the Cabinet Office from April to May 2020, just after the declaration of a state of emergency, the ratio of elementary/junior-high school students receiving online education was 45.1% nationally and 69.2% in the 23 Wards of Tokyo.

In the medical field, considering the difficulties people faced in visiting medical institutions due to the spread of COVID-19, telephone and **online diagnosis and prescription** were made possible from initial examination as provisional/exceptional measures in April 2020. As a result, online medical care was available in 15.0% of all medical institutions as of the end of June 2021. Medication education over the phone or via information/communication equipment was also allowed, provided that pharmacists implemented it appropriately after obtaining information on the patient and their prescription situation.[58]

In response to the increase in working from home and staying indoors, online events rapidly spread, such as online meetings and drinking parties using social media, teleconference systems (e.g., Zoom) and online concerts using video streaming platforms, etc. **(Figure 1-5-2-2).**

Figure 1-5-2-2 Online meeting



(Source) AC

As described above, ICT has come to fulfill a role as the "infrastructure of infrastructure" that supports all social and economic activities, including education, medical care and labor.

[58] See Ministry of Health, Labour and Welfare, "Annual Report on Health, Labour and Welfare" Part 1, Chapter 1 Section 1 https://www.mhlw.go.jp/stf/wp/hakusyo/kousei/20/index.html

Chapter 2

Future Prospects for Japanese Society

Considering that, as described in Chapter 1, ICT has become an infrastructure that supports every social/economic activity, Chapter 2 takes a look at the changes expected in Japanese society in the future, analyzes the anticipated role of ICT and summarizes the challenges that are coming to the surface with the advancement and diversification of ICT and its spread in society.

Section 1 Prospects for the Role of ICT in Future Japanese Society

In Section 1, we provide an overview of the social changes expected in Japan in the future and analyze how ICT will respond to individual changes and also how it will change society.

1. Prospects for Japanese society in the future

The prospects for Japanese society in the future include increasingly serious social/economic challenges, such as shrinkage of the working-age population, decline of local economies, intensifying disasters, aging of infrastructure, further expansion in data distribution and increase in traffic, and acceleration of global warming due to growing power consumption.

(1) Shrinkage of the working-age population

With a declining birthrate, the working-age population (aged 15 to 64) of Japan has been declining from its peak in 1995 and is expected to fall to 52.75 million by 2050 (29.2% decrease from 2021).[1] There are concerns that the shrinkage of the working-age population will aggravate various social/economic issues, including labor shortages and the shrinkage of the economic scale due to a decrease in domestic demands.

(2) Declining birthrate and aging of population in rural areas

The falling population in combination with population aging is more significant in rural areas. While the ratio of the population aged 65 and over is expected to become over 30% in metropolitan areas by 2045, it is predicted to exceed 40% in rural areas. In particular regard to rural areas, there are concerns over increasingly serious challenges, including a shortfall in human resources in local economy/industries and difficulties in maintaining communities.

(3) Frequent and intensified disasters

In recent years the frequency of heavy rain with a risk of storm disaster has sharply increased, while accompanying landslide disasters are also on the increase.[2] Furthermore, according to a prediction by the Headquarters of Earthquake Research Promotion,[3] the probability of a Nankai Trough earthquake (magnitude 8 to 9) within 30 years is 70 to 80%, and the probability of an earthquake of around magnitude 7 (accompanying the sinking of the plate along the Sagami Trough) is around 70% during the same period (as of January 1, 2022).[4] There are concerns that natural disasters will continue to increase in frequency and intensity.

(4) Aging of infrastructure

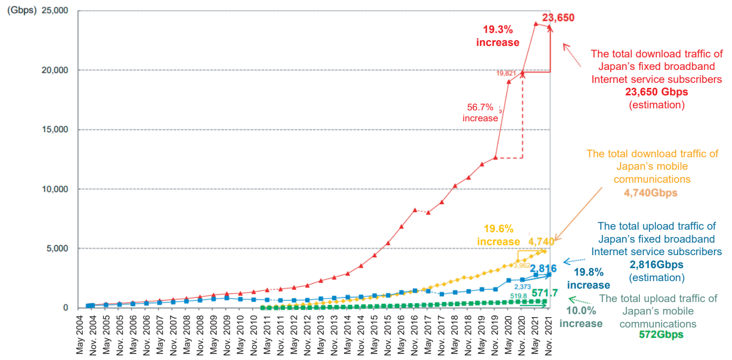
Social infrastructure that was developed during an era of high growth in Japan is rapidly aging. According to an estimation on the aging of social infrastructure from 2018 to 2033 by the Ministry of Land, Infrastructure, Transport and Tourism, the ratio of facilities that date back to more than 50 years ago will increase at an accelerated pace: from about 25% to about 63% for highway bridges, and from about 32% to about 62% for river management facilities.[5] There are concerns about increasing maintenance and renovation costs, as well as the occurrence of major accidents due to the aging of social infrastructure.

(5) Further growth in data distribution and traffic increase

Internet traffic in Japan doubled in two years from November 2019, just before the spread of COVID-19, and November 2021 **(Figure 2-1-1-4)**. There is a prediction that global IP traffic will increase more than 30 times by 2030 and 4,000 times by 2050.[6] It is expected that traffic will continue to also increase in Japan with the digitalization of socioeconomics.

[1] https://www8.cao.go.jp/kourei/whitepaper/w-2022/zenbun/pdf/1s1s_01.pdf
[2] https://www.bousai.go.jp/taisaku/gekijinhukko/list.html
[3] An organization that was established to communicate results of survey research on earthquakes and promote unified countermeasures by the government by using the lessons learned from the Great Hanshin Awaji Earthquake on January 17, 1995
[4] https://www.jishin.go.jp/evaluation/long_term_evaluation/lte_summary/
[5] https://www.mlit.go.jp/hakusyo/mlit/r02/hakusho/r03/html/n1221000.html
[6] https://www.jst.go.jp/lcs/proposals/fy2018-pp-15.html

Figure 2-1-1-4 Changes in Internet traffic



(Source) MIC (2022), "Aggregation result of Internet traffic in Japan (in November 2021)"[7]

(6) Fast rising electric power consumption and acceleration of global warming

With the progress in ICT utilization and increase in traffic, power consumption by ICT-related equipment is also on the increase. For example, it has been estimated that the world's data centers consume 1 to 2% of global power consumption. There is an estimation that, assuming that power consumption will increase in proportion to the increase in IP traffic in Japan, ICT-related equipment alone will consume nearly double the amount of current annual power consumption **(Figure 2-1-1-5)**. There are concerns over an acceleration in global warming due to rapidly growing increases in power consumption.

Figure 2-1-1-5 Predictions for IT-related power consumption

Forecast of IT-related power consumption	2016	2030	2050
IP traffic (ZB/year)	4.7	170	20,200
Power consumption (Japan: TWh/year)	41	1,480	176,200
Power consumption (World: TWh/year)	1,170	42,300	5,030,000

(Source) Center for Low Carbon Society Strategy, Japan Science and Technology Agency (2019) "Impact of Progress of Information Society on Energy Consumption (Vol. 1): Current Status and Future Forecast of Data Center Energy Consumption and Technical Issues[8]

2. Prospect for the roles to be fulfilled by ICT

In order to cope with various social and economic challenges, including the shrinkage of the working-age population, decline of local economies, and intensifying disasters which are expected to worsen in the future, it is necessary to reform society as a whole through activities toward improving labor productivity, expanding labor participation and regional vitalization. Next, we examine what role ICT can play in this process to contribute to social reform.

(1) Improving labor productivity and expanding labor participation through ICT

While labor shortages due to the shrinkage of the working-age population have been forecasted, improvements in labor productivity and expansion of new labor participation are expected from the utilization of ICT.

Examples include: the use of robots/AI to replace manual work to reduce the labor needed to generate the same products/added values, or to improve work efficiency through the speeding up of work and accuracy improvement, and analysis of big data to further improve efficiency of production and distribution processes.

Furthermore, it is expected that the use of telework, satellite offices and cloud sourcing will enable people to work regardless of geographic limitation and empower those who have difficulty in working for various reasons, such as childcare, family care or disabilities to choose from diverse and flexible working styles, which would contribute to an improvement in the labor force participation rate.

(2) Regional revitalization through ICT

While local economies are expected to shrink, use of ICT could expand the trading area of local enterprises, and enable working styles and use of services not limited by geographic conditions, which would contribute to regional revitalization.

For example, spread of ICT expanded markets without limits on time and location nationwide and around the world. Thanks to lower matching costs, different kinds of manufacturing at even a small scale can find

[7] https://www.soumu.go.jp/joho_tsusin/eidsystem/market01_05_03.html
[8] https://www.jst.go.jp/lcs/proposals/fy2018-pp-15.html

markets without scale restrictions, and small local enterprises can provide goods and services that meet various needs in every region.

The development of ICT enables telework and other working styles not limited by location, and people living in rural and urban areas can enjoy the same services (e.g., online shopping, telemedicine, remote education). These new working styles and lifestyles are expected to enable young people living in their hometowns to work for companies in metropolitan areas, and people in metropolitan areas to move to rural areas while maintaining their current jobs and to use various services there, which would contribute to increasing the resident populations of rural areas.

(3) Prompt and efficient information collection and communication using ICT

As disasters are increasingly fierce and frequent, use of ICT is expected to contribute to efficient and effective disaster prevention and mitigation through prompt, efficient and detailed collection of disaster-related data as well as the prompt and accurate provision of information for evacuation etc.

For example, the integrated handling of information from a variety of sensors and high-definition videos that make use of the ultra-high speed and large capacity of 5G would improve prediction accuracy for river flooding and enable the prompt issuing of evacuation orders. When there is a disaster, high definition videos from cameras installed on-site or mounted on drones can be transmitted via ultra-high-speed and low-delay 5G for accurate understanding of the disaster or the accident situation to improve evacuation efficiency. Regarding the provision of information for residents, AI analysis of positional information that is based on the built-in GPS of smartphones, and information on applications and information sent by victims, etc., is expected to enable the efficient distribution of information needed by victims, which would contribute to prompt and accurate evacuations.

(4) Maintenance and management of social infrastructure by using ICT

Amid concerns about the rapid aging of social infrastructure, use of ICT is expected to enable more efficient and sophisticated infrastructure maintenance, renovation and management, and contribute to the long life of social capital and reduction/leveling of total cost of social capital, including maintenance and renovation in the long run.

For example, the transmission of 4K/8K and other high-definition videos will improve the precision of monitoring, while analyzing videos with increased information volume using AI technologies will enable more prompt and detailed detection of abnormalities in electric cables, roads, building outer walls, railway lines, etc. Furthermore, ultra-high-speed and low-delay transmission through 5G from cameras installed on sites, mounted on drones and inspection vehicles will enable real-time monitoring and management.

(5) Contribution to Green Society

At a time when global warming is expected to get worse, the power consumption of ICT equipment is also expected to increase. Power saving through the development and introduction of new technologies is expected to contribute to the realization of a green society (Greening ICT). It is also expected that the use of ICT in society, including homes and enterprises, will promote the realization of a Green Society through operational efficiencies and reductions in the movement of people and merchandise (Greening by ICT).

Efforts for the Greening ICT include: the development of software with small environmental load in upper layers, development of all-photonics networks for low power consumption in the network layer, and reduction in power consumption through the virtualization of mobile phone base stations. It is expected that the greening of ICT itself through the development and introduction of these new technologies will contribute to the realization of a green society.

For the Greening by ICT, the manufacturing industry is advancing smart factory initiatives where ICT is used for saving labor and optimizing production lines to improve energy efficiency per unit of production. In homes, use of HEMS (Home Energy Management System), which uses ICT to optimize power use by understanding the power consumption and operating conditions of electric equipment for a fixed period, will contribute to energy saving and environmental load reduction. In addition, expanding the use of digital services, including video and music streaming and e-books, is expected to lead to a reduction in CO2 emissions through reduced human movement and physical distribution.

Section 2　Responses to Already Apparent Challenges

As described above, at a time when ICT is playing an increasingly significant role in social and economic activities, some challenges associated with the rapid penetration of ICT are already emerging, which Japan and other countries are responding to. Of these challenges, (i) risks involved in changes in the international environment, (ii) data governance, and (iii) illegal and harmful information, will be discussed in Section 2 and existing activities to respond to those challenges will be reviewed.

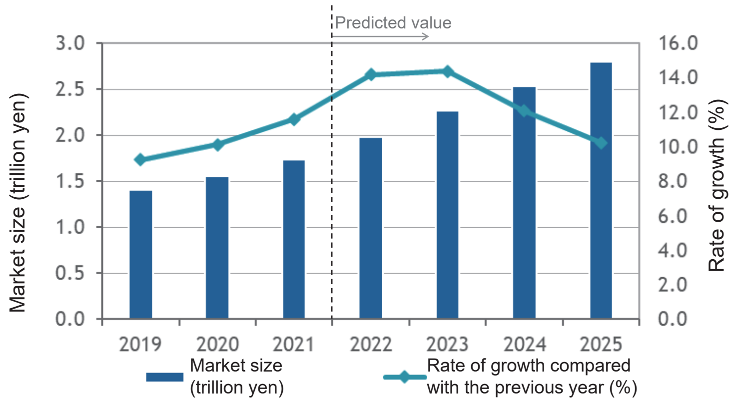
1. Response to risks involved in changes in the international environment

As discussed in Chapter 1, Section 5, amid increasingly complicated international situations in recent years, inherent risks have come to be recognized, such as the vulnerability of basic infrastructure and supply chains that form the foundation of people's lives and economic activities. In the meantime, ICT, like energy, has become the most basic infrastructure elements that support all sorts of social and economic activities, including the activities of other industries, along with the progress in digitalization in society as a whole. Therefore, it is an important task to strengthen ICT infrastructure and supply chains for ICT-related equipment and components, to secure the stable supply of ICT services and to enhance communications networks.

In recent years, there have been cases in which malware or other illegal software programs have penetrated networks through supply chains related to the procurement of equipment or systems for communication that are part of the information and communications infrastructure or related to system maintenance or operation, and there have also been cases in which supply chain security has been undermined through vulnerable organizations. There have also been cases in which the development of ICT networks has been delayed as a result of a global semiconductor shortage caused by the impact of the COVID-19 pandemic.[9]

In line with future growth in data demand due to the spread of the practical application of digital technology in rural areas, for example, the importance of data centers which store and process data is expected to grow further. Given that prospect, excessive dependence on data centers located in other countries would entail the risk of data leakage and access disruption. Around 60% of all data centers in Japan are located in the Tokyo metropolitan area (Tokyo, and Saitama, Chiba and Kanagawa Prefectures), and the predominant concentration of data centers there is expected to continue in the future. Considering the possibility that damage caused by a major earthquake or other disaster in the Tokyo metropolitan area may have a huge impact on the communications environment on a nationwide scale, it is essential to geographically disperse data centers in order to strengthen the resilience of Japanese communications networks against disasters.

Figure 2-2-1-1　Changes and forecasts for the size (sales) of the data center service market in Japan



(Source) IDC Japan[10]

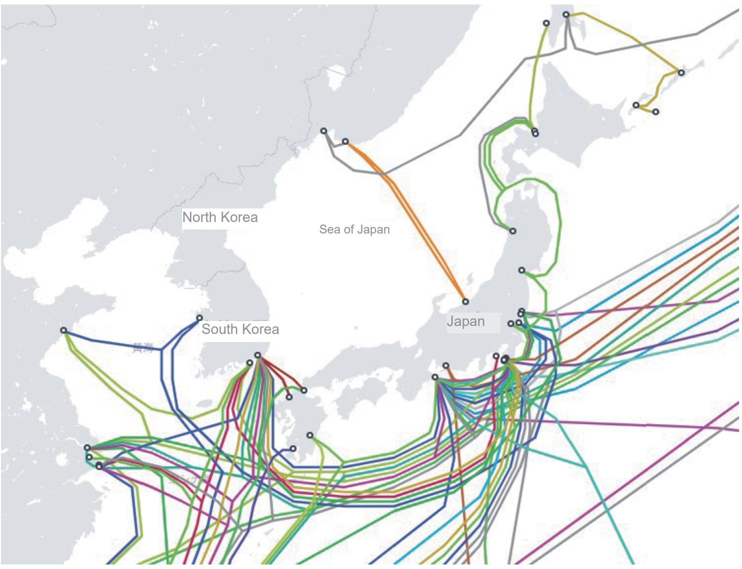
Moreover, as approximately 99% of international communications traffic goes through submarine cables, their importance is growing, associated with the probability of a further increase in international traffic is expected. However, Japan's submarine cable network is underdeveloped (a missing link) in areas off the Sea of Japan coast because domestic submarine cables have been laid mainly off the Pacific coast. In addition, cable landing stations, which represent the ends of submarine cables, are concentrated in the Boso Peninsula **(Figure**

[9] Rakuten Mobile previously planned to move forward, by around five years to the summer of 2021 or earlier, the achievement of the goal of raising the population coverage rate to 96% by the end of March 2026 under a base station development plan submitted to and approved by the Ministry of Internal Affairs and Communications. However, the goal was achieved only in February 2022 due to delays in the development of 4G base stations caused by a semiconductor shortage.

[10] https://www.idc.com/getdoc.jsp?containerId=prJPJ48272821

2-2-1-2). Risk, such as the disconnection of submarine cables, has materialized, as was the case when a volcanic eruption in Tonga caused disruptions to international communications due to submarine cable breakage, or when the Great East Japan Earthquake caused multiple submarine cables to be severed. Therefore, it is necessary to assume various risks, including natural disasters, human error, and sabotage, and to take steps to secure flows of communications traffic via submarine cables.

Figure 2-2-1-2 Map of submarine cables laid around Japan

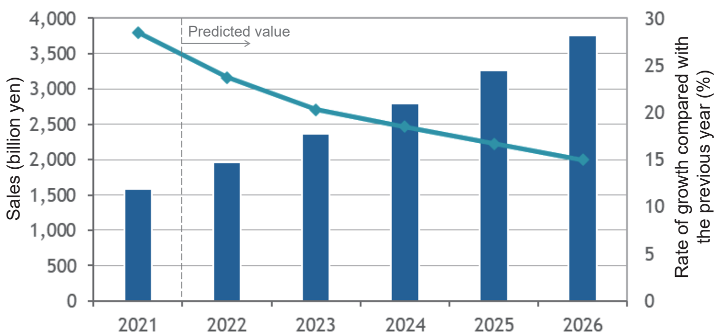


(Source) TeleGeography, "Submarine Cable Map"[11]

According to the results of observations[12] by the Network Incident Analysis Center for Tactical Emergency Response (NICTER), which is operated by the National Institute of Information and Communications Technology (NICT), the annual total number of packets observed per IP address, which represents the level of cyberattack-related internet activity, declined from the previous year (by around 6%) to approximately 1.75 million in 2021, marking a turnaround from the uptrend that had continued since 2012. However, compared with 2019, that number still represents an increase of around 40% over a two-year period, reflecting a continued flood of cyberattack-related packets. Furthermore, when it comes to data security, Japan has fallen into a vicious spiral of failure: the country depends heavily on foreign sources for its supply of cybersecurity products, services and information, resulting in a lack of access to real-world data essential for research and development, which has impeded the development of original Japanese cybersecurity technology, and this situation is in turn undermining the ability to collect and analyze cyberattack information in Japan.[13]

Although the development of cloud services has been remarkable in Japan as well (**Figure 2-2-1-3**), U.S. and other foreign vendors have come to dominate the cloud service market in Japan, raising concerns in some quarters about an excessive dependence on foreign sources.

Figure 2-2-1-3 Changes and forecasts for the market size (sales) of public cloud service in Japan



(Source) IDC Japan[14]

[11] https://www.submarinecablemap.com/
[12] NICT (2022) "NICTER Observation Report 2021," https://www.nict.go.jp/press/2022/02/10-1.html
[13] Ministry of Internal Affairs and Communications, Cybersecurity Task Force (2021), "ICT Cybersecurity Comprehensive Measures 2021" https://www.soumu.go.jp/menu_news/s-news/02cyber01_04000001_00192.html
[14] https://www.idc.com/getdoc.jsp?containerId=prJPJ48986422

Chapter 2

In May 2022, the Economic Security Promotion Act (formally known as the Act on Promotion of Economic Security through Integrated Implementation of Economic Measures), which has four pillars—securing stable supply of critical goods, ensuring stable provision of basic infrastructure services, supporting the development of key advanced technologies, and non-disclosure of patent applications—was enacted, to be enforced in phases.

The Ministry of Internal Affairs and Communications has developed a new technology strategy intended to accelerate research and development, through intensive investment by the government in order to acquire strategic indispensability and strengthen Japan's international position with respect to the development of advanced technologies in which the country has an advantage and can lead the world, such as all-photonics network technology[15], NTN (non-terrestrial network), and secure virtualized and integrated network technology.[16]

Moreover, in order to secure the strategic autonomy of and acquire strategic indispensability for the information and communications industry, which has a growing role as a strategic infrastructure industry, the ministry has developed a comprehensive strategy which lays down the development and introduction roadmap of new technologies that could become game-changers, the processes of customer- and market-oriented business expansion, the direction of initiatives related to practical application of solutions based on the integration of "monozukuri" (traditional manufacturing) expertise and digital infrastructure, and eight priority fields.[17]

2. Current state of data governance

As mentioned in the previous chapter, the economic value of data has been dramatically rising in recent years. Data is considered to be "a key source of knowledge/wisdom, value and competitive strength, and a powerful card for the solution of social issues of Japan as an advanced country with new problems."[18] Meanwhile, concerns are mounting globally over the concentration of user data, including personal preferences and behavior history, among the global platformers and how this data is analyzed and used by them as described in Chapter 1, Section 5. For example, in Japan, some media reported the case where the personal information of users held by a domestic business was accessible by a foreign corporation which had been entrusted with operations,[19] and it has been pointed out that there are growing risks due to the inappropriate handling of information by business operators sitting on a large mass of information amid the progress of globalization, including the overseas consignment of development, and the use of diverse vender products and overseas data centers.

In this context, **data governance** initiatives toward the effective and proper use of data are progressing in Japan and other countries. Under the **European Strategy for Data** released in February 2020, the **EU** is developing unified rules on access to the enormous quantity of data generated by individuals and enterprises, with the aim of constructing a single data market and promoting technological innovations so that it can hold a leading position in the digital economy.[20] The **Data Governance Act**, which was developed based on the strategy, proposes a mechanism for the use of data that suits needs across industries and borders in order to promote reliable data distribution.[21] In addition, the Proposal for a Regulation on harmonized rules on fair access to and use of data [22] that provides the right to access industrial data, etc., was published in February 2022. **The United States**, which is home to many global IT giants, including GAFA, has not made any strong interventions in the promotion of data utilization in the private sector. However, **both federal and state governments are working proactively in the public sector**. For example, the federal government is rapidly constructing a data value improvement and governance structure based on its Federal Data Strategy published in June 2019.[23] **In China, the Data Security Law** was enforced on September 1, 2021. This law clearly defined the concept of data, established basic systems including protection of data classification/grading, risk assessment, monitoring/early warning and emergency response, and clarified the obligations to be fulfilled when handling data.[24]

In line with these international trends, Japan made a cabinet decision in June 2021 on a **National Data Strategy and** compiled challenges and countermeasures with seven layers, including strategy and policy, organization, rules and service platform.[25]

MIC with cooperation of bodies concerned conducted a questionnaire survey to understand actual situations including efforts by telecommunications carriers and examined their security measures and data handling. In addition, the Act Partially Amending the Telecommunications Business Act (Act No. 70 of 2022) was enacted in June 2022. The act obligates the proper handling of user

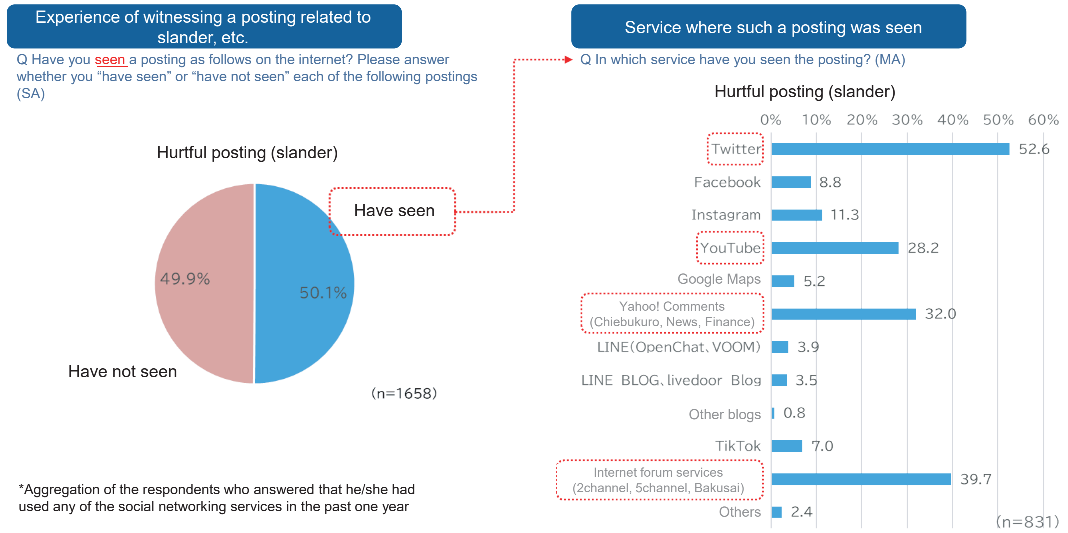
[15] One of the major technical fields under the IOWN initiative, which is being promoted by NTT.
[16] For further details, see Chapter 4, Section 7.
[17] For further details, see Chapter 4, Section 1.
[18] National Data Strategy (Cabinet Decision on June 18, 2021)
[19] Later, it was confirmed that access by the foreign corporation was a legitimate operation in the development and maintenance processes.
[20] https://www.jetro.go.jp/biznews/2022/02/225affa523fffc72.html
[21] https://www.pwc.com/jp/ja/knowledge/prmagazine/pwcs-view/202203/37-03.html
[22] https://digital-strategy.ec.europa.eu/en/library/data-act-proposal-regulation-harmonised-rules-fair-access-and-use-data
[23] https://www.soumu.go.jp/main_content/000756398.pdf
[24] https://www.jetro.go.jp/ext_images/_Reports/01/580a6448fa87f0bb/20210056_04.pdf
[25] National Data Strategy (Cabinet Decision on June 18, 2021)
https://www.digital.go.jp/assets/contents/node/basic_page/field_ref_resources/63d84bdb-0a7d-479b-8cce-565ed146f03b/02063701/policies_data_strategy_outline_02.pdf

information obtained by telecommunication carriers, which has a significant impact on the interests of users, by formulating and disclosing handling rules for such information. Moreover, when a telecommunication carrier intends to transmit a program that orders the transmission of information on a user to a third party, etc., carriers have to provide users with an opportunity to confirm, for example. Since then, the public and private sectors have been jointly advancing discussions toward the smooth enforcement of the act.

3. Response to illegal/harmful information

With the dissemination of various Internet services including social networking and video streaming services, anyone can send information, enormous quantities of information are being distributed, and a variety of information is readily available. While ICT has become an infrastructure that forms the foundation for daily life and socio-economic activities, the spread of illegal/harmful information has become a challenge, which includes the distribution of expressions slandering people and contents infringing intellectual property rights. According to a survey conducted by MIC[26], about half of the respondents (50.1%) have seen “a hurtful post (slander)” **(Figure 2-2-3-1)**.

Figure 2-2-3-1 Experience of witnessing a post related to slander, etc. and the service where such posts were found



(Source) From Material 5 of MIC Study Group on Platform Services (36th meeting)[27]

Recently, the problem of disinformation has emerged, including false information distributed with intention and information of unknown authenticity. It has also been pointed out that there are biases in the information acquired by users on platform services such as social media. For example, communities of users with similar interests and opinions are formed and the community’s users see only opinions similar to theirs (echo chamber); and other information, outside of their personalized, desired information, is automatically excluded (filter bubble). This problem is emerging across the world. Various initiatives are being conducted to address this around the world, such as efforts to improve the ICT literacy of users, to promote fact checking and to mediate information distribution by business operators.

Institutional responses are also progressing. For example, in April 2022 the EU provisionally agreed on the Digital Service Act, which stipulates the responsibilities of all intermediary service providers (e.g., platformers) on the distribution of illegal contents, and obligations to protect users according to the scale of the business. In the United States, the problem of disinformation at the time of the 2016 presidential election triggered surveys and discussions on disinformation countermeasures. A public hearing on the efforts of platformers was held at Congress in a move to review Section 230 of the Communications Decency Act of 1996, which stipulates that providers are not responsible for content disseminated by a third party.

In Japan too, institutional measures have been implemented to facilitate relief for sufferers of rights violations through slander, etc., over the Internet, which includes an amendment of the Provider Liability Limitation Act to establish a new judicial procedure (for non-contentious cases) for the disclosure of sender information (the amended act was enacted in April 2021 and enforced in October 2022), and an amendment of the Penal Code to raise the statutory penalty of insults (the amended code was enacted in June 2022 and the statutory penalty of contempt is to be enforced in summer of the same year), for example. In addition, under the Policy Package for Dealing with Slander Over the Internet, which

[26] Questionnaire survey on actual state of distribution of slander on the Internet
[27] https://www.soumu.go.jp/main_sosiki/kenkyu/platform_service/02kiban18_02000207.html

was compiled and published in September 2020, MIC in collaboration with relevant groups has been implementing the following: a system to disclose the identification information of senders; user education on information ethics and ICT literacy; support for voluntary initiatives by platformers and improvement of their transparency and accountability (through the continuous monitoring of platformers); and enhancement of the consultation counter functions (strengthening the system of the Illegal/Harmful Information Hotline, strengthening of collaboration among consultation centers and dissemination of the information on multiple consultation centers). In addition, private businesses and groups are also taking actions, which include handling reports from the public regarding illegal content and harmful content on the Internet by the Safer Internet Association (SIA).

With regard to disinformation, MIC is continuously conducting surveys on the state of contact with, reception and spread of disinformation by citizens and their attitude to information distribution, and considering measures against disinformation based on the results, etc. Furthermore, diverse stakeholders in the private sector are advancing various initiatives. Examples are initiatives to promote fact checking, including the development and publication of the fact check guidelines and rating standard by the Fact Check Initiative Japan, and the study of disinformation countermeasures by the Forum against Disinformation set up by SIA.

Column 1 Past 50 years of mail and correspondence delivery

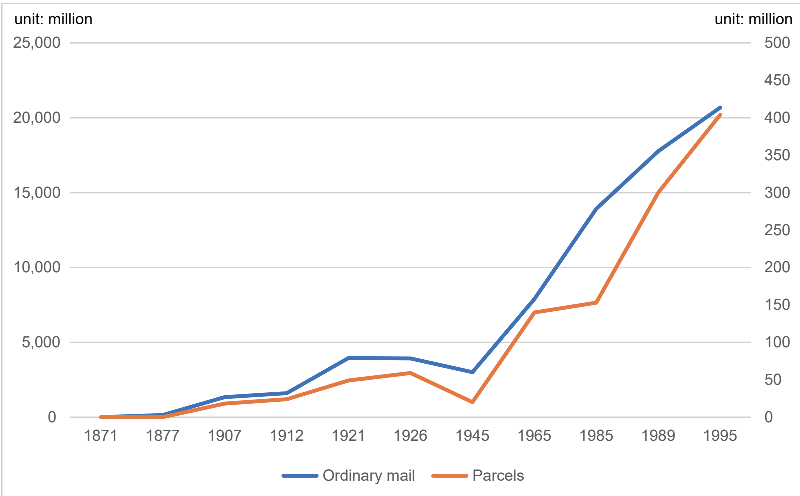
This column reviews the history of mail and correspondence delivery by dividing the 50 years after the publication of the White Paper into five periods as in Chapter 1.

1. 1973 to 1985

With the expansion of economic activities during a period of high economic growth in Japan, the volume of mail and parcels increased. The total volume of post reached 15.3 billion items in fiscal 1979[1], the third highest volume in the world after the United States and the Soviet Union.

During this period, the further development of transportation means, including railways and aircraft, as well as progress in mechanization and computerization, further increased the speed of postal service provision. Key initiatives of the mechanization and computerization of postal services include a full-automatic system to consistently handle all processes, from the sorting of letters to placing them in mailbags, was introduced in 1975, and self-service machines for accepting mail were introduced in 1976.

Figure 1 Changes in postal volume



	1871	1877	1907	1912	1921	1926	1945	1965	1985	1989	1995
Ordinary mail	0.6	143	1,340	1,606	3,944	3,915	3,007	7,898	13,917	17,767	20,683
Parcels	0	0	18	24	49	59	20	140	153	300	404

(Source) Excerpt from Nakamura (1997)[2]

[1] Japan Post (2021) "Serving Customers – 150-year History of Postal Service" material p263.
https://www.japanpost.jp/150th/digest/pdf/08.pdf

[2] NAKAMURA, Yoshiaki (1997) "Transition of Postal Undertaking over 100 years -From Railroad Horse to Car &Airplane, from Manual Handling to Machine Processing" Japan Society of Mechanical Engineering, Vol.100, No.939, pp.177-184.
https://www.jstage.jst.go.jp/article/jsmemag/100/939/100_KJ00003054331/_pdf/-char/ja

2. 1985 to 1995

In this period, attention was paid to how postal services contribute to creating vibrant communities. The Ministry of Posts and Telecommunications proposed its "Utopia Vision" in 1987 and experimentally introduced "Town Mail[3]" and "DM Support Service[4]" as new community post office services **(Figure 2)**.

This is also a period when the quality of postal service was improved through use of information and communications technologies. Introduction of a parcel tracking system and the international business mail (current EMS) tracking system in 1988 and the registered mail tracking system in 1991 enabled a prompt answer to customers' inquiry of arrival.[5]

Figure 2 Model cities of the Utopia Vision

(Source) Excerpt from 1989 Communications White Paper[6]

3. 1995 to 2005

This period saw major changes in systems for providing postal services. Specifically, as a result of a central government reorganization in January 2001, the Ministry of Posts and Telecommunications was reorganized into the Ministry of Internal Affairs and Communications (MIC) and the Postal Service Agency was set up as an affiliated agency of MIC. Later, the Postal Service Agency was reorganized into a public corporation, Japan Post, in April 2003. This marked a radical change in the form of postal services, and was a transition from national on-site operations that had existed since the Meiji Period (1868-1912). At the same time as the establishment of Japan Post, private enterprises were permitted to enter the industry of correspondence delivery services, which had previously been a monopoly.

This is also a period during which various initiatives started for the streamlining and stabilization of postal services. In particular, the expansion of postal codes to seven digits in 1998 enabled the identification of addresses to a town level. Furthermore, sorting work was facilitated and overall postal services were streamlined by the reading of postal codes and address information on post with an OCR (Optical Character Reader) and by attaching bar codes to individual addresses.[7]

[3] Service to deliver post without addresses to all households in areas designated by the sender
[4] Direct mail support service where post offices connect individuals' demand to receive direct mail meeting their needs and demand of enterprises, stores, etc. to send direct mail meeting needs
[5] NAKAMURA, Yoshiaki (1997)
[6] https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h01/html/h01a01040600.html
[7] OE Hiroko and UCHIDA Hideo (2007) "Paradigm Shift Brought about by Information Processing Technologies in Postal Services – Impact of 7-digit Postal Code" Lectures of the 69th National Convention of the Information Processing Society of Japan, pp.341-342. https://ipsj.ixsq.nii.ac.jp/ej/?action=repository_action_common_download&item_id=173915&item_no=1&attribute_id=1&file_no=1

4. 2005 to 2015

With the enactment of the Postal Service Privatization Act (Act No. 97 of 2005), the Japan Post Group consisting of five companies was established: Japan Post Holdings, Japan Post Service, Japan Post Network, Japan Post Bank, and Japan Post Insurance. Later in October 2012, with the amendment of the Postal Service Privatization Act, Japan Post was established with the merging of Japan Post Service and Japan Post Network (reorganization to the current 4-company structure). At the same time, the obligation of universal financial services at post offices[8] expanded the scope of universal services: a system was established to provide basic bank and insurance services in addition to existing postal services in an integrated manner at post offices.

5. From 2015 to present day

In November 2015, a part of the shares of the three companies of Japan Post Group (stocks of Japan Post Holdings held by the government and the stocks of Japan Post Bank and Japan Post Insurance held by Japan Post Holdings) were listed on the Tokyo Stock Exchange and sold to the market.

During this period, as ICT has come to play a key role in social and economic activities, the Japan Post Group has worked to upgrade its post office network using ICT, which includes collaboration with other companies in the mobile, digital transformation and e-commerce fields.[9] Initiatives to take advantage of ICT and use the nationwide post office network to solve regional challenges are also in progress.

Data related to Column 1
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#2-C-1 (Data collection)

[8] https://www.soumu.go.jp/main_content/000431455.pdf
[9] Rakuten Group "Progress of business alliance between the Japan Post Group and the Rakkuten Group" (April 28, 2021) https://corp.rakuten.co.jp/news/press/2021/0428_02.html

Part 2:
Current Status and Challenges for Information and Communications

Chapter 3

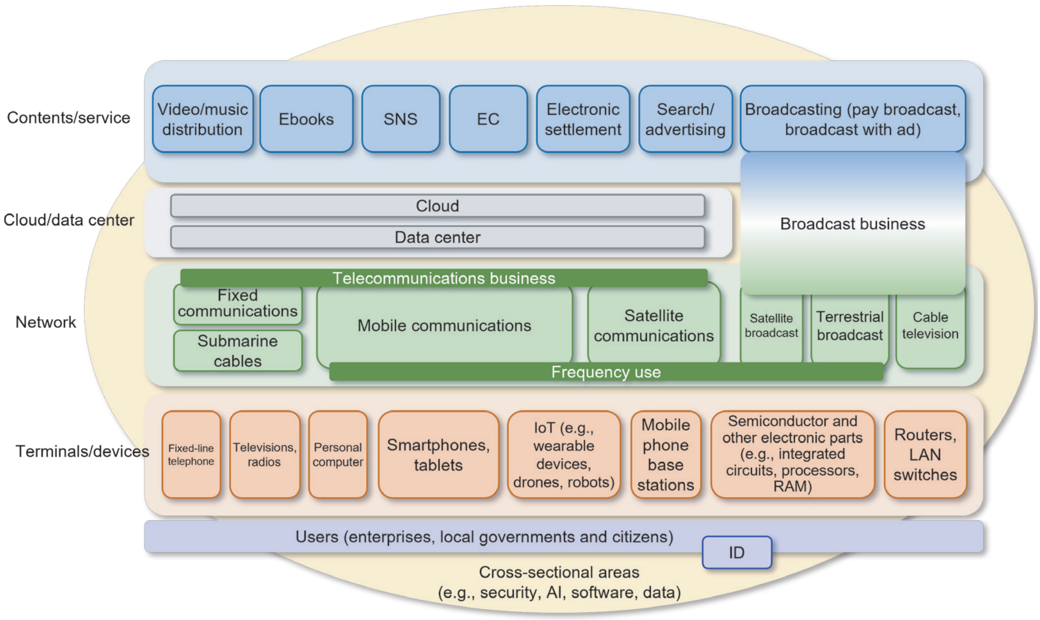
Trends in the ICT Market

Section 1　Trends in ICT Industry

1. Size of the ICT market

ICT market includes: equipment/terminals that are interfaced with users; networks provided by telecommunication carriers, broadcasters, etc.; cloud/data centers; content services including video/music distribution; security, and; AI.

Figure 3-1-1-1　Layered market structure around ICT



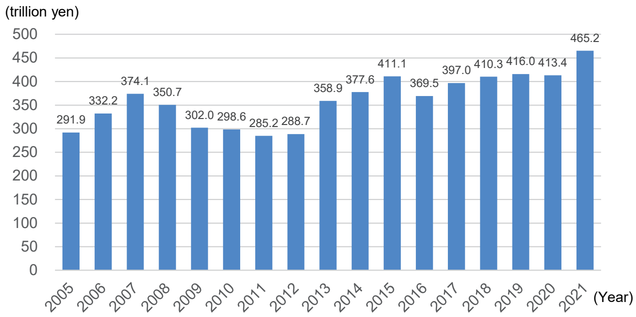
(Source) MIC

Due to the spread of smartphones, cloud service and other factors, the global ICT market (in terms of expenditure) has been on the increase since 2016: it was valued at 465.2 trillion yen[1] (12.5% increase from the previous year) in 2021[2] **(Figure 3-1-1-2)**.

The domestic ICT market (ICT investment by private sector) was valued at 12.970 trillion yen (0.6% increase from the previous year). Although many enterprises, mostly mid-sized enterprises, suspended or postponed ICT investment due to poor business performance in the context of the COVID-19 pandemic, big companies invested in ICT largely as planned, and enterprises understanding the need of environmental improvement, digitalization and business reform for implementation of telework accelerated ICT investment **(Figure 3-1-1-3)**.

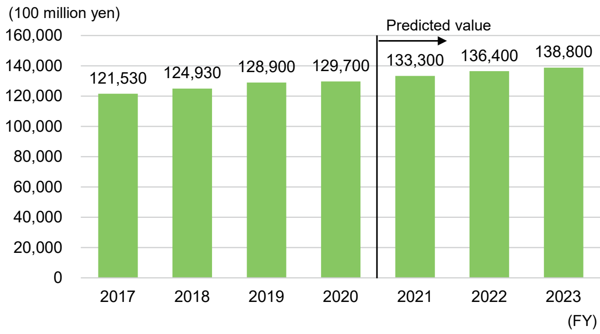
[1] Converted to Japanese yen using the average exchange rate of each year (the same hereinafter)
[2] MIC (2022) “Survey Study on the Trends in the Market Environment Surrounding ICT” (the same hereinafter)

Figure 3-1-1-2 Changes in the size of the global ICT market (in terms of expenditure)[3]



(Source) Statista (Gartner)[4]

Figure 3-1-1-3 Changes and forecasts for the ICT market (ICT investment by private sector) in Japan[5]

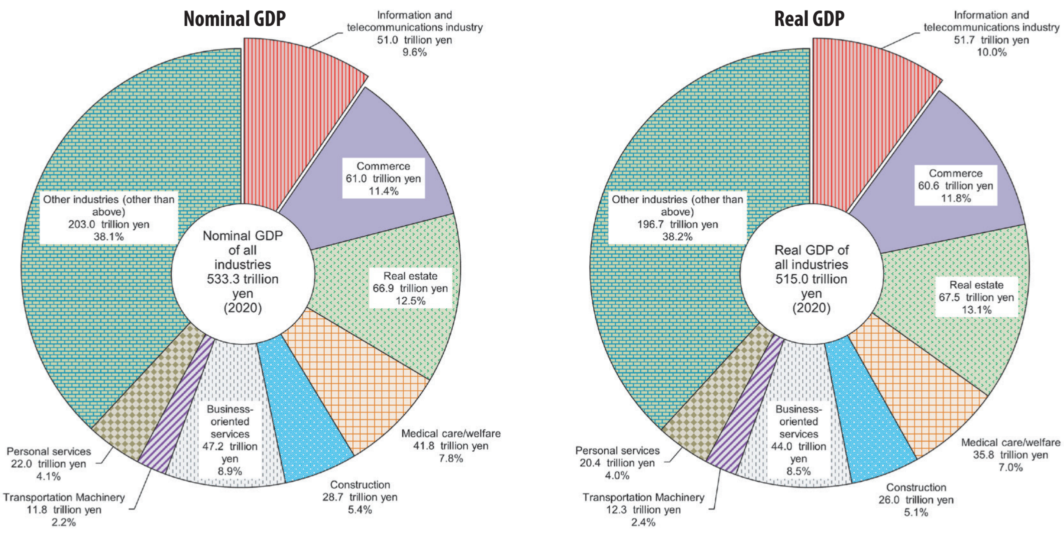


(Source) Yano Research Institute, "IT Investment by Domestic Companies 2021" released on November 18, 2021[6]

2. Gross Domestic Product (GDP) of the information and telecommunications industry[7]

Nominal GDP of the information and telecommunications industry in 2020 was 51 trillion yen decreasing 2.5% from 52.3 trillion yen in the previous year **(Figure 3-1-2-1 and Figure 3-1-2-2)**.

Figure 3-1-2-1 GDP of major industries (nominal and real)



(Source)MIC (2022), "2021 Survey on economic analysis of ICT"

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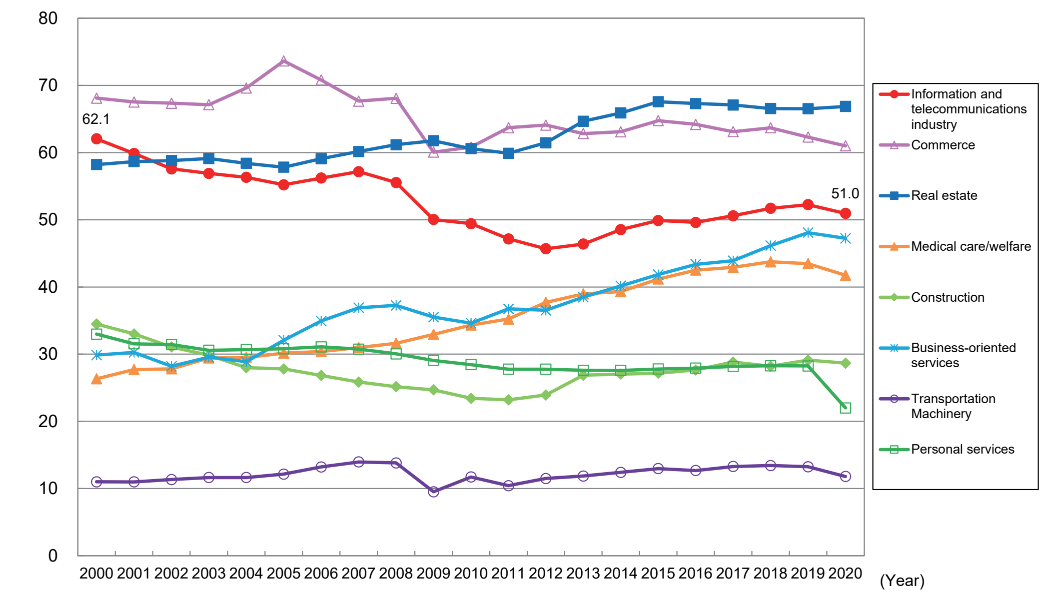
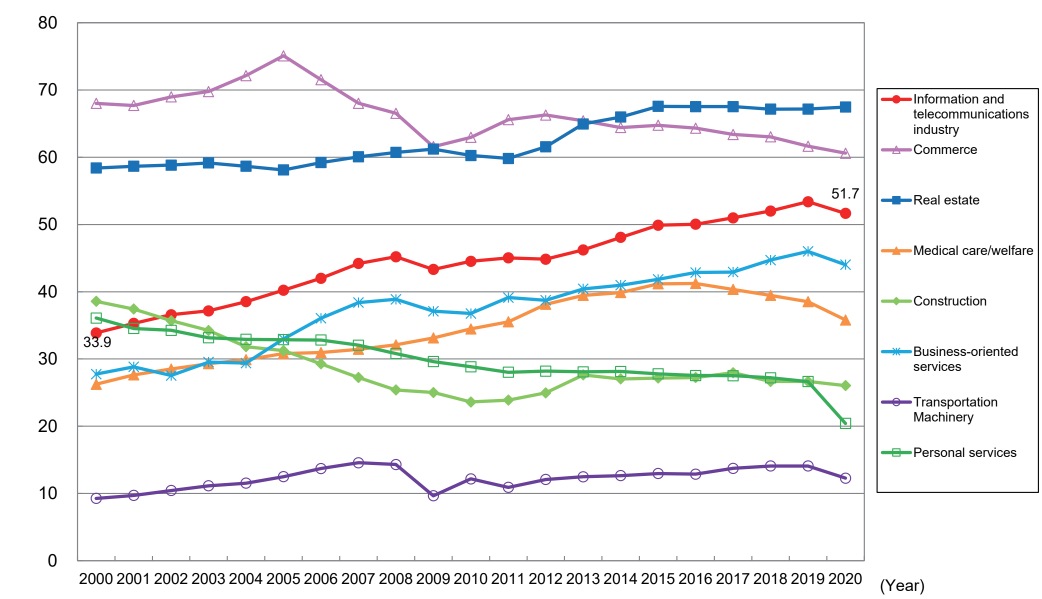
[3] ICT market includes data center systems, enterprise software, devices, ICT service and communications service.
[4] https://www.statista.com/statistics/203935/overall-it-spending-worldwide/
[5] ICT market includes ICT investment by domestic private enterprises (e.g. hardware, software including scratch development and package (including customized packages) introduction, services including maintenance, operations management and outsourcing, ASP, cloud and other online services, access fees and consulting)
[6] https://www.yano.co.jp/press-release/show/press_id/2856
[7] Information and telecommunications industry includes 9 sectors: "telecommunications," "broadcasting, "information service," "services incidental to the Internet," "video/sound/character information production," "manufacturing related to information and telecommunication," "services related to information and telecommunication," "construction related to information and telecommunications" and "research."

Figure 3-1-2-2 Changes in GDP of major industries (nominal and real)

Nominal GDP



Real GDP

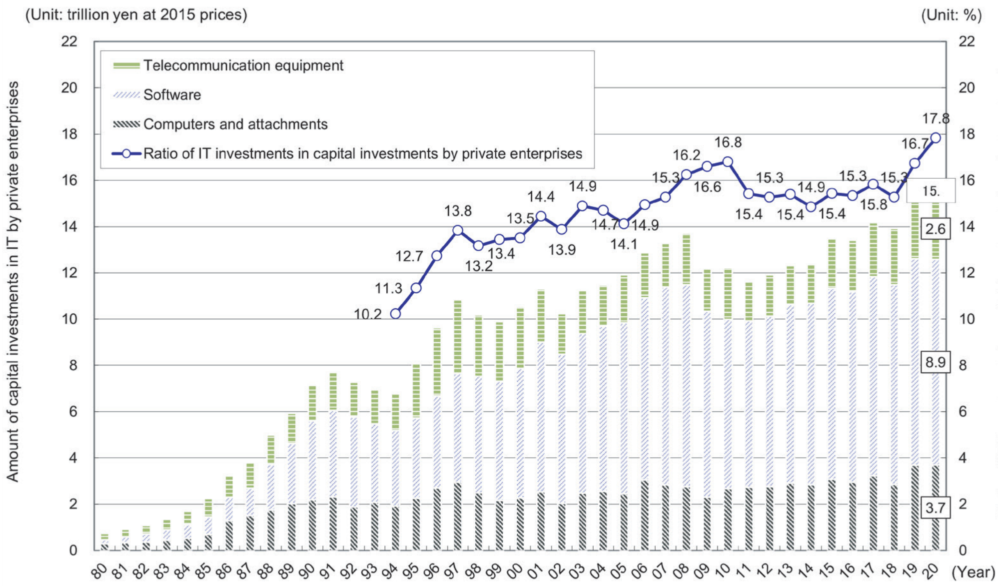


(Source)MIC (2022), "2021 Survey on economic analysis of ICT"

3. IT investments[8]

In 2020, IT investments by private companies were 15.2 trillion yen (0.4 % decrease year-on-year) in terms of 2015 prices. In breakdown, investments in software (entrusted development and packaged software) accounted for about 60% at 8.9 trillion yen. The ratio of IT investments to capital investment by private companies in 2020 was 17.8% (1.1 point increase from the previous year). IT investments account for a certain part of the capital investment **(Figure 3-1-3-1)**.

Figure 3-1-3-1 Changes in IT investments in Japan



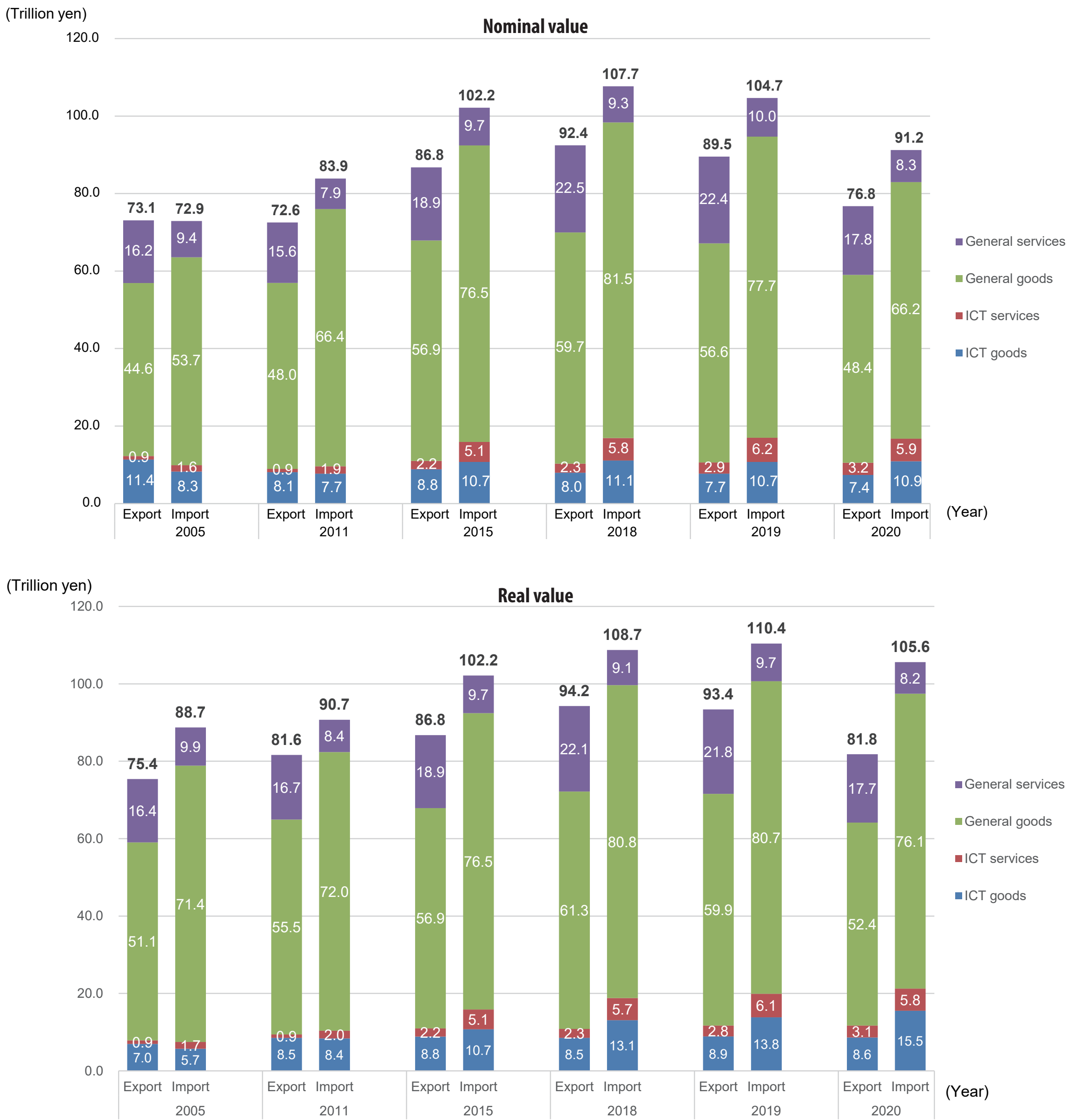
(Source)MIC (2022), "2021 Survey on economic analysis of ICT"

[8] Here, the term refers to investment in information and telecommunications capital goods (computers and attachments, telecommunication equipment, software). Use of cloud services that have spread drastically in recent years is not purchase of capital goods and therefore not included in IT investment here.

4. Exports and imports in the ICT field

In 2020, exports of goods/services (nominal) were 76.8 trillion yen, while imports were 91.2 trillion yen. Of the above, exports of ICT goods/services were 10.6 trillion yen (13.7% of all exports), while imports were 16.8 trillion yen (18.4% of all imports). Import surplus of ICT goods was 3.5 trillion yen (16.6% increase year-on-year) and import surplus of ICT services was 2.7 trillion yen (20.0% decrease year-on-year). The increase in the import surplus of ICT goods is significant (**Figure 3-1-4-1**).

Figure 3-1-4-1 Changes in exports/imports of goods/services



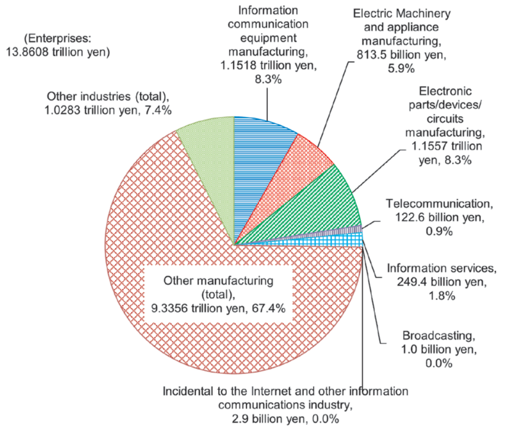
(Source) MIC annual "Input-Output Table of the Information Communications Industry
https://www.soumu.go.jp/johotsusintokei/link/link03_01.html

5. Trend of R&D in the ICT field

(1) State of research and development expenses

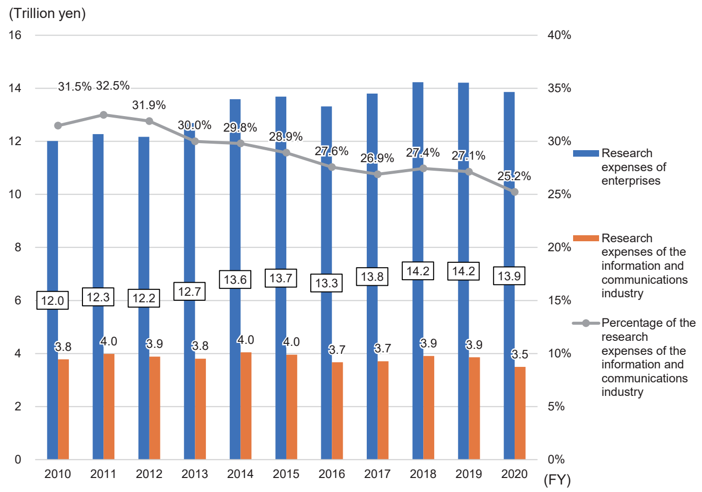
In fiscal 2020, total expenses for science and technology R&D in Japan (hereinafter "research expenses") were 19.2365 trillion yen (sum of the research expenses of enterprises, NGOs, public institutions, universities, etc.) which include 13.8608 trillion yen expenses by enterprises. Research expenses of the ICT industry[9] were 3.497 trillion yen (25.2% of research expenses of all enterprises) (**Figure 3-1-5-1**). Research expenses of the ICT industry have been declining or flat in recent years (**Figure 3-1-5-2**).

Figure 3-1-5-1 Enterprise research expenses by industry (fiscal 2020)



(Source) Prepared based on MIC, "2021 Survey of Science and Technology Research"
https://www.stat.go.jp/data/kagaku/kekka/index.html

Figure 3-1-5-2 Changes in research expenses of enterprises



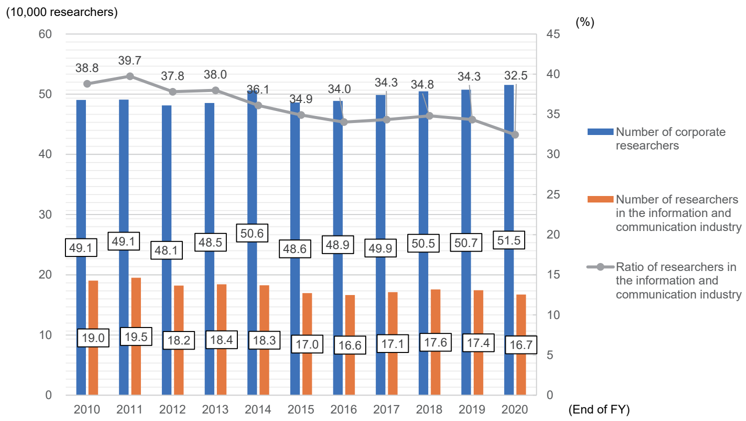
(Source) Prepared based on MIC "Survey of Science and Technology Research" (annual)
https://www.stat.go.jp/data/kagaku/kekka/index.html

(2) State of R&D human resources

At the end of fiscal 2020, the number of researchers in Japan (total of the researchers in enterprises, NGOs, public institutions, universities, etc.) was 890,548, of which 515,469 were in enterprises. Among the corporate researchers, the number of researchers in the ICT sector was 167,283 (32.5%) in fiscal 2020. The number has remained almost unchanged in recent years (**Figure 3-1-5-3**).

[9] Here, the term refers to information communication equipment manufacturing, electric machinery and appliance manufacturing, electronic parts/devices/circuits manufacturing, information communication (information services, telecommunications, broadcasting, incidental to the Internet and other information communication industries).

Figure 3-1-5-3 Changes in the number of corporate researchers



(Source) Prepared based on MIC, "Survey of Science and Technology Research" (each year)
https://www.stat.go.jp/data/kagaku/kekka/index.html

Related data
Percentage of corporate researchers by industry (as of March 31, 2021)
Source: Prepared from MIC, "2021 Survey of Science and Technology Research"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-1-38 (Data Collection)

Section 2 Trends in the Telecommunication Sector

1. Trends of the domestic and overseas communications markets

Since 2000, the number of fixed-line broadband subscriptions[10] has been increasing in major countries (**Figure 3-2-1-1**). By country, China rose to the top position overtaking the United States in 2008 and has been sharply increasing the number since 2015. Compound annual growth rate (CAGR) of China from 2000 to 2020 is 65%, which is by far higher than 15% of the United States and 22% of Japan

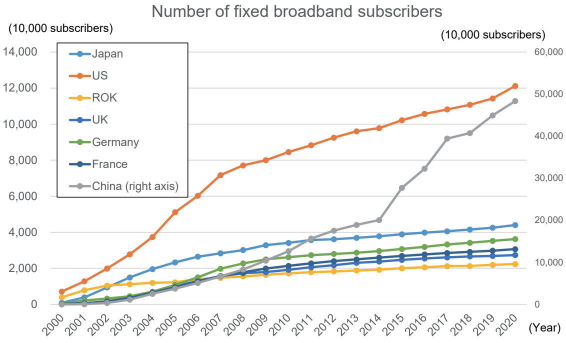
The number of mobile phone subscriptions[11] has also been on the increase in major countries. The number sharply increased especially in China (**Figure 3-2-1-2**). CAGR of China from 2000 to 2020 is 16%, which is higher th an 6% of the United States and Japan. In 2020, the ratio of the number of mobile communication subscriptions to the population was 154.5% (57.4 point increase from 2010) in Japan, 106.0% (16.3 point increase from 2010) in the United States and 121.7% (53.8 point increase from 2010) in China.[12]

[10] According to "fixed-broadband subscriptions" of ITU statistics. Fixed-broadband refers to high-speed lines providing communication speed over 256kbps either or both of uplink and downlink. High-speed lines include cable modem, DSL, optical fiber and satellite communications, fixed wireless access and WiMAX, but do not include subscriptions of data communication using mobile networks (cellular systems).

[11] According to "Mobile-cellular subscriptions" of ITU Statistics. The number includes deferred-payment subscriptions and prepaid subscriptions. Prepaid subscriptions are included only when the service was used for a fixed period of time (e.g., three months). Data card and USB modem subscriptions are not included.

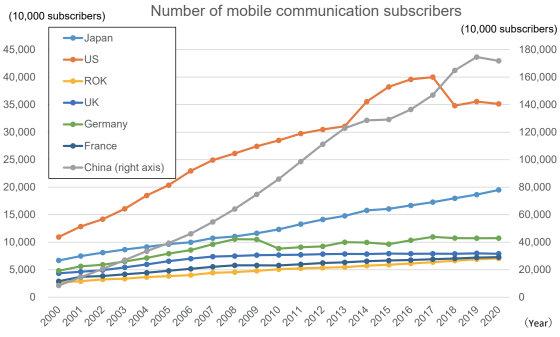
[12] Number of mobile subscriptions includes prepaid-based subscriptions.

Figure 3-2-1-1 Changes in the number of fixed-line broadband service subscriptions in major companies[13]



(Source) ITU[14]

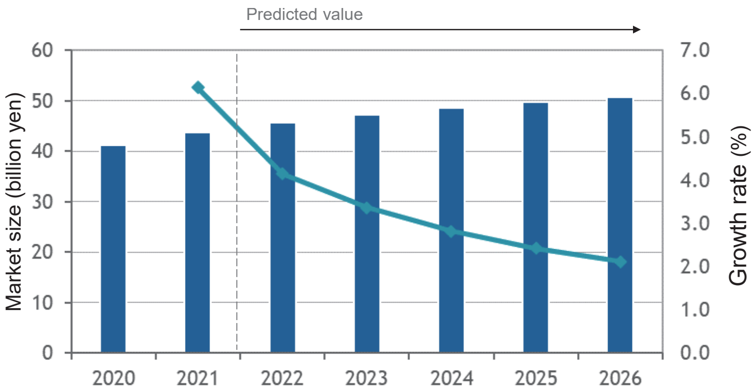
Figure 3-2-1-2 Changes in the number of mobile communication subscriptions in major countries



(Source) ITU[15]

In 2021, the market size of network virtualization was 2.8942 trillion yen (18.3% increase year-on-year) in the world. With the spread of server virtualization, reduction in cost of its ownership and flexible extensibility of networks, network virtualization technologies have been gradually introduced. The size of Japan's network virtualization/automation market (sum of the markets for data centers and corporate networks)[16] was 43.8 billion yen in 2021 and expected to grow at a compound annual growth rate of 3.0% from 2021 to 2026 (**Figure 3-2-1-4**). Background factors of the gradual growth include: its establishment as the method for infrastructure construction and operation at data centers; and rising need for network construction in corporate LAN and for speeding up and efficient improvement of network operations.

Figure 3-2-1-4 Changes and forecasts of the size (in terms of sales)of Japan's network virtualization/automation market



(Source) IDC Japan[17]

Regarding RAN (Radio Access Network) of carriers, progress is being made in Open RAN[18] to realize multi-venders and vRAN[19] to realize virtualization and other initiatives to innovate the composition of network equipment. Regarding virtualization of core networks, for example, it is AT&T's policy to transfer the core network for mobile communication services operated by the company to Microsoft Azure that is a public cloud of Microsoft and to develop 5G network.[20] In Japan, Rakuten Mobile adopted the world's first open and fully virtualized architecture albeit on 4G network, procured equipment from multiple venders and implemented a virtual-

[13] In addition to the subscriptions with FTTH, DSL, CATV and FWA, subscriptions with VPN and broad area Ethernet services, which are provided mainly for businesses are also included.
[14] https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx
[15] https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx
[16] Total of the network virtualization/automation markets of datacenter networks and corporate networks. Network virtualization and automation refer to the function to virtualize and automate networks by using software and hardware. The market consists of network infrastructure and network automation/virtualization platforms.
[17] https://www.idc.com/getdoc.jsp?containerId=prJPJ49092722
[18] Open Radio Access Network. Mobile Front Haul that is interface between Distributed Unit (DU) and Radio Unit (RU) is standardized as O-RAN Front Haul by the O-RAN Alliance. The standardization is expected to facilitate provision of communication network equipment by various vendors and at the same time facilitate area building and lower equipment procurement costs.
[19] Virtual Radio Access Network. Virtualization technology deploys communication software on virtualization layers installed on general hardware and activates the software independent of hardware characteristics.
[20] businessnetwork.jp, "The plan to 'Move 5G networks to Azure' started to gather momentum: what will carriers gain from move to cloud?" (M ay 23, 2022) https://businessnetwork.jp/Detail/tabid/65/artid/9133/Default.aspx

ized network.[21]

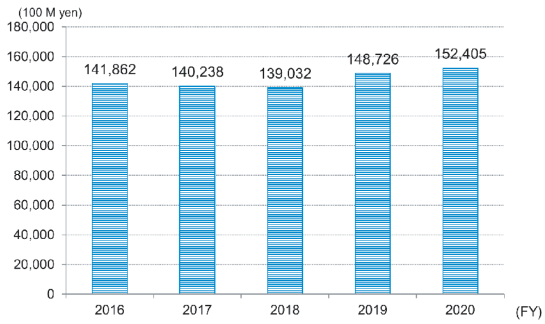
Regarding the development of NTN (Non-Terrestrial Network), Internet connectivity services using outer space have begun in earnest overseas. For example, the US Space X is providing Starlink that is a broadband Internet service using satellite constellation.[22] In Japan, mobile operators are leading initiatives to construct NTN.[23] For example, SoftBank and its affiliate HAPS Mobile Inc. participate in "HAPS Alliance," an industry group aiming to construct High Altitude Platform Station, and take the initiative in earnest. For implementation of satellite constellation using low-orbit satellites, KDDI signed a contract with Space X to use Starlink as backhaul line of au base stations in September 2021. KDDI plans sequential introduction starting from around 1,200 sites across Japan in 2022.[24] NTT and SKY Perfect JSAT announced a plan to establish the Space Compass Corporation in July 2022. The joint venture is expected to play a central role in the space satellite projects including a space data center project to deploy satellites with data center functions on a geostationary satellite orbit and the space RAN[25] project.[26] Furthermore, Rakuten Mobile together with AST SpaceMobile of the United States is working on "Rakuten Mobile Space Project" to build a mobile broadband network for transmission from outer space by using low-orbit satellites and thereby expand the area of its mobile communication service on Earth.[27]

2. Current status of telecommunications in Japan

(1) Market size

In fiscal 2020, sales in the telecommunication sector continued to grow to 15.2405 trillion yen (2.5% increase year-on-year) (**Figure 3-2-2-1**).

Figure 3-2-2-1 Changes in telecommunications sector sales



*Sales are total of the sales of all responding business operators. Comparison must be made carefully because the number of respondents varies depending on the year.

(Source) Prepared from MIC / METI "Basic Survey on the Information and Communications Industry"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

(2) Number of carriers

The number of telecommunication carriers at the end of fiscal 2021 was 23,111 (330 registered carriers and 22,781 notified carriers). The number continued to increase following the previous fiscal year (**Figure 3-2-2-2**).

Figure 3-2-2-2 Changes in the number of telecommunication carriers

End of FY	2013	2014	2015	2016	2017	2018	2019	2020	2021
Number of telecommunication carriers	16,321	16,723	17,519	18,177	19,079	19,818	20,947	21,913	23,111

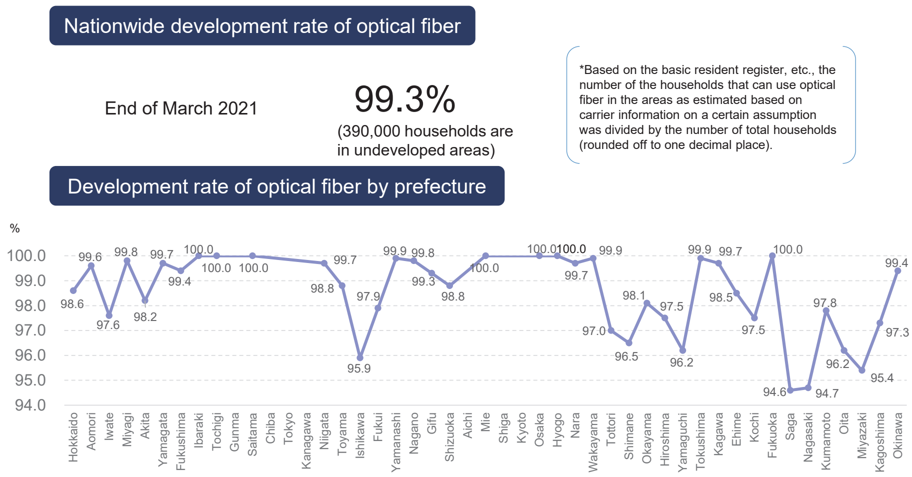
(Source) Information & Communications Statistics Database
https://www.soumu.go.jp/johotsusintokei/field/tsuushin04.html

21 Nikkei XTECH, "Qualcomm and others challenge the unchallenged position of Intel for leadership in virtualization base station vRAN" (April 1, 2022) https://xtech.nikkei.com/atcl/nxt/column/18/01273/00028/
22 As of March 2022, beta tests were conducted in 29 countries including Ukraine. Nikkei XTECH, "Satellite network covering the globe delivers videos from Ukraine" (May 9, 2022)
https://xtech.nikkei.com/atcl/nxt/column/18/02040/00002/
23 R&D to realize NTN (Non-Terrestrial Network) is advanced. NICT, for example, is working on R&D on "generic technologies of satellite flexible network".
24 KDDI, "Agreed to sign a contract of business alliance with SpaceX to adopt its satellite broadband Starlink to au communication network" (September 13, 2021)
https://news.kddi.com/kddi/corporate/newsrelease/2021/09/13/5392.html
25 Radio Access Network
26 Nippon Telegraph and Telephone and SKY Perfect JSAT, "NTT and SKY Perfect JSAT agreed to establish Space Compass Corporation – toward a new space computing network business for realization of a sustainable society" (April 26, 2022) https://group.ntt/jp/newsrelease/2022/04/26/220426a.html
27 Rakuten, "Rakuten invests in AST & Science of the U.S. and signed a strategic partnership" (March 3, 2020)
https://corp.rakuten.co.jp/news/press/2020/0303_02.html

(3) State of infrastructure development

The Development rate of optical fiber (household coverage) was 99.3% in Japan at the end of fiscal 2020 (**Figure 3-2-2-3**).

Figure 3-2-2-3 State of optical fiber development (estimation) at the end of March 2021



As of the end of fiscal 2020, 5G infrastructure deployment rate[28] was 16.5% and the number of 5G base stations was approximately 21,000.[29] There are regional differences in the development. For example, the number of 5G base stations per 10km^2 in November 2021 was 1.0 in national average but around 41.3 in Tokyo (**Figure 3-2-2-4**).

According to OECD, Japan is at the world's top level in terms of the ratio of optical fiber to the fixed broadband. Spread of digital infrastructure in Japan is advanced in international comparison.

Figure 3-2-2-4 The number of 5G base stations per 10km^2 in November 2021

National average	Approx. 1.0 stations
Tokyo	Approx. 41.3 stations
Osaka prefecture	Approx. 16.2 stations
Kanagawa Prefecture	Approx. 6.6 stations
Hiroshima Prefecture	Approx. 1.1 stations

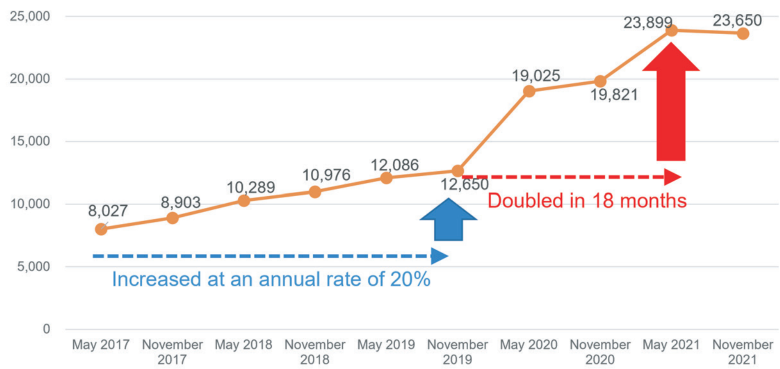
(3.7GHz band, 4.5GHz band, 28GHz band)

(Source) Excerpt from MIC (2021) "Special Commission on Digital Administrative Reform (2nd session)" Material 3

(4) State of traffic

The download traffic of fixed-line broadband in Japan increased rapidly after COVID-19 began to spread (**Figure 3-2-2-5**).

Figure 3-2-2-5 Changes in internet traffic (fixed-line broadband download traffic)



(Source) MIC (2022), "Aggregate results of Internet traffic in Japan (in November 2021)"[30]

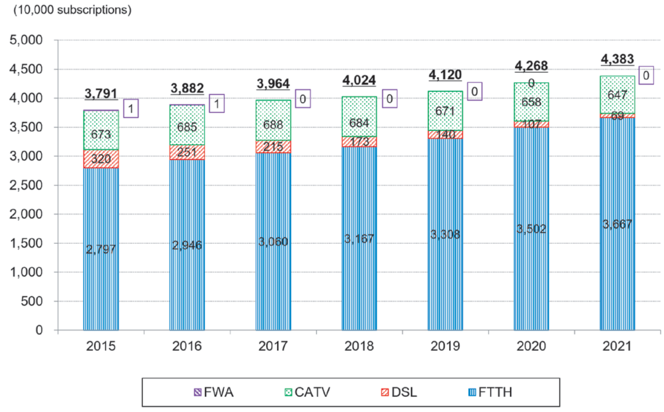
[28] Development rate of master station (advanced specified base station) in 10km-square area (around 4500 areas nationwide)
[29] https://www.soumu.go.jp/main_content /000803507.pdf
[30] https://www.soumu.go.jp/joho_tsusin/eidsystem/market01_05_03.html

(5) State of broadband utilization

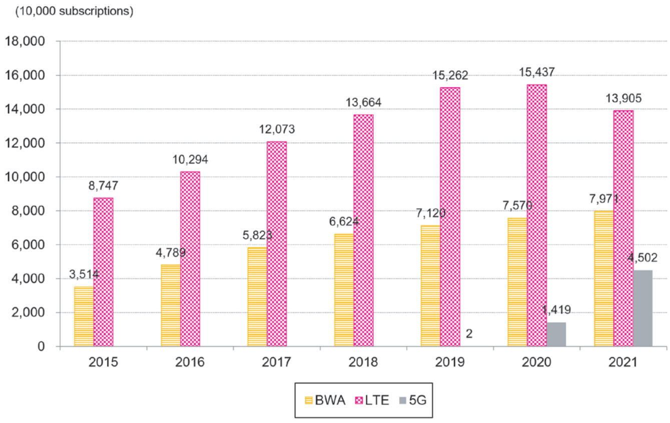
At the end of fiscal 2021, the number of fixed-line broadband subscriptions[31] reached 43.83 million (2.7% increase from the previous fiscal year). The breakdown of the number of ultrafast mobile broadband subscriptions is: 139.05 million (9.9% decrease) for 3.9/4G mobile phones (LTE); 45.02 million (by 30.83 million from the year before) for 5G mobile phones; and 79.71 million (5.3% increase) for BWA (**Figure 3-2-2-6**).

Figure 3-2-2-6 Changes in the number of fixed-line broadband subscriptions[32]

Fixed-line broadband



Ultrafast broadband mobile



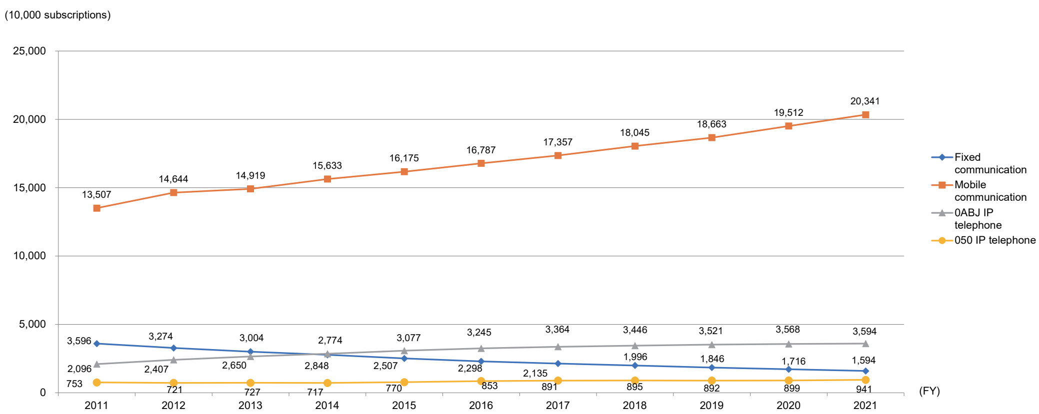
(Source) MIC, "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

(6) State of the number of subscriptions with voice communication services

In recent years, while the number of fixed communication subscriptions (NTT East/West subscribed telephone, chokushu (dedicated line) telephone[33]and CATV telephone, excluding 0ABJ IP telephone) has been declining, the number of subscriptions with mobile communication (mobile phone, PHS and BWA) and 0ABJ IP telephones has been steadily increasing. The number of mobile communication subscriptions was about 12.8 times the number of fixed communication subscriptions in fiscal 2021. The number of subscriptions of 050 IP telephone has been almost unchanged in recent years (**Figure 3-2-2-7**).

[31] The number of fixed-line broadband subscriptions is the sum of the subscriptions of FTTH, DSL, CATV (coaxial, JFC) and FWA.
[32] This is the number of subscriptions with 5G, LTE and BWA and does not include subscriptions with 3G or PHS.
[33] Chokushu telephone is subscribed telephone service by telecommunications carriers other than NTT East/West and includes choku subscription, choku subscription ISDN, new-type chokushu and new-type chokushu ISDN.

Figure 3-2-2-7 Changes in the number of subscriptions with voice communication services



*1 Mobile communication is the sum of mobile phones, PHS and BWA.

*2 Values of mobile communication since fiscal 2013 are "after adjustment of intra-group transactions," namely, when an MNO as MVNO received a mobile-phone or BWA service from other M NO of the group and provided the service combined with its own service through one mobile phone, etc., this is counted as one subscription.

(Source) MIC, "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

(7) International comparison of telecommunication charge

In comparison of the communication charge of six cities—Tokyo (Japan), New York (US), London (UK), Paris (France), Düsseldorf (Germany) and Seoul (Korea)—, smartphone bills in Tokyo (new 4G contracts with the top MNO share operator) are at a medium level for plans with a monthly data volume of 2GB and 5GB, and at a low level for plans with 20GB.

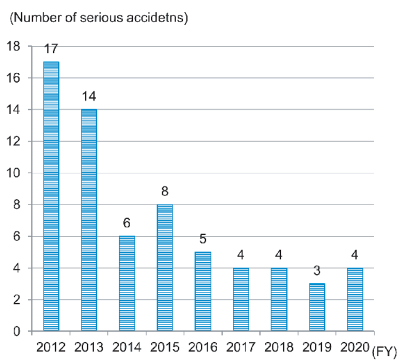
Regarding fixed-telephone bills, the basic rate and local-call rate for three minutes at 12:00 on weekday are at a medium level.

Related data
International comparison of fixed telephone charge based on individual charge (FY2021)
International comparison of mobile phone bill based on model
Source: MIC, "FY2021 Survey on domestic-overseas price difference of telecommunication service"
URL: https://www.soumu.go.jp/menu_news/s-news/01kiban03_02000789.html

(8) Occurrences of telecommunication service accidents

The number of reported accidents that require quarterly reporting was 6,610 in fiscal 2020. Among them, four were serious accidents.[34] The number has been almost unchanged since fiscal 2017 (**Figure 3-2-2-8**).

Figure 3-2-2-8 Changes in the number of serious accidents



(Source) MIC, "Occurrences of telecommunication service accidents (Fiscal 2020)"
https://www.soumu.go.jp/menu_news/s-news/01kiban05_02000229.html

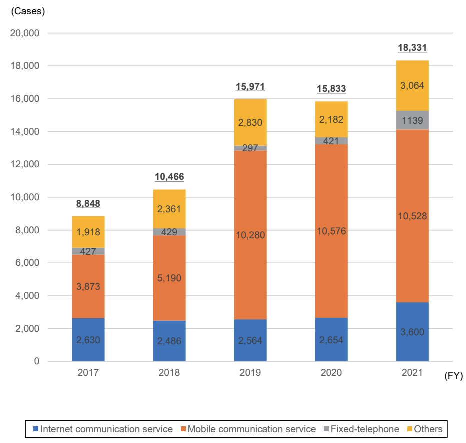
[34] Accidents falling under "if -snip - any other serious accident specified by Order of the Ministry of Internal Affairs and Communications has occurred with respect to its telecommunications operations, it must report without delay to the Minister for Internal Affairs and Communications to that effect including its reason or cause" of Article 28 of the Telecommunications Business Act

(9) Complaints/requests for consultation on telecommunication service, and requests for consultation on illegal/harmful information

i Complaints/requests for consultation on telecommunication service

The number of complaints/requests for consultation on telecommunication service sent to MIC increased to 18,331 in fiscal 2021 from the previous year (**Figure 3-2-2-9**).

Figure 3-2-2-9 Changes in the number of complaints/requests for consultation sent to MIC

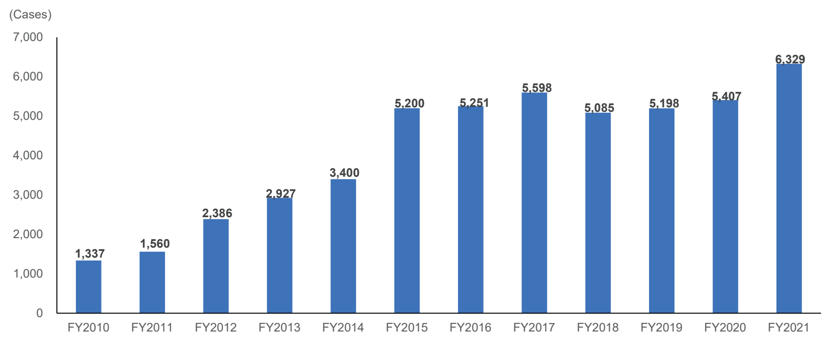


(Source) Prepared by MIC

ii Request for consultation on illegal/harmful information

The number of consultations provided at the Illegal Harmful Hotline operated by MIC increased about five-fold to 6,329 from fiscal 2010, when consultation started (**Figure 3-2-2-10**). The top five operators involved were Twitter, Google, Meta, 5 Channel and LINE.

Figure 3-2-2-10 Changes in the number of requests for consultation on illegal/harmful information



Related data
Breakdown of the number of consultations provided at the Illegal Harmful Hotline by business operator
Source: MIC, "2021 Report on consultations on illegal harmful information on the internet and other contract operations (summary)" p8
URL: https://www.soumu.go.jp/main_content/000814645.pdf

3. New technology development

(1) IOWN (Innovative Optical and Wireless Network) Concept

NTT is leading an initiative toward technical innovation by introducing optical technologies to all networks, computing and semiconductors. It is expected to bring about a paradigm shift and become a game changer in the near future.[35]

(2) IoT network using low earth orbit satellites

Rakuten Mobile and the University of Tokyo began joint research and development into "IoT ultra-coverage utilizing low Earth orbit (LEO) satellites" in November 2021.[36] The project aims at IoT ultra-coverage by using communication satellites to expand the area coverage to 100% of the national land and to realize long-distance communication with the existing narrowband IoT (telecommunications standard for IoT equipment with advanced narrowband and low power consumption) and IoT terminals.

35 https://www.soumu.go.jp/main_content/000781800.pdf
36 https://corp.mobile.rakuten.co.jp/news/press/2021/1129_01/

Section 3 Trends in the Broadcasting and Content Sectors

1. Broadcasting

(1) Size of the broadcasting market

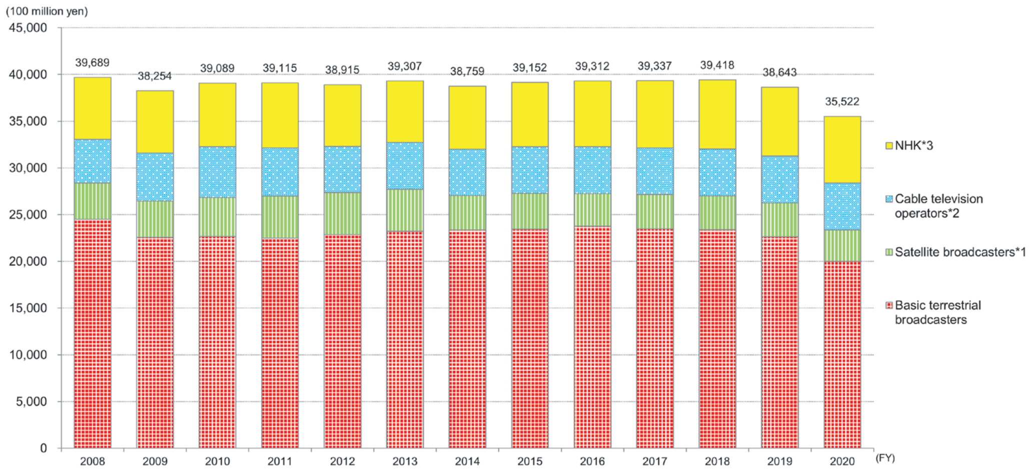
i Sales of broadcasters

In Japan, broadcasting is operated by NHK based on subscription fee income and private broadcasters based on advertising revenue or broadcast fee. In addition, the Open University of Japan operates broadcasting for education.

Total sales of all broadcasters including broadcasting business income and other income decreased to 3.5522 trillion yen (8.1% decrease year-on-year) in fiscal 2020.

In detail, total sales of private basic terrestrial television broadcasters were 1.9993 trillion yen (11.7% decrease year-on-year), total sales of private satellite broadcasters were 338.6 billion yen (6.5% decrease year-on-year), total sales of cable television operators were 500.6 billion yen (almost unchanged from the previous year) and ordinary business income of NHK was 713.7 billion yen (3.2% decrease year-on-year) (**Figure 3-3-1-1**).

Figure 3-3-1-1 Changes in and breakdown of the size of the broadcasting sector market (total sales)



FY			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Private broadcasters	Basic terrestrial broadcasters		24,493	22,574	22,655	22,502	22,870	23,216	23,375	23,461	23,773	23,471	23,396	22,640	19,993
		(community broadcasters of the above*4)	150	123	116	120	115	124	127	126	136	136	143	145	130
	Satellite broadcasters*1		3,905	3,887	4,185	4,490	4,510	4,491	3,661	3,809	3,463	3,697	3,619	3,623	3,386
	Cable television operators*2		4,667	5,134	5,437	5,177	4,931	5,030	4,975	5,003	5,031	4,992	5,030	5,008	5,006
NHK*3			6,624	6,659	6,812	6,946	6,604	6,570	6,748	6,879	7,045	7,177	7,373	7,372	7,137
Total			39,689	38,254	39,089	39,115	38,915	39,307	38,759	39,152	39,312	39,337	39,418	38,643	35,522

*1 Business income pertaining to satellite broadcasting is counted.
*2 Up to fiscal 2010: corporations for profit that had facilities that were approved under the former Cable Television Broadcasting Act and conducted independent broadcasting (including facilities registered under the Act on Broadcast on Telecommunications Services and with broadcasting method equivalent to the said facilities) are counted. From fiscal 2011: registered general commercial broadcasters conducting independent broadcasting using wire telecommunication equipment (excluding business operators using IP multicast method in either case) are counted.
*3 The values of NHK are ordinary business income.
*4 Excluding community broadcasters combining cable television business, etc.

(Source) Prepared from MIC "Income and Expenditure of Private Broadcasters" of each fiscal year and NHK financial statements for each fiscal year

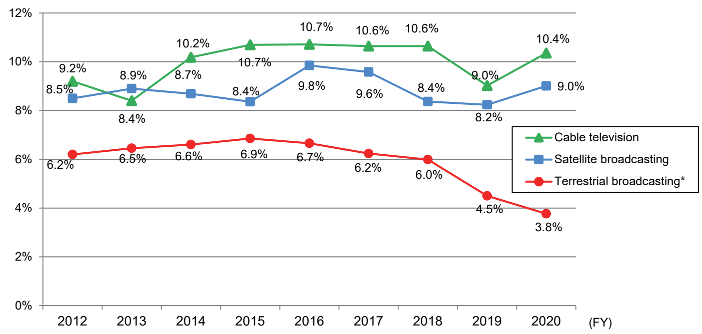
Advertising expenditures of basic terrestrial broadcasters was 1.829 trillion yen. In detail, 1.7184 trillion yen pertaining to terrestrial television broadcasting and 110.6 billion yen pertaining to radio broadcasting.[37]

ii Financial status of private broadcasters

Private basic terrestrial broadcasters (operating profit on sales was 3.8% in fiscal 2020), private satellite broadcasters (9.0%) and cable television operators (10.4%) all continued to post profits following fiscal 2019 (**Figure 3-3-1-2**).

[37] For the entire advertising market, see Chapter 3, Section 3-2 "2 Advertisement".

Figure 3-3-1-2 Changes in operating profits on sales of private broadcasters



*Basic terrestrial broadcast excluding community broadcast

(Source) Prepared from MIC, "Income and Expenditure of Private Broadcasters "of each fiscal year, etc.

(2) Number of business operators

At the end of fiscal 2021, breakdown of private broadcasters was: 534 private basic terrestrial broadcasters (including 338 broadcasters conducting community broadcasting) and 42 private satellite broadcasters (**Figure 3-3-1-3**).

Figure 3-3-1-3 Changes in the number of private broadcasters

At the end of fiscal year			2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Terrestrial	Television broadcast (Single operation)	VHF	16	93	93	94	94	98	94	94	95	95	95	96
		UHF	77											
	Radio broadcast (single operation)	Medium -wave (AM) broadcasting	13	13	13	14	14	14	14	14	15	15	15	16
		Ultrashort wave (FM) broadcasting	298	307	319	332	338	350	356	369	377	384	384	388
		Community broadcasting of the above	246	255	268	281	287	299	304	317	325	332	334	338
		Short wave	1	1	1	1	1	1	1	1	1	1	1	1
	Television/radio broadcasting (combined operation)		34	34	34	33	33	33	33	33	32	32	32	31
	Text broadcasting (single operation)		1	1	0	0	0	0	0	0	0	0	0	0
	Multimedia broadcasting				1	1	1	4	4	4	6	6	2	2
	Subtotal		440	449	461	475	481	500	502	515	526	533	529	534
Satellite	Basic satellite broadcasting	BS broadcasting	20	20	20	20	20	20	19	19	22	22	20	22
		110 degrees east longitude CS broadcasting	13	13	22	23	23	23	23	20	20	20	20	20
	General satellite broadcasting		91	82	65	45	7	5	4	4	4	4	4	4
	Subtotal		113	108	92	72	46	44	41	39	41	41	39	42
Cable television	General cable broadcasting pertaining to registration (limited to operators of voluntary broadcasting)	Broadcasting using former authorized facilities (limited to operators of voluntary broadcasting)	502	556	545	539	520	510	508	504	492	471	464	-
		Broadcasting using former cable services	26											
		IP multicast broadcasting of the above	5	5	4	3	3	3	5	5	5	5	5	-
	Subtotal		528	556	545	539	520	510	508	504	492	471	464	-

*1 The number of television broadcasters (single operation) at the end of fiscal 2015 includes five operators conducting basic terrestrial broadcasting for mobile reception (one of them combined basic terrestrial broadcasting)

*2 Regarding satellite broadcasters, BS broadcasting and 110 degrees east longitude CS broadcasting are counted as basic satellite broadcasting, while other satellite broadcasting is counted as general satellite broadcasting based on the Broadcast Act amended and enforced in June 2011.

*3 Because some of the satellite broadcasters combine more than two of "BS broadcasting, "110 degrees east longitude CS broadcasters" and "general satellite broadcasting," sum of the values of the columns does not agree with the value of subtotal. Only operating broadcasters are included in fiscal 2011 and after.

*4 Cable television operators include: former approved facility operators under the former Cable Television Broadcasting Act and registered operators under the former Act on Broadcast on Telecommunications Services up to fiscal 2010, and: registered general broadcasters conducting independent broadcasting using wire telecommunication equipment under the Broadcast Act in fiscal 2011 and after (IP multicast broadcasting is included in former broadcasting using cable service up to fiscal 2010, and; in registered general broadcasters conducting independent broadcasting using wire telecommunications equipment in fiscal 2011 and after)

(Source) Prepared from MIC, "Current State of Cable Television"[38] (only the values of cable television operators)

(3) State of the provision of broadcasting services

i Terrestrial television broadcasting

Nationwide 127 companies (including 31 combined operation) were providing private terrestrial television broadcasting at the end of fiscal 2021.

ii Terrestrial radio broadcasting

Medium-wave (AM) broadcasting service is provided by local private basic terrestrial broadcasters (47 companies at the end of fiscal 2021)

Ultrashort wave (FM) broadcasting is provided by local private basic terrestrial broadcasters (388 companies at the end of fiscal 2021). Of them, 338 are community broadcasters for some districts of a municipality in principle.

Short wave broadcasting was conducted by one private basic terrestrial broadcaster at the end of fiscal 2021.

iii Multimedia broadcasting

V-Low multimedia broadcasting using 99MHz-108MHz spectrum that has become available through the digitali-

[38] https://www.soumu.go.jp/main_content/000504511.pdf

zation of terrestrial television broadcasting is conducted by two private basic broadcasters (as of the end of fiscal 2021).

iv Satellite broadcasting

A Basic satellite broadcasting

BS broadcasting is conducted by NHK, the Open University of Japan and 22 private broadcasters (as of the end of fiscal 2021) by using satellites of the Broadcasting Satellite System Corporation. 110 degrees east longitude CS broadcasting is conducted by 20 private broadcasters (as of the end of fiscal 2021) by using satellites of Sky Perfect JSAT (**Figure 3-3-1-5**).

Since December 2018, new 4K8K satellite broadcasting has been conducted for 18 programs of 10 companies in BS and 110 degrees east longitude CS broadcasting. In the field of dextrorotation BS broadcasting, in March 2022, three companies (BS Yoshimoto Co., LTD., BS Shochiku Tokyu Co., Ltd. and Japanet Broadcasting Co., Ltd.) that were authorized for basic satellite broadcasting in November 2019 opened free channels with diverse themes including regional revitalization

B General satellite broadcasting

General satellite broadcasting is conducted by 4 private broadcasters (as of the end of fiscal 2021) by using satellites of Sky Perfect JSAT Corporation (**Figure 3-3-1-5**).

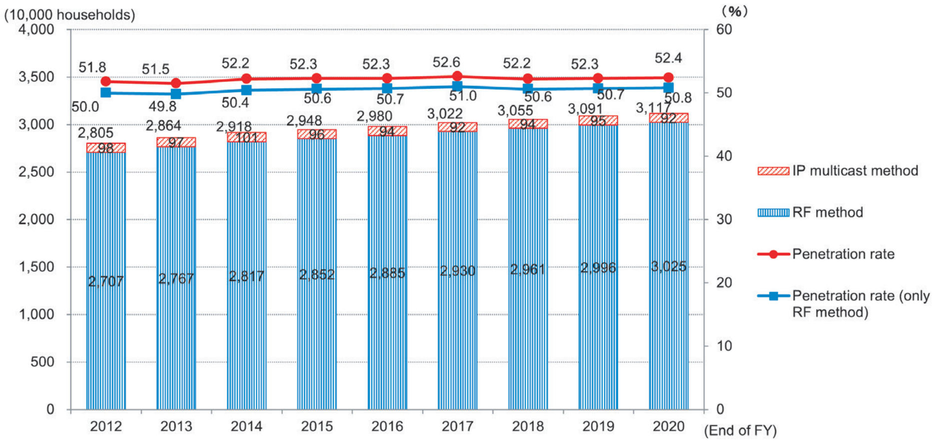
Figure 3-3-1-5 Major satellites used for satellite broadcasting in Japan (at the end of fiscal 2021)

Broadcasting type	Satellites	Orbit (east longitude)	Start of operation
Basic satellite broadcasting	BSAT-3a	110 degrees	Oct. 2007
	BSAT-3b	110 degrees	Jul. 2011
	BSAT-3c/JCSAT-110R	110 degrees	Sep. 2011
	JCSAT-110A	110 degrees	Apr. 2017
	BSAT-4a	110 degrees	Dec. 2018
	BSAT-4b	110 degrees	Sep. 2020
General satellite broadcasting	JCSAT-4B	124 degrees	Aug. 2012
	JCSAT-3A	128 degrees	Mar. 2007

v Cable television

The number of cable television operators was 464 at the end of fiscal 2020. Cable television provides multi-channel broadcasting including re-transmission of terrestrial and satellite broadcasting and independent broadcasting channels. The number of the subscribed households receiving service through wire telecommunications equipment (with more than 501 terminals) for independent broadcasting pertaining to registration is approximately 31.17 million and their ratio to all households is approximately 52.4% (**Figure 3-3-1-6**).

Figure 3-3-1-6 Changes in the number and ratio of the subscribed households receiving service through wire telecommunications equipment for independent broadcasting pertaining to registration



*1 Penetration ratio was calculated based on the number of households in the basic resident register.

*2 Number of the subscribed households and penetration ratio of: facilities that were authorized under the former Cable Television Broadcasting Act and conducted independent broadcasting (including facilities registered under the former Act on Broadcast on Telecommunications Services and with broadcasting method equivalent to the said facilities) up to fiscal 2010, and; wire telecommunications equipment for independent broadcasting pertaining to its registration in fiscal 2011 and after

*3 "Number of households" in RF method refers to the total number of households connected to wire telecommunications equipment pertaining to its registration (including the households with radio disturbance)

(Source) Prepared from MIC, "Actual State of Cable Television"[39]

[39] https://www.soumu.go.jp/main_content/000504511.pdf

(4) State of NHK

i State of domestic broadcasting by NHK

At the end of fiscal 2021, the number of domestic NHK broadcasting channels was 9: two channels for terrestrial television broadcasting; three channels for radio broadcasting; and four channels for satellite television broadcasting (**Figure 3-3-1-7**).

Figure 3-3-1-7 Domestic broadcasting by NHK (end of fiscal 2021)

Category			Number of channels
Terrestrial broadcasting	Television broadcasting		2
	Radio broadcasting	Medium-wave (AM) broadcasting	2
		Ultrashort wave (FM) broadcasting	1
Satellite broadcasting (BS broadcasting)	Television broadcasting		4

*1 Number of broadcast waves of radio broadcasting is also listed as channels.
*2 With the end of analog television broadcasting on March 31, 2021, all television broadcasting has moved to digital broadcasting.

ii State of international television/radio broadcasting by NHK

NHK is broadcasting international television/radio programs for overseas Japanese and foreigners almost all over the world (**Figure 3-3-1-8**).

Figure 3-3-1-8 State of international television/radio broadcasting by NHK (as planned in April 2022)

	Television		Radio
	For overseas Japanese	For foreigners	For overseas Japanese and foreigners
Broadcasting hours	Around 5 hours a day	24 hours a day	56 hours 19 minutes in total per day
Budget	21.1 billion yen (FY2022 NHK budget)		5.2 billion yen (same as on the left)
Language	Japanese	English	18 languages
Service area	Almost all over the world		Almost all over the world
Satellites used / Transmission facilities	Foreign satellites, CATV, etc.		Domestic transmitting stations, overseas relay stations, etc.

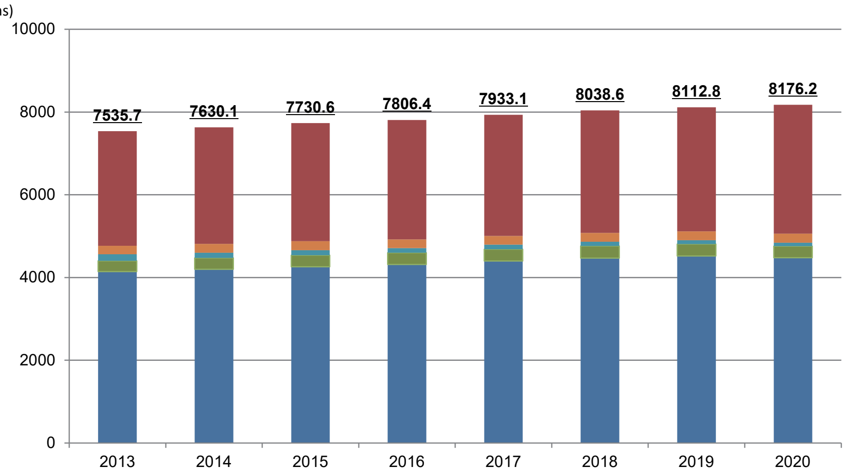
*Hours of international television broadcasting for foreigners include the hours of JIB (Japan International Broadcasting)

(5) Usage status of broadcasting services

i Number of subscribers

In fiscal 2020, the number of subscribers with 110 degrees east longitude CS broadcasting and cable television increased compared with the previous fiscal year, whereas subscribers with other broadcasting services decreased (**Figure 3-3-1-9**).

Figure 3-3-1-9 Number of subscribers with broadcasting services



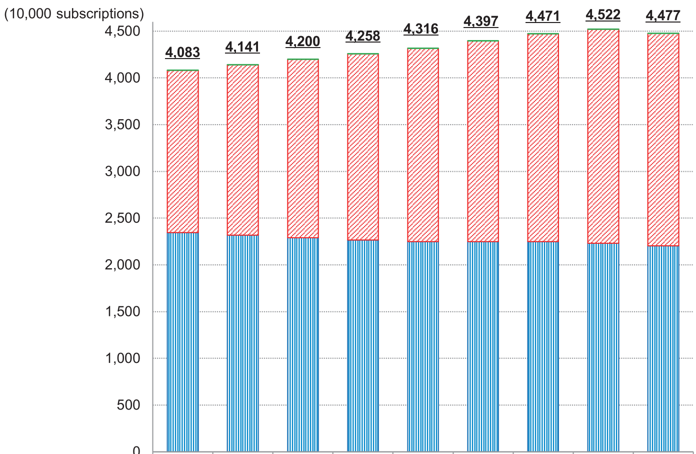
(FY)	2013	2014	2015	2016	2017	2018	2019	2020
Cable television	2,767.0	2,817.0	2,852.0	2,885.0	2,930.3	2,960.7	2,995.9	3,117.1
110 degrees east longitude CS	205.6	212.0	219.5	209.3	208.4	213.7	215.8	218.3
124/128 degrees east longitude CS	157.1	125.4	120.3	114.4	109.4	102.7	93.1	84.4
WOWOW	264.8	275.6	280.5	282.3	287.6	290.1	285.5	279.1
NHK	4,141.2	4,200.1	4,258.3	4,315.4	4,397.4	4,471.4	4,522.5	4,477.3
Satellite contract, etc.	1,823.2	1,911.3	1,993.3	2,066.7	2,147.6	2,221.5	2,289.1	2,274.2

*1 The number of cable television subscribers is the number of the households subscribed: with former facilities that were approved under the former Cable Television Broadcasting Act and conducted independent broadcasting (including facilities registered under the former Act on Broadcast on Telecommunications Services and with broadcasting method equivalent to the said facilities) up to fiscal 2010; and with wire telecommunications equipment for independent broadcasting pertaining to registration in fiscal 2011 and after (excluding IP-multicast broadcasting in either case)
*2 The number of subscribers with 110 degrees east longitude CS is the number of contracts with SKY Perfect!
*3 The number of subscribers with 124/128 degrees east longitude CS is the number of contracts with SKY Perfect! Premium Service
*4 The number of subscribers with WOWOW is the number of contracts with WOWOW.
*5 Number of NHK terrestrial broadcasting is the number of all receiver contracts with NHK.
*6 The number of subscribers with satellite contract, etc. is the number of satellite contracts and special contracts with NHK.
(Source) Prepared from materials of the Japan Electronics and Information Technology Industries Association, the Japan Cable Laboratories, NHK and MIC "Current State of Satellite Broadcasting" and "Current State of Cable TV"

ii Number of receiving contracts with NHK

In fiscal 2020, the number of receiving contracts with NHK was 44.77 million, consisting of about 22.03 terrestrial contracts (ordinary and color), 22.73 million satellite contracts and 10,000 special contracts (**Figure 3-3-1-10**).

Figure 3-3-1-10 Changes in the number of receiving contracts with NHK



	2012	2013	2014	2015	2016	2017	2018	2019	2020
Special contract	1	1	1	1	1	1	1	1	1
Satellite contract	1,736	1,822	1,910	1,992	2,066	2,146	2,220	2,288	2,273
Terrestrial contract	2,346	2,318	2,289	2,265	2,249	2,250	2,250	2,233	2,203
Total	4,083	4,141	4,200	4,258	4,316	4,397	4,471	4,522	4,477

(FY)

(Source) Prepared from NHK material

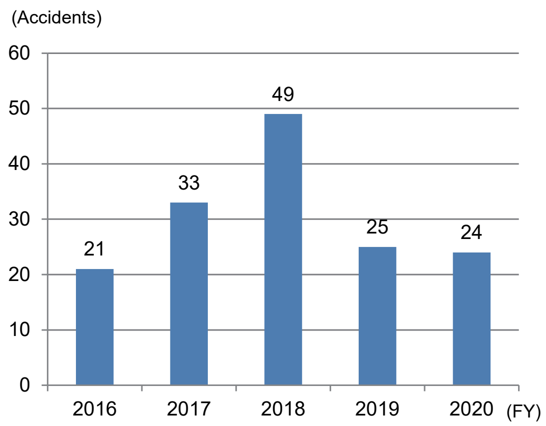
(6) Ensuring of security and reliability of broadcasting equipment

Because broadcasting is of a highly public nature as a means to broadly and instantly transmit information necessary for daily life, including disaster information, high safety and reliability is required from broadcasting equipment.

In fiscal 2020, the number of off-the-air accidents was 384, of which 24 (about 6%) were serious accidents.[40] In the light of these accidents, initiatives to prevent similar accidents have been promoted by sharing the cases in the industry in addition to reliable implementation of recurrence prevention measures by individual business operators (**Figure 3-3-1-11**).

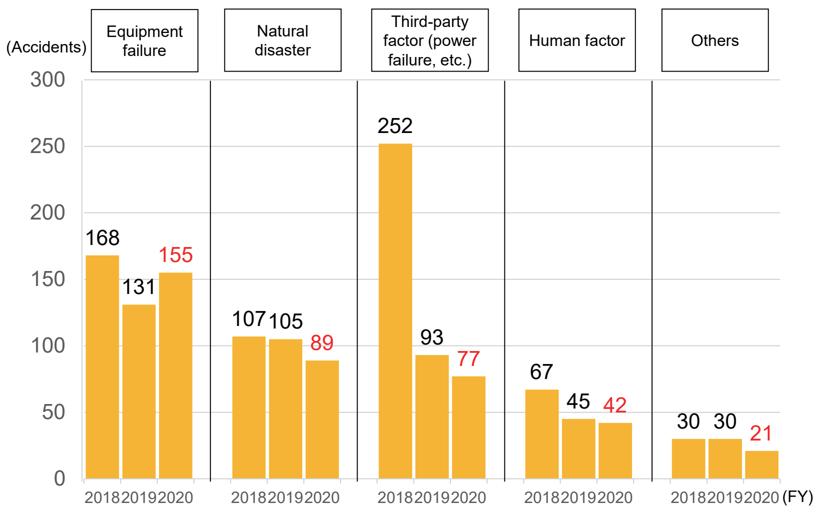
The number of off-the-air accidents of terrestrial/satellite broadcasting was 291, the smallest number since fiscal 2011 when aggregation started. The number of accidents of general cable broadcasting decreased from the number of fiscal 2019, but still higher than the average of the period from fiscal 2016 to 2017. The top cause of the off-the-air accidents in fiscal 2020 was equipment failure followed by natural disaster (**Figure 3-3-1-12**).

Figure 3-3-1-11 Changes in the number of serious accidents*



*Some of the values of the last edition are corrected.
(Source) Prepared from MIC, "Occurrences of off-the-air accidents" (fiscal 2020)[41]

Figure 3-3-1-12 Changes in the number of off-the-air accidents by cause*



*Some of the values of the last edition are corrected.
(Source) Prepared from MIC, "Occurrences of off-the-air accidents" (fiscal 2020)[42]

[40] Accidents falling under the Broadcast Act Articles 113, 122 and 137: "If the suspension of broadcasting caused by the facilities for basic broadcasting or other major accident which is stipulated in the provisions of Order of the Ministry of Internal Affairs and Communications occurs, the approved basic broadcaster must report such matter as well as the reason or cause without delay to the Minister of Internal Affairs and Communications."
[41] https://www.soumu.go.jp/menu_news/s-news/01ryutsu08_02000250.html
[42] https://www.soumu.go.jp/menu_news/s-news/01ryutsu08_02000250.html

2. Content market

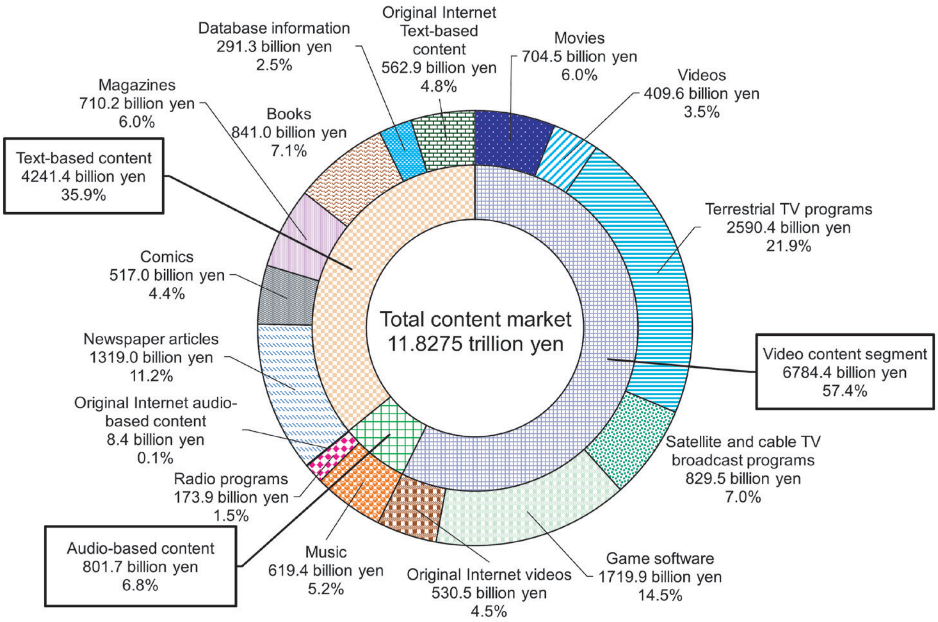
(1) Size of the Japanese content market

i Market overview

The Japanese content market was valued at 11.8275 trillion yen in 2020. By content segment, video-based content accounted for nearly 60% of the market. Text-based content and audio-based content accounted for about 36% and 7% respectively[43] (**Figure 3-3-2-1**).

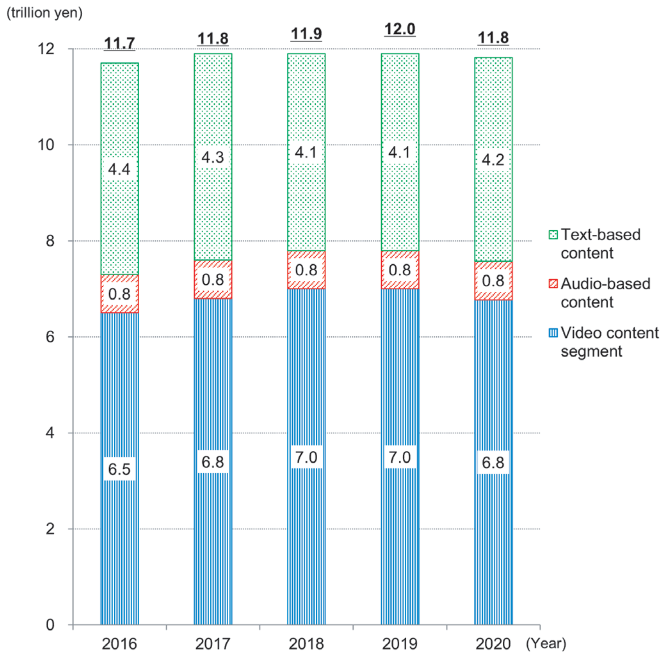
The content market, which had been on the increase in recent years, decreased compared with the previous year. By content segment, video content, which had expanded in recent years, decreased compared with the previous year (**Figure 3-3-2-2**).

Figure 3-3-2-1 Breakdown of Japan's content market (2020)



(Source) Institute for Information and Communications Policy, MIC, "Survey on the Production and Distribution of Media Content"

Figure 3-3-2-2 Changes in the size of the content market of Japan (by content segment)



(Source) Institute for Information and Communications Policy, MIC, "Survey on the Production and Distribution of Media Content"

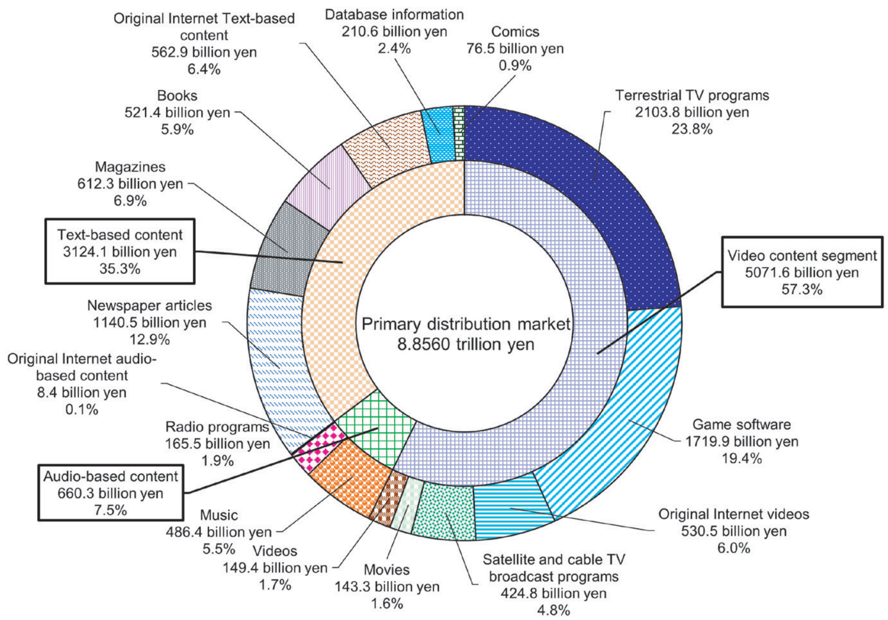
[43] Market size was calculated and analyzed after recounting by distribution stage such as primary distribution and multi-use with focus on the original nature of the content rather than aggregation by media.

ii State of multi-use[44]

In 2020, the primary distribution market was valued at 8.856 trillion yen accounting for about 75% of the entire market. The value is broken down to 5.0716 trillion yen of video-based content, 3.1241 trillion yen of text-based content and 660.3 billion yen of audio-based content (**Figure 3-3-2-3**).

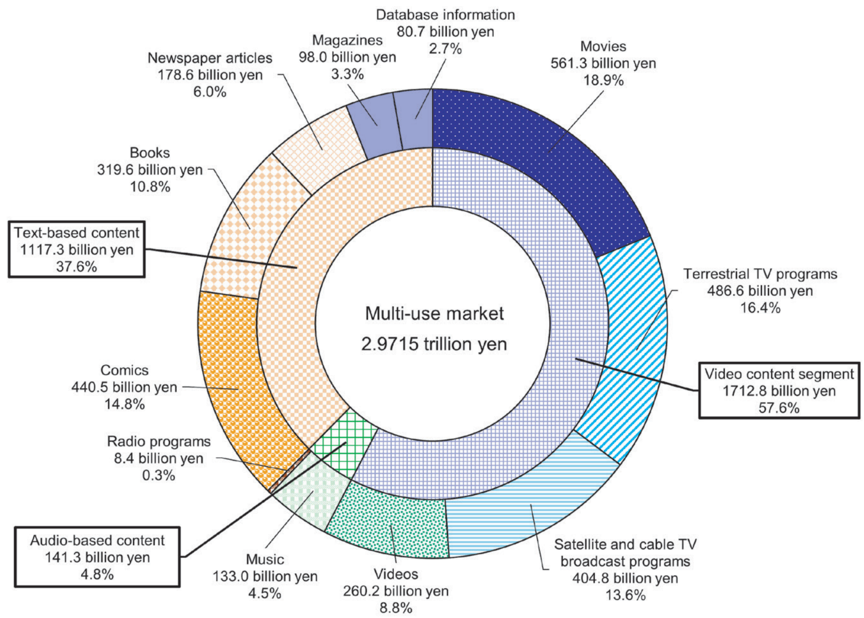
In the same year, the multi-use market was valued at 2.9715 trillion yen accounting for about 25% of the entire market. It is broken down to 1.7128 trillion yen of video-based content, 1.1173 trillion yen of text-based content and 141.3 billion yen of audio-based content (**Figure 3-3-2-4**).

Figure 3-3-2-3 Breakdown of the primary distribution market (2020)



(Source) Institute for Information and Communications Policy, MIC, "Survey on the Production and Distribution of Media Content"

Figure 3-3-2-4 Breakdown of the multi-use market (2020)



(Source) Institute for Information and Communications Policy, MIC, "Survey on the Production and Distribution of Media Content"

iii Communication content market

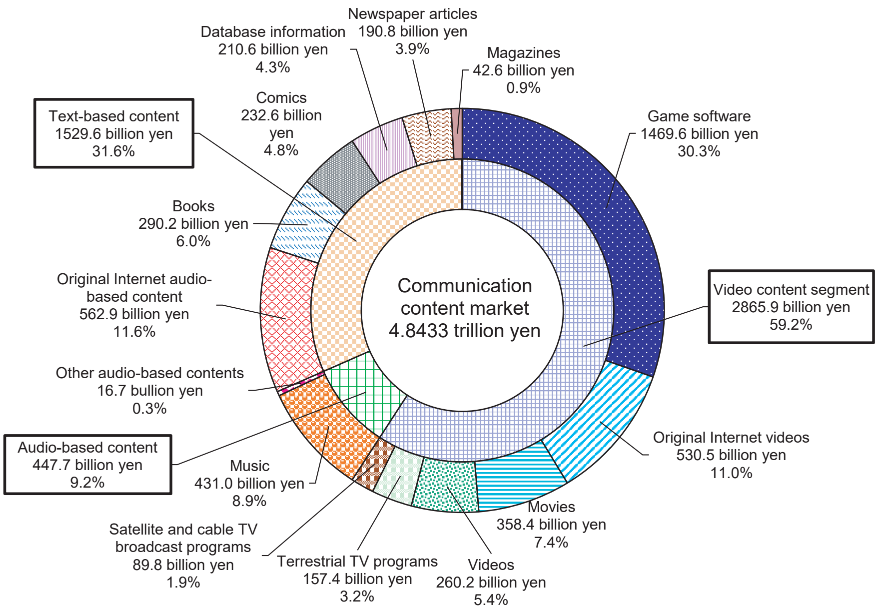
Among the content markets, the market size of communication content for personal computers, mobile phones, etc. via the internet is valued at 4.8433 trillion yen. In composition ratio by content segment, video-based content, text-based content and audio-based content account for

[44] Distribution of software in multiple media in secondary use and after, while maintaining its identical content.

59.2%, 31.6% and 9.2% respectively (**Figure 3-3-2-5**).

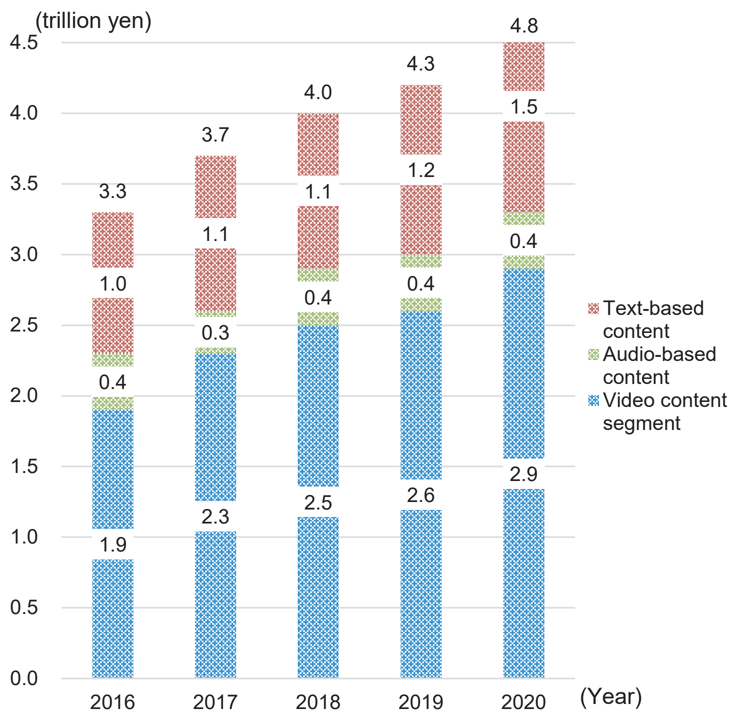
The market size of the communication content has been growing in recent years. By content segment, video content continues to increase due to the growth in movies, net originals, game software, etc., while text-based content is also increasing thanks to the growth in books, comics and original internet content, which contributes to the expansion of the communication content market (**Figure 3-3-2-6**).

Figure 3-3-2-5 Breakdown of the communication content market (2020)



(Source) Institute for Information and Communications Policy, MIC, "Survey on the Production and Distribution of Media Content"

Figure 3-3-2-6 Changes in the market size of communication content (by content segment)

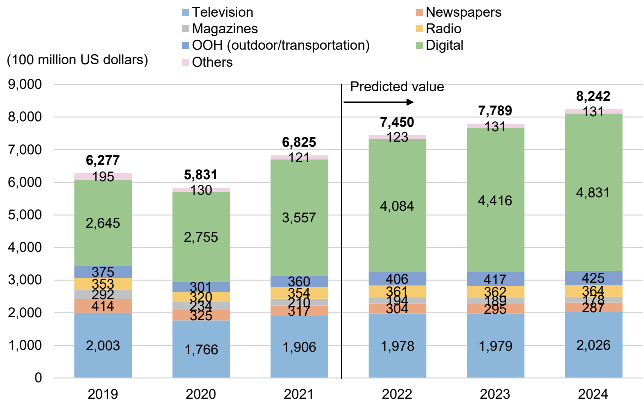


(Source) Institute for Information and Communications Policy, MIC, "Survey on the Production and Distribution of Media Content"

(2) Advertisement

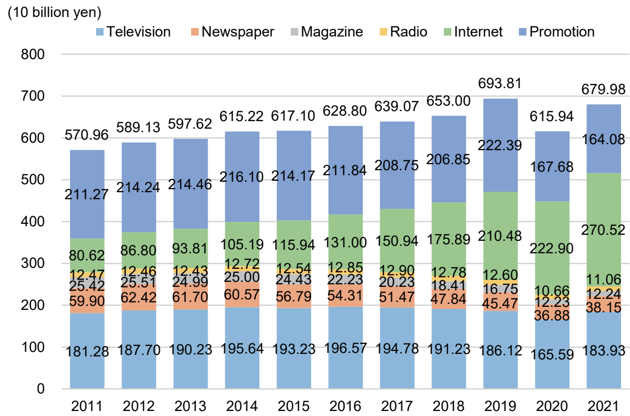
With the penetration of digitalization triggered by the COVID-19 pandemic, digital advertisements led the growth of the entire advertising market of the world and grew to 39.0396 trillion yen (32.7% increase year-on-year) in 2021 (**Figure 3-3-2-7**). The digital advertisement market is substantially growing in Japan also, where internet advertising expenditures (2.7052 trillion yen) exceeded the four traditional media[45] advertising expenditures (2.4538 trillion yen) for the first time in 2021 (**Figure 3-3-2-8**).

Figure 3-3-2-7　Changes in and projections of advertisement expenses by media in the world



(Source) Prepared from Dentsu Group, "Projection of the growth rate of the advertisement expenses in the world (2021-2024)"[46]

Figure 3-3-2-8　Changes in advertising expenditures by media in Japan[47]



(Source) Prepared from Dentsu, "Advertisement Expenses in Japan (annual)"[48]

Related data
Changes in and projections of total global advertisement expenses
Source: Dentsu Group, "Global advertisement spend growth rate forecast (2021-2024)"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-3-31 (Data Collection)

(3) Trends of exports of broadcasting content of Japan

Among the types of the broadcast programs produced by enterprises doing a business that falls under "broadcast program production", the ratio of "information programs (including publicity)" is highest at 69.6% (1.3 point decrease from the previous fiscal year), followed by "CM" at 55.0% (2.8 point decrease from the previous fiscal year) and "variety" at 50.5% (0.9% decrease from the previous fiscal year) in fiscal 2020.

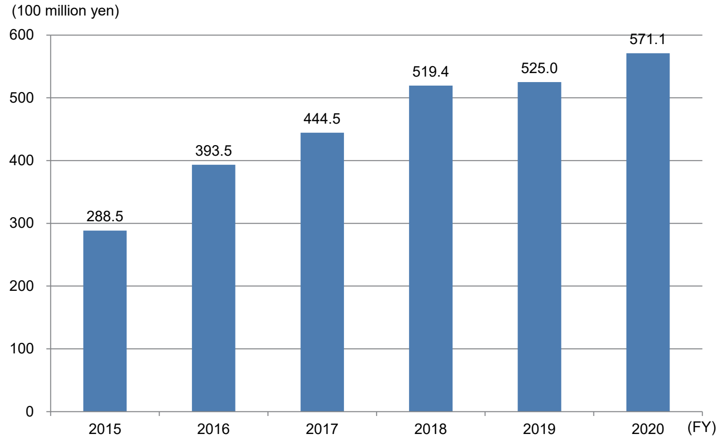
Related data
Ratio of the types of broadcast programs produced (multiple answers)
Source: MIC/METI "2021 Basic Survey on the Information and Communications Industry"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-3-32 (Data Collection)

In fiscal 2020, export of broadcast content continued to increase and reached 57.11 billion yen (**Figure 3-3-2-9**).

With the growth of video distribution services, value of program broadcasting right, video release right, etc. decreased, while the ratio of Internet distribution right increased (**Figure 3-3-2-10**).

[45] Television, newspapers, magazines and radio
[46] https://www.group.dentsu.com/jp/news/release/000643.html
[47] Since 2019, "advertisement on EC platform for sales of goods" and "event field" are included in the advertisement expenses of Japan to estimate the advertisement market. Data of 2018 and before are not retroactively adjusted.
[48] https://www.dentsu.co.jp/knowledge/ad_cost/index.html

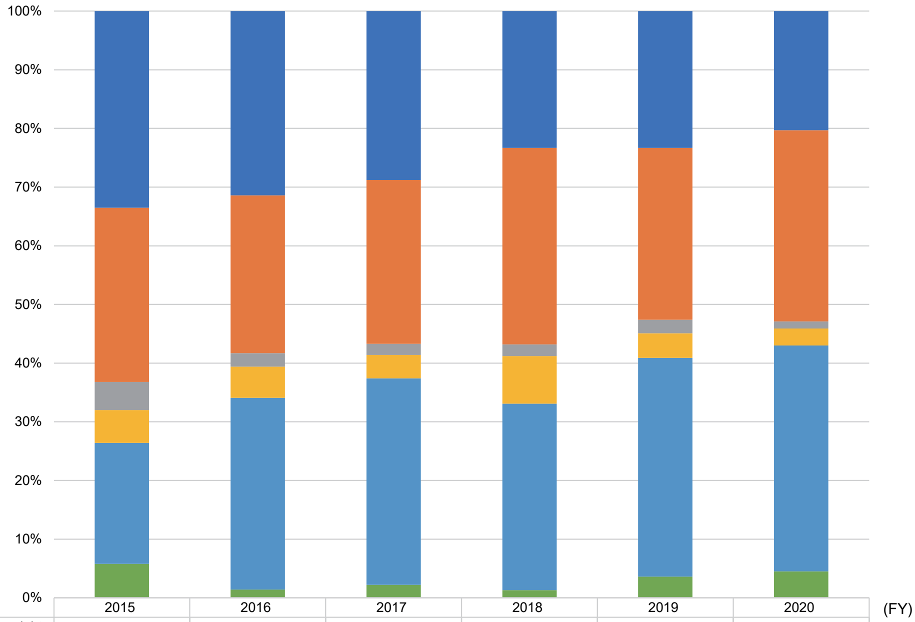
Figure 3-3-2-9 Changes in the export value of Japanese broadcast content



*1 Export value of broadcast content: total of the overseas sales of program broadcasting right, internet distribution right, video/DVD release right, TV formatting/remaking right and merchandizing right
*2 Calculated based on questionnaire surveys of NHK, key private stations, sub key private stations in Osaka, local stations, satellite broadcasters, CATV operators, productions, and others.
*3 After fiscal 2016, there have been changes such as clear inclusion of right to turn into a game in calculation.

(Source) Prepared from MIC, annual "Present Data Analysis on Overseas deployment of broadcast content"[49]

Figure 3-3-2-10 Changes in the ratio of the export value of Japanese broadcast content by type of right



(FY)	2015	2016	2017	2018	2019	2020
Program broadcasting right	33.5	31.4	28.8	23.3	23.3	20.3
Internet distribution right	29.7	26.9	27.9	33.5	29.3	32.6
Video/DVD release right	4.8	2.3	1.9	2.0	2.3	1.2
TV formatting/remaking right	5.6	5.3	4.0	8.1	4.2	2.9
Merchandizing right	20.6	32.7	35.2	31.8	37.3	38.5
Others	5.8	1.4	2.2	1.3	3.6	4.5

*1 Merchandizing right and video/DVD release right do not include overseas sales of characters and other merchandise and medium itself such as videos and DVDs.
*2 In cases where clear division is not possible, for example, when multiple rights including program broadcasting right were sold or the question on category was not answered, the sales are classified as program broadcasting right.
*3 After fiscal 2016, there have been changes such as clear inclusion of right to turn into a game in calculation.

(Source) Prepared from MIC, annual "Present Data Analysis on Overseas deployment of broadcast content"[50]

Related data
Changes in ratio of Japan's exports of broadcast content by entity
Source: Prepared from MIC, annual "Analysis of Current Situation of Overseas Export of Broadcasting Content"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-3-35 (Data Collection)

[49] https://www.soumu.go.jp/menu_news/s-news/01ryutsu04_02000185.html
[50] https://www.soumu.go.jp/menu_news/s-news/01ryutsu04_02000185.html

Section 4 Trends of Radio Spectrum Use in Japan

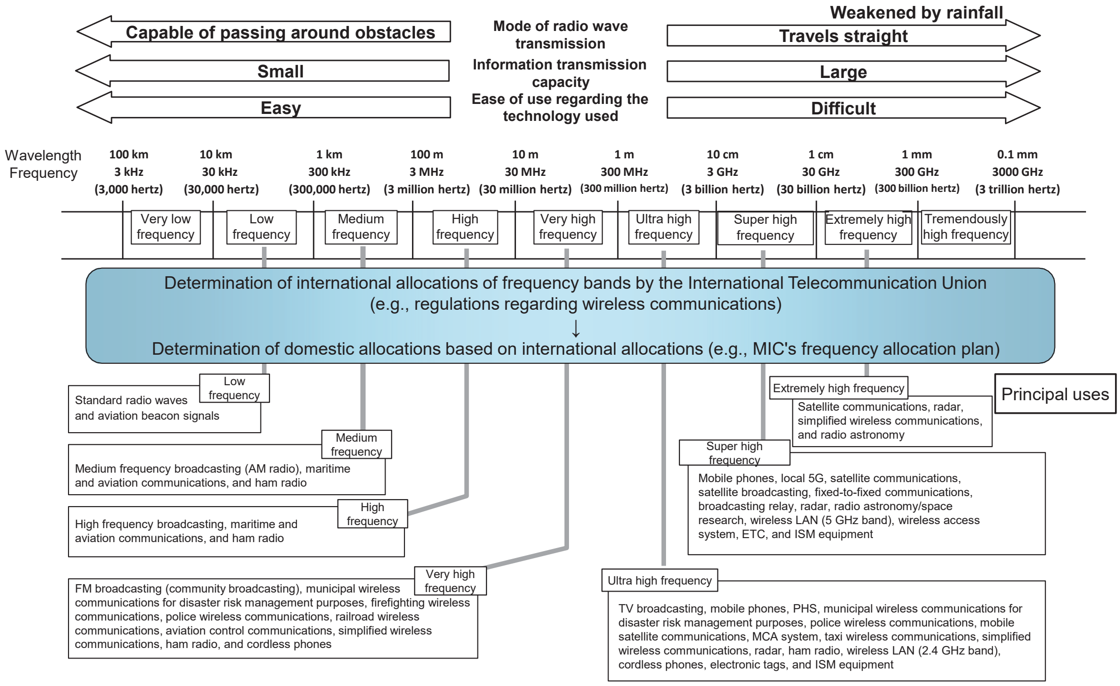
1. Principal use by spectrum

Radio Regulations stipulated in the International Telecommunication Union (ITU) Constitution and Convention have established the international frequency allocation that divides the world into three regions and defines the category of operations for each spectrum.

In order to help application for license of radio stations, MIC has established the Frequency Assignment Plan[51] based on the international allocation and the Radio Act which defines the frequencies that can be assigned, category of operations, purposes, conditions, etc. When establishing or changing the plan, the Radio Regulatory Council is consulted.

Major usage and characteristics of each spectrum in Japan are shown in **Figure 3-4-1-1**.

Figure 3-4-1-1 Major usages and radio wave characteristics in Japan by spectrum



Spectrum	Wave length	Characteristics
Very low frequency	10 to 100km	Propagating along ground surface, waves of this spectrum can go over low hills. Being capable of propagating in water, the spectrum can be used for seabed exploration
Low frequency	1 to 10km	Being capable of propagating to very distant places, the spectrum is used by standard frequency stations to inform radio clock, etc. of time and frequency standard.
Medium frequency	100 to 1000m	Capable of propagating through reflection off the E-layer of the ionosphere that is formed at the height of about 100km, the spectrum is used mainly for radio broadcasting.
High frequency	10 to 100m	Capable of reaching the other side of the globe by being reflected off the F-layer of the ionosphere that is formed at the height of about 200 to 400km and by repeating reflection between F-layer and the ground surface. Widely used for ocean ship and international flight plane communication, international broadcasting and amateur radio.
Very high frequency	1 to 10m	Waves of this spectrum propagate rather straight and are not easily reflected off the ionosphere, but are capable of reaching the other side of mountains and buildings to a certain extent. The spectrum is widely used for a variety of mobile communications including emergency and fire emergency radio.
Ultra-high frequency	10cm to 1m	Waves of this spectrum have stronger tendency to propagate straight compared with very high frequency, but are capable of reaching the other side of mountains and buildings to a certain extent. The spectrum is widely used mostly for a variety of mobile communication systems including mobile phones, and digital television broadcasting and microwave ovens. .
Super high frequency	1 to 10cm	Due to the strong tendency to propagate straight, this spectrum is suitable for emission to a specific direction. It is mainly used for fixed trunk circuits, satellite communication, satellite broadcasting and wireless LAN.
Extremely high frequency	1 to 10mm	With strong tendency to propagate straight, waves of the spectrum can transmit very large information quantity, but not very far in bad weather due to rain or fog. For this reason, the spectrum is used for relatively short-distance radio access communication and image transmission systems, simplicity radio, car collision prevention radar and radio telescopes for astronomical observation.
Trem endously high frequency	0.1 to 1mm	The spectrum has nature similar to light. It is rarely used for communication but used for radio telescopes for astronomical observation as is the case of Extremely high frequency.

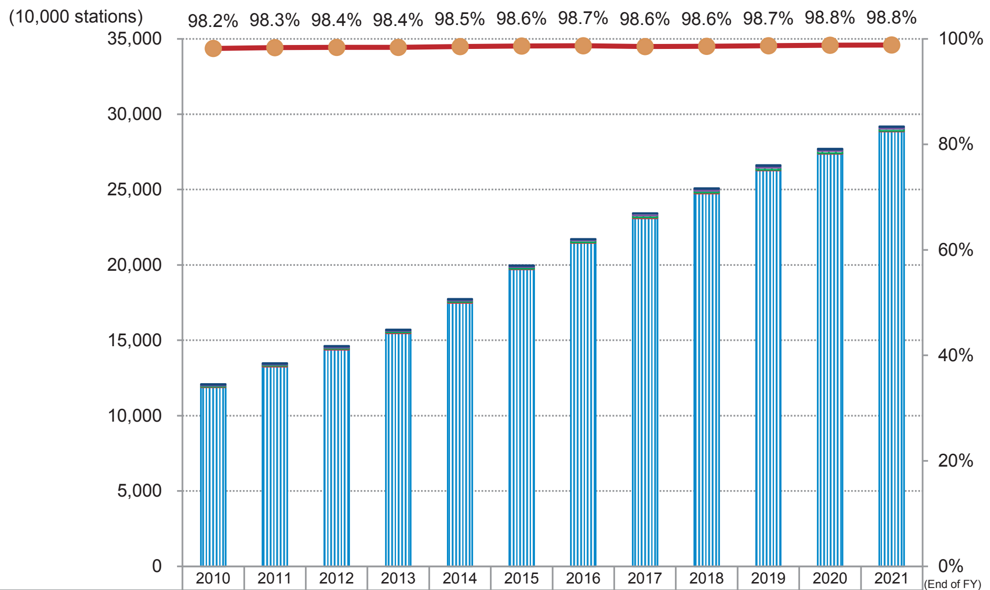
[51] Frequency Assignment Plan: https://www.tele.soumu.go.jp/j/adm/freq/search/share/index.htm

2. Changes in the number of radio stations

The number of radio stations (excluding license-free radio stations such as wireless LAN terminals) at the end of fiscal 2021 was 291.98 million, an increase by 5.4% from the previous year, including 288.59 million mobile phones and other land mobile stations (increase by 5.2% from the previous year). The ratio of mobile phones and other land mobile stations is at a high level of 98.8%.

Simplicity radio stations have also increased to 1.42 million (increase by 3.9% from the previous year) (**Figure 3-4-2-1**).

Figure 3-4-2-1 Changes in the number of radio stations



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Other	46	43	46	50	50	55	49	49	55	59	61	51
Base stations	54	58	63	68	71	70	73	125	132	117	95	108
Convenience stations*2	74	77	84	90	97	105	112	118	125	132	137	142
Amateur stations	45	44	44	44	44	44	43	43	41	40	39	38
Land mobile stations*1	11,879	13,266	14,388	15,472	17,493	19,711	21,457	23,109	24,748	26,278	27,379	28,859
Percentage of land mobile stations	98.2%	98.3%	98.4%	98.4%	98.5%	98.6%	98.7%	98.6%	98.6%	98.7%	98.8%	98.8%

*1 Land mobile station: radio stations operated when moving on land or stopping at unspecified points (e.g. mobile phone terminals)
*2 Simplicity radio station: radio stations for simple radio communication

3. Satellites

In the field of satellite communication, Japan is working to powerfully advance social implementation and international standardization of the results of the development that will realize expansion of communication coverage for seamless connection of land, sea and air (Non-Terrestrial Network (NTN) technology including satellite and HAPS).

Due to their wide coverage, high broadcast possibilities, disaster resistance and other advantages, communication satellites including geostationary satellites and non-geostationary satellites are used for in-house channels, communication with mountainous regions/isolated islands where use of terrestrial channels is difficult, mobile satellite communication services for ships and aircraft, and communication at the time of disaster. Some communication satellites are used for satellite broadcasting (CS broadcasting).

(1) Geostationary satellite

Rotating in the geosynchronous orbit at the height of 36,000km above the equator with an orbital period matching the Earth's rotation period, geostationary satellites seem to maintain a fixed position when observed from the earth. Thanks to the high position, three geostationary satellites can cover the whole earth except polar regions and are used for fixed and mobile satellite communications. Due to the long distance from the earth, transmission delay is long and high power is required from terminals, which makes terminal downsizing difficult.

(2) Non-geostationary satellite

Non-geostationary satellites travel in an orbit other than geostationary orbit that is generally higher than non-geostationary orbit. For this reason, their transmission delay is shorter and terminal output is smaller, which makes smaller and mobile terminals possible. Communication in polar regions is possible, which is difficult in a geostationary orbit on the equator. On the other hand, because satellites pass over an area in a short period of time, it is necessary to simultaneously operate a large number of satellites in order to cover a wide area while ensuring communicable time.

Related data
Major geostationary satellites used for communication services in Japan (at the end of fiscal 2021)
Major non-geostationary satellites used for communication services in Japan (at the end of fiscal 2021)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-4-3 (Data Collection)

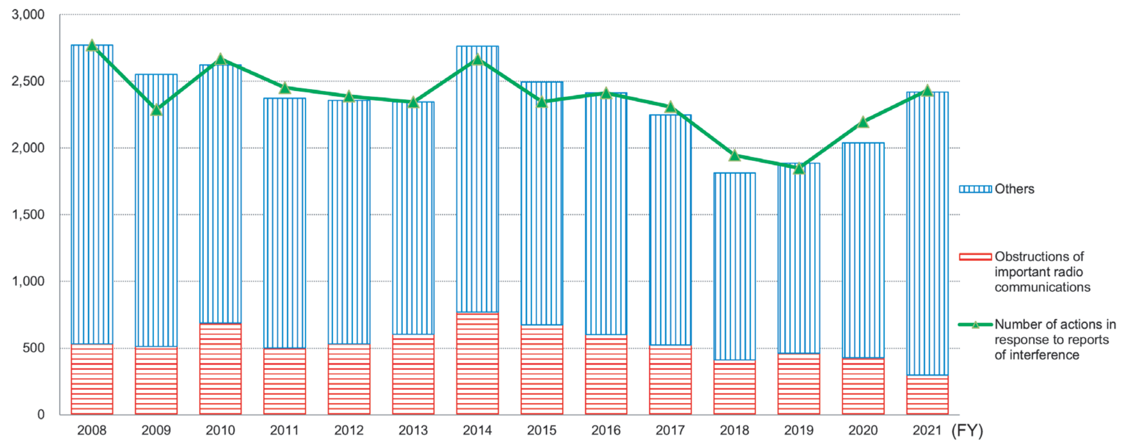
4. Radio wave monitoring to eliminate obstruction of important radio communications, etc.

Using sensor station facilities installed on steel towers and building rooves in major cities across the country and vehicles for search of unlicensed radio stations, MIC is investigating sources of radio emission jamming important radio communications including fire/emergency radio, aeronautical/maritime radio and mobile phones and is cracking down on unlicensed radio stations. In addition, MIC is monitoring radio waves by establishing DEURAS, which is a system to detect emission sources of radio waves including unlicensed radio stations disturbing radio usage environment.[52]

In fiscal 2020, the number of reports of radio interference or obstructions increased 153 to 2,039 (increase by 8.1% from the previous year), 439 of which are obstructions of important radio communications (decrease by 32 cases or 6.9% from the previous year). The number of actions taken against interference or obstructions was 2,198[53] in fiscal 2020 (**Figure 3-4-4-1**).

The number of unlicensed radio stations found in fiscal 2020 increased 228 (3.5% increase) to 6,765. The number of actions taken2 decreased by 304 to 643 (48.4% decrease from the previous year), which is broken down to 62 prosecutions (9.6% of all actions) and 581 guidance (90.4% of all actions) (**Figure 3-4-4-2**).

Figure 3-4-4-1 Changes in the number of reports of and actions against interference or obstructions to radio stations



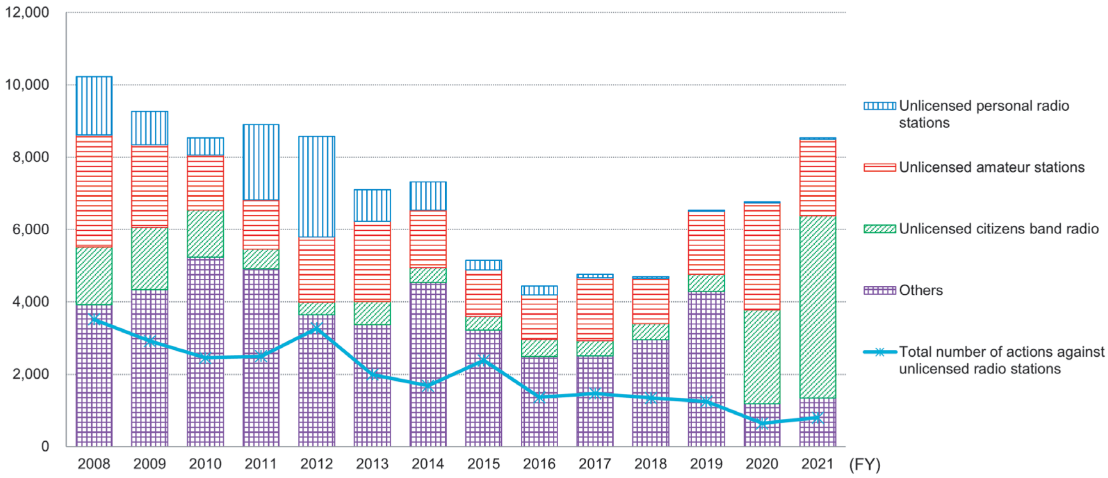
Number of reports of interference or obstruction

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Obstructions of important radio communications	532	513	689	501	532	605	771	676	603	522	412	461	429	298
Others	2,241	2,041	1,934	1,873	1,826	1,740	1,995	1,821	1,811	1,727	1,401	1,425	1,610	2,121
Total	2,773	2,554	2,623	2,374	2,358	2,345	2,766	2,497	2,414	2,249	1,813	1,886	2,039	2,419
Number of actions in response to reports of interference or obstructions														
Number of actions in response to reports of interference	2,772	2,289	2,669	2,453	2,389	2,346	2,667	2,348	2,414	2,310	1,946	1,850	2,198	2,434

[52] In fiscal 2010, DEURAS established a 24-hour system to receive obstruction reports and have been working to promptly eliminate obstructions to important radio communications. As an international radio wave monitoring facility registered with the International Telecommunication Union (ITU), DEURAS plays a role in HF and cosmic radio wave monitoring.

[53] The number of actions taken includes actions in response to the reports made in the previous year, for which action had not been taken.

Figure 3-4-4-2 Changes in the number of unlicensed radio stations found and the number of actions taken



Number of unlicensed radio stations found		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Stations found	Unlicensed personal radio stations	1,617	920	479	2,081	2,788	865	784	265	245	99	40	28	25	32
	Unlicensed amateur stations	3,097	2,283	1,525	1,367	1,803	2,225	1,592	1,291	1,229	1,749	1,253	1,739	2,959	2,126
	Unlicensed citizens band radio	1,592	1,729	1,295	538	342	642	404	375	478	414	443	477	2,594	5,035
	Others	3,926	4,338	5,239	4,917	3,648	3,369	4,541	3,221	2,489	2,508	2,958	4,293	1,187	1,341
	Total	10,232	9,270	8,538	8,903	8,581	7,101	7,321	5,152	4,441	4,770	4,694	6,537	6,765	8,534
Number of actions against unlicensed radio stations															
Number of actions	Prosecution	330	340	262	249	231	228	215	230	168	168	208	189	62	49
	Guidance	3,190	2,578	2,190	2,247	3,038	1,764	1,465	2,156	1,196	1,300	1,136	1,058	581	752
	Total	3,520	2,918	2,452	2,496	3,269	1,992	1,680	2,386	1,364	1,468	1,344	1,247	643	801

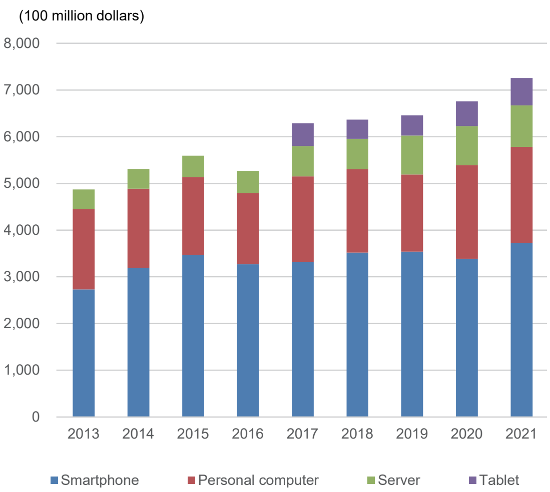
Section 5 Trends Related to Equipment and Terminals

1. Trends in the Information Terminals Market

Global shipments of information terminals have been increasing since 2016 and reached 79.6625 trillion yen (10.4% increase year-on-year) in 2021 (**Figure 3-5-1-1**). In breakdown, smartphones and personal computers account for a major part.

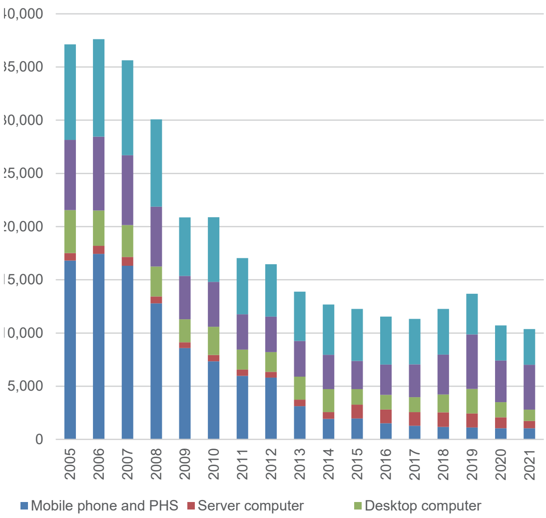
Japan's production of information terminals was on the decrease up to 2017, turned to increase in 2018, but decreased again in 2020 and fell to 1.0370 trillion yen (3.2% decrease year-on-year) in 2021 (**Figure 3-5-1-2**). In breakdown, mobile phones and PHS[54] accounted for a major part up to the mid-2010s, but their ratio decreased later. Now, desktop computers, laptop computers and information terminals[55] take a leading part.

Figure 3-5-1-1 Changes in shipment of information terminals in the world[56]



(Source) Omdia

Figure 3-5-1-2 Changes in Japan's production of information terminals



(Source) METI "Current Survey of Production – Machinery"[57]

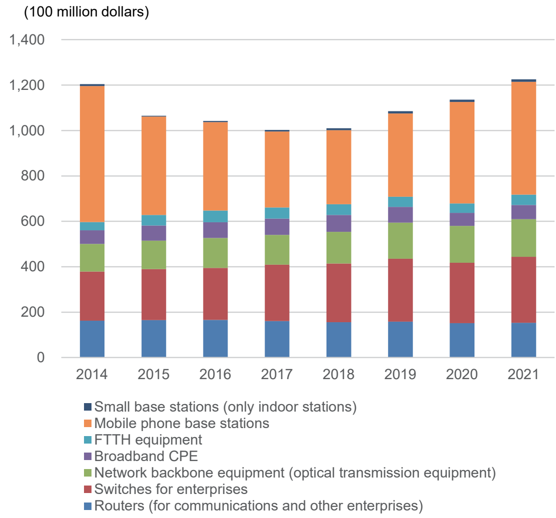
2. Trends in the network equipment market

Global shipments of network equipment have been increasing since 2017 and reached 13.4520 trillion yen (10.9% increase year-on-year) in 2021 (**Figure 3-5-2-1**). Mobile phone base stations and switches for enterprises accounted for a major part of the shipments.

Japan's production of network equipment had been decreasing from the first half of the 2000s, started to gradually increase in 2018, but again decreased to 774.3 billion yen (0.5% decrease year-on-year) in 2021 (**Figure 3-5-2-2**). In detail, telephone application equipment[58] and exchangers decreased with the shift from fixed telephone to mobile/IP telephones. Today, wireless application devices[59] and other wireless communication equipment[60] are major segments. Production of base station communication equipment has greatly fluctuated. It had stagnated since 2016 when investments in 4G had completed, but turned to increase in 2020. Network connection devices[61] used for IP communication turned to increase in 2019 but decreased in 2021. Carrier devices[62] have been increasing since 2019 mainly with the contribution of digital transmission devices.

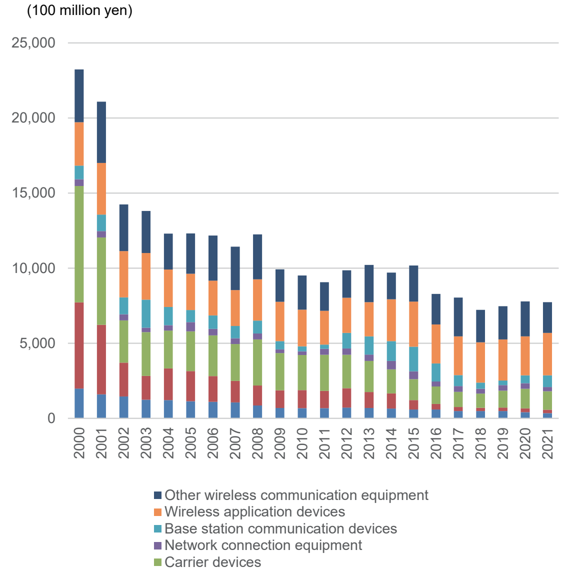
[54] Because production of mobile phones and PHS is not disclosed since fiscal 2019, the values of radio communication equipment (including satellite communication equipment) are used after deducting the values of broadcasting equipment, fixed communication equipment (satellite and terrestrial), other terrestrial mobile communication equipment, maritime/aeronautical mobile communication equipment, base station communication equipment, other radio communication equipment and associated radio equipment.
[55] External memories, printers, monitors, etc. Information kiosk terminal devices are excluded because their production was not disclosed in some years.
[56] Tablets have been included since 2017.
[57] https://www.meti.go.jp/statistics/tyo/seidou/index.html
[58] Key telephone systems and interphones
[59] Maritime/aeronautical radars, wireless location measuring devices, telemeter/telecontrol apparatus, etc.
[60] Satellite/terrestrial fixed communication equipment, maritime/aeronautical communication equipment, transceivers, etc.
[61] Routers, hubs, gateways, etc.
[62] Digital transmission devices, power line carrier devices, CATV carrier devices, optical transmission devices, etc.

Figure 3-5-2-1　Changes in the global shipments of network equipment



(Source) Omdia

Figure 3-5-2-2　Changes in Japan's production of network equipment



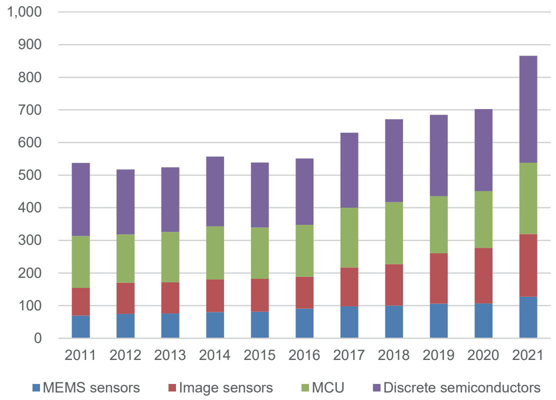
(Source) MIC "Current Survey of Production – Machinery[63]"

3. Trends in the semiconductor[64] market

The global shipments of semiconductors have been increasing since 2015 and reached 9.4999 trillion yen (26.7% increase year-on-year) in 2021 (**Figure 3-5-3-1**). In detail, discrete semiconductors accounted for the largest part of the shipments, while image sensors have grown greatly in recent years.

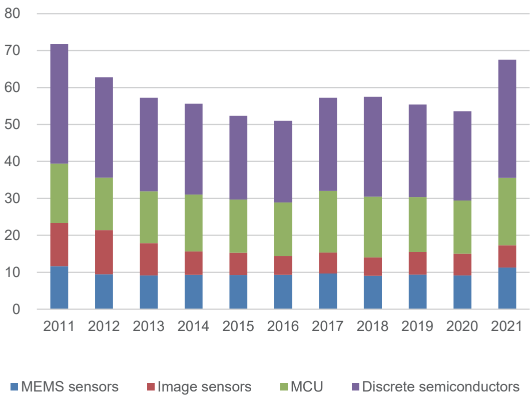
Japan's shipments of semiconductors had been decreasing from 2018 but turned to increase to 741.2 billion yen (29.6% increase year-on-year) in 2021 (**Figure 3-5-3-2**). In detail, discrete semiconductors accounted for the largest part (nearly half) of the production as is the case with the world market.

Figure 3-5-3-1　Changes in global semiconductor shipments



(Source) Omdia

Figure 3-5-3-2　Changes in Japan's semiconductor shipments



(Source) Omdia

[63] https://www.meti.go.jp/statistics/tyo/seidou/index.html

[64] In this section, the term refers to discrete semiconductors that are used for image sensers, MCU, MEMS sensors and indispensable power sources. These are key devices of IoT and electronic equipment mounted with AI, introduction of which is advancing toward digital transformation.

4. Changes in exports/imports of ICT equipment

China's exports of ICT equipment[65] are rapidly increasing. Exports of the United States and Japan turned to increase after the decrease in the early 2000s and remained almost unchanged before decreasing again in 2009. After 2010, the United States maintained a high level, whereas Japan experienced a decreasing trend. Imports of ICT equipment significantly increased in China and the US. Imports increased only slightly in Japan: the difference between China and the US has increased.

In 2020, Japan's exports of ICT equipment were 6.0871 trillion yen (1.1% decrease year-on-year), while imports were 9.5804 trillion yen (0.5% decrease year-on-year), resulting in a 3.4932 trillion yen import surplus (0.5% increase year-on-year). The excess of imports over exports of the United States was 22.3201 trillion yen (8.8% increase year-on-year), while the excess of exports over imports of China was 19.8044 trillion yen (7.8% decrease year-on-year).

Related data
Changes in ICT exports/imports of various countries
Source: UNCTAD, "UNCTAD STAT"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-5-7 (Data Collection)

5. Global and Japanese market share by business operator

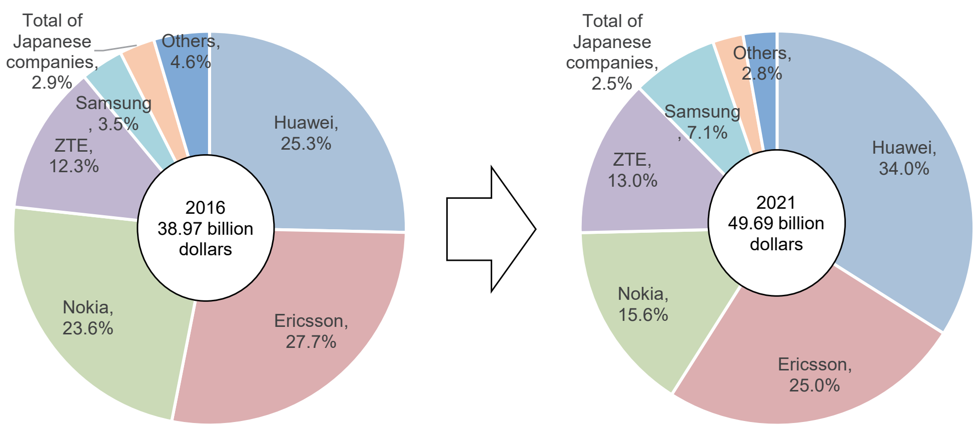
(1) Global market

In the 2021 global market, Samsung had the top smartphone market share (20.3%: number of sales), followed by Apple (17.5%) and Xiaomi (14.2%).

Huawei (34.0%) had the top share in macro cell base stations in value of shipment, followed by Ericsson (25.0%) and Nokia (15.6%) (**Figure 3-5-5-1**). Cisco (64.6%) had the top share in routers for enterprises (in value of shipments) followed by H3C (8.3%) and Huawei (6.3%).

In semiconductor shipment value, Intel had the top share (13.0%) followed by Samsung Electronics (12.8%) and SK Hynix (6.3%).

Figure 3-5-5-1 Changes in macro cell base station share in the global market



(Source) Omdia

Related data
Changes in global share of the smartphone, router for enterprises and semiconductor markets
Source: Omdia
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-5-9 (Data Collection)

[65] Computers, communicators, electric appliances for consumers, electronic components, etc.

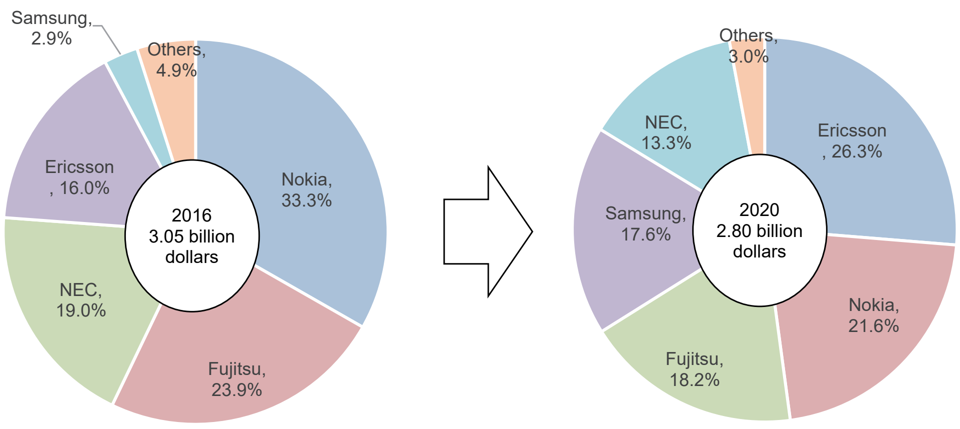
(2) Japanese market

In the 2020 Japanese market, Apple had the top smartphone share (67.4%: number of sales) followed by Samsung (9.4%) and Sharp (9.0%).

In the network equipment segment, Ericsson (26.3%) had the top share in macro cell base stations (in value of shipments), followed by Nokia (21.6) and Fujitsu (18.2%) (**Figure 3-5-5-2**). Cisco (28.8%) had the top share in routers for enterprises followed by Yamaha (28.1%) and NEC (27.1%).

In terms of semiconductor shipment, Intel had the top share (8.6%) followed by Renesas Electronics (8.3%) and Samsung Electronics (6.5%).

Figure 3-5-5-2 Changes in the macro cell base station share in the Japanese market



(Source) Omdia

Related data
Changes in share of the smartphone, router for enterprises and semiconductor markets in Japan
Source: Omdia
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-5-13 (Data Collection)

Section 6 Trends of Services and Applications

1. Platform trends

(1) Market trends

In terms of market capitalization of the major players of the global ICT market, GAFAM[66] occupy the top positions. In July 2021, the total of GAFA's market capitalization exceeded the total of all Japanese stocks. Market capitalization of the top 15 companies sharply increased from 408.1724 trillion yen in 2017 to 1,586.8443 trillion yen[67] in 2022 (**Figure 3-6-1-1**).

Figure 3-6-1-1 Changes in the top 15 companies in terms of market capitalization in the global ICT market

2017

Company name	Major business	Country	Market capitalization (100 million dollars)
Apple	Hardware, software, services	US	8,010
Alphabet/Google	Search engine	US	6,800
Amazon.com	e-commerce	US	4,760
Facebook	SNS	US	4,410
Tencent	SNS	China	3,350
Alibaba	e-commerce	China	3,140
Priceline Group	Online booking	US	920
Uber	Mobility	US	700
Netflix	Media	US	700
Baidu China	Search engine	China	660
Salesforce	Cloud service	US	650
Paypal	Payment	US	610
Ant Financial	Payment	China	600
JD.com	e-commerce	China	580
Didi Kuaidi	Mobility	China	500

2022

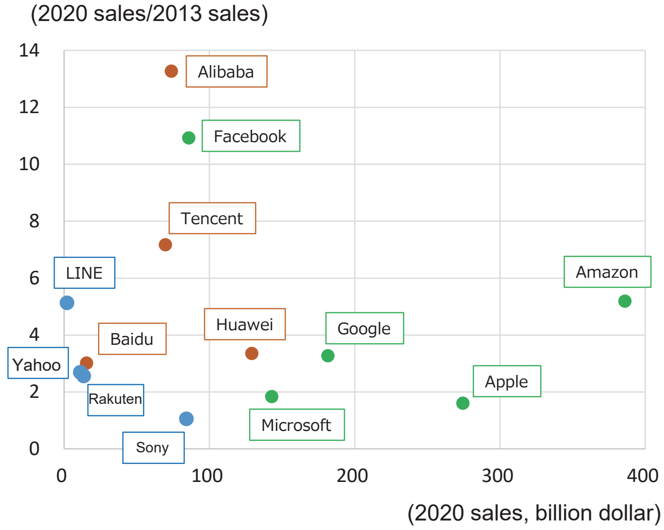
Company name	Major business	Country	Market capitalization (100 million dollars)
Apple	Hardware, software, services	US	28,282
Microsoft	Cloud service	US	23,584
Alphabet/Google	Search engine	US	18,215
Amazon.com	Cloud service, e-commerce	US	16,353
Meta Platforms /Facebook	SNS	US	9,267
NVIDIA	Semiconductor	US	6,817
Taiwan Semiconductor Manufacturing	Semiconductor	Taiwan	5,946
Tencent	SNS	China	5,465
Visa	Payment	US	4,588
Samsung Electronics	Hardware	Korea	4,473
Mastercard	Payment	US	3,637
Alibaba	e-commerce	China	3,589
Walt Disney	Media	US	2,811
Cisco Systems	Hardware, security	US	2,578
Broadcom	Hardware, semiconductor	US	2,557

(Source) For 2017, MIC (2018) "Current State and Challenges of Platform Services "[68]; for 2022, Wright Investors' Service, Inc[69] (as of January 14, 2022)

In comparison with the 2020 sales[70] of the biggest platformers of Japan, the United States and China, Amazon's sales were largest (41.2214 trillion yen), increasing 5.2 fold from its sales in 2013 (**Figure 3-6-1-2**). Alibaba (7.8924 trillion yen) of China grew 13.3 fold compared with 2013. By contrast, Japanese companies are smaller and do not bear comparison in terms of growth: 5.1 fold of LINE, 2.7 fold of Yahoo, 2.6 fold of Rakuten and 1.1 fold of Sony.

[66] Google, Amazon, Facebook, Apple and Microsoft
[67] Converted to yen using the average exchange rate of January 2022.
[68] https://www.soumu.go.jp/maincontent/000579804.pdf
[69] https://startup-db.com/magazine/category/research/marketcap-global-2022
[70] Sales of Japanese and Chinese companies were converted to dollar by using average rate of the respective year.

Figure 3-6-1-2 Sales of platformers of Japan, the US and China



*Sales of 2019 for LINE

(Source) Prepared from Statista data

(2) Trends of platformer regulation in Japan and abroad

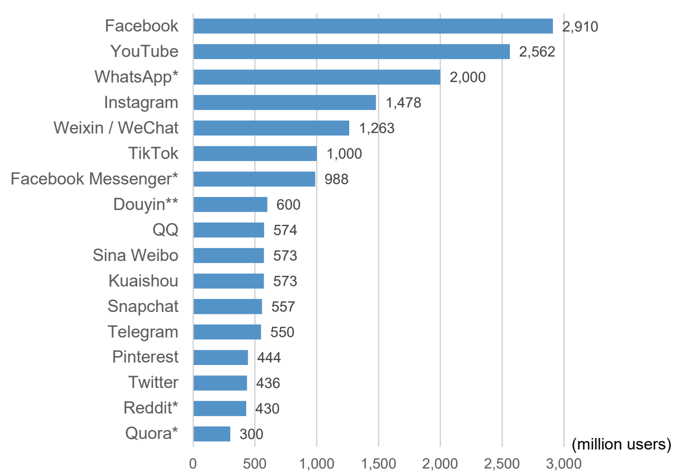
In recent years, in order to ensure fair competition environment in the market, there are moves to strengthen regulations on huge platformers who are increasing market power.

Also in recent years, there is a challenge of distribution of illegal/harmful information including slander and disinformation through social media, etc. To address this situation, Japan and other countries are taking various measures including consideration of new regulations on platformers and promotion of their voluntary responses.[71]

2. Social media

As of January 2022, the monthly number of active Facebook users was approximately 2.9 billion, the largest number in the world, followed by video-based social media YouTube and WhatsApp.

Figure 3-6-2-1 Monthly number of active users of major social media in the world (January 2022)



*The latest data is data from over one year ago
** Number of daily active users

(Source) Statista (We Are Social; Hootsuite; DataReportal)[72]

[71] For detail of the initiatives in Japan, see Chapter 2, Section 2 and Chapter 4, Section 2.
[72] https://www.statista.com/statistics/272014/global-social-networks-ranked-by-number-of-users/

3. EC

Total sales in the global EC market sharply increased in 2020 due to the COVID-19 pandemic and remained high at 542.0 trillion yen (19.5% increase year-on-year) in 2021. By country, China accounted for the largest part at 178.4 trillion yen followed by the United States at 101.7 trillion yen, Japan at 28.0 trillion yen, Germany at 17.2 trillion yen, the UK at 16.6 trillion yen and Korea at 13.7 trillion yen.

Related data
Changes and forecasts for the global EC market sales, Forecasts for the EC market sales by country (2022)
Source: Statista (eMarketer), Statista, "Digital Market Outlook"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-6-6 (Data Collection)

4. Electronic payment[73]

Total global mobile transactions (mobile wallet) reached 214.4 trillion yen in 2020[74] and are expected to further expand as a result of infection control measures, issuance of coupons and points in response to the COVID-19 pandemic. By country, China has an overwhelming share followed by the United States. Japan is at the same level as some European countries.

Related data
Changes and forecasts for transaction values of global mobile payment, Transaction values of mobile payment in each country (2020)
Source: Statista, "Digital Payments report 2021", etc
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-6-8 (Data Collection)

5. Search services

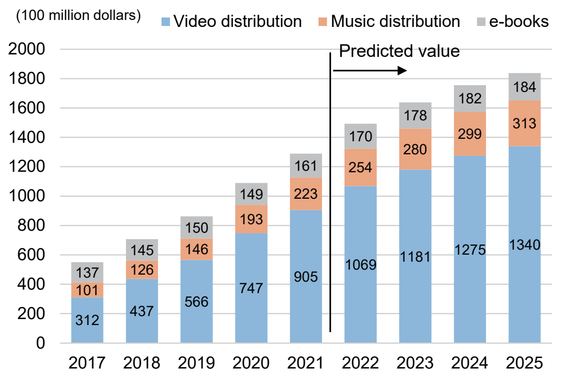
In the global search engine market, Google's share is at over 85%, but is gradually decreasing in recent years and BING is slightly increasing its share. In Japan, Google has the top share both for personal computers and smartphones. Yahoo! has around a 20% share for smartphones.

Related data
Changes in the global share of search engines, Search engine share in Japan (by terminal used)
Source: Statista (StatCounter)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-6-10 (Data Collection)

6. Video distribution, music distribution and e-books

In 2021, the global markets of video distribution, music distribution and e-books were14.1452 trillion yen in total (21.7% increase year-on-year) due to the spread of flat rate services and expansion of stay-at-home demand during the COVID-19 pandemic (**Figure 3-6-6-1**). In Japan, the market was 1.0171 trillion yen (18.4% increase year-on-year) in total.

Figure 3-6-6-1 Changes and forecasts for the size of the global video distribution, music distribution and e-book markets



(Source) Omdia, Statista "Digital Market Outlook"[75]

[73] Payment method by sending/receiving electronic data rather than cash
[74] Because 2020 is the first year of the survey, there is no year-on-year comparison.
[75] https://www.statista.com/forecasts/1294207/ebookmarket-revenue-worldwide

Each market also grew in 2021: the global video distribution market was 9.9310 trillion yen (24.5% increase from the previous year); the music distribution market was 2.4462 trillion yen (18.6% increase from the previous year); and the e-book market was 1.7680 trillion yen (11.5% increase from the previous year). The markets grew in Japan as well: the video distribution market was 461.4 billion yen (19.0% increase from the previous year); the music distribution market was 89.5 billion yen (14.3% increase from the previous year); and the e-book market was 466.2 billion yen (18.6% increase from the previous year).

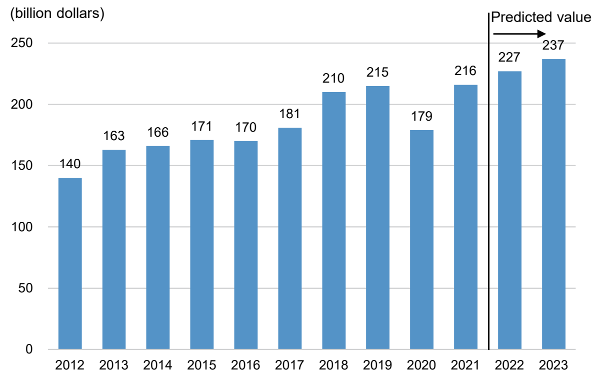
Related data
Changes in the music distribution market in Japan, Changes in the e-book market in Japan
Source: The Recording Industry Association of Japan,The All Japan Magazine and Book Publisher's and Editor's Association/The Research Institute for Publications, etc
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-6-14 (Data Collection)

7. Trends in the data center market

The number of large-scale data centers in the world continued to increase and reached around 700 at the end of the third quarter of 2021. Regarding the share of the global data center capacity, the United States account for nearly half at 49%, followed by Europe, Middle East and Africa (19%), China (15%) and Asia Pacific Region excluding China (13%).

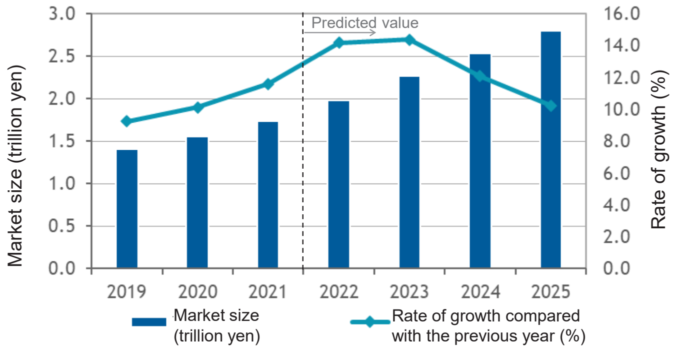
The global market size (expenditure) of data center systems was 23.7069 trillion yen (24.0% increase year-on-year) in 2021 (**Figure 3-6-7-1**). The sales temporarily decreased in 2020 due to the COVID-19 pandemic, but recovered to the level of 2019 in 2021. The market size (sales) of data center services in Japan was 1.7341 trillion yen (11.6% increase year-on-year) in 2021 (**Figure 3-6-7-2**).

Figure 3-6-7-1 Changes and forecasts for the size (expenditure) of the global data center system market



(Source) Statista (Gartner)[76]

Figure 3-6-7-2 Changes and forecasts for the size (sales) of the data center service market in Japan



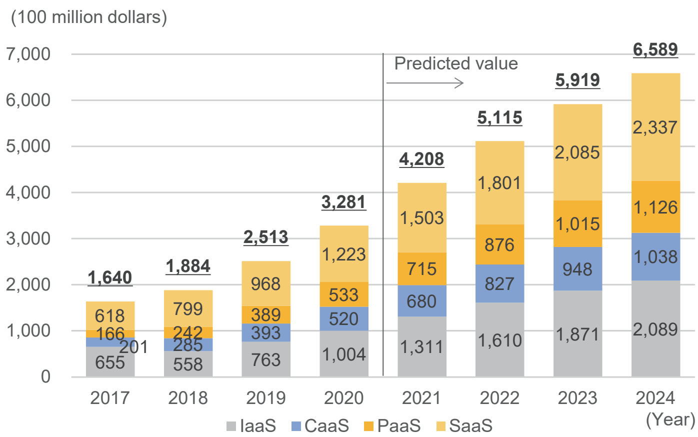
(Source) IDC Japan[77]

[76] https://www.statista.com/statistics/314596/total-data-center-systems-worldwide-spending-forecast/
[77] https://www.idc.com/getdoc.jsp?containerId=prJPJ48272821

8. Trends in the cloud service market

The size of the global public cloud service market (sales) was 35.0315 trillion yen in 2020 (27.9% increase year-on-year) (**Figure 3-6-8-1**). Particularly, growth of the PaaS market is significant. It is thought to have played an important role in corporate activities influenced by the COVID-19 pandemic.

Figure 3-6-8-1 Changes and forecasts for the size (sales) of the global public cloud service market[78]



(Source) Omdia

In the first half of 2021, the top five companies (Microsoft, Amazon, IBM, Salesforce and Google) accounted for 48.1% of the market. Oligopoly has further progressed.

Related data
Market shares of the global public cloud service, Changes and forecasts for the market size (sales) of public cloud service in Japan
Source: Omdia, IDC Japan
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-6-20 (Data Collection)

9. AI

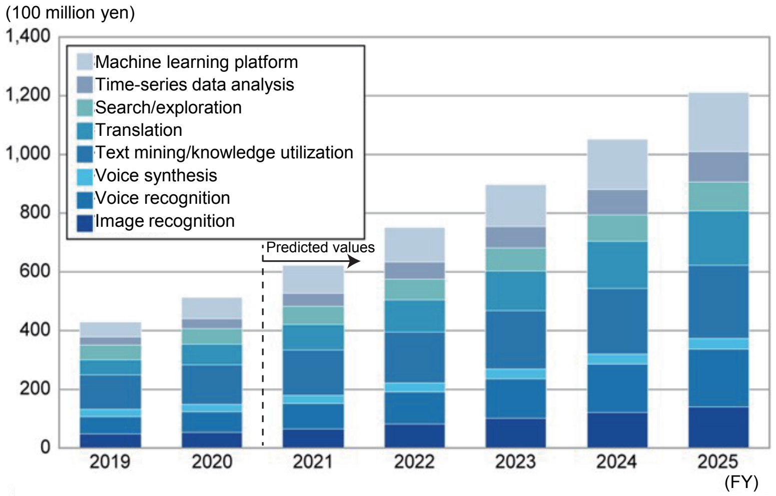
(1) Market overview

The global sales of AI-related software are expected to increase 55.7% from 382.7 billion yen of 2021 to 595.7 billion yen in 2022.[79]

Use cases and functions of AI include image/voice recognition and text mining. According to ITR survey, the sales of Japan's eight major AI markets (machine learning platform, time-series data analysis, search/exploration, translation, text mining/knowledge utilization, voice synthesis, voice recognition and image recognition) reached 51.3 billion yen (19.9% increase year-on-year) in fiscal 2020 and are expected to reach 120 billion yen in fiscal 2025 (**Figure 3-6-9-1**). By market segment, the machine learning platform that supports self-creation of an AI environment is expected to increase most.

[78] IaaS (Infrastructure as a Service) provides hardware and ICT infrastructure via the Internet.
CaaS (Cloud as a Service) provides services of other clouds on a cloud.
PaaS (Platform as a Service) provides platform to run applications via the Internet.
SaaS (Software as a Service) provides software packages via the internet.
[79] https://www.statista.com/statistics/941835/artificial-intelligence-market-size-revenue-comparisons/

Figure 3-6-9-1 Changes and forecasts for the size of Japan's eight major AI markets



*Sales of venders as converted on fiscal year base

(Source) ITR, "ITR Market View: 2021 AI Market[80]

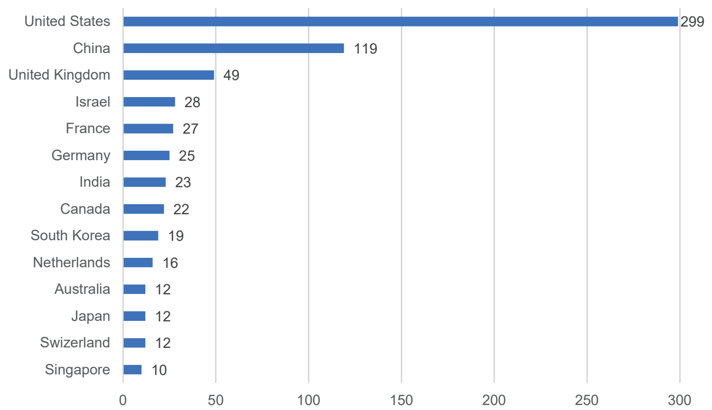
(2) Changes in key players

Key players in AI-related markets include businesses providing AI system /software and businesses providing AI chip sets such as NVIDIA. In recent years, there are new changes including entry by Microsoft, Google and other major platformers and entry from other business areas such as chip set manufacturing.

Most of the AI-related businesses have head offices in the United States or Europe.

Investments in AI-related companies are increasingly active. According to "Artificial Intelligence Index Report 2022" that is a report published by Stanford University, the United States leads in the number of newly funded companies (299) in 2021, followed by China (119) (**Figure 3-6-9-2**).

Figure 3-6-9-2 Number of newly funded AI companies (by country in 2021)



(Source) Stanford University, "Artificial Intelligence Index Report 2022"[81]

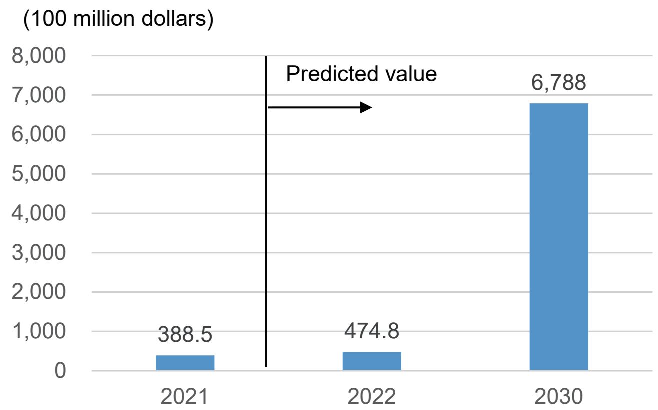
Related data
Major AI-related enterprises in the world, Forecasts for the AI market in China (in terms of spending)
Source: MIC (2022), "Survey Study on the Trends in the Market Environment Surrounding ICT",
IDC's Worldwide Artificial Intelligence Spending Guide Taxonomy, 2022: Release V1, 2022
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-6-27 (Data Collection)

[80] https://www.itr.co.jp/company/press/210826PR.html
[81] https://aiindex.stanford.edu/wp-content/uploads/2022/03/2022-AI-Index-Report_Master.pdf

10. Virtual space, etc.

Metaverse is a virtual space on the internet, where users operate their avatars to interact with other users. There are also experimental services such as product purchase in a virtual space. Thanks to the technology advancement and service development, sales of the global metaverse market reached 4.2640 trillion yen in 2021 and are expected to rapidly increase to 78.8705 trillion yen by 2030 **(Figure 3-6-10-1)**. Beyond media and entertainment, the use of metaverse is expected in various fields including education and retail.

Figure 3-6-10-1 Changes and forecasts for the size (sales) of the global metaverse market



(Source) Statista (Grand View Research)[82]

Block chain is based on cryptographic, P2P, distributed consensus and other technologies. Its features include information sharing without risk of alteration, construction of a value distribution system and guarantee of value traceability. In recent years, new digital economic zones where independent users are directly connected without depending on a specific platform are about to be constructed on distributed networks based on block chain. This is called Web 3.0, a next-generation frontier following Web 1.0 that was led by e-mail and websites and Web 2.0 that was characterized by smartphone and social media. Non Fungible Token (NFT) that is a unique digital token issued on block chain is thought to spark powerful expansion of the digital economic zone in the era of Web 3.0.

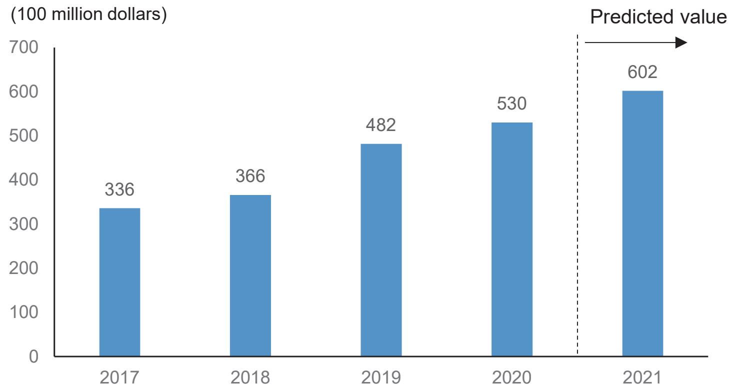
[82] https://www.statista.com/statistics/1295784/metaverse-market-size/

Section 7 Cyber Security Trends

1. Overall condition of the global market

Due to the rapid increase of targeted cyber-attacks including ransomware and other factors, the global cyber security market increased to 5.6591 trillion yen in 2020 and is expected to reach 6.6072 trillion yen in 2021 (16.8% increase year-on-year) (**Figure 3-7-1-1**).

Figure 3-7-1-1 Changes and forecasts for the size of the global cyber security market



(Source) Prepared from Estimation by Canalys[83]

Five major players - Cisco, Palo Alto Networks, Check Point, Symantec and Fortinet – have been ranked high in market share since 2017 (**Figure 3-7-1-2**). However, the top share of Cisco is around 10%. Shares are dispersed in the global cyber security market.

Figure 3-7-1-2 Major global cyber security operator

Operators	Global market share			
	2017	2018	2019 (Q1)	2020 (Q1)
Cisco	9.4%	9.9%	10%	9.1%
Palo Alto Networks	5.9%	6.9%	7%	7.8%
Check Point	6.4%	6.1%	6%	5.4%
Symantec	7.5%	6.1%	6%	4.7%
Fortinet	5.1%	5.5%	5%	5.9%

(Source) Prepared from Estimation by Canalys[84]

[83] https://www.canalys.com/newsroom/cybersecurity-market-grows-9-in-2018-to-reach-us37-billion
https://canalys.com/newsroom/cybersecurity-investment-2020
https://canalys.com/newsroom/canalys-cybersecurity-2021-forecast

[84] https://www.canalys.com/newsroom/cybersecurity-market-grows-9-in-2018-to-reach-us37-billion
https://www.canalys.com/newsroom/cybersecurity-market-q1-2019
https://www.canalys.com/newsroom/canalys-cybersecurity-market-q1-2020

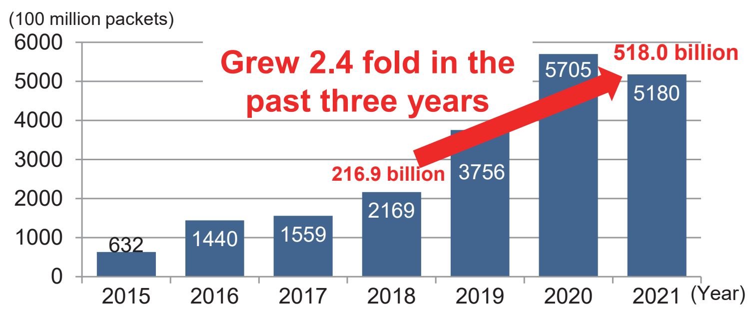
2. Present state of cyber security in Japan

i Increasing threat to cyber security

The number of cyber-attack-related communications (approximately 518.0 billion packets) as observed by Network Incident analysis Center for Tactical Emergency Response (NICTER) that is operated by NICT increased 2.4-fold in 2021 compared with three years ago (216.9 billion packets in 2018), and 3.7-fold compared with five years ago (144.0 billion packets in 2016). Huge quantities of cyber-attack-related communications are still observed (**Figure 3-7-2-1**). The number of cyber-attack-related communications observed in 2021 is equivalent to one attack per 18 seconds on each IP address.

The number decreased from 2020 to 2021. The factors include the absence of specific phenomena (large-scale backscatter[85] and a huge quantity of concentrated communications that is thought to be sent from specific senders for the purpose of survey) found in 2020.

Figure 3-7-2-1 Changes in the number of cyber-attack-related communications detected by NICTER



(Source) NICT, NICTER Observation Report 2021

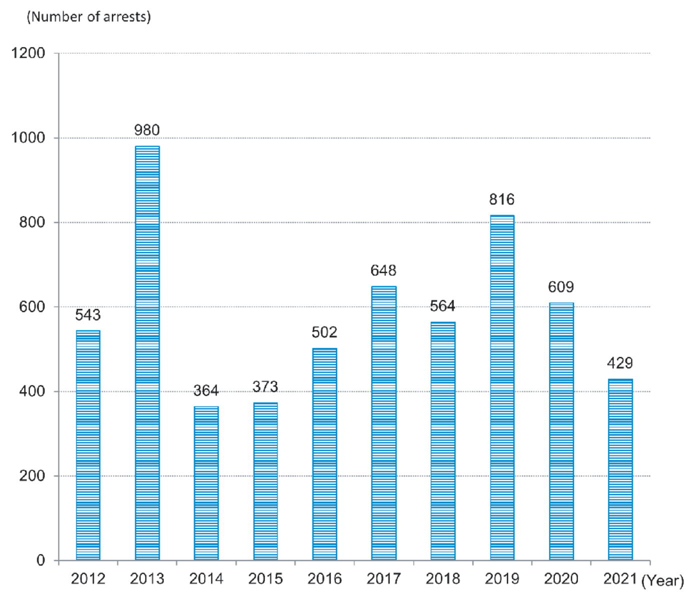
By content of cyber-attack-related communications detected by NICTER, communications targeting IoT equipment account for the largest part. The ratio of the attacks targeting Windows that was second last year decreased, while the ratio of communications to ports used for various services, which were not in the top places last year, and the ratio of other increased. Targets of attacks continued to diversify.

Related data
Targets of cyber-attack-related communications detected by NICTER
Source: Prepared from the National Institute of Information and Communications Technology, "NICTER Observation Report 2021"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-7-4 (Data Collection)

The number of arrests for violation of the Act on Prohibition of Unauthorized Computer Access (hereinafter "Unauthorized Access Prohibition Act") was 429, decreasing 180 compared with the previous year (**Figure 3-7-2-2**).

[85] Refers to answer (SYN-ACK) packet from a server that is under DoS attack (SYN-flood attack) with spoofed send-side IP address. Because a large quantity of response packets reaches the darknet from the servers targeted by DoS attack if IP addresses are randomly spoofed, the DoS attack can be detected.

Figure 3-7-2-2 Changes in the number of arrests for violation of the Unauthorized Access Prohibition Act



(Source) Prepared from NPA/MIC/METI, "State of Occurrence of Unauthorized Access and R&D of Technologies related to Access Control Functions"

Since November 2021, there have been signs of resumption of Emotet attack activities. In February 2022, in response to its rapid spread, the Information-technology Promotion Agency (IPA) and JPCERT/CC called attention to the attack.

Considering the increased risk of cyber-attack cases, an alert calling for strengthening of cyber security measures was sent out by METI on February 23, 2022, by METI, MIC, MHLW, MLIT, NPA and Cabinet Secretariat Center for CyberSecurity (NISC) on March 1, 2022, and by METI MIC, NPA and NISC on March 24. On April 25 of the same year, METI, MIC, NPA and NISC advised to take countermeasures toward the long vacation.

ii Wireless LAN security trends

According to an attitude survey conducted by MIC in March 2021 to understand security awareness of wireless LAN users, most respondents know the existence of public wireless LAN (approx. 96%), but only about half of them are actually using it. "Security concern" is the top reason for not using public wireless LAN, way ahead of other reasons. About 90% of public wireless LAN users feel anxiety about security, but half of them answered that this is "vague sense of unease."

iii Introduction state of sender domain authentication technologies

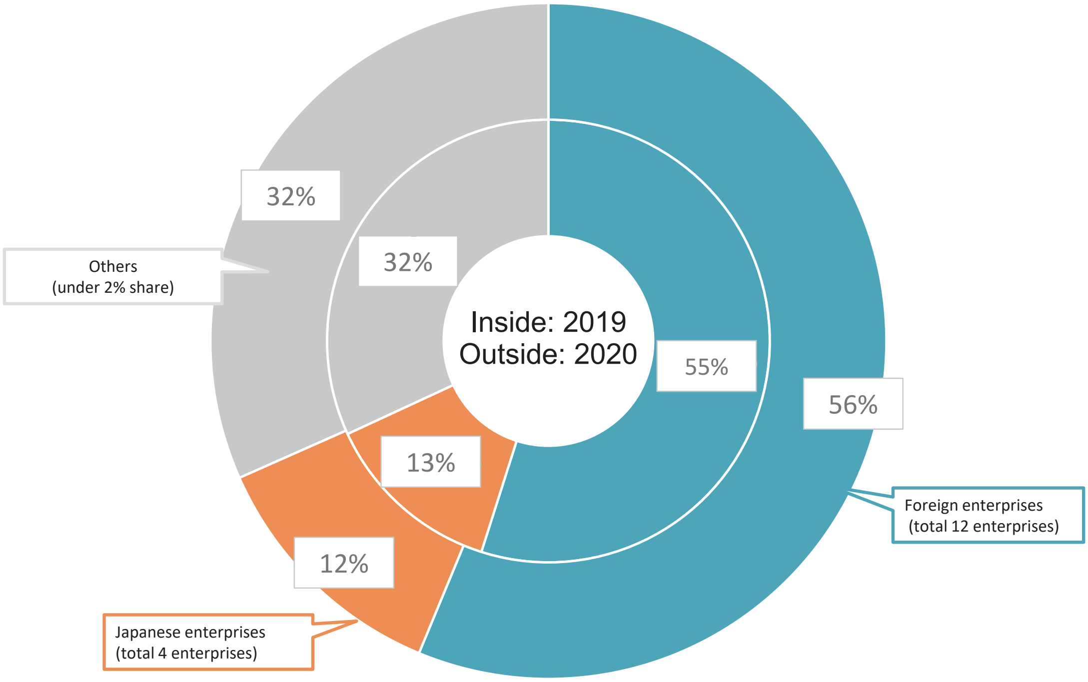
Introduction rate of "sender domain authentication technologies" to prevent spoofed e-mails is slightly increasing: about 67.5% for SPF and about 2.1% for DMARC in December 2021.

Related data
State of introduction of sender domain authentication technologies to IP domains
Source: MIC, "State of setting sender domain authentication technology in IP domain names
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-7-13 (Data Collection)

iv Dependence on overseas cyber-security products

We divided enterprises with over 2% share (in sales) in the domestic information security product market in 2020 into foreign enterprises and domestic enterprises, and totalized their sales in 2019 and 2020. Foreign enterprises have a large share of sales both in 2019 and 2020. Japan continues to heavily rely on overseas operators for cyber-security products (**Figure 3-7-2-3**).

Figure 3-7-2-3 Domestic information security product market share (sales) (2019 to 2020)



(Source) Prepared from IDC Japan, July 2021, "Japan IT Security Products Market Shares, 2020: External Threat Measures and Internal Threat Measures Drive the Market" (JPJ46567421)

Section 8 Digital Usage Trends

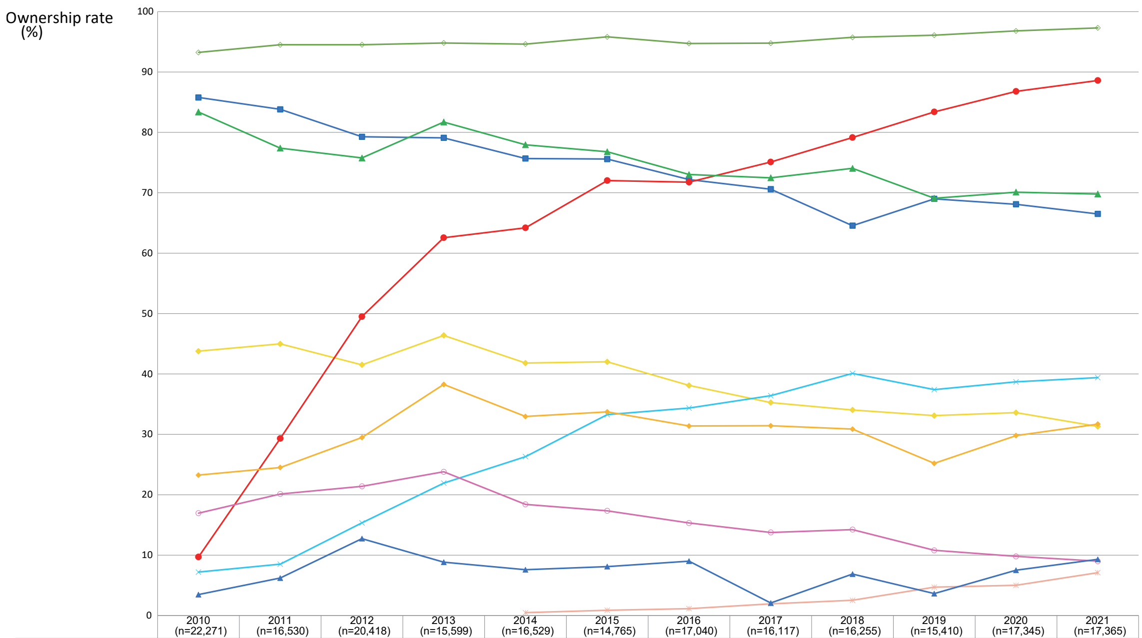
1. Digital usage trends in the daily life of the public

(1) Overview

i Ownership of information communication equipment

Regarding terminals for internet connection necessary to use digital technologies, the rate of household ownership of any "mobile terminal" is 97.3%: rates of "smartphone" and "personal computer" are 88.6% and 69.8% (included in the total) respectively (**Figure 3-8-1-1**).

Figure 3-8-1-1 Changes in the rate of household ownership of information communication equipment



	2010 (n=22,271)	2011 (n=16,530)	2012 (n=20,418)	2013 (n=15,599)	2014 (n=16,529)	2015 (n=14,765)	2016 (n=17,040)	2017 (n=16,117)	2018 (n=16,255)	2019 (n=15,410)	2020 (n=17,345)	2021 (n=17,365)
Fixed-line telephone	85.8	83.8	79.3	79.1	75.7	75.6	72.2	70.6	64.5	69.0	68.1	66.5
FAX	43.8	45.0	41.5	46.4	41.8	42.0	38.1	35.3	34.0	33.1	33.6	31.3
Mobile devices (overall)	93.2	94.5	94.5	94.8	94.6	95.8	94.7	94.8	95.7	96.1	96.8	97.3
Smartphones	9.7	29.3	49.5	62.6	64.2	72.0	71.8	75.1	79.2	83.4	86.8	88.6
Computers	83.4	77.4	75.8	81.7	78.0	76.8	73.0	72.5	74.0	69.1	70.1	69.8
Tablets	7.2	8.5	15.3	21.9	26.3	33.3	34.4	36.4	40.1	37.4	38.7	39.4
Wearable devices	—	—	—	—	0.5	0.9	1.1	1.9	2.5	4.7	5.0	7.1
Home game consoles	23.3	24.5	29.5	38.3	33.0	33.7	31.4	31.4	30.9	25.2	29.8	31.7
Portable music players	17.0	20.1	21.4	23.8	18.4	17.3	15.3	13.8	14.2	10.8	9.8	9.0
Smat appliances	3.5	6.2	12.7	8.8	7.6	8.1	9.0	2.1	6.9	3.6	7.5	9.3

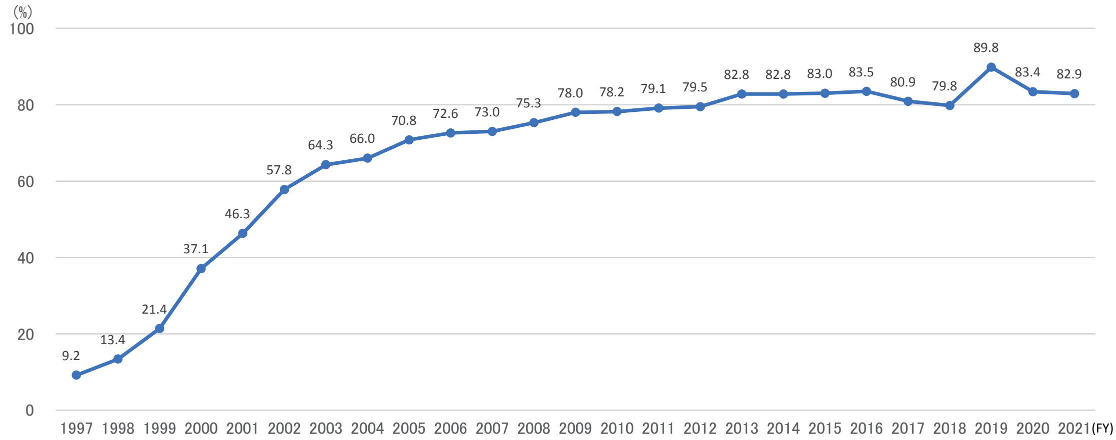
(Source) MIC, "Communications Usage Trend Survey"[86]

ii Internet usage trend

The internet usage rate (individuals) was 82.9% in 2021 (**Figure 3-8-1-2**). By terminal, rate of "smartphone" (68.5%) is higher than that of "personal computer" (48.1%) by 20.4 points.

[86] https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

Figure 3-8-1-2 Changes in the internet usage rate (individuals)[87]



(Source) MIC, "Communications Usage Trend Survey"

Related data
Type of terminals for using the internet (individuals)
Source: MIC, "Communications Usage Trend Survey"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-8-4 (Data Collection)

iii Media usage time

Since 2012, the Institute for Information and Communications Policy of MIC has surveyed the usage time, time slots of usage, purpose and reliability of information and communications media and information behavior as joint research with Professor HASHIMOTO Yoshiaki at the School of Arts and Science, Tokyo Woman's Christian University, and others[88]. [89] Below is an overview of the usage time, etc. of information and communication media based on the survey result of fiscal 2021.[90]

(i) Average usage time[91] and doers' ratio[92] of major media

Figure 3-8-1-3 shows average usage time and doers' ratio of "television viewing (real-time)",[93] "television viewing (recorded program)", "Internet use"[94], "newspaper reading" and "radio listening."

Average usage time of "television viewing (real-time)" and "Internet use" of all respondents is long for both weekdays and holidays. On weekdays, "Internet use" is longer than "television viewing (real-time)" for the second straight year. Doers' ratio of "television viewing (real-time)" is lower than the doers' ratio of "Internet use" for both weekdays and holidays.

By age group, average usage time of Internet increased or remained almost flat except among teens on weekdays and teens and fifties on holidays. "Television viewing (real-time)" is longer with older age groups, and longest among sixties. On holidays, doers' ratio of "Internet use" is highest in the 10s, 20s, 30s and 40s age groups, while doers' ratio of "television viewing (real-time)" is highest in the 50s and 60s age groups. On weekdays, doers' ratio of "Internet use" of fifties exceeded their doers' ratio of "television viewing (real-time)" for the first time. Doers' ratio of "newspaper reading" is also higher with older age.

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87 Because the design of questionnaire of the 2019 survey is partially different compared with other years, interannual comparison requires caution.
88 Professor KITAMURA Satoshi at the Faculty of Communication Studies, Tokyo Keizai University, and Project Assistant Professor KAWAI Daisuke at the Center for Integrated Disaster Information Research (CIDIR), Interfaculty Initiative in Information Studies, the University of Tokyo.
89 Survey on Usage Time of Information and Communication Media and Information Behavior: 1,500 men and women aged 13 to 69 (selected by sex and age group (in 10 year increments) in proportion to the actual situation in the Basic Resident Register. Register of January 2021 was used for the 2021 survey.) were visited and received questionnaires based on random location quota sampling.
90 FY2021 survey was conducted from November 30 to December 6. The values of 2017 in the figure show the result of the survey of 2017, while values of 2018 and after are results of the respective fiscal year.
91 The total time of the referred information activity per a survey day is divided by the number of the survey subjects. Average time is calculated by including the respondents who did not do the activity throughout the day.
92 For weekdays, a percentage of all persons who did the referred information activity during two surveyed days was calculated and the average value of the two days was obtained. Rate of holiday is the rate of the survey date.
93 Television viewing (real-time): Real-time television viewing with any equipment not limited to TV receiver
94 Internet use: regardless of equipment, the term refers to use of services enabled by internet connection, which include email, websites, social media, video sites, and online games.

Figure 3-8-1-3 Average usage time and doers' ratio of major media

[One weekday]

		Average usage time (minute)					Doers' ratio (%)				
		Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening	Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening
All age groups	2017	159.4	17.2	100.4	10.2	10.6	80.8%	15.9%	78.0%	30.8%	6.2%
	2018	156.7	20.3	112.4	8.7	13.0	79.3%	18.7%	82.0%	26.6%	6.5%
	2019	161.2	20.3	126.2	8.4	12.4	81.6%	19.9%	85.5%	26.1%	7.2%
	2020	163.2	20.2	168.4	8.5	13.4	81.8%	19.7%	87.8%	25.5%	7.7%
	2021	146.0	17.8	176.8	7.2	12.2	74.4%	18.6%	89.6%	22.1%	6.2%
10s	2017	73.3	10.6	128.8	0.3	1.5	60.4%	13.7%	88.5%	3.6%	1.4%
	2018	71.8	12.7	167.5	0.3	0.2	63.1%	15.2%	89.0%	2.5%	1.1%
	2019	69.0	14.7	167.9	0.3	4.1	61.6%	19.4%	92.6%	2.1%	1.8%
	2020	73.1	12.2	224.2	1.4	2.3	59.9%	14.8%	90.1%	2.5%	1.8%
	2021	57.3	12.1	191.5	0.4	3.3	56.7%	16.3%	91.5%	1.1%	0.7%
20s	2017	91.8	13.9	161.4	1.4	2.0	63.7%	14.4%	95.1%	7.4%	3.0%
	2018	105.9	18.7	149.8	1.2	0.9	67.5%	16.5%	91.4%	5.3%	0.7%
	2019	101.8	15.6	177.7	1.8	3.4	65.9%	14.7%	93.4%	5.7%	3.3%
	2020	88.0	14.6	255.4	1.7	4.0	65.7%	13.6%	96.0%	6.3%	3.1%
	2021	71.2	15.1	275.0	0.9	7.0	51.9%	13.7%	96.5%	2.6%	3.0%
30s	2017	121.6	15.3	120.4	3.5	4.3	76.5%	15.5%	90.6%	16.6%	2.3%
	2018	124.4	17.4	110.7	3.0	9.4	74.1%	19.1%	91.1%	13.0%	4.3%
	2019	124.2	24.5	154.1	2.2	5.0	76.7%	21.9%	91.9%	10.5%	2.2%
	2020	135.4	19.3	188.6	1.9	8.4	78.2%	19.4%	95.0%	8.8%	6.0%
	2021	107.4	18.9	188.2	1.5	4.8	65.8%	20.9%	94.9%	5.9%	3.2%
40s	2017	150.3	19.8	108.3	6.3	12.0	83.0%	17.3%	83.5%	28.3%	7.9%
	2018	150.3	20.2	119.7	4.8	16.6	79.2%	18.8%	87.0%	23.1%	7.4%
	2019	145.9	17.8	114.1	5.3	9.5	84.0%	18.9%	91.3%	23.6%	6.0%
	2020	151.0	20.3	160.2	5.5	11.7	86.2%	23.0%	92.6%	24.1%	6.0%
	2021	132.8	13.6	176.8	4.3	12.9	77.8%	15.3%	94.6%	17.9%	5.4%
50s	2017	202.0	19.1	77.1	16.3	19.5	91.7%	16.1%	76.6%	48.1%	9.1%
	2018	176.9	20.8	104.3	12.9	17.2	88.5%	20.6%	82.0%	43.9%	9.3%
	2019	201.4	22.5	114.0	12.0	18.3	92.8%	21.9%	84.2%	38.5%	12.2%
	2020	195.6	23.4	130.0	11.9	26.9	91.8%	20.7%	85.0%	39.4%	13.4%
	2021	187.7	18.7	153.6	9.1	23.6	86.4%	20.9%	89.4%	33.8%	11.1%
60s	2017	252.9	20.0	38.1	25.9	17.3	94.2%	16.6%	45.6%	59.9%	9.5%
	2018	248.7	27.3	60.9	23.1	22.8	91.6%	19.7%	59.0%	52.8%	11.7%
	2019	260.3	23.2	69.4	22.5	27.2	93.6%	21.2%	65.7%	57.2%	13.4%
	2020	271.4	25.7	105.5	23.2	18.5	92.9%	22.3%	71.3%	53.7%	12.1%
	2021	254.6	25.8	107.4	22.0	14.4	92.0%	23.0%	72.8%	55.1%	10.0%

[One holiday]

		Average usage time (minute)					Doers' ratio (%)				
		Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening	Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening
All age groups	2017	214.0	27.2	123.0	12.2	5.6	83.3%	22.2%	78.4%	30.7%	4.5%
	2018	219.8	31.3	145.8	10.3	7.5	82.2%	23.7%	84.5%	27.6%	5.1%
	2019	215.9	33.0	131.5	8.5	6.4	81.2%	23.3%	81.0%	23.5%	4.6%
	2020	223.3	39.6	174.9	8.3	7.6	80.5%	27.6%	84.6%	22.8%	4.7%
	2021	193.6	26.3	176.5	7.3	7.0	75.0%	21.3%	86.7%	19.3%	4.2%
10s	2017	120.5	20.6	212.5	0.5	3.6	66.2%	19.4%	92.1%	3.6%	1.4%
	2018	113.4	28.6	271.0	0.9	0.7	67.4%	27.7%	91.5%	3.5%	2.1%
	2019	87.4	21.3	238.5	0.1	0.0	52.8%	17.6%	90.1%	0.7%	0.0%
	2020	93.9	29.8	290.8	0.9	0.0	54.9%	25.4%	91.5%	1.4%	0.0%
	2021	73.9	12.3	253.8	0.0	0.0	57.4%	14.9%	90.8%	0.0%	0.0%
20s	2017	120.3	26.6	228.8	2.4	2.9	67.6%	24.5%	97.7%	7.9%	2.3%
	2018	151.0	32.8	212.9	2.1	2.1	66.5%	24.9%	95.7%	6.2%	2.4%
	2019	138.5	23.0	223.2	0.9	1.2	69.7%	19.9%	91.0%	3.3%	1.9%
	2020	132.3	26.5	293.8	2.0	1.9	64.3%	20.2%	97.7%	6.6%	2.3%
	2021	90.8	17.2	303.1	0.7	1.8	49.3%	14.0%	97.2%	2.3%	1.4%
30s	2017	166.9	26.4	136.0	3.8	2.8	79.4%	21.8%	90.5%	14.1%	1.9%
	2018	187.2	26.6	150.2	3.5	3.9	79.8%	19.1%	92.6%	11.7%	3.5%
	2019	168.2	31.0	149.5	2.5	2.0	78.3%	23.3%	90.1%	9.9%	2.0%
	2020	198.1	45.0	191.3	1.6	7.4	77.2%	31.6%	91.2%	5.6%	3.2%
	2021	147.6	30.3	212.3	1.5	3.2	69.6%	22.7%	92.3%	4.0%	1.2%
40s	2017	213.3	31.6	109.2	7.6	4.7	83.8%	25.2%	84.4%	29.6%	5.0%
	2018	213.9	39.0	145.3	6.4	8.2	82.7%	25.9%	90.4%	25.3%	3.4%
	2019	216.2	37.5	98.8	6.0	5.0	83.7%	25.5%	84.7%	20.2%	3.7%
	2020	232.7	41.5	154.5	5.2	4.2	85.3%	28.5%	89.3%	19.9%	3.1%
	2021	191.1	28.5	155.7	4.9	6.3	79.0%	21.0%	91.0%	14.8%	3.4%
50s	2017	265.7	30.8	82.4	16.1	7.4	93.4%	23.3%	73.3%	44.6%	5.8%
	2018	260.8	22.9	115.0	15.3	10.4	91.9%	21.5%	80.7%	42.2%	7.0%
	2019	277.5	48.0	107.9	12.9	6.6	90.3%	30.6%	77.3%	37.4%	6.5%
	2020	256.5	49.8	127.8	12.5	16.3	91.6%	31.4%	81.5%	36.6%	7.7%
	2021	242.6	28.9	119.0	9.2	14.2	84.8%	24.9%	82.2%	29.6%	8.1%
60s	2017	320.7	23.6	44.6	33.0	10.2	96.7%	18.1%	46.1%	62.8%	7.9%
	2018	315.3	34.6	64.3	26.1	14.1	93.0%	24.4%	63.2%	56.9%	10.0%
	2019	317.6	28.1	56.1	21.8	18.5	94.5%	19.0%	60.7%	51.7%	10.3%
	2020	334.7	37.2	83.7	22.0	10.9	91.8%	25.9%	63.1%	50.4%	9.2%
	2021	326.1	31.4	92.7	22.3	11.2	93.5%	25.4%	71.0%	50.4%	8.0%

(Source) Institute for Information and Communications Policy, MIC, "FY2021 Survey on Usage Time of Information and Communication Media and Information Behavior"

(ii) Positioning of the internet as media

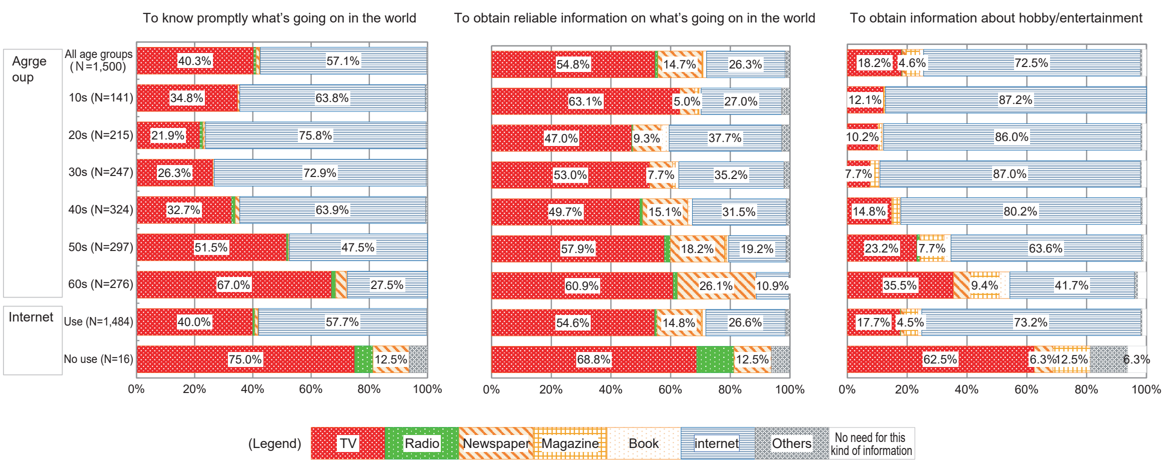
Figure 3-8-1-4 compares use of Internet as media with other media for each purpose of use.

The most used media “to know promptly what’s going on in the world” of all respondents is “Internet”. By age group, “Internet” is more used than “television” for this purpose by respondents in their 10s, 20s, 30s and 40s, while “television” is most used by respondents in their 50s and 60s.

The most used media “to obtain reliable information on what’s going on in the world” is “television” in total of all age groups as well as in each age group. The ratio of “newspaper” increases with higher age and exceeds the ratio of “Internet” in the 60s bracket.

The most used media “to obtain information about hobby/entertainment” is “Internet” in all and each age groups. The ratio is over 80% among the respondents in their 10s, 20s, 30s and 40s.

Figure 3-8-1-4 Media use by purpose (most used media of all age groups, by age group and by use of the internet)



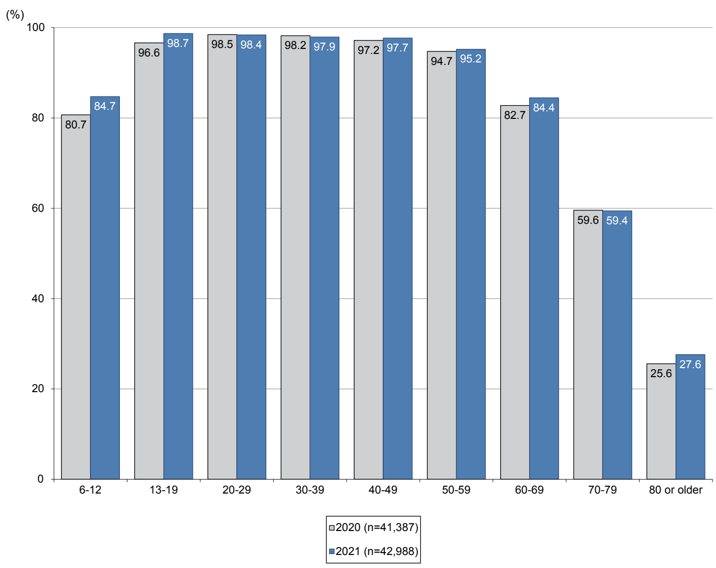
(Source) Institute for Information and Communications Policy, MIC, “FY2021 Survey on Usage Time of Information and Communication Media and Information Behavior”

(2) Challenges in utilization of digital technologies

i Digital divide due to age

According to “Communications Usage Trend Survey” conducted by MIC, Internet usage rate is over 90% in age groups from 13 to 59, but the usage rate decreases with older age groups starting from 60 (**Figure 3-8-1-5**).

Figure 3-8-1-5 Internet usage rate by age group

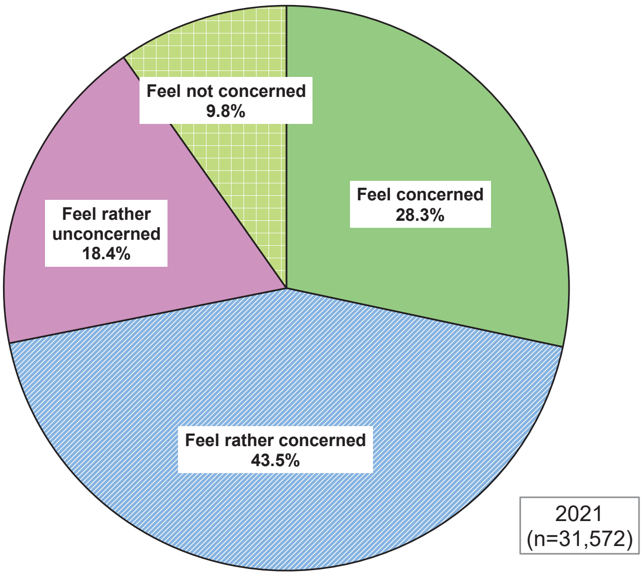


(Source) MIC “Communications Usage Trend Survey”

ii Concerns about and resistance to use of digital technologies

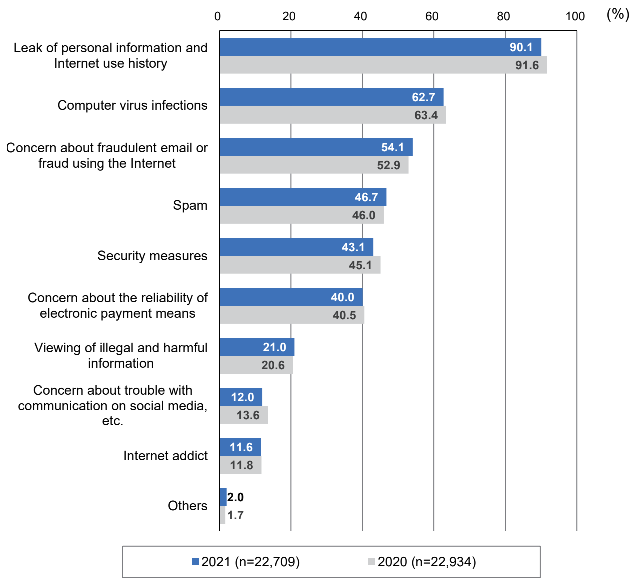
According to the "Communications Usage Trend Survey" conducted by MIC, about 75% of Internet users aged 12 or older have some concerns about using the Internet (**Figure 3-8-1-6**). The most common concern is in relation to "leaks of personal information and internet usage history" at 90.1%, followed by "computer virus infections" (62.7%) and "fraudulent email or fraud using internet" (54.1%) (**Figure 3-8-1-7**).

Figure 3-8-1-6 Responses of individuals regarding concerns about using the Internet



(Source) MIC "Communications Usage Trend Survey"

Figure 3-8-1-7 Content of the concern when using internet (multiple answers)



(Source) MIC "Communications Usage Trend Survey"

Chapter 3

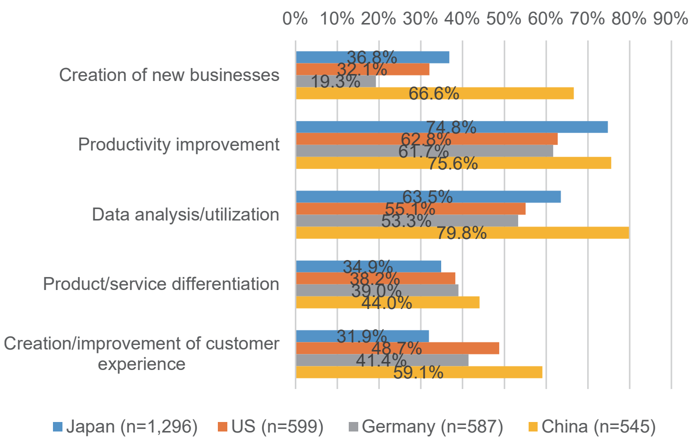
2. Trends in utilization in corporate activities

(1) Digital Transformation (DX)[95]

i Current status of digital transformation initiatives

Ratio of enterprises advancing initiatives for DX (total of “making company-wide efforts on DX based on a company-wide strategy”, “some departments are working on DX based on a company-wide strategy” and “each department is separately working on DX”) was about 56% in Japan, which is lower than about 79% in the United States.[96] The top purpose of DX efforts was “productivity improvement” among Japanese enterprises at 75%, while it was “data analysis/utilization” among Chinese companies at 80% (**Figure 3-8-2-2**).

Figure 3-8-2-2 Purpose of digitalization (bycountry)



(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

ii Effects of digital transformation

Effects of digitalization were investigated by aspects of “Creation of new businesses”, “Productivity improvement”, “Data analysis/utilization” and “Product/service differentiation.[97] In all aspects, the number of responding companies answering “more than expected” are smaller in Japan compared with the US, China and Germany, while the number of responses “effects did not come up to our expectation” of Japan is largest among four countries.

Related data
Effect of digitalization aimed at creation of new businesses (by country), Effect of digitalization aimed at productivity improvement (by country), Effect of digitalization aimed at data analysis/utilization (by country), Effect of digitalization aimed at product/service differentiation (by country)
Source: MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-8-27 (Data Collection)

iii Challenges in promoting digital transformation

As challenges/barriers for digitalization, the percentage of Japanese enterprises answering "shortage of human resources" (67.6%) is by far larger in comparison with enterprises of the United States, China and Germany. The next is “lack of digital technology knowledge/literacy (44.8%)”. Challenges/barriers related to human resources account for a large part (**Figure 3-8-2-3**).

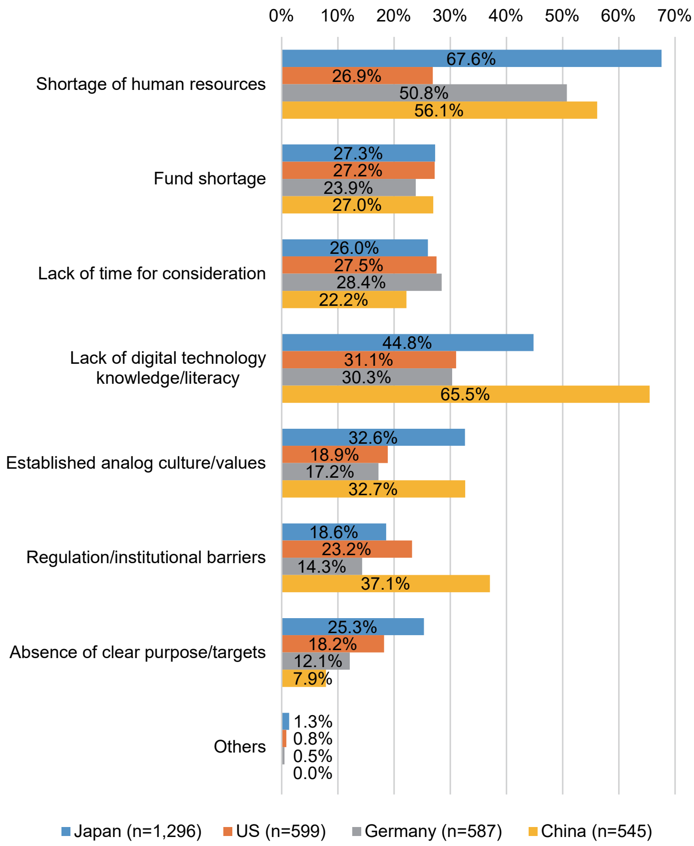
Regarding shortage of digital human resources held by enterprises (“CIO, CDO and other digitalization leaders” and “AI/data analysis experts”), the sum of “very much lacking” and “slightly lacking” is over 50% among Japanese enterprises. Overall, they are short of digital

[95] Here, “digital transformation” is defined as “while responding to drastic changes in external ecosystems (customers and markets), and leading transformation of the internal ecosystem (organization, culture and employees), enterprises create values and establish their competitive advantage by transforming both internet and real customer experiences through new products, services and business models taking advantage of the 3rd platform technologies (cloud, mobility, big data analytics and social). (Source) “Declaration to be the World’s Most Advanced IT Nation - Basic Plan on the Advancement of Public and Private Sector Data Utilization” (Cabinet decision on July 17, 2020) (https://cio.go.jp/node/2413)
[96] https://www.ipa.go.jp/files/000093706.pdf
[97] The question is for the enterprises who chose any of the aspects as the purpose of digitalization and totaled the responses of each purpose.

human resources. In particular, "AI/data analysis experts" are "very much lacking" in more than 30% of the enterprises. The shortage is more serious in Japan compared with the US and Germany.

Regarding reasons for the shortage of digital human resources in enterprises, both "system to employ digital human resources is not yet established" and "system to develop digital human resources is not yet established" are about 40% for the two types of digital human resources among Japanese enterprises. The survey also investigated qualitative aspects (necessary skills) of the efforts to secure digital human resources by enterprises of each country: "new and mid-term hiring" is the most common answer of US enterprises, while "reshuffling and training of existing human resources" is the most frequent among Japanese enterprises.

Figure 3-8-2-3 Challenge/barrier of digitalization (by country)



MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

Related data
Questionnaire survey on the state of shortage in digital human resources, reason of the shortage and efforts for securing (by country and type of digital human resources)
Source: MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-8-35 (Data Collection)

(2) Telework[98]

i Use situation

Slightly under 60% of people in the United States and Germany, and over 70% of people in China have experienced telework, while the rate is around 30% in Japan (**Figure 3-8-2-4**). For reason of difficulty to implement telework, the environmental and cost side including internet connections are often cited in other countries, while "rules/systems are not established" is the most common answer at 35.7% in Japan.

Looking at telework usage in Japan by age group, younger people are more positive about telework. Usage rate of the 20-30 age group is highest at around 35%, while the ratio of the respondents who think "it is not necessary" is lowest in this age group (**Figure 3-8-2-5**).

Figure 3-8-2-4 Telework use situation (by country)

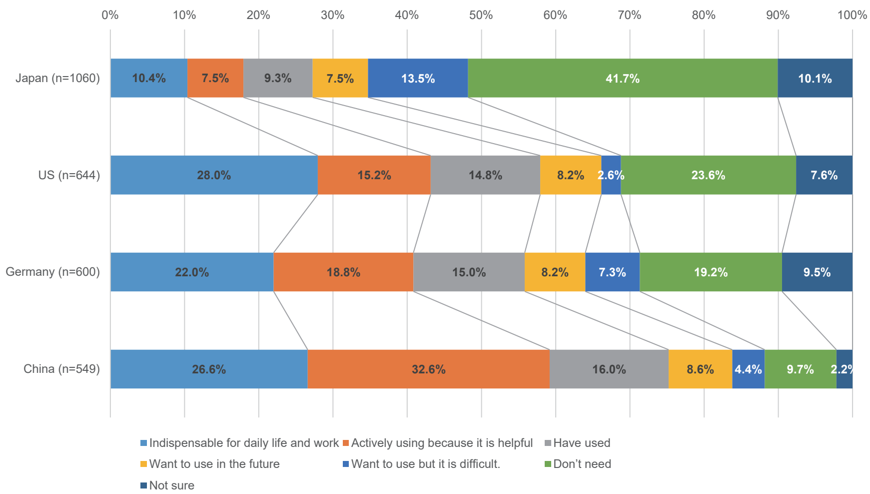
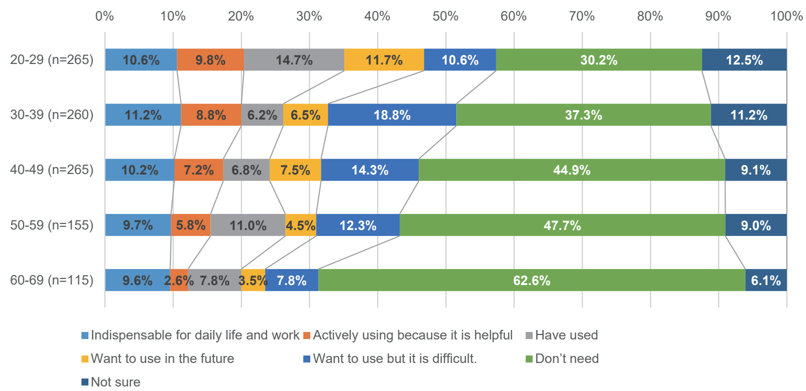


Figure 3-8-2-5 Telework use situation in Japan (by age group)



(Source) MIC (2022) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"[99]

Related data
Questionnaire survey on reasons of difficulty to use telework (by country)
Source: MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-8-43 (Data Collection)

ii Trends of telework security in Japan

According to a survey conducted by MIC for the period from December 2021 to January 2022 to assess the actual state of telework security at enterprises and others, introduction of telework progressed triggered by the COVID-19 pandemic and over 75% of the enterprises plan to continue to use telework: it has been rooted in the implementing enterprises. In introduction of telework, "security of security" remains a big challenge of implementing enterprises.[100]

[98] For policy trends related to telework at MIC, see Chapter 4, Section 6-2.
[99] This survey research is based on web questionnaire of residents in Japan, the US, Germany and China in March 2022 to grasp the trends in digital technology use by the citizens. For this reason, the respondents may include more experienced digital users compared with mail survey and visit survey, which requires attention.
[100] Survey on actual condition of telework security (FY2021): https://www.soumu.go.jp/main_sosiki/cybersecurity/telework/

Related data
Telework usage status, Challenges for introducing telework (multiple answers)
Source: Prepared from MIC "Fiscal 2021 Result of Survey on Actual Condition of Telework Security"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-8-44 (Data Collection)

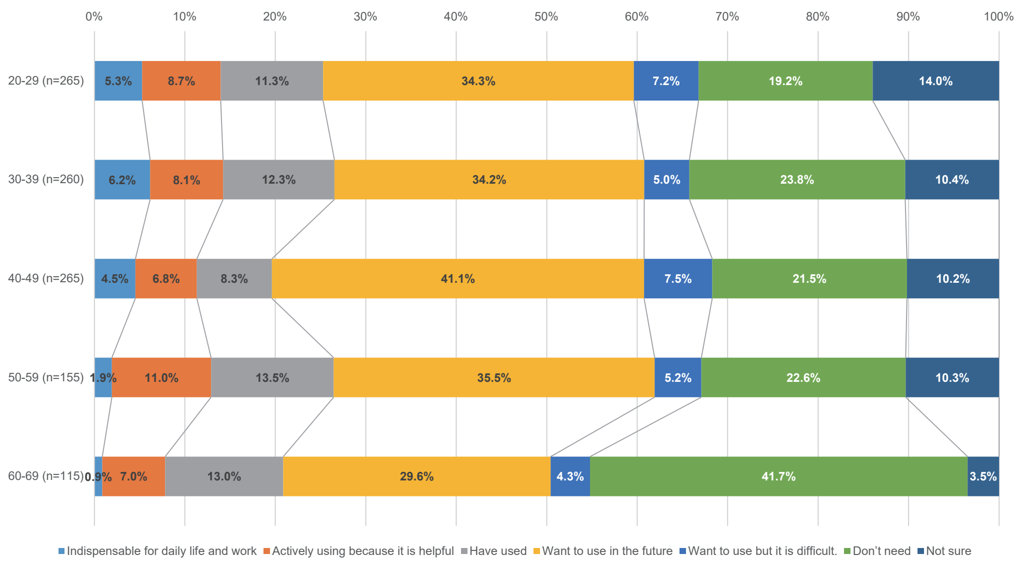
3. Trends in regard to digital usage in administration

(1) Use situation of electronic administrative services (electronic applications, filing and notifications)

The percentage of respondents who answered that they have used electronic administrative services (electronic applications, filing or notifications) is over 60% in other countries, whereas the percentage is as low as 23.8% in Japan. Intention to use is also lower compared with other countries. Cited reasons for the difficulty of use include insufficient speed and stability of Internet connection in foreign countries, while "security concern" is the most common answer in Japan.

By age group in Japan, use rate is from 20% to around 25% in all age groups. Intention to use is over 30% in age groups from the 20s to 50s, but the ratio of "not necessary" is large in the 60s (**Figure 3-8-3-1**).

Figure 3-8-3-1 Use situation of electronic administrative services in Japan (by age group)



(Source) MIC (2022) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

Related data
Questionnaire survey of Use situation of electronic administrative services (electronic applications, filing and notifications) and reasons for difficulty to use (by country)
Source: MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-8-47 (Data Collection)

(2) Development status of data linkage and authentication infrastructure

i Individual Number Card

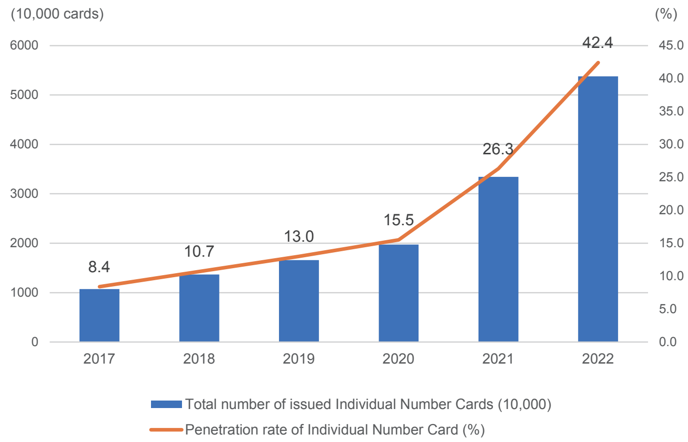
Under the acts related to digital reform[101] promulgated in May 19, 2021, use of the individual number system is promoted, which includes: digitalization of the affairs regarding national qualifications including medical license using individual numbers; and establishment of a system to voluntarily register an account for receipt of public money and to use the account for receipt of emergency benefits.

Penetration rate of Individual Number Card was 26.3% in March 2021, but rose to 42.4% in March 2022 (**Figure 3-8-3-2**).

[101] the Basic Act on the Formation of a Digital Society (Act No.35 of 2021), the Act on the Establishment of the Digital Agency (Act No.36 of 2021), the Act on the Arrangement of Related Laws for the Formation of a Digital Society (Act No.37 of 2021), the Act on Registration of Saving Account for Prompt and Sure Implementation of Public Benefits, etc. (Act No.38 of 2021), the Act on the Management, etc. of Deposit Accounts by Using Individual Numbers Based on the Intention of Depositors (Act No. 39 of 2021), and the Act on the Standardization of Local Government Information Systems (Act No. 40 of 2021)

Chapter 3

Figure 3-8-3-2 Penetration rate of Individual Number Card



*Number of issued card as of March of each year

(Source) Prepared from MIC, "issuance status of Individual Number Card"[102]

ii Base registry

Development of base registry[103] is indispensable for once-only administrative procedures and creation of Smart City and other new services. In Japan, actions have been taken according to the Base Registry Roadmap formulated in December 2020.[104] The roadmap sets the target year of data development at 2030 and plans to construct a system for this target within five years.

Digital Agency opened a demonstration site of "registry catalog" and "address base registry" which is a pilot project of base registry on April 22, 2022.[105] As of May, 6, 2022, 7,464 data sets are registered: addressing system/residence master data set of 721 entities and event data set of 128 entities are available.

EU positions "base registry" as one of its top priority policies and sets the goal of constructing "European Data Space" that is "single market of data" in "A European strategy for data "[106] published in February 2020 in order to realize "once-only principle" that is one of the goals of the Tallinn Declaration in 2017.

102 https://www.soumu.go.jp/kojinbango_card/kofujokyo.html

103 Data registry refers to "a database of basic social data, such as people, corporations, land, buildings, and qualifications, that is registered and published by public organizations and referenced in various situations, and serves as the foundation of a society that ensures accuracy and currency" (https://www.kantei.go.jp/jp/singi/it2/dgov/data_strategy_tf/dai4/siryou1-2.pdf).

104 https://www.soumu.go.jp/main_content/000725147.pdf

105 https://registry-catalog.registries.digital.go.jp/dataset

106 "A European strategy for data" (European Commission, February 19, 2020) (https://ec.europa.eu/info/sites/info/files/com m unication-european-strategy-data-19feb2020_en.pdf)

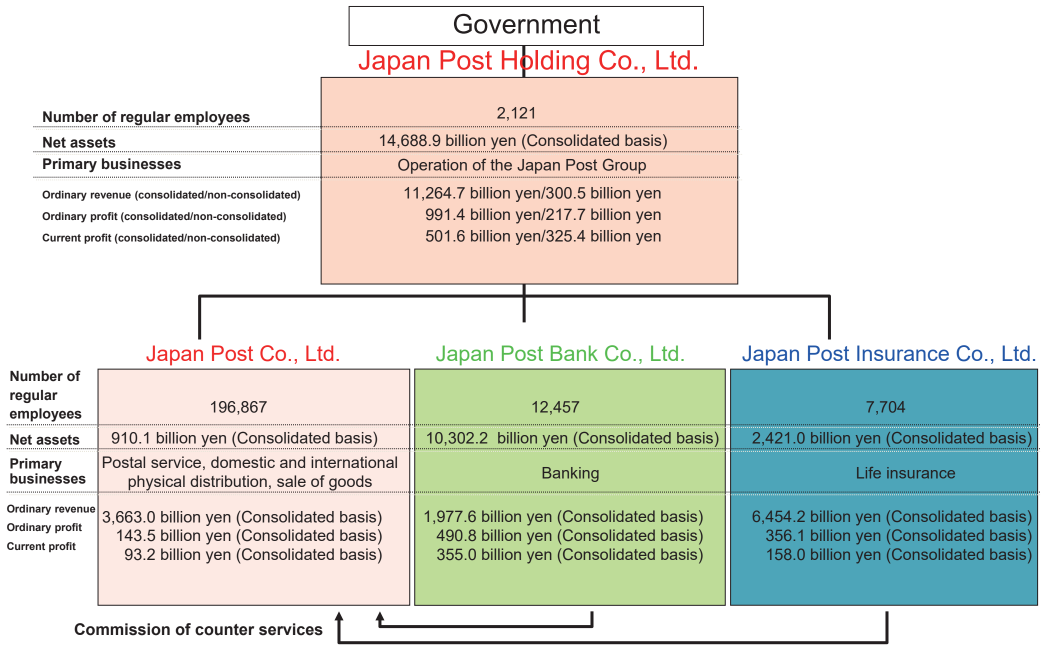
Section 9 Trends in Postal Service and Correspondence Delivery Business

1. Postal service

(1) Japan Post Group

Since October 1, 2012, Japan Post Group has a four-company structure under Japan Post Holdings Co., Ltd. (**Figure 3-9-1-1**). Japan Post Holdings holds 100% of the issued stocks of Japan Post, 89.0% of the issued stocks of Japan Post Bank and 59.9% of the issued stocks of Japan Post Insurance (as of the end of February 2022).

Figure 3-9-1-1 Organization of the Japan Post Group



*1 Numbers of (regular) employees, branch offices, etc. are as of September 20, 2021
*2 "Current profit" of the respective companies is "current profit belonging to the shareholders of the parent company" or "current loss belonging to the shareholders of the parent company"

(Source) Prepared from 2022 March settlement materials, 2021 disclosure document, etc.

In the fiscal 2021 consolidated statement of the Japan Post Group, ordinary revenue was about 11.3 trillion yen, while current profit was 501.6 billion yen (**Figure 3-9-1-2**).

Figure 3-9-1-2 Financial status of the Japan Post Group

(100 million yen)

Fiscal year	2016	2017	2018	2019	2020	2021
Ordinary revenue	133,265	129,203	127,749	119,501	117,204	112,647
Ordinary profit	7,952	9,161	8,306	8,644	9,141	9,914
Current profit	-289	4,606	4,794	4,837	4,182	5,016

(Source) Prepared from "Summary of Settlement of Accounts" of Japan Post Holding

(2) Japan Post Co., Ltd.

i Financial condition

In the fiscal 2021 consolidated statement of the Japan Post, operating revenue was about 3.6569 trillion yen, operating profit was 148.2 billion yen, ordinary profit was 143.5 billion yen, and current profit was 93.2 billion yen: both income and profit decreased.

By business segment, operating revenue of the postal service/physical distribution was 2.412 trillion yen, operating expenses were 1.9389 trillion yen, and operating profit was 102.2 billion yen decreasing 21.4 billion yen over the previous term, while operating revenue of the post office counter service was 1.517 trillion yen, operating expenses were 1.1272 trillion yen, and operating profit was 24.5 billion yen decreasing 13.1 billion yen over the previous term (**Figure 3-9-1-3**).

Figure 3-9-1-3　Changes in operating profit/loss of Japan Post (consolidated)

(100 million yen)

Fiscal year	2016	2017	2018	2019	2020	2021
Postal/physical distribution	120	419	1,213	1,475	1,237	1,022
Post office counter service	633	397	596	445	377	245
International physical distribution	56	102	103	-86	35	287
Japan Post (consolidated)	534	865	1,820	1,790	1,550	1,482

*The business segment "financial counter service" was renamed to "post office counter service" in the fiscal term ending March 2022.

(Source) Prepared from Japan Post Holdings, "Summary of Settlement of Accounts"

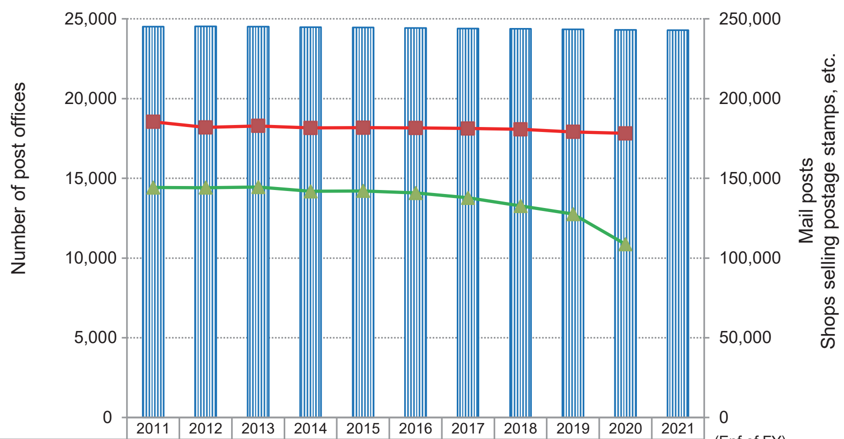
Operating profit of the postal service of Japan Post was 24.0 billion yen in fiscal 2020.

Related data
Balance of postal service
Source: Prepared from Japan Post Co., Ltd., "Status of postal service balance"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-9-3 (Data Collection)

ii Number of postal-service-related facilities

At the end of fiscal 2021, the Number of post offices was 24,284. The number has been almost flat (**Figure 3-9-1-4**).

Figure 3-9-1-4　Changes in the number of postal-service-related facilities



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Post offices	24,514	24,525	24,511	24,470	24,452	24,421	24,395	24,367	24,341	24,311	24,284
Mail posts	185,409	181,895	182,839	181,521	181,692	181,523	181,221	180,774	179,129	178,211	–
Shops selling postage stamps, etc. and places selling stamps	144,155	144,153	144,504	141,888	142,104	140,881	137,790	132,613	127,633	108,624	–

(Source) Prepared from materials disclosed by Japan Post Group, and Japan Post's website "Information on the number of postal offices (open data)"

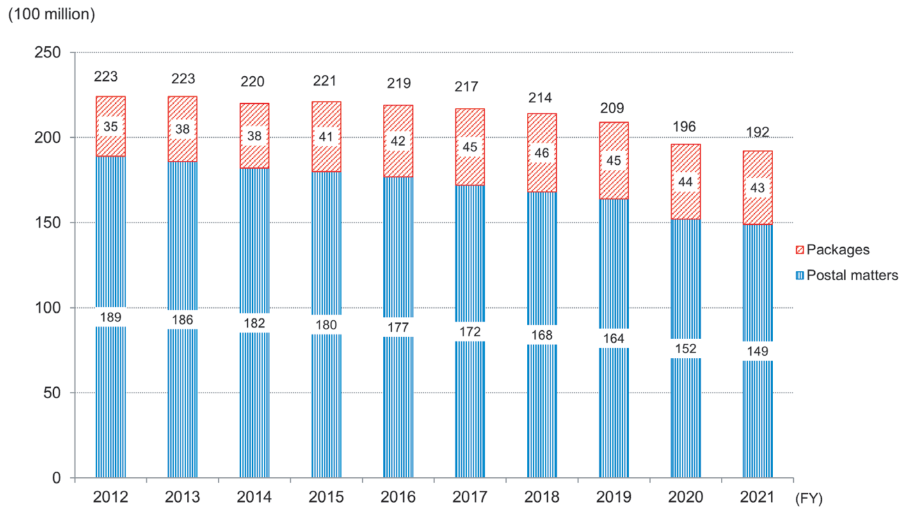
Looking at the details of the number of post offices at the end of fiscal 2021: the number of directly managed post offices (including satellite offices and currently closed offices) is 20,145, while the number of simple post offices (including currently closed simple post offices) was 4,139.

Related data
Breakdown of the number of post offices (end of fiscal 2021)
Source: Prepared from Japan Post Co., Ltd. Website, "Information on the number of postal offices (open data)"
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-9-5 (Data Collection)

iii Number of accepted postal matters

The total number of accepted postal matters was 19.19273 billion in fiscal 2021 (**Figure 3-9-1-5**).

Figure 3-9-1-5 Changes in the total number of accepted postal matters



* Yu-pack and Yu-mail are not small parcels under the Postal Act, but freight under the Motor Truck Transportation Business Act

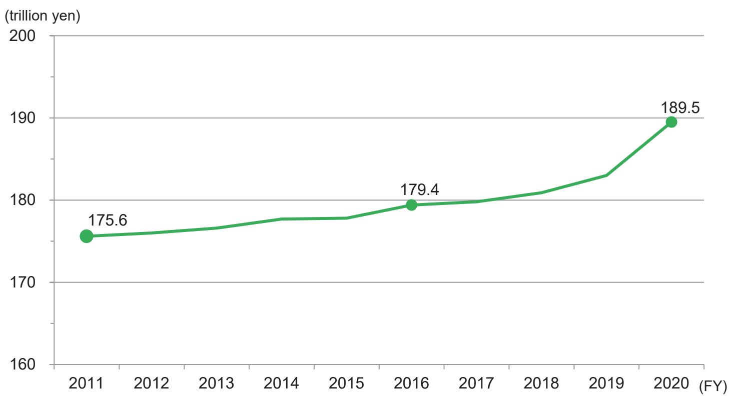
(Source) Japan Post material, annual "Number of accepted postal matters, etc."

(3) Japan Post Bank Co., Ltd.

Japan Post Bank conducts business at 233 directly managed offices, while commissioning agency services to about 20,000 post offices.

The balance of deposits of Japan Post Bank (including postal savings since the time of the government management) was 189.5 trillion yen at the end of fiscal 2020. The balance decreased 70.5 trillion yen (27.1%) form the peak at 260.0 trillion yen at the end of fiscal 1999.

Figure 3-9-1-6 Changes in the balance of deposits with Japan Post Bank



*Figures are sum of the deposits before and after the Japan Post privatization

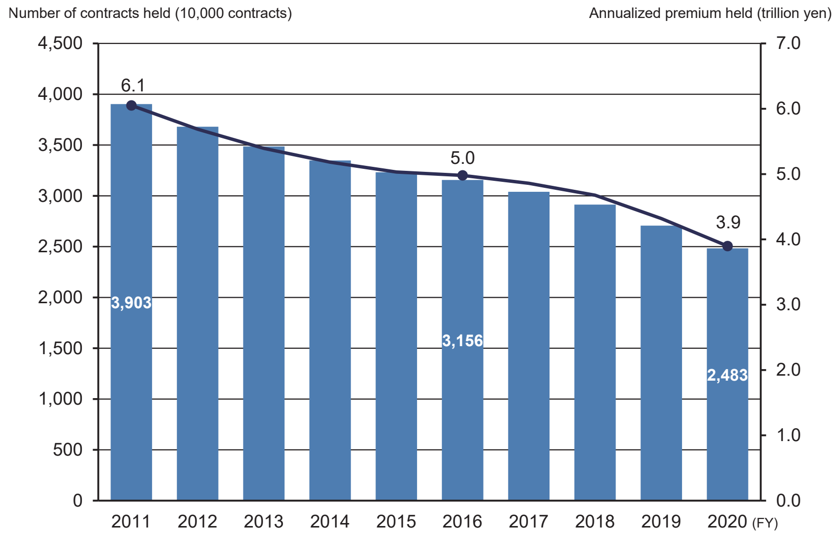
(Source) Prepared from the statement of accounts of Japan Post Bank

(4) Japan Post Insurance Co., Ltd.

Japan Post Bank conducts business at 82 directly managed offices, while commissioning agency services to about 20,000 post offices.

The number of insurance contracts with Japan Post Insurance (including postal life insurance during the time of the government management) was 24.83 million at the end of fiscal 2020. The number decreased 59.49 million (70.5%) from the peak of 84.32 million at the end of fiscal 1996. Annualized premiums also decreased by 3.8 trillion yen (49.3%) from 7.7 trillion yen at the end of fiscal 2008 to 3.9 trillion yen at the end of fiscal 2020.

Figure 3-9-1-7 Changes in the number of contracts with and annualized premium held by Japan Post Insurance



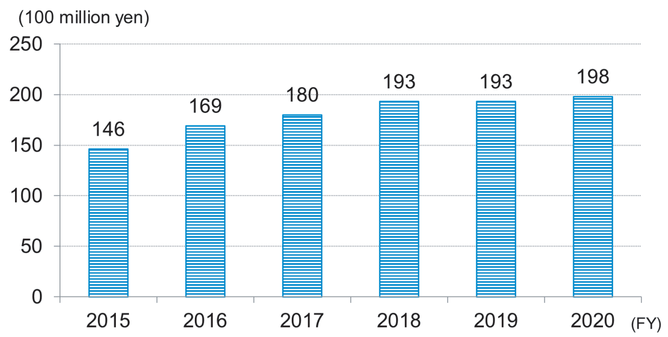
(Source) Prepared from the statement of accounts of Japan Post Insurance

2. Correspondence delivery service

(1) Sales of correspondence delivery service

In fiscal 2020, sales of specified correspondence delivery service was 19.8 billion yen, increasing 2.6% from the previous fiscal year (**Figure 3-9-2-1**).

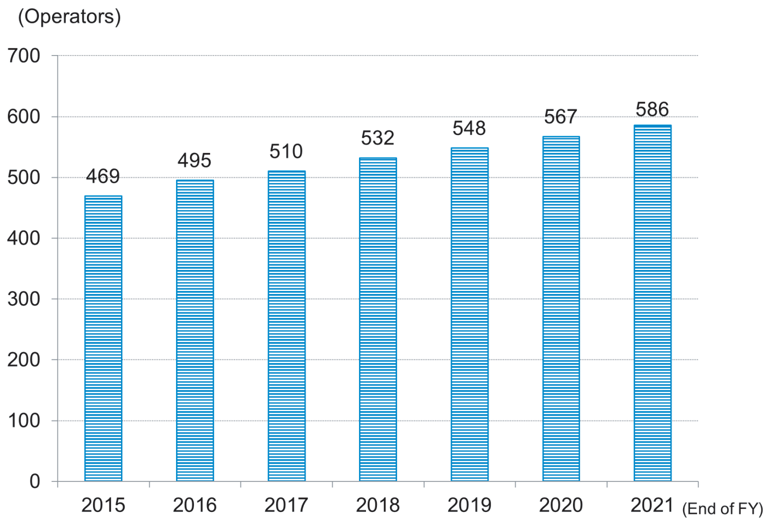
Figure 3-9-2-1 Changes in the sales of correspondence delivery service operators



(2) Number of correspondence delivery service operators

After the enforcement of the Act on Correspondence Delivery by Private Business Operators (Act No. 99 of 2002) in April 2003, there has been no entry into general correspondence delivery service[107], but entry into specified correspondence delivery service[108] is steadily increasing: there were 586 entries as of the end of fiscal 2021 (**Figure 3-9-2-2**). By type of provided service, providers of Class 1 and Class 3 services are increasing.

Figure 3-9-2-2 Changes in the number of correspondence delivery service operators



Related data
Changes in the number of business operators by type of service (specified correspondence delivery service)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-9-9 (Data Collection)

(3) Record of handled correspondences

In fiscal 2020, the number of accepted correspondences was 21.05 million, increasing 1.0% from the previous fiscal year.

Related data
Changes in the amount of accepted correspondence mail
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-9-10 (Data Collection)

Data related to Chapter3
Changes and forecasts for the size of ICT markets in the world (video distribution, music distribution, mobile application, Web conference, router/switch, optical transmission equipment, FTTH equipment, macro cell stations, indoor small cell, LPWA, smartphone, tablets, wearable terminals, domestic/consumer robots, AI speaker, AR/VR, IoT devices)
Source: Omdia
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#3-R-1 (Data Collection)

[107] “Nationwide full-scale entry” business that can deliver all types of correspondences on condition of providing general correspondence service across the country
[108] Innovative “specified service” business that needs to satisfy either of Specified Correspondences Service Class 1, 2 or 3.

Chapter 4

Chapter 4

Status of ICT Policy at MIC

Section 1 Promotion of Comprehensive ICT Policies

1. Current State and Challenges

(1) Arrival of aging society with fewer children and distressed local economy

In Japan, the low birthrate and population decrease have become increasingly serious. Decline in births is progressing at a faster speed than past projections. Total fertility rate once recovered to 1.45 but has been slightly decreasing in the past few years. Progress of declining birthrate and aging has significant impacts on socioeconomics through population (especially working-age population) decrease, which include decline in labor supply, contraction of the economy and market, lower economic growth rate, fewer leaders in communities and society, increasing burden on working generations and decline in the level of administrative services.

In particular, many regions are facing various social challenges to solve toward regional revitalization: increase in the number of vulnerable road users, shortage in workers who provide medical/nursing care services, decline in retail/daily-life-related services in communities and increasing burden of infrastructure maintenance/management.

In this context, ICT utilization is expected to enable the employment of people who had few employment opportunities due to various social reasons including child care, family care and disabilities, while at the same time contributing to improvement of corporate productivity and business processes. Construction of a structure for new value creation taking advantage of digital technologies would help problem solving and attraction enhancement in communities.

(2) Preparedness for intensifying disasters

In recent years, weather disasters have become increasingly serious and frequent due to climate change, and large scale earthquakes including the Nankai Trough earthquake, subduction zone earthquakes around Japan Trench and Chishima Trench, are imminent. Furthermore, because infrastructure that was intensively developed in and after the high-growth period will age at once hereafter, it is necessary to ensure steady maintenance/renewal of infrastructure. However, preventive maintenance cycle is not yet established. Failure to make appropriate responses would not only increase medium- to long-term total cost but also cause dysfunction of administrative and socioeconomic systems of Japan.

In order to overcome these national crises, protect lives and assets of the people and maintain important functions of the state and society, it is necessary to advance Japan's development as a disaster-resistant country by accelerating and deepening the efforts for disaster prevention/mitigation and national resilience.

For more efficient implementation of the measures for disaster prevention/mitigation and national resilience, it is essential to take advantage of digital technologies that have been rapidly developing in recent years. It is expected that ICT utilization will enable high-quality disaster countermeasures including efficient and effective transfer/sharing of disaster information and thereby help realization of a disaster-resistant resilient society. In addition, it is necessary to ensure reliable and prompt communication through broadcasting at times of disaster by promoting measures toward a resilient and disaster-resistant broadcast network.

(3) COVID-19 pandemic

The COVID-19 pandemic triggered the need to adopt a non-contact/non-face-to-face lifestyle in various scenes of daily life including shopping, commuting and leisure activities. Enterprises also need to introduce a non-contact/non-face-to-face workstyle and improve operation efficiency amid slumping consumption. When social conditions are greatly changing in this way, various problems of Japan including its delay in digitalization have come to the surface due to the COVID-19 pandemic. On the other hand, there are also positive changes toward the future: changes in workstyle using digital technologies, an increased awareness of environmental problems and an increased interest in living in the countryside. In addition, there are new moves and attempts including young people and enterprises playing active roles in the world.

In this context, we need to spread digitalization at the micro level -individuals, homes, awareness/action of enterprises- and accelerate the move toward "post-coronavirus" society by changing systems and structures across society including legacy corporate organizations, and by changing workstyle and manpower training toward more diversity, resilience and flexible response to changes.

(4) Changing world affairs

Trade issues between the United States and China have become increasingly serious, and their competition in 5G, quantum and other cutting-edge technologies is intensifying. When changes in the power balance in international society have become increasingly accelerated and complicated, new challenges including security in economy and technologies have come to the surface. On another front, with the progress of science and technology in recent years, activities in outer and cyber spaces have increased, which has brought about a big opportunity but also generated new risks and threats.

In this context, while cooperating with the international community, Japan needs to work on its economic security policy including strengthening of ICT supply chain and construction of safe and reliable ICT infrastructure, and countermeasures against cyber-attacks and other new challenges accompanying the progress of innovative ICT.

2. Initiatives for Promotion of Comprehensive ICT Policies

(1) Promotion of initiatives toward the Digital Garden City Nation

The Vision for a Digital Garden City Nation is a plan to connect to the world by digitalizing rural areas, creating new waves of changes and narrowing the gap between rural and urban areas. In November 2021, the Council for the Realization of the Vision for a Digital Garden City Nation chaired by the prime minister was set up in order to achieve the vision while promoting regional vitalization through digital transformation.

In response, MIC set up the Promotion Headquarters of the Vision for a Digital Garden City Nation in November 2021 and has been promoting initiatives based on the three pillars behind the vision: (1) development of digital infrastructure; (2) development and securing of digital human resources and initiatives to leave no one behind; and (3) digital implementation to solve regional challenges.

Related data
Council for the Realization of the Vision for a Digital Garden City Nation
URL https://www.cas.go.jp/jp/seisaku/digital_denen/index.html

Related data
MIC Promotion Headquarters of the Vision for a Digital Garden City Nation
URL https://www.soumu.go.jp/main_sosiki/singi/denen_toshi/index.html

(2) Consideration of information and communications policies toward 2030

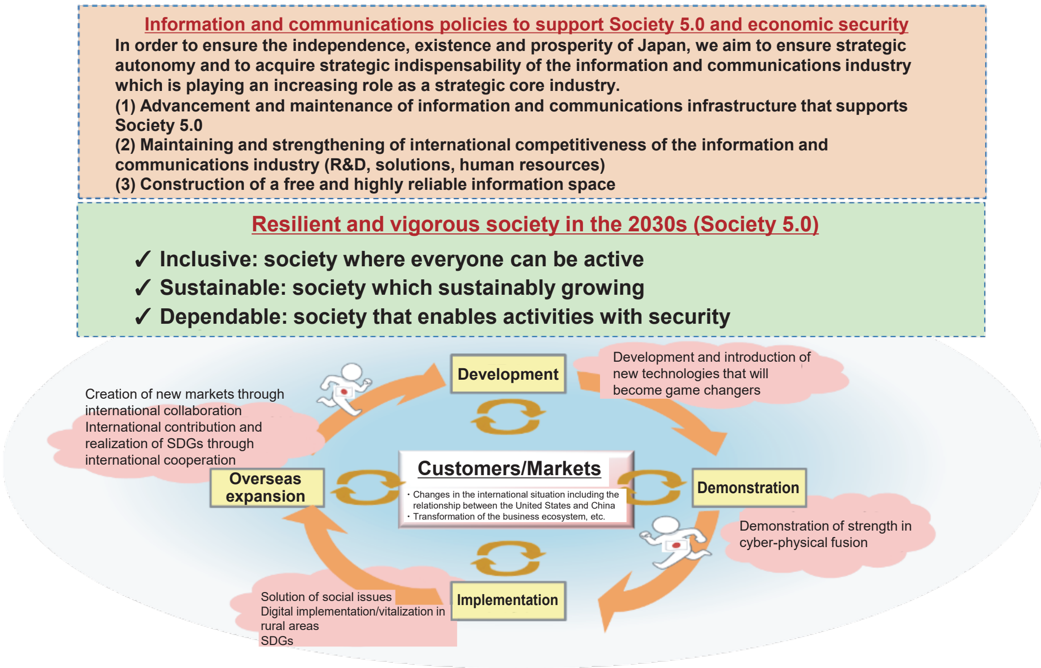
Considering the increasing presence of overseas platform operators in Japan's information and communications market and supply chain risks due to changing international situations, MIC consulted the Information and Communications Council regarding "Desirable Information and Communications Policies toward 2030" in September 30, 2021. In response, the council conducted research and investigations on the direction and urgent tasks of information and communications policies in order to achieve the realization of Society 5.0[1] and ensure economic security.

In order to ensure the independence, existence and prosperity of Japan, and to ensure strategic autonomy and acquire strategic indispensability of the ICT industry which is playing an increasingly important role as a strategic core industry, the report finds the following as necessary: (1) advancement and maintenance of information and communications infrastructure; (2) maintaining and strengthening of international competitiveness of the information and communications industry (R&D, solutions, human resources); and (3) construction of a free and highly reliable information space **(Figure 4-1-2-2)**. In this process, considering the challenges facing Japan and factors of "digital defeat" of its ICT industry, the report presents the direction of the initiatives (e.g. development and introduction of new technologies with potential to become game changers, customer/market-oriented business development process, implementation of solutions by integrating manufacturing technologies and digital infrastructure).

It also presented eight priority fields and items of focus in each field. The fields are: (1) spread and advancement of 5G and its overseas expansion; (2) expansion of broadband; (3) R&D, implementation and international standardization of the next-generation networks; (4) study on future vision of broadcasting and broadcasting system; (5) construction of a safe and secure environment for internet use; (6) promotion of content services; (7) security of cyber security overlooking the entire cyber space; and (8) strengthening of human resources and promotion of its use. For the above, the report finds it essential to start new initiatives free of existing ways through organic linking of roles (vertical division) and cross-functional initiatives across stakeholders, relevant government offices and MIC departments.

[1] Vision set forth in the Fifth Science and Technology Basic Plan (Cabinet Decision on January 22, 2016). This is a human-centered society balancing economic development and resolving of social issues through the sophisticated integration of cyberspace with physical space by maximizing ICT ("Super Smart Society"). Industry-academia-public-private initiatives have been promoted toward its realization by around 2030.

Figure 4-1-2-2 Basic approach toward the realization of Society 5.0



Related data
General Policy Committee, Information and Communications Policy Section, Information and Communications Council
URL https://www.soumu.go.jp/main_sosiki/joho_tsusin/policyreports/joho_tsusin/sougou_seisaku/index.html

Column 2 "Recommendations on Information and Communication Administration from Young Administrators—a Roadmap to MIC 2.0"

In September 3, 2021, MIC published "Recommendations on Information and Communication Administration by Young Administrators—a Roadmap to MIC 2.0" that is a recommendation by a team formed to propose innovations.[2]

The team was set up in July 2021 and 45 mostly young officials became members through public recruitment in MIC. They held intensive discussions on challenges of information and communication administration and necessary reform toward the desirable state, and compiled the result in the recommendation. Prior to its release, the team handed the recommendation to Minister Takeda for Internal Affairs and Communications (at the time) and they exchanged opinions.

The recommendation made proposals in six fields, some of which have been reflected in budgetary requests and discussions at expert committees. Below is a summary of the recommendations.

1. Information distribution/cross-cutting field

MIC has been returning the ICT development results to society and promoting advancement of social life and economic activities. However, with the rapid progress of digitalization under the COVID-19 pandemic and other factors, new challenges of "post COVID-19 age" have come to the surface. In order to ensure prompt and appropriate response to the challenges, it is necessary for the entire organization to strengthen its system so that limited resources will be concentrated on the right policy issues through true "selection and concentration." Specifically, MIC should work on the four issues: (1) strengthening of information collection and analysis functions; (2) promotion of selection of external human resources for higher positions; (3) full focus on hands-on approach; and (4) organizational reform of MIC departments.

2. Technology/international affairs

In order to respond to an increasingly volatile, uncertain, complex and ambiguous society, it is necessary to frame policies free from the traditional approaches. In addition to the current initiatives, the following new initiatives should be promoted.

- Strengthen linkage of technology development, social implementation and international deployment to establish systems/environment and policy schemes for streamlined promotion.
- In order to promote problem solving through ICT, make broad and flexible efforts including development of peripheral technologies and uncharted territories without excessive consideration of jurisdiction.
- In order to build person-to-person relationships in international affairs, make special personnel consideration including higher titles to staff members who work on international negotiations.

3. Communications/radio waves

Communications/radio waves is a core industry that is expected to exceed 100 trillion yen in the future and a strategically important industry that will have a decisive influence on the future of Japan depending on the current policy. In future policy making, the three perspectives of (1) national level, (2) local level, and (3) global level, and approaches of "attack" and "defense" will be useful. There are a variety of issues to tackle, which include economic growth/regional revitalization; safe, secure and low-cost ICT use environment; and security of outer/cyber spaces and electromagnetic waves. In addition to considerations of bold funding for promotion of local and enterprise digital transformation through construction of even more resilient infrastructure and local 5G, we should reform systems toward more competitive and transparent spectrum allocation.

4. Broadcasting

"Broadcasting" has led media content in Japan and played a public role, but its environment is rapidly and irreversibly changing due to the spread of smartphones and rapid progress of video distribution platforms. It has become natural to view "what one likes" "at any time" and "anywhere" without being aware whether it is through "broadcasting" or "communication." In this context, it is clear that we will not be able to meet the needs of the public/viewers if we stick to the past "broadcasting" forms/business model.

MIC needs to study "past," "present" and "future" of "broadcasting" and advance specific reforms to contribute to (1) ensuring of "reliable" service, (2) contents that meet "viewers' demand" and (3) challenge to "go beyond" television.

[2] https://www.soumu.go.jp/menu_news/s-news/01tsushin01_02000321.html

5. Postal Affairs

Post offices have fulfilled their role as important infrastructure of communities since their establishment, but their presence is gradually weakening and they are now regarded as “a symbol of analog technology” amid the rapid digitalization of society. In order to continue to be necessary for people throughout the ages, post offices should specify a roadmap for “data utilization” and show their presence again as a source of “regional revitalization” in addition to maintaining the existing services.

Japan Post Group and MIC need to take the following actions:

- Entry into community infrastructure business: Stadt Werke Post Office Style
- Exchange of people leading regional revitalization project: “Dispatch of digital human resources by using post offices”
- Creation of new dialog opportunities: “Post administration dialog”

6. Organizational culture/ways to proceed with work

MIC has been working on workstyle reform and review of operations, which include the activities of the team. However, the team makes the following recommendations on operational environment and personnel system reform from the perspective unique to administrative affairs of information and communications.

Regarding operation environment, MIC should put its operations completely online on the premise of telework. In order to support this process, it is necessary to further improve ministry LAN and efficiency of routine tasks. For personnel system reform, it is necessary to take measures to proactively support active career development of each official. Training of experts who can play active roles in the frontline of security, privacy, international relationships and other fields is a pressing issue. In order to prevent concentration of tasks on specific officials, it is necessary to reduce gaps in work experience/knowledge and to study the desirable state of information exchange network with private enterprises.

Section 2 Trends in Telecommunication Policy

1. Summary

(1) Initiatives so far

For over 35 years since the liberalization of telecommunications business and the enforcement of the Telecommunications Business Act in 1985, there have been a large number of new entries into the telecommunication market. Under the competition principle, price reduction and service diversification/upgrading have impressively advanced through the progress and introduction of a variety of communication technologies including IP/ digitalization and mobile broadband. In the past, MIC has constantly reviewed various policies and institutions in its approach to ensure provision of reliable telecommunication services while at the same time maintaining the innovations and dynamism of the telecommunication services.

For example, Japan's telecommunications market has experienced major environmental changes, including the popularization of mobile phones and the rollout of broadband, and the progress of competition between groups of players, mainly mobile carriers, in recent years. Considering these changes, MIC has developed rules to ensure a fair competition environment. Furthermore, to address the issue that mobile bills are high compared with other countries and price plans of carriers are too complex to understand, MIC has taken measures for enabling people to access the low-price and diverse mobile phone services that are daily necessities today.

MIC has also developed rules to cope with growing and diverse problems in the use of telecommunication services caused by information gaps between users and carriers, or inappropriate solicitation by business, and the growing global risks of complication and sophistication of cyber-attacks.

(2) Future challenges and direction

Telecommunication business provides services indispensable for people's daily lives and socio-economic activities. As the social structure of Japan is moving toward "rapid population decrease and extreme population aging," it is expected that the roles of ICT for regional revitalization will increase, which include strengthening of regional industrial infrastructure and promotion of migration to rural areas. It is thought that the roles ICT should play are also increasing in vitalization of economic activities including creation of new businesses and productivity improvement, in realization of safe and secure society and for solution of social challenges in medical, education, administration and other sectors. Importance of telecommunication services is further increasing.

In this context, it is extremely important for individuals and Japan's socio-economy to ensure the benefits for telecommunication service users and to develop digital infrastructure as the foundation to promote innovations in the entire society and to support digitalization/digital transformation.

It is expected that not only the telecommunications market, but even Japan's social structure will further drastically change and the existing social/economic models that have been assumed will no longer apply. There is an increasing need to solve social challenges and create values by using advanced information and communications technologies.

For this purpose, it is necessary to create an environment where all entities in Japan can use safe, secure and reliable information and communications services.

2. Development of a Fair Competitive Environment

(1) Analysis/validation of the telecommunications market

i Validation of the telecommunications market

Since fiscal 2016, MIC has conducted integrated market validation including analysis/validation of market trends and confirmation of adequateness of the operation of telecommunication businesses. With the aim of obtaining advice from objective and technical perspectives, MIC has held the Meeting for Telecommunications Market Validation consisting of experts and other members. Since December 2020, MIC has held a "study meeting on the ideal way of ensuring fair competition" under the Meeting for Telecommunications Market Validation to conduct a study from the perspective of ensuring fair competition in the telecommunications market.

Based on the recommendations concerning the need for strengthening market validation in the report of the study meeting, MIC released "Basic Policy on Market Validation in Telecommunications Business" in December 2021. Based on this policy, MIC will formulate an annual plan presenting implementation policy of market validation, etc. and implement market validation measures according to the plan.

ii Development of a fair competition environment in the mobile market

(i) Validation of the competition rules in the mobile market

In order to realize low-cost and diverse services through active competition among business operators, MIC has been taking measures for development of a fair competition environment in the mobile market. In 2019, the Telecommunications Business Act was amended for separation of communications charges and terminal device charges, prohibition of excessive customer retention and other purposes. Since 2020, effects of the measures taken based on the amendment and their impact on the mobile market have been continuously examined at the "Working Group (WG) on Verification of Competition Rules" set up under the "Meeting for Telecommunications Market Validation."

(ii) Formulating and releasing an action plan

Based on the "2020 Report on Verification of Competition Rules" (October 2020) of the WG and others, MIC released "Action Plan for Creating a Fair Competitive Environment for the Mobile Market" which specifies the issues that should be addressed to improve the fair competition environment in the mobile market.

As part of the efforts in response to the action plan, in order to improve the environment toward lower mobile phone charges, MIC and the Consumer Affairs Agency jointly published "Reminder regarding display of 'down payment' and terminal selling prices in the mobile phone industry – to people considering purchase of a mobile phone terminal" in November 2020. In addition, MIC opened "Mobile Phone Portal Site (provisional version)" posting neutral information to help users in choosing the plan that meets their needs on the MIC website in December 2020, which was followed by an official version on April 2, 2021. Further in April 2022, MIC renewed its design and extensively expanded the content to promote further understanding of consumers.

Related data
Mobile Phone Portal Site
URL https://www.soumu.go.jp/menu_seisaku/ictseisaku/keitai_portal/

(iii) Prohibition of SIM lock in principle

In November 2020, MIC set up "Switching Facilitation Taskforce" under the Working Group (WG) on Verification of Competition Rules. The task force conducted intensive, specialized, and technical studies to facilitate switching between carriers.

Based on the report of the taskforce (May 2021) and the "2021 Report on Verification of Competition Rules" (September 2021) of the WG, MIC developed rules for in-principle prohibition of SIM lock and early dissolution of existing contracts. Mobile operators are also advancing their initiatives including abolition of penalty payment, start of portable carrier mail address service and introduction of eSIM. In this way, development of a fair competition environment in the mobile market is progressing.

(2) Development of interconnection rules

i Review of calculation method of mobile connection charge

Since February 2021, mobile operators have been sequentially offering new low-cost price plans for mobile communication. Competition among MNOs and MVNOs in the mobile market is expected to further lower charges and upgrade and diversify their services.

Based on the Fifth Report (September 2021) of the "Study Group on Calculation of Interconnection Charges, etc.," MIC partially amended the Enforcement Regulation of the Telecommunications Business Act to request telecommunications carriers installing Category II designated telecommunications facilities for report on details of the calculation method of mobile interconnection charges and specific values of the basis of calculation.

ii Review of the system for wholesale telecommunications services

MNO's voice call charges (measured rate) were not lowered for a long period of time. As a cause of the high voice call charges for a long time, ineffective negotiations between MNOs and MVNOs were suggested by the "2021 Report on Verification of Competition Rules," the "Fifth Report" of the "Study Group on Calculation of Interconnection Charges, etc." and others.

Based on the recommendation by the "Study Group on Calculation of Interconnection Charges, etc." (February 2022), a bill for partial amendment of the Telecommunications Business Act was submitted to the Diet in March of the same year and enacted in June. The bill newly provides obligations of wholesalers to provide wholesale telecommunications services using designated facilities and present information contributing to smooth negotiation at the request of their customers. MIC plans to study details toward its smooth enforcement.

iii Review of the interconnection system for fixed telephones

MIC consulted the Information and Communications Council on "Ideal State of Interconnection System with Consideration at Stage of Migration to IP Networks" on April 2020 and received its partial report in September of the same year and the final report in September 2021.

Based on the final report, a bill for partial amendment of the Telecommunications Business Act was submitted to the Diet in March 2022 and enacted in June of the same year. The bill includes the change of the area for calculation of the share of subscriber lines installed by individual telecommunications carriers under the Category 1 designated telecommunications facilities system from prefecture to their service areas. MIC plans to study details toward its smooth enforcement.

Based on the final report, MIC amended the regulation for the Category 1 designated telecommunications facility interconnection charge (Ordinance of the Ministry of Posts and Telecommunications No. 64 of 2000) in order to establish provisions on voice connection charge of subscribed telephones at the stage of migration to IP networks. At the same time, concerning the right to set charges for calls from subscribed telephones to mobile phones, MIC amended the examination criteria related to the Telecommunications Business Act (MIC Official Directive No.75 of 2001) and formulated the ruling policy on the right to set user charges.

3. Development and Maintenance of Digital Infrastructure

(1) Promoting optical fiber development

Today when people's movement is restricted with the spread of COVID-19, the importance of using digital technologies is further increasing to enable non-face-to-face/non-contact lifestyle including telework, remote education and remote diagnosis. As a result, ultra-fast broadband using optical fiber has become indispensable for socioeconomic activities and people's lives. Furthermore, its need as the trunk circuit to support 5G, which was commercialized in 2020 and whose area development is advancing, is also rising. The early national deployment of 5G is expected, but the development is delayed in depopulated areas, remote islands and other geographically disadvantaged regions.[3]

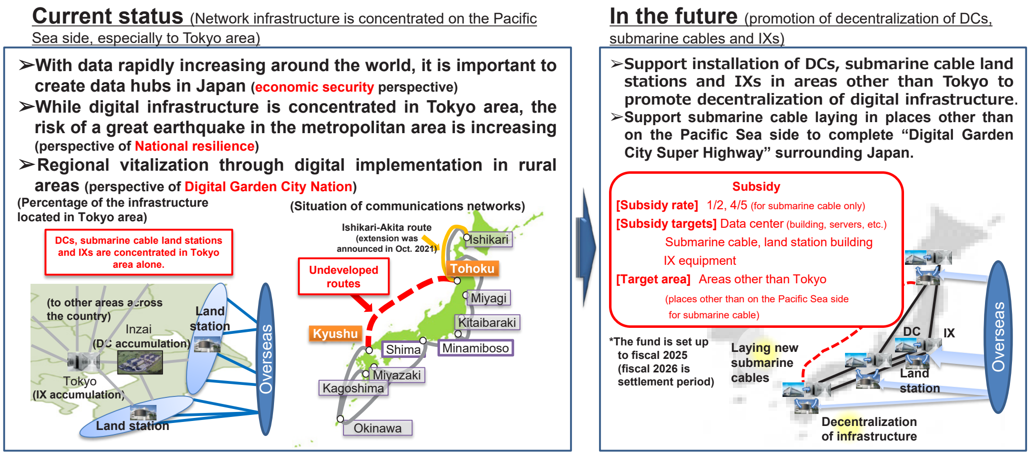
In this context, since fiscal 2019 MIC has been implementing the "project to promote advanced wireless environment" to subsidize a part of operating expenses of optical fiber development by local governments, telecommunication carriers, or others as a premise of high-speed and large capacity wireless communications including 5G. In fiscal 2021, expenses of maintenance/management of optical fiber, etc. in isolated islands by local governments were added to the eligible expenses. In March 2022, MIC announced "Infrastructure Development Plan for a Digital Garden City Nation." Under the plan, MIC is working to increase the household coverage of optical fiber from 99.3% at the end of March 2021 to 99.9% by the end of March 2027.

(2) Decentralization of data centers, submarine cables, etc.

While the data distribution amount through digital infrastructure (e.g., data centers, submarine cables) has been increasing every year with the progress of digitalization, the COVID-19 pandemic triggered a rapid increase of the data distribution amount. Because this increase is expected to continue globally, the importance of digital infrastructure is thought to further increase. In these circumstances, the majority of Japan's data centers are in the Tokyo area. In the event of an earthquake in the metropolitan area, there is a risk that breakdown of data centers would cause disturbance in the use of various services, information of which is managed by data centers, not only in Tokyo area but also in other regions. Furthermore, communications with overseas for use of services provided by foreign enterprises, for example, require optical fiber cables laid on the sea bed (submarine cables). If submarine cables are damaged due to natural disaster or other causes, there is a risk of disruption of communications with overseas.

To address this issue, MIC in cooperation with METI and other relevant government offices considered digital infrastructure development. As a result, MIC decided to provide financial support to contribute to the realization of "a Digital Garden City Nation Vision" by encouraging construction of regional data centers and submarine cables to develop resilient communication network locations toward improvement in resilience and communication network efficiency. Specifically, under the "Project on Strengthening Digital Infrastructure by Decentralizing Data Centers, Submarine Cables, and Other Facilities" (**Figure 4-2-3-1**), the "Digital Infrastructure Development Fund" is established to support private businesses who decentralize data centers, submarine cables, etc. under FY2021 supplementary budget.

Figure 4-2-3-1 Outline of the project for resilient digital infrastructure through decentralization of data centers, submarine cables, etc.



[3] See Chapter 3, Section 2.

(3) Securing broadband services

Based on the Final Report on the "Comprehensive Review of Competition Rules in the Telecommunications Business Sector" (Information and Communication Council on December 17, 2019), MIC has held the "Study Group on Broadband Infrastructure" since April 2020 for technical and concentrated study on the desirable state of broadband infrastructure. With the shift from "development" to "maintenance" phase of communications infrastructure in mind, the study group discussed various issues including measures for securing broadband services and compiled its final report in February 2022.

Based on the recommendations of the final report, a bill for partial amendment of the Telecommunications Business Act was submitted to the Diet in March 2022 and enacted in June of the same year. The bill includes positioning of certain broadband services as a new type of "universal telecommunication service" and establishing a grant system for telecommunication carriers providing broadband service in unprofitable areas. MIC plans to study details toward its smooth enforcement.

4. Ensuring Safe and Reliable Telecommunications Infrastructure

(1) Establishing systems for technical standards on telecommunications facilities

Considering the advancement of communication networks and diversification of use forms with the penetration of IoT in recent years, and for the purpose of securing a network environment for secure and stable use of various IoT services, the IP Network Facilities Subcommittee of the Department on Information and Communications Technology under the Information and Communications Council has studied "technical requirements for telecommunications facilities in response to the spread of IoT" since December 2017.[4] The partial report[5] of the Information and Communication Council in September 2021 made the following recommendations on accident reporting/validation systems to ensure a safe, secure and reliable information and communication network:

① Regarding accidents in communication services that are provided to important infrastructure, establish necessary rules including clarification of the approach to prompt report to MIC and addition of report items pertaining to quarterly accident report,

② Regarding disturbance of cloud service provided to communication services, clarify in the current guidelines the approach to eligibility for communication accidents,

③ Separately from the communication accident report system, establish necessary rules for incidents (situation indicating a possible communication accident) including prompt reporting of serious incidents, and

④ Establish necessary rules including prompt reporting of serious incidents caused by cyber-attacks and more flexible reporting deadline of the detail of serious accidents.

Based on the partial report, a bill for partial amendment of the Telecommunications Business Act was submitted to the Diet in March 2022 and enacted in June of the same year. The bill includes new provisions for obligation of prompt reporting of serious accidents. MIC plans to study details toward its smooth enforcement.

Under the progress in introduction of virtualization technologies to and use of cloud services in communication networks and the further increase in diversity and complexity of the structure for providing communication services, since April 2022 the committee has studied "technical requirements of telecommunications facilities in response to increased diversity and complexity of networks associated with the development of virtualization technology."

(2) Securing communication services in disasters

i Continuous information sharing, etc.

In recent years, natural disasters including earthquakes, typhoons, heavy rain, heavy snow, flooding, sediment disasters and volcano eruptions have occurred frequently in Japan. As a result, communication services have been disturbed due to power failure, communication equipment failure, cable breakage, etc.

In order to ensure more appropriate response by reviewing past responses to disasters and by confirming the systems among MIC, designated public corporations and other major telecommunication carries at normal times to ensure communication services at a time of disaster, MIC has been holding the "Liaison Committee on Securing Communications Services in the Event of Disaster" since October 2018. The Liaison Committee shares information and exchange opinions on tasks including the system for immediate response and cooperation, prompt assessment of damage and restoration in order to ensure communication services in disasters.

ii MIC - Telecom Emergency Assistance Members (MIC-TEAM)

MIC launched a team named "MIC - Telecom Emergency Assistance Members (MIC-TEAM)" in June 2020 to provide supports to secure communication means in disasters. In times or in danger of a large-scale disaster, the team is dispatched to the local government of the afflicted area to assess the damage to information communication services and conduct liaison and coordination with relevant administrative organs, business opera-

[4] The results of studies by the committee from 2017 to 2020 were submitted by the Information and Communication Council as the 1st report in September 2018, the 2nd report in May 2019, the 3rd report in March 2020 and the 4th report in November 2020.
[5] Partial Report (September 28, 2021) on "technical requirements for telecommunications facilities in response to the spread of IoT" by the Information and Communications Council. https://www.soumu.go.jp/menu_news/s-news/01kiban05_02000230.html

tors and others. The team also provides local governments with technical advice and lends mobile power supply vehicles. At the time of heavy rain that started on July 1, 2021, the team was dispatched to Kagoshima, Kumamoto and Shizuoka Prefectures and Atami City.

In order to address challenges regarding cooperation for power supply, fuel supply and handling of fallen trees based on the experience of 2019 Boso Peninsula Typhoon and other disasters, MIC with Sapporo City (Hokkaido), Tanabe City (Wakayama) and Yatsushiro City (Kumamoto) implemented cooperation drills for initial response by relevant organizations including carriers and power/fuel-related businesses in fiscal 2021.

(3) Analysis and verification of telecommunication accidents

For prevention of telecommunication accidents, it is necessary to take appropriate measures at the time and after the accident in addition to prior measures. In order to verify accident reports for effective utilization for various initiatives to prevent recurrence, MIC has been holding a “telecommunications accident verification meeting” since 2015. The meeting analyzes and verifies reports with focus on “serious accidents” as provided in the Telecommunications Business Act and reports falling under “accidents subject to quarterly report” provided in the Telecommunications Business Reporting Regulations. The meeting compiled the verification results of telecommunication accidents that occurred in fiscal 2020 and released the “2020 Verification Report on Telecommunications Accidents and its Outline” in September 2021.

5. Developing Safe and Secure Environments for Use of Telecommunications Services

(1) Ensuring governance of telecommunications businesses

Telecommunications business is indispensable for innovations in various sectors. In order to promote provision of innovative services by introducing digital technologies and to accelerate digital transformation of the whole society, it is necessary to ensure secure and highly reliable telecommunication services for users.

Toward securing of safe, secure and reliable communication service networks in the digital age, MIC set up “the Study Group on the Telecommunications Business Governance” in May 2021 to examine approaches to governance of cyber security measures and data management by telecommunications carriers and to discuss future measures. The study group compiled the examination result in a report in February 2022. The report recommends three specific measures: (1) measures against risks of information leak/improper management pertaining to telecommunications business; (2) measures against risks of telecommunication service suspension considering diversification of communication networks; and (3) provision of information to users regarding proper management of information and provision of telecommunication services.

Based on the recommendations, with the aim of promoting proper management of user information mostly by telecom carriers who acquire and handle a mass of information, while ensuring consistency with regulations in other countries, a bill for partial amendment of the Telecommunications Business Act was submitted to the Diet in March 2022 and enacted in June of the same year. The bill includes: mandatory formulation and notification of information management rules and other new disciplines; and development of rules for cyber-attack countermeasures in coordination among businesses, accident reporting system and other measures for smooth provision of telecommunication services. MIC plans to study details toward its smooth enforcement.

(2) Developing consumer protection rules

i Summary

While advancement and diversification of telecommunications services have improved convenience and increased choices for many users, there are problems caused by information gaps between users and carriers, or inappropriate solicitation by business. In order to prevent these problems and help consumers enjoy the benefits of advancement and diversification of telecommunications services, MIC has developed rules for consumer protection pertaining to telecommunication services, and appropriately enforces and reviews the rules as needed.

ii Ensuring effectiveness of consumer protection rules

(i) Accepting complaints, providing consultation, cooperating with parties involved and implementing administrative guidance

MIC set up the Telecommunications Consumer Consultation Centers[6] to receive information from consumers. In addition, the MIC has held the Liaison Meeting for Telecommunications Consumer Support[7] for information sharing and opinion exchange among parties concerned in different regions across the country two times every year. Based on the information obtained through these initiatives, MIC is working to ensure effectiveness of consumer protection rules pertaining to telecommunications services through administrative guidance and responses in cooperation with the Consumer Affairs Agency as needed.

In addition, MIC promotes voluntary initiatives by concerned bodies for observance of the consumer protection rules.

(ii) Implementing monitoring

MIC formulated "basic policy for supervising the user protection discipline of telecommunications businesses." Under the policy, MIC has been monitoring the im-

[6] The centers received 18,331 complaints and requests for consultation by phone or Web in fiscal 2021.
[7] This liaison meeting consisting of consumer centers, telecommunication carrier groups and other members is organized by MIC to exchange opinions on consumer support regarding telecommunications services.

plementation status of consumer protection rules and held "periodic meetings for monitoring the implementation status of consumer protection rules"[8] participated in by experts and relevant trade associations to share and assess trends two times a year.

This meeting shares and assesses not only overall trends of complaints and consultations in the telecommunications sector, but also the analysis results of trends by service types including MNO, MVNO and FTTH. The sharing/assessment also covers the results of analysis and field surveys (mystery shopping) under individual themes[9] , results of occasional surveys of individual cases, analysis results of complaints/requests for consultations accepted by trade associations,[10] and follow-up of improvement initiatives by businesses.

Based on the assessment at the meeting, MIC gives guidance on points to be improved to telecommunication carriers subject to the field survey and requests trade associations and others for industry-wide efforts and dissemination to members. Analysis results and assessment at the meeting are used for consideration of review of consumer protection rules and for promotion of voluntary efforts by businesses.

iii Review of consumer protection rules

Considering the changes in the telecommunications market and the state of consumer claims, MIC has successively reviewed and expanded the consumer protection rules. In June 2020, "Study Group on Consumer Protection Rules" started vigorous discussions on review of the system and compiled the "2021 Report of the Study Group on Consumer Protection Rules" in September 2021. Based on the report, MIC has expanded the consumer protection rules as follows and continues to enhance consumer protection through monitoring and other measures.

① Amendment of the Ordinance for Enforcement of the Telecommunications Business Act
In February 2022, the Ordinance for Enforcement of the Telecommunications Business Act was amended to provide: (1) mandatory explanation of service conditions by using written explanation when doing telemarketing; (2) mandatory measures for cancellation by users without delay, and; (3) restriction on the amount billed due to cancellation (enforced on July 1).

② Amendment of Guidelines
In the "Guidelines for Consumer Protection Rules for the Telecommunications Business Act," it is provided with specific examples that consignment contracts between mobile operators and their distributers may be subject to order for business improvement, if the contract might encourage violation to the consumer protection rules, and the description of actions desirable for consumer protection was expanded.

③ Study on complaint processing systems
In October 2021, the "Task Force on Complaint Processing System" was set up and it started to study systems for effective solving of consumer complaints that cannot be smoothly solved with individual businesses. The task force plans to reach a conclusion by summer of 2022.

(3) Protecting privacy of communications and user information

i Summary

Various people, things and organizations are connected to the internet through smartphones and IoT, which leads to rapid progress in generation and accumulation of a mass of digital data. At the same time, there is an orientation toward Society 5.0 where data analysis by AI and other results are fed back to the real world to solve various social issues.

In this context, platform operators who provide various free services have been increasing their presence and acquiring and accumulating user information more than before. In addition, as services necessary for daily life are provided by platform operators via smartphone, etc., their importance in daily life has been increasing and they have been acquiring and accumulating more confidential information.

In order to balance users' convenience and secrecy/privacy protection and to ensure full functioning of platforms, it is important to ensure proper management of user information so that platform operators increase attraction of their services and users can use services with a sense of security.

ii Study at the Working Group on the Handling of User Information for Platform Services

The "Study Group on Platform Services" held by MIC set up the "Working Group on the Handling of User Information for Platform Services" to discuss the matter. The "Interim Report" (September 2021) compiling the result of the discussions presented the following direction:

Regarding the content and scope of the disciplines under the Telecommunications Business Act, etc. it is appropriate to consider development of a specific system for handling of user information including cookie and location information, while considering the discussions on e-privacy rules (draft), and

It is desirable to compile the Guidelines for Protection of Personal Information in Telecommunications Business (MIC Public Notice No. 152 of 2017) as a document for unified reference for telecommunication carriers to ensure proper handling of secrecy of communication, personal information and privacy pertaining to user information.

Regarding "Issue 10: Concerns about acquisition/use

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[8] Periodic meetings for monitoring the implementation status of consumer protection rules: https://www.soumu.go.jp/main_sosiki/kenkyu/shouhisha_hogorule/index.html
[9] The 12th meeting held in February 2022 examined complaints/consultation: (1) regarding transmission speed; (2) from the elderly citizens; (3) regarding corporate contracts, and;(4) related to COVID-19.
[10] Telecommunications Carriers Association and the National Association of Mobile-phone Distributors

of personal data" in the "Evaluation of Competition in the Digital Advertising Market - Final Report" released by the Digital Market Competition Council in April 2021, the interim report recommends review of the Guidelines for Protection of Personal Information in Telecommunications Business.

iii Establishing rules on transmitting user information to an external party

Based on the direction of the interim report, a bill for partial amendment of the Telecommunications Business Act was submitted to the Diet in March 2022 and enacted in June of the same year. The bill includes mandatory provision of an opportunity for confirmation (through notification, disclosure, etc.) by the user when a telecommunication carrier transmits a program that orders transmission of information on a user to an external party during provision of a telecommunication service. MIC plans to study details toward its smooth enforcement.

iv Review of the Guidelines for Protection of Personal Information in Telecommunications Business

Based on the interim report, etc. MIC amended the Guidelines for Protection of Personal Information in Telecommunications Business in line with the review of the guidelines of the Personal Information Protection Commission in March 2022 in time with the enforcement of the 2020/2021 acts to amend the Act on the protection of Personal Information.[11] At the same time, an additional amendment for proper securing of user information was made. In accordance with the amended guidelines, MIC plans to conduct regular monitoring of the status of handling by platform service providers and continue studies to ensure proper handling of user information.

(4) Dealing with illegal/harmful information

i Summary

Distribution of illegal/harmful information on the internet continues to be serious. MIC in cooperation with concerned parties has been continuously taking measures against a variety of illegal/harmful information including slander, pirated editions, fake news and false information.

ii Dealing with slander on the internet

Considering the increasingly serious problem of slander on the internet, especially on social networking services (SNS) and other platform services, MIC formulated and released a "policy package for dealing with slander on the internet" in September 2020. Based on the package, MIC in collaboration with concerned bodies is taking the following measures:

① Enlightenment activities for users to improve information ethics and ICT literacy
② Support for voluntary activities by platform operators and improvement of their transparency/accountability (through their continuous monitoring)
③ Measures for sender information disclosure (enactment of related governmental and ministerial ordinances toward enforcement of the amended Provider Liability Limitation Act and preparation for its smooth operation)
④ Enhancement of the consultation counter functions (strengthening the system of the Illegal/Harmful Information Hotline, strengthening of collaboration among consultation centers and dissemination of the information on multiple consultation centers).

In particular, as part of ①, MIC has been implementing educational activities through various media including government publicity. For example, MIC jointly with Social Media Association of Japan and Safer Internet Association opened a special website under the slogan of "#NoHeartNoSNS" to provide useful information including consulting services for people distressed by interaction on social network. Another special site was created in tie-up with the popular character of "Secret Society Eagle Talon."

Under this policy package, the "Study Group on Platform Service" conducted hearing and other survey of platform operators. Based on the result, the study group compiled and released an "interim report" in September 2021. The report proposes the future direction of dealing with illegal/harmful information and stresses the importance of voluntary elimination, etc. by platform operators and ensuring of transparency and accountability in Japan. The study group conducted hearing of platform operators again in March 2022 and continues discussions.

iii Countermeasures against pirated editions on the Internet

MIC formulated "MIC's Policy Menu of Anti-piracy Measures on the Internet" in December 2021. Based on the policy menu, in addition to the amendment of the law pertaining to sender information disclosure, MIC has conducted enlightenment activities for users to improve information ethics and ICT literacy, promoted introduction of security software to inhibit access to pirated copies, and strengthened international coordination through discussions at ICANN and other international forums.

Since November 2021, the Study Group on Inhibiting Access to Pirated Websites on the Internet has been held to confirm the progress of the measures based on the policy menu and to discuss additional issues to be addressed and the direction of countermeasures.

iv Measures against fake news and disinformation

MIC at the Study Group on Platform Services has discussed fake news and disinformation that have become a problem in recent years. In February 2020, the study group compiled and released desirable specific measures including assessment of the actual situation in Ja-

[11] The parts on the amendment of the Act on the Protection of Personal Information, etc. of the Amendment Act of the Act on the Protection of Personal Information, etc. (Act No.44 of 2020) and Article 50 of the Act on the Arrangement of Related Laws for the Formation of a Digital Society (Act No. 37 of 2021)

pan, construction of cooperative relationships by diverse stakeholders, appropriate handling by platform operators and ensuring of transparency/accountability. Starting from the release of the survey on distorted or misleading information (false rumor, fake news) regarding COVID-19 in June of the same year, the study group has continuously surveyed people's contact with, reception and spread of fake news/disinformation and their attitude to information circulation.

The "Study Group on Platform Services" conducted hearing of platform operators in September 2021 and released an interim report that includes the desirable direction for dealing with disinformation and advises disinformation countermeasures based on voluntary efforts by platform operators and other parties in the private sector. The study group conducted hearing of platform operators again in March 2022 and continues discussions.

(5) Development of a secure internet usage environment for young people

i Summary

For safe and secure internet usage by youth today when the internet has become indispensable in the daily life of the people, MIC has been taking measures with a focus on promotion of use of filtering in mobile phone terminals and on educational activities. In addition, MIC holds the Taskforce on Safe and Secure Internet Use Environment for Youth[12] to share information on the current status of the measures among people involved and to discuss further efforts.

ii Promotion of filtering

With the spread of internet connection via smartphones, applications/public wireless LAN, there is a significant decrease in filtering utilization rate. To address this situation, the Act Partially Amending the Act on Establishment of Enhanced Environment for Youth's Safe and Secure Internet Use (Act No.75 of 2017) which includes mandatory setting (activating) of filtering function by mobile operators and their distributers when they sell a mobile phone terminal was enforced in February 2018. In response, MIC is promoting filtering activation by mobile operators and their distributers.

iii Promotion of educational activities

(i) Compiling and releasing "Case Study of the Internet Troubles"

In order to ensure safe and secure internet use by youth, not only youth but their guardians, teachers, etc. need to have sufficient media and information literacy. Every year since fiscal 2009, MIC has released updated version of "Case Study of the Internet Troubles" compiling means for preventing troubles relating to the Internet.

The 2022 updated version contains topics such as filtering and time management functions of smartphones and environments for using the Internet that are appropriate to users' ages in addition to copyright issues, slander on the internet and other cases of trouble.

(ii) Production and release of educational videos

As an effective approach to youth and their guardians, MIC produces videos using popular characters and uses the videos for educational activities with cooperation of relevant business operators. For example, MIC produced an educational video on filtering and other topics in cooperation with a popular comic, "My Hero Academia." The video is posted on websites of relevant government offices and business operators, and also used at mobile phone shops and mobile retailers across the country as well as youth education sites.

(iii) Lecture on demand in schools

For the purpose of popularization and enlightenment for safe internet use by youth, since fiscal 2006, MIC in cooperation with the Ministry of Education, Culture, Sports, Science and Technology, the Foundation for MultiMedia Communications, common carriers and other partners has provided free lectures on demand, "e-net Caravan," for students, guardians, school personnel and others in various places including schools.

Since autumn 2020, in response to the spread of COVID-19, the program has provided remote lectures in addition to the existing group lessons.

(iv) Period for concentrated efforts

Many young people acquire smartphones for the first time after their new enrollment or graduation in spring. With particular emphasis on this period, since 2014 MIC has been implementing "Spring Safety Net Campaign with Chain of Moves" in cooperation with related government agencies and businesses to intensively conduct awareness-raising activities for young people, guardians and school personnel to promote safe and secure use of smartphones and social media.

In 2022, the campaign focused on promotion of parental control and on educational activities contributing to improvement of youth's skills to use the internet appropriately.

iv Initiatives assuming internet use by youth

In recent years, while increasingly younger people use the internet, the COVID-19 pandemic triggered rapid progress of society-wide digitalization including progress in use of ICT terminals in school under the GIGA School Concept. In response to these environmental changes, the Taskforce on Safe and Secure Internet Use Environment for Youth compiled "New Issues and Measures to Establish Safe and Secure Internet Use Environment for Youth[13]" as future priorities.

[12] In order to establish environments for youth's safe and secure internet use, the task force was set up in April 2016 to conduct educational activities for appropriate utilization of the internet and to study filtering services that were effective means for protection of youth while considering respective roles of stakeholders including mobile carriers and other internet-related business operators and guardians.
https://www.soumu.go.jp/main_sosiki/kenkyu/ict_anshin/index_12.html

[13] Taskforce on Safe and Secure Internet Use Environment for Youth, "New Issues and Measures to Establish Safe and Secure Internet Use Environment for Youth": https://www.soumu.go.jp/menu_news/s-news/01kiban08_03000356.html

Based on the above, MIC in public-private cooperation takes measures to prevent troubles triggered by youth's "sending" information and other measures assuming internet use by young people in addition to the existing measures that have principal objectives to prevent youth from being in contact with illegal/harmful information.

6. Mediation and arbitration by the Telecommunications Dispute Settlement Commission

(1) Functions of the Telecommunications Dispute Resolution Commission

The Telecommunications Dispute Resolution Commission (hereinafter "Commission") is a specialized organization set up for prompt and fair processing of disputes that are increasingly diverse in the telecommunications sector where technological innovation and competition are rapidly progressing. Currently five members and eight extraordinary members who were appointed by the Minister of Internal Affairs and Communications are processing disputes.

The Commission has three functions: (1) mediation and arbitration, (2) examination and report in response to request for consultation from the Minister of Internal Affairs and Communications, and (3) recommendations to the Minister of Internal Affairs and Communications.

Consulting service is provided at the Commission's secretariat to accept inquires and request for consultation regarding disputes between businesses.

Related data
Outline of the functions of the Telecommunications Dispute Resolution commission
URL https://www.soumu.go.jp/main_sosiki/hunso/outline/about.html

i Mediation and arbitration

Mediation is a procedure that is made when there is a dispute between telecommunication carriers or broadcasters. Mediation members are appointed by the commission from among its members and extraordinary members to encourage compromise from the parties to solve the dispute promptly and fairly. Mediation members present mediation proposals, but the proposals are not forced because this is a procedure based on the agreement of the both parties.

Arbitration is a procedure where the commission appoints three "arbitration members" from among its members and extraordinary members in principle, based on the agreement of both parties. The procedure is made after the parties agree to follow the arbitral award. Arbitral award has the same effect as that of final judgment between the parties.

ii Examination and report in response to request for consultation from the Minister of Internal Affairs and Communications

When telecommunication carriers or broadcasters fail to reach an agreement, either party may file for an order for consultation or apply for ruling to the Minister of Internal Affairs and Communications based on the provisions of the Telecommunications Business Act or the Broadcasting Act.

When issuing an order for consultation or ruling, the minister must consult the commission. When receiving a request for consultation, the commission discusses the case and submits a report.

iii Recommendations to the Minister of Internal Affairs and Communications

Regarding improvements in competition rules and other matters that emerged through mediation, arbitration or discussions/reporting in response to a request for consultation, the commission may made recommendations to the minister. When receiving such a recommendation, the minister publishes the content.

(2) Status of the commission activities

In fiscal 2021, there was no application for mediation/arbitration, but consultation was provided to seven cases at the secretariat.

From November 2001 when the commission was established to the end of March 2022, the commission processed 69 mediation cases and three arbitration cases, made 11 reports in response to requests for consultation from the minister and submitted 3 recommendations to the minister.

Related data
Mediation processing status
URL https://www.soumu.go.jp/main_sosiki/hunso/case/number.html

Section 3 Radio Policy Trends

1. Summary

(1) Initiatives so far

Radio waves are limited and scarce resources and common property of the people widely used for services that are indispensable for people's lives including mobile phones, police and firefighting. For this reason, it is necessary to ensure fair and efficient use of radio waves. Specifically, because use of the same frequency in the same area causes interference, radio waves should not be used randomly and require a system to ensure proper use. In addition, because how radio waves propagate and the transmittable quantity of information vary depending on the spectrum, it is necessary to use them for the purposes appropriate for each spectrum. Furthermore, due to their nature to propagate across borders, use of radio waves requires international rules and coordination including treaties.

The old Radiotelegraphy Act that stated "radiotelegraphy and wireless telephones shall be administered by the Government" was replaced by the Radio Act, the purpose of which is "to promote the public welfare by ensuring the fair and efficient utilization of radio waves" (Article 1) in 1950. Since its enactment, Japan has promoted the private sector use of radio waves that are common property of the public. Today, radio waves have become indispensable for people's daily lives.

MIC has allocated frequencies under international cooperation and licensed radio stations, and has been making efforts that include: radio wave supervision for good radio use in an environment that is free of interference/jamming; R&D to expand radio resources; and technical examination work for effective radio use.

(2) Future challenges and direction

Information communication networks are core infrastructure for every socio-economic activity. Wireless communications, in particular, are essential for environments for easy use of information and communication services anytime and anywhere. The role of radio waves for improvement of people's lives is further expanding.

The trend of increasing the number of land mobile radio stations including mobile phones is expected to continue in the future, and traffic will increase accordingly. Traffic is also expected to increase due to the spread of new services such as subscription. In order to maintain the comfortable radio wave use environment for mobile phones, etc., it is necessary to promote further effective use of the frequencies currently in use, to share the frequencies used for other purposes and to develop terahertz and other unused frequencies

It is also important to maintain an appropriate radio use environment while handling changes in the circumstances of radio use. To this purpose, it is necessary to further advance radio wave monitoring, radio equipment trial purchase and other measures, while responding to new radio use and changes in radio equipment distribution.

2. Consideration of Promotion of Effective Radio Utilization in the Age of Digital Transformation

(1) Progress of digital transformation across society

In Japan it is expected that the COVID-19 pandemic and other factors will trigger further progress of digital transformation across society, which is necessary for establishment of "new normal" and maintenance/ development of economic activities. In this context, it is necessary to effectively use radio waves that are limited and scarce resources shared by the people, while at the same time spreading their benefits broadly among the people, which will revitalize the economy and society of the country.

(2) Consideration at the Round-table Conference on Radio Policy in the Age of Digital Transformation

Since November 2020, MIC has held the "Round-table Conference on Radio Policy in the Age of Digital Transformation." The report compiled by the conference in August 2021 sets the goal to increase spectrums for four radio wave systems: mobile phone network system including 5G/Beyond 5G that especially need spectrums; satellite communication/HAPS system; IoT/wireless LAN system, and; the next-generation mobility system. The goal is about 16GHz increase by the end of fiscal 2025 and about 102GHz increase by the 2030s compared with the end of fiscal 2020. For effective use of radio waves in the age of digital transformation, the report recommends: "introduction and spread of radio systems necessary for the age of digital transformation"; "validation of effective use of frequencies and allocation measures"; "measures for effective use of frequencies for public use"; "regulation and supervision of radio waves in the age of digital transformation"; and "review of the spectrum user fee system."

(3) Partial amendment of the Radio Act

In order to promote fair and efficient use of radio waves based on the recommendations of the report of the Conference, a bill for partial amendment of the Radio Act and the Broadcasting Act was submitted to the Diet in February 2022 and enacted in June of the same year. The bill includes strengthening of the functions of the Radio Regulatory Council, establishment of a system for frequency reallocation for mobile phones, and review of the spectrum user fee system. MIC plans to make preparations for its smooth enforcement.

- Strengthening of the functions of the Radio Regulatory Council
  Evaluation of the level of effective radio use (hereinafter "effective use evaluation") has been made by the Minister of Internal Affairs and Communications based on the result of radio usage survey. However, in order to ensure appropriate evaluation in response to technology progress, the evaluation will be made by the Radio Regulatory Council consisting of members with extensive experience and knowledge.
- Establishment of a system for frequency reallocation for mobile phones
  Reallocation may be made, when the result of the effective use evaluation by the Radio Regulatory Council regarding the frequencies used by base stations of a telecommunication business including mobile phones does not satisfy a certain level, or the minister found that reallocation examination is necessary considering overlapping applications. The amendment created responsibility of attested establishers to establish the specified base stations in places other than in the places included in the approved plan, and added matters relating to ensuring fair radio use to the matters to be stated in establishment guidelines.
- Review of the spectrum user fee system
  The amount of spectrum user fees will be revised considering the expected total expenses for spectrum users and the prospect of radio station establishment for the three years from fiscal 2022 to fiscal 2024, while allowing the use of spectrum user fees for granting subsidies to R&D toward Beyond 5G.

(4) Initiatives for effective use of frequencies for public use

The report of the conference confirmed the direction of "measures for effective use of frequencies for public use," which are "abolishment," "frequency migration," "frequency sharing" or "digitalization" of the radio stations for public services operated by the state (relevant government agencies) and found it necessary to follow up the progress of the measures every year for the time being. In response, the working group on frequencies for public use conducted follow-up including hearing of relevant government agencies from March to June 2022 and plans to compile the result around the summer of 2022.

(5) Consideration of allocation method of new mobile phone frequencies

In Japan, needs for frequencies for mobile phones is rapidly increasing due to 5G introduction, technological innovation and other reasons. In order to further promote and ensure effective and fair radio use, there is an increasing need to consider new allocation methods of mobile phone frequencies.

In this context, MIC has held the "Study Group on New Allocation Methods for Mobile Phone Frequencies" since October 2021 to conduct a broad range of surveys and analysis of frequency allocation methods of other countries and to discuss allocation methods of mobile phone frequencies for Japan based on the result, while considering the advantages of the methods of other countries. The Study Group compiled the result of the surveys and analysis of mobile phone frequency allocation methods of other countries in its 1st report in March 2022 and plans to compile the 2nd report around summer of 2022.

3. Spread/development of 5G/B5G

(1) Spread/development of 5G based on the Infrastructure Development Plan for a Digital Garden City Nation

i Formulation of Master Plan 2.0 on the Regional Development of ICT Infrastructure

5G enables not only "ultra-high speed" communication extending 4G but also "ultra-low delay" for smooth operation of robots in a remote location and "multiple simultaneous connection" of a large number of devices to the network. Because of these advantages, there are great expectations for 5G as infrastructure indispensable for an IoT society where everything is connected to the Internet. Actually, specific initiatives using 5G are in progress in various regions and sectors including automated driving of tractors, product inspection through image analysis using AI and remote control of construction machines.

Recognizing that 5G will become global common infrastructure for economy and society, MIC has been actively contributing to 5G international standardization activities at the International Telecommunication Union (ITU), while at the same time making efforts to strengthen international cooperation with European, American and Asian countries. In order to develop ICT infrastructure across Japan as early as possible through integrated and effective use of the measures to support 5G and other ICT infrastructure development and the measures to promote 5G utilization, MIC formulated the "Master Plan on the Regional Development of ICT Infrastructure" for the period up to the end of fiscal 2023 in June 2019 (amended in July and December 2020).

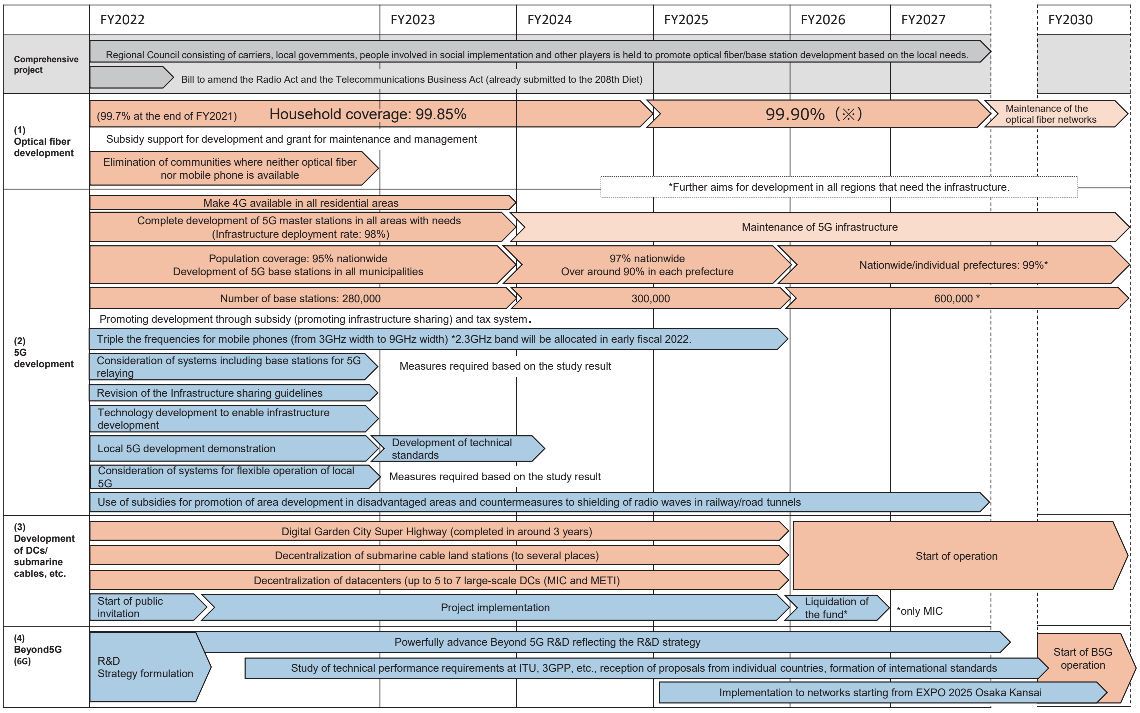
ii Formulation of the Infrastructure Development Plan for a Digital Garden City Nation

In December 2021, Prime Minister Kishida announced raising of the 5G population coverage to 90% by fiscal 2023 toward realization of the Vision for the Digital Garden City Nation. In response, at the end of the same month MIC asked mobile operators for more active development of 5G base stations and formulation and submission of a plan including the number of 5G base stations and population coverage up to 2025. Based on the plans submitted by the mobile operators, MIC formulated and released "Infrastructure Development Plan for a Digital Garden City Nation" on March

29, 2022, to succeed the "Master Plan 2.0 on the Regional Development of ICT Infrastructure."

The Infrastructure Development Plan aims to realize the world's top level 5G environment in a two-step strategy consisting of the 1st phase: nationwide development of 5G infrastructure (4G/5G master stations) and the 2nd phase: development of slave stations in rural areas to expand area coverage. Specifically, in the 1st phase, the plan aims to make 4G available in all residential areas, while developing 5G master stations that are the basis of 5G deployment in almost all areas with needs across the country. In the second phase, the goals of population coverage of 5G are: 95% nationwide by the end of fiscal 2023 (from over 30% at the end of fiscal 2020) with development of 5G base stations in all municipalities; 97% nationwide and around 90% in each prefecture by the end of fiscal 2025. Specific measures to achieve the goals include: allocation of new frequencies for 5G; amendment of the Radio Act to stipulate the responsibility to establish base stations; encouragement by subsidy and tax measures; and promotion of infrastructure sharing **(Figure 4-3-3-4)**.

Figure 4-3-3-4 Infrastructure Development Toward a Digital Garden City Nation (road map)



(2) Beyond 5G

Beyond 5G, following 5G, is expected to further advance the characteristic functions of 5G to: (1) 10-fold faster communication, (2) one tenth of delay, and (3) 10-fold multiple simultaneous connection. In addition, for creation of new values, it must realize (4) "ultra-low power consumption" (one hundredth of the existing system), (5) "ultra-safe and reliable" including instant recovery from failure, (6) "autonomy" to build optimal network instantaneously, and (7) "extensibility" for communication everywhere on land, sea, air and outer space. Beyond 5G is expected to be introduced around 2030. Because this is indispensable for development of Society 5.0 and is resilient and secure core ICT infrastructure in the future to support the "new normal" with and post COVID-19, it is important for Japan to be involved in its technology development and international standardization processes by maximizing the strength of the country.

Since January 2020, MIC has held the "Beyond 5G Promotion Strategy Roundtable" to discuss formulation of comprehensive strategy considering the needs and technological progress expected around the time of introduction of Beyond 5G. In June 2020, MIC released "Beyond 5G Promotion Strategy—Roadmap towards 6G" consisting of the following three strategies. Various projects are in progress for realization of Beyond 5G based on the Promotion Strategy.

① "R&D strategy" to create the world's top level R&D environment through intensive investments in advanced technologies and bold open spectrum policy toward implementation of advanced technologies with competitive advantage

② "Intellectual property and standardization strategy" to establish a network for cooperation with strategic partners at an early stage and work to gain the world's top level share of patents necessary for Beyond 5G toward creation of opportunities to enter new markets

③ "Rolling out strategy" to create Beyond-5G-ready environments by establishing environments and systems necessary for development and expansion of use cases that will contribute to rolling out of 5G/optical fiber networks across society and to problem solving

Examples of vigorous activities include: establishment of the "Beyond 5G Promotion Consortium" in December 2020 to promote the strategy in industry-government-academia collaboration; release of the "Beyond 5G White Paper" compiling future visions and technologies of Beyond 5G as envisioned by Japan in March 2022; and holding of the "Beyond 5G International Conference" aimed at strengthening of partnership among parties concerned at home and abroad in November 2021. In December 2020, the "Beyond 5G New Business Strategy Center" was established and has been working vigorously, which includes dissemination of information through new business strategy seminars as described in Chapter 4 Section 7.

4. Promotion of advanced radio use systems

(1) Intelligent Transport System

Intelligent Transport Systems (ITS), which connect people, roads and vehicles by using information and communications technologies, contribute to safe and comfortable mobility of people and things through reduction in traffic accidents and solving of traffic congestion. Because it is expected that ITS and automated driving will require transfer and exchange of a large quantity of real-time data, development of information and communications infrastructure is essential. In addition, in order to meet the need of automated driving and connected cars, it is necessary not only to use existing ITS but also to upgrade the information and communications infrastructure including 5G. For this purpose, research and demonstration toward automated driving systems using LTE and 5G are conducted in many countries.

"Public-Private ITS Initiative/Roadmaps. Past initiatives and the basic concept of the future ITS Initiative"[14] formulated by the IT Strategic Headquarters in June 2021 identified the following three priority initiatives: "Creation of a digital platform for realizing a new mobility society," "Further advancement of automated driving, etc." and "Dissemination and use of diverse mobility" to promote specific measures from five perspectives including "technological development" and "traffic infrastructure development and implementation of connected cars." The "Strategic Innovation Promotion Program Phase 2: Automated Driving for Universal Services" led by the Council for Science, Technology and Innovation (CSTI), Cabinet Office, aims to build a safe and comfortable automated-driving society through vehicle-infrastructure cooperation technology using signal information from transport infrastructure installed on general roads and information to support merging to highways.

While allocating frequencies for the Vehicle Information and Communication System (VICS), Electronic Toll Collection System (ETC), 76/79GHz-spectrum on-vehicle radar system, and 700MHz-spectrum intelligent transport system and developing their technical standards, MIC has promoted these systems.

Based on the "Public-Private ITS Initiative/Roadmaps. Past initiatives and the basic concept of the future ITS Initiative," MIC has been taking actions to spread 5G. The ministry is also working for realization of an automated-driving society by conducting technical study on frequency sharing that is necessary for introduction of a new V2X[15] system to 5.9GHz-spectrum that is considered for V2X globally, for example. Other activities in this field include: technical study of the required conditions for communications in use cases where automated driving needs communications; study for formulation of a draft information communication technology roadmap based on the realization timing of the communications and diffusion rate of self-driving cars; and R&D on technologies to recognize dynamic information from diverse sources continuously and correctly, collect and integrate necessary information in real-time according to the target area (narrow or medium) and distribute the result to vehicles to create panoramic views of the peripheral traffic situation toward safe and secure automated driving.

(2) Public safety LTE

Because major public institutions of Japan separately develop and operate their radio systems specialized in their operations, intercommunication across the institutions is not easy. Furthermore, these systems are mostly based on voice due to the restrictions of available frequencies and development costs.

In the US, the UK and other countries, fire defense, police and other institutions for public safety introduce joint-use mobile communication networks that enable high-speed transmission of image/video data in addition to voice by using Long Term Evolution (LTE), which is a communication technology used for mobile phones. These networks for public safety using LTE are called "Public Safety LTE (PS-LTE)." PS-LTE is expected to secure intercommunication between public safety institutions in the event of terrorist attack or major disaster and thereby contribute to smoother rescue activities. Furthermore, use of the globally standardized technologies is expected to lower equipment costs.

Toward realization of PS-LTE in Japan, MIC constructed a demonstration system for basic functions of PS-LTE in fiscal 2020, implemented functional verification in the actual field in cooperation with bodies concerned and examined operational challenges for social implementation as well as response measures. Since fiscal 2021, MIC has continued demonstrations while ensuring safety, reliability and security toward full-scale operation in fiscal 2022.

[14] Public-Private ITS Initiative/Roadmaps. Past initiatives and the basic concept of the future ITS Initiative: https://cio.go.jp/sites/default/files/uploads/documents/its_roadmap_20210615.pdf

[15] V2X stands for "vehicle to everything". This is a general term for communications between vehicles and various things, which include vehicle to vehicle communication (V2V) and vehicle to network (V2N) communication.

(3) Satellite constellation

Thanks to smaller and lighter equipment used for satellites and reduction in satellite launching costs, practical application of small satellites has become relatively easier. As a result, it is possible to construct “satellite constellation,” which refers to integral operation of a large number of small non-geostationary satellites launched into medium/low orbits. Because satellite constellation uses non-geostationary satellites following medium/low orbits with short communication delay, it is possible to provide diverse services including high-speed/large capacity communication globally on land, sea and airplane, both in emergency and at normal times. For this reason, various satellite constellation systems are planned around the world.

In November 2020, MIC established a system necessary for introduction of a system to upgrade the existing systems using L-band based on satellite constellation and its service started in 2022. In August 2021, MIC established a system necessary for introduction of a Ku-band non-geostationary satellite communication system based on satellite constellation that uses 500km high orbit. Its service is expected to start within 2022. In addition, MIC received a report of the Radio Regulatory Council regarding establishment of a system necessary for introduction of a Ku-band non-geostationary satellite communication system based on satellite constellation that uses 1,200km-high polar orbit. MIC plans to establish the system shortly.

(4) Space-transmission-type wireless electric power transmission system

A space-transmission-type wireless electric power transmission system transfers power through several-meter distance by radio wave transmission without wire connection. Its use is expected for power supply to sensors in factory. Through supply of low electric power without cable connection or charging battery, the system will improve comvenience and enable flexible installation of sensors. It is expected to contribute to Society 5.0 through IoT.

Toward practical application of the system, MIC has been studying shared use of frequencies with other radio systems, radio wave safety, technical conditions, structure of smooth operation coordination and other related matters. Based on the studies, the ministry established a system for its indoor use meeting certain requirements as premise radio station of 920MHz, 2.4GHz and 5.7GHz bands in May 2022.

5. Promoting Overseas Deployment of Radio Wave Systems

The role of radio wave monitoring systems and other technologies and systems to ensure safe and secure radio use is growing. The importance is recognized also in other countries including Southeast Asian countries where radio use is rapidly expanding. In this context, it has become an important task to make contribution to international society through overseas deployment of radio wave systems where Japan has excellent technologies, while at the same time fostering our radio infrastructure services into a promising business with global competitiveness toward further growth of the domestic economy.

To this end, public and private sectors are cooperating to promote strategic initiatives for global deployment of the radio systems where the country has strength with focus on Asian countries. Specifically, the “program to promote internationally harmonized use of frequencies” is implemented to globally spread technologies with high utilization efficiency of frequencies suitable to the circumstances in Japan so that the technologies will be established as international standard based on global superiority. The program includes survey on technology trends at home and abroad, overseas demonstration experiments, dispatch of public-private missions and exchange among technology users. Considering global rise in demand for safe, secure and reliable ICT infrastructure, MIC plans intensive overseas deployment of 5G network solutions by Japanese enterprises using open RAN and vRAN for the next three years. Taking advantage of the results of domestic 5G deployment including local 5G, MIC is promoting 5G open architecture including proposal of 5G models according to the need.

6. Establishment of Radio Usage Environments

(1) Promoting measures for the electromagnetic environment of living organisms

MIC is promoting initiatives to develop environments for safe and secure radio use.

Regarding danger of radio waves to public health, laws and regulations have established safety standards on radio wave strength, etc. according to the radio-wave protection guidelines.[16] The standards are equivalent with international guidelines and reflect the results of surveys on radio safety over many years.[17] Existing surveys and research have found no causal relationship between radio waves below the level of the safety standards and health impact. MIC conducts educational campaigns for the public on the safety of radio waves used by mobile phones including 5G through telephone consultations, briefing sessions and leaflets.[18]

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[16] Radio-wave protection guidelines: radio-wave protection guidelines https://www.tele.soumu.go.jp/j/sys/ele/medical/protect/
[17] Study on radio safety at MIC: https://www.tele.soumu.go.jp/j/sys/ele/seitai/index.htm
[18] Radio use website (survey and evaluation technology of radio wave safety): https://www.tele.soumu.go.jp/j/sys/ele/index.htm

A survey on the influence of radio waves to medical appliances[19] is conducted every year. In fiscal 2021, MIC measured the influence of radio waves from 5G mobile phone terminals (3.7GHz, 4.5GHz and 28GHz bands) on implanted cardiac peacemakers and home medical care apparatus. To ensure safe and secure radio use when radio usage in medical institutions is progressing, MIC is disseminating points to be noted about medical telemeters, mobile phones, wireless LAN, etc. and desirable radio wave regulations by holding briefing sessions for medical workers in various places. Since fiscal 2017, medical facilities have been subject to radio wave barrier measures using "subsidy for operating cost of projects to support spread of radio systems" in order to develop an environment for safe and secure use of mobile phones in medical facilities.

(2) Promoting countermeasures against electromagnetic interference

With the spread of various electric/electronic appliances, measures to protect radio use against unnecessary radio waves emitted from various appliances/equipment have become important. For this purpose, The Radio Wave Utilization Environment Committee[20] set up under the Department of Information and Communications Technology of the Information and Communications Council conducts surveys and studies on electromagnetic interference countermeasures and contributes to deliberation on international standards at the Comité International Spécial des Perturbations Radioélectriques (CISPR). In response to the report by the Information and Communications Council, MIC takes measures to eliminate interference by unnecessary radio waves on radio equipment and prevent interference with electric/electronic appliances through standardization in Japan.

Internationally, the discussions on international standards regarding wireless power transmission systems used for electric vehicles, multimedia equipment and home appliances are becoming serious at CISPR. Here, Japan is leading the vigorous discussions on technologies to prevent interference with existing radio stations by radio waves leaked from wireless power transmission systems for electric vehicles.

Domestically, study was conducted on domestic standardization related to the revisions of CISPR standards. MIC received partial report on "Technical requirements of radio-frequency interference and immunity measuring devices: auxiliary device-conducted interference," "Technical requirements of radio-frequency interference and immunity measuring method: measurement method of conducted interference" and "Technical requirements of radio-frequency interference and immunity measuring method: measurement method of radiated interference" from the Information and Communications Council in February 2022.

(3) Preventing radio wave interference/jamming

In recent years, interference/jamming with important radio communications by three types of illegal radio stations (illegal citizen's band, illegal personal radio and illegal amateur radio) that was once a social issue has decreased as a result of rapid spread of mobile phones and strengthened radio wave monitoring. However, jamming/interference with radio communications caused by radio equipment that is easily available through online shopping but not conforming to technical standards of the Radio Act has become a big challenge.

In order to exclude jamming/interference and maintain good radio wave use environments when spectrum use is expanding, MIC is strengthening measures pertaining to the distribution of radio equipment that may cause jamming/interference in addition to radio wave monitoring and elimination of jamming/interference.[21] Specific measures include: educational campaigns to prevent general consumers from purchasing and using radio equipment not conforming to the technical standard and violating the Radio Act (illegal establishment of a radio station) or causing jamming/interference with other radio stations; "Trial purchase test of radio equipment"[22] to purchase radio equipment in the market, measure the strength of its radio waves to determine whether the equipment conforms to the standard specified in the Radio Act, and publish the result every year to provide information for protection of general consumers (since fiscal 2013). Since fiscal 2021, the test includes measurement to determine conformance with the technical standard of Chapter 3 of the Radio Act. Furthermore, MIC calls on manufacturers, distributers and importers of the equipment to handle only conforming radio equipment and refrain from selling non-conforming equipment. In addition, in order to prevent distribution of radio equipment not conforming to the technical standard, MIC formulated guidelines specifying actions required from radio equipment manufacturers, etc. as obligation to make effort, and voluntary actions by internet shopping mall operators to promote actions to prevent distribution of non-conforming equipment.

[19] Research study on the influence of radio waves on implanted medical appliances: https://www.tele.soumu.go.jp/j/sys/ele/seitai/chis/index.htm
[20] The Radio Wave Utilization Environment Committee:
https://www.soumu.go.jp/main_sosiki/joho_tsusin/policyreports/joho_tsusin/denpa_kankyou/index.html
[21] MIC radio use website: Outline of radio wave monitoring https://www.tele.soumu.go.jp/j/adm/monitoring/index.htm
[22] Results of radio equipment trial purchase test: https://www.tele.soumu.go.jp/j/adm/monitoring/illegal/result/

Section 4 Trends in Broadcasting Policy

1. Summary

(1) Initiatives so far

Broadcasting is a basis of democracy. It has fulfilled the role of social capital to share disaster information, community information and other basic information of society.

Television broadcasting, which had been based on an analog method, was fully digitalized at the end of March 2012. Since then, broadcasting services have been upgraded with hi-vision images and data broadcasting. In order to promote 4K/8K broadcast services with higher-definition and picture quality even compared with high vision, MIC, in cooperation with broadcasters, home appliance manufacturers and others, implemented necessary projects for many people across the country to enjoy the 2021 Tokyo Olympic and Paralympic games through lively and powerful 4K/8K pictures.

Overseas deployment of broadcasting content promises great positive spill-over effects including expansion of export of agricultural, forestry, fisheries and other local products/services and increase in foreign tourists. MIC has promoted the overseas deployment of broadcasting contents in cooperation with relevant government agencies.

Furthermore, with focus on radio broadcasting, the usefulness of which was recognized when earthquakes occurred, MIC has promoted initiatives that contribute to the resilience of broadcasting networks, which includes countermeasures against poor reception of radio broadcasting and protection of transmitting equipment from disasters so that broadcasting can continue to appropriately provide people with disaster information and other information. In order to equalize information access opportunities through broadcasting, MIC has promoted the spread of broadcasting for people who are visually challenged or have hearing impairments by formulating “guidelines for information accessibility in broadcasting” and other measures. The guidelines establish: subsidies for private broadcasters that have production costs for programs with subtitles, commentary programs and sign-language programs; subsidies for the equipment needed to add subtitles to live programs; and target values for broadcasters to increase programs with subtitles.

(2) Future challenges and directions

The environment surrounding broadcasting is rapidly changing, which includes spread of video streaming via the internet and a loss of interest in television. In response to these changes, it is necessary to tackle tasks including strengthening of the foundation of broadcasting businesses, promotion of the distribution of broadcast content, strengthening of the resilience of broadcasting networks and their disaster resistance, while at the same time studying a future vision for broadcasting and a desirable state for the broadcasting system from a medium- to long-term perspective.

2. Desirable state of public broadcasting

Amid changes in the environment surrounding public broadcasting, MIC set up the “Subcommittee to Study the Public Broadcasting System” in April 2020 and studied: (1) follow-up of the three-part reform of NHK operation, fee for receiving NHK broadcasting and its governance; and (2) the desirable state of the system of the fee for receiving broadcasts, from various viewpoints.

Regarding follow up of the three-part reform, the subcommittee compiled “Efforts expected from NHK for promotion of the three-part reform” in June 2020. Since its 4th meeting on June 26 of the same year, the subcommittee discussed the desirable state of the broadcast receiving fee system considering the requests regarding the system reform, which were presented through hearing of NHK and other concerned bodies. The result was compiled in the “Report on the desirable state of public broadcasting and broadcast receiving fee system” in January 2021. The report recommends future directions including: (1) “reserved fund” to return the receiving fee to viewers; (2) extra charge to ensure fair burden; (3) obligation of NHK and commercial broadcasters to make efforts for cooperation; and (4) introduction of an intermediate holding company system.

Based on the recommendations, a bill for partial amendment of the Radio Act and the Broadcasting Act was submitted to the Diet in February 2022 and enacted in June of the same year. The bill includes establishment of a system regarding reserve funds to return profits for proper and fair burden of the fee for receiving NHK broadcasting, and establishment of a provision of obligation to make effort pertaining NHK’s cooperation with other broadcasters in performing their responsibilities. MIC plans to make preparations for its smooth enforcement.

Related data
Summary of the report on the desirable state of public broadcasting and broadcast receiving fee system
URL https://www.soumu.go.jp/main_content/000728676.pdf

3. Desirable state of restrictions on foreign investment

MIC set up a “Study Group on Foreign Investment Restrictions in the Information and Communications Field” in June 2021 to study the ideal state of foreign investment restrictions in the information and communications field. The group compiled the “Report on the Ideal State of Foreign Investment Restrictions in the Information and Communications Field” (January 2022) recommending the following future direction: (1) strengthening of the checking function of foreign investment restriction; (2) clarification of the procedures for cases not conforming to the foreign investment restriction; (3) strengthening of the examination system at MIC; and (4) abolishment of foreign investment restriction pertaining to radio stations established on ships/airplanes and other matters **(Figure 4-4-3-1)**.

Based on the recommendation, a bill for partial amendment of the Radio Act and the Broadcasting Act was submitted to the Diet in February 2022 and enacted in June of the same year. The bill includes review of foreign investment restriction in the information and communication field. MIC plans to make preparations for its smooth enforcement.

Figure 4-4-3-1 Summary of the Report on the Ideal State of Foreign Investment Restrictions in the Information and Communications Field

	Current state and challenges	Future direction
1. Strengthening of checking	➢ Details of foreign capital ratio, etc. cannot be ascertained in the current system. ➢ Legal mechanism to know conformance status is insufficient ➢ Rules are too strict for the size of community broadcasting	➢ **Stricter examination** ・Preparation of forms for materials to be submitted to enable grasp/verification of conformity with the foreign investment restriction ➢ **Establishment of a legal system for conformity checking** ・Legally specify the entry of foreign capital ratio in applications and notifications of change. ・Establish a system of periodic reporting of conformity with the foreign investment restriction. ➢ **Review of the foreign investment restriction in community broadcasting** ・Considering the small social impact, abolish the indirect restriction and maintain only the direct restriction
2. Response to non-conformity	➢ When non-conformity with the foreign investment restriction is found, the accreditation should be rescinded.	➢ **Clarification of the procedures when non-conformity with the foreign investment restriction is found** ・Introduce a system to enhance inspection when foreign capital ratio has come close to the upper limit of the standard. ・In addition to the above, introduce a system to seek rectification within a certain time limit if it is unavoidable to do so. In this process, take into consideration the circumstances of non-conformity and impact on viewers.
3. Examination system	➢ Unclear checking framework and responsibilities in examination among MIC officials in charge	➢ **Enhancement of the examination system** ・Establish a system to enable sharing of examination methods by departments involved and cross-sectional examination.
4. Other	➢ Because radio stations established on ships, etc. move internationally, there is no need for priority use by citizens of the country.	➢ **Abolishment of the foreign investment restriction pertaining to radio stations established on ships/airplanes*** *Foreign investment restriction on radio stations on ships does not exist in many developed countries and it is not applied to foreign vessels in Japan.

4. Strengthening the Foundation of Broadcasting Businesses

(1) Study on desirable state of the broadcasting system from a medium- to long-term perspective

Today, with the progress of broadband infrastructure development, spread of smartphones and diversification of terminals including devices enabling use of video streaming services through the internet without using a television tuner, people can access a variety of information without limitation in a place or time. As a result, the environment surrounding broadcasting is rapidly changing, which includes the spread of video viewing via the internet and decline in television viewing. When the sales of broadcasters are decreasing, local stations that have contributed to maintaining and developing the communities’ culture by broadcasting information rooted in the communities face a big challenge to strengthen the foundation of their broadcasting business so that they can continue stable broadcasting. The measures may include adaptation to the new competitive environment and securing of new revenue sources through overseas deployment of broadcasting content. It has become necessary to study the future of broadcasting and desirable state of broadcasting system by adapting to changes in the times, without being constrained by the existing frameworks and to increase management options from medium- and long-term perspectives. In this context, MIC has held a “Study Group on the Ideal Broadcasting System in the Digital Age” since November 2021. The study group discusses: significance and role of broadcasting in the digital age; future visions of broadcasting network infrastructure; the ideal Internet distribution of broadcasting content; and the ideal broadcasting system in the digital age.

(2) Initiatives regarding AM radio broadcasting

The “Subcommittee to Study Strengthening of the Foundation of Broadcasting Businesses” that was set up under the "Study Group on Issues Surrounding Broadcasting" compiled a "Report on Strengthening the Foundation of Broadcasting Businesses" in July 2020. The report makes recommendations with focus on: (1) the current state and future outlook of business conditions of broadcasters; (2) business governance of broadcasters; (3) state of AM radio, and; (4) promotion of business expansion and diversification of local stations.

(3) above was recommended in response to the request made by the Japan Commercial Broadcasters Association to MIC in March 2019. The request includes: considering the decrease in operating income of AM radio broadcasting and aging of transmitting antennas, review the existing supplementary FM relay station system to enable change from AM to FM broadcasting or operation of both AM and FM based on the business judgment of the commercial AM radio broadcasters by the time of the license renewal in 2028 at latest, and take institutional measures to allow prior end of AM broadcasting around the time of the license renewal in 2023. Specifically, the report recommends MIC, the Japan Commercial Broadcasters Association and individual commercial radio broadcasters to address the future challenges (coverage area, adaptable receivers, public relations, efficient use of frequencies, etc.) by the time of the demonstration experiment in 2023 (by the time of the license renewal in 2028 at latest).

Based on the recommendation, MIC compiled "Approach to 'demonstration experiment' regarding switching from AM to FM broadcasting by commercial radio broadcasters" and released the approach in December 2020. MIC will revise the system to allow changing from AM to FM broadcasting or operation of both AM and FM by the commercial AM radio broadcasters within 2022, invite public participation in the 1st demonstration experiment around January 2023 and start the 2nd demonstration experiment in November of the same year.

(3) Strengthening the efforts to spread the new 4K8K satellite broadcasting

The "Working Group on the Future Image of Satellite Broadcasting" set up under the "Study Group on Issues Surrounding Broadcasting" conducted studies considering the big changes in the situation surrounding the satellite broadcasting, which include the start of the new 4K8K satellite broadcasting in December 2018, further growth in online video streaming services and the impact of the COVID-19 pandemic. The results were released as a report in October 2021 (**Figure 4-4-4-1**). As issues to tackle in the future, the report proposes: (1) improvement of the reception environment to spread the new 4K8K satellite broadcasting and enhancement of 4K content; (2) utilization of vacant spectrums of BS dextrorotation and unused spectrums of BS levorotation; and (3) reduction in the infrastructure usage fee and flexible platform operation in response to changes in the business environment.

Based on the recommendation, MIC in collaboration with broadcasters and manufacturers is advancing strengthened initiatives including public relations regarding the receiving method and a wide array of 4K8K content toward spread of the new 4K8K satellite broadcasting. Because it was decided to allocate the vacant spectrums of BS dextrorotation to 4K broadcasting when such spectrums are secured in the future, MIC plans to develop necessary systems for the allocation, which include revision of the basic broadcasting dissemination plan.

Figure 4-4-4-1 Summary of the report by the Working Group on the Future Image of Satellite Broadcasting

Current state and challenges

○After the start of the "new 4K8K satellite broadcasting" in December 2018, the number of receivers that can receive the broadcasting reached 10.3 million in total. (*) However, there is a need for further promotion of improvement in reception environments, enhancement of 4K content and public relations targeting viewers. *As of the end of August 2021.
○Some vacant spectrums are expected in BS dextrorotation in the future. In addition, there are still significant unused spectrums in BS and CS levorotation
○Due to the spread of online video streaming and the impact of the COVID-19 pandemic, the business environment of broadcasters is increasingly severe. In this contest, there is a new task to reduce their burden of usage fee of infrastructure including satellite relay units.

Tasks to be tackled in the future

1. Popularization of the new 4K8K satellite broadcasting

(1) Improvement of the reception environment
Promote the following initiatives in industry-government collaboration
①Strengthen public relations regarding reception methods
○Publicity considering the difference in reception environment between dextrorotation and levorotation
○Publicity for utilization of services using cable television and optical communication link
②Support for facility modification
○Project to improve the environment for reception of satellite broadcasting
○Project to promote conversion of cable television networks to fiber optics
③Development of simple modification methods using new technologies
○Use of plastic optical fiber (POF) and local 5G
(2) Enhancement of 4K contents
①It is essential to enhance both quality and quantity of pure 4K content
②Promote public relations with strong customer appeal

2. Promotion of effective use of frequencies

(1) Utilization of vacant spectrums of BS dextrorotation
①When certain vacant spectrums are secured in the future, the spectrum will be allocated to 4K broadcasting to spread the broadcasting
②Establish necessary systems for allocation
○Revision of the basic broadcasting dissemination plans
○Putting together an approach to cost allocation
(2) Utilization of unused levorotation spectrums
①Improve the reception environment steadily.
②Consider possibilities of use for new services other than 4K8K broadcasting
○Verification of technical feasibility of using the HEVC method for 2K broadcasting

3. Response to changes in the business environment

(1) Reduction in burden of infrastructure usage fee
①Infrastructure operators (B-SAT and SKY Perfect JSAT) make efforts to lower the usage fee by reviewing their cost structure.
○Streamlining of systems, minute examination of the operation costs
○Joint operation /use of earth station equipment, etc.
○Consideration of hybrid satellite procurement
②Setting up a place for opinion exchange of infrastructure operators, broadcasters, etc.
(2) Flexible platform operation
○It is necessary for pay broadcast management business (SKY Perfect JSAT) to promptly and flexibly respond to changes in the market environment, which includes revision of the Platform Guideline.

5. Promoting Broadcast Content Circulation

(1) Promoting production and circulation of broadcast content

i Initiatives for effective webcast of broadcast content, etc.

In recent years, the environment of information dissemination has been greatly changing with the spread of video streaming services through the internet, and acceleration of loss of interest in television especially among young people, for example. When video-sharing sites and video streaming platforms are filled with content, we are facing the social problems of “filter bubble” and “echo chamber.” In particular, community information that was naturally distributed and shared through local broadcasting, etc. increasingly fails to attract sufficient attention (view counts) in the Internet world, and lies buried and overwhelmed.

In this context, the necessity increases to build a framework to prevent highly reliable information including basic information of society from being buried in a mass of content and to effectively deliver it to viewers in public-private cooperation. To this end, MIC is promoting public-private collaboration initiatives including: demonstration projects regarding effective webcast of broadcast content using TVer in fiscal 2021 to facilitate access for the local viewers to the broadcast content of the community on nationwide video streaming platforms; and securing of highly skilled personnel with technical/legal knowhow for effective webcast of such content in the communities. By deepening and expanding these projects, MIC aims to further promote webcast of highly reliable content on safe and secure nationwide video streaming platforms.

ii Utilization of viewing data in the broadcasting field and the ideal state of privacy protection

By collecting and analyzing viewing history, etc. of broadcast programs from television receivers connected to the internet, we can use the results for production of programs and provision of disaster information tailored to the detailed needs of each region. However, there is a problem in that it is technically possible to derive sensitive personal information including political beliefs and medical history of individual viewers.

Considering the public nature of broadcasting, MIC has established rules specific to the broadcasting sector, which should be observed by every person handling personal information of broadcast recipients, etc. in the “Guidelines on Personal Information Protection of Broadcast Recipients etc.” in addition to the minimum rules under the Act on the Protection of Personal Information. Furthermore, MIC has held a “Study Group on the Utilization of Viewing Data in the Broadcasting Field and the Ideal State of Privacy Protection” since April 2021. For the development of rule balancing data utilization and privacy protection, the study group has been discussing the ideal state of rules for handling of webcast history of broadcast content, in addition to the ideal state of rules on handling of viewing data collected in the process of broadcasting.

iii Smoother rights processing pertaining to simultaneous distribution of live broadcast programs

In response to changes in the viewer environment due to the spread of smart devices, broadcasters are advancing online simultaneous distribution of broadcast programs (refers to simultaneous distribution, repeat broadcasts and time-limited repeat broadcasts. The same applies hereinafter.) and similar initiatives. These initiatives expand opportunities to view high-quality contents and are important for improvement of viewers’ convenience, promotion of the contents industry and securing of their international competitiveness. However, there is a challenge of rights processing because a mass of diverse works is used in broadcast programs and failure in processing copyrights and other rights in simultaneous distribution, etc. may cause “masking” of the programs. For this reason, it was necessary to create an environment for more speedy and smoother use of works, etc. when promoting simultaneous broadcasting, etc.

MIC worked out broadcasters’ requests regarding smoother processing of rights pertaining to simultaneous broadcasting, etc. and submitted the result to the Agency for Cultural Affairs (ACA) holding jurisdiction over the Copyright Act (Act No. 48 of 1970). Later, MIC together with ACA heard the opinions of concerned parties and studied the direction of the system amendment. As a result, the Act Partially Amending the Copyright Act (Act No. 52 of 2021) was enacted at the 2021 ordinary session of the diet and measures were taken for smoother rights processing pertaining to simultaneous distribution. These measures were enforced on January 1, 2022. MIC prepared the system for the enforcement, which includes formulation of the “Guidelines for Interpretation and Operation of Presumption Rules of Permission for Simultaneous Broadcasting on Transmission of the Internet.”

iv Promoting regulation on production and trade of broadcast content

In order to improve the production environment and enhance motivation of producers in the broadcast content sector, MIC held the “Study Group on Verification and Review on Promotion of Production and Trade of Broadcast Content” consisting of experts and other members. Based on the discussions of the group, MIC formulated the “Guidelines for Regulation on Production and Trade of Broadcast Content Developed” (seventh edition) (Hereinafter the “Guidelines”) and is urging broadcasters and program production companies to regulate production and trade of broadcast content.

Specific measures include: regular follow-up survey regarding the Guidelines to assess the state of production and trade of broadcast content; assessment of the actual situation of compliance with the Guidelines through hearing of broadcasters and program production companies; regarding discovered problems, giving guidance based on the Article 4 of the Act on the Promotion of Subcontracting Small and Medium-sized Enterprises (Act No.145 of 1970); holding online courses for dissemination of the Guidelines; and setting up a “legal consultation hotline for produced broadcast content” to provide free consultation by a lawyer on specific individual issues.

(2) Overseas deployment of broadcast content

Overseas deployment of broadcast contents increases interest in agricultural, forestry, fishery and other local products and culture of each region of Japan and is expected to produce economic effects including sales expansion. It is extremely important also from a diplomatic point of view because it contributes to a better image of Japan and strengthening of its soft power.

MIC, in cooperation with the Broadcast Program Export Association of Japan (BEAJ), which is promoting overseas deployment of broadcast content and relevant government agencies, is continuously supporting initiatives of Japanese broadcasters and others to produce broadcast contents conveying the appeal of various regions in Japan jointly with overseas businesses and disseminate the contents to the world. In addition, MIC conducted PR activities in public-private cooperation for overseas deployment of Japanese content by taking the opportunity of the international content fair at TIFFCOM (Tokyo) in November 2021 and ATF (Singapore) in December of the same year.

MIC will continue to promote overseas deployment of broadcast content toward the goal of 1.5-fold increase of overseas sales (compared with fiscal 2020) by fiscal 2025.

6. Promoting the spread of broadcasting for the visually challenged and those with hearing impairments

In the broadcasting sector, MIC formulated the “Guidelines on Information Accessibility in the Broadcasting Sector” in February 2018 and is encouraging voluntary efforts by broadcasters so that the visually challenged and those with hearing impairments can smoothly obtain information through television broadcasting.

In addition, based on the Act on Advancement of Facilitation Program for Disabled Persons' Use of Telecommunications and Broadcasting Services, with a View to Enhance Convenience of Disabled Persons (Act No. 54 of 1993), MIC provides subsidy for production costs of subtitled broadcasts, explanatory broadcasts, and sign language broadcasts. Since fiscal 2020, the subsidy is provided also for the equipment needed to add subtitles to live programs.

These measures increased subtitled broadcasts nationwide, but adding subtitles to live programs involves many hands and costs, and requires human resources with special skill. To address this issue, since fiscal 2018 MIC has been implementing a demonstration project to develop a series of systems to automatically generate subtitles from speech of broadcast programs with little manual intervention and to display subtitles on televisions and smartphones via a communication network by using ICT including speech recognition and machine learning.

7. Improving the Resilience of Broadcast Networks and Enhancing Their Disaster Resistance

(1) Conversion of cable networks to fiber optics

In order to enhance the disaster resistance of cable networks, which are the information and communication infrastructure of communities, through their conversion to fiber optics, MIC implements the “Project to enhance the disaster resistance through conversion of cable televisions to fiber optics toward establishment of ‘New Normal’,” which provides subsidy for a part of the costs necessary for conversion of cable networks to fiber optics in communities by using the fiscal 2021 supplementary budget and the fiscal 2022 initial budget **(Figure 4-4-7-1)**.

Figure 4-4-7-1 Project to enhance the disaster resistance through conversion of cable televisions to fiber optics toward establishment of 'New Normal'

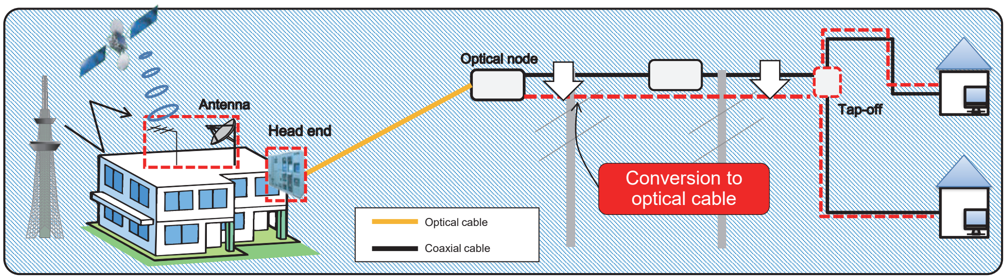
Project illustration

○Project operator
Municipalities, municipality collaboration entities or a third sector (including entities that continue to fulfill the role pertaining to the provision of cable television services through transfer of the relevant facilities from these entities (Succeeding business operators))

○Target regions
Regions satisfying all of (1) to (3) below:
(1) Municipalities where cable television is positioned in their regional disaster prevention plan
(2) Regions with unfavorable conditions
(3) Municipalities with financial index 0.5 or lower and other regions where the subsidy is found particularly necessary

○Subsidy rate
(1) Municipalities or municipality collaboration entities (Succeeding business operators): 1/2
(2) Third sector (Succeeding business operators): 1/3

○Subsidized costs (shown in red in the figure below)
Optical fiber cable, transmitting/receiving facilities, antennas, etc.



(2) Supporting initiatives by broadcasters

In order to support initiatives by broadcasters, local governments and others to improve resilience of broadcast networks, MIC implements "projects to support broadcast network development (the project to develop basic terrestrial broadcasting networks, the project to develop regional cable television networks and the project to support improvement of resilience of communal reception facility networks)" **(Figure 4-4-7-2)**, "project to support resolution of poor reception of commercial radio broadcasting" and "project to support improvement of disaster resistance of basic terrestrial broadcasting, etc." using the fiscal 2022 initial budget.

Figure 4-4-7-2 Projects to support broadcast network development

- Projects to support broadcast network development improve the resilience of the broadcast networks, which are important information transmission means in communities in the event of a disaster, by subsidizing a part of the following development costs in order to securely provide disaster information, evacuation information and other information essential for protecting people's lives and properties.
  ① Reserve transmission station facilities pertaining to new radio/television development, supplementary transmission station facilities, Earthquake Early Warning facilities, etc.
  ② Double routing, etc. of cable television trunk lines
  ③ Improvement of disaster resistance of communal reception facilities

Subsidy rate

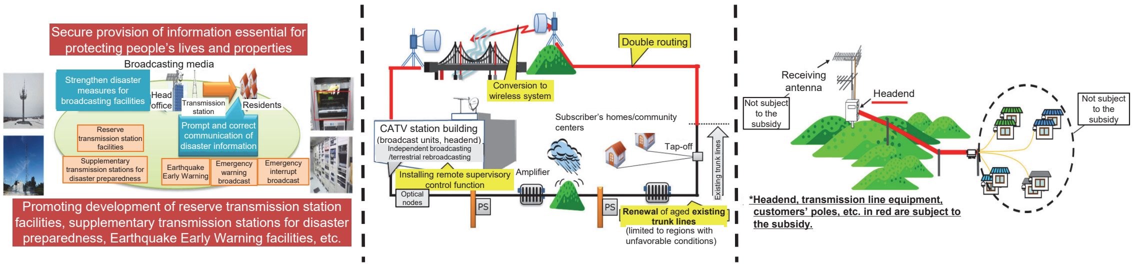
- Local governments: 1/2
- Third sector, commercial broadcasters, etc.: 1/3

Project name/image

①Project to develop basic terrestrial broadcasting networks

②Project to develop regional cable television networks

③Project to support improvement of resilience of communal reception facilities networks



Section 5 Trends in Cybersecurity Policy

1. Summary

(1) Initiatives so far

Under intensifying threats to cybersecurity on a worldwide scale, the Basic Act on Cybersecurity (Act No. 104 of 2014) stipulating basic principles of national cybersecurity policy was enacted in 2014. Based on the act, the Cybersecurity Strategic Headquarters was established under the Cabinet in 2015 to lead cybersecurity measures of the government. Since then, a Cybersecurity Strategy has been formulated every three years setting goals and policies of measures considering changes in economic society and the increase in threats against cybersecurity. In September 2021, a new "Cybersecurity Strategy"[23] was decided by the Cabinet and cybersecurity policies have been promoted based on the strategy.

"The 4th Action Plan on Information Security of Critical Infrastructure"[24] (decided by the Cybersecurity Strategic Headquarters in April 2017) establishing basic framework for protection of critical infrastructure designates the information and communication sector (telecommunication, broadcasting and cable television) as one of the 14 critical infrastructure sectors, suspension or unavailability of which would heavily affect people's lives and socioeconomic activities. The next action plan is scheduled to include clarification of the responsibilities of related entities and enhancement of the troubleshooting system. Holding jurisdiction over critical infrastructure, MIC needs to take measures to secure safety and reliability of the information and communication networks.

MIC has held a Cyber Security Task Force consisting of security experts since 2017. The task force has successively compiled a list of challenges and measures to be tackled by MIC with consideration to various changes in the situation, including Tokyo Olympic and Paralympic games and the COVID-19 pandemic. In July 2021, the task force formulated the "Comprehensive ICT Cybersecurity Measures 2021"[25], which includes measures regarding ICT infrastructure/services. Based on the above, MIC has been implementing measures to promote cybersecurity in the ICT sector.

(2) Future challenges and direction

When movement of persons is restricted to prevent the spread of COVID-19 and use of telework is progressing, promotion of digitalization of overall socioeconomic activities by the people, or promotion of digital transformation across society is recognized as an increasingly important policy issue.

ICT infrastructure and services including IoT and 5G provide the basis for digital transformation. In order to promote digital reform and transformation across society, it is a critical prerequisite to ensure cybersecurity so that each citizen can use ICT safely.

As described in Chapter 3 Section 7, a large number of cyber-attack-related communications are still observed. Because the ratio of the attacks targeting IoT equipment remains the highest, it is necessary to continue to strengthen security measures for IoT equipment.

For introduction of telework and wireless LAN which are necessary for digitalization across society, ensuring security and dealing with anxiety concerning security remain the largest and urgent issues.

Domestic security business models are mostly based on introduction and operation of overseas security products. As a result, domestic security companies cannot collect domestic cyberattack information, etc., and conduct R&D based on real data to develop domestic security technologies, which leads to the failure of such domestic technologies to spread. In order to avoid or grow out of the excessive dependence on security technologies provided by overseas players, and to enhance the ability to independently handle cyber-attacks including development of the cybersecurity human resources, it is necessary to create an ecosystem that will accelerate domestic generation of cybersecurity information and human resource development.

2. Securing safety and reliability of information and communications networks

(1) Initiatives pertaining to IoT

While IoT is progressing as social infrastructure, IoT devices are often exposed to cyber-attacks because it is difficult to manage them completely, and appropriate security measures cannot be taken due to their limited performance and other reasons. The need to strengthen the countermeasures has been pointed out. Cyber-attacks abusing IoT devices are actually made and the ratio of the attacks targeting IoT equipment is the highest among the cyber-attack-related communications observed in 2021 by the Network Incident Analysis Center for Tactical Emergency Response (NICTER) operated by NICT.

Under these circumstances, in order to strengthen cybersecurity measures for IoT devices, the Act on the National Institute of Information and Communications Technology, Independent Administrative Agency[26] was partially amended in 2018. Based on the amendment, MIC and NICT in collaboration with internet service providers (ISPs) have been implementing an initiative named "National Operation Towards IoT Clean Environ-

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[23] Cybersecurity Strategy: https://www.nisc.go.jp/active/kihon/pdf/cs-senryaku2021.pdf
[24] The 4th Action Plan on Information Security of Critical Infrastructure (revised): https://www.nisc.go.jp/active/infra/pdf/infra_rt4_r2.pdf
[25] Comprehensive ICT Cybersecurity Measures 2021: https://www.soumu.go.jp/main_content/000761893.pdf
[26] Act on the National Institute of Information and Communications Technology, Independent Administrative Agency (Act No. 162 of 1999)

ment (NOTICE)" since February 2019. NOTICE is a series of projects: (1) NICT identifies devices on the internet, which can be abused for cyber-attacks by entering a password that can be easily derived such as "password" or "123456"; (2) NICT notifies the information of the identified devices to the relevant ISP, and (3) the notified ISP identifies the users of the devices and alerts them.

Concurrently with NOTICE, MIC, NICT, ICT-ISAC and ISPs cooperate to implement a project where ISPs alert the users of IoT device already infected with malware. In this project, devices performing communications caused by malware infection are detected based on the information obtained through NICTER above, and the ISPs identify the users of the devices.

(2) Initiatives related to active measures taken by telecommunications carriers

With the progress of 5G, it is expected that use of IoT devices will further expand in various industries. In order to improve the effectiveness of security measures for IoT devices, it seems necessary to improve the environment for more flexible responses on the network side where traffic is passing in addition to the existing measures on the terminal side.[27]

In this context, in November 2021 MIC at "the Study Group for Proper Dealing with Telecommunications Business Cyber-attacks" found that it is possible for telecommunication carriers to detect C&C servers (servers giving directions to terminals infected with malware) by collecting, accumulating and analyzing flow of information at normal times and share the information on the detected C&C servers under certain conditions considering secrecy of communication.[28] The study group plans to start validity verification of the technology to detect C&C servers by telecommunication carriers through analyzing flow of information and a demonstration project to sort out operational challenges for sharing among carriers in fiscal 2022.

Certified Association against Cyber Attacks on Telecommunications Facilities[29] is a third party organization to conduct operations including sharing, survey and research of senders' information of DDoS and other cyber-attacks. In the past, information sharing and analysis at the association was limited to cases where the senders are identified after attacks. In order to allow information sharing and analysis before attack, a bill for partial amendment of the Telecommunications Business Act was submitted to the Diet in March 2022 and enacted in June of the same year, as an effort to promote collaboration among telecommunication carriers in handling DDoS and other cyber-attacks.

3. Initiatives related to Telework Security

Security was the biggest challenge in a questionnaire survey of enterprises introducing telework.[30] In order to dispel anxiety about security so that enterprises can implement telework with security, MIC has formulated a "telework security guideline"[31] since 2004. The COVID-19 pandemic triggered drastic changes in the environment surrounding telework and there are also changes in security trends, which include progress in use of the cloud and sophistication of cyber-attacks. In response, MIC made a total revision of the security measures to be implemented, specific trouble cases and other matters in May 2021.

Some SMEs may not have dedicated security staff, or their persons in charge may not understand technical schemes. In response, MIC formulated "Telework Security Guide for SMEs (Checklists)" focusing on reliable securing of minimum security and revised the guide along with the guidelines in May 2021.

4. Initiatives related to Trust Services

In Society5.0, integration of real space and cyberspace will further progress and every activity in the real space will be placed in cyberspace. In this process, construction of infrastructure for data distribution with confidence is essential, and trust services (**Figure 4-5-4-1**) that are a system to prevent data falsification and sender masquerade are increasingly important.

(1) Study by the Working Group on Trust Services

MIC set up "Working Group on Trust Services" under the "Study Group on Platform Services" in January 2019. The working group studied the ideal state of trust services in Japan and presented the following directions for time-stamp and e-seal initiatives in its final report in February 2020.

Regarding time-stamps certifying that electric data existed at a certain time and has not been altered after that time, a private authorization system has been operated. However, without state support for its reliability, there is a concern about international applicability. Therefore, it is appropriate for the state to establish a system to authorize reliable time-stamp services and business operators.

Regarding e-seal that enables simple confirmation of

[27] "Comprehensive ICT Cybersecurity Measures 2021" formulated in 2021 states: "it is necessary to consider measures to realize advanced and flexible responses in information and communication networks managed by ISP on the internet" in the section of "Active measures by telecommunication carriers against cyber-attacks" (https://www.soumu.go.jp/menu_news/s-news/02cyber01_04000001_00192.html)
[28] The Fourth Report of the Study Group for Proper Dealing with Telecommunications Business Cyber-attacks: https://www.soumu.go.jp/main_content/000779208.pdf
[29] Based on Article 116-2 (1) of the Telecommunications Business Act, ICT-ISAC was certified as a Certified Association against Cyber Attacks on Telecommunications Facilities in January 2019.
[30] Survey on actual conditions of telework security (2nd survey in fiscal 2020): https://www.soumu.go.jp/main_sosiki/cybersecurity/telework/
[31] Ensuring security in telework: https://www.soumu.go.jp/main_sosiki/cybersecurity/telework/

the organization sending electronic data, this is a new service and its content and technologies for its provision have not been established. Therefore, it is appropriate to formulate technical and operational guidelines for reliable services and business operators with involvement of the state, and establish a private authorization system based on the guidelines.

(2) Establishment of time-stamp authorization system by the state

Based on the recommendations of the working group, the "Study Group on the Time Stamp Certification System" conducted further study, and MIC established a state certification system by instituting the Provisions Concerning Approval of Time-stamp Authentication Operations (Ministry of Internal Affairs and Communications Notice No. 146 of 2021) in April 2021. Further through the tax reform in fiscal 2022, time-stamps based on a private certification system (Japan Data Communications Association) are replaced by time-stamps based on the state certification system in scanner archiving of taxation-related documents and other systems.[32] In the future, MIC will operate the state certification system appropriately and reliably, while taking necessary measures for further expansion of the use of time-stamps.

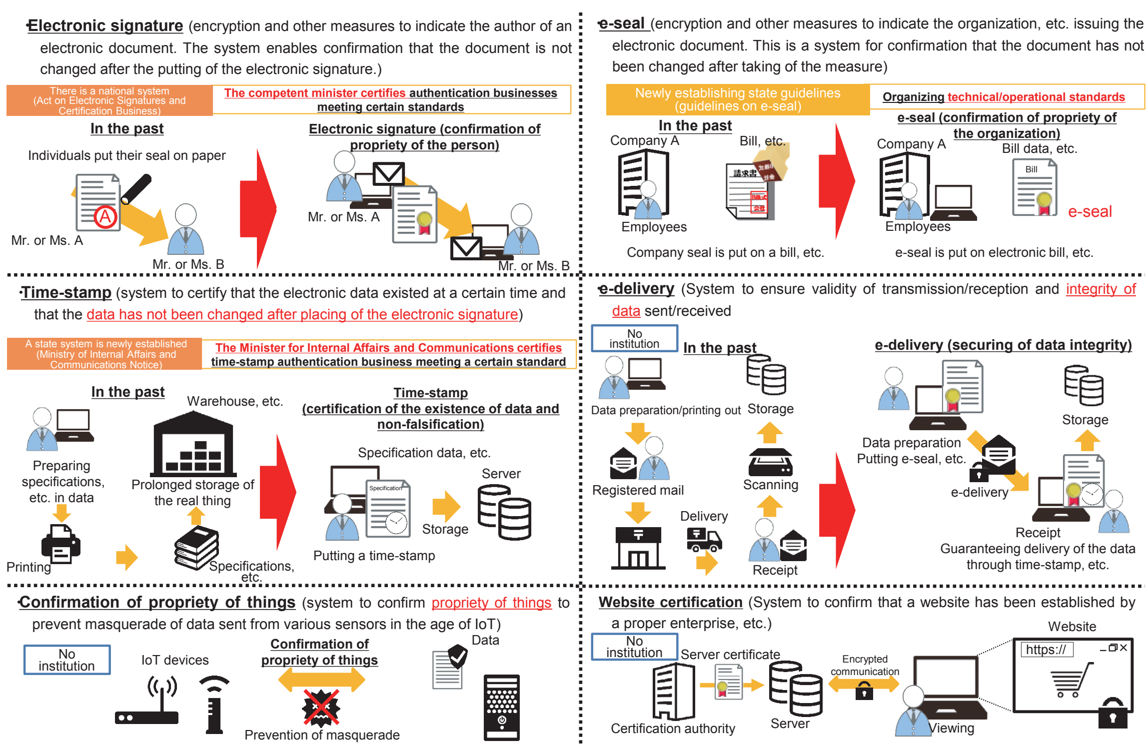
(3) Formulation of the guidelines on e-seals

Based on the recommendations of the working group, the "Study Meeting on a System for Ensuring the Reliability of Data Issued by Organizations" set up in April 2020 studied the ideal e-seals in Japan. Later in June 2021, MIC released a report of the study meeting and formulated "Guidelines on e-seal"[33] compiling technical/operational standards required from reliable e-seal services/business operators in Japan.

(4) Study at the Digital Agency

It was found effective that the Digital Agency would handle dissemination of electronic signatures and system planning integrally based on the Act on Electronic Signatures and Certification Business (Act No. 102 of 2000[34]). As a result, affairs regarding this Act were relegated from MIC and METI to the Digital Agency[35], and the Agency is leading efforts to expand use of electronic signature and improvement of its convenience. At the whole government level, under the Data Strategy Promotion Working Group based on the Digital Society Promotion Council Order (Cabinet Order No.193 of 2021), the Sub-working Group for Trust-Assured Digital Transformation was established to study digitalization needs and the necessary assurance level of various procedures and transactions in the public and private sectors in November 2021. The sub working group discusses the framework of trust services based on the MIC's initiatives regarding time-stamps and e-seal.

Figure 4-5-4-1 Image of trust service



[32] For the period from April 1, 2022 to July 29, 2023, a transitional measure is taken to allow use of time-stamps pertaining to operations authorized by Japan Data Communications Association as before.
[33] Guidelines on e-seal (https://www.soumu.go.jp/main_content/000756907.pdf)
[34] Report of the Working Group on Digital Reform Related Bills Task Force: (https://www.kantei.go.jp/jp/singi/it2/dgov/houan_wg/dai4/siryou2.pdf)
[35] Provisions regarding legal effects of electronic signature (e.g., presumption of authentic establishment of private documents) remain under the jurisdiction of the Ministry of Justice.

5. Initiatives related to wireless LAN security

Wireless LAN is widely used in homes, workplaces and while on the go through a public wireless LAN service, for example. However, without an appropriate security measure, there is a danger of cyber attacks and information theft through wireless LAN devices. To address this issue, MIC has formulated guidelines on wireless LAN security measures separately for users and providers and released revised versions of them both adapted to new technologies and the latest security trends in May 2020.[36]

"Simplified manual for Wi-Fi users" for wireless LAN users presents three points of security measures: (1) carefully check the access point to connect; (2) check whether right URL is used for HTTPS communication; and (3) check the setting of the device installed in the home, which are followed by commentary on each point.

"Guide on security measures for Wi-Fi providers" for wireless LAN providers is compiled to help a broad range of people including restaurants and retail stores providing wireless LAN service to check what security risks are involved in the provision and what security measures to take.

6. Initiatives related to ensuring safety of cloud services

(1) Assessment of safety of cloud services for government information systems

Under "Principle of the Cloud-by-Default", the government at the "Study Group on Safety Evaluation of Cloud Services" studied safety assessment of cloud services. As a result, (1) the basic framework for a system, (2) the approach to cloud usage in each government ministry and agency, and (3) jurisdiction and operation of the system have been determined as per "The Basic Framework for the Security Evaluation System of Cloud Services in the Government Information System" (established by the Cyber Security Strategy Headquarters, January 30, 2020).

In response, based on the rules decided by the ISMAP Management Committee consisting of experts and competent authorities (National center of Incident readiness and Strategy for Cybersecurity, Digital Agency, MIC and METI), the Information system Security Management and Assessment Program (ISMAP) system was established in June 2020. Registration of cloud services that are confirmed to be implementing security measures specified in the system started in March 2021. As of June 1, 2022, 34 services are open to the public in the ISMAP Cloud Service List[37].

(2) Formulation of guidelines on information security measures in cloud service provision

In order to promote safe and secure use of cloud services, MIC formulates "guidelines on information security measures in cloud service provision" compiling information security measures to be taken by cloud service providers. In September 2021, MIC released a revised edition (the 3rd edition) based on the actual state of cloud service provision and use.[38] Recently, there are cases where failure of cloud service users to use the service appropriately resulted in risk of information leak. To address this issue, a broad range of entities including providers and users are studying means for promotion of appropriate use of cloud services and plan to formulate and release guidelines for appropriate settings for cloud service provision and use.

7. Initiatives for development of security human resources

While cyber-attacks are increasingly sophisticated and complicated, Japan is short of cyber-security human resources both in quality and quantity. To address this issue, MIC with the National Cyber Training Center of NICT is actively promoting training of cybersecurity human resources (CYDER and SecHack365).

(1) Cyber Defense Exercise with Recurrence (CYDER)

CYDER is a practical cyber defense exercise for persons in charge of information systems at various organizations including state organs, local governments, independent administrative agencies and critical infrastructure operators. Teams of trainees participate in the exercise and experience actual machine operation for a series of actions from detection of incidents caused by cyber-attacks, response, reporting and restoration in a large-scale virtual LAN environment simulating the network environment of their organization. Since fiscal 2017, 13,867 trainees in total have taken the course. Since fiscal 2021, in addition to the existing basic and intermediate-level exercise courses, CYDER includes: upper-intermediate courses to learn more advanced security skills taking advantage of the knowledge of Cyber Colosseo[39] and an online exercise course for people who cannot take CYDER due to geographical/time constraints or other reasons to learn minimum handling.

36 For safe use of wireless LAN: https://www.soumu.go.jp/main_sosiki/cybersecurity/wi-fi/
37 ISMAP Cloud Service List: https://www.ismap.go.jp/csm?id=cloud_service_list
38 Guidelines on information security measures in cloud service provision (the 3rd edition): https://www.soumu.go.jp/main_content/000771515.pdf
39 Cyber Colosseo: practical cyber exercise program that was held prior to the Tokyo Olympic and Paralympic Games for persons in charge of security at organizations related to the games. Colosseo consisted of: Colosseo Exercise to learn methods to deal with attacks through offence and defense exercise using real machines, where cyber-attacks were simulated in a virtual network environment faithfully reproducing the systems involved in the games, and: Colosseo College to learn security knowledge and skills through lectures and seminars. Colosseo was held in close cooperation with The Tokyo Organizing Committee of the Olympic and Paralympic Games for the period from fiscal 2017 to 2020. 571 enrollees were trained through the Exercise and 1,717 enrollees in College in total.

(2) Program for cultivating young security innovators (SecHack365)

SecHack365 is a program for ICT talents age 25 or younger and living in Japan to become cutting-edge security innovators who can create new security technologies. Front-line researchers and engineers teach research and development of security technologies by using NICT's actual cyber-attack-related data continuously and at full scale for one year. 41 enrollees completed the course in fiscal 2021, 212 in total since fiscal 2017.

8. Constructing the integrated cybersecurity knowledge/human resource development foundation (CYNEX)

Because domestic security business models are mostly based on introduction and operation of overseas security products, security measures in Japan heavily depend on overseas products and information, which leads to insufficient collection and analysis of cyberattack information, etc. in Japan. In addition, through use of overseas security products, domestic data flows to overseas businesses, the security-related information of Japan is analyzed overseas, and domestic businesses purchase threat information based on the analytical results from foreign businesses.

As a result, domestic security businesses cannot accumulate core knowhow and knowledge, and it is difficult for them to contribute to global information sharing or to train engineers who can work internationally. User companies also have a shortage of personnel who can appropriately handle security products and information. In order to enhance Japan's independent skills to cope with cyber-attacks, which include training of cyber-security talents, it is necessary to build an ecosystem that accelerates domestic generation of cybersecurity information and human resource development in Japan.

In collaboration with NICT implementing Japan's top-level R&D on cybersecurity, MIC has built a cutting-edge "integrated cybersecurity knowledge/human resource development platform (popularly named CYNEX)," a huge industry-academia-government node regarding cybersecurity around the technologies/knowhow of NICT, since 2021 and started trial operation in 2022.

This cutting-edge platform enables collection and analysis of a broad range of cyber security information in Japan, and further promotes development of domestic security products taking advantage of such information, while at the same time training highly skilled security personnel and supporting human resource development in private and educational institutions. Through this project, MIC aims to further reinforce cybersecurity measures in Japan.

9. Promoting formulation of security communities rooted in the area (regional SECUNITY)

In order to ensure safety and reliability of information and communication services/networks in Japan, it is an important issue to secure cybersecurity not only at business operators providing national or metropolitan-area services but also at business operators providing information communication services in local areas. However, local enterprises and governments have challenges including: information gap compared with enterprises running business in Tokyo metropolitan area or nationwide; difficulty of taking sufficient security measures independently due to lack of management resources, or failure to recognize the need for security measures.

MIC established regional SECUNITY - communities that have built "mutual help" relationships regarding security among involved parties - in 11 regions (mostly districts of Regional Bureaus of Communications) by fiscal 2021. In fiscal 2022, MIC continues support by holding events and other initiatives in addition to seminars to deploy activities across regions and expand awareness-raising activities to a wide range of people.

10. Initiatives related to international cooperation

Because cyberspace spreads globally, collaboration with other countries is essential for establishment of cybersecurity. For this purpose, MIC actively engages in discussions, disseminating and collecting information at various international conferences and cyber consultations with the aim of contributing to building international consensus on cybersecurity.

Furthermore, in order to promote information sharing on international cybersecurity among private entities including information communication operators, MIC holds workshops with participation of ISP of ASEAN countries as well as Japan-US and Japan-EU opinion exchange sessions at the Information Sharing and Analysis Center (ISAC).

In ASEAN region, the ASEAN Japan Cybersecurity Capacity Building Center (AJCCBC) is leading initiatives to improve cybersecurity skills in the region.[40] At the same time, MIC regularly holds ASEAN-Japan Cyber Security Workshop for ISP businesses of ASEAN countries in order to promote information sharing and to build and enhance collaboration systems.

[40] See Chapter 4 Section 8

Section 6 Promoting ICT Usage

1. Summary

(1) Initiatives so far

Since the establishment of the Information Technology Strategic Headquarters and the enactment of the Basic Act on the Formation of an Advanced Information and Telecommunications Network Society (Act No. 144 of 2000)[41] in 2000, Japan has promoted the use of ICT under various national strategies including e-Japan Strategy. Based on these strategies, MIC has promoted the use of ICT in various sectors such as medical care/health and regional revitalization in order to deal with Japan's social/economic challenges including the declining birthrate and aging society and their associated labor shortages, increases in medical/care expenses, and intensified natural disasters.

(2) Future challenges and direction

Since before the COVID-19 pandemic, Japan has been facing serious social issues including aging population with fewer children, and it has been said that it is essential to make the most use of digital technologies to improve productivity and recover the economy. Under the prolonged impact of the COVID-19 pandemic, promotion of ICT usage across society is further increasing in importance.

It is expected that the use of ICT will improve the productivity of corporate activities though replacement of simple works and routine works by machine and creation of higher value added services. In particular, it is thought to help growth of SMEs and other enterprises facing difficulties to secure sufficient labor force.

ICT usage by enterprises can create new business models, such as Personal Data Trust Bank, and both enterprises and citizens can obtain the benefits from the progress of cashless payments and cloud services. In this way, it is expected that ICT usage will contribute to the revitalization of Japan's economy. Because the use of AI by enterprises is expected to bring great benefits broadly to Japan's economy and society, it is required to implement safe, secure and trusted AI in society.

As described in Chapter 3, Section 8, overall, the use of ICT has been progressing, but there are some gaps in Internet usage rate depending on age, geographical and other conditions. In order to realize digitalization that "leaves no one behind," it is necessary to narrow the digital divide caused by age/geographical and other conditions by eliminating anxiety/resistance to digitalization among the public including the elderly, and by advancing initiatives to improve people's ability to use digital technologies, for example.

With the rapid spread of smartphones in recent years, many young people have come to use social media including SNS and online games. It has become essential to improve the "media and information literacy"[42] of the whole of society, including kids, their guardians and teachers, so that young people can safely and securely use smartphones and social media by understanding the risks associated with the use and countermeasures against such risks.

2. Promoting ICT usage that will contribute to solving social/economic problems

(1) Promoting local 5G

i Overview of local 5G

Unlike nationwide 5G services provided by mobile operators, local 5G is a 5G system that can be flexibly constructed by various entities including local enterprises and governments in their building or premise based on individual needs of the community or industry. The use of local 5G is expected in various fields, usage forms and environments to deal with various challenges and create new values.

ii Development demonstrations for realizing local 5G services to solve issues

In order to spread local 5G, since fiscal 2020, MIC has tackled "development demonstrations for realizing local 5G services to solve issues" to implement technical studies on radio wave propagation under a variety of use environments assuming actual use scenes, while at the same time creating solutions using local 5G.

Furthermore, for the purpose of promoting local 5G introduction to various fields including factories, farm land, transportation, medical practice, construction sites and disaster sites, the "Public-private Liaison Conference to Spread Local 5G" consisting of the government offices responsible for the respective fields, groups representing the respective business fields, organizations and other members to promote local 5G was established in January 2021. The Conference functions as a hub connecting entities introducing local 5G to relevant government agencies, common carriers, venders and other members.

iii Promoting 5G development through tax system

With the aim of promoting introduction of safe and reliable 5G and solving various social issues in the communities by using 5G, while at the same time strengthening international competitiveness of Japan's economy, a

[41] This act was abolished by the Basic Act on the Formation of a Digital Society (Act No.35 of 2021).
[42] This is a concept combining media literacy and information literacy, as advocated by UNESCO. The concept includes other various related literacies such as news literacy and digital literacy. This refers to a set of competencies for citizens to share, create, access, search for, understand, evaluate and use information and media contents in every format in critical, ethical and effective ways and by using various tools, with the aim of participating and engaging in personal, professional and social activities.

tax system to promote introduction of 5G was established in fiscal 2020. In the fiscal 2022 tax reform, toward realization of the “Vision for a Digital Garden City Nation,” the application time limit of the tax benefits was extended after the review to promote base station development in rural areas. Specifically, the time limit of application of the special measure to allow tax credit or special depreciation for some facilities of national 5G base stations and local 5G was extended to the end of fiscal 2024, after the revision of target equipment and introduction of gradual reduction in tax credit rate from maximum 15% to ensure concentrated development in rural areas in the next 3 years. The special measure to halve the basis of fixed property tax of certain facilities of local 5G for three years after the acquisition was extended to the end of fiscal 2023 after an appropriate review.

(2) Promoting telework

i Overview of telework

Telework is a flexible working style to use time and place effectively taking advantage of ICT. It can realize diverse work styles according to the life stage and lifestyle of each person including families with small children, senior citizens, and persons with disabilities and is also effective for ensuring business continuity in times of disaster or pandemic. Because people can work in the place where they wish to live while maintaining income, telework can create flow of people from urban areas to rural areas.

With the spread of COVID-19 since 2020, telework has been widely used to reduce commuting mostly in urban areas. However, telework implementation rate remains low in SMEs and rural areas. Furthermore, because many enterprises introduced telework to prevent infection, the telework implementation rate tends to decrease when declaration of a state of emergency is cancelled.

ii Implementing “Telework Days”

With the aim of easing traffic congestion in the city centers and establishing telework, since 2017, MIC together with relevant government offices has implemented “Telework Days” in summer to call on enterprises and others to implement telework all over Japan. In 2021 when Tokyo Olympic Paralympic Games was held and movement of athletes and people involved was expected, MIC designated the period from July 19 to September 5, which include the period of the games, as “Telework Days” for concentrated implementation of telework.

iii Supporting the spread of telework

In order to increase the incentive for enterprises to introduce telework through selection and publication of advanced cases and collect examples for reference by enterprises considering telework, since 2015 MIC has selected “Top Hundred Telework Pioneers” to publicly recognize enterprises with sufficient record of using telework. Among them, enterprises implementing especially excellent initiatives of telework in terms of management performance, ICT usage and contribution to regional revitalization are awarded with the MIC Minister Award.

With the aim of supporting introduction of telework in SMEs and rural areas where the telework implementation rate remains low, MIC in collaboration with the local chambers of commerce and industry and associations of labor and social security attorneys has established telework support networks across Japan and implements public relation activities in collaboration with regional bureaus of telecommunications and others. In addition, MIC is working to spread better telework by providing free individual consultation by experts (telework managers) for enterprises, etc. considering introduction or improvement of telework. Since fiscal 2022, these supports have been provided integrally with labor-related telework consultation by the Ministry of Health, Labour and Welfare as “one-stop telework support projects.”

Furthermore, in order to address information security concerns that are often cited as challenges for telework introduction, MIC formulated “Telework Security Guidelines” and “Telework Security Guide for SMEs (Checklists)” for reference by enterprises, etc. when implementing telework. In fiscal 2021, MIC released their revised editions.

(3) Promoting Smart City vision

Expanding the Projects Related to ICT Town Development initiated in fiscal 2012, MIC has implemented “data-linkage-type smart city promotion projects” since fiscal 2017. The projects promote introduction of data collaboration infrastructure securing interoperability, extensibility and security to enable cross-sectional collaboration with the aim of solving various problems facing cities.

In fiscal 2021, the Cabinet Office and relevant authorities set up the “Joint Review Committee for Projects Related to Smart Cities” to promote Smart Cities in close cooperation with the relevant authorities, and MIC supported the Smart City projects in nine municipalities/groups.

(4) Promoting ICT use in education

In order to further promote the use of ICT in education, MIC in cooperation with MEXT implemented “Smart School Platform Demonstration Project” using data from the “school affairs system” used by teachers and “lesson/learning system” used also by students to examine safe, effective and efficient data linkage methods of the systems from fiscal 2017 to 2019. In fiscal 2020, MIC released “Smart School Platform Technical Specifications” that are the outcome of the project on its website and worked for its adoption. Since fiscal 2021, toward realization of a “digital education platform” that is the basis of information sharing between digital learning systems held by business operators outside of school, MIC has been studying necessary technical specifications (reference models).

In fiscal 2020, MIC constructed the model of a local 5G usage in education. Specifically, MIC built a 5G use environment in schools by installing local 5G base stations and implemented demonstrations taking advantage of ultra-high speed and other 5G features to disseminate use cases.

(5) Promoting ICT usage in the medical field

Japan has plunged into an ultra-aging society. In order to solve problems including increasing medical/care expenses and uneven distribution of medical resources and to enhance medical products/services, it is imperative to promote networking and pioneering ICT usage in the fields of medicine, nursing and health.

To this end, MIC has implemented research projects by Japan Agency for Medical Research and Development (AMED), which include: research on networks necessary for advanced telemedicine and development of data infrastructure using AI/IoT since fiscal 2020; research on networks necessary for advanced telemedicine for two years from fiscal 2020; and research toward practical application of advanced telemedicine networks since fiscal 2022.

Furthermore, in order to promote use of PHR[43] by private business operators, MIC together with MHLW and METI studied the requirements to be observed by private PHR business operators, and compiled and released "Basic Guidelines for the Management of Health and Other Personal Data by Private-sector PHR Business Operators" in April 2021 (partially amended in April 2022).

(6) Developing disaster prevention information systems

Japan is one of the world's top nations in terms of natural disasters and has sustained severe social/economic damage each time it was hit by a large-scale natural disaster. As large-scale natural disasters including Nankai Trough earthquakes are anticipated in the future, it is important to alleviate human and physical damages from disasters by efficiently using ICT.

i Developing disaster resistant communication networks for firefighting and disaster prevention

Collection and communication of information pertaining to damage situations requires a communication network that can secure communication in times of disaster. For this purpose, communication networks connecting the state, the Fire and Disaster Management Agency (FDMA), local governments, residents and others have been constructed. The networks consist of: (1) Central Disaster Management Radio Communications Network collecting and conveying information within the government, (2) Fire Defense Disaster Prevention Radio Network connecting FDMA and prefectures, (3) Prefectural disaster management radio communications system connecting the prefecture and municipalities, (4) municipal disaster management radio communications system connecting the municipality and residents, and (5) satellite communication network connecting the state and local governments, and local governments to local governments. Regarding the satellite communication network, MIC is promoting measures to introduce high-performance and inexpensive next-generation systems.

ii Deploying mobile communication devices for disaster management

In order to secure communications in afflicted areas when communication by mobile phone, etc. is shut down, MIC lends mobile communication devices for disaster management to local governments and others. As of April 2022, 317 satellite cell phones, 280 MCA radios and 1065 simplicity radios are deployed in Regional Bureaus of Telecommunications, etc., across the country. Use of these devices is expected to complement communications of information essential for a series of activities from collection and circulation of disaster information during the initial response to prompt and smooth operation of emergency restoration activities.

iii Securing means of emergency communication at times of disaster

In preparation for situations where it is difficult to use telecommunication services through a public telecommunication network at times of disaster, ICT units (attaché case type) developed by MIC have been deployed in Regional Bureaus of Telecommunications nationwide since fiscal 2016. A system has been established to help securing of necessary means of communication by lending the units at the request of local governments and other disaster prevention organizations.

iv Stable operation of Nationwide Instantaneous Alert System (J-Alert)

FDMA has established J-Alert, a system to instantaneously transmit information on situations requiring immediate response, which include ballistic missile information, earthquake early warning and tsunami warning from the government to residents through emergency alert mails to mobile phones and the municipal emergency radio system. In order to transmit emergency information promptly and surely through J-Alert, MIC improves its operations by fixing bugs, and enhances its functions, which include multiplexing of information transmission means linked to J-Alert.

v Promoting use of L-Alert

MIC is promoting the use of L-Alert, which is a common platform for unified transmission of disaster information including evacuation orders issued by local governments to diverse media including a large number of broadcast stations and internet business operators. Fukuoka prefecture started to use L-Alert in April 2019 completing the use in all 47 prefectures in Japan. It has spread across the country to play a part as disaster information infrastructure.

For further promotion of spread and use of L-Alert, MIC tackled demonstration to map disaster information provided through L-Alert to help visitors and other people who are not familiar with the region to understand the area subject to the evacuation order, etc. easily. In addition, MIC has provided training on L-Alert for local

[43] Abbreviation for Personal Health Record and generally refers to lifelong personal health/medical information (e.g., health examination results, vaccination/medication history, inspection results, vital signs checked by the person). Its accurate grasp as electronic record and use for health promotion by the person is expected.

government officers and other users.

(7) Promoting the use of personal number card/public personal authentication services

In the process of coping with the COVID-19 pandemic, various challenges of digitalization have become apparent, which has increased the need to enhance the convenience of the individual number cards essential in a digital society. In the "Toward Drastic improvement of the individual number system and national/local digital infrastructure (national/local digitalization guidelines)" of the Digital Government Action Plan (Cabinet Decision on December 25, 2020), it was decided to consider mounting of an individual card function (digital certificate) on smartphones.

In response, MIC started to hold "The Study Group on Smartphones with Individual Number Card Functionality" consisting of external experts and other members in November 2020. The study group compiled the second report on the direction of future initiatives for smartphones with individual number card functionality in April 2022. Specific studies and construction will be carried out by the Digital Agency.

3. Promoting data distribution/use and new businesses

(1) Social implementation of the Personal Data Trust Bank

In order to promote appropriate use of personal data including private information, MIC and METI compiled the "Guidelines on Accreditation of Information Trust Function version 1.0" regarding voluntary certification of personal data trust bank by private organizations, etc. in June 2018. The guidelines focus on use of data originating from individual users and consist of (1) accreditation criteria, (2) entries of model agreement, and (3) accreditation scheme. Based on the guidelines, the Information Technology Federation of Japan that is an accreditation organization decided the first "data trust bank" accreditation in June 2018. "Data trust bank" accreditation was made for seven companies in total by February 2022.

Later, the guidelines were reviewed. In August 2021, revision was made regarding the issues that came to surface in the process of operation of the scheme, which include handling of health/medical information and selection of third party recipients. The result was released as the "Guidelines on Accreditation Scheme of Information Trust Functions version 2.1." In April 2022, MIC released "Draft Guidelines on Certification of Information Trust Functions version 2.2" and "Draft Summary of Discussion on Handling of Data Profiling by Personal Data Trust Banks" based on the 2020 and 2021 Act on Protection of Personal Information and discussions on the ideal state of profiling rules at personal data trust banks.

(2) Promoting cashless payment

The "Follow-up on Growth Strategy" (Cabinet Decision in June 2019) decided to promote cashless payment toward the goal of doubling the percentage of cashless payment to about 40% by June 2025.

Among cashless payment means, code payment has a challenge of troublesome operation for shops introducing multiple services among many services. To address this issue, Payments Japan established as an organization to promote cashless payment by concerned bodies and business operators (its observers include MIC and METI) formulated "the Guideline for Unified Technical Specification of Code Payment" in March 2019 and the unified code based on the guideline was named JPQR. Since then, code payment has been promoted with focus on restaurants, retail stores, barber shops/beauty salons, taxis and other industries highly compatible with JPQR, and municipality counters handling fees for issuing various documents including resident cards. By the end of fiscal 2021, about 13,000 shops in total had introduced JPQR.

In fiscal 2021, MIC implemented a demonstration project for shops in communities to independently use cashless payment/purchase data and conducted studies toward formulation of guidelines.

(3) Promoting introduction of cloud services

With the spread of cloud services including ASP, SaaS, PaaS and IaaS, it has become necessary to create an environment for users to obtain sufficient information for comparison, assessment and selection of cloud services. To this end, MIC formulated and released "Information Disclosure Guidelines for Safety and Reliability of Cloud Services" in 2011 (partially revised in 2022). An example of using the guidelines in the private sector is the establishment by the Japan Cloud Industry Association (ASPIC) of a certification system by sector for information disclosure by cloud service providers.

In addition, MIC is working for dissemination of good practices of cloud service in collaboration with industry groups.

(4) Discovery/fostering of ICT ventures

Since the majority of the world's top 10 enterprises in market capitalization are start-up ICT companies, it is imperative for Japan to create and foster ICT venture companies that are sources of innovations. Toward discovery and fostering of ICT ventures, MIC and NICT in collaboration with universities, technical colleges, local governments, chambers of commerce and industry and other partners, are working to discover young talents and enterprises nationwide, provide mentoring to them and hold "Entrepreneurs' Koshien" and "Entrepreneurs' EXPO" where business plans are presented by students and venture companies who won local district primaries.

(5) Promoting the spread of AI

It is expected that linking of AI with other AI, information systems, etc. via the internet (AI networking) will drastically increase both benefits and risks, while broadly spreading them without being limited by space.

"Conference toward AI Network Society" launched by MIC in October 2016 studies social, economic, ethical and legal issues for promotion of AI networking. The conference compiled and released "Draft AI R&D GUIDELINES for International Discussions"[44] summarizing the matters to be noted in AI development in July 2017 and "AI Utilization Guidelines"[45] summarizing the matters to be noted in AI utilization in August 2019. Later, the conference released reports compiling ambitious initiatives regarding AI by enterprises in 2020 and 2021[46] and continues to work toward promotion of "social implementation of safe, secure and trusted AI."

In addition, MIC has actively participated in international discussions on AI at G7, OECD and other international conferences. In particular, Japan will chair the next Global Partnership on AI (GPAI) scheduled around the end of 2022. GPAI is an international initiative established in June 2020 to guide the responsible and "human-centric" development and use of AI. MIC continues to disseminate information at various opportunities and actively contribute to international discussions.

4. Creating Environments Where Everyone Can Enjoy the Convenience of ICT

In order to realize digitalization that "leaves no one behind" by bridging the digital divide due to disabilities or age, MIC is actively promoting various measures for barrier-free information, while at the same time working to improve the information literacy of youth.

(1) Supporting R&D for barrier-free information

With the aim of bridging the digital divide due to disabilities or age, MIC provides subsidies to promote barrier-free information in the communication and broadcasting sectors. Specifically, "R&D on technologies to bridge the digital divide" program provides necessary funds to enterprises conducting R&D on technologies regarding communication/broadcasting services for people with disabilities and the elderly. The subsidy was granted to 4 entities in fiscal 2021.

Furthermore, based on the Act on Advancement of Facilitation Program for Disabled Persons' Use of Telecommunications and Broadcasting Services, with a View to Enhance Convenience of Disabled Persons (Act No. 54 of 1993) MIC through NICT provides "subsidies for promotion of provision/development of barrier-free information communication/broadcasting" to enterprises providing or developing communication/broadcasting services for disabled persons. The subsidy was provided to five entities in fiscal 2021.

(2) Providing phone relay service as public infrastructure

"Telephone relay service" refers to a service where sign language interpreters mediate in communications between persons with hearing impairment (persons having difficulty communicating due to a disability of hearing, language functions, phonetic functions) and persons without hearing impairment by interpreting sign language/letters of persons with hearing impairment and making phone calls accordingly.

In order to ensure proper provision of "phone relay service," the Act on Facilitation of the Use of Telephones for the Persons with Hearing Impairments, etc. (Act No,53 of 2020) was enforced in December 2020, and the service as public infrastructure was started in July 2021 by The Nippon Foundation Telecommunication Relay Service that is designated as a telephone relay service providing body.

(3) Improving accessibility of the websites of public organizations

In order to facilitate the use of public institution websites by everyone, including the elderly and persons with disabilities, MIC formulated "Guidelines for operation of public websites for everyone (2016 edition)" in April 2016 to support accessibility improvement of websites of the national and local governments and other public organizations. In fiscal 2021, MIC implemented a questionnaire survey on the current status of website accessibility at public organizations and a survey on JIS correspondence status of their websites.

(4) Supporting digital use by the elderly and other people

In order to bridge the digital divide and create an environment where everyone can obtain the benefits of digitalization with the advancement of digitalization across society, MIC is tackling "Project on Digital Utilization Support for Users." The project supports the elderly and other people having concerns about using digital technology through advice and consultation on online administrative procedures using smartphone, etc. in workshops. In fiscal 2021, a workshop was held at more than 2,000 locations, many of which are mobile phone shops. (See Column 3 for detail.)

(5) Improving media and information literacy among youth

i Dissemination and awareness raising activities

MIC cooperates with "ICT Conference for High School Students" that aims to help improvement of the internet environment for youth by providing high school students with opportunities to think about the desirable ways of ICT utilization, listen to opinions of other people, discuss, form and present their opinions. MIC also implements "e-net Caravan," which is a lecture on demand for dissemination and awareness raising for safe internet use by youth, and develops "Case Study of the Internet Trouble."

In the broadcasting sector, MIC is working to improve media literacy of youth by: dissemination and awareness raising by lending the learning materials for elementary,

[44] Draft AI R&D GUIDELINES for International Discussions https://www.soumu.go.jp/main_content/000499625.pdf
[45] AI Utilization Guidelines https://www.soumu.go.jp/main_content/000809595.pdf
[46] "Report 2020" https://www.soumu.go.jp/menu_news/s-news/01iicp01_02000091.html
"Report 2021" https://www.soumu.go.jp/menu_news/s-news/01iicp01_02000097.html

junior-high and high school students, which MIC has developed, and opening a website "media literacy in the broadcasting sector" to develop and post online teaching materials and lesson packages for teachers (guidance plan, lesson report, worksheet, etc.).

ii Implementing tests to evaluate internet literacy of youth

MIC developed the Internet Literacy Assessment indicator for Students (ILAS) to evaluate online literacy of youth in fiscal 2011. Every year since fiscal 2012, MIC has implemented the ILAS test for high school first years and equivalents nationwide to assess online literacy of youth, along with a questionnaire survey on actual use of smartphones and other information and communication equipment.

iii Promoting spread of Community ICT Clubs

MIC is working to spread "Community ICT Clubs" that provide children with opportunities to learn programming and other ICT skills in the community, while at the same time contributing to the development of human resources of the community by taking up local challenges as a theme. Specifically, MIC posted information on the activities conducted by Community ICT Clubs in various places across the country under the past demonstration projects (fiscal 2018 and 2019), and built a national network consisting of "Community ICT Clubs" implementing bodies.

Column 3 Promoting support for digital usage by the elderly

1. Current state of digital divide among the elderly

The "Priority Policy Program toward the Realization of a Digital Society" that was decided by the Cabinet on December 24, 2021, states that Japan aims to realize a digital society that "leaves no one behind." However, the opinion poll of the Cabinet Office released in January 2021 shows that 25.7% of people in their 60s and 57.8% of people in their 70s are unable to use ICT equipment including smartphones; the ratio rises as age rises.[47]

2. "Project on Digital Utilization Support for Users"

MIC is working on a "Project on Digital Utilization Support for Users" ("project" hereafter) to help every person to live a better life actively by using digital technologies. Under the project, workshops on use of smartphones for online administrative procedures are held across the country to help the elderly and other people who have worries about use of digital technologies. The project has been implemented since June 2021 in collaboration with private enterprises and local governments.

The workshops are provided by lecturers who completed the training designated by MIC. There is no age limit or fee for participation and anyone can participate any number of times. Two types of groups hold the workshops: nationwide groups, typically mobile phone shops, and; community-based groups cooperating with the local government, which include local ICT enterprises, councils of social welfare, and Silver Human Resource Centers. In fiscal 2021, 2,143 nationwide groups and 198 community-based groups were adopted. The numbers are far greater than MIC's expectation and show nationwide keen interest in this project. The workshop menus that can be implemented vary depending on the type. The community-based type can implement: the "basic course" including smartphone operations such as how to turn on power and use the internet, and the more in-depth "applied course" including application for individual number card and online administrative procedures. On the other hand, nationwide type can implement only the "applied course." The portal site of the project provides teaching materials and videos that can be used for participants to review what they have learned at the workshop. MIC hopes to help participants to establish smartphone use through repeated operations taking the opportunity of the workshop.

3. Future prospects of "Project on Digital Utilization Support for Users"

MIC plans to intensively implement this project for five years from fiscal 2021 to 2025, but thinks it is necessary to develop the initiatives of the project based on the needs by expanding both its quantity and quality in order to bridge the digital divide that continues to widen. To this end, MIC plans to greatly increase the workshop locations to about 3,000 in fiscal 2022. Considering that 750 municipalities do not have any mobile phone shops[48], MIC plans to start a new initiative to dispatch lecturers to support people in these areas.

[47] https://survey.gov-online.go.jp/hutai/tindex-r02.html
[48] Tabulated on November 10, 2021.

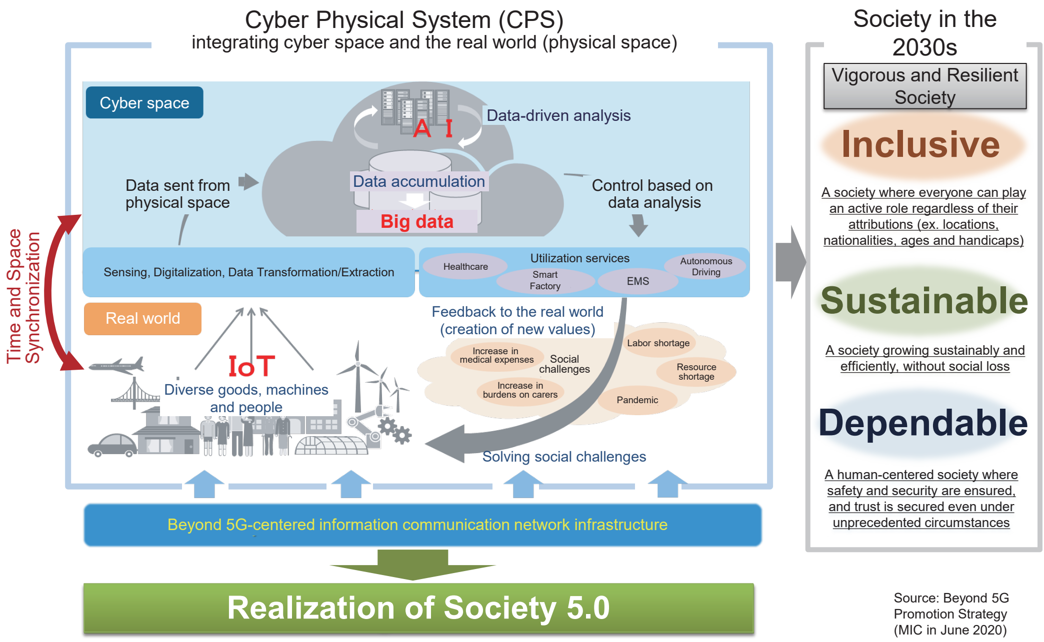
Section 7 ICT Technology Policies

1. Summary

(1) Initiatives so far

The “Beyond 5G Promotion Strategy” formulated by MIC in June 2020 aims to realize a “vigorous and resilient society” where people’s lives and economic activities are smoothly maintained through a Cyber Physical System integrating cyber and physical spaces as a society in the 2030s when realization of Beyond 5G is expected (**Figure 4-7-1-1**). While pursuing Beyond 5G R&D strategies and IP/international standardization based on the strategy, MIC has promoted R&D and international standardization of cutting-edge technologies in the ICT field based on the Growth Strategy, the Science, Technology and Innovation Basic Plan, the Integrated Innovation Strategy (AI Strategy and Quantum Technology Innovation Strategy), the Intellectual Property Strategic Program, and the Basic Plan on Space Policy, etc. of the entire government.

Figure 4-7-1-1 Society expected in the 2030s



Source: Beyond 5G Promotion Strategy (MIC in June 2020)

Related data
Science, Technology, and Innovation Basic Plan (Cabinet Decision in March 2021) for the entire government
Source: Prepared by MIC from materials of the Cabinet Office
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#4-7-2 (Data Collection)

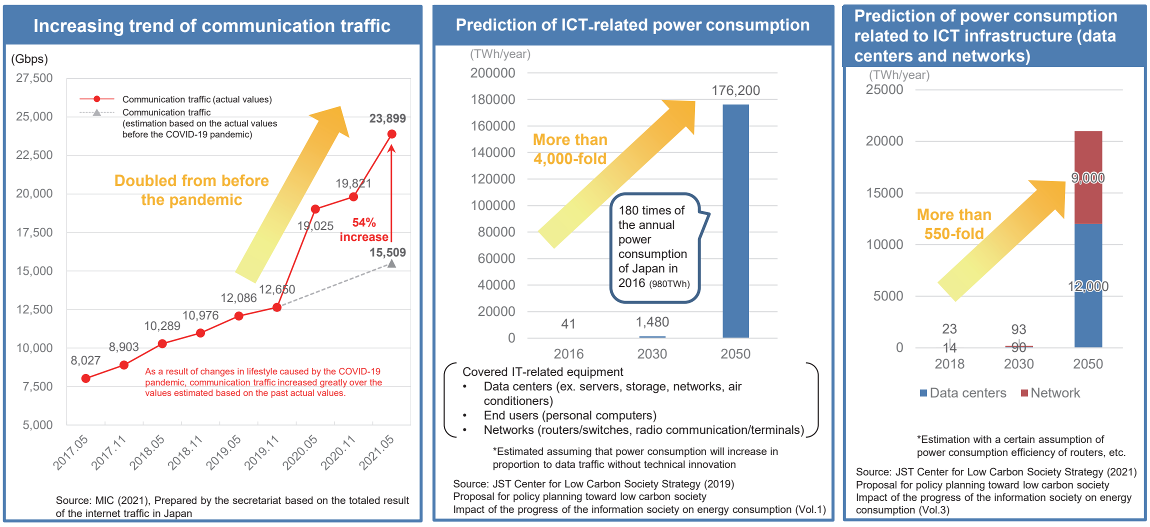
(2) Future challenges and direction

As global R&D competition toward Beyond 5G has been intensifying every year, beyond 5G studies and activities are progressing at home and abroad. In this context, it is necessary to realize the social implementation of development results and market gain, strengthen Japan’s international competitiveness and ensure its economic security by further crystallizing the existing strategies of R&D, IP and international standardization in close industry-academia -government coordination and promoting such crystallized strategies. Considering the role of Beyond 5G connected to the infrastructure of all industries and social activities, this process should be based on the government-wide policies including post-coronavirus society, Vision of Digital Garden City Nation, environment/energy, disaster prevention/mitigation and security policies. To this end, the Act on Promotion of Ensuring of Security by Taking Economic Measures in an Integrated Manner (Act No.43 of 2022) was enacted in 2022.

In addition, after tackling the challenge of economic growth and the solution of social issues after the COVID-19 pandemic, and with consideration of future technology trends in the ICT sector and the innovation policy of the entire government, it is necessary to strategically promote development of cutting-edge technologies, IP and international standardization, while at the same time advancing the study/formulation of ICT technology strategies toward a resilient and vigorous society in the 2030s.

Furthermore, communication traffic in Japan has increased exceeding the past estimation due to changes in lifestyle caused by the COVID-19 pandemic and other factors, and power consumption of the ICT sector is increasing as a result. In addition, there is concern over significant increase in power consumption in the ICT sector as a result of the future development of technologies and services (**Figure 4-7-1-2**). In this context, Japan declared that it aims to achieve carbon neutrality by 2050 as an international commitment. As the realization of green digital society and carbon neutrality of the ICT industry by 2040 are positioned in the policies of the entire government, MIC needs to promote initiatives toward greening and digitalization in the ICT sector.

Figure 4-7-1-2 Trends of communication traffic and energy consumption in the ICT sector



(Source) MIC, the Department of Information and Communications Technology of the Information and Communications Council, materials of the 27th technology strategy committee

2. Beyond 5G

(1) International trends surrounding Beyond 5G

Other countries have started to consider or implement Beyond 5G-related R&D investments by governments for the purpose of securing international competitiveness and economic security. For example, the United States in the Japan-US joint declaration announced investments in the next generation mobile communication network, etc., while Next G Alliance formulated "6G Roadmap." In Europe, there is progress in various initiatives including decision on investments in 6G R&D by Horizon Europe and the launch of Hexa-X that is a 6G R&D project. It is expected that the countries will continue to actively promote Beyond 5G R&D in the future (**Figure 4-7-2-1**).

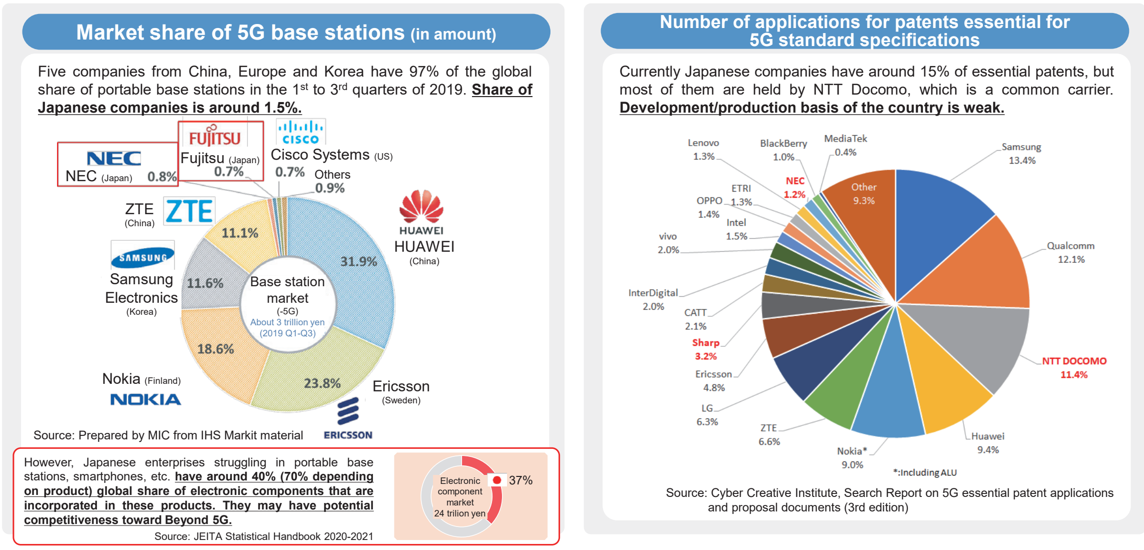
Figure 4-7-2-1 Beyond 5G R&D by the governments of other countries

The United States	● Next G Alliance that is an industry group to promote 6G set up a Roadmap WG and a Green G WG and started studies to clarify the elements necessary for promotion of 6G and other new technologies and realization of a sustainable ecosystem through new technologies. (March 2021) ● The government expressed 2.5 billion dollar (4.5 billion dollar in total from Japan and the U.S.) investment in the next generation mobile communication network, etc. in the U.S.-Japan Joint Leaders' Statement (April 2021) ● Next G Alliance formulated 6G Roadmap and recommended government support in three areas: "consistent policy framework for success of 6G", "support for 6G research and development" and "policies to incentivize private investment in 6G" (February 2022) ● Federal Communications Commission (FCC) reorganized the Technological Advisory Commission (TAC) with 6G as a new focus (February 2022). ● National Science Foundation (NSF) announced projects adopted for RINGS that is 6G R&D support partnership (April 2022)
Europe	EU, Germany and Finland governments invest 1.85 billion Euro (about 240 billion yen) in total in 6G R&D (as of March 2022)
EU	● 6G R&D project Hexa-X started, funded by Horizon 2020 (from January 2021 to June 2023) ● EU decided 900 million Euro investment in 6G R&D in the next R&D program Horizon Europe (2021-2027) (March 2021) Combined with 1.1 billion Euro from the private sector, SNS JU secured 2 billion Euro (260 billion yen) in total (March 2022) and already made 240 million Euro (31 billion yen) contributions to Work Program (2021 to 2022) (December 2021)
Germany	● Decided to invest 700 million Euro in total in 6G technology R&D (2021 to 2025) (April 2021). 250 million Euro (about 33 billion yen) of the amount is invested in construction of 6G R&D hub (June 2021)
Finland	● Started 6Genesis Flagship Program and budgeted 250 million Euro (about 33 billion yen) in eight years from 2019 to 2026 (May 2018) ● Held the 1st 6G Wireless Summit (March 2019)
China	● Established a 6G promotion organization 2IMT-2030(6G)" and started 6G R&D (June 2019) ● Released a digital economy plan to enhance 6G R&D as part of the 14th five-year plan (January 2022) ● Tsinghua University announced a success of 1TB/sec transmission experiment at a Beijing Olympic venue (February 2022)
Korea	● Ministry of Science and ICT (MSIT) announced a 6G R&D action plan, including 220 billion won (about 21 billion yen) investment by 2025 (June 2021). ● Started to formulate "the Next-Generation Network Development Strategy" that includes 6G (January 2022) ● Discussed cooperation in ICT including 6G with the United States, Finland and Indonesia (March 2022)

(2) Potential competitiveness toward Beyond 5G

Major overseas enterprises have a high share in the global communication infrastructure market (portable base station), hold many related patents and are expected to maintain high competitiveness also in the future. Japanese enterprises are less competitive and could be left in the dust in the field of 5G if the situation remains the same. Whereas Japanese enterprises are struggling in portable base stations and smartphones, they have a certain global share in the electronic components incorporated in these products. For this reason, they may have potential competitiveness in Beyond 5G (**Figure 4-7-2-2**).

Figure 4-7-2-2 International competitiveness of Japan in the communication infrastructure market



(Source) MIC, the Department of Information and Communications Technology of the Information and Communications Council, materials of the 34th technology strategy committee

(3) Policy trends

i Formulation of Beyond 5G strategy

Toward realization of "Beyond 5G," which is the next-generation information and communication infrastructure in the 2030s, Japan has accelerated industry-academia-government activities by formulating the "Beyond 5G Promotion Strategy," and setting up "Beyond 5G Promotion Consortium" and "Beyond 5G New Business Strategy Center." Specifically, focusing on the seven functionalities to be upgraded and expanded from 5G (ultra-fast & large capacity, ultra-low latency, ultra-numerous connectivity, autonomy, scalability, ultra-security and resiliency and ultra-low power consumption), industry, academia and the government cooperate to study visions and technical challenges. MIC has started R&D on core technologies.

In September 2021, MIC sent an inquiry to the Information and Communications Council on "information and communications technology strategy for beyond 5G." The council gave shape to technology strategy toward Beyond 5G, including priority R&D tasks and measures to promote them, and compiled an interim report on June 30, 2022.

Related data
Functions required for Beyond 5G
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#4-7-6 (Data Collection)

ii Promoting R&D on Beyond 5G

In order to support R&D on cutting-edge elemental technologies necessary for Beyond 5G, MIC established a Funding Program for World-Leading Innovative R&D on information and communication technologies at NICT by using the 3rd supplementary budget of fiscal 2020, while at the same time developing test beds and other common facilities/equipment to promote Beyond 5G R&D by gathering knowledge of the public and private sectors. In the "Beyond 5G R&D Promotion Project," MIC implements core technology R&D based on open application with focus on the seven functionalities required from Beyond 5G (ultra-fast & large capacity, ultra-low latency, ultra-numerous connectivity, ultra-low power consumption, ultra-security and resiliency, autonomy and scalability) under the following programs:

① Beyond 5G Function Realization Program
R&D of core technologies to realize the functionalities required from Beyond 5G
② Beyond 5G International Joint R&D Program
R&D on cutting-edge technologies in international collaboration with strategic partners
③ Beyond 5G Seeds Creation Program
R&D projects to generate innovation by creating seeds for technology

Related data
Schema of the Beyond 5G R&D Promotion Project (Fund)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#4-7-7 (Data Collection)

"Beyond 5G R&D Promotion Project" in fiscal 2022 and after plans to promote Beyond 5G R&D reflecting the technology strategy mentioned in (i) and aims to implement the development results in society gradually starting from EXPO 2025 Osaka, Kansai.

iii Promoting acquisition of IP and international standardization for Beyond 5G

With the aim of strategically accelerating acquisition of Intellectual Property and global standardization under industry-academia-government cooperation, MIC established the "Beyond 5G New Business Strategy Center" in December 2020. The center disseminates information through New Business Strategy Seminars and promotes human resource development through workshops for candidate-executives of enterprises and Hackathon events for university and technical college students. Furthermore, MIC is working on development of information infrastructure for study on future standardization, which includes construction of IP landscape to analyze IP acquisition status.

In order to promote international standardization activities from the initial stage of R&D, MIC conducts international joint research that promises synergy effects with research institutes of countries/regions that are reliable strategic partners. Specifically, MIC in collaboration with the European Commission has implemented Japan-EU joint research that provides R&D funds to joint proposals from universities, private enterprises and other research institutes in Japan and the EU. In fiscal 2022, research on eHealth adopted through the 5th public invitation is underway. Since fiscal 2016, MIC has implemented joint research with the U.S. research institutes, started research on 5G upgrading adopted through the new public invitation in fiscal 2021 and plans public invitation for new Japan-U.S joint research and Japan-Germany joint research in fiscal 2022.

3. Quantum technology

(1) Trends of the quantum security network policy

Quantum technology is an innovative technology that will dramatically and discontinuously develop future society and economy. It is also crucially important for economic security. Other countries, especially the United States, European countries and China are significantly increasing R&D investments in this technology and making strategic efforts including development of R&D sites and human resources.

Based on the "Quantum Technology Innovation Strategy" (decision made by the Integrated Innovation Strategy Promotion Council in January 2020) and "Vision for the Quantum Future Society – a vision for future society to create using quantum technology and strategies toward its realization" (decision made by the Integrated Innovation Strategy Promotion Council in April 2022), the Government of Japan supports enhancement of R&D and activities for commercialization in each technology field (quantum computers, quantum software, quantum security networks, quantum metrology/sensing and quantum materials). In addition, the government plans to promote formation of sites for comprehensive initiatives from basic research to technology demonstration and human resource development in industry-academia-government partnership, and other infrastructural initiatives to generate innovations.

(2) R&D on quantum cryptographic communication technologies

In the age of quantum computing where there is a concern of security failure of the current cryptography, we need quantum cryptography, decryption of which is impossible by any computer in principle. MIC in collaboration with NICT is promoting R&D on quantum cryptographic communication (quantum key distribution) technologies, while at the same time establishing a "Quantum Security Hub" for the field of quantum security network technologies at NICT based on the Quantum Technology Innovation Strategy in fiscal 2021 and tackling a broad range of activities including social implementation through construction and use of test beds and human resource development.

i R&D on distance extension and networking of quantum encryption communication

For social implementation of quantum encryption communication, extension of its communication distance is one of the big challenges. With the aim of tackling the challenge of distance extension and realizing a global quantum encryption communication, MIC has been working on R&D of long distance linking and relaying of terrestrial quantum encryption communication since fiscal 2020. In addition, toward safe satellite communication networks, MIC has been working on R&D to use quantum encryption communication for microsatellites since fiscal 2018 and started R&D to construct a global quantum encryption communication network integrating terrestrial and satellite networks in fiscal 2021.

ii Developing testbeds for quantum encryption communication and promoting its social implementation

In Japan, NICT has been working on R&D of elemental technologies of quantum encryption communication from an early stage. NICT constructed the "Tokyo QKD Network" that is a testbed for quantum encryption communication in 2010 with the aim of verifying principles of quantum encryption communication, and has operated it for a long period of time. The basic specifications of quantum encryption communication equipment developed based on the long-term operation of Tokyo QKD Network were adopted as international standard (ITU-T Y.3800 series) in 2020, which shows its high international competitiveness.

Because quantum encryption communication is expected to be used in financial, medical and other commercial services in addition to use in public institutions handling confidential information, there are strong demands for its early practical application. In response, with the aim of accelerating social implementation through verification of use in actual environments, since fiscal 2021 MIC has been working to develop broad-area testbeds for quantum encryption communication, which are capable of demonstration of network architectures including routing control with architecture connecting multiple sites.

Related data
Image of global quantum cryptography network
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#4-7-8 (Data Collection)

4. AI technologies

In recent years AI has been evolving at an accelerated pace as represented by machine learning based on deep learning. Its application is progressing around the world with significant impacts on a wide range of industries and social infrastructure, making AI an essential technology to maintain fundamental functions of society.

Based on the "AI Strategy 2022" (decision made by the Integrated Innovation Strategy Promotion Council in April 2022), MIC, in collaboration with NICT that has AI-related core centers, is working on a wide range of R&D and social implementation of natural language processing, multi-lingual translation/speech processing and brain cognitive model construction.

For example, MIC together with NICT is working on R&D of multi-lingual translation to eliminate language barriers in the world to realize global and free exchange. Multilingual translation technology developed by NICT achieved a practical level accuracy for 12 languages assuming response to foreigners visiting or staying in Japan. MIC and NICT are also promoting social implementation of multilingual translation technology. NICT provides VoiceTra as a research application targeting independent travelers. More than 30 private-sector services are developed[49] through technology transfer and used in a variety of fields including disaster management, transportation and medical care in addition to government offices.

Related data
Multilingual translation technology
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#4-7-9 (Data Collection)

With a view to EXPO Osaka, Kansai in 2025, MIC formulated "Global Communication Plan 2025" in March 2020, in order to further advance the multilingual translation technology of NICT. Based on the plan, MIC creates a computer environment for the world's cutting-edge and top-level AI R&D at NICT, while at the same time implementing R&D to upgrade the technology of serial translation of short sentences to "simultaneous interpretation" that can handle discussions at business and international conferences since fiscal 2020.

Related data
Efforts to further advance the multilingual translation technology
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#4-7-10 (Data Collection)

Furthermore, MIC plans to add eight languages with foreigners visiting/living in Japan and diplomacy in mind, while conducting R&D on multilingual simultaneous interpretation.

5. Remote sensing technologies

With the aim of contributing to early detection of sudden atmospheric phenomena represented by "guerrilla rainstorms" and tornadoes, and elucidation of their development mechanism, NICT implements R&D of remote sensing technologies to observe precipitation, vapor, wind, etc. with high time/space resolution.

Regarding Dual Polarization Multi-Parameter Phased Array Weather Radar (MP-PAWR) capable of high-speed and high-accuracy 3D observation of rain clouds, for example, NICT implements large-scale events using the metropolitan area heavy rain forecasting system in collaboration with other institutions, and demonstration experiments together with local governments. NICT is also promoting R&D on: technology to estimate water vapor content in the atmosphere by using propagation delay of terrestrial digital broadcast waves; wind profiler

[49] Global Communication Development Promotion Council, examples of products/services of private enterprises using the multilingual translation technology of the National Institute of Information and Communications Technology (NICT): https://gcp.nict.go.jp/news/products_and_services_GCP.pdf

technology to measure wind speed up in the air; on-ground water vapor/wind lidar using eye-safe infrared pulse lasers capable of simultaneous observation of water vapor and wind up in the air, for example.

Related data
Improvement of resolution and technology demonstration of synthetic-aperture radar for observation of the ground surface from aircraft
URL: https://www.nict.go.jp/press/2022/01/25-1.html

6. Space ICT

According to the Basic Space Plan based on the Basic Space Act (Act No. 43 of 2008) and its schedule, MIC is promoting the following R&D for space development and use:

① R&D of radio-optical hybrid communication technology toward small satellites constellation in order to realize ultrawide-band satellite optical communication system through effective use of frequency resources

② R&D to establish core technologies of quantum cryptography in satellite communication and realize a global network of quantum encryption communications through satellite networks, etc.

③ R&D of technology to explore water energy resources on the lunar surface to contribute to the international space exploration (Artemis Program) proposed by the United States

④ R&D of satellite communication systems for the engineering test satellite No.9 and optical communication technology that will enable ground-satellite optical data transmission at 10Gbps level

⑤ R&D of space environment monitoring sensors that will observe and analyze ionosphere, magnetosphere and solar activities, to be used for space weather forecast under 24-hour, 365-day human-crewed operation and to be mounted on the successor of the geostationary meteorological satellite Himawari.

Importance of space weather forecasting is increasing among enterprises responsible for the stable operation of social infrastructure, especially electric power, communications, broadcasting and aviation. Considering the forecast that solar activities will increase in the future, MIC, by holding a “Study Group on the Advancement of Space Weather Forecasting” encourages the industry, academia and the public sector to take their respective measures, while at the same time ensuring space weather forecasting (a report was compiled in June 2022).

Related data
Influence of solar flares on the earth
Source: MIC, Material of the Study Group on the Advancement of Space Weather Forecasting (the 1st session)
URL: https://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2022/data_collection.pdf#4-7-11 (Data Collection)

Section 8 Promoting International Strategies for ICT

1. Summary

(1) Initiatives so far

Based on the "Infrastructure System Overseas Promotion Strategy 2025" (Decision by the Infrastructure Strategy Economic Cooperation Meeting on December 10, 2020), which is an overseas infrastructure promotion strategy of the entire government and the "MIC World Development Action Plan 2020" (formulated by MIC on April 30, 2020), MIC has energetically worked for the overseas development of ICT infrastructure systems through total support for enterprises, which includes human resource development, maintenance and finance in accordance with the development stage (project identification, proposal and formation).

MIC has also contributed to the formation of international frameworks through active participation in discussions on digital economy and the establishment of international rules in the ICT field, by taking opportunities of bilateral policy dialogues with the United States and other countries, and multilateral talks including the G7 and the G20.

While digital infrastructure, including optical submarine cables and 5G networks, has become essential for various social and economic activities, concerns about economic security have been increasing. To address these concerns, MIC has also been working to secure economic security through international cooperation, for example.

(2) Future challenges and direction

In the big trend of digitalization, competitions in developing digital technologies are further intensifying and competition in spreading such technologies to countries needing them is also rising. In these circumstances, it is important for Japan's economic growth to create an environment for the advancement and spread of digital technologies of Japan, improve our international competitiveness and show its presence to the world through bilateral and multilateral collaboration. Deploying high-quality infrastructure also contributes to solving social challenges in the world and leads to achievement of SDGs.

In this context, with the aim of strengthening the international competitiveness of Japan's digital technologies and solving global social challenges, MIC is working for overseas development in digital and other fields and for establishment of international frameworks through international cooperation. For overseas development, in particular, as part of the MIC World Development Action Plan 2020, it is necessary to contribute to the world's economic development and solution of social challenges by using Japan's technologies and experience through application of ICT solutions in the medical and agricultural sector including telemedicine in addition to 5G/optical submarine cables and other ICT infrastructure systems. Furthermore, in order to lead establishment of international rules in the digital field, it is necessary to actively participate in international discussions taking opportunities of international conferences, etc.

2. Overseas deployment of digital infrastructure, etc.

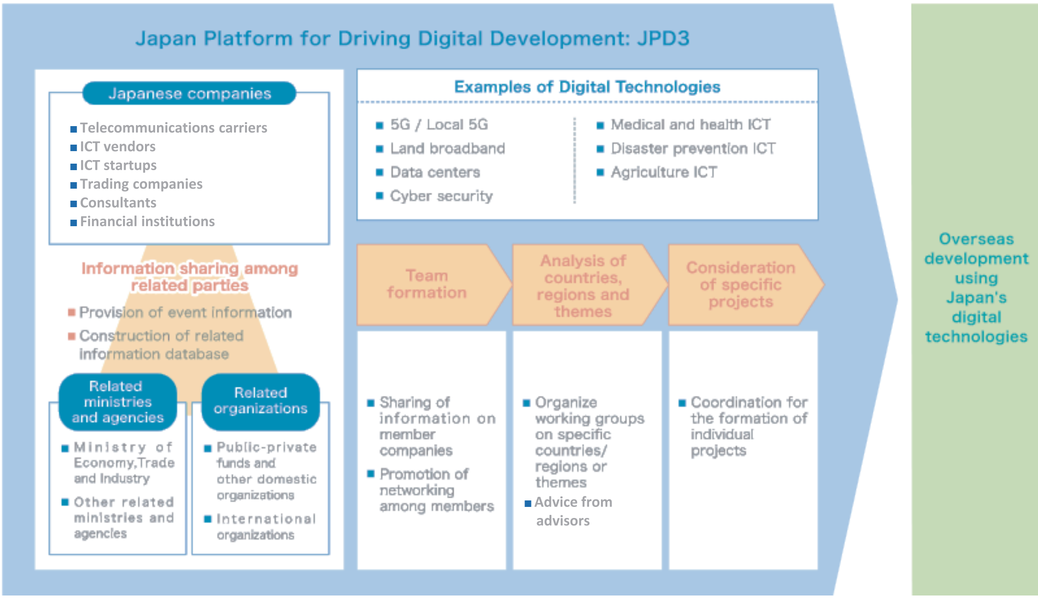
Considering the global increase in the demand for communication infrastructure services as a result of the progress of digitalization of society and economy, MIC is promoting support for overseas deployment of digital infrastructure with the aim of strengthening the international competitiveness of Japan's digital industry and solving global challenges by using digital technologies.

(1) Overseas deployment support tools at MIC

MIC supports overseas deployment of high-quality digital infrastructure of Japan in accordance with the phases from basic survey to demonstration projects depending on the situation and challenges of the respective countries.

In February 2021, MIC established the "Japan Platform for Driving Digital Development" that is a public-private partnership framework to support overseas ICT deployment of Japan with MIC's initiative. As of January 2022, over 100 members including ICT-related companies and relevant government agencies/organizations participated in the framework to share information on countries and regions (51 countries and one organization) in databases, hold workshops, form teams and discuss specific projects.

Figure 4-8-2-1 Japan Platform for Driving Digital Development



(2) Fund Corporation for the Overseas Development of Japan's ICT and Postal Services (JICT)

The Fund Corporation for the Overseas Development of Japan's ICT and Postal Services (JICT), which is a public-private fund under MIC's jurisdiction, supports investments and hands-on projects by entities providing overseas communication, broadcasting or postal services and those supporting them. As of the end of March 2022, funds and loans of 78.8 billion yen in total have been allocated for the support.

Considering the ICT development and needs, and policy trends of other countries in recent years, MIC decided to add medical ICT, cybersecurity and other ICT services that do not involve hard infrastructure development to JICT targets, while at the same time advancing LP investments in the fund.[50] Its support standards were amended in February 2022 (Ministry of Internal Affairs and Communications Notice No. 34 of 2022).

(3) Initiatives toward overseas deployment for each field

i Core communications infrastructure

Mobile communication networks: The government of Ethiopia approved licensing of mobile phone service in the country to an international consortium including a Japanese enterprise in 2021. The service will be launched in 2022. MIC takes this opportunity to promote digital solution deployment in the country and African region.

Optical submarine cables: MIC through JIST has been supporting projects with a focus on Southeast Asia (decided to provide funds/loans up to 78 million dollars included in the total project costs of 400 million dollars). In addition, since September of 2021, Japanese companies have participated in a project to lay optical submarine cables in the Indian Ocean, which was announced by Prime Minister Modi of India in August 2020. Moreover, MIC in collaboration with willing countries and relevant government agencies/organizations is working on improvement of the relatively less-developed communication environments of Pacific island nations.

5G/Local 5G: As the importance of safe and secure 5G network is discussed in the international arena, MIC is working for its overseas deployment using Open RAN that attracts attention as a technology to realize open and secure networks. For example, since fiscal 2021, MIC and a local communication carrier have jointly examined the possibility of overseas deployment through construction of a Local 5G network using 5G radio facilities based on Open RAN and demonstration experiments of Local 5G applications.

Japanese digital terrestrial TV broadcasting system: 20 countries including Japan (many of them are in Latin America) have adopted this system. MIC continues to support smooth transition to digital broadcasting.

ii Digital technology use models

Use in the medical field: Japanese companies have received orders for a telemedicine system using smartphone mostly from Latin America. Since fiscal 2021, MIC has conducted studies through demonstrations at local hospitals toward spread of endoscopes using high-definition video technology and AI diagnosis support systems to ASEAN countries.

Radio system: In Thailand, MIC is preparing for demonstration experiments of the Ground-Based Augmentation System (GBAS), which is an aircraft approach/landing system using positioning satellite including GPS. Through this and similar initiatives, MIC shares under-

[50] According to the results of the review of the enforcement status based on the provision of Article 4, Supplementary Provisions of the Act on the Fund Corporation for the Overseas Development of Japan's ICT and Postal Services (Act No. 35 of 2015)

standing of Japan's technological advantages with other countries to promote international use of Japan's radio technologies with high frequency use efficiency and international cooperation in frequency use.

iii Broadcasting contents

MIC has continuously supported initiatives of Japanese broadcasters to produce broadcast contents conveying the appeal of Japan jointly with overseas broadcasters and to disseminate the contents to the world from fiscal 2014 to 2022 with a focus on Asia. As a result, exports of broadcasting contents more than tripled in the seven years from 13.78 billion yen in fiscal 2013 to 57.11 billion yen in fiscal 2020. In addition, overseas deployment of broadcasting contents has produced various effects including economic ripple effects such as development of the market for regional products and spread of the appeal of Japan.

iv Other

(i) Fire defense

MIC signed a memorandum of cooperation in fire defense with Vietnam in October 2018 and made arrangement for training on standards/conformity assessment system of fire equipment. In addition, MIC has disseminated information of quality and standards/conformity assessment system of fire equipment of Japan by obtaining authentication registration of Japan Fire Equipment Inspection Institute and the Fire Equipment and Safety Center of Japan in the United Arab Emirates.

(ii) Postal service

In multiple countries mostly in Southeast Asia, MIC is promoting international cooperation and overseas deployment in public-private cooperation by identifying opportunities and challenges in efficiency improvement and modernization of postal services and sharing Japan's knowledge and experience contributing to their solution, for example. The efforts realized consultation for streamlining of operations and ordering of sorting machines for Vietnam Post. In addition, MIC is promoting new initiatives to expand business opportunities of postal business entities through ICT use.

(iii) Administrative counseling/statistics

In the field of administrative counseling, MIC cooperates with public ombudsman of individual countries and signed a memorandum of cooperation pertaining to redress of administrative grievances with Vietnam, Uzbekistan, Turkey and Thailand. Based on the agreement, MIC accepted 270 trainees in total in the last eight years from Vietnam, for example.

In the field of statistics, MIC supports government digitalization by taking advantage of knowledge on construction of highly reliable e-government and statistic systems. For example, MIC supported construction of an information sharing system between the central and local departments of Vietnam.

3. Contribution to establishment of international rules on the digital economy

(1) Data Free Flow with Trust (DFFT)

G7 Roadmap for cooperation regarding DFFT (Data Free Flow with Trust) was formulated at the Meeting of G7 Digital Ministers in April 2021 and approved by the G7 Summit in June of the same year. The Meeting of G20 Digital Ministers in August 2021 and the G20 Summit in October of the same year reaffirmed the importance and challenges of DFFT.

Based on the above, MIC actively participates in international discussions toward rule formation to promote DFFT in the concrete at occasions including G7, G20, OECD and bilateral discussions.

(2) Response to discussions on international rules of cyber space

i Making international rules of cyberspace

Regarding international rules of cyberspace, MIC emphasizes two points: (1) give maximum consideration to free flow of information, which not only supports democracy but also is a source of innovations to drive economic growth; and (2) ensure participation of all stakeholders including private enterprises, academia and civil society who are actually using the internet and managing networks (multi-stakeholder framework), in order to secure cyber security. Based on the two points, MIC took up related subjects in bilateral talks including the U.S.-Japan Policy Cooperation Dialogue on the Internet Economy (IED) and Japan-EU ICT Strategy Workshop to strengthen cooperation with like-minded countries. In addition, MIC actively participates in discussions at multilateral meetings by issuing a "Declaration for the Future of the Internet" together with other core members (the United States, Australia, Canada, EU and the United Kingdom) and interested countries in April 2022, for example.

ii Bilateral and multilateral talks on cybersecurity

Bilateral talks for discussing cybersecurity were held in 2021 including "the Japan-US Cyber Dialogue" director-level meeting in May, "the 6th Japan-UK Cyber Talk" in June, "the 2nd Japan-Germany Cyber Talk" in May, and "the 4th Japan-Estonia Cyber Talk" in December. Through these talks on recognition of the situation, initiatives in the respective countries, cooperation in the international arena, support for capacity building, etc., Japan strengthens collaboration with these countries.

As for multilateral discussions on cybersecurity, opinion/information on the current status in the respective countries and capacity building support for ASEAN region are exchanged at ASEAN-Japan Cybersecurity Policy Meeting and other occasions. In addition, Japan, the United States, Australia and India agreed to cooperate for cybersecurity under the framework of QUAD. The entire government engages in discussions toward strengthening of cooperation with like-minded countries.

(3) Promotion of trade liberalization in the ICT field

In order to complement a multilateral free trade system built around the World Trade Organization (WTO) and promote bilateral economic partnerships, Japan is actively working to conclude Economic Partnership Agreements (EPAs) and Free Trade Agreements (FTAs).

Specifically, since 2018, MIC participated in discussions on the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (TPP11), Japan-EU Economic Partnership Agreement (EPA), The US-Japan Digital Free Trade Agreement, the Japan-UK Comprehensive Economic Partnership Agreement (EPA) and the Regional Comprehensive Economic Partnership Agreement (RCEP), which were signed and came into effect. Currently negotiations on Japan-China-Korea FTA and other agreements continue. In each EPA negotiation, MIC demands relaxation/abolishment of restriction on foreign investments in the telecommunication sector, negotiates development of the rules for promoting competition including interconnection and discusses cooperation between contracting parties in order to obtain commitment to liberalization above the WTO level.

(4) Promotion of strategic international standardization

International standardization in the ICT sector is an important policy issue that can lead to creation of a global market through common standards. Because strategic initiative in development of international standards is critically important for strengthening international competitiveness, MIC has been strategically promoting international standardization activities.

Specifically, MIC implements trend research and standards establishment regarding forum standards[51] in addition to de jure standards[52], training of human resources engaged in international standardization, initiatives to deepen understanding of the importance of standardization activities. MIC also implements joint research aimed at international standardization with EU, the United States and Germany, R&D and demonstration experiments in promising fields for social implementation (ex. wireless factories).

4. Securing economic security in the digital field

Considering the importance of the communication sector including 5G in socioeconomic activities, MIC is working to secure and enhance economic security in the digital field through collaboration with the United States and other like-minded countries. One example of the efforts is establishment of the Global Digital Connectivity Partnership (GDCP) through the Japan-US summit in April 2021.

In the part of “Ensuring safety and reliability of core infrastructure,” which is one of the four pillars of the Act on Promotion of Ensuring of Security by Taking Economic Measures in an Integrated Manner (Act No.43 of 2022) enacted in 2022, telecommunication, broadcasting and postal services are designated as one of the businesses related to key infrastructures. Preparation works are scheduled toward its enforcement. In addition, the government is strengthening the review system for inward direct investment based on the Foreign Exchange and Foreign Trade Act (Act No. 228 of 1949). In this way, enhancement of systems has been promoted also in the digital field.

5. International cooperation in multilateral frameworks

At policy consultations in multilateral frameworks including G7/G20, APEC, APT, ASEAN, ITU, UN, WTO and OECD, MIC actively leads international collaboration initiatives in the ICT field, which include promotion of free information distribution, safe and secure cyberspace, development of high-quality ICT infrastructure and contribution to the Sustainable Development Goals (SDGs).

(1) G7/G20

As a result of globalization and digitalization of socioeconomic activities, cross-border data flow, businesses and services are progressing. In this context, the G7 ICT Ministers' Meeting in Takamatsu, Kagawa, that was chaired by Japan in April 2016 triggered vigorous discussions in the framework of G7 toward development of the digital economy.

Discussions on the digital economy have been continuously made also in the framework of G20 that includes China and India. Specifically, MIC, the Ministry of Foreign Affairs and METI held the G20 Ibaraki-Tsukuba Ministerial Meeting on Trade and Digital Economy in June 2019. The ministers agreed on AI principles with “human-centric” approach for the first time in G20, which was followed by the top-level agreement at G20 Osaka Summit. The idea of Data Free Flow with Trust (DFFT) was also supported at the top level and its importance was reaffirmed at the 2020 G20 Digital Economy Ministers Meeting (Saudi Arabia).

In addition, the G7 Digital and Technology Ministerial Meeting (UK) held in April 2021 declared their opposition to measures which may undermine democratic values, such as internet shutdowns and network restrictions by governments. The meeting formulated a roadmap for cooperation among G7 countries in specific promotion of DFFT and proposed actions in four areas for cooperation of the roadmap: (1) Data localization; (2) Regulatory cooperation; (3) Government Access to

[51] Standards formulated based on the agreement of multiple enterprises, universities and other forum members.
[52] Standards formulated by the International Telecommunication Union (ITU) or other public international standardization body.

Data, and (4) Approaches to data sharing in priority sectors. The roadmap was approved in the G7 Summit in June of the same year.

Japan, which will chair the 2023 G7, continues to contribute to international discussions on rulemaking concerning the digital economy, which includes promotion of DFFT.

(2) Asia Pacific Economic Cooperation (APEC)

Asia Pacific Economic Cooperation (APEC) is an international conference of major countries and regions in the Asia Pacific region for sustainable development of the region. In APEC, discussions on the telecommunication field are led by the Telecommunications and Information Working Group (TEL) and the Ministerial Meeting on Telecommunications and Information Industry (TELMIN).

As a result of the adoption of the Aotearoa Plan of Action at the APEC Summit in 2021, TEL is advancing studies for promotion of "innovation and digitalization" listed as one of the three economic drivers in the plan.

MIC actively contributes to TEL operation through participation in discussions and promotion of projects regarding digital government at TEL held twice a year and dissemination of ICT policies in Japan.

(3) Asia-Pacific Telecommunity (APT)

Asia-Pacific Telecommunity (APT) is an international organization in the information and communication sector of the Asia Pacific region established in 1979 with the aim of balanced development of telecommunication and information infrastructure in the region. Its activities include human resource development through training and seminars, and regional policy coordination in standardization and radio communication. Currently Mr. KONDO Masanori (former MIC senior official) from Japan is its secretary general.

Through contributions to APT, MIC supports activities including acceptance of trainees and exchange of ICT engineers and researchers in broadband and wireless communication and other ICT fields where Japan has strength. In fiscal 2021, MIC supported eight online training courses, four international joint research projects and two pilot projects.

(4) Association of Southeast Asian Nations (ASEAN)

The Association of Southeast Asian Nations (ASEAN) is a regional cooperative organization consisting of 10 Southeast Asian countries. Its major purposes are promotion of economic growth and social/cultural development, political/economic stability and cooperations regarding challenges in the region. ASEAN Digital Ministers' Meeting (ADGMIN) discusses policies in the digital field.

i Contributing to achievement of the goals of ASEAN Digital Masterplan 2025

Japan cooperates for achievement of the goals of the ASEAN Digital Masterplan 2025 formulated in January 2021. Specifically, Japan and ASEAN countries implement joint projects using ASEAN ICT Fund established with contributions from Japan and other funds. In fiscal 2021, workshops in the field of Vehicle to X (V2X) and initiatives to formulate a best practice guide for development of 5G ecosystem were implemented.

ii Strengthening cooperation system in the field of cybersecurity

Currently, MIC implements cybersecurity exercises including Cyber Defense Exercise with Recurrence (CYDER) for cybersecurity personnel of government agencies and critical infrastructure operators in ASEAN countries online or at the ASEAN Japan Cybersecurity Capacity Building Centre (AJCCBC)[53] on a continual basis. In addition, considering the recent spread of COVID-19, since fiscal 2020 AJCCBC has provided online self-learning materials and expands exercise content through provision of teaching materials from third parties other than Japan or ASEAN.

Furthermore, MIC promotes information sharing and strengthens cooperation systems among related parties by regularly holding Japan-ASEAN Information Security Workshop for ISP services in ASEAN countries. Since fiscal 2020, MIC has developed an online information sharing system pertaining to cybersecurity between Japan and ASEAN.

(5) International Telecommunication Union (ITU)

The International Telecommunication Union (ITU: headquartered in Geneva, Switzerland, with 193 member countries) is a specialized agency of the United Nations (UN). Its purpose is to extend international cooperation for improvement and rational use of telecommunication, and to promote development and efficient operation of technical means for efficiency improvement, increase in use and spread of telecommunication services. ITU consists of the following three sectors conducting allocation of frequencies, standardization of telecommunication technologies, telecommunication development support in developing countries and other activities.

① ITU-R: ITU Radiocommunication Sector
② ITU-T: ITU Telecommunication Standardization Sector
③ ITU-D: ITU Telecommunication Development Sector

Election of the next Director of the Telecommunication Standardization Sector is scheduled in September 2022 and Japan supports Mr. ONOE Seizo, currently serving as the CSSO (Chief Standardization Strategy Officer) of Nippon Telegraph and Telephone Corporation.

i Initiatives at ITU-R

In order to ensure rational, efficient, economical and fair use of the radio frequency spectrum by all radio communication services, ITU-R conducts research on use of frequencies and formulates standards related to radio communications. Radiocommunication Assembly

[53] AJCCBC: https://www.ajccbc.org/index.html

(RA) that approves recommendations submitted by Study Groups and discusses issues and systems of the next SG period, and the World Radiocommunication Conferences (WRC) aimed at amendment of the radio regulations providing international frequency allocation and other matters are the largest ITU-R meetings held once every three to four years. MIC has actively contributed to the discussions.

ii Initiatives at ITU-T

ITU-T studies international standards of communication network technologies and operation methods, and conducts technical studies necessary for formulation of the standards.

The World Telecommunication Standardization Assembly (WTSA), which is the supreme decision-making meeting of ITU-T held once every four years, was held in March 2022. The assembly discussed appointment of chairs and vice-chairs of study groups and approval of resolutions. As a result, Japan obtained two chairs and 7 vice-chairs, and the assembly agreed on new resolutions on the review of reorganization of ITU-TSG and new telephone numbers common across Africa, and on revision of 36 resolutions.

As regards the Focus Groups in which non-ITU members can participate, the Focus Group on "Artificial Intelligence and Internet of Things for Digital Agriculture" (FG-AI4A) and the Focus Group on Testbed Federations for IMT-2020 and beyond (FG-TBFxG) were set up in fiscal 2021 to start new studies on AI and future networks.

iii Initiatives at ITU-D

ITU-D assists development in the information and communications sector of developing countries.

The World Telecommunication Development Conference (WTDC), which is the supreme decision-making meeting of ITU-D, is held once every four years. In the current Study Group Period (2018 to 2021), ITU-D implements ICT development support projects, ICT human resource development and other activities based on the strategic goals and action plans adopted by WTDC-17 held in 2017. Individual projects include the Connect2Recover[54] initiative that was launched by ITU and MIC in 2020 to strengthen digital infrastructure and ecosystem in the light of the global needs for enhancement of communication networks, which came to the surface as a result of the COVID-19 pandemic.

(6) United Nations

i United Nations General Assembly Second Committee Economic and Social Council (ECOSOC)

In the United Nations General Assembly Second Committee handling economy and finance, the Commission on Science and Technology for Development (CSTD) set up under the Economic and Social Council (ECOSOC) leads discussions on promotion of global digital cooperation toward inclusive digital society, public nature of the internet and other issues. Through participation in CSTD annual meetings and other activities, Japan contributes to international discussions regarding information and the communication sector including internet governance.

ii Internet Governance Forum (IGF)

The Internet Governance Forum (IGF) is an international forum for dialogue on various public policy issues regarding the internet.

In December 2021, the 16th meeting was held in Poland. Japan made active contributions to the meeting by organizing an open forum on global data governance, and MIC Minister Kaneko took the platform of its closing session in the form of a video letter announcing that Japan would host IGF in 2023 toward maintenance and development of a free, open, safe and segmentation-free internet.

(7) World Trade Organization (WTO)

There has been little progress in the telecommunication sector since the agreement of the Basic Telecommunication Negotiations in 1997 as a result of stagnation of the Doha Round that started in 2001. However, based on the recent rising attention to e-commerce handling data distribution on the internet, like-minded members formally started e-commerce negotiations at WTO in 2019. Japan as co-chair country together with Australia and Singapore leads the discussions.

(8) Organization for Economic Co-operation and Development (OECD)

Pioneering discussions on the ICT sector are made at the Committee on Digital Economy Policy (CDEP) of the Organisation for Economic Co-operation and Development (OECD). MIC provides personnel and financial support to the OECD Secretariat and actively contributes to policy discussions at OECD as exemplified by many MIC officials serving as CDEP chair (since January 2020) or vice-chairs of Working Parties under CDEP.

Since 2016 CDEP has been working on initiatives on AI and adopted and published the “Recommendation of the Council on Artificial Intelligence” in May 2019. The recommendation presents principles to be shared by people engaging in AI and the matters to be tackled by governments. This is the first inter-governmental consensus document on AI. CDEP continues active efforts including establishment of the “AI Policy Observatory (OECD.AI)” that is an online platform on AI (January 2020) and setting up of the “OECD Network of Experts on AI (ONE AI)” that is an AI expert group (February of the same year).

(9) ICANN

For IP addresses, domain names and other internet resources that are absolutely necessary for internet use,

[54] At first, the initiative’s target was Africa where internet connection rate was low, but with participation of the government of Saudi Arabia and declaration by the government of Australia to participate, it has expanded to a global scale.

it is important to ensure appropriate global management/coordination including prevention of overlapping assignments. International management/coordination of internet resources is currently handled by the Internet Corporation for Assigned Names and Numbers (ICANN)[55] that was launched as a nonprofit corporation in 1988. In addition to IP address assignment and domain name coordination, ICANN coordinates operation/deployment of route server/system and development of policy related to these technical services.

MIC actively contributes to ICANN activities as an official member of its Governmental Advisory Committee consisting of the representatives of the governments of the member countries. To address unauthorized use of DNS, for example, Japan proposed study of methods for the Registry-Registrar to observe the provisions of the contract with ICANN and identification of registrants of domain names in the 70th to 72nd ICANN meetings.

6. International cooperation in bilateral relationships

(1) Policy cooperation with the United States

Based on the outcome document[56] issued after the Japan-U.S. summit meeting between Prime Minister Suga and President Biden of the United States on April 16, 2021, the Global Digital Connectivity Partnership (GDCP)[57] was launched in May of the same year in order to promote secure connectivity and vibrant digital economies. With the launch of GDCP, the Japan-U.S. Policy Cooperation Dialogue on the Internet Economy (IED) is positioned as the framework to promote GDCP.

The 12th Japan-US IED intergovernmental and public-private meetings were held on November 11 and 12 combining face-to-face and online methods. Participants of the meetings discussed a broad range of issues including 5G/B5G and cybersecurity, cooperation in the international arena, AI, and global free flow of data. As an outcome of the meetings, the Joint Statement on the 12th U.S.-Japan Policy Cooperation Dialogue on the Internet Economy was released.[58] At the meetings, following expert-level working group meetings of the GDCP in May and October 2021, the two countries reaffirmed their commitment to promoting secure connectivity and a vibrant global digital economy.

At the private sector meeting on November 5, 2021, Keidanren, the American Chamber of Commerce in Japan (ACCJ) and other participants from American industry issued the "Joint Statement 2021 by the US-Japan Internet Economy Private Working Group." The Joint Statement was submitted to the two governments at the Japan-US IED public-private meeting.

Figure 4-8-6-1 Global Digital Connectivity Partnership (GDCP)

GDCP concept

Toward secure connectivity and vibrant digital economies with cooperation of Japan and the United States, GDCP promotes: ① cooperation in third countries, ② multilateral collaboration and ③ bilateral collaboration with a view to global development (especially 5G and B5G)

Cooperation in third countries	Cooperation for ICT infrastructure development and human resource development in third countries (with focus on the Indo-Pacific, but including other regions)
Multilateral collaboration	Enhanced collaboration in multilateral frameworks including ITU, G7/G20, OECD and APEC
Bilateral collaboration	Investments in R&D environments for 5G and Beyond5G (6G)

(2) Cooperation with Europe

i Cooperation with the European Union (EU)

MIC and the Directorate-General for Communications Networks, Content and Technology of the European Commission hold “Japan-EU ICT Policy Dialogues” (the 27th dialogue in February 2022 was the latest) for exchange of information and opinion on ICT policy, and “Japan-EU ICT Strategy Workshops” (the 13th workshop in April 2022 was the latest) to promote public-private collaboration/cooperation in the digital field.

At the 27th Japan-EU ICT Policy Dialogue, the two sides discussed 5G/Beyond 5G(6G), regulatory reform, AI, DFFT and cybersecurity, and reaffirmed the importance of in-depth discussions by like-minded countries for establishing international rules including DFFT.

In addition, the Japan-EU Digital Partnership was launched in May 2022. The partnership covers digital priorities shared by Japan and the EU, with the Digital Agency, MIC and METI playing leading roles from Japan and the European Commission (EC)'s Directorate-General for Communications Networks, Content and Technology (DG Connect) doing so from the EU.

ii Cooperation with European countries

(i)The United Kingdom

In May 2022, MIC, the Digital Agency and METI launched the UK-Japan Digital Group with the UK as a framework to tackle common digital priorities of the two countries. The group will hold a director-general-level meeting, and MIC will be in charge of the coordination.

(ii) Germany

MIC holds Japan-Germany ICT policy dialogue with the Federal Ministry for Digital and Transport (BMDV)

[55] Mr. MAEMURA Akinori (Japan Network Information Center: JPNIC) from Japan has been ICANN board member since November 2016.
[56] https://www.mofa.go.jp/mofaj/na/na1/us/page1_000951.html
[57] https://www.soumu.go.jp/menu_news/s-news/01tsushin08_02000119.html
[58] https://www.soumu.go.jp/menu_news/s-news/01tsushin08_02000126.html

of Germany to deepen the mutual understanding between Japan and Germany on policy aspects in the ICT field and promote the collaboration and cooperation of the two countries. At the 6th meeting held as a web conference in March 2022, the two countries discussed the governments' initiatives to promote Open RAN, the status of progress in R&D toward Beyond 5G, global digital governance, digital platform policies and data utilization/AI. Through the discussions, Japan and Germany confirmed that the two countries continue the collaboration. In addition, public-private sessions were held to exchange information on 5G and other initiatives in Japanese and German industries.

(iii) France

MIC and the Ministry for the Economy, Finance and the Recovery of the French Republic hold Japan-France ICT Policy Dialogues to share information on the latest initiatives regarding important ICT topics. The latest meeting was the 21st Dialogue in June 2021.

(3) Cooperation with Asia-Pacific countries

MIC cooperates with information and communication departments of Asia-Pacific countries in the ICT field including communication infrastructure development and ICT usage.

i India

In September 2021, MIC, the Ministry of Communications of India and other organizations held the "Japan-India intergovernmental consultation and public-private workshop in the field of 5G," shared the current status of intergovernmental and public-private 5G and Beyond 5G(6G) initiatives in the two countries and directions of future initiatives, and exchanged opinions.

ii Southeast Asian countries

MIC has held ICT Joint Working Groups between Vietnam and Japan since 2018. In the 5th Working Group, the two sides exchanged opinions on digital transformation, cybersecurity, 5G and other matters and agreed to continue Japan-Vietnam cooperation.

In November 2021, MIC held an online meeting with the National Broadcasting and Telecommunications Commission (NBTC) of Thailand to share information and exchange opinions on 5G policy and other topics and deepened understanding of the recent information and communication administration including 5G development in the two countries.

In July 2021, MIC and the Ministry of Communications and Information of the Republic of Singapore signed a Memorandum of Understanding on Cooperation in the information and communications field. The two countries agreed to further strengthen cooperation in the field (ex. digital economy, AI, cybersecurity).

Philippines is the only ASEAN country adopting the Japanese terrestrial digital television standard. MIC continues support for smooth transition to terrestrial digital in the country with a view to support through ODA.

(4) Cooperation with Latin American countries

In Latin America, following Brazil, which adopted the Japanese terrestrial digital television standard (ISDB-T) in 2006, 14 countries adopted ISDB-T. Currently, MIC supports activities to end analog broadcasting in the countries and introduction of the Emergency Warning Broadcast System (EWBS) that is one of the functions of ISDB-T in Peru, Ecuador and other countries.

MIC also holds 5G seminars in Latin American countries to explain the importance of constructing open and secure 5G networks, in particular, and supports Japanese enterprises having excellent technologies in this field to expand their business in this region.

Furthermore, in order to encourage initiatives to use Japan's excellent ICT to solve social challenges in these countries, MIC conducts: demonstration of Smart City including protection of World Heritage in Cartagena, Colombia; demonstration of agriculture ICT solutions to improve operational efficiency of agricultural producers in Ecuador and Brazil, and; demonstration of medical ICT solutions using Local 5G in Chile.

(5) Cooperation with other regions

i Cooperation with Africa

Cooperation with African countries in the ICT field has progressed starting from the adoption of the Japanese terrestrial digital television standard (ISDB-T) by Botswana (2013) and Angola (2019). The Japan-Africa ICT High-level Round Table, an official side event of the 7th Tokyo International Conference on African Development (TICAD7) held in Yokohama 2019 adopted a joint statement that includes Japan-Africa cooperation in the field of ICT.

Toward realization of the agreed matters in the joint statement, since fiscal 2019 MIC has implemented demonstration experiments of communication infrastructure (Senegal and Kenya), agricultural ICT (Botswana and Ethiopia), and medical ICT (Ghana, Kenya and the Democratic Republic of the Congo) to contribute to solving of social issues in Africa, while at the same time supporting development by Japanese enterprises. The results will be reported at the 8th Tokyo International Conference on African Development (TICAD8) scheduled in 2022.

ii Cooperation with Middle East

MIC has strengthened the cooperative relationship with Saudi Arabia. Based on "Japan-Saudi Vision 2030" (2017) and the memorandum of cooperation with Saudi Arabia on cooperation in the ICT field signed with the Minister of Communications and Information Technology of Saudi Arabia (2019), MIC has established cooperative relationships between enterprises of the two countries and supported technology deployment by Japanese enterprises through dispatch of a public-private mission to Saudi Arabia in fiscal 2018 (the mission was suspended from fiscal 2019 to 2020 due to the COVID-19 pandemic) and public-private online ICT workshops in January 2022. In fiscal 2021, MIC implemented a demonstration experiment of medical ICT using VR technology of Japan.

Section 9 Promoting Postal Service Administration

1. Summary

(1) Initiatives so far

The postal service that started from the foundation of "shinshiki yubin" (new postal service) in 1871 celebrated its 150th anniversary in 2021. During this period, the universal postal service has been provided to every corner of Japan through post offices in step with the growth of the country, while at the same time changing its organization from state-operation to public corporation and then private corporation with the times.

MIC has been working to ensure soundness in management of the Japan Post Group and fair and free competition, to secure universal service by post offices and to use the post office network in the communities.

(2) Future challenges and direction

In terms of the financial condition of the Japan Post Group, operating income continues to decrease but ordinary profit and current net profit maintain a certain level. In the postal and physical distribution sector, the number of post offices has been around 24,000, and postal matters continue to decrease while packages are increasing. In the financial (savings and insurance) sector, the balance continues to decrease or remain level.

As the social environment surrounding the Japan Post Group is changing, it is important that post offices and their services continue to improve users' convenience and contribute to the communities, while at the same time the Japan Post Group secures the required performance as a private enterprise and maintains the post office network and universal service in the medium- to long-term.

It is necessary for MIC to continue to ensure soundness in management of the Japan Post Group and fair and free competition, and secure stable universal service by post offices. Moreover, MIC needs to promote improvement of users' convenience and contribute to the communities through diverse and flexible services adapted to the new era and digitalization, and streamlining of operations by effectively using the network of 24,000 post offices.

2. Promoting post office administration

(1) Securing universal postal service

i Subsidy/contribution system to support maintenance of the post office network

In order to ensure stable provision of universal postal service, a subsidy/contribution system to support maintenance of the post office network was established in June 2018 and its operation started in April 2019. The Organization for Postal Savings, Postal Life Insurance and Post Office Network delivers subsidies and collects contributions. In fiscal 2022, the amount of subsidy to Japan Post was about 280.8 billion yen, while contributions were 230.7 billion yen from Japan Post Bank and 50.2 billion yen from Japan Post Insurance.

ii Review of postal services by partial amendment of the Postal Act, etc.

The Act Partially Amending the Postal Act and Act on Letter Service by Private Business Operators (Act No. 70 of 2020) was enforced in May 2021 to review the services related to delivery days of the week for ordinary mail, the number of days required for delivery, and pertinent conditions. In Response, Japan Post partially reviewed its postal services in order since October 1, of the same year. The review includes no delivery on Saturdays and later delivery (**Figure 4-9-2-1**).

Figure 4-9-2-1 Partial review of the postal service implemented since October 2021

(1) No delivery on Saturdays

Implemented from Saturday, October 2, 2021
*Limited to ordinary mail. Normal post cards for election campaign are delivered on the day before the voting day.

(2) Later delivery (on the following day -> the day after next)

Stepwise implemented from Friday, October 1, 2021
*Limited to ordinary mail. No change to express, registered mail, Letax, Yupack, etc.)

<To destinations where mail used to be delivered on the following day if the mail was posted before 17:00>

Date of acceptance	Delivery day of week		
	Past	From October 2021	From January 22, 2022
Mon	Tue	Tue	Wed
Tue	Wed	Wed	Thu
Wed	Thu	Thu	Fri
Thu	Fri	Fri	Mon
Fri	Sat	Mon	Mon
Sat	Mon	Mon	Tue
Sun	Mon	Tue	Tue

(3) Expansion of the offices accepting special mails within the ward (quantity discount)

Mail needed to be brought to their delivery office in order to obtain discount. Discount is given also to mail brought to local dividing offices in charge of the delivery office.

<Commencing time>

-Bringing more than 100 pieces of mail at one time: from October 2021

-Bringing more than 1,000 pieces of mail at one time: from April 2022

(4) Lowering express delivery fee

Express delivery fee is lowered about 10% from Friday, October 1, 2021
*The fee is lowered considering the change in the delivery days of ordinary mail.

Weight	Fee up to Sep. 30	Fee from Oct. 1
Up to 250g	290 yen	**260 yen**
Up to 1kg	390 yen	**350 yen**
Up to 4kg	660 yen	**600 yen**

Note: from (1) to (3) above are implemented based on the partial revision of the Postal Act (enacted on November 27, 2020 and enforced on May 1, 2021)

(2) Ensuring soundness in postal service management

i Notification and approval of new services of Japan Post Bank and Japan Post Insurance

MIC and the Financial Service Agency approved "personal loan service (including direct handling of Flat 35)" in April 2021 and "intermediary operations for conclusion of investment blanket contract" in March 2022 based on the Postal Service Privatization Act.

In June 2021, Japan Post Holdings disposed of more than half of the shares of Japan Post Insurance. As a result, new businesses of Japan Post Insurance are made subject to notification instead of approval in the past and "revision of special medical contract" was notified in November of the same year.

ii Ideal Postal Services in the Digital Age

Since November 2020, MIC held a "Roundtable Conference on the Ideal Postal Services in the Digital Age" (hereinafter the "Conference").[59] The Conference released a final report of recommendations on: utilization of data at the Japan Post Group and post offices; contribution by the Japan Post Group to regional revitalization; enhancement of the compliance and group governance at the Japan Post Group; and contribution by the Japan Post Group to SDGs and its efforts for ESG (environment, society and governance) in July 2021.

Considering the recommendations of the final report, with the aim of promoting effective utilization of data held by the Japan Post Group while at the same time protecting privacy of correspondence and personal information, since October 2021, MIC has held a "Study Group on Utilizing Post Office Data and Ideal Privacy Protection" to study balancing of utilization of data held/acquired by post offices and privacy protection.[60]

iii Promoting monitoring of the Japan Post Group

Since 2018 there have been misconducts inflicting a loss to customers in the Japan Post Group, which include inappropriate sale by Japan Post Insurance and fraudulent use of cashless service in Japan Post Bank. To address this situation, MIC as the supervising ministry of Japan Post Holdings and Japan Post provided guidance and took administrative dispositions as necessary, and monitored their recurrence prevention measures. However, there were still frequent misconducts that damaged public trust in postal services, which included embezzling of a large amount of money by postmasters and abandonment of a mass of postal matters, etc.

Based on the study result of the "Roundtable Conference on the Ideal Postal Services in the Digital Age - Compliance Working Group," MIC put together a basic approach for its supervision, and formulated and released "the Guidelines for Supervision of Japan Post Holdings Co., Ltd. and the Guidelines for Supervision of Japan Post Co., Ltd." In August 2021. In February 2022, MIC set up a postal administration monitoring meeting, which aims to strengthen MIC's supervision system in postal administration and promote proper monitoring of the business sector with the advice of experts.

(3) Contribution to regional revitalization

i Supporting utilization of post offices

Under the "Post Office Revitalization Project (by post offices and local governments by using ICT)" that has been promoted since fiscal 2019, MIC implemented demonstration projects to promote monitoring and disaster countermeasures in communities (Miyoshi City, Hiroshima) and to support administrative procedures using digital technologies (Yatsushiro City, Kumamoto, and Ishigaki City, Okinawa) in fiscal 2021.

In January 2022, a "post office monitoring application

[59] https://www.soumu.go.jp/menu_news/s-news/01ryutsu14_02000095.html
[60] https://www.soumu.go.jp/main_sosiki/kenkyu/postaldata_privacy/

that uses smart speakers" that was demonstrated in these projects was launched as a service for local governments by Japan Post. MIC plans to spread the result of the project across the country, while at the same time creating model cases of collaboration of post offices and local governments, etc.

ii Promoting entrustment of municipal affairs

In May 2021, the Act on Handling of Certain Services of Local Governments at Postal Offices (Act No. 120 of 2001) was amended[61] to add administrative processes including issuance and renewal of electronic certificates of individual number cards to the services that post offices may be entrusted with (ex. issuance of public certificates such as copy of the certificates of residence).

MIC also implements a "program to promote use of individual number cards at post offices" using the fiscal 2021 supplementary budget. Under this program, demonstrations are conducted to expand usage of individual number cards at post offices as residents' infrastructure rooted in the community. MIC continues to promote the spread of individual number cards toward further digitalization and regional revitalization.

3. Promoting postal administration in the international field

(1) Response to the Universal Postal Union (UPU)

The Universal Postal Union is a specialized organization of the United Nations and leads various cooperation projects and development of fair and open rules on international mail (ex. rules for handling expansion of cross-border e-commerce) for the purpose of global development of a universal postal service network to further improve convenience of international mail.

MIC makes voluntary contributions to UPU and conducts various cooperation projects, which include: (1) support for construction of a disaster-resistant postal network; (2) support for construction of a postal network with less environmental burden; (3) support for initiatives to use postal networks as infrastructure for social needs including watching over communities and new business development; and (4) raising added value of postal service network by using ICT and other cutting-edge technologies. Through these projects, Japan actively contributes to further development of the international postal network services and fair and open rule making regarding international mail at UPU.

Mr. METOKI Masahiko who served as Chair of the Postal Operations Council from October 2012 to August 2021 was elected Director General of UPU first from Asia at the 27th Universal Postal Union (UPU) Congress held in August 2021. He took up the position in January 2022. (The term of office is four years. One person may be elected up to two terms.)

(2) Supporting overseas development of Japanese postal infrastructure

As part of the "Infrastructure System Overseas Promotion Strategy 2025"[62] (amended in June 2021) of the government, MIC promotes overseas development of Japanese postal infrastructure system. This initiative provides excellent postal technologies and operational knowhow of Japan to India and other emerging and developing countries in Southeast Asia and Eastern Europe to support modernization and upgrading of postal services of the countries. Taking opportunities of renewal or extension of sorting machines or other important postal infrastructure, MIC tries to grasp needs and challenges of overall postal services of the partner countries, explores business opportunities including e-commerce and digital transformation and promotes entry of Japanese businesses with technologies/knowhow in these fields, while at the same time working to win peripheral businesses including equipment to be used in sorting centers.

MIC continues to promote overseas development of Japanese postal infrastructure by advancing the existing cooperation projects with these countries, while implementing basic surveys on postal service conditions of individual regions to identify new partner country candidates.

4. Trends of correspondence delivery

The Act on Correspondence Delivery by Private Business Operators (Act No. 99 of 2002) allowed correspondence delivery service by private business operators. Specified correspondence delivery that provides services not impeding provision of the universal postal service is provided by 586 operators (as of the end of fiscal 2022). The services include: service to go rounds of a fixed route, receive and deliver correspondence at each point; express delivery service within a short distance or limited area; and service similar to telegrams to deliver messages of congratulation or condolences together with a decorated card.

In order to promote understanding of the purpose and the system of correspondence service and ensure appropriate sending of correspondence, MIC disseminates information on the definition of correspondence and the correspondence delivery system.

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[61] The Act on the Arrangement of Related Laws for the Formation of a Digital Society (Act No.37 of 2021) and the Act to Prepare Related Laws for the Promotion of Reform to Enhance Local Autonomy and Independence (Act No. 44 of 2021)

[62] Infrastructure System Overseas Promotion Strategy 2025: https://www.kantei.go.jp/jp/singi/keikyou/pdf/infra2025.pdf

Introduction

Section1

1. 1973 and today: changes in communication tools (Figure 0-1-1-1 in White Paper)

Telephone

(Source) cocolog “a child making a call in the 1970s”, Photo AC

2. 1973 and today: changes in video viewing means (Figure 0-1-1-2 in White Paper)

Television

(Source) Kamijima Digital Archive, InfoCom Research, Inc.

Section2

2. 1973 and today: fields where ICT has come to be used (Figure 0-2-1-2 in White Paper)

Education

Medical care

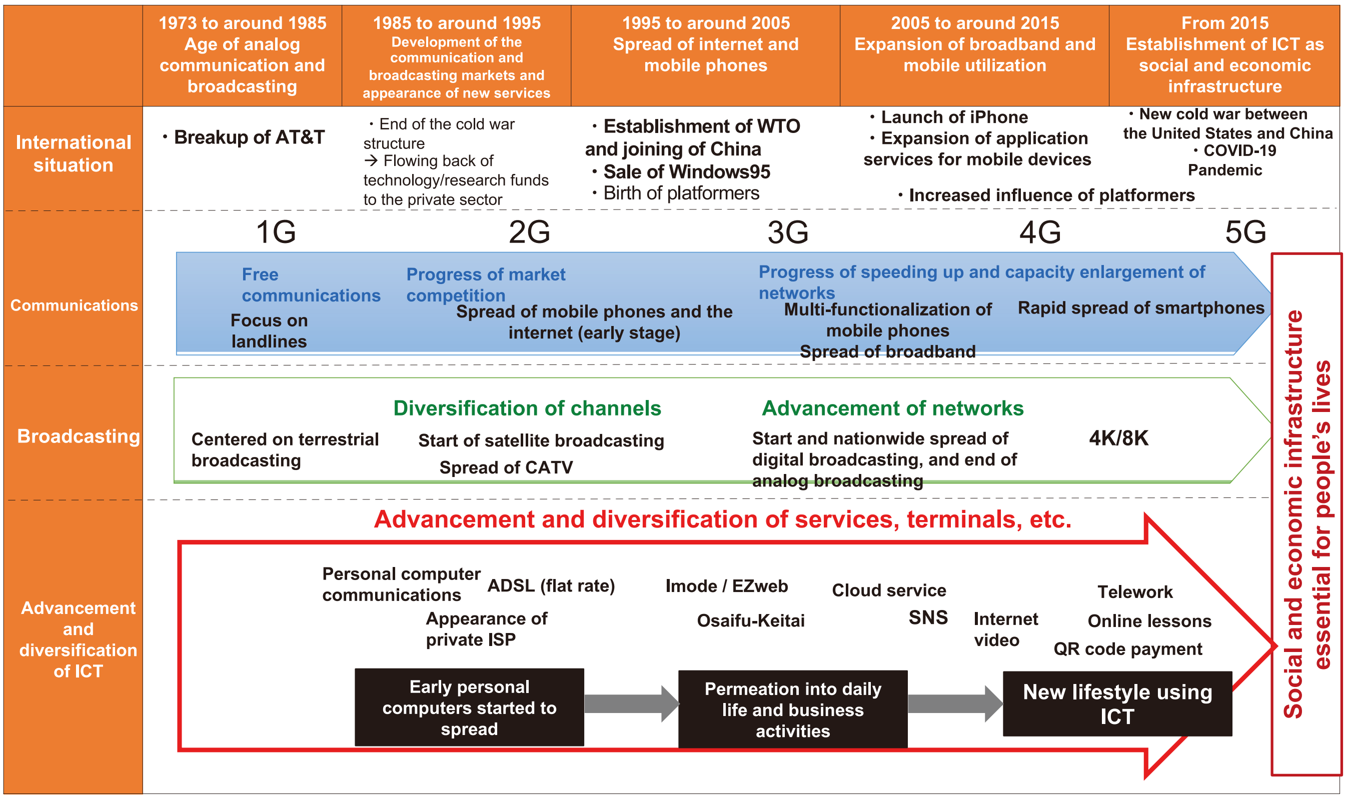
Agriculture

(Source) Chiba City Fire Bureau, Niigata City Konan Elementary School, Photo AC

Chapter 1

Introduction

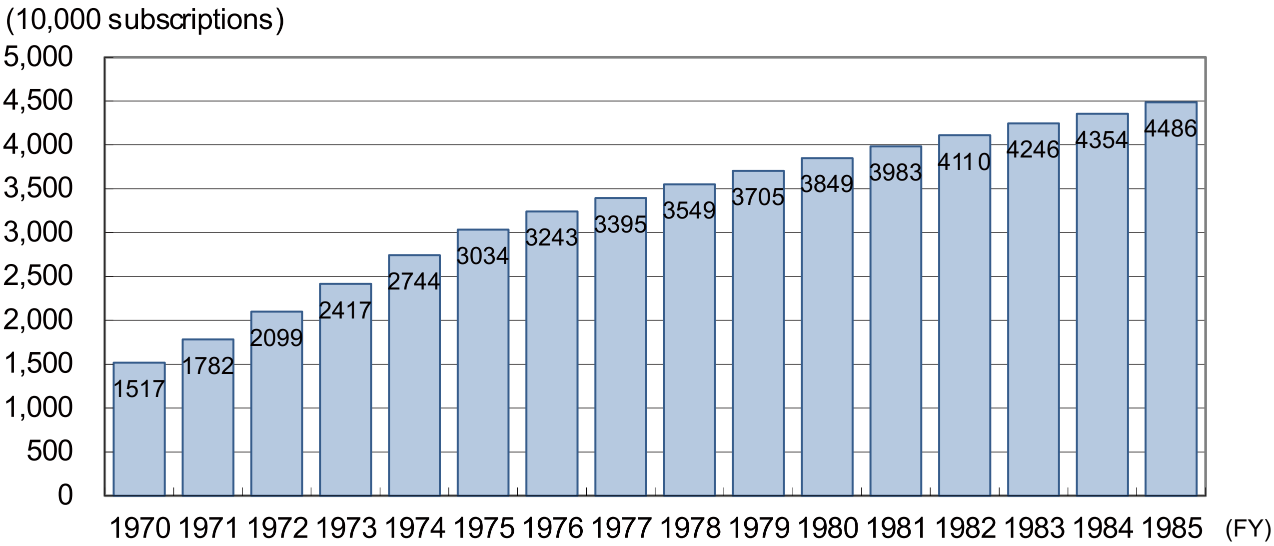
1. Trends in the information and communication field in the past 50 years (Figure 1-0-1-1 in White Paper)



(Source) MIC (2022) "Research Study on Economic Security in Digital Society"

Section1

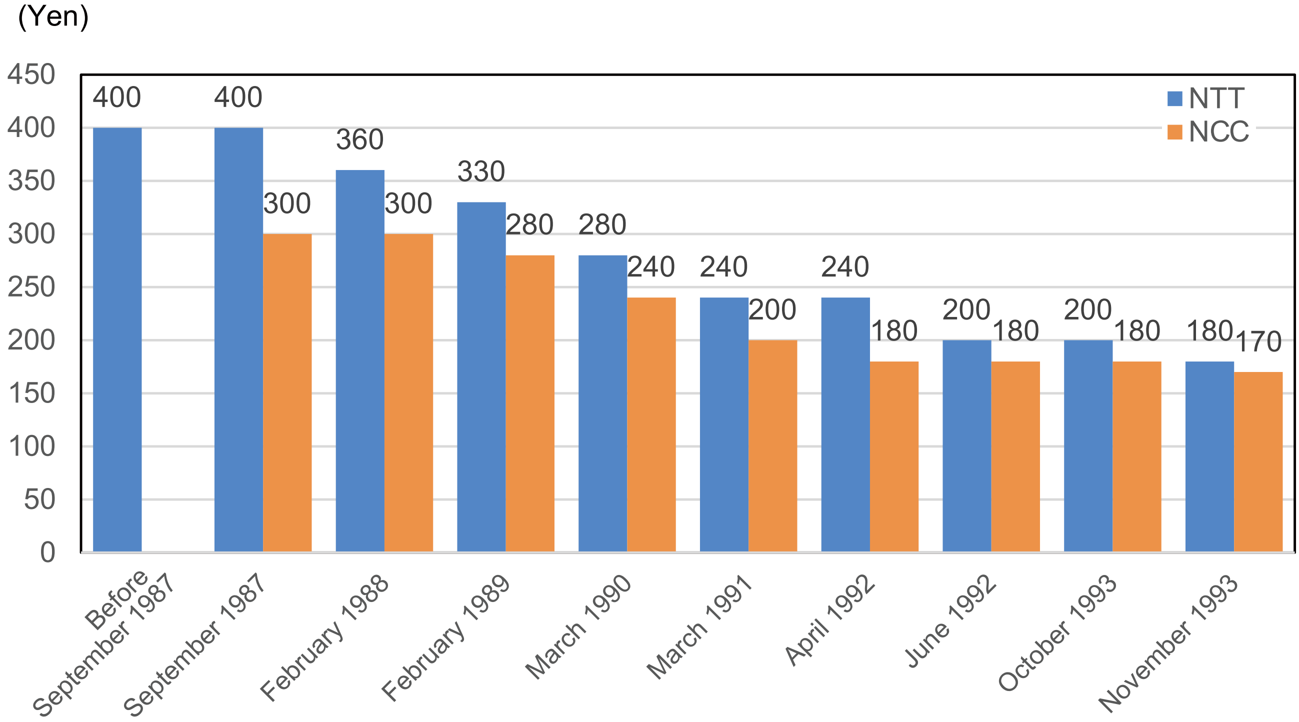
1. Transitions in the number of subscribers with subscription telephones (Figure 1-1-2-1 in White Paper)



(Source) Prepared from History of the Nippon Telegraph and Telephone Public Corporation"

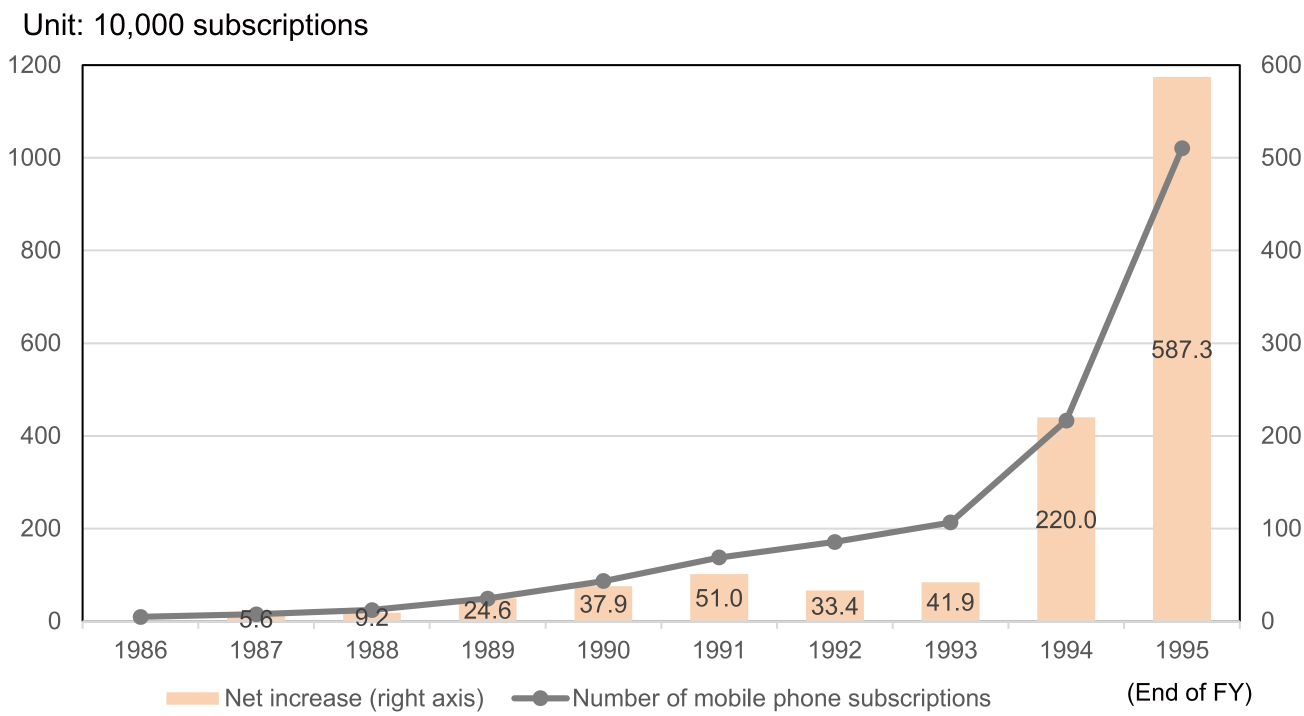
Section2

1. Transitions in charges for long distance telephone calls (Figure 1-2-2-1 in White Paper)



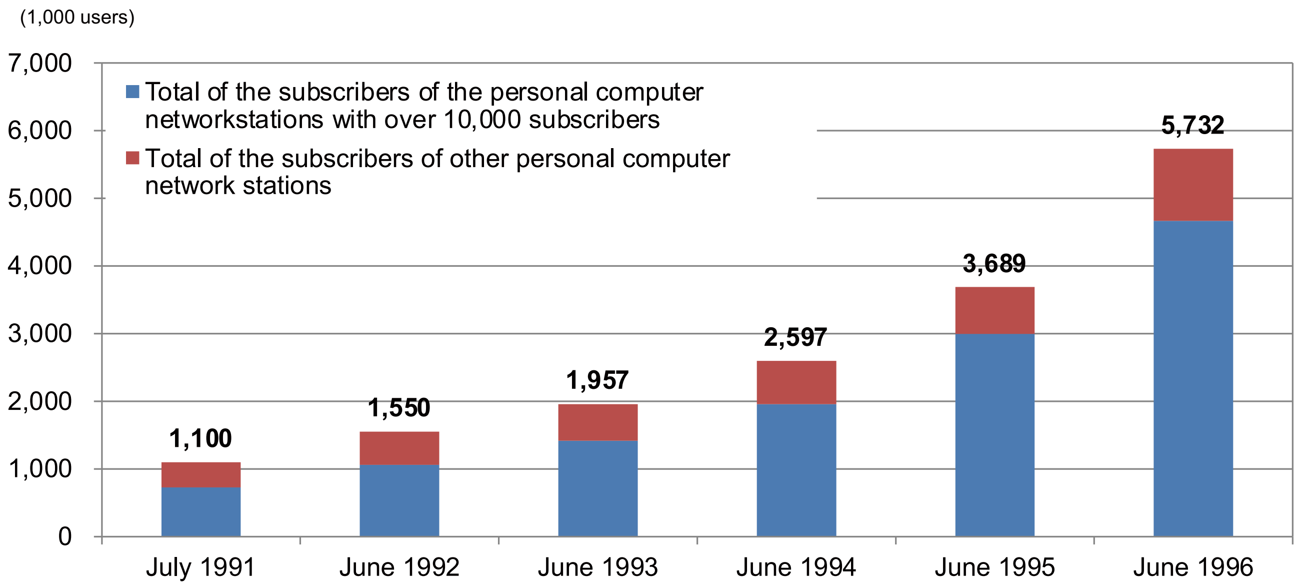
(Source) Prepared from NTT (1996) "10 years of NTT from 1985 to 1995: an overview of its history"

2. Transitions in the number of mobile phone subscribers (Figure 1-2-2-2 in White Paper)



(Source) Prepared from 1997 Communications White Paper

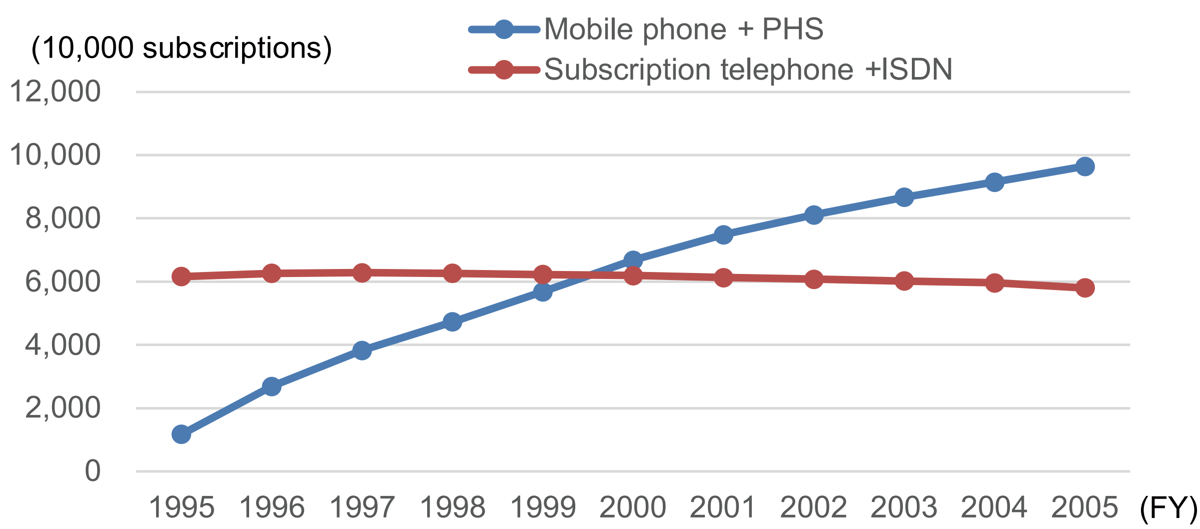
3. Changes in the number of users of personal computer communication (Figure 1-2-2-3 in White Paper)



(Source) Prepared from the 1997 Communications White Paper

Section3

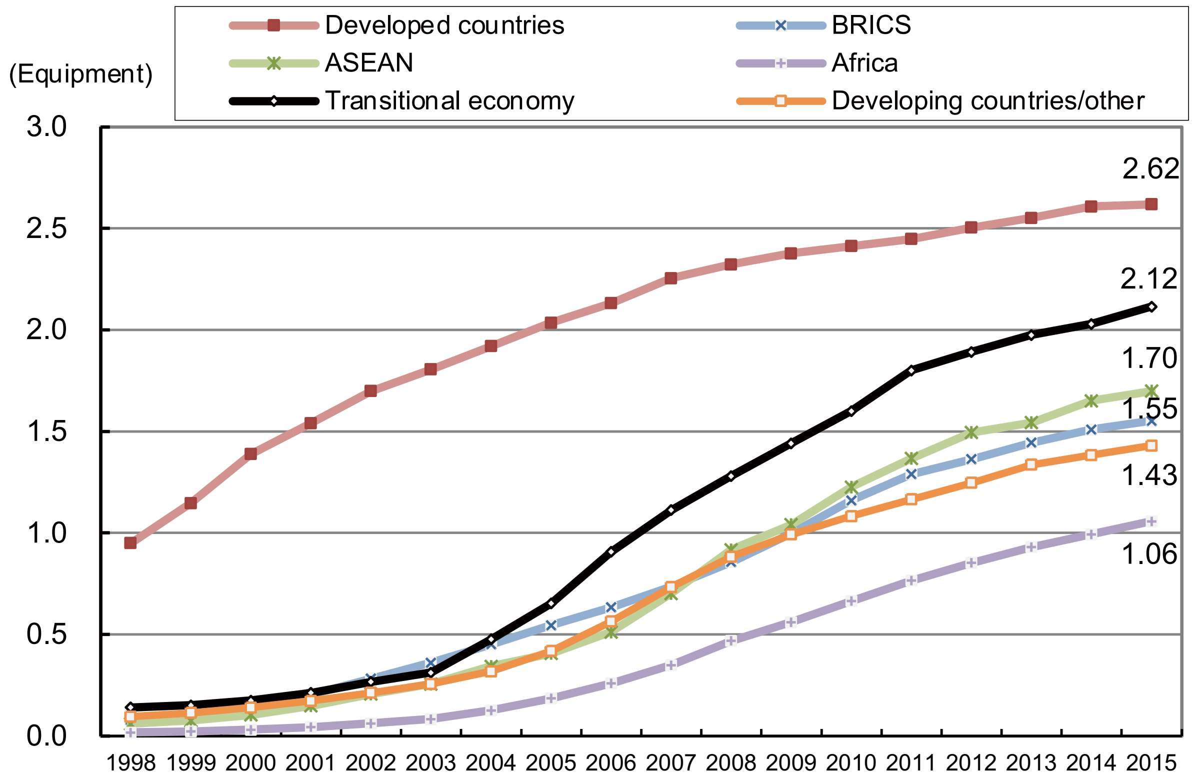
1. Number of subscribers of communication services (Figure 1-3-2-1 in White Paper)



(Source) MIC "Information & Communications Statistics Database"

Section4

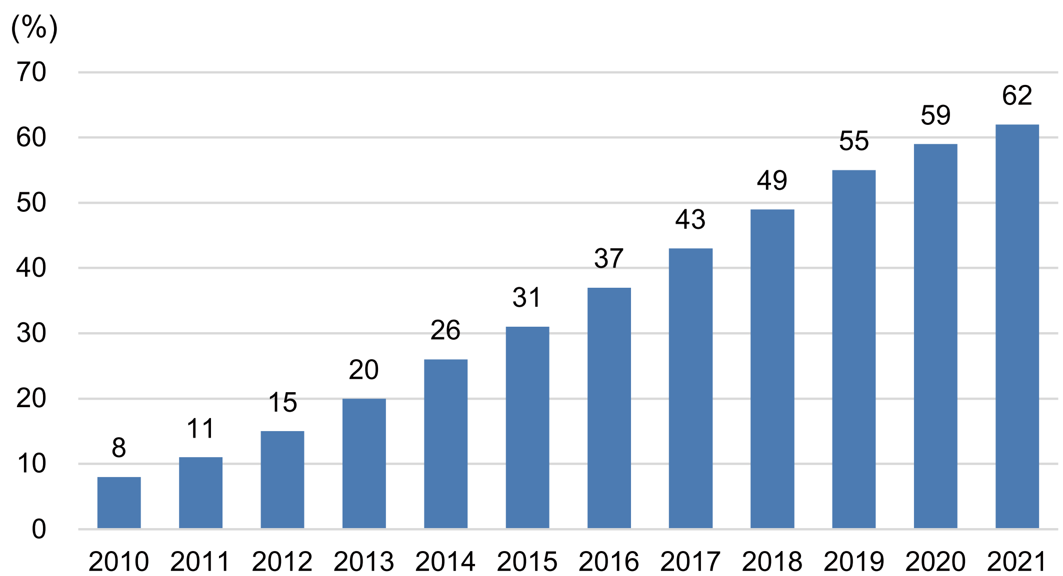
1. Changes in ICT equipment amount per capita by region (Figure 1-4-1-1 in White Paper)



* ICT equipment amount is the sum of the number of fixed landline telephone lines, mobile phone subscribers, fixed broadband internet connections, internet users and households owning computers divided by the population.

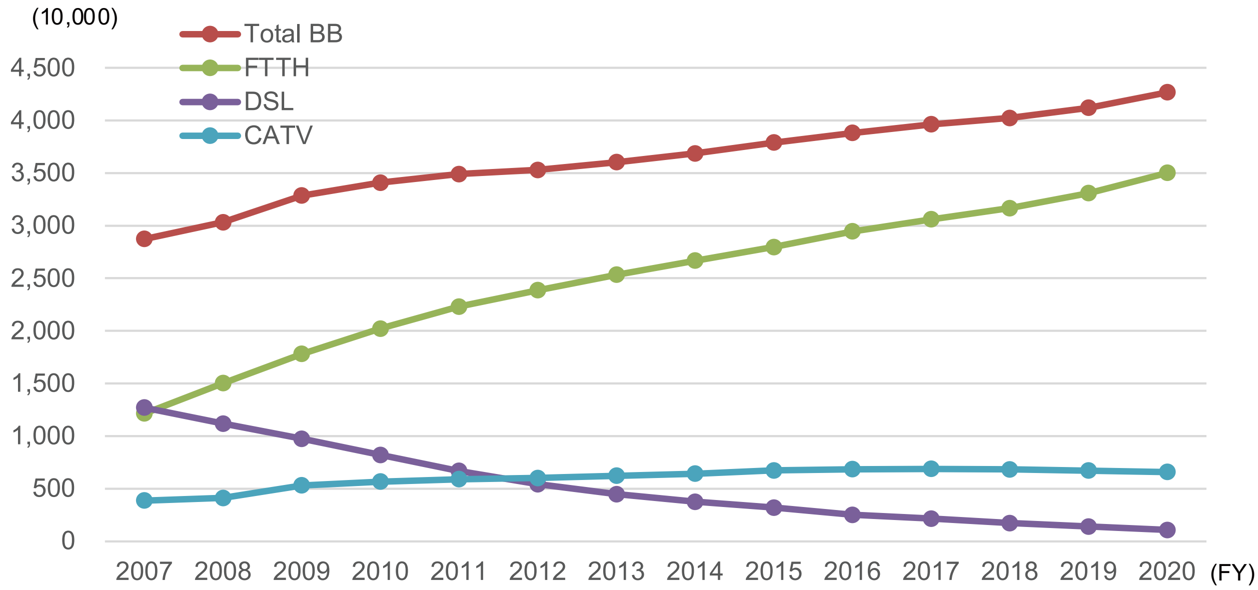
(Source) Noguchi et al. (2018)

2. Transitions in the spread of smartphones in the world (Figure 1-4-1-2 in White Paper)



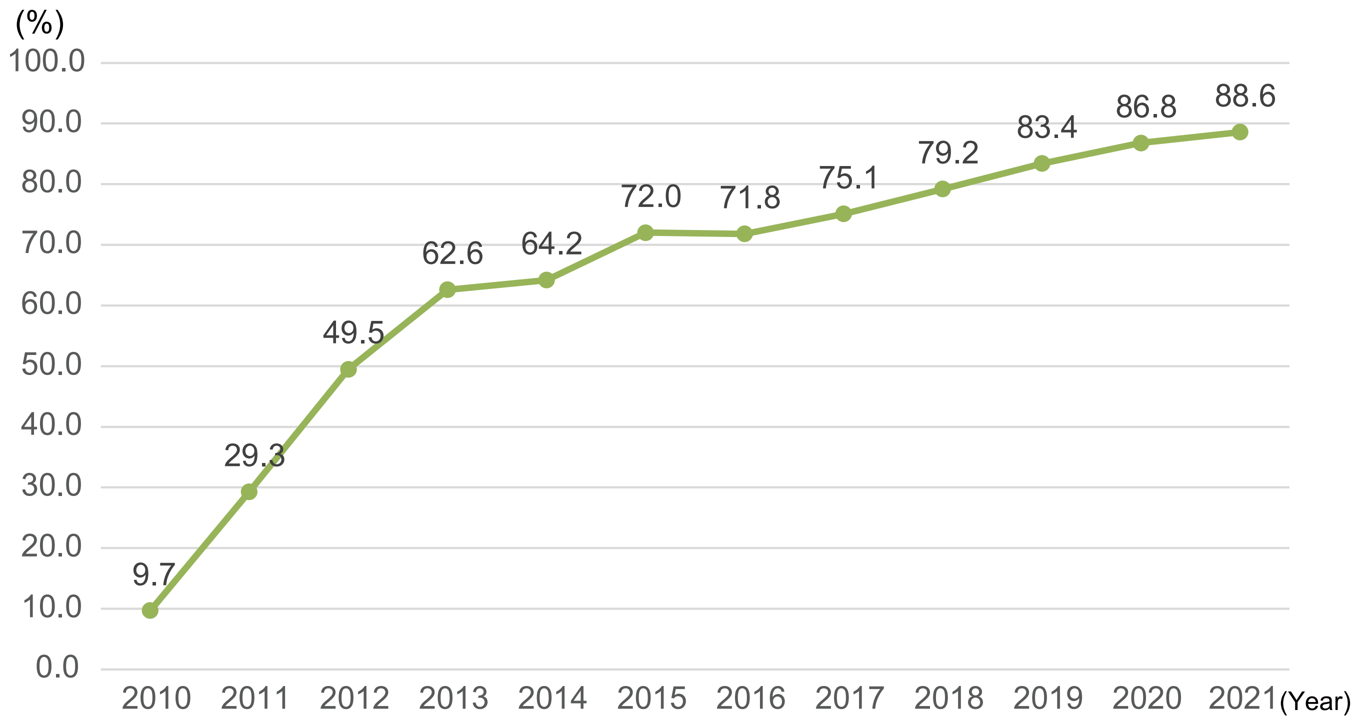
(Source) Prepared based on Statista

3. Changes in the number of fixed broadband subscriptions in Japan (Figure 1-4-2-1 in White Paper)



(Source) MIC “Information & Communications Statistics Database”

4. Changes in the ratio of households with smartphones (Figure 1-4-2-2 in White Paper)



(Source) Prepared from MIC “Communications Usage Trend Survey”

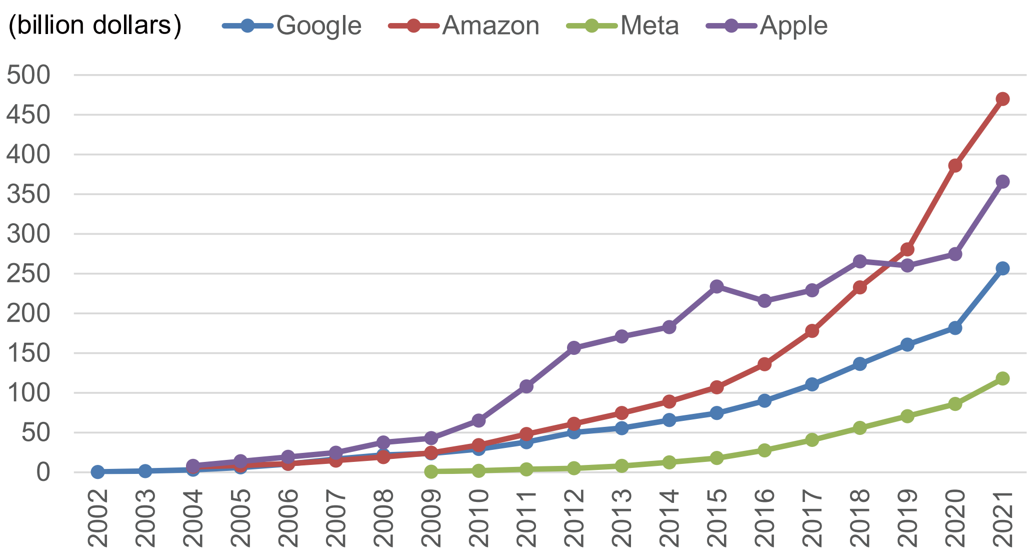
Section5

1. Trends in the initiatives for economic security in the United States and China (Figure 1-5-1-1 in White Paper)

Country	Trends of initiatives for economic security
The U.S.	"The National Strategy for Critical and Emerging Technologies" was released in October 2020. Pillars of the strategy include promoting National Security Innovation and Industrial Base (NSIB) and to protect the country's tech advantages in critical and emerging technologies in order to lead the world in these technologies. The strategy identifies 20 technology area priorities, which include: "Communication and Networking Technologies," "Quantum Information Science," "Semiconductors and Microelectronics" and "Space Technologies." The 2021 Innovation and Competition Act that passed the Senate in June 2021 includes the Endless Frontier Act, the Strategic Competition Act, the Securing America's Future Act (provisions related to the Committee on Homeland Security and Governmental Affairs of the Congress) and the Meeting the China Challenge Act.
China	U.S. sanctions against China (high-tech cold war) made China face the vulnerability of its own supply chains. Starting with Huawei in May 2019, one Chinese high tech company after another were placed on the trade restriction "Entity List", which was designated by the U.S. Department of Commerce under the Export Administration Act, and became unable to procure American products. In order to overcome this weakness, the country announced a policy to upgrade industrial infrastructure, modernize industry chains and promote digitalization in "the 14th Five-year Plan."
Reference Japan	The government held expert meetings for economic security legislation to discuss economic security legislation from technical viewpoints. A bill for ensuring security by integrally taking economic measures with the four pillars of "supply chain," "critical infrastructure," "public-private technical cooperation" and "patent non-disclosure" was submitted to the 2022 ordinary session of the Diet and enacted in May of the same year.

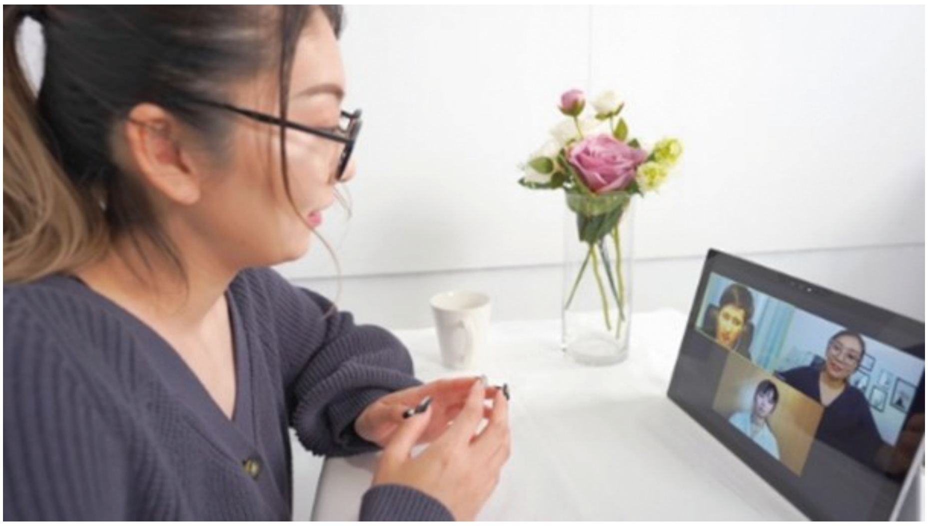
(Source) MIC (2022) "Survey Research on R&D on the Latest Information and Communications Technologies and Trends of Use of Digital Technologies in Japan and Abroad"

2. Changes in the sales of GAFA (Figure 1-5-1-2 in White Paper)



(Source) Prepared based on Statista data

4. Online meeting (Figure 1-5-2-2 in White Paper)

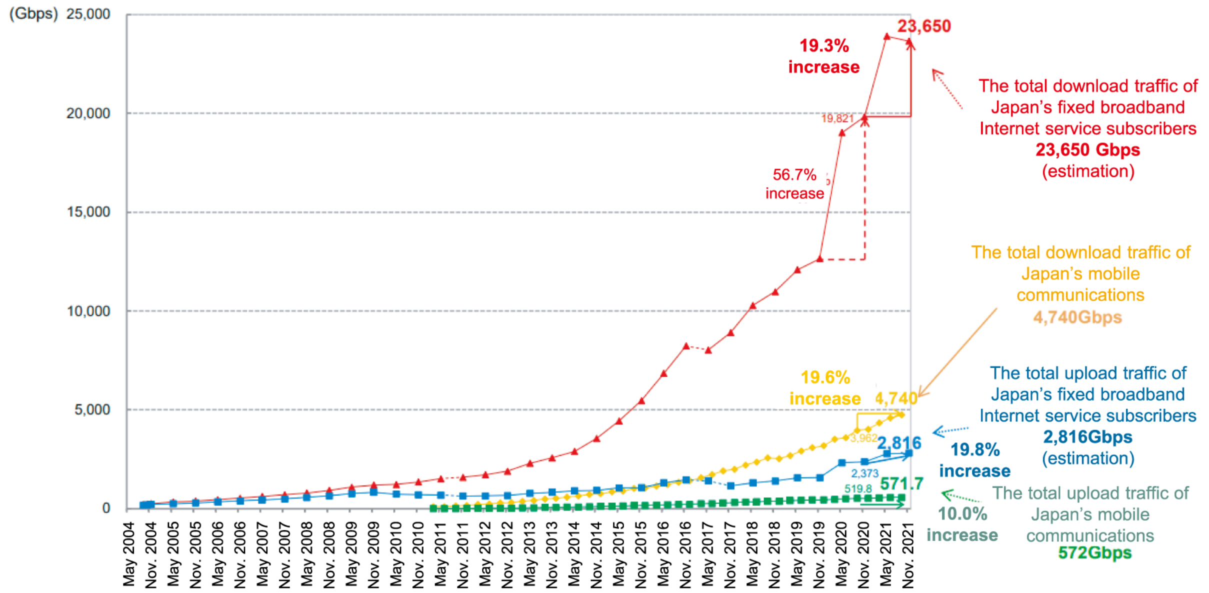


(Source) AC

Chapter 2

Section1

4. Changes in Internet traffic (Figure 2-1-1-4 in White Paper)



(Source) MIC (2022), "Aggregation result of Internet traffic in Japan (in November 2021)"

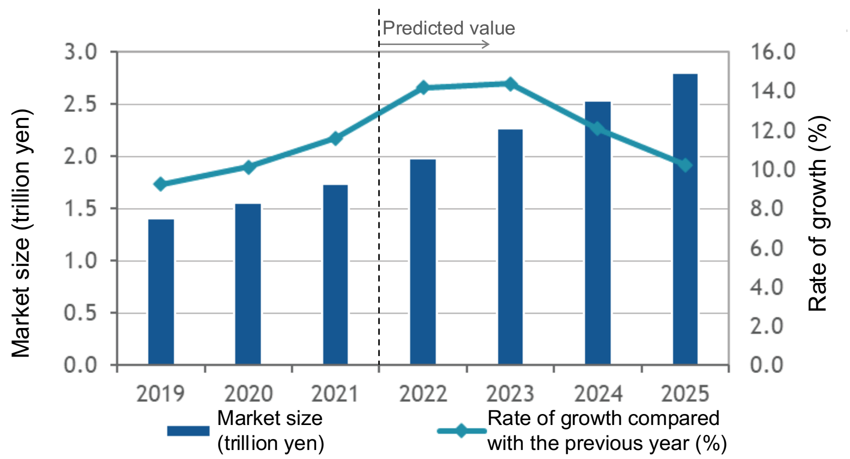
5. Predictions for IT-related power consumption (Figure 2-1-1-5 in White Paper)

Forecast of IT-related power consumption	2016	2030	2050
IP traffic (ZB/year)	4.7	170	20,200
Power consumption (Japan: TWh/year)	41	1,480	176,200
Power consumption (World: TWh/year)	1,170	42,300	5,030,000

(Source) Center for Low Carbon Society Strategy, Japan Science and Technology Agency (2019) "Impact of Progress of Information Society on Energy Consumption (Vol. 1): Current Status and Future Forecast of Data Center Energy Consumption and Technical Issues"

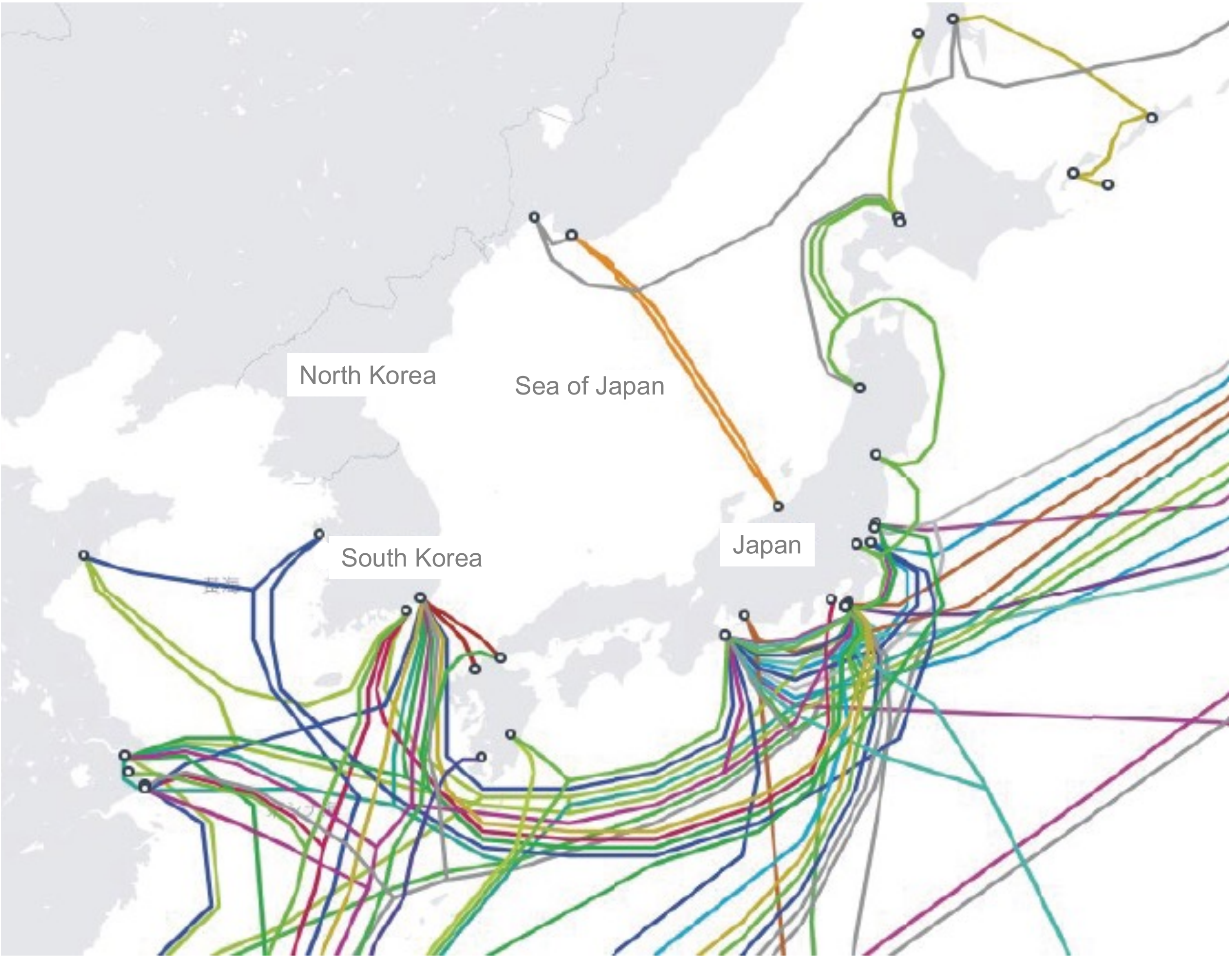
Section2

Changes and forecasts for the size (sales) of the data center service market in Japan (Figure 2-2-1-1 in White Paper)



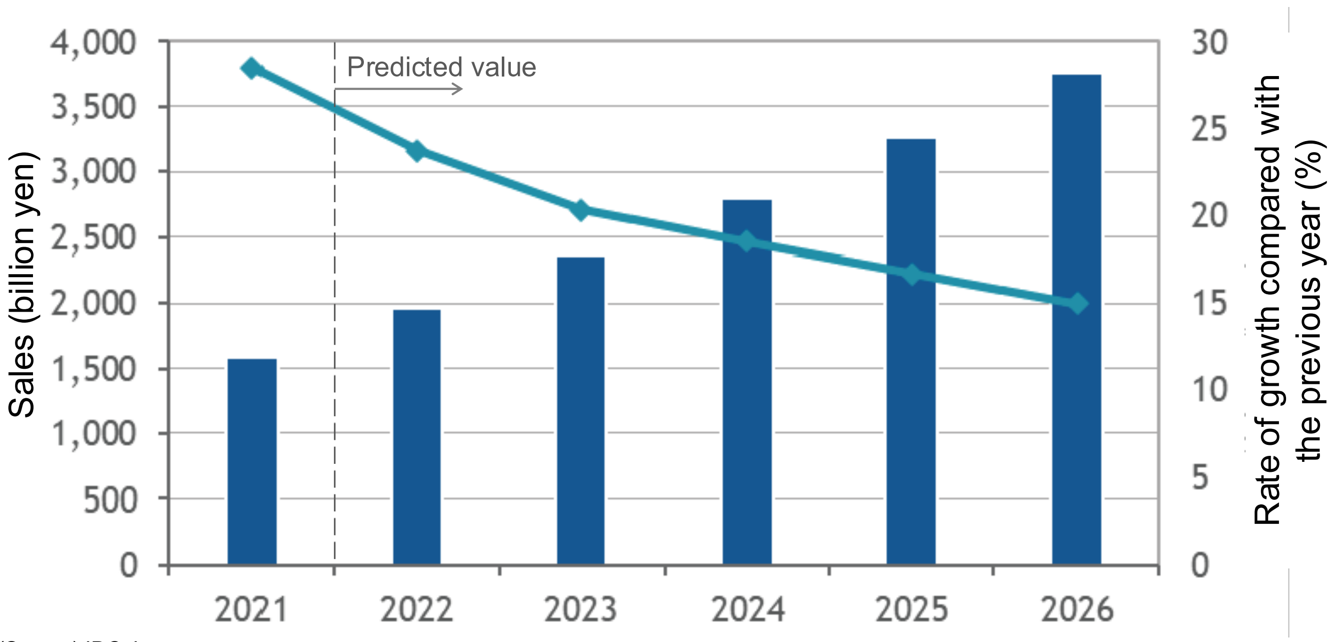
(Source) IDC Japan

2. Map of submarine cables laid around Japan (Figure 2-2-1-2 in White Paper)



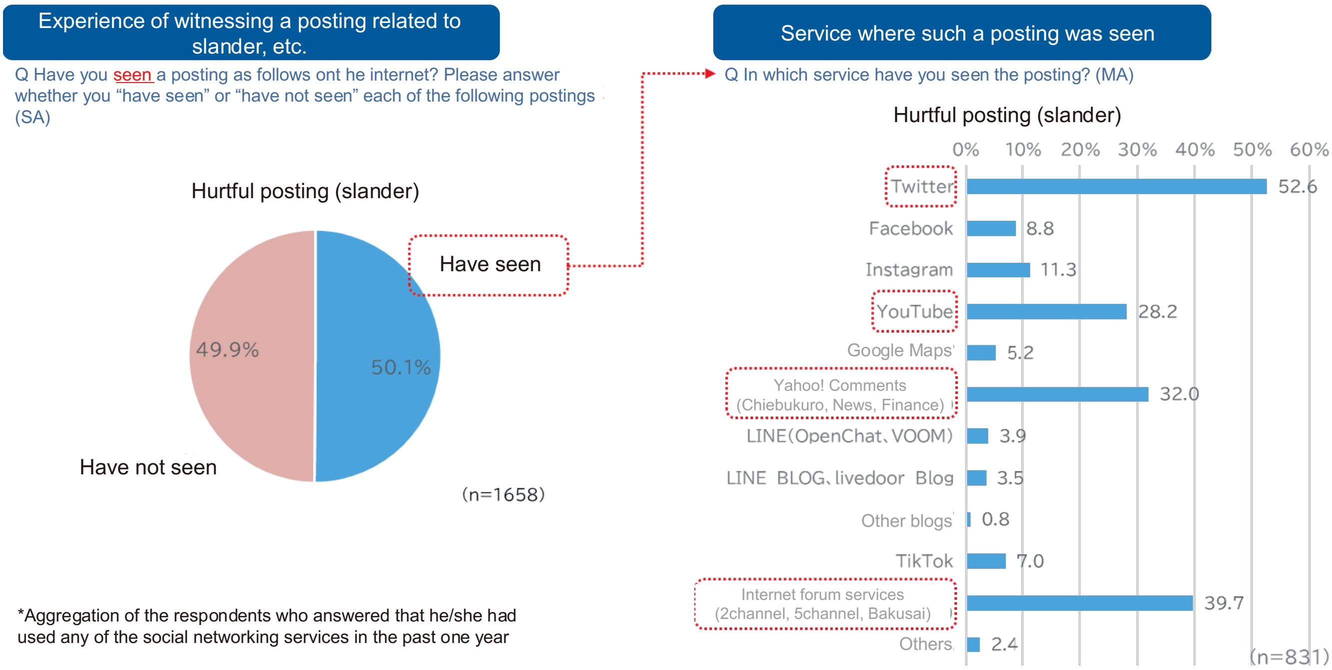
(Source) TeleGeography, “Submarine Cable Map“

3. Changes and forecasts for the market size (sales) of public cloud service in Japan (Figure 2-2-1-3 in White Paper)



(Source) IDC Japan

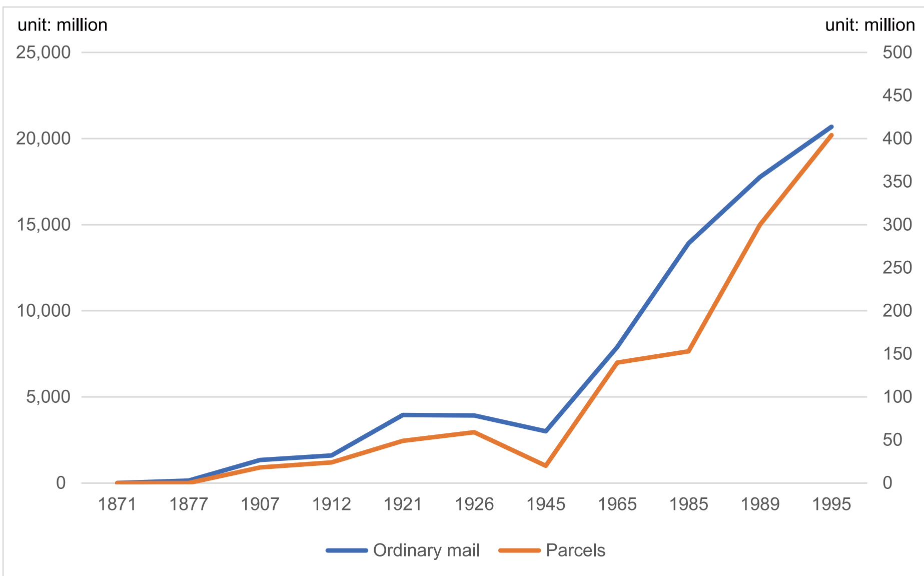
5. Experience of witnessing a post related to slander, etc. and the service where such posts were found (Figure 2-2-3-1 in White Paper)



(Source) From Material 5 of MIC Study Group on Platform Services (36th meeting)

Column1

1. Changes in postal volume



	1871	1877	1907	1912	1921	1926	1945	1965	1985	1989	1995
Ordinary mail	0.6	143	1,340	1,606	3,944	3,915	3,007	7,898	13,917	17,767	20,683
Parcels	0	0	18	24	49	59	20	140	153	300	404

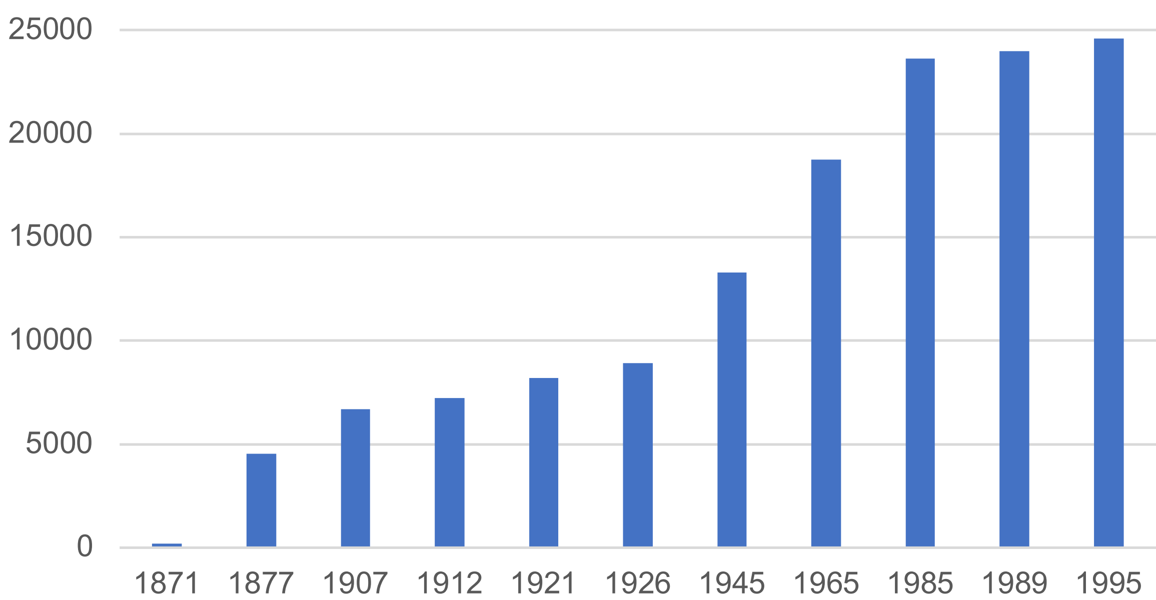
(Source) Excerpt from Nakamura (1997)

2. Model cities of the Utopia Vision

Note
Shiogama/Taga Area: Shiogama City, Tagajo City, Shichigahama Town
Kanazawa Area: Kanazawa City, Nonoichi Town, Uchinada Town
Matsuyama Area: Matsuyama City, Matsumae Town, Tobe Town, Shigenobu Town

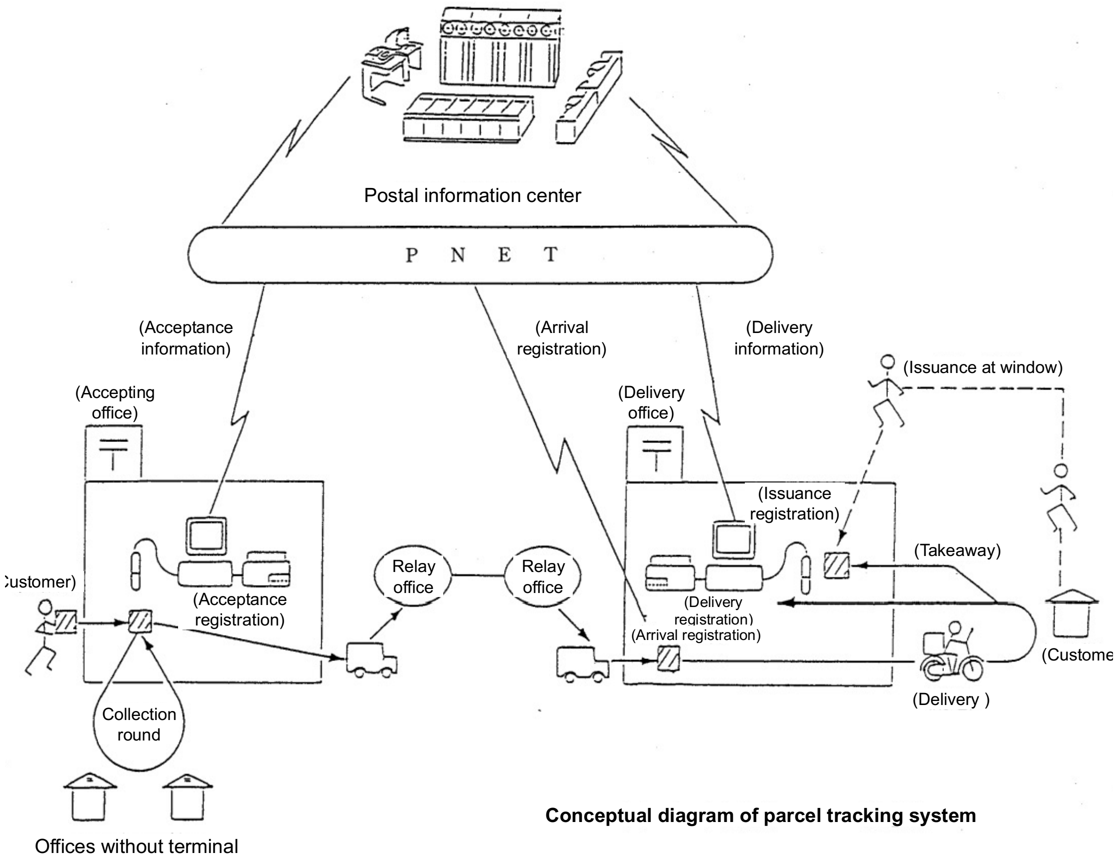
(Source) Excerpt from 1989 Communications White Paper

3. Changes in the number of postal service facilities



(Source) NAKAMURA Yoshiaki (1997), “Transition of Postal Undertaking over 100 years -From Railroad Horse to Car &Airplane, from Manual Handling to Machine Processing” Japan Society of Mechanical Engineering, Vol.100, No.939, pp.177-184.
https://www.jstage.jst.go.jp/article/jsmemag/100/939/100_KJ00003054331/_pdf/-char/ja

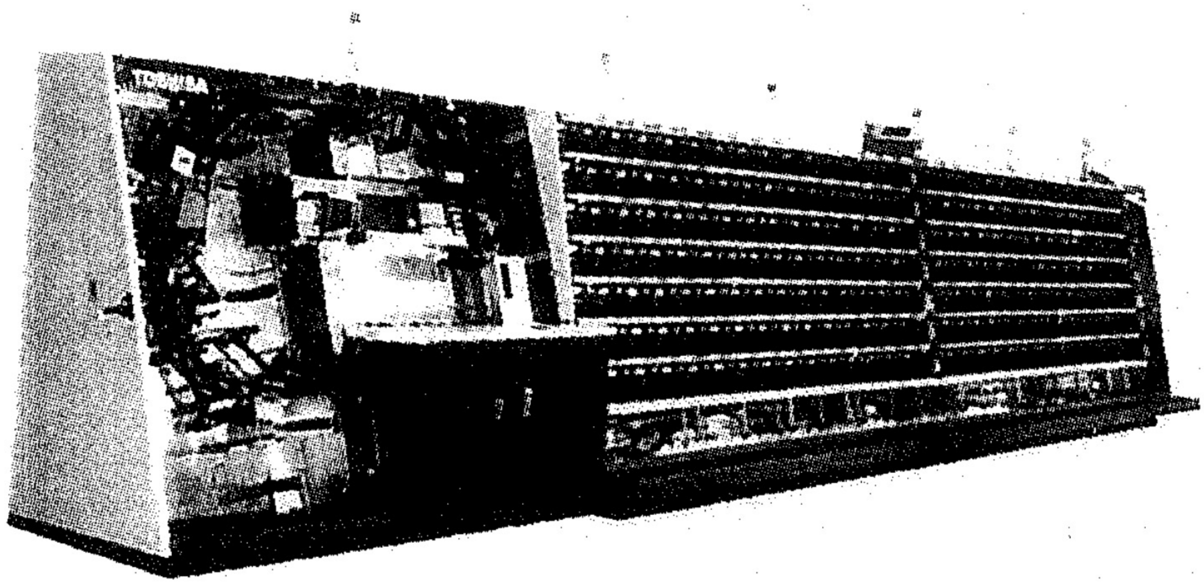
4. Parcel tracking system



Conceptual diagram of parcel tracking system

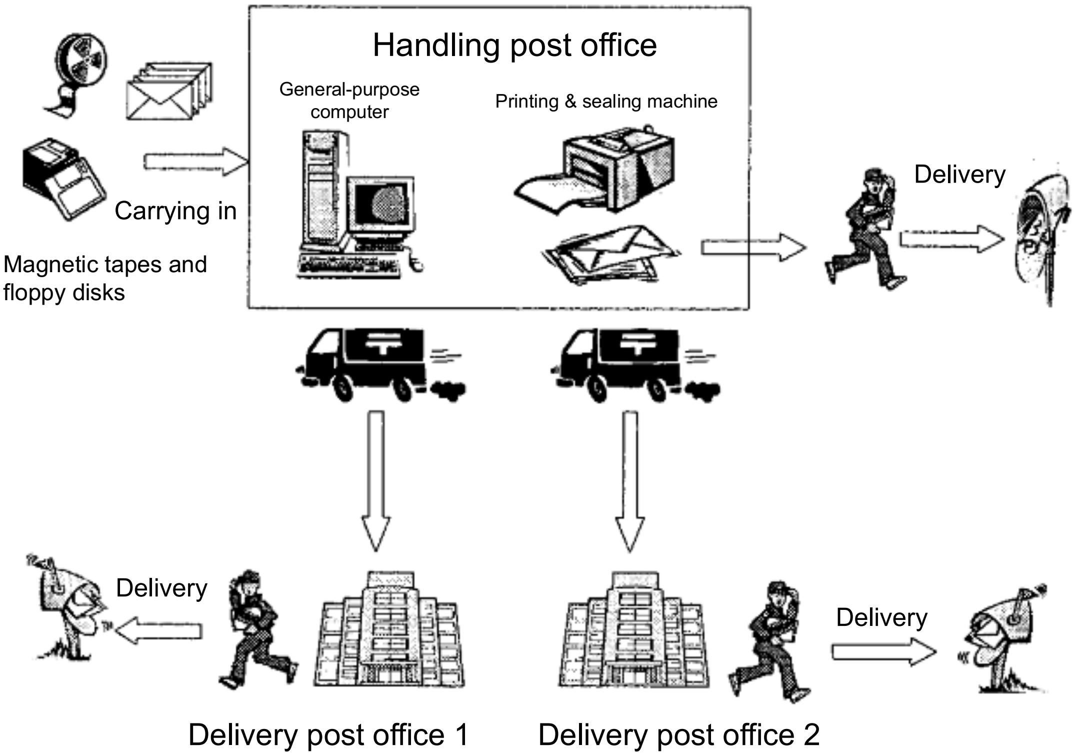
(Source) NAKAMURA Yoshiaki (1997), "Transition of Postal Undertaking over 100 years -From Railroad Horse to Car &Airplane, from Manual Handling to Machine Processing" Japan Society of Mechanical Engineering, Vol.100, No.939, pp.177-184.
https://www.jstage.jst.go.jp/article/jsmemag/100/939/100_KJ00003054331/_pdf/-char/ja

5. Automatic postal code reading and sorting machine



(Source) NAKAMURA Yoshiaki (1997), "Transition of Postal Undertaking over 100 years -From Railroad Horse to Car &Airplane, from Manual Handling to Machine Processing" Japan Society of Mechanical Engineering, Vol.100, No.939, pp.177-184.
https://www.jstage.jst.go.jp/article/jsmemag/100/939/100_KJ00003054331/_pdf/-char/ja

6. Process of digital postal service



(Source) MITSUYA Yuichi, “Digital Postal Service – New Postal Service of Internet Age” UNYSIS TECHNOLOGY REVIEW, No.73, May 2002. https://dl.ndl.go.jp/info:ndljp/pid/8559771

7. Services provided in model cities of Yu-topia Vision (the first designated cities)

(As of the end of FY1989)

Service menu \ Model city	Musashino City	Utsunomiya City	Sakura City	Odawara City	Matsumoto City	Numazu City	Takayama City	Kanazawa area	Wakayama City	Nishinomiya City	Matsue City	Hofu City	Matsuyama area	Kurume City	Miyazaki City	Yamagata City	Shiogama area	Otaru City	Hakodate City	Naha City
1 Issuing illustrated postcards	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
2 Developing and introducing travel brochures	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
3 Developing and introducing Hometown Parcels	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
4 Holding culture schools	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
5 Forming elderly pen pal circles	○	○	○	○	○	○	○	○	○	○	○	○	○	○			○		○	○
6 Offering post office conference facilities for use		○			○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
7 Offering space in post office lobby	○	○			○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
8 Ensuring a community space		○	○		○			○	○			○	○	○					○	
9 Installing new media equipment	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
10 Setting up small post offices		○	△	○	○		○	○	○	○	○	○	○	○	○	○	○	○	△	
11 Setting up letter presentation spots	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
12 Setting up memorial posts	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
13 Accepting Letax user terminal	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○
14 Cyclic collection and delivery	○			○																
15 Town Mail		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
16 Heart Letax	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○
17 Gift Letax		○	○	○				○			○				○					
18 DM support service	○	○											○							
19 Select Post service	○										○					○				○
20 International correspondence service					○	○	○		△		○	○	○						△	○
21 Sister city commemorative service		○		○	○	○							○						○	
22 Enhancement of overseas Hometown Parcels								○												

*Circles in the table indicate services implemented or in operation. Triangles indicate services in preparation.

(Source) 1990 White Paper - Communications in Japan
https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h02/html/h02b0220.html

8. Affairs handled by postal service offices

Issuance of certificates

Acceptance of requests for issuance of the following and issuance of copies and certificates (requested by the person):

① Copy of the family register
② Certificate of tax payment
③ Copy of the person's alien registration file and certificate of matters entered in an alien registration file
④ Copy of the certificate of residence, certificate of items entered in the certificate of residence
⑤ Copy of the attachment to a family register
⑥ Seal registration certificate

Examples of the services provided at post office service counter

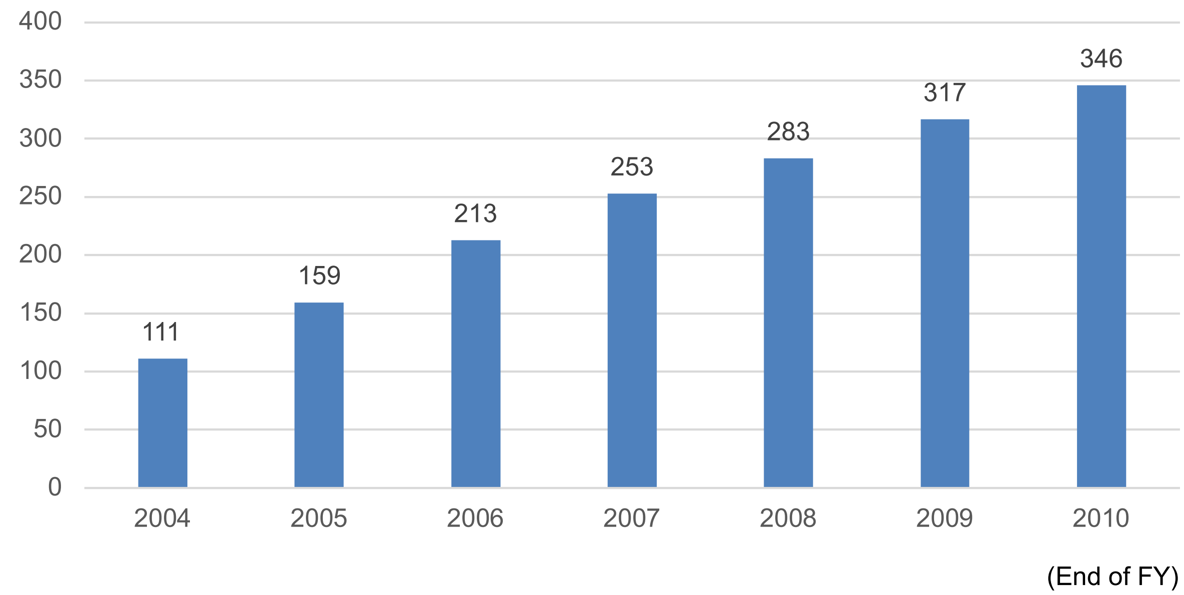
① Selling of tickets for municipal bus, garbage disposal tickets, excretion treatment tickets and garbage bags
② Intermediary of applications for use of public facilities/learning courses

Examples of the services by external staff

① Dropping by and talking with the elderly, delivering commodities, etc.
② Delivery of library books and returning to libraries
③ Providing information about illegal waste dumping

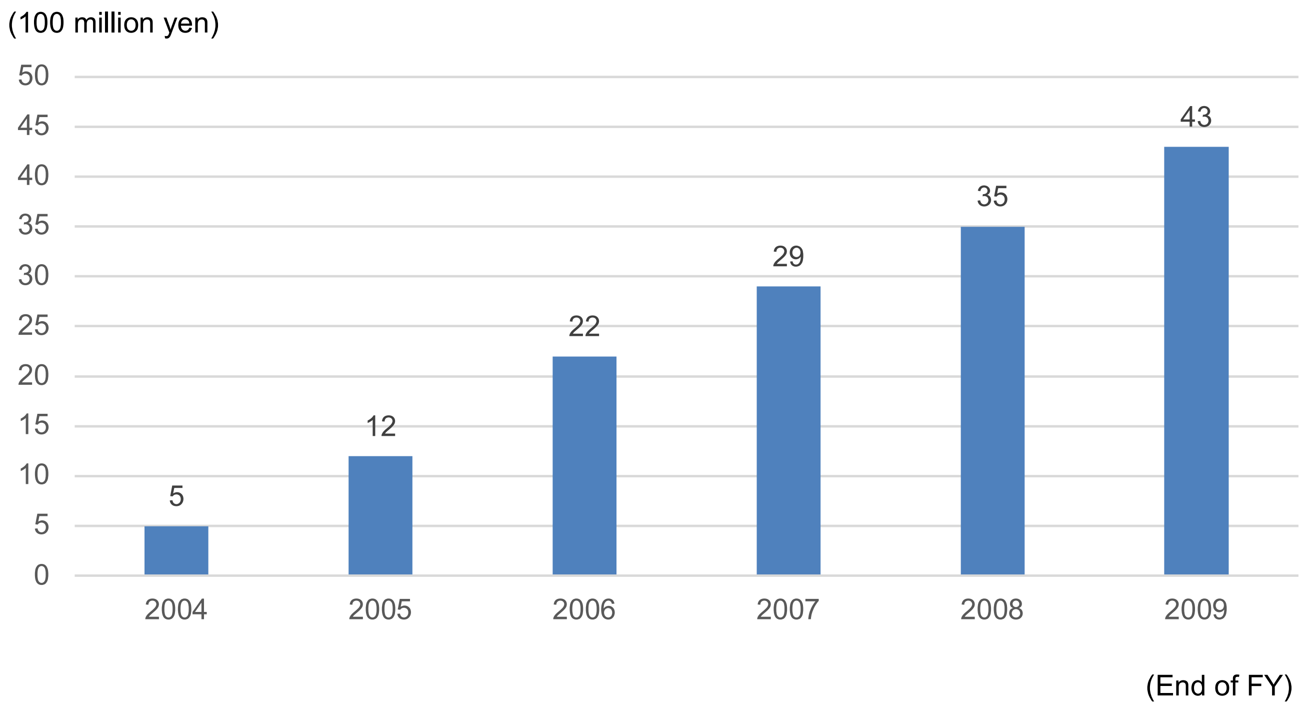
(Source) 2002 White Paper – Information and Communications of Japan
https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h14/html/E3092000.html

10. Changes in the number of specified correspondence delivery service providers



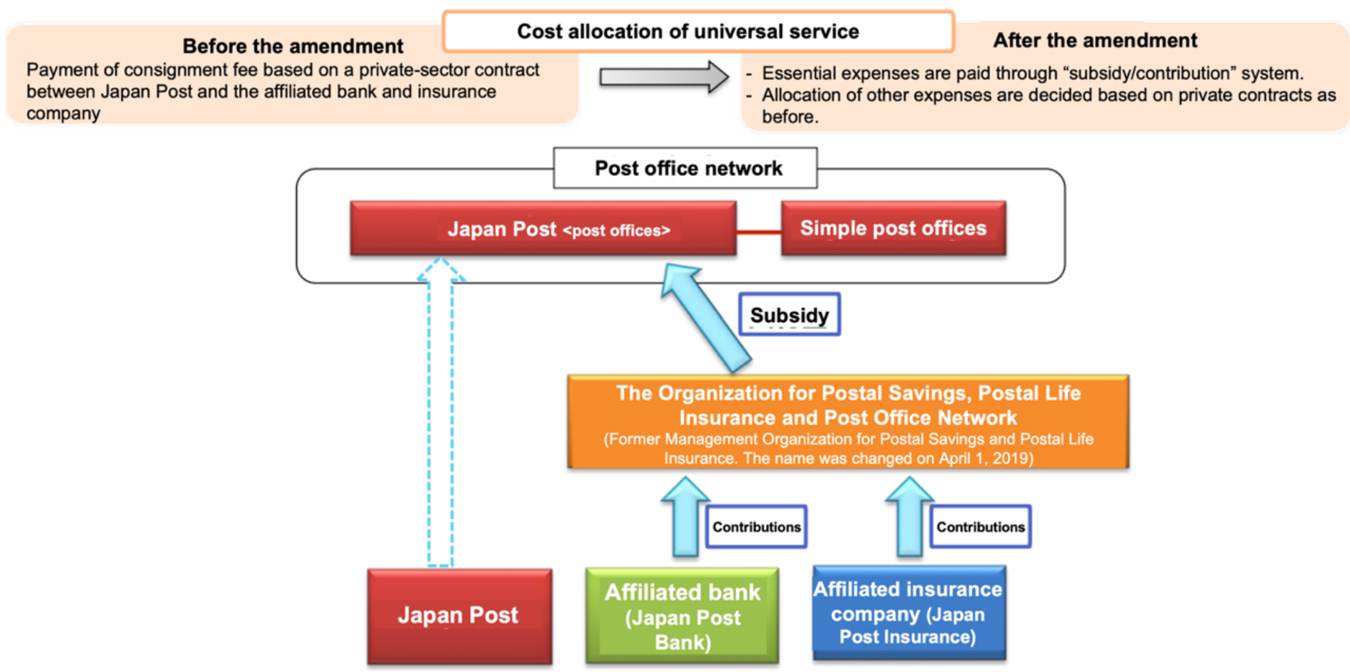
(Source) 2011 White Paper – Information and Communications of Japan
https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h23/html/nc347210.html

11. Changes in the sales of correspondence delivery service providers



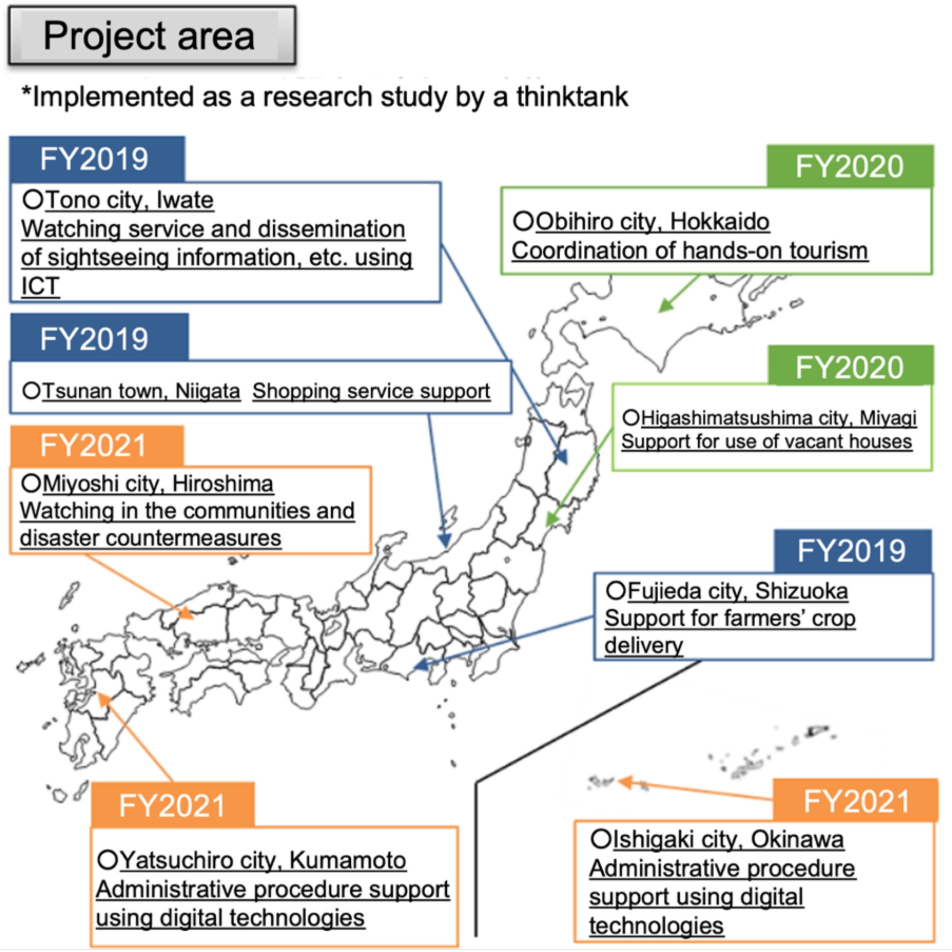
(Source) 2011 White Paper – Information and Communications of Japan
https://www.soumu.go.jp/johotsusintokei/whitepaper/ja/h23/html/nc347220.html

12. Subsidy/contribution system



(Source) MIC, "Commencement of a subsidy/contribution system to support the maintenance of the post office network" (April 11, 2019)
https://www.yuseimineika.go.jp/iinkai/dai201/siryou201-2.pdf

13. Post office revitalization project

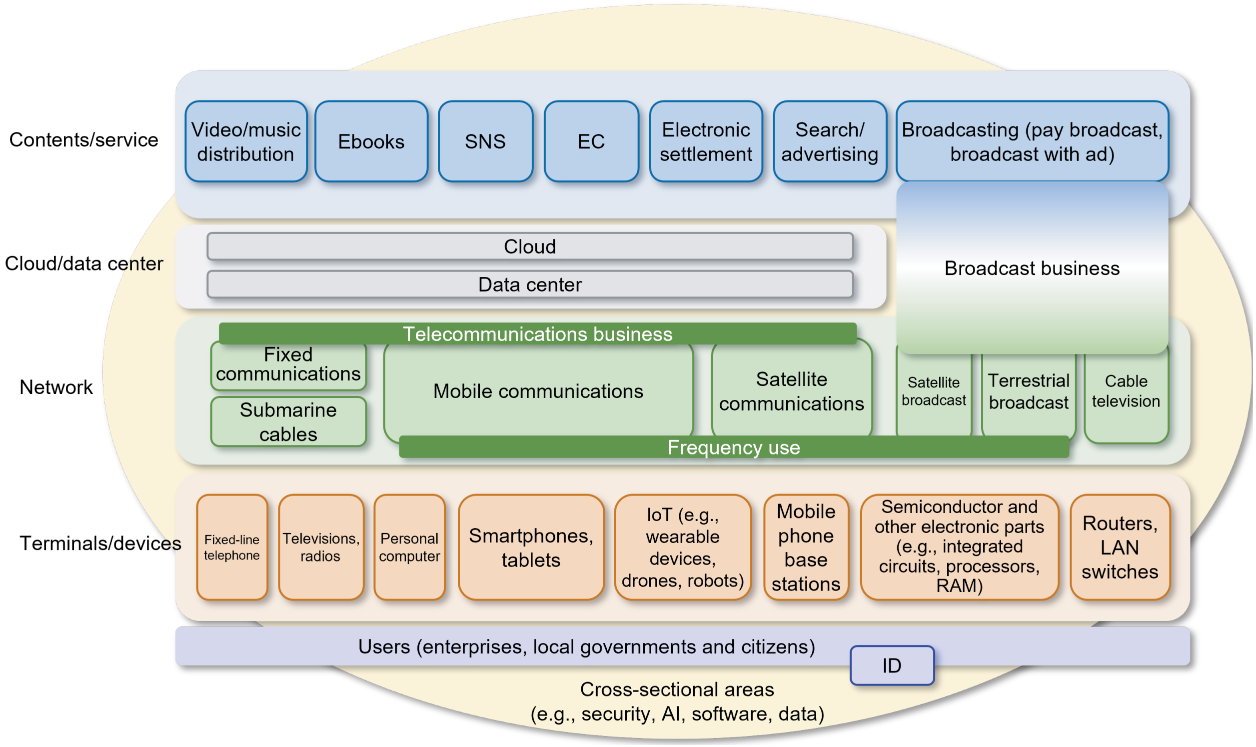


(Source) MIC "Post office revitalization project (post offices, local governments and ICT)"
https://www.soumu.go.jp/yusei/kasseika.html

Chapter 3

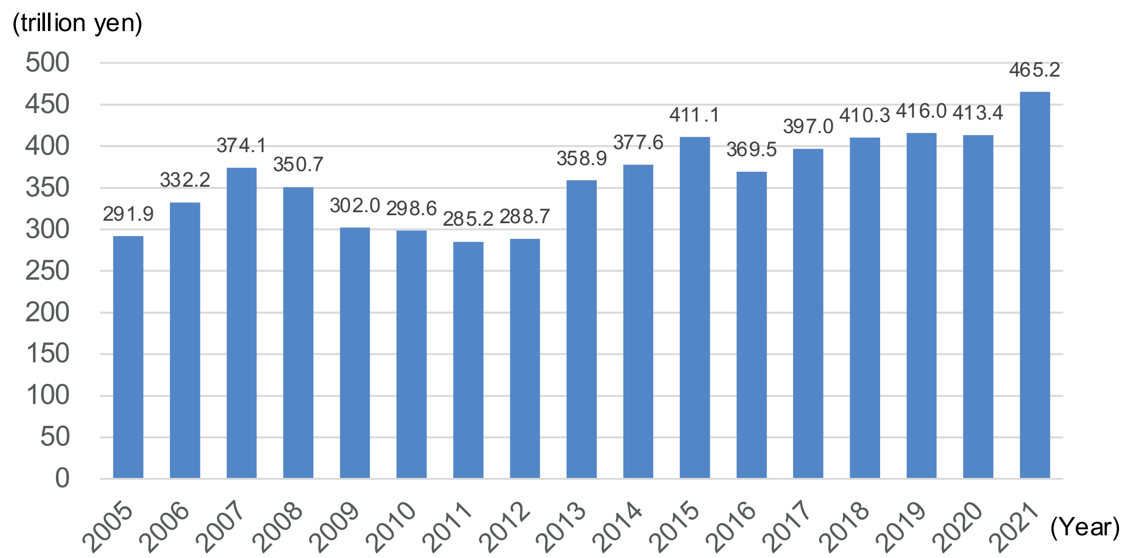
Section1

1. Layered market structure around ICT (Figure 3-1-1-1 in White Paper)



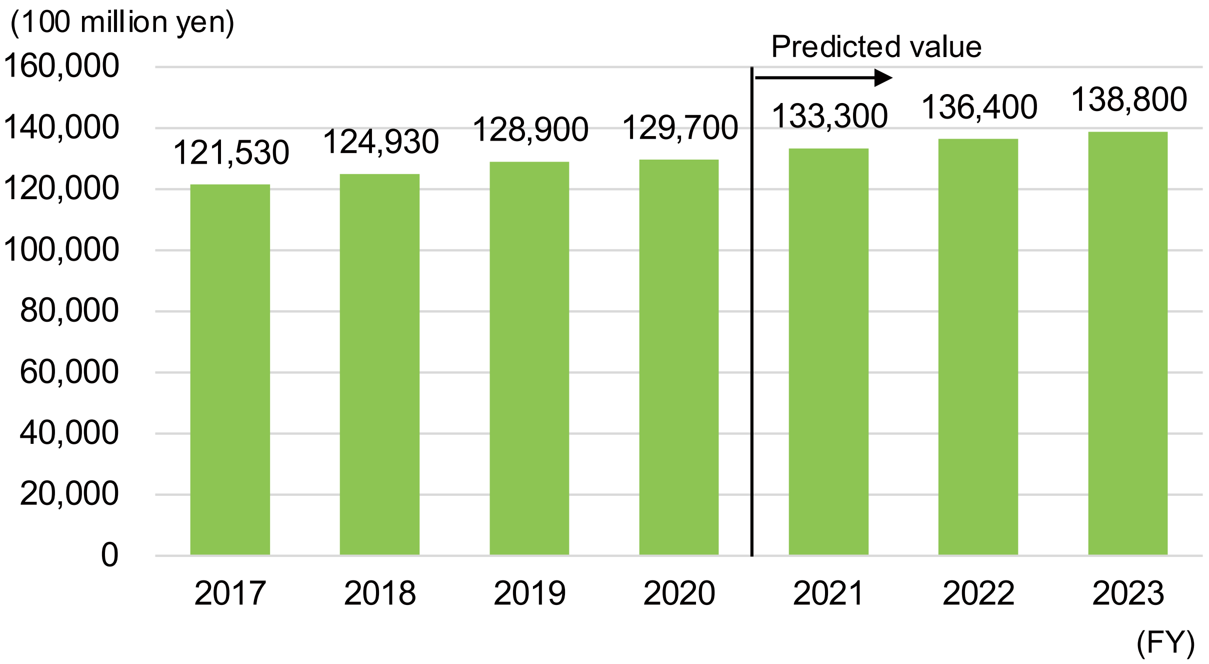
(Source) MIC

2. Changes in the size of the global ICT market (in terms of expenditure) (Figure 3-1-1-2 in White Paper)



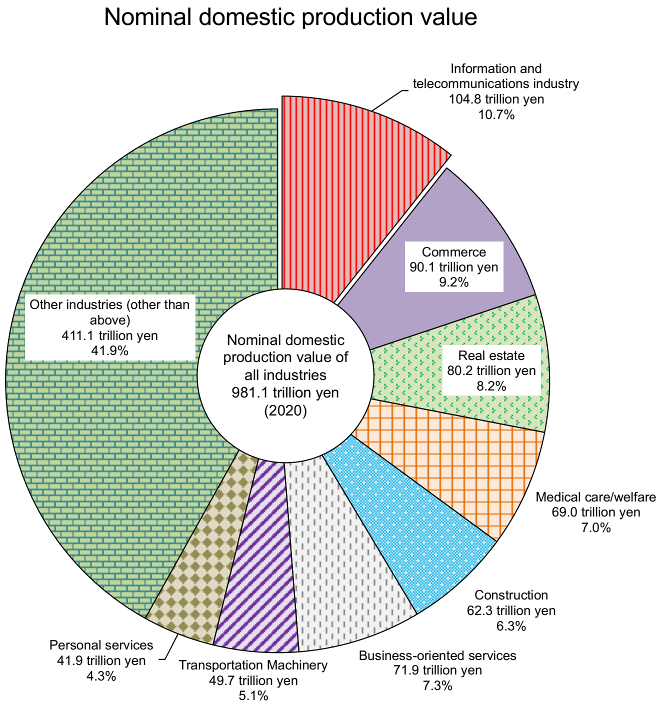
(Source) Statista (Gartner)

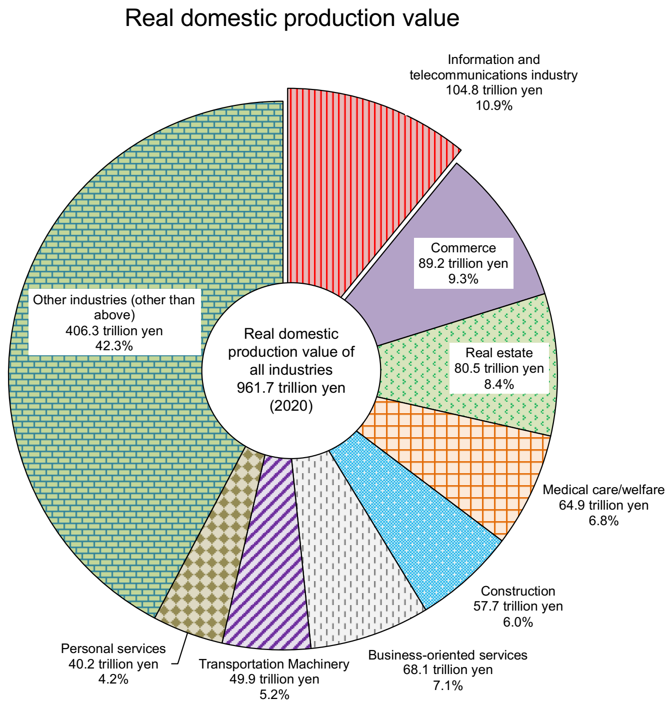
3. Changes and forecasts for the ICT market (ICT investment by private sector) in Japan (Figure 3-1-1-3 in White Paper)



(Source) Yano Research Institute, “IT Investment by Domestic Companies 2021” released on November 18, 2021

4. Nominal and real domestic production values of major industries (breakdown of 2020)*

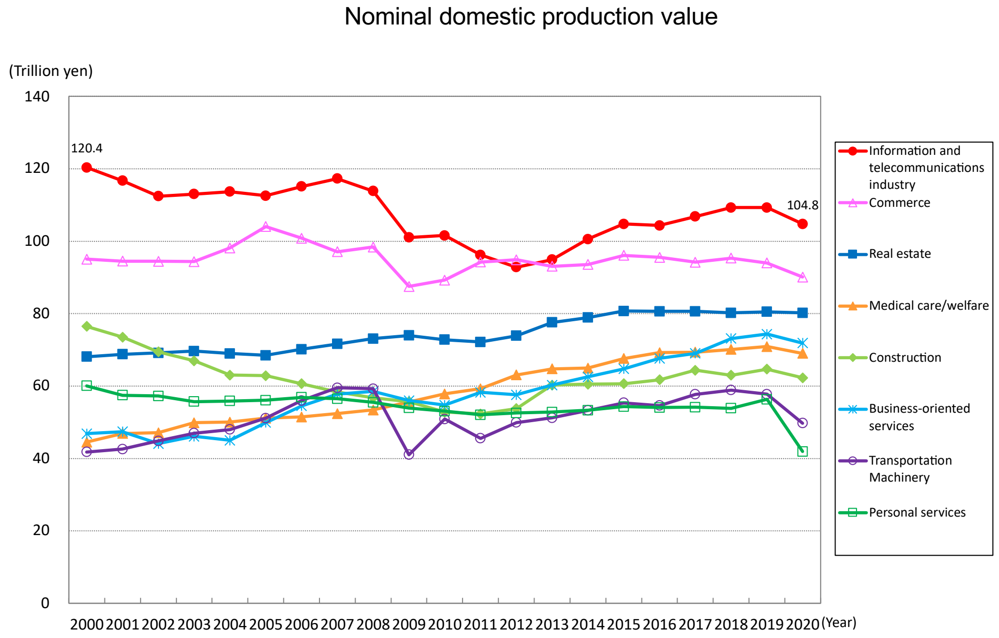


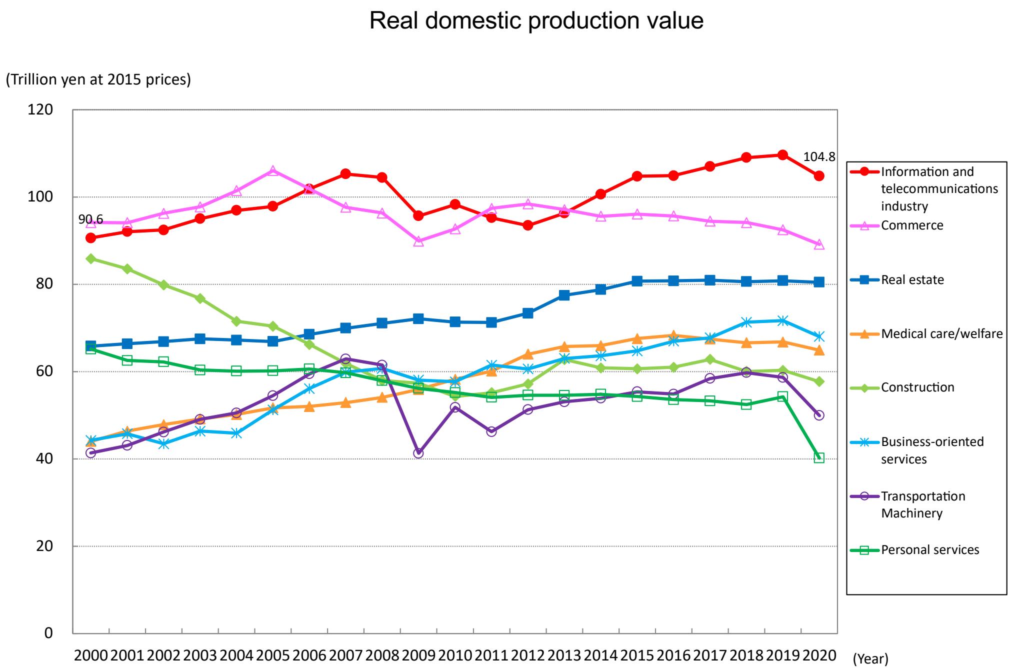


*1 Real domestic production value is calculated using the 2015 prices.
*2 For scope of the information and communications industry, see Annotation 2 of the Appendix.

(Source) MIC (2022), “Fiscal 2021 Survey on economic analysis of ICT”

5. Changes in domestic production value of major industries (nominal and real)*

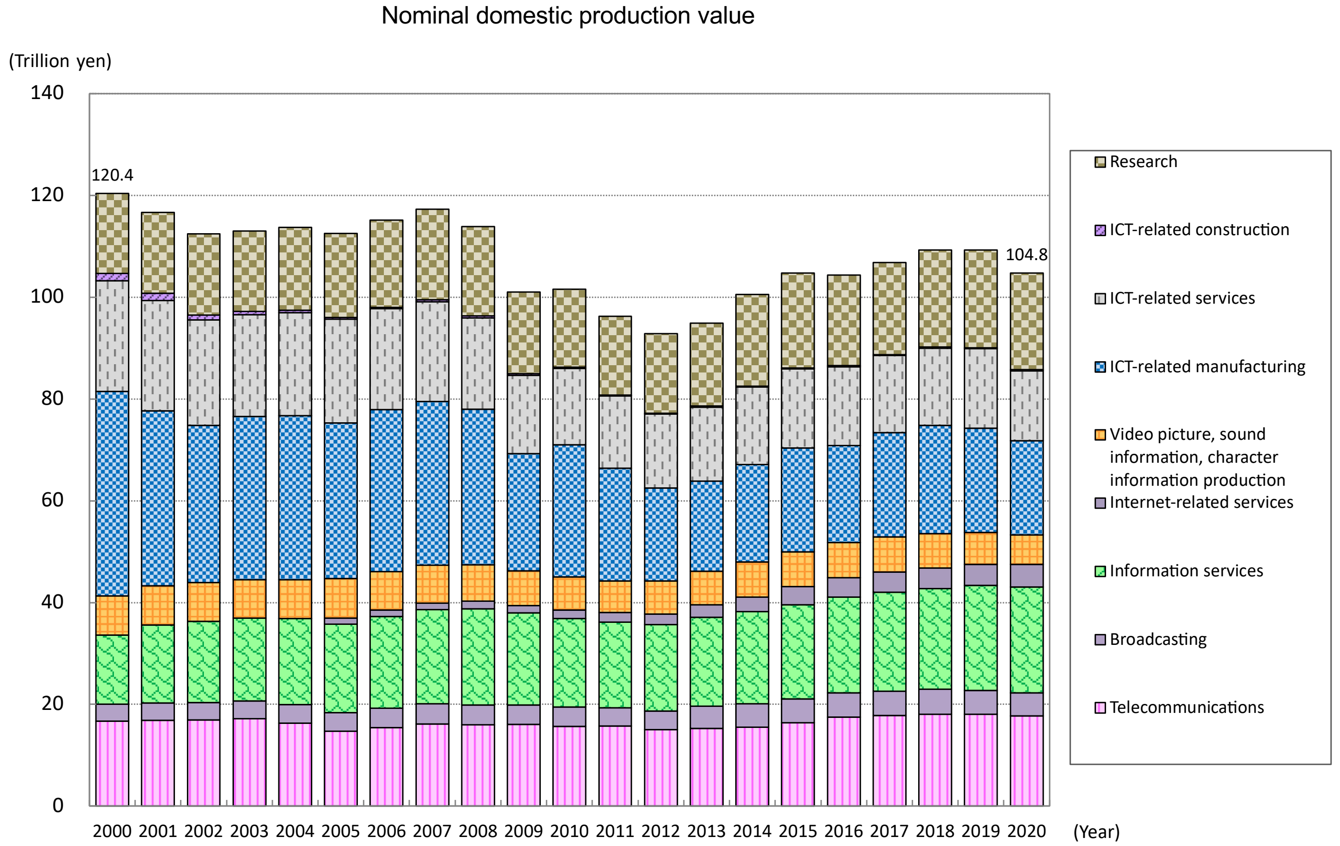


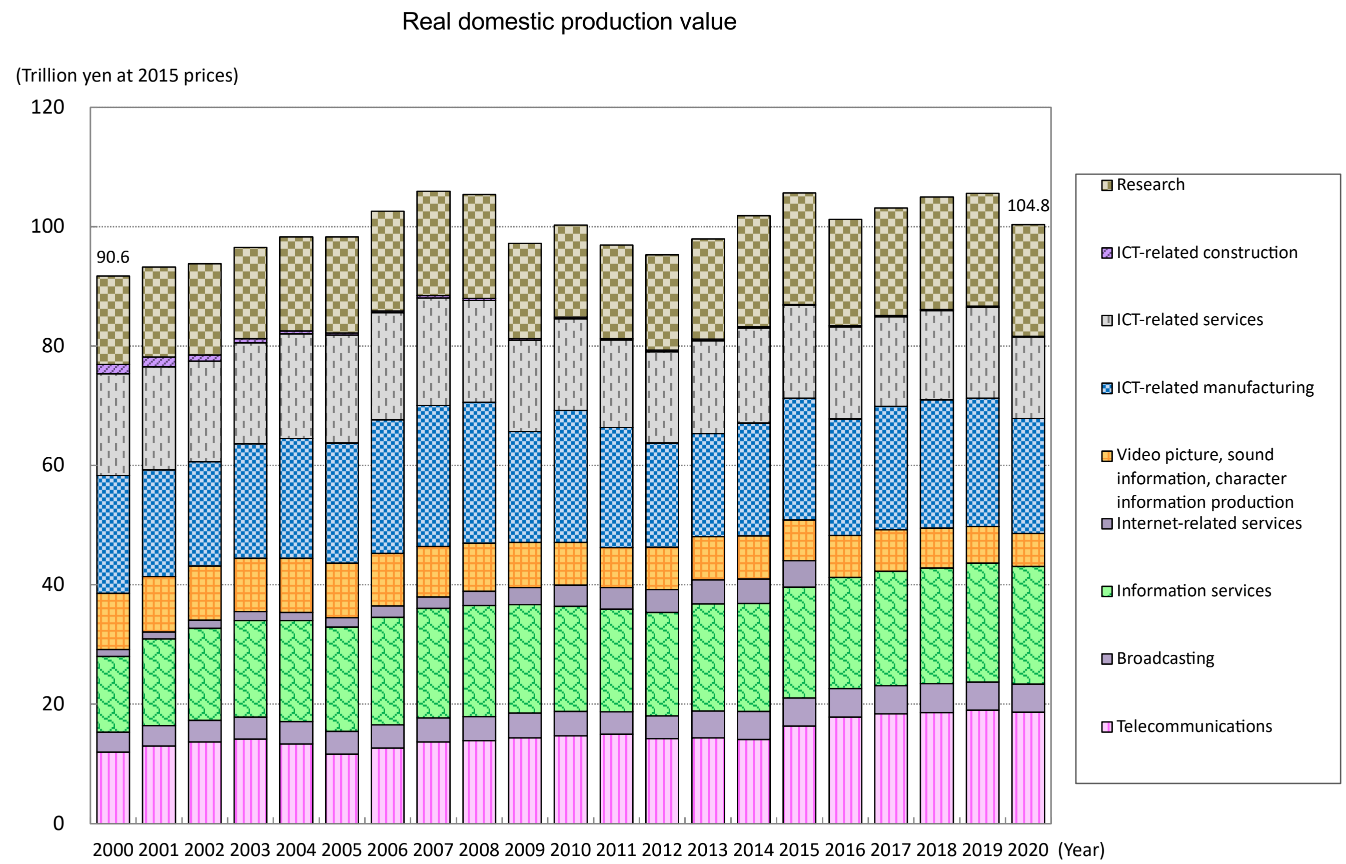


*For the details of the values, see Data 1 and Data 2 of the Appendix.

(Source) MIC (2022), “Fiscal 2021 Survey on economic analysis of ICT”

6. Changes in domestic production value of the information and communication industry (nominal and real)*

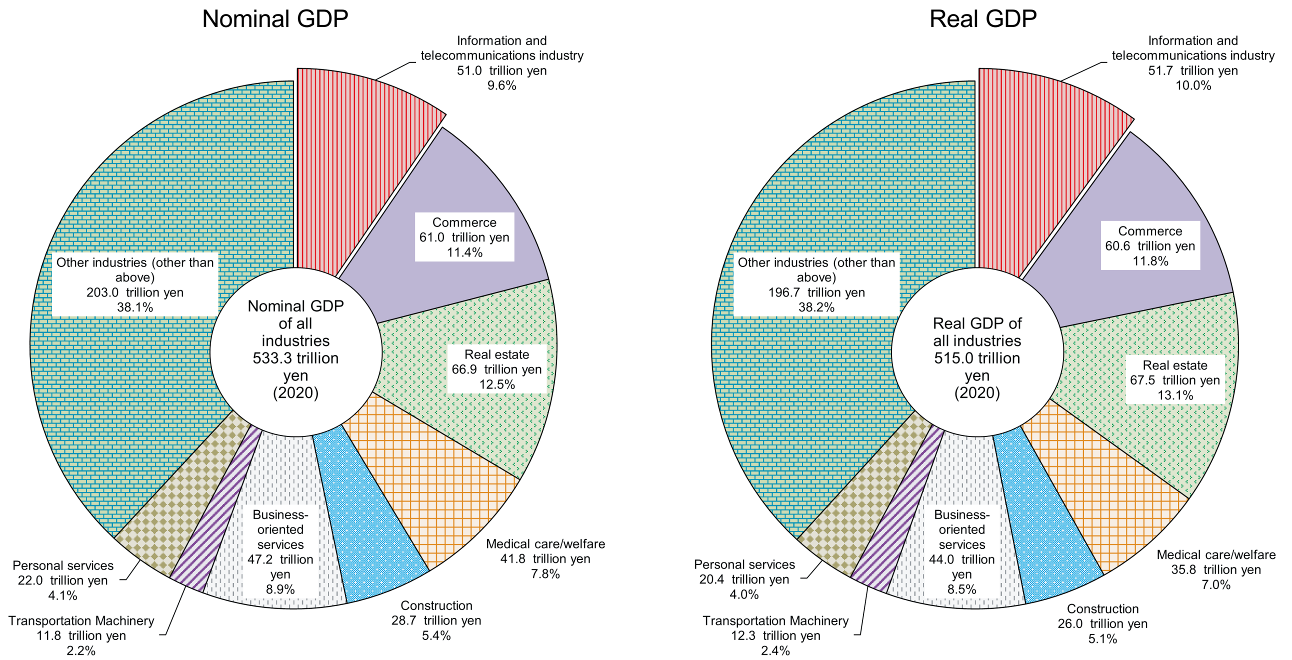




*For the details of the values, see Data 6 and Data 7 of the Appendix.

(Source) MIC (2022), "Fiscal 2021 Survey on economic analysis of ICT"

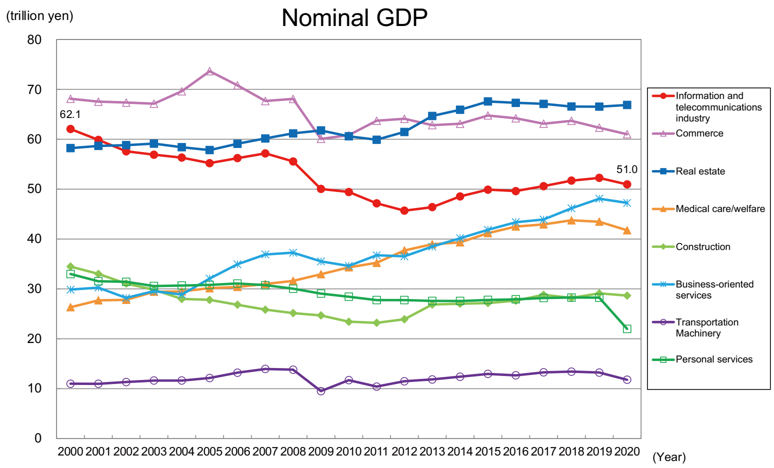
7. GDP of major industries (nominal and real) (Figure 3-1-2-1 in White Paper)

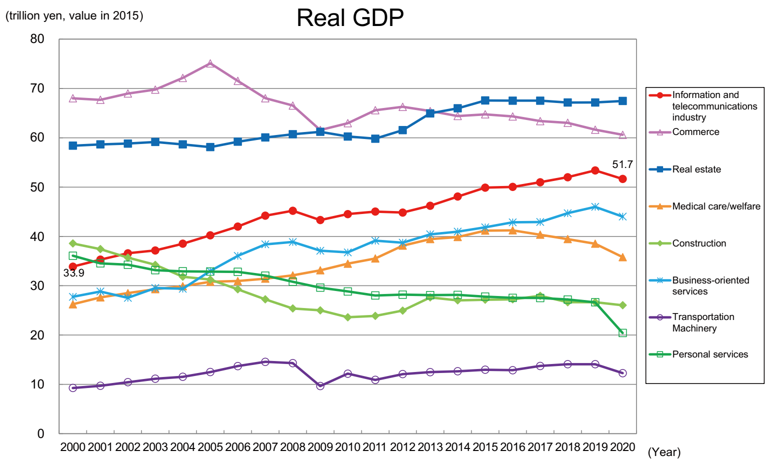


*Real domestic production value is calculated using the 2015 prices.

(Source) MIC (2022), “2021 Survey on economic analysis of ICT”

8. Changes in GDP of major industries (nominal and real) (Figure 3-1-2-2 in White Paper)

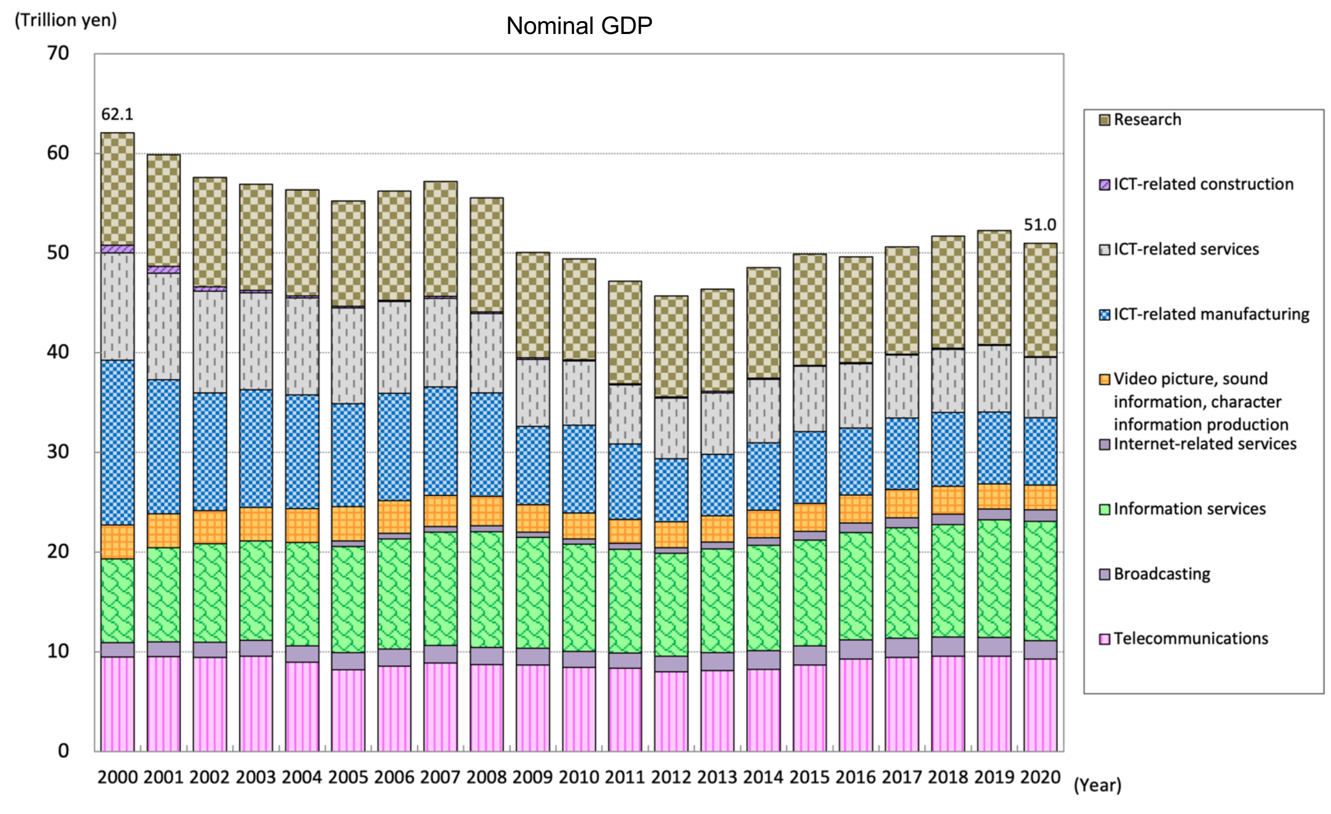


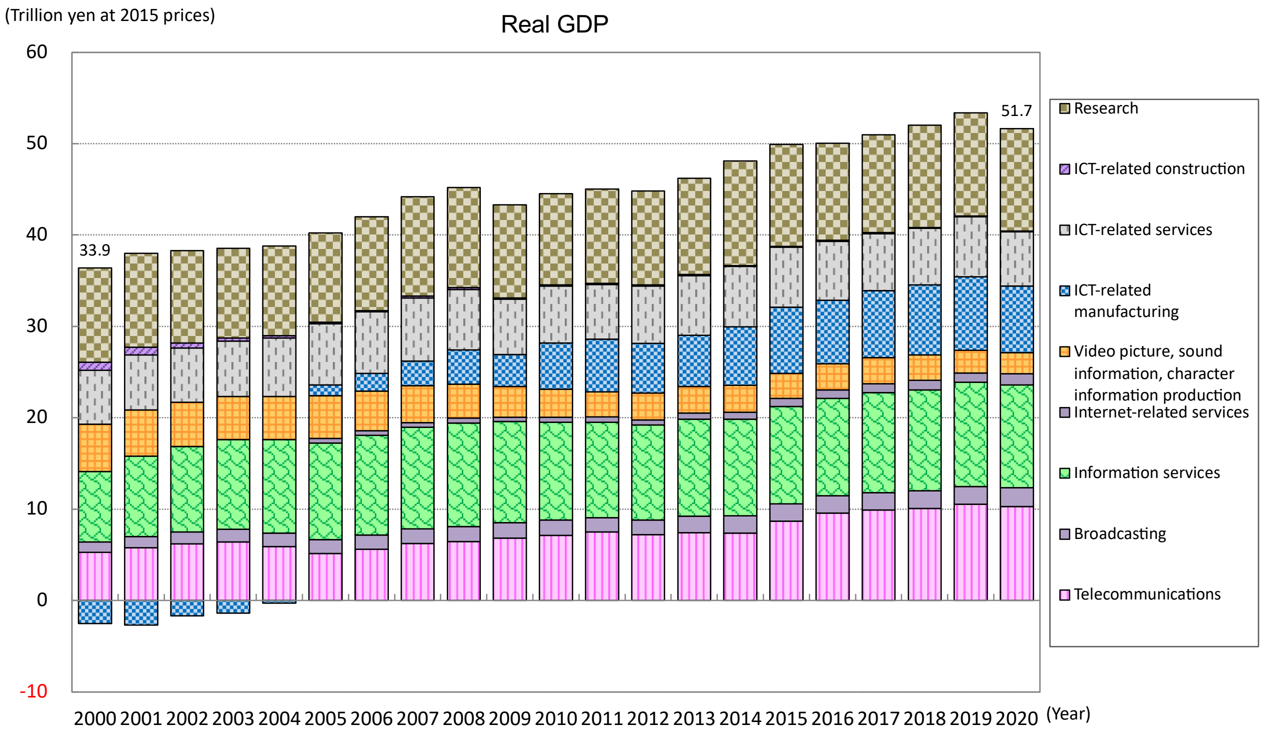


*For the details of the values, see Data 3 and Data 4 of the Appendix.

(Source) MIC (2022), “2021 Survey on economic analysis of ICT”

9. Changes in GDP of the information and communication industry (nominal and real)*

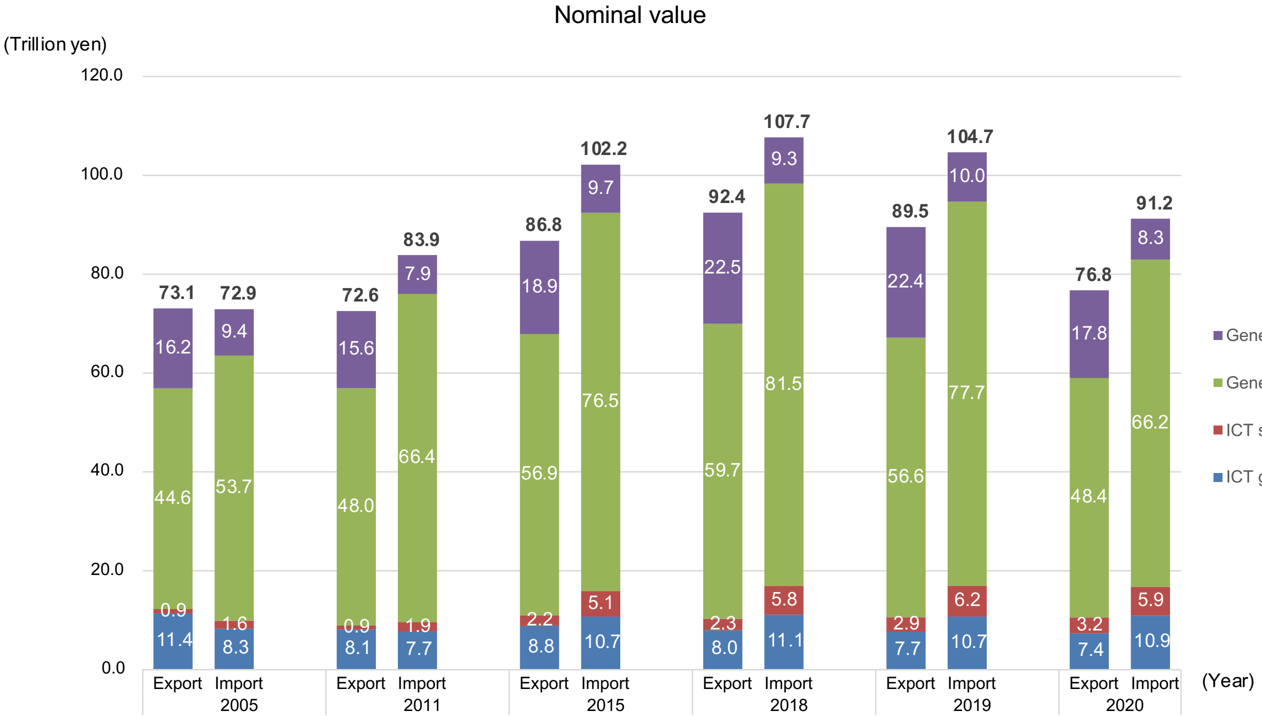


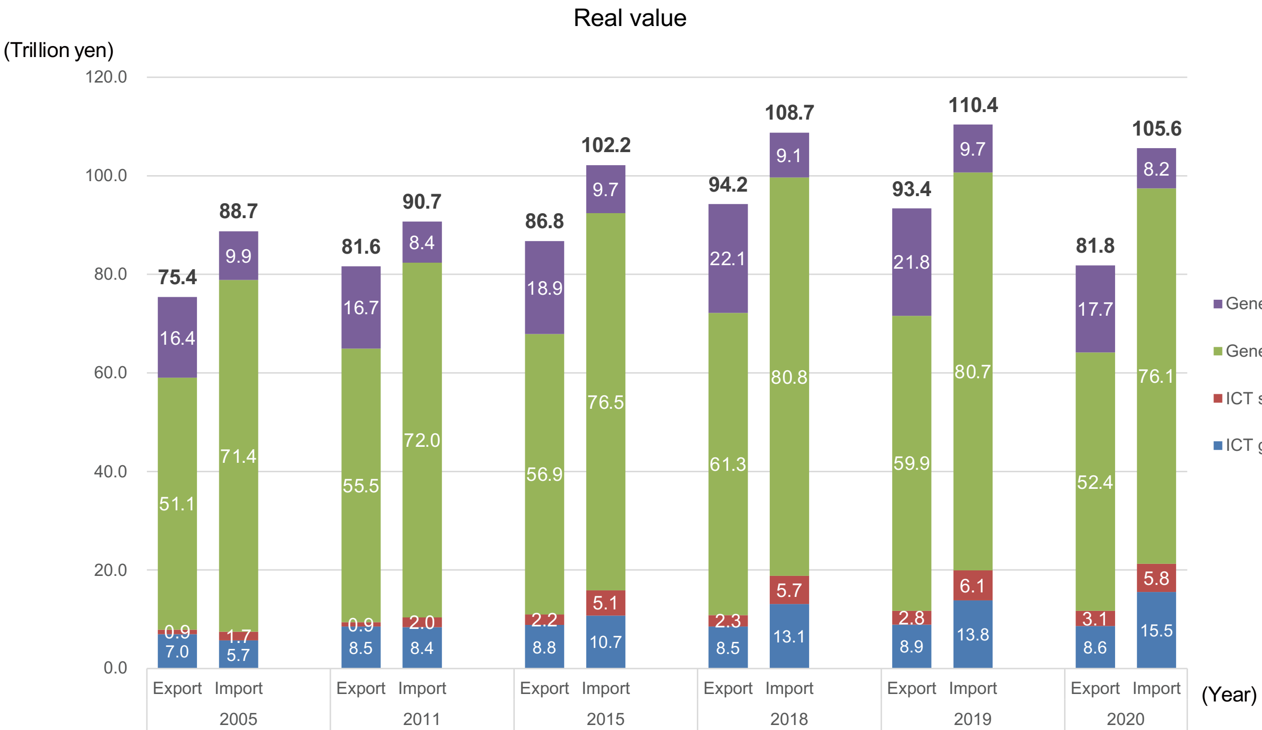


*For the details of the values, see Data 8 and Data 9 of the Appendix.

(Source) MIC (2022), "Fiscal 2021 Survey on economic analysis of ICT"

10. Changes in exports/imports of goods/services (Figure 3-1-4-1 in White Paper)

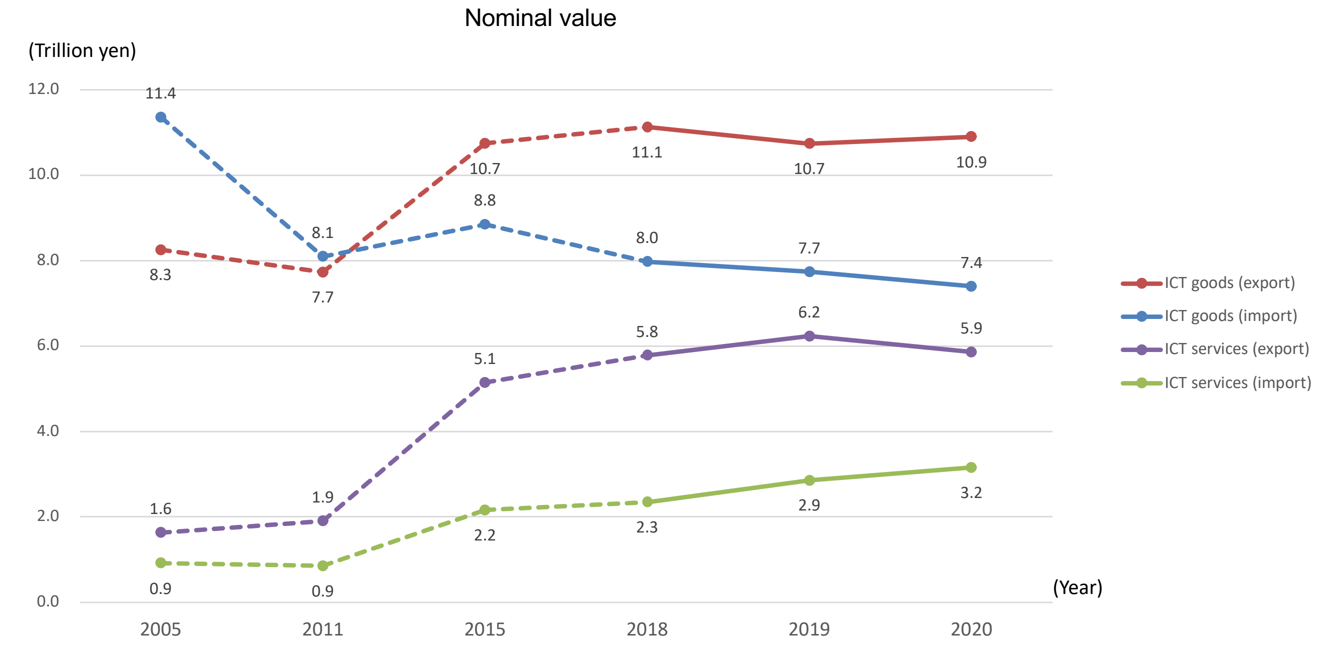


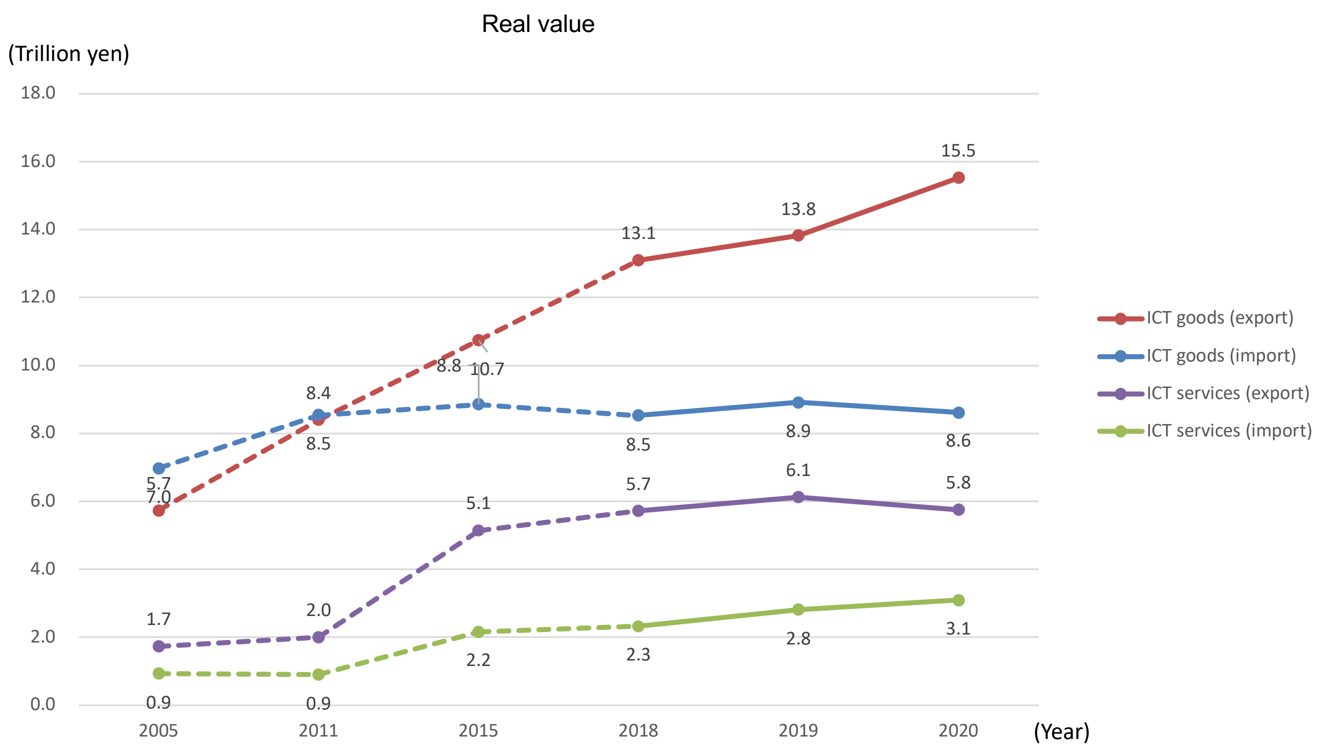


*Real value is calculated using the 2015 prices.

(Source) MIC annual “Input-Output Table of the Information Communications Industry"
https://www.soumu.go.jp/johotsusintokei/link/link03_01.html

11. Exports and imports of ICT goods/services

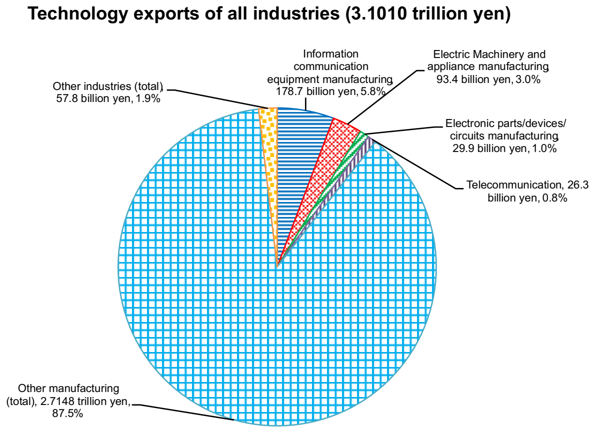


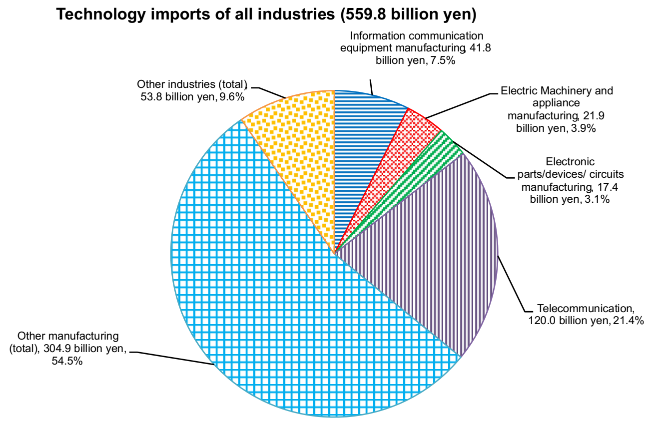


*The transition from 2005 to 2018 is indicated by a dashed line because there is a gap in the period.

(Source) MIC annual “Input-Output Table of the Information Communications Industry”
https://www.soumu.go.jp/johotsusintokei/link/link03_01.html

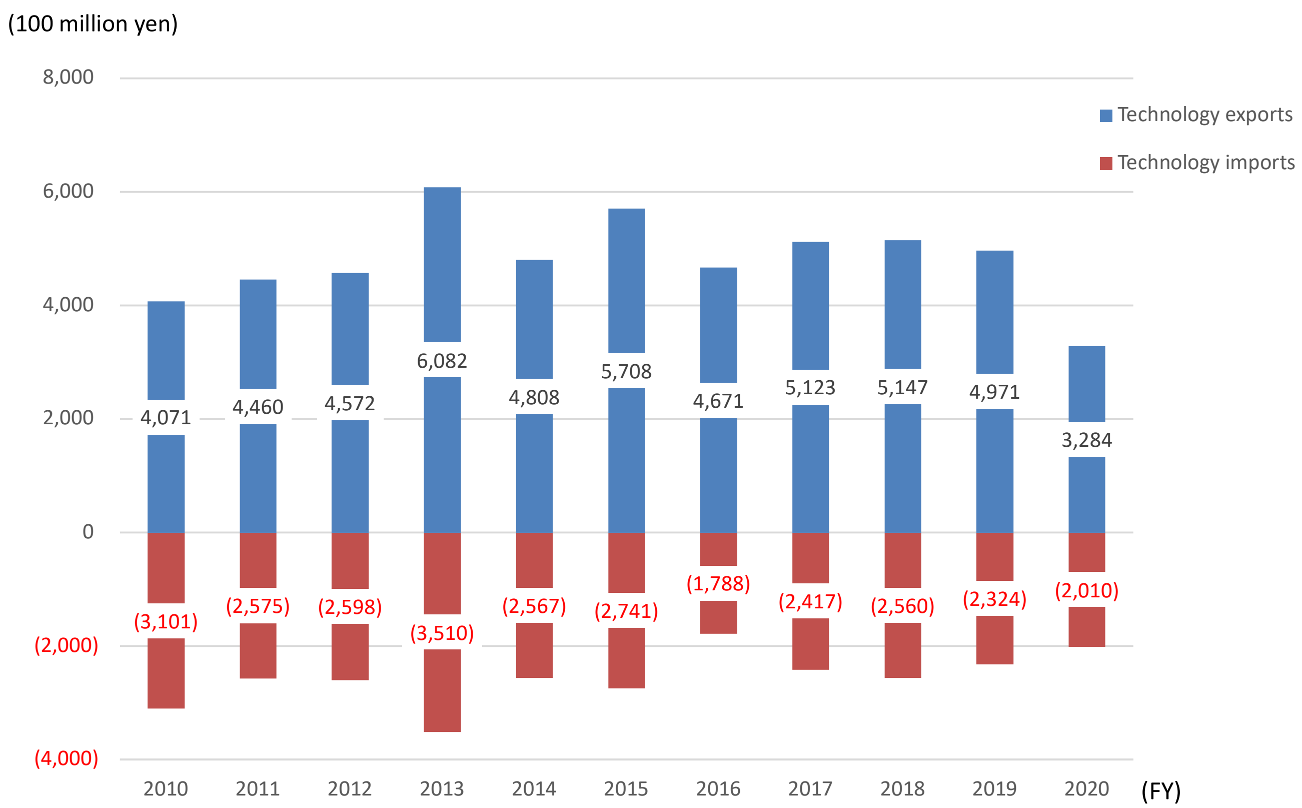
12. Proportion of technology trade values by industry (fiscal 2020)





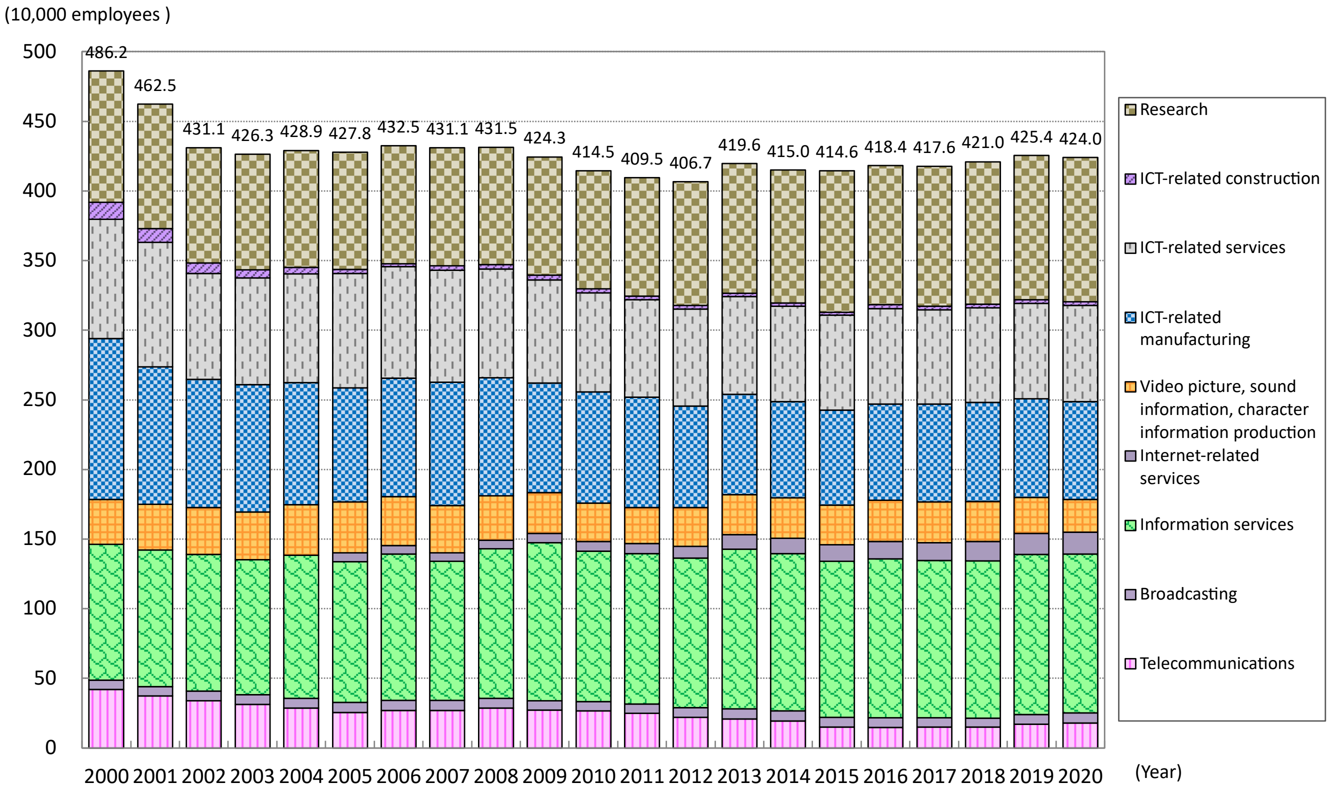
(Source) MIC, annual "Survey of Science and Technology Research"
https://www.stat.go.jp/data/kagaku/index.html

13. Changes in technology trade values of the information and communication industry



(Source) Prepared from MIC, annual "Survey of Science and Technology Research"
https://www.stat.go.jp/data/kagaku/index.html

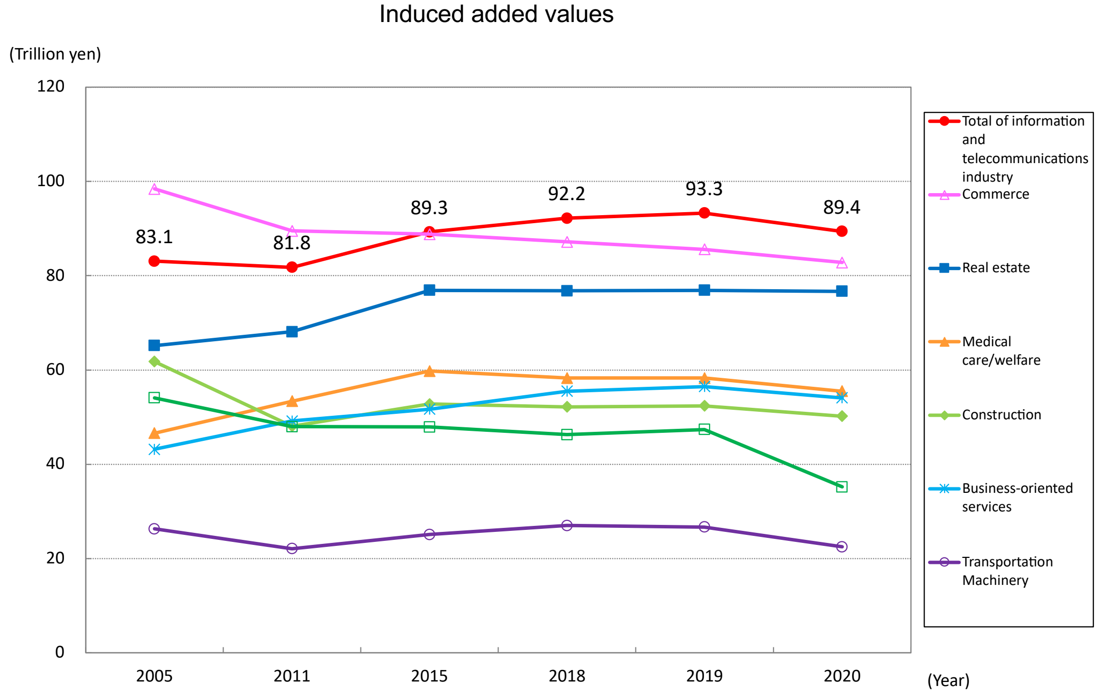
14. Changes in the number of employees of the information and communication industry*

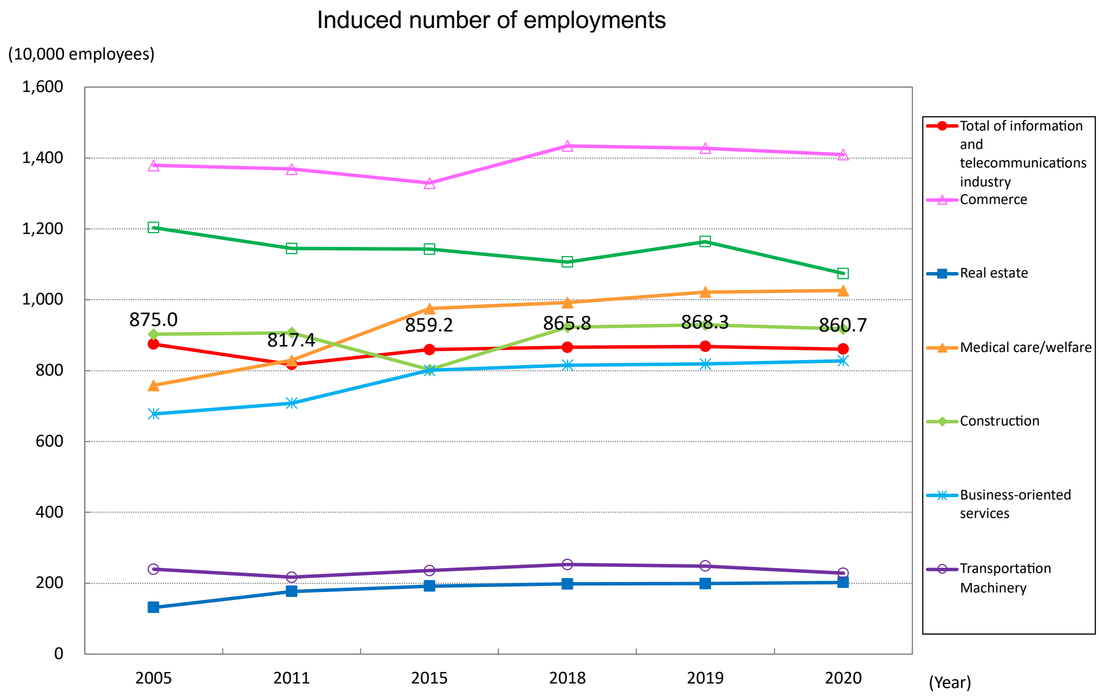


*For the details of the values, see Data 10 of the Appendix.

(Source) MIC (2022), “Fiscal 2021 Survey on economic analysis of ICT”

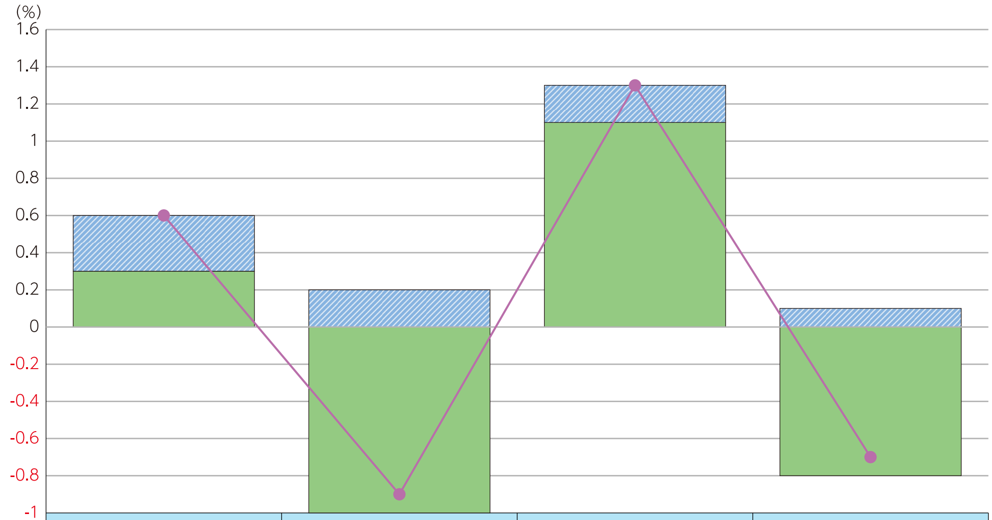
15. Changes in the economic ripple effects (induced added values and number of employments) of production activities of major industry sectors





(Source)MIC (2022), “Fiscal 2021 Survey on economic analysis of ICT”

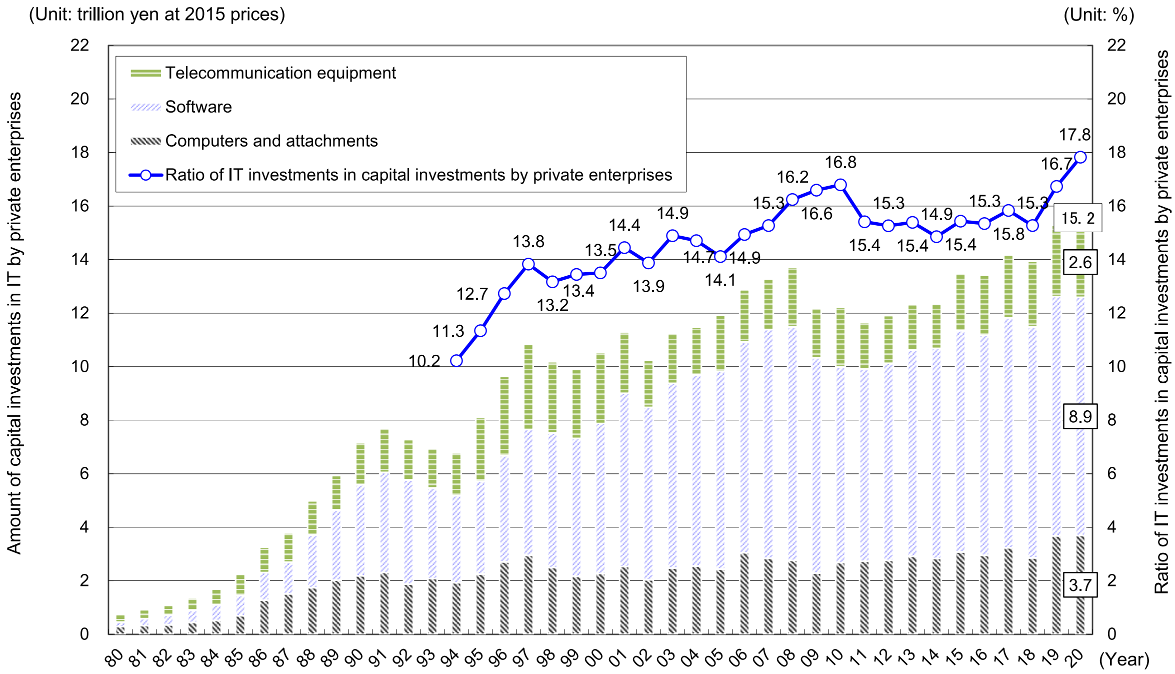
16. Contribution of the information and communications industry to the real GDP growth rate



	2000 to 2005 (annual average)	2005 to 2010 (annual average)	2010 to 2015 (annual average)	2015 to 2020 (annual average)
Information and communications industry	0.3	0.2	0.2	0.1
Other industries	0.3	-1.0	1.1	-0.8
All industries	0.6	-0.9	1.3	-0.7

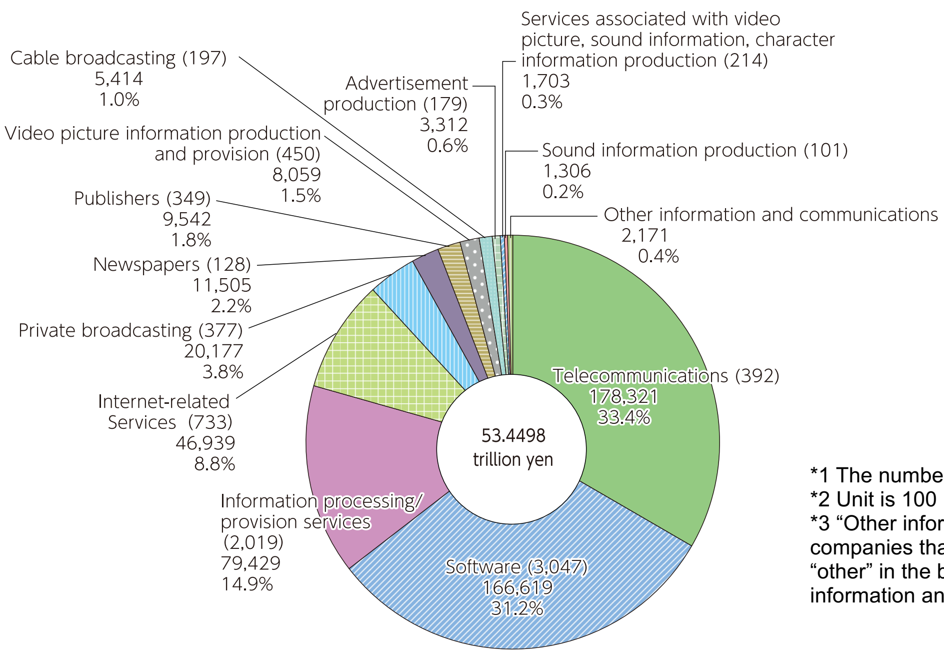
(Source) MIC (2022), “Fiscal 2021 Survey on economic analysis of ICT”

17. Changes in IT investments in Japan (Figure 3-1-3-1 in White Paper)



(Source) MIC (2022), “2021 Survey on economic analysis of ICT”

18. Sales of the information and communications industry (fiscal 2020)



*1 The number of companies in ( )
*2 Unit is 100 million yen
*3 “Other information and communications” refer to companies that answered that their main business is “other” in the breakdown on the sales pertaining to the information and communications industry.

(Source) MIC/METI, “2021 Basic Survey on the Information and Communications Industry”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

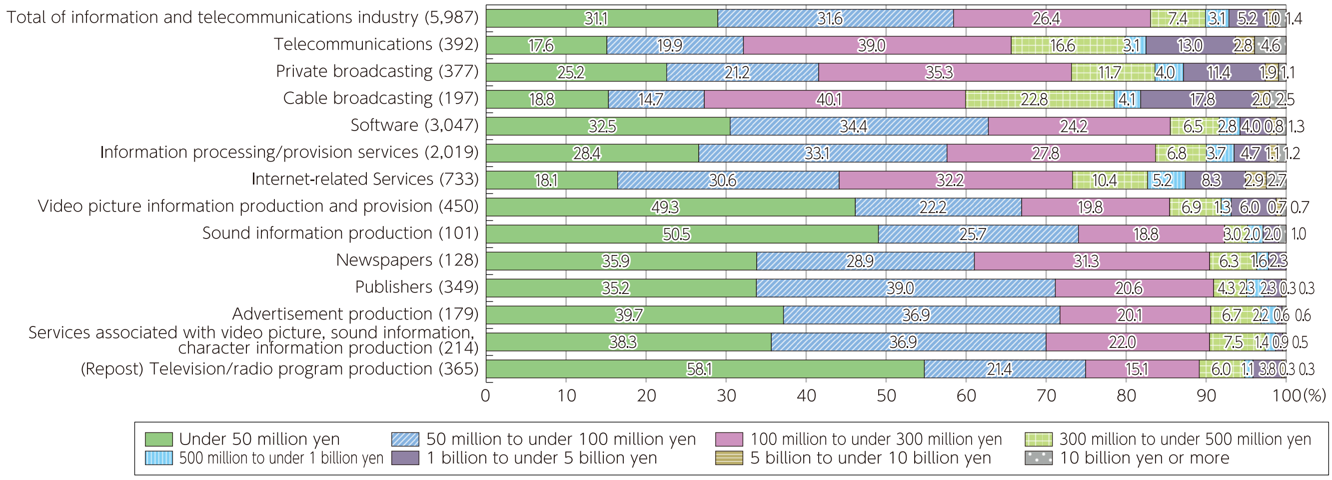
19. General overview of the information and communications industry

		Number of enterprises	Number of places of business	Number of employees	Number of permanent employees	Sales (100 million yen)	Sales of the business type concerned (100 million yen)	Operating income (100 million yen)	Ordinary income (100 million yen)	Number of subsidiary/affiliated companies
Total	FY2019	5,714	26,463	1,651,373	1,646,320	703,384	516,459	63,194	70,269	10,118
	FY2020	5,987	27,489	1,756,129	1,750,614	742,200	534,498	71,719	80,991	10,134
	Year-on-year (%)	4.8	3.9	6.3	6.3	5.5	3.5	13.5	15.3	0.2
Telecommunications	FY2019	389	2,324	183,203	182,538	206,812	175,520	29,529	31,083	880
	FY2020	392	2,736	213,857	212,561	219,972	178,321	32,227	33,533	756
	Year-on-year (%)	0.8	17.7	16.7	16.4	6.4	1.6	9.1	7.9	-14.1
Private broadcasting	FY2019	358	1,579	41,299	40,788	26,676	21,662	1,501	1,795	418
	FY2020	377	1,581	42,987	42,159	25,862	20,177	1,230	1,482	442
	Year-on-year (%)	5.3	0.1	4.1	3.4	-3.1	-6.9	-18.1	-17.4	5.7
Cable broadcasting	FY2019	197	733	24,043	23,610	15,114	5,140	1,589	1,577	126
	FY2020	197	681	24,689	24,239	15,990	5,414	1,932	1,923	112
	Year-on-year (%)	0.0	-7.1	2.7	2.7	5.8	5.3	21.6	21.9	-11.1
Software	FY2019	2,940	10,901	891,872	890,546	298,129	162,988	20,715	25,066	5,032
	FY2020	3,047	11,585	918,196	916,701	298,955	166,619	22,738	27,507	4,814
	Year-on-year (%)	3.6	6.3	3.0	2.9	0.3	2.2	9.8	9.7	-4.3
Information processing/provision service	FY2019	1,923	10,387	709,731	707,674	194,099	71,599	12,138	13,446	2,938
	FY2020	2,019	11,162	747,779	745,903	209,794	79,429	13,646	14,855	2,979
	Year-on-year (%)	5.0	7.5	5.4	5.4	8.1	10.9	12.4	10.5	1.4
Internet-related services	FY2019	707	4,260	237,775	236,600	140,932	41,296	9,896	11,188	2,683
	FY2020	733	4,267	241,038	240,458	125,438	46,939	13,606	16,459	2,635
	Year-on-year (%)	3.7	0.2	1.4	1.6	-11.0	13.7	37.5	47.1	-1.8
Video picture information production/provision	FY2019	437	1,691	54,056	53,739	25,519	8,913	1,641	1,885	580
	FY2020	450	1,253	54,551	54,179	22,345	8,059	1,452	1,712	606
	Year-on-year (%)	3.0	-25.9	0.9	0.8	-12.4	-9.6	-11.5	-9.2	4.5
Sound information production	FY2019	103	261	9,754	9,707	4,863	1,218	784	193	62
	FY2020	101	288	9,497	9,455	4,125	1,306	201	217	58
	Year-on-year (%)	-1.9	10.3	-2.6	-2.6	-15.2	7.2	-74.3	12.1	-6.5
Newspapers	FY2019	131	2,041	40,531	40,310	15,668	12,726	342	510	722
	FY2020	128	1,995	39,204	39,045	14,102	11,505	83	244	691
	Year-on-year (%)	-2.3	-2.3	-3.3	-3.1	-10.0	-9.6	-75.8	-52.3	-4.3
Publishers	FY2019	348	2,833	79,082	78,803	31,368	8,756	1,310	1,678	786
	FY2020	349	2,582	74,528	74,078	29,253	9,542	1,888	2,212	746
	Year-on-year (%)	0.3	-8.9	-5.8	-6.0	-6.7	9.0	44.2	31.8	-5.1
Advertisement production	FY2019	185	687	23,651	23,595	7,297	2,295	340	365	181
	FY2020	179	613	29,146	29,070	19,911	3,312	486	519	165
	Year-on-year (%)	-3.2	-10.8	23.2	23.2	172.9	44.3	43.0	42.5	-8.8
Services associated with video picture, sound information, character information production	FY2019	201	932	31,747	31,384	9,607	2,293	401	468	200
	FY2020	214	879	32,128	31,815	8,240	1,703	198	280	222
	Year-on-year (%)	6.5	-5.7	1.2	1.4	-14.2	-25.8	-50.7	-40.2	11.0
(Repost) Television/radio program production	FY2019	363	895	31,502	31,207	12,517	4,735	513	625	319
	FY2020	365	803	35,341	34,983	12,856	3,763	370	488	310
	Year-on-year (%)	0.6	-10.3	12.2	12.1	2.7	-20.5	-27.8	-21.9	-2.8

*1 Sales of “business type concerned” refer to the sales pertaining to the activities. For example, sales of “business type concerned” of telecommunications are the sales pertaining to telecommunications out of the sales of the entire company.
*2 The total of “business type concerned” does not agree with the itemized total because some of the companies answered “other.”
*3 “(Repost) Television/radio program production” refers to the sum of “television program production” and “radio program production” of the “Video picture, sound information, character information production.”

(Source) MIC/METI “2021 Basic Survey on the Information and Communications Industry
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

20. Enterprise makeup percentage by capital



(Source) MIC/METI “2021 Basic Survey on the Information and Communications Industry”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

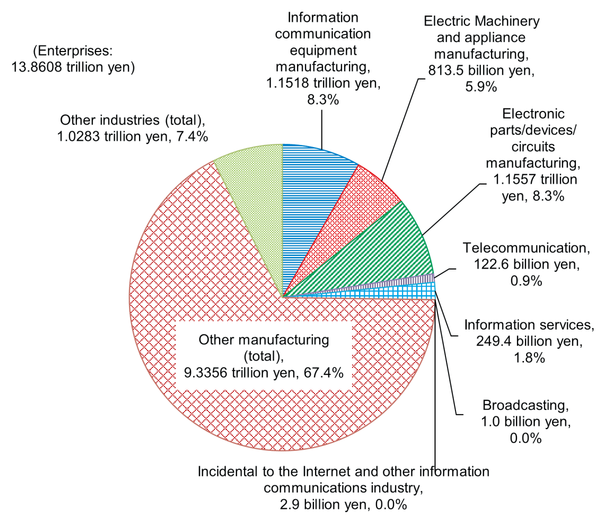
21. Labor productivity, labor equipment ratio and labor distribution rate

	Number of companies			Labor productivity (10,000 yen per person)			Labor equipment ratio (10,000 yen per person)			Labor distribution rate (%)		
	FY2019	FY2020	Year-on-year	FY2019	FY2020	Year-on-year	FY2019	FY2020	Year-on-year	FY2019	FY2020	Year-on-year
Total of information and telecommunications industry	5,714	5,987	4.8%	1,413.1	1,424.6	0.8%	1,427.9	1,411.1	-1.2%	40.4	40.9	0.5pt
Telecommunications	389	392	0.8%	4,084.8	3,761.2	-7.9%	7,084.8	7,174.9	1.3%	15.1	17.4	2.4pt
Private broadcasting	358	377	5.3%	1,733.5	1,627.7	-6.1%	2,970.3	2,887.1	-2.8%	41.4	41.7	0.4pt
Cable broadcasting	197	197	0.0%	2,470.8	2,532.4	2.5%	4,736.2	4,748.3	0.3%	20.9	21.2	0.3pt
Software	2,940	3,047	3.6%	1,134.1	1,149.2	1.3%	412.6	409.7	-0.7%	54.2	53.8	-0.4pt
Information processing/provision service	1,923	2,019	5.0%	978.5	985.6	0.7%	747.9	533.8	-28.6%	53.5	55.2	1.6pt
Internet-related services	707	733	3.7%	1,538.9	1,521.4	-1.1%	2,289.4	907.6	-60.4%	39.2	38.4	-0.9pt
Video picture information production/provision	437	450	3.0%	1,206.9	1,107.0	-8.3%	1,378.5	1,384.1	0.4%	50.0	51.5	1.5pt
Sound information production	103	101	-1.9%	1,514.9	933.5	-38.4%	361.6	401.2	10.9%	30.7	51.7	21.0pt
Newspapers	131	128	-2.3%	1,297.0	1,278.1	-1.5%	2,686.0	2,708.3	0.8%	61.4	61.4	-0.0pt
Publishers	348	349	0.3%	1,108.0	1,230.0	11.0%	1,554.3	1,628.3	4.8%	57.0	51.9	-5.1pt
Advertisement production	185	179	-3.2%	785.9	1,044.2	32.9%	290.7	231.4	-20.4%	60.7	63.3	2.6pt
Services associated with video picture, sound information, character information production	201	214	6.5%	876.1	831.2	-5.1%	790.6	752.1	-4.9%	60.1	67.4	7.3pt
(Repost) Television/radio program production	363	365	0.6%	1,029.1	1,004.4	-2.4%	1,063.8	1,079.1	1.4%	58.1	60.1	2.0pt

Note: Labor productivity = added value amount/number of employees. This is an indicator of the added value amount per employee
Labor equipment ratio = tangible fixed assets / number of employees. This is an indicator to see how much capital (tangible fixed assets) is used per employee.
Labor distribution rate = gross pay / added value amount x 100. Indicator to see how much of the generated added values are distributed to labor expense.

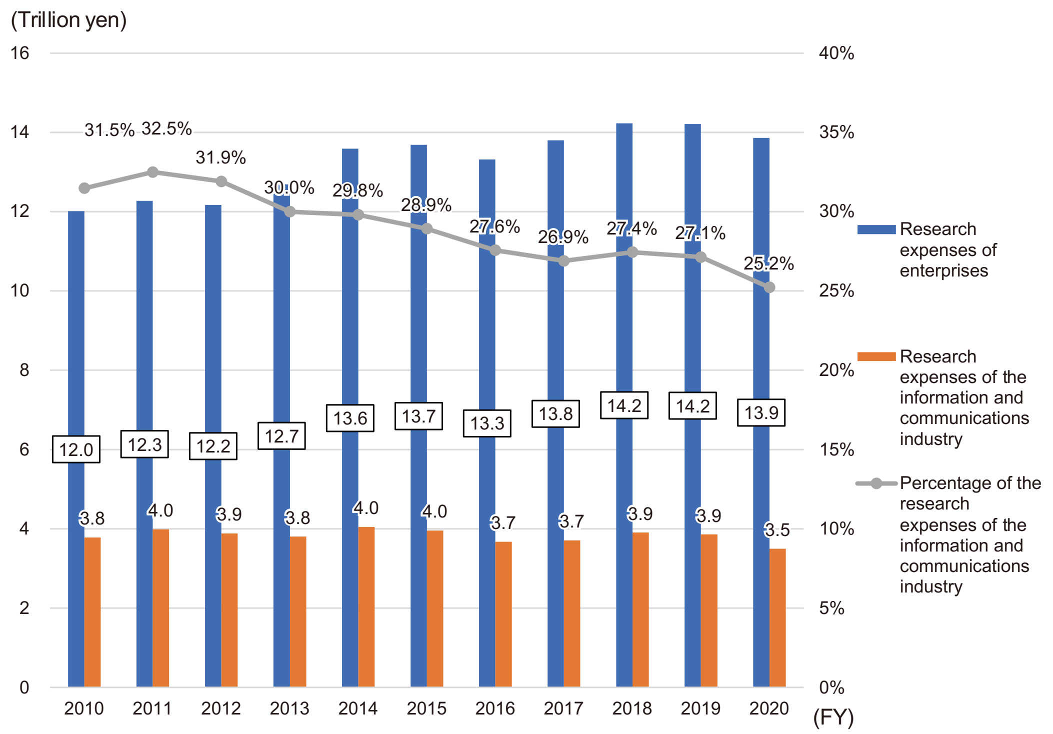
(Source) MIC/METI “2021 Basic Survey on the Information and Communications Industry”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

22. Enterprise research expenses by industry (fiscal 2020) (Figure 3-1-5-1 in White Paper)



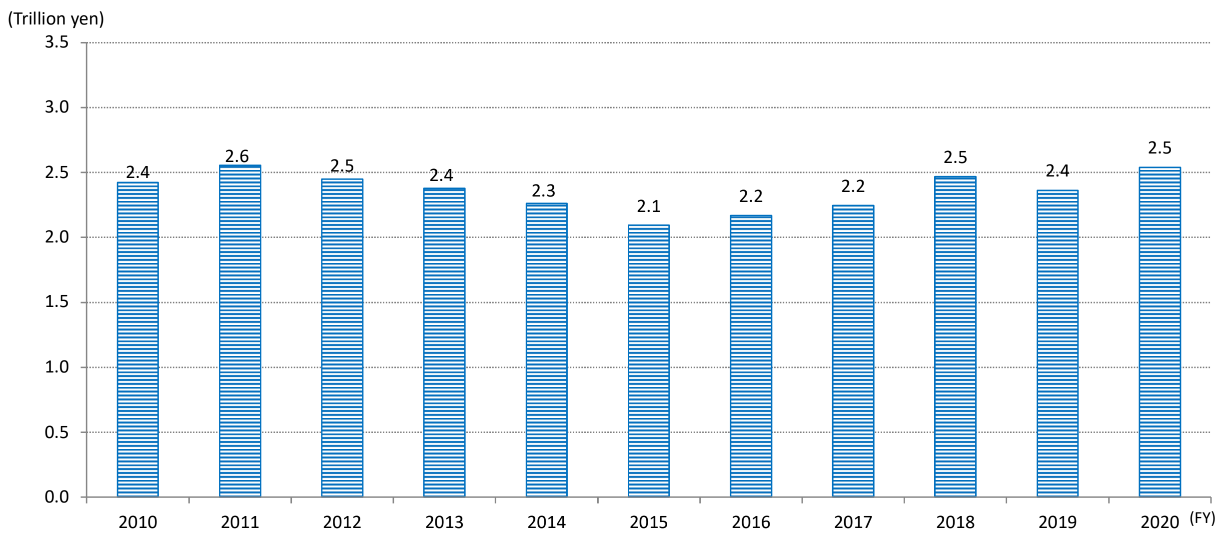
(Source) Prepared based on MIC, “2021 Survey of Science and Technology Research”
https://www.stat.go.jp/data/kagaku/kekka/index.html

23. Changes in research expenses of enterprises (Figure 3-1-5-2 in White Paper)



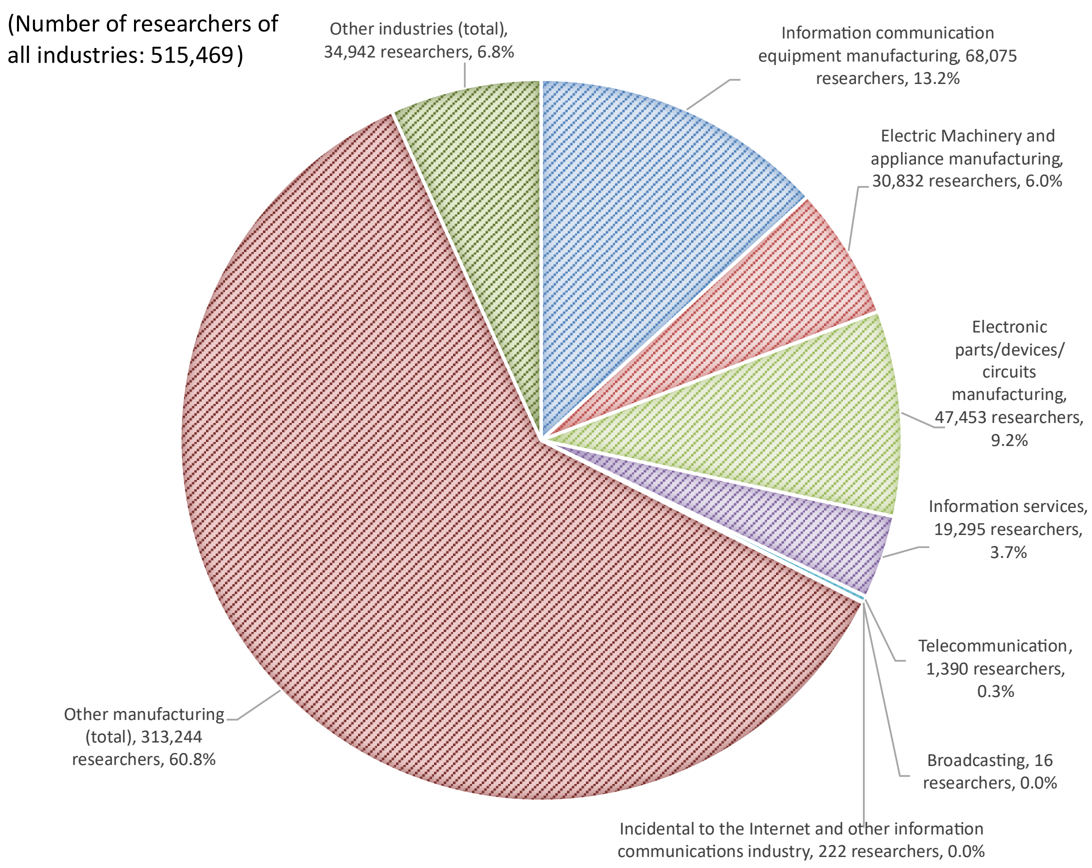
(Source) Prepared based on MIC "Survey of Science and Technology Research" (annual)
https://www.stat.go.jp/data/kagaku/kekka/index.html

24. Changes in research expenses in the information and communications sector



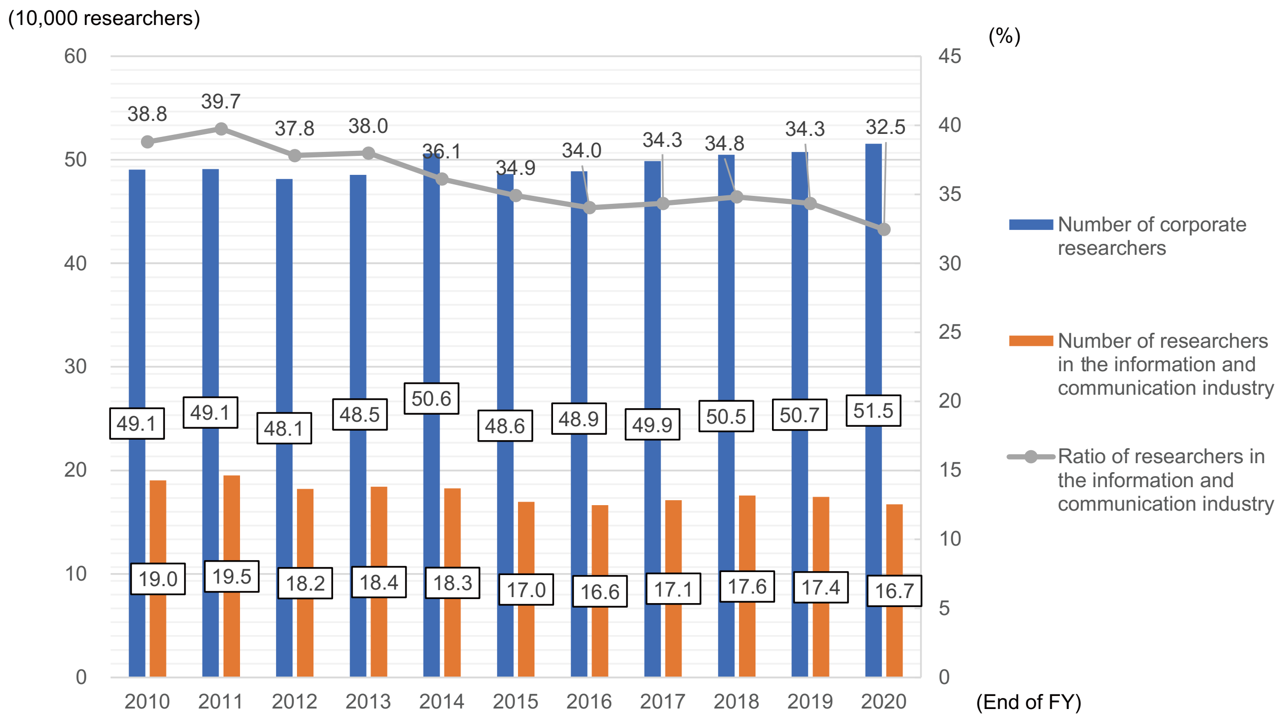
(Source) Prepared from MIC, annual "Survey of Science and Technology Research"
https://www.stat.go.jp/data/kagaku/index.html

38. Percentage of corporate researchers by industry (as of March 31, 2021)



(Source) Prepared from MIC, "2021 Survey of Science and Technology Research"
https://www.stat.go.jp/data/kagaku/index.html

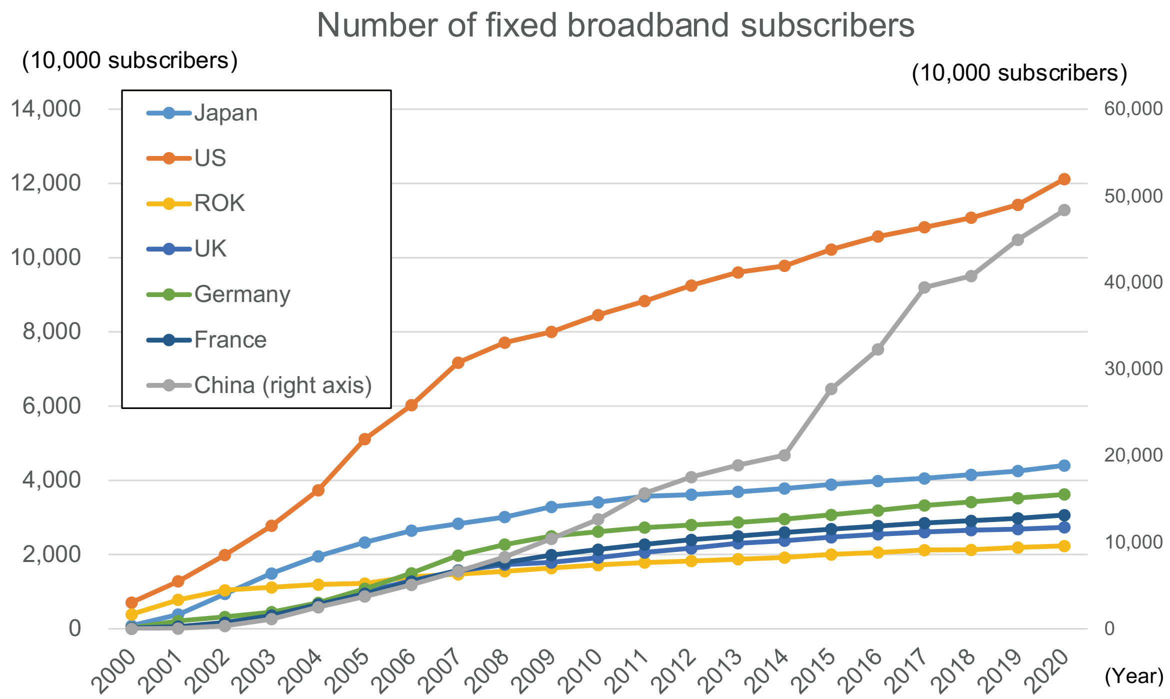
39. Changes in the number of corporate researchers (Figure 3-1-5-3 in White Paper)



(Source) Prepared based on MIC, "Survey of Science and Technology Research" (each year)
https://www.stat.go.jp/data/kagaku/kekka/index.html

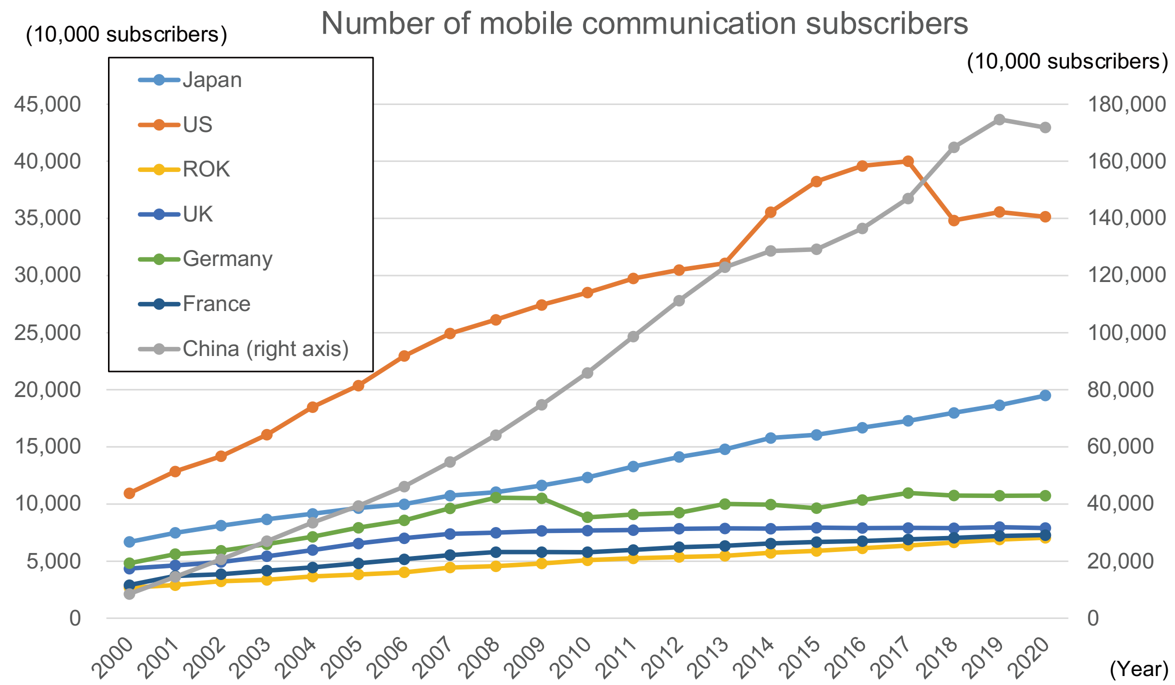
Section2

1. Changes in the number of fixed-line broadband service subscriptions in major countries (Figure 3-2-1-1 in White Paper)



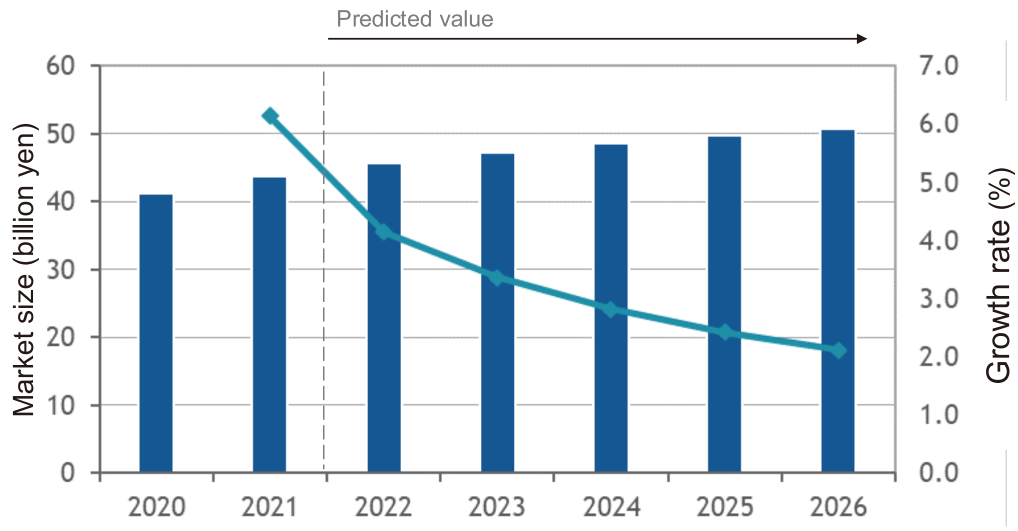
(Source) ITU

2. Changes in the number of mobile communication subscriptions in major countries (Figure 3-2-1-2 in White Paper)



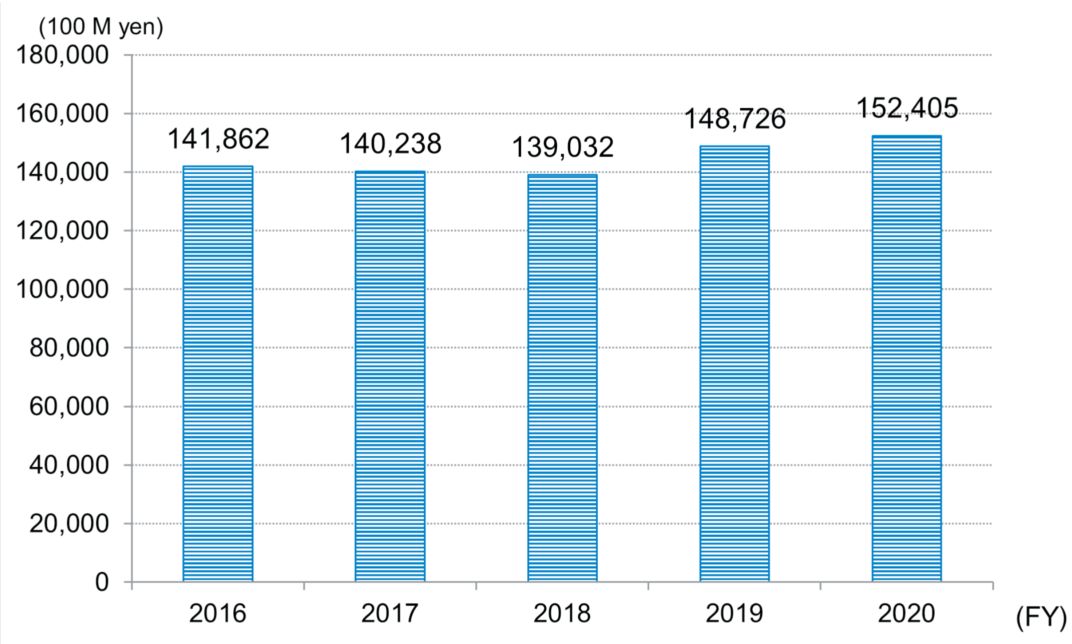
(Source) ITU

4. Changes and forecasts of the size (in terms of sales)of Japan's network virtualization/automation market (Figure 3-2-1-4 in White Paper)



(Source) IDC Japan

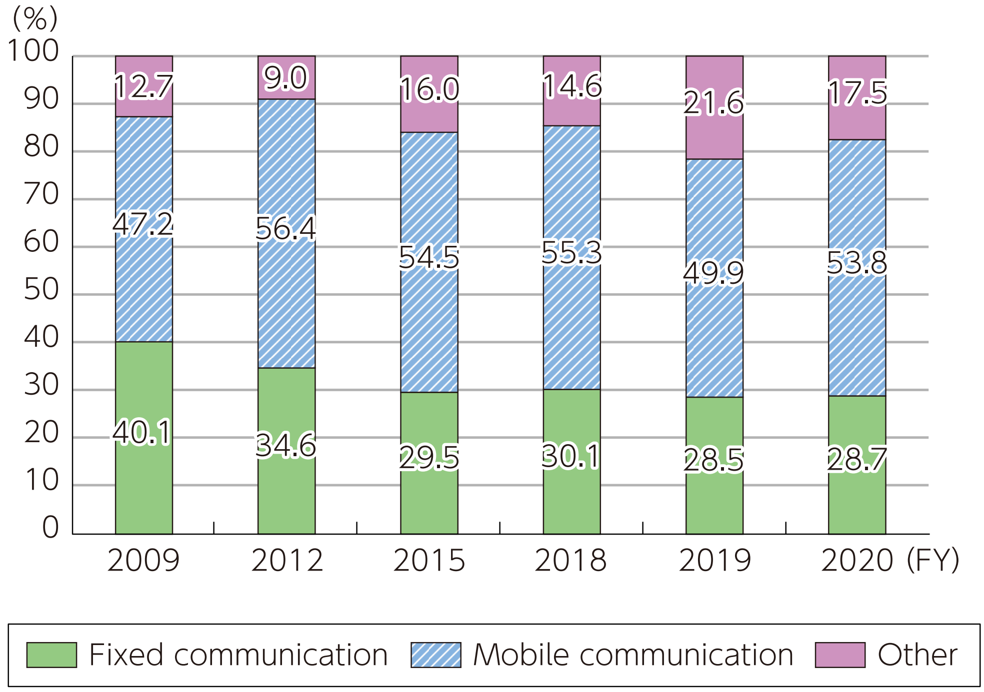
5. Changes in telecommunications sector sales (Figure 3-2-2-1 in White Paper)



*Sales are total of the sales of all responding business operators. Comparison must be made carefully because the number of respondents varies depending on the year.

(Source) Prepared from MIC / METI “Basic Survey on the Information and Communications Industry”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

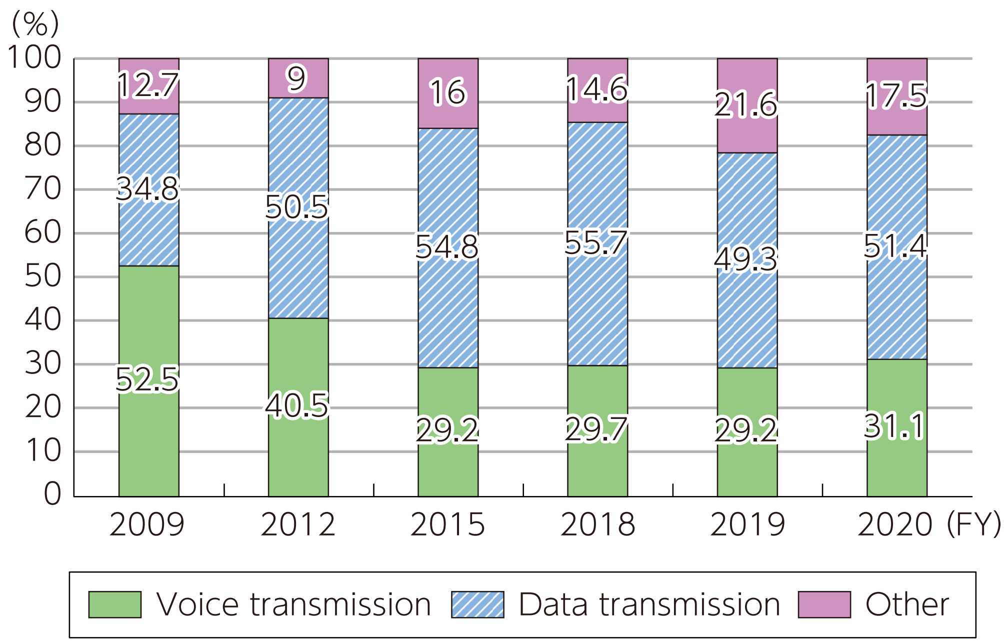
6. Changes in sales ratio of fixed and mobile communications by telecommunication carriers



*Calculated by excluding “unknown” in the sales breakdown

(Source) Prepared from MIC/METI, annual “Basic Survey on the Information and Communications Industry”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

7. Changes in sales ratio of voice transmission and data transmission by telecommunication carriers



*Calculated by excluding “unknown” in the sales breakdown

(Source) Prepared from MIC/METI, annual “Basic Survey on the Information and Communications Industry”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

8. Changes in the number of telecommunication carriers (Figure 3-2-2-2 in White Paper)

End of FY	2013	2014	2015	2016	2017	2018	2019	2020	2021
Number of telecommunication carriers	16,321	16,723	17,519	18,177	19,079	19,818	20,947	21,913	23,111

(Source) Information & Communications Statistics Database
https://www.soumu.go.jp/johotsusintokei/field/tsuushin04.html

9. State of optical fiber development (estimation) at the end of March 2021 (Figure 3-2-2-3 in White Paper)

Nationwide development rate of optical fiber

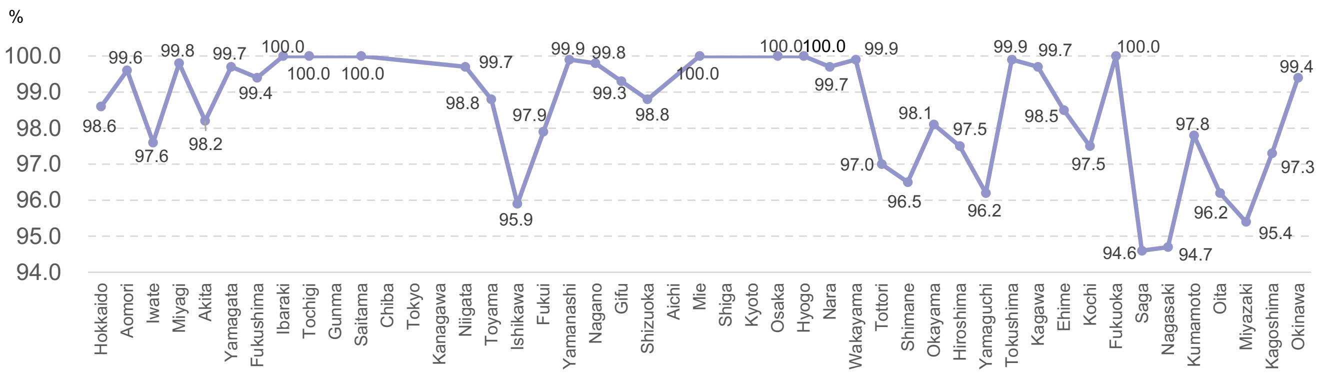
End of March 2021

99.3%

(390,000 households are in undeveloped areas)

*Based on the basic resident register, etc., the number of the households that can use optical fiber in the areas as estimated based on carrier information on a certain assumption was divided by the number of total households (rounded off to one decimal place).

Development rate of optical fiber by prefecture



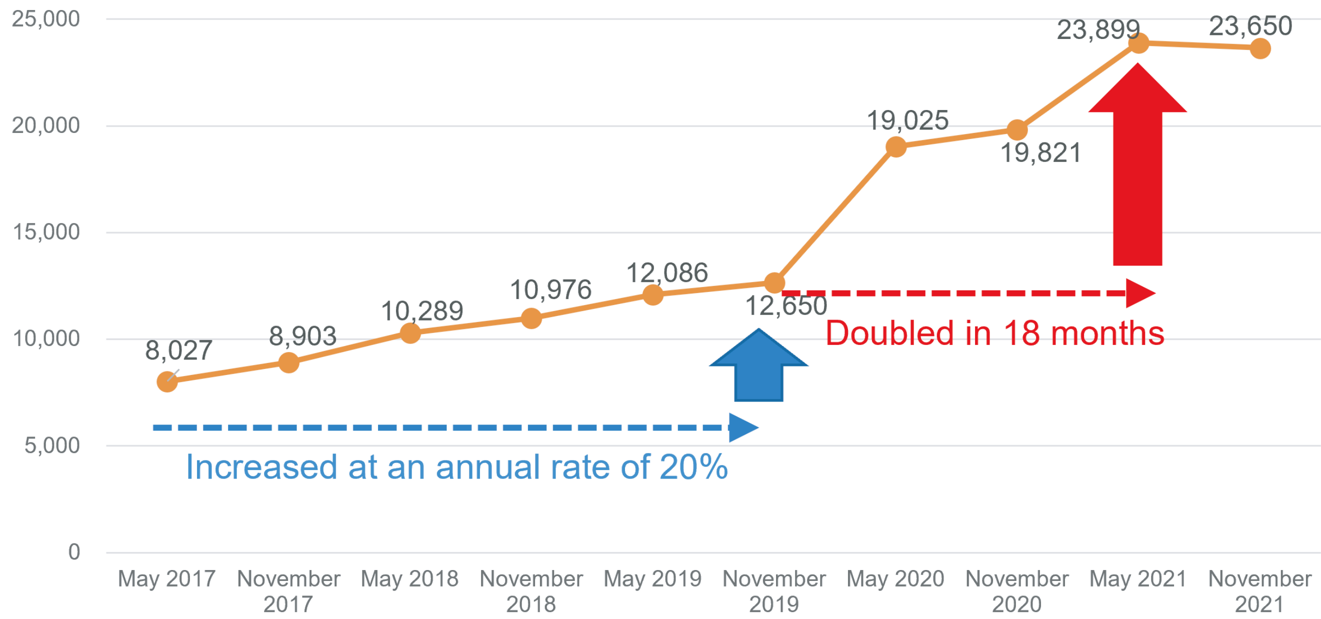
10. The number of 5G base stations per 10km² in November 2021 (Figure 3-2-2-4 in White Paper)

National average	Approx. 1.0 stations
Tokyo	Approx. 41.3 stations
Osaka Prefecture	Approx. 16.2 stations
Kanagawa Prefecture	Approx. 6.6 stations
Hiroshima Prefecture	Approx. 1.1 stations

(3.7GHz band, 4.5GHz band, 28GHz band)

(Source) Excerpt from MIC (2021) “Special Commission on Digital Administrative Reform (2nd session)” Material 3

12. Changes in internet traffic (fixed-line broadband download traffic) (Figure 3-2-2-5 in White Paper)



(Source) MIC (2022), "Aggregate results of Internet traffic in Japan (in November 2021)”

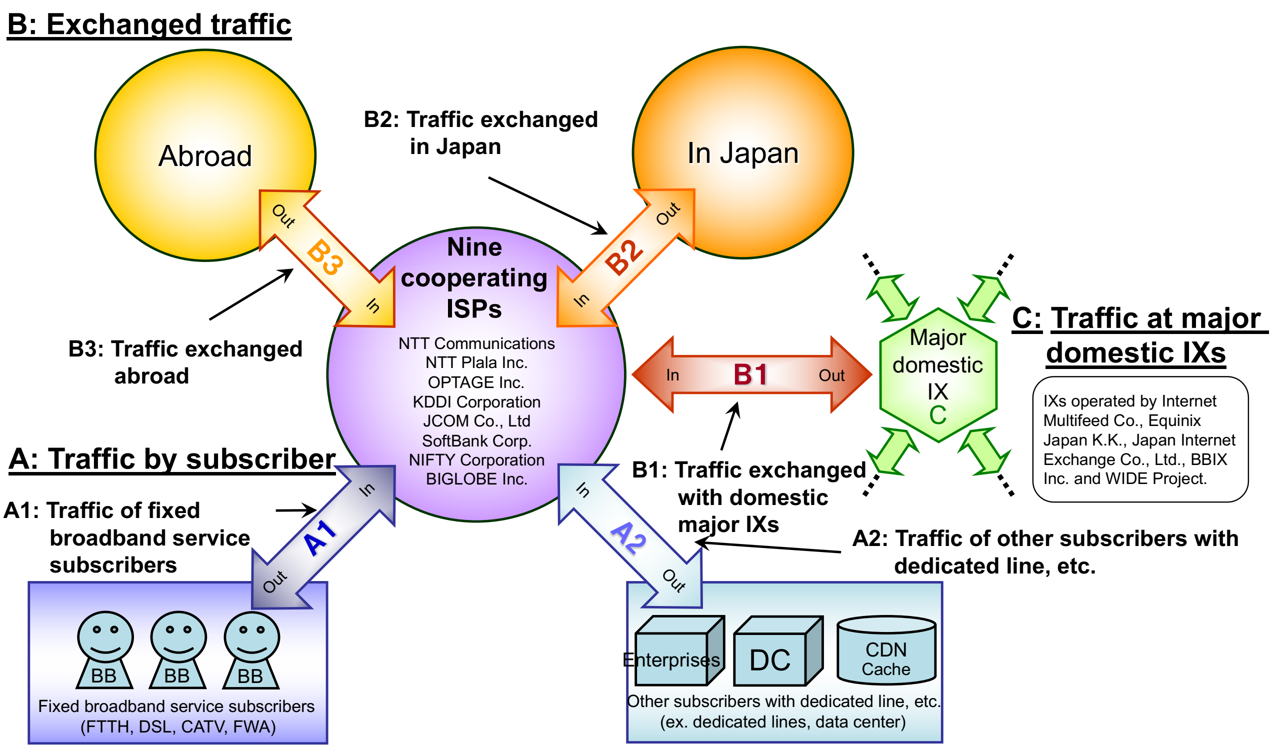
13. Totalization and trial calculation of internet traffic in Japan*1*2

Totalization and estimates of traffic

Year	Month	Total traffic of broadband service subscribers in Japan (estimates) [Gbps] *3		Traffic per broadband service subscriber (estimates) [kbps]		(A1) Traffic of broadband service subscribers (FTTH, DSL, CATV, FWA) [Gbps]		(A2) Traffic of other subscribers (ex. dedicated line, data center) [Gbps]		(B1) Traffic exchanged among major domestic IX and cooperating nine ISPs [Gbps]		(B2) Traffic exchanged between domestic ISPs and nine cooperating ISPs without mediation of IX [Gbps]		(B3) Traffic exchanged between domestic ISPs and nine cooperating ISPs [Gbps]		(X) Share of nine cooperating ISPs (calculated based on the number of contracts) *4
		In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	
2019	May	1,563	12,086	38.7	298.9	1,016.7	7,859.6	2,159.4	948.9	950.2	289.4	5,519.1	848.9	1,671.0	408.5	65.03%
	November	1,571	12,650	38.4	309.2	1,073.0	8,641.0	2,323.4	956.5	994.1	290.8	6,232.5	901.2	1,995.5	540.9	68.31%
2020	May	2,321	19,025	56.1	460.2	1,534.3	12,575.6	2,968.1	2,420.1	1,610.7	328.6	10,065.5	1,353.3	2,945.8	724.5	66.10%
	November	2,373	19,821	56.2	469.4	1,542.7	12,885.5	2,787.3	2,552.4	1,502.0	290.5	9,380.0	1,535.1	2,603.5	593.5	65.01%
2021	May	2,781	23,899	64.8	556.8	1,776.4	15,264.6	3,226.4	3,084.7	1,881.8	584.3	12,454.5	1,651.1	2,946.1	715.6	63.87%
	November	2,816	23,650	64.7	543.2	1,772.3	14,885.5	3,590.7	3,147.5	2,078.7	631.9	12,906.8	1,654.0	2,518.9	820.7	62.94%

*1 In “Total traffic of broadband service subscribers in Japan (estimates)”, “Traffic per broadband service subscriber (estimates)”, A1 and A2, “in” corresponds to “upload” while “out” corresponds to “download”.
*2 Aggregate and estimated values of nine cooperating ISPs (Internet Initiative Japan Inc., NTT Communications, NTT Plala Inc., OPTAGE Inc., KDDI Corporation, JCOM Co., Ltd., SoftBank Corp., NIFTY Corporation and BIGLOBE Inc.)
*3 Total traffic of broadband service subscribers in Japan (estimates) is calculated based on the traffic of broadband subscribers of nine cooperating ISPs (A1) and their share of subscribers (X).
*4 Estimation by linear interpolation based on the “publication of quarterly data on the number and share of telecommunication service contracts”

Type of aggregated traffic (Related to fixed broadband services)



*1 A1 includes the following traffic:
・Part of the traffic on some ISPs’ public wireless LAN services
・A part of the traffic on some mobile carriers’ femtocell service

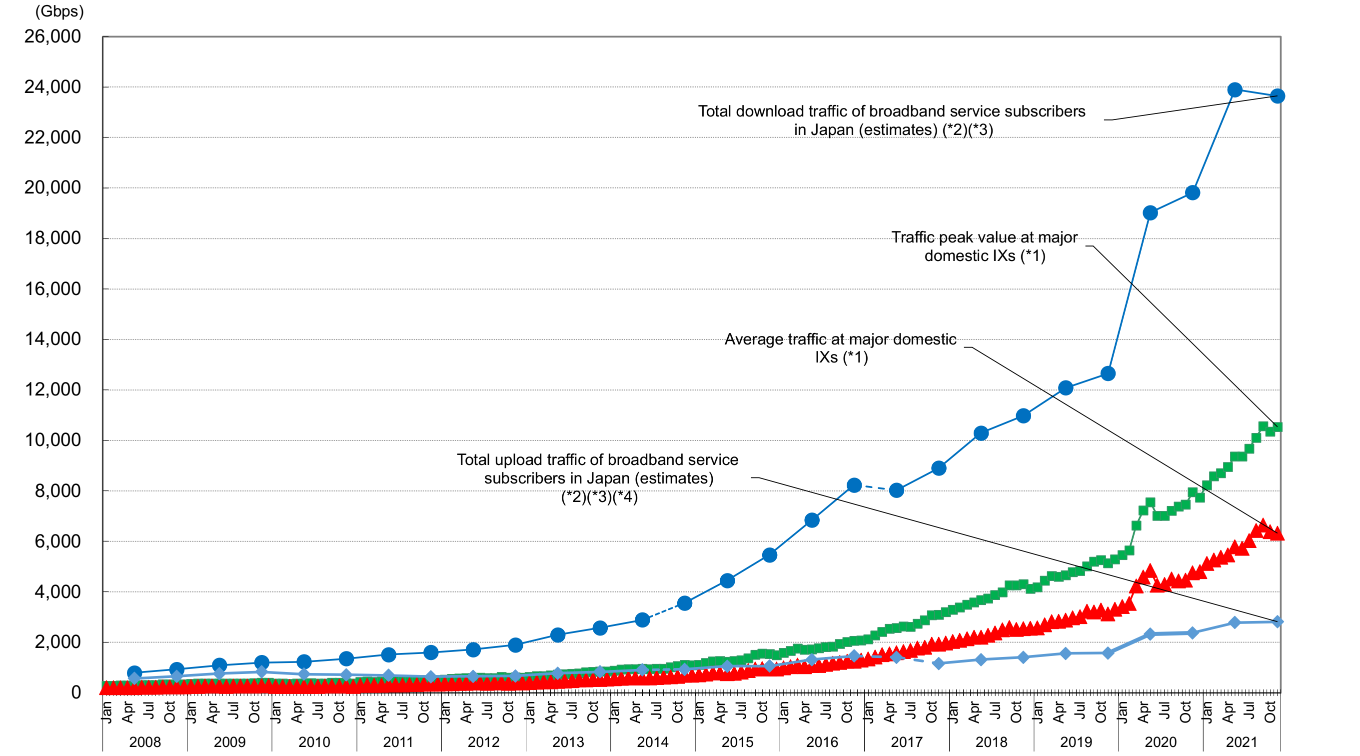
*2 A2 includes the following traffic: From November 2016, it was clarified that traffic by CDN caches and traffic by customer ISPs connecting with cooperating ISPs which provide transit are treated as A2.
・Data centers of cooperating ISPs, CDN caches, and other internal traffic.

*3 B2 includes traffic exchanged via:
・Private peering
・Transit
・Public peering, etc. at domestic IX other than major domestic IX

*4 B3 contains traffic exchanged via: However, from November 2016, it was clarified that among the traffic, the traffic at domestic connection points are treated as B2.
・Private peering
・Transit
・Public peering, etc. at overseas IX

(Source) Prepared from MIC, “Aggregation result of Internet Traffic in Japan (release of the aggregation result in November 2021)”
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000202.html

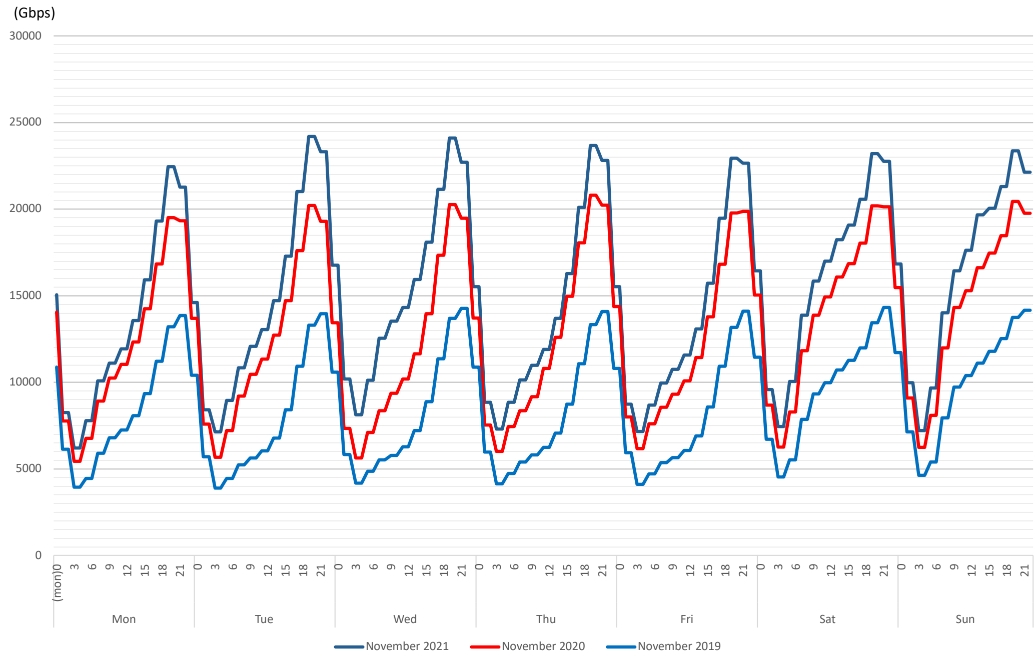
14. Changes in the internet traffic in Japan



*1 Before December 2010: traffic at three major IXs (WIDE Project (NSPIXP),) Japan Internet Exchange Co. (JPIX) and Internet Multifeed Co. (JPNAP));
In January 2011 and after: traffic at three IXs above plus additional two IXs (BBIX Inc. and Equinix Japan K.K.)
*2 Before May 2011, a part of mobile communication traffic with mobile telephone network was included in the traffic between some cooperating ISPs and broadband service subscribers.
Because exclusion of the traffic concerned from calculation became possible, traffic has been aggregated and calculated without the traffic concerned since November 2011.
*3 Data is discontinuous because number of cooperating ISPs increased from 5 to 9 in May 2017 and total values and estimates have been based on the nine ISPs since then.
*4 Data is discontinuous due to a review of measurement method by some of the cooperating business operators during the period from May to November 2017.

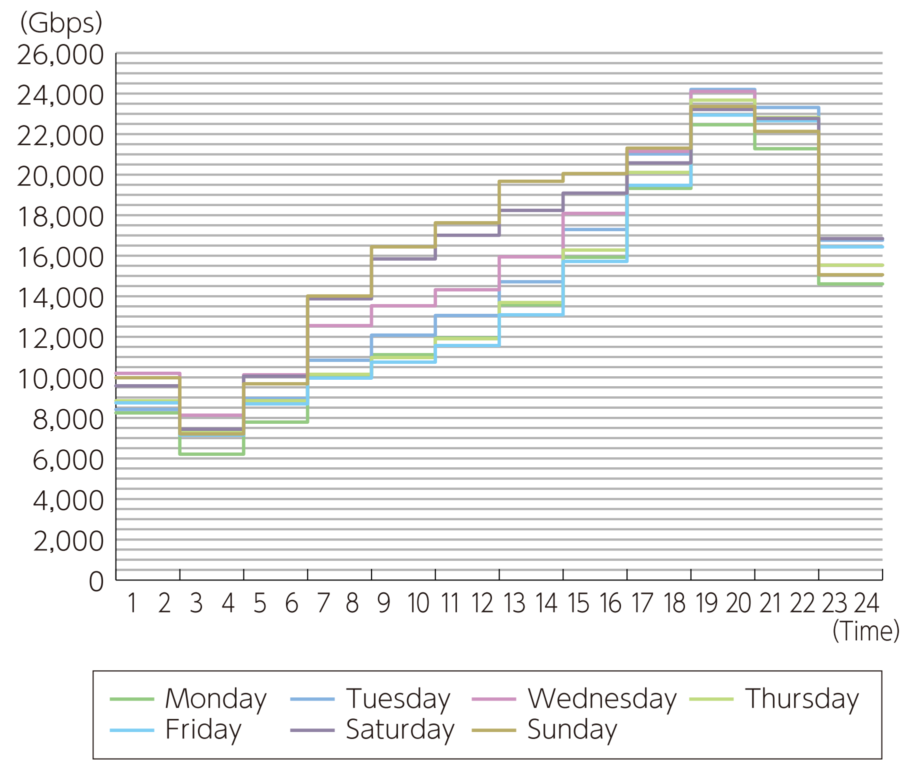
(Source) Prepared from MIC, “Aggregation result of Internet Traffic in Japan (release of the aggregation result in November 2021)”
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000202.html

15. Changes in download traffic of broadband subscribers with nine ISPs



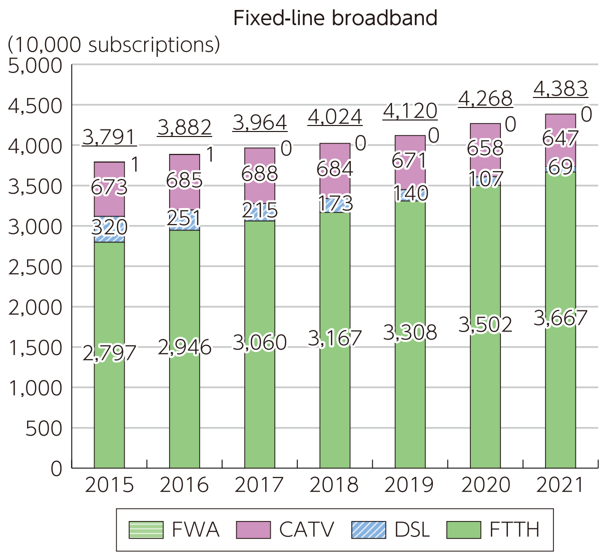
(Source) Prepared from MIC, “Aggregation result of Internet Traffic in Japan (release of the aggregation result in November 2021)”
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000202.html

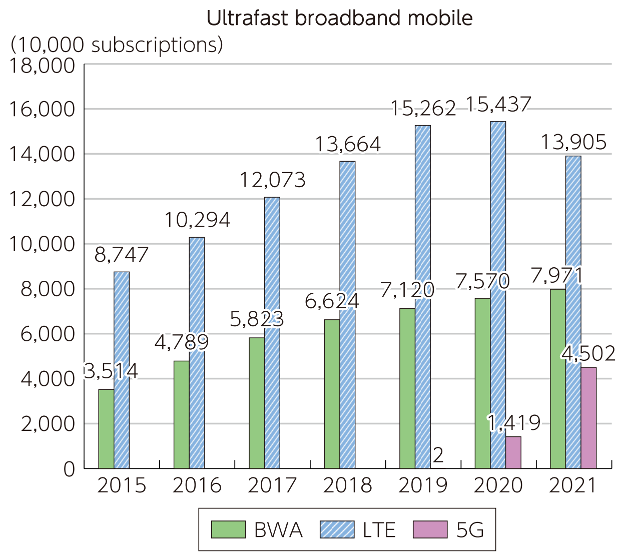
16. Changes in traffic of broadband subscribers with nine ISPs by day of week



(Source) Prepared from MIC, "Aggregation result of Internet Traffic in Japan (release of the aggregation result in November 2021)"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000202.html

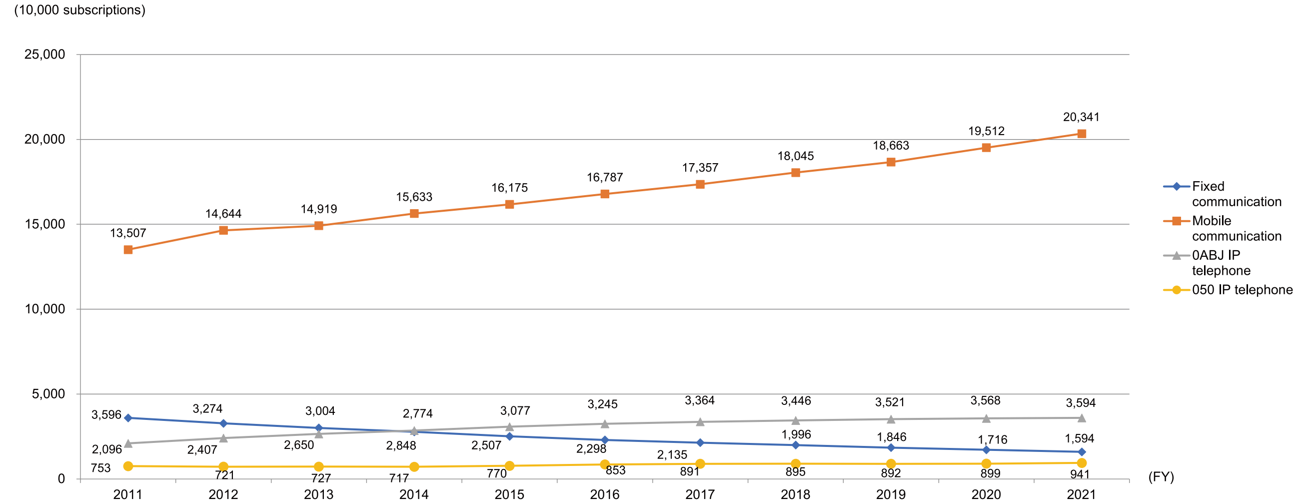
17. Changes in the number of fixed-line broadband subscriptions (Figure 3-2-2-6 in White Paper)





(Source) MIC, "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.htm

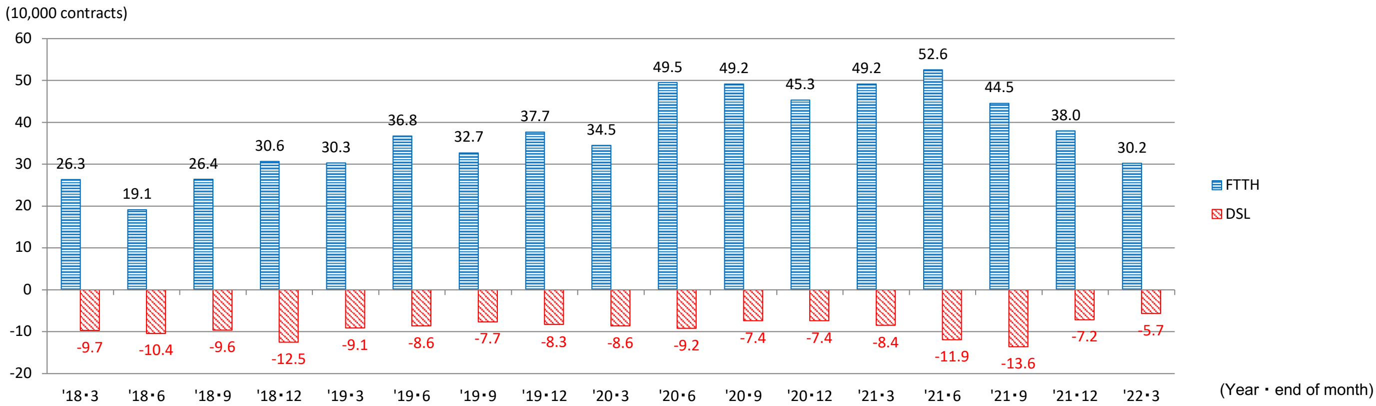
18. Changes in the number of subscriptions with voice communication services (Figure 3-2-2-7 in White Paper)



*1 Mobile communication is the sum of mobile phones, PHS and BWA.
*2 Values of mobile communication since fiscal 2013 are "after adjustment of intra-group transactions," namely, when an MNO as MVNO received a mobile-phone or BWA service from other M NO of the group and provided the service combined with its own service through one mobile phone, etc., this is counted as one subscription.

(Source) MIC, "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

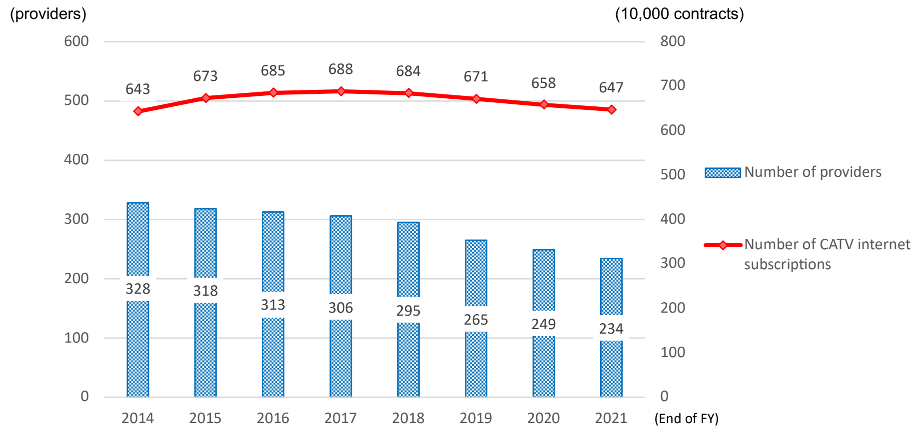
19. Changes in net increase of FTTH and DSL contracts (compared with the end of the previous quarter)



*Past values are different from the past published values due to correction of the report by the business operators.

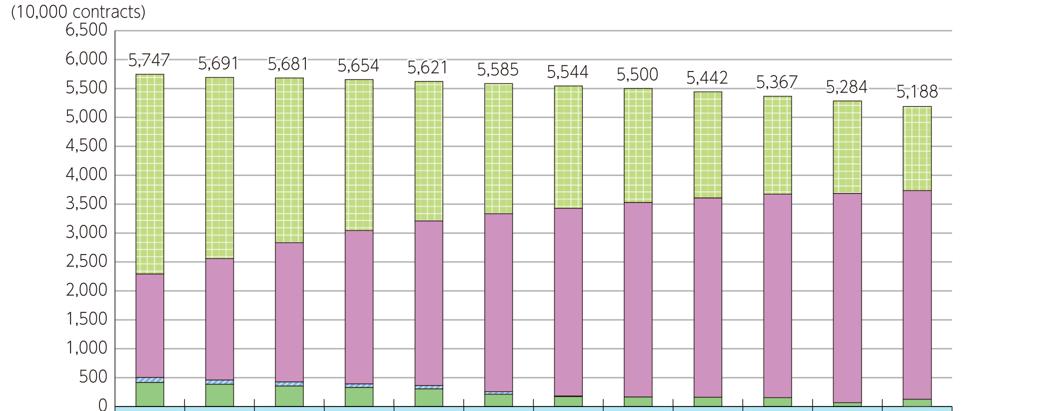
(Source) Prepared from MIC, "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

20. Changes in the number of CATV internet (coax/HFC) providers and contracts



(Source) Prepared from MIC (2022), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

21. Changes in the number of subscribers with fixed telephone

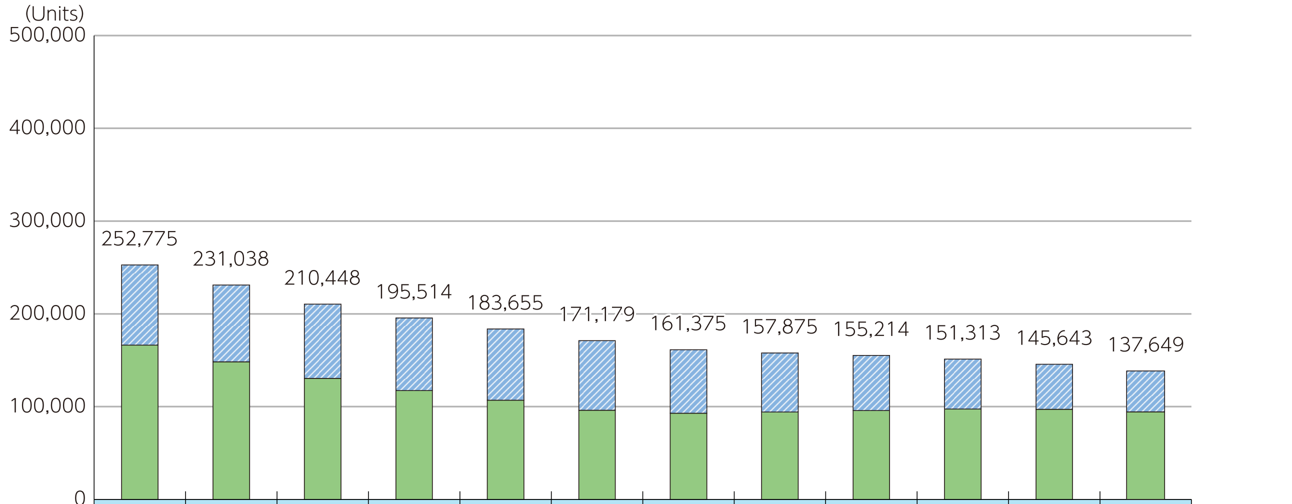


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
NTT East/West subscribed telephone (including ISDN)	3,452	3,135	2,847	2,610	2,411	2,250	2,114	1,969	1,834	1,693	1,573	1,460
0ABJ IP telephone	1,790	2,096	2,407	2,650	2,848	3,077	3,245	3,364	3,446	3,521	3,568	3,594
CATV telephone	86	75	70	63	55	44	12	0	0	0	0	0
Chokushu (dedicated line) telephone	418	386	357	331	308	214	172	166	162	153	143	134
Total	5,747	5,691	5,681	5,654	5,621	5,585	5,544	5,500	5,442	5,367	5,284	5,188

(End of FY)

(Source) Prepared from MIC (2022), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

22. Changes in the composition of public telephone facilities of NTT East/West

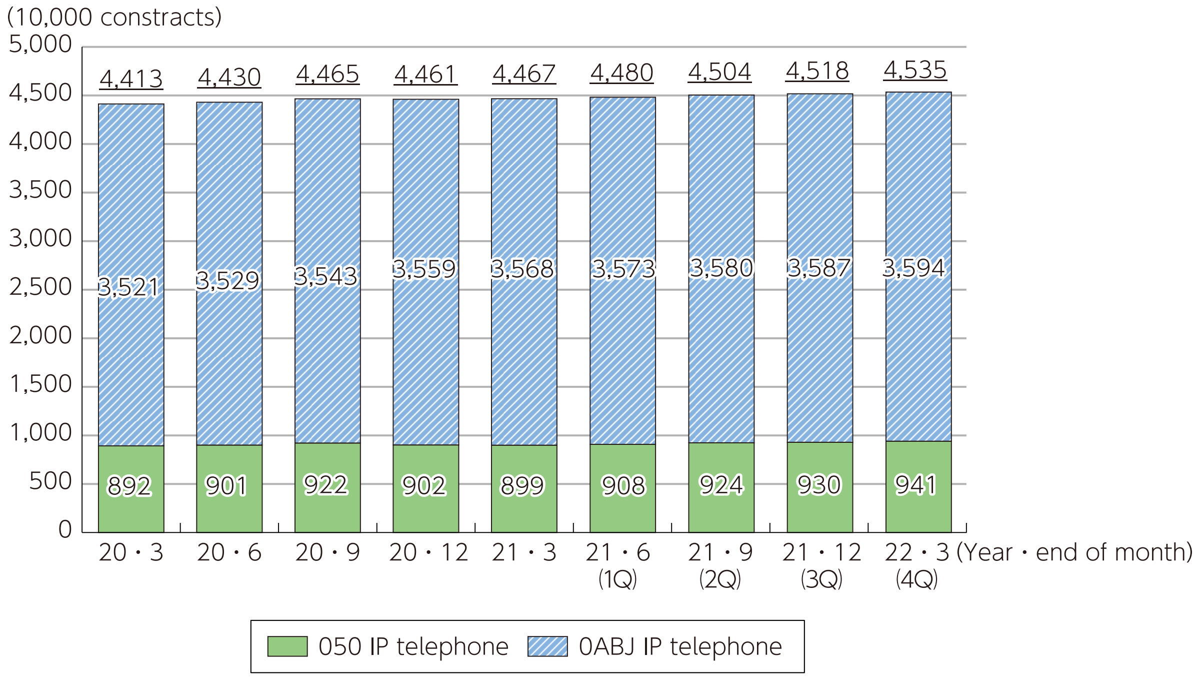


	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Digital	86,526	82,678	79,919	78,179	76,755	75,149	68,546	63,751	59,437	53,831	48,574	43,710
Analog	166,249	148,360	130,529	117,335	106,900	96,030	92,829	94,124	95,777	97,482	97,069	93,939
Total	252,775	231,038	210,448	195,514	183,655	171,179	161,375	157,875	155,214	151,313	145,643	137,649

(End of FY)

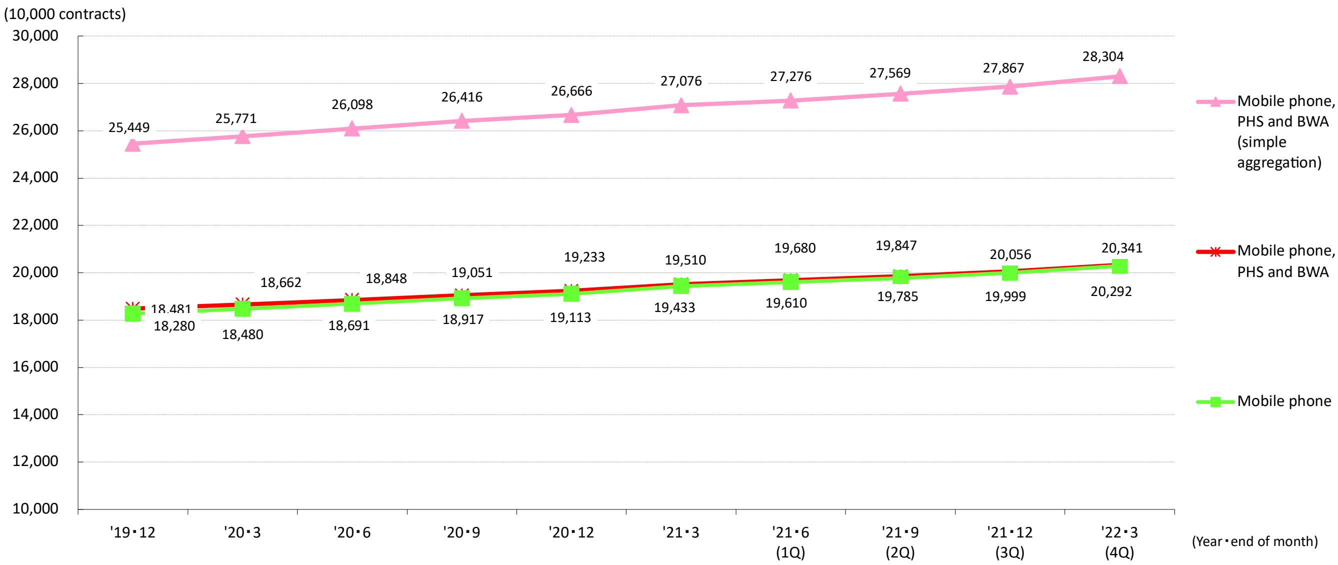
(Source) Prepared from materials of NTT East/West

23. Usage status of IP telephone



(Source) Prepared from MIC (2022), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

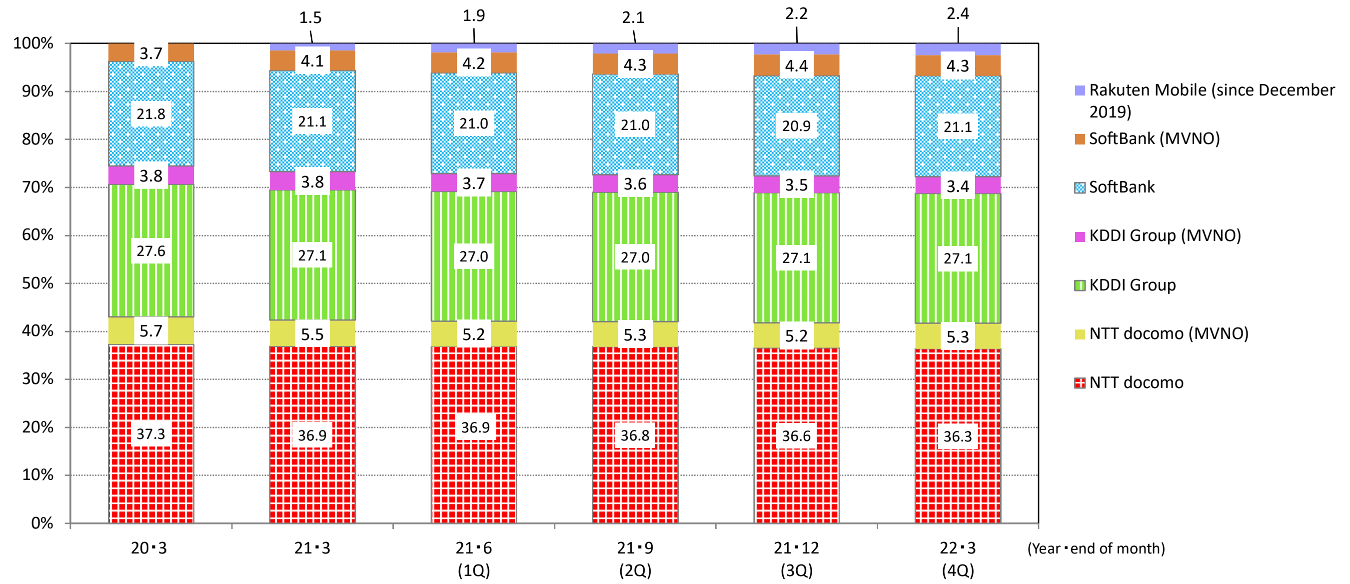
24. Changes in the number of mobile communication contracts



* “After adjustment of intra-group transactions” means: when an MNO as MVNO of the group received a mobile-phone or BWA service from another MNO of the group and provided the service combined with its own service through one mobile phone, etc., this is counted as one subscription.
*Past values are different from the values published last year due to correction of the report by the business operators.

(Source) Prepared from MIC (2022), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

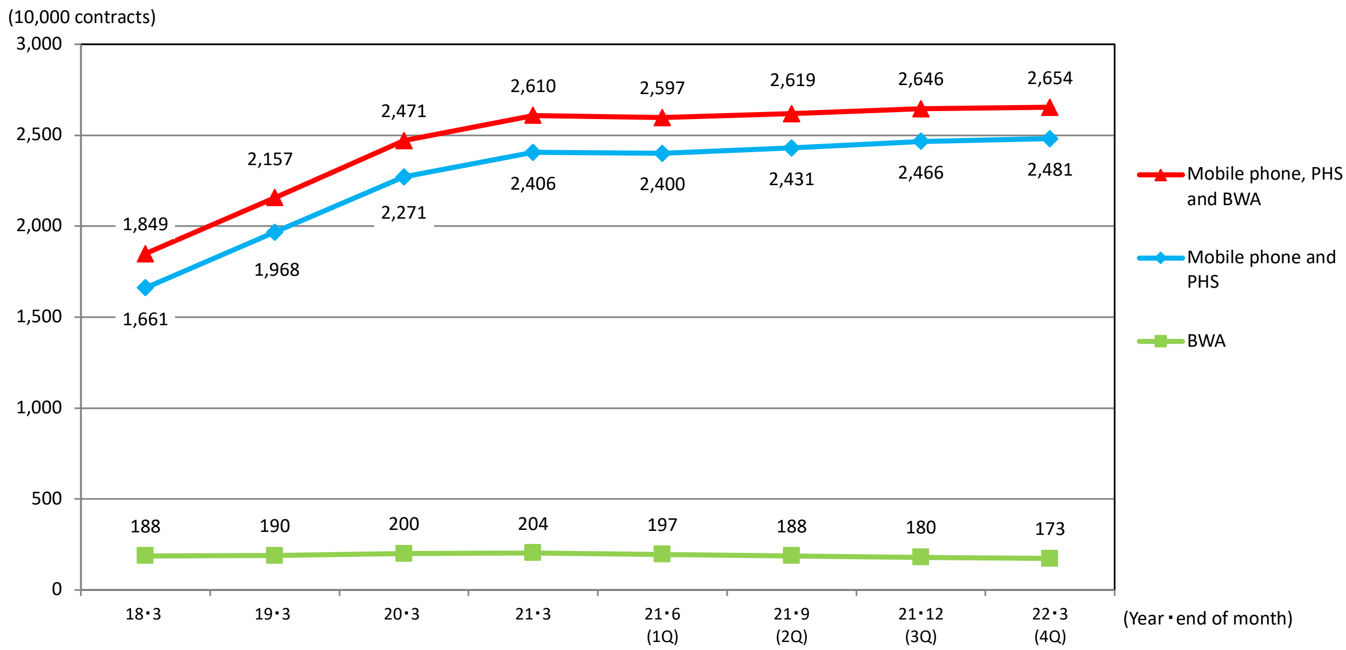
25. Changes in the share of mobile communication contracts (after adjustment of intra-group transactions) by business operator



*1 Share of KDDI Group includes KDDI, Okinawa Cellular and UQ Communications.
*2 Share of MVNO is added up for each providing MNO group and "(MVNO)" is added to the respective MNO Group name.
*3 Share of Rakuten Mobile is its share as MNO. MVNO services provided by Rakuten Mobile are included in NTT docomo (MVNO) and KDDI Group (MVNO).

(Source) Prepared from MIC (2022), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

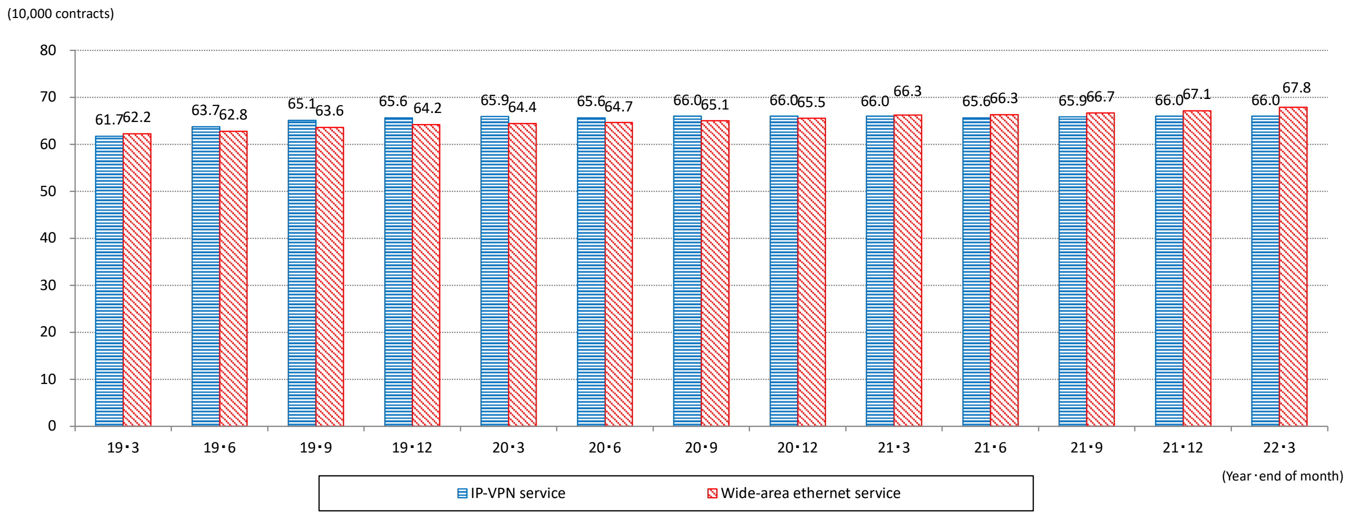
26. Changes in the number of MVNO contracts (excluding MVNOs that are also MNO)



*Past values are different from the values published last year due to correction of the report by the business operators.

(Source) Prepared from MIC (2022), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

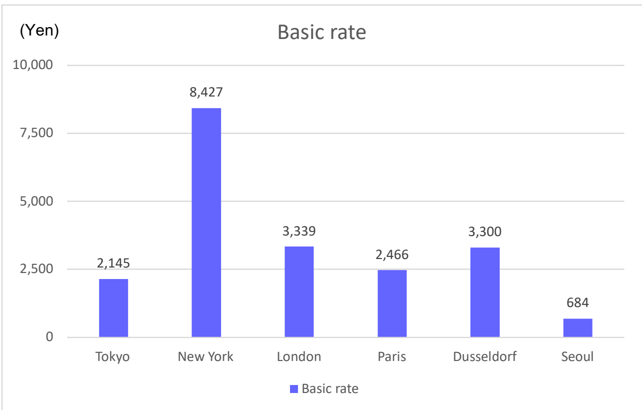
27. Changes in the number of IP-VPN service and wide-area ethernet service contracts

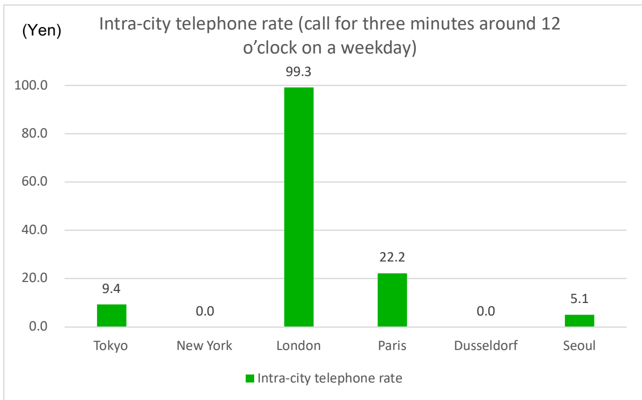


*Past values are different from the values published last year due to correction of the report by the business operators.

(Source) Prepared from MIC (2022), "Quarterly data on the number of subscribers and the market share of telecommunications services (the 4th quarter of fiscal 2021 (at the end of March))"
https://www.soumu.go.jp/menu_news/s-news/01kiban04_02000206.html

28. International comparison of fixed telephone charge based on individual charge (FY2021)





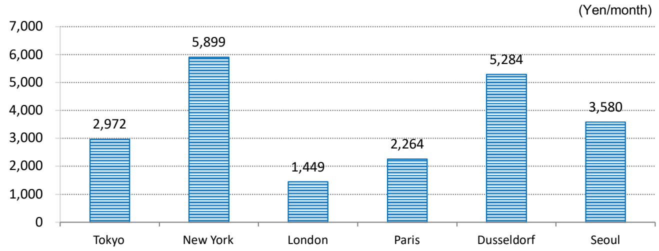
*1 Simple comparison of monthly fee is difficult because each city has a diverse rate structure including a plan where monthly basic rate includes a certain length of call, and a plan that is not based on duration of call or communication range.
*2 Charge in Tokyo is based on the subscribed telephone light plan of Home Use Class 3 Station (category of station with the number of subscribers 0.4 million or more) of NTT East (with no contract period)
*3 Values of New York and Düsseldorf are IP telephone rate. (Subscribers pay only monthly basic rate, but do not pay for individual calls. The basic rate includes internet connection fee.)

(Source) MIC, “FY2021 Survey on domestic-overseas price difference of telecommunication service”
https://www.soumu.go.jp/menu_news/s-news/01kiban03_02000789.html

29. International comparison of mobile phone bill based on model (fiscal 2021)

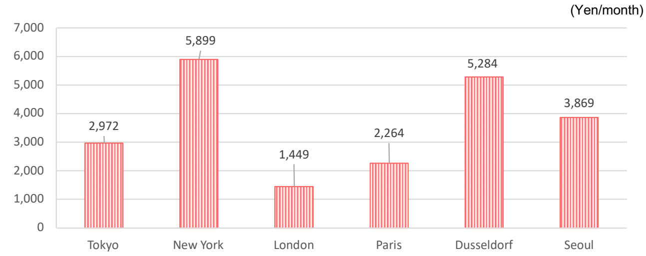
Smartphone user A

(Voice: 59 minutes per month; e-mail: 60 mails per month; data: 2GB per month; 4G)



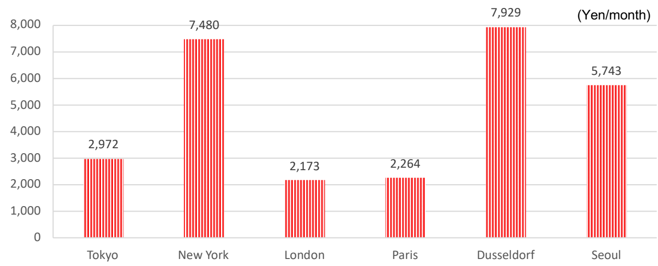
Smartphone user B

(Voice: 59 minutes per month; e-mail: 60 mails per month; data: 5GB per month; 4G)



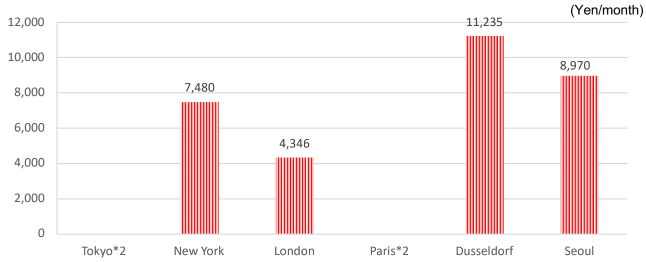
Smartphone user C

(Voice: 59 minutes per month; e-mail: 60 mails per month; data: 20GB per month;4G)



Smartphone user D

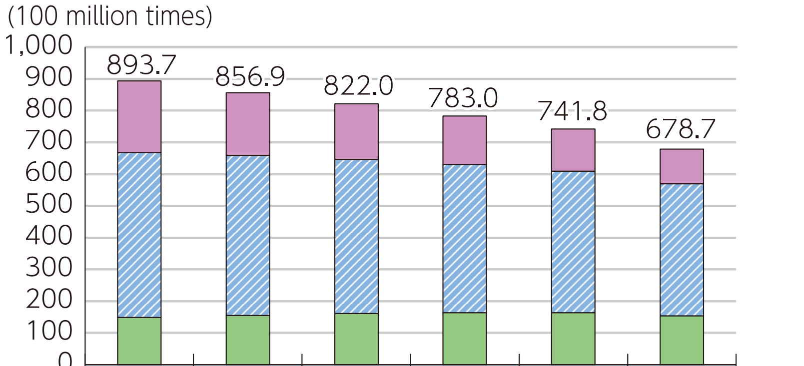
(Voice: 59 minutes per month; e-mail: 60 mails per month; data: unlimited)



*1 Model rate was calculated based on the usage state of calls, mail and data communication using mobile phone in Japan to compare monthly amount of payment.
*2 Unlimited use plan is not offered in Tokyo or Paris
*3 Regarding telecommunication service charges, it is necessary to pay attention to the fact that charge varies depending on use form due to various rate structures including separation of regular and discount rates in each country

(Source) MIC, "FY2021 Survey on domestic-overseas price difference of telecommunication service"
https://www.soumu.go.jp/menu_news/s-news/01kiban03_02000789.html

30. Changes in communication frequency (by calling terminal)



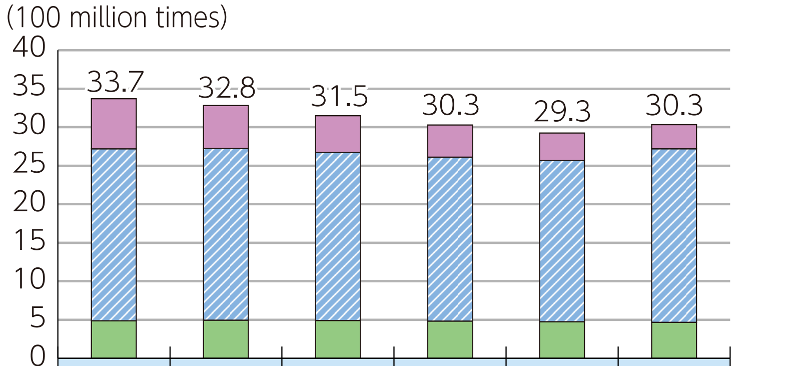
	2015	2016	2017	2018	2019	2020
Fixed	226.4	198.1	174.9	152.7	132.2	108.6
Mobile	518.1	503.9	486.1	466.3	445.3	416.5
IP telephone	149.1	154.9	160.9	164.0	164.3	153.5
Total frequency	893.7	856.9	822.0	783.0	741.8	678.7

(FY)

*Mobile communication: from mobile phone/PHS; Fixed communication: from subscribed telephone, ISDN and public telephone

(Source) MIC, "Voice communication usage status in Japan based on the communication traffic volume (fiscal 2020)"
https://www.soumu.go.jp/menu_news/s-news/01kiban03_02000763.html

31. Changes in communication time (by calling terminal)

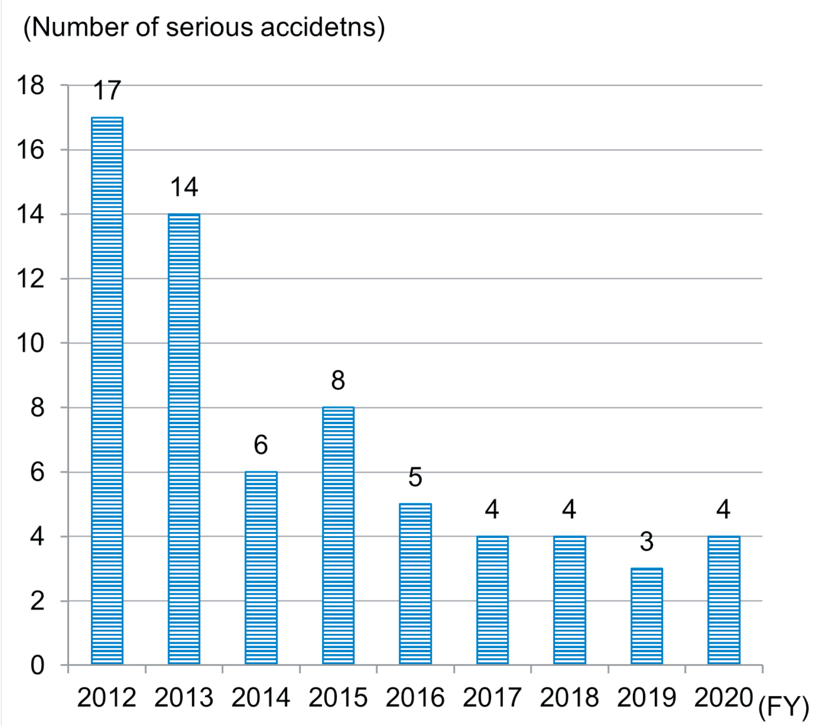


	2015	2016	2017	2018	2019	2020 (FY)
Fixed	6.5	5.6	4.8	4.2	3.6	3.1
Mobile	22.3	22.3	21.8	21.3	20.9	22.5
IP telephone	4.9	4.9	4.9	4.8	4.7	4.7
Total communication time	33.7	32.8	31.5	30.3	29.3	30.3

*1 Mobile communication: from mobile phone/PHS; Fixed communication: from subscribed telephone, ISDN and public telephone
*2 Unit is changed from “million hours” to “100 million hours” and values are rounded to the first decimal place. See the source for the values before rounding.

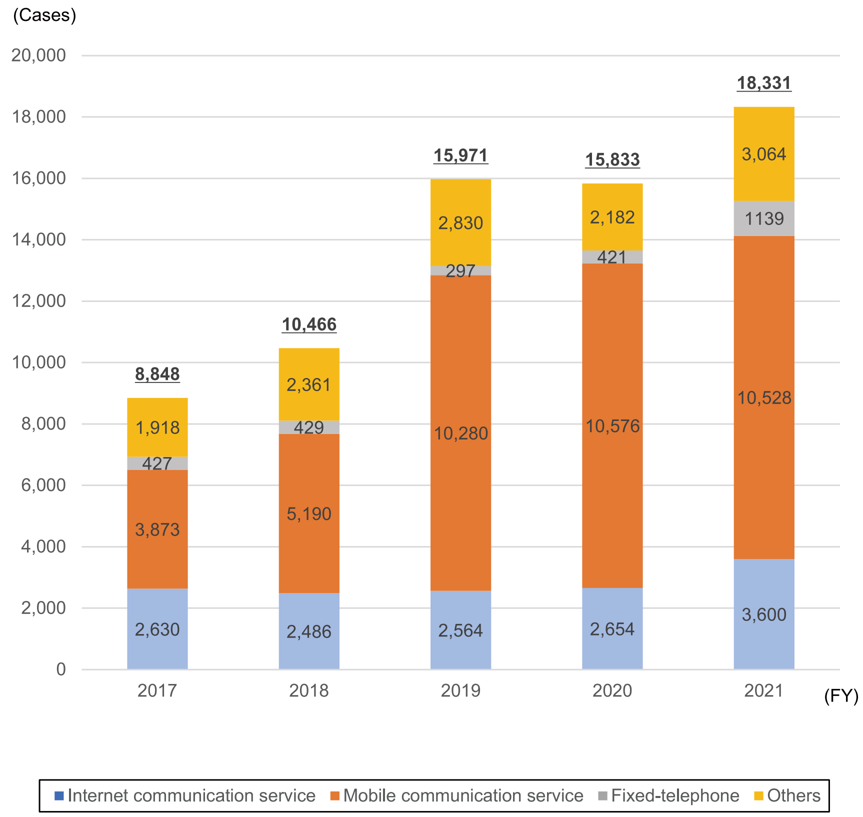
(Source) MIC, “Voice communication usage status in Japan based on the communication traffic volume (fiscal 2020)”
https://www.soumu.go.jp/menu_news/s-news/01kiban03_02000763.html

32. Changes in the number of serious accidents (Figure 3-2-2-8 in White Paper)



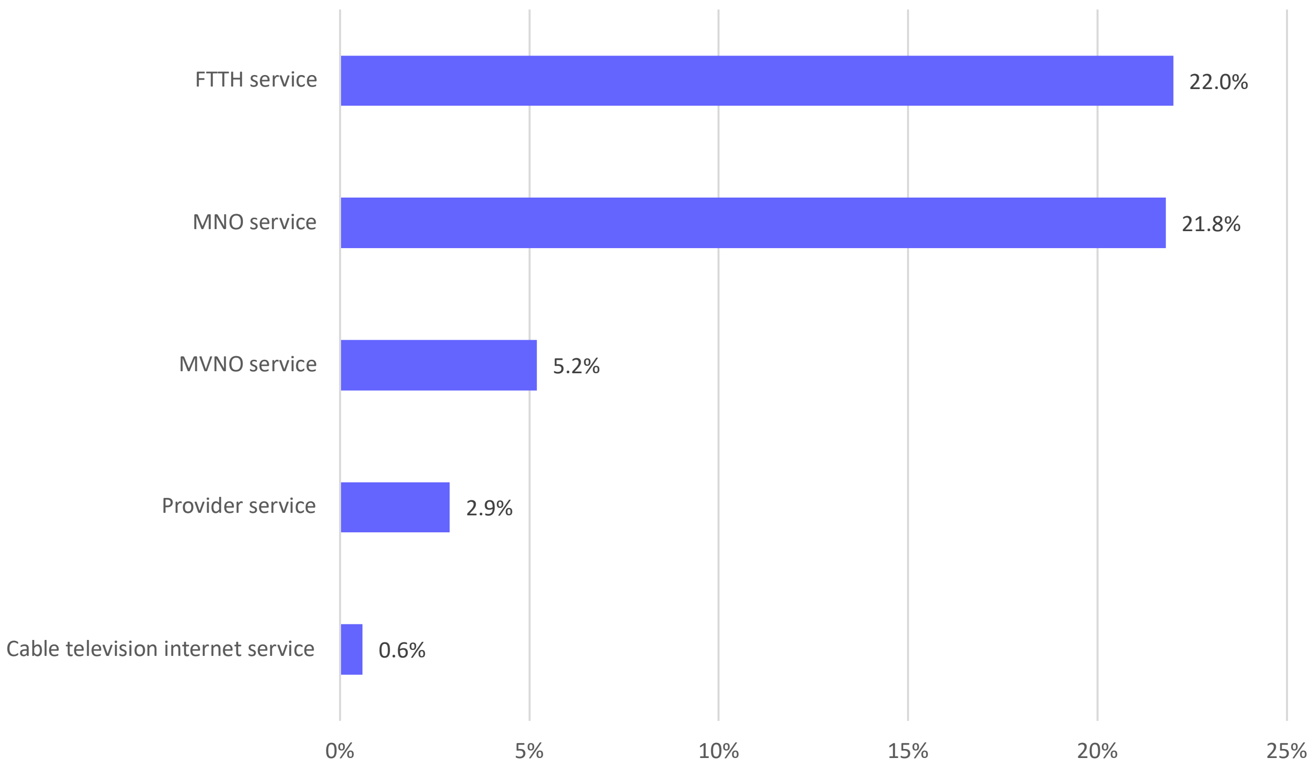
(Source) MIC, “Occurrences of telecommunication service accidents (Fiscal 2020)"
https://www.soumu.go.jp/menu_news/s-news/01kiban05_02000229.html

33. Changes in the number of complaints/requests for consultation sent to MIC (Figure 3-2-2-9 in White Paper)



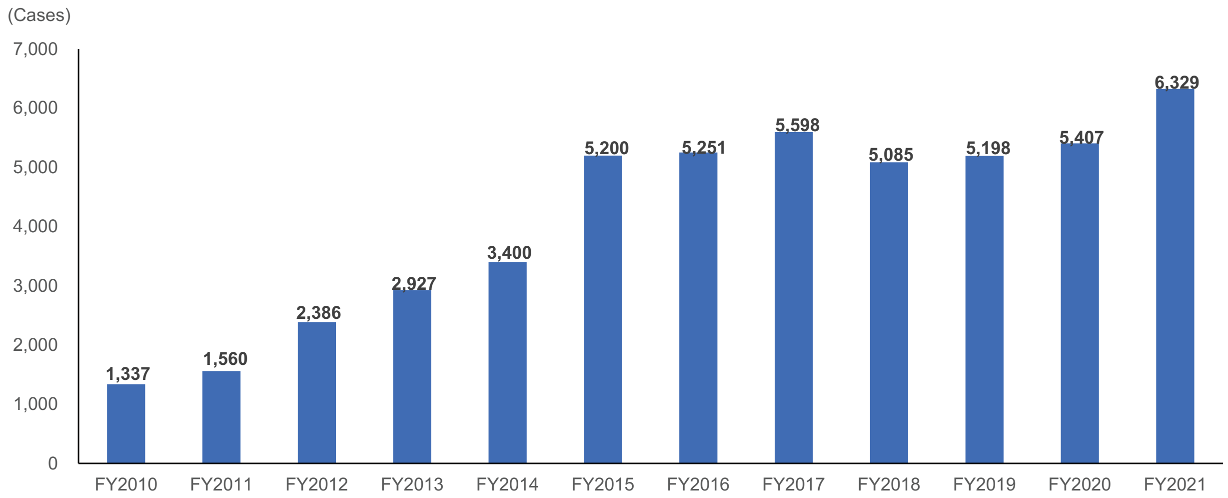
(Source) Prepared by MIC

34. Breakdown of services pertaining to the complaints/requests for consultation received at Consumer Centers across Japan and MIC

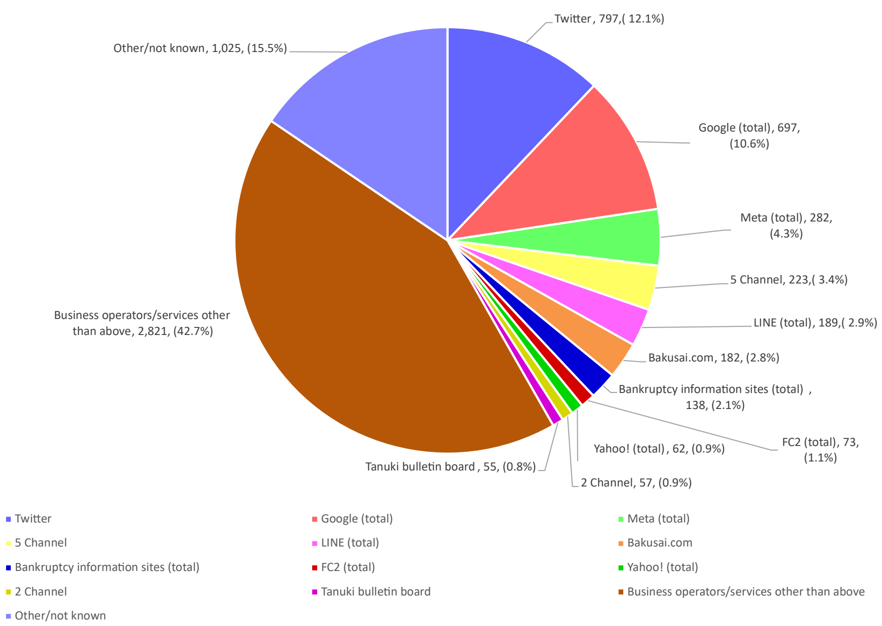


(Source) Regular meeting on the monitoring of the implementation status of the Consumer Protection Rules (the 12th session)

35. Changes in the number of requests for consultation on illegal/harmful information (Figure 3-2-2-10 in White Paper)



36. Breakdown of the number of consultation at the Illegal Harmful Hotline by business operator



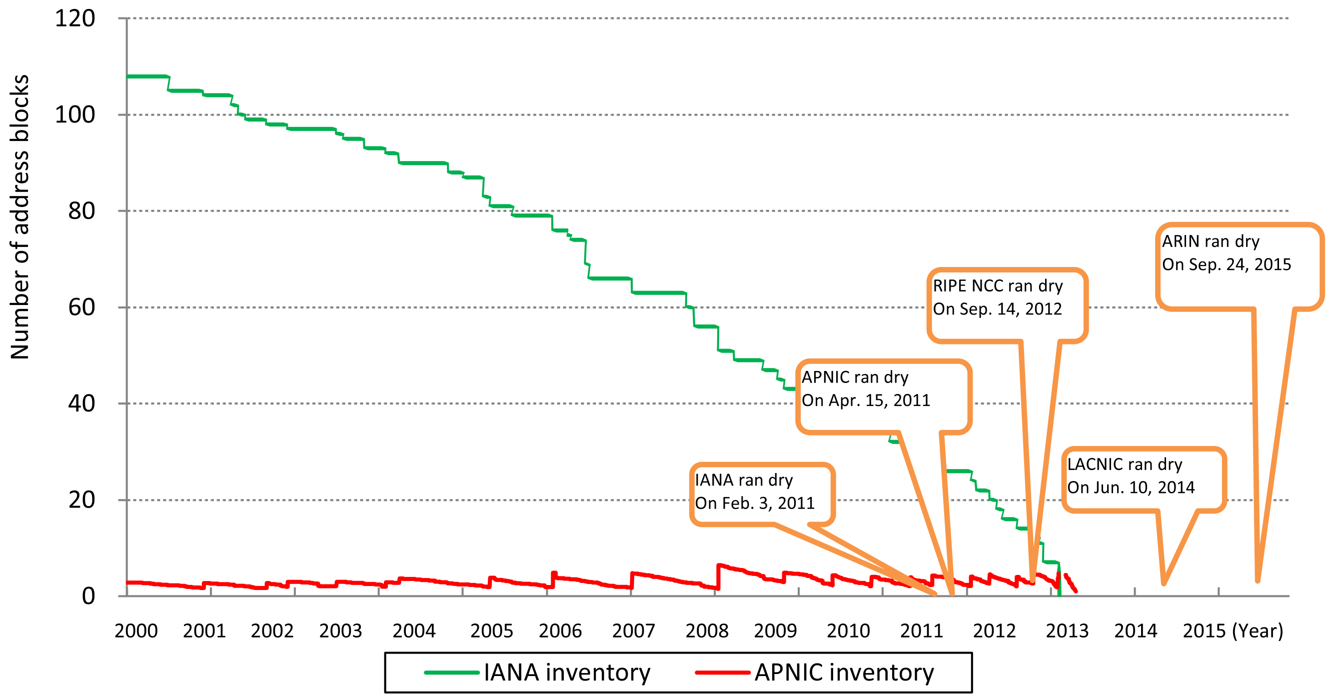
Business operator, service, etc.		Number of requests	Percentage
Twitter		797	12.1%
Google (total)		697	10.6%
	Search	450	6.8%
	YouTube	112	1.7%
	Map	108	1.6%
	Other	27	0.4%
Meta (total)		282	4.3%
	Instagram	216	3.3%
	Facebook	66	1.0%
5 Channel		223	3.4%
LINE (total)		189	2.9%
	Livedoor services	128	1.9%
	Services in LINE applications	61	0.9%
Bakusai.com		182	2.8%
Bankruptcy information sites (total)		138	2.1%
FC2 (total)		73	1.1%
Yahoo! (total)		62	0.9%
	Auction	14	0.2%
	News	13	0.2%
	Advice	12	0.2%
	Search	9	0.1%
	Other	14	0.2%
2 Channel		57	0.9%
Tanuki bulletin board		55	0.8%
Business operators/services other than above		2,821	42.7%
Other/not known		1,025	15.5%

*Breakdown of consultations (works): by business operator/service (n=6,601, Fiscal 2021) (6,329 consultations (works) in total)

Note 1 This is the number of consultations (works). The Hotline did not judge whether the issues of individual consultations fall under infringement or not.
Note 2 This is not exact statistical information because the representative domain of each work was entered and aggregated when the issue involves multiple sites.
Note 3 Some subjects use an original domain and actual domain is not clear.

(Source) Breakdown of consultations (works): by business operator/service (n=6,601, Fiscal 2021) (6,329 consultations (works) in total)

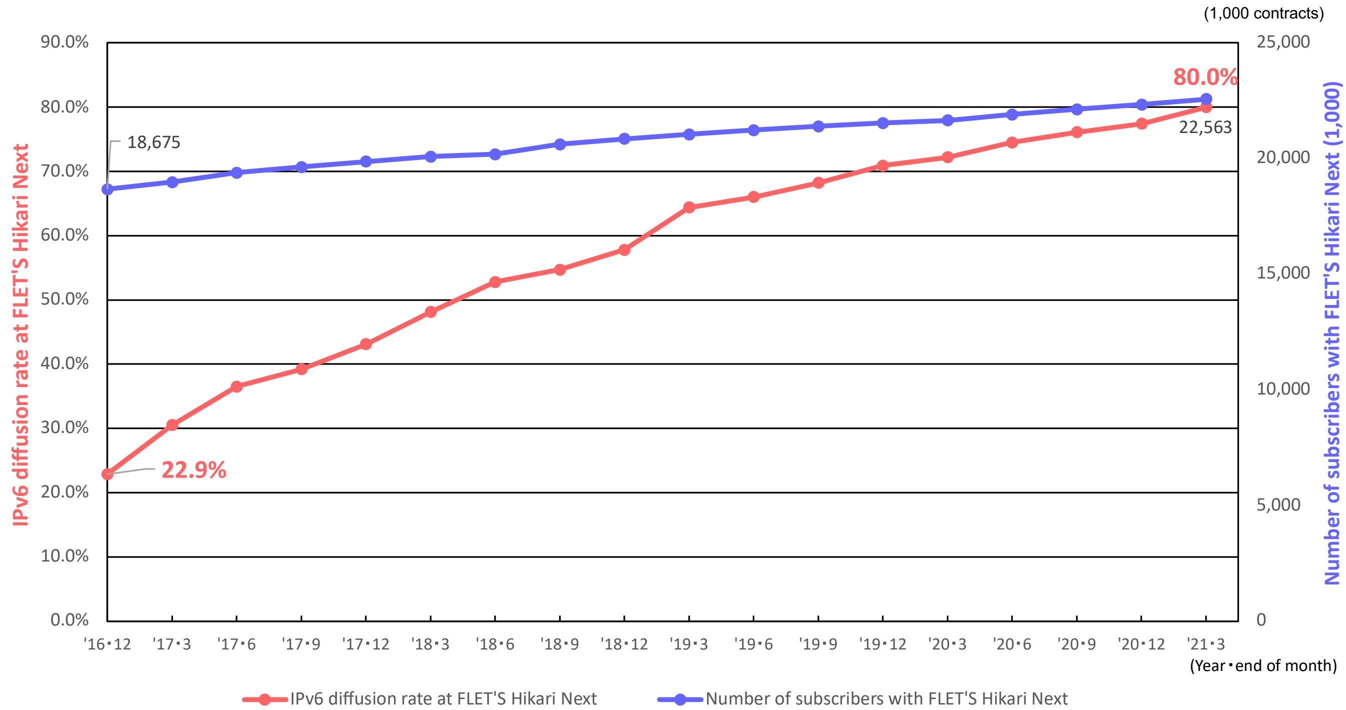
37. Consumption of IPv4 addresses



*1 One block contains 16 million IP addresses.

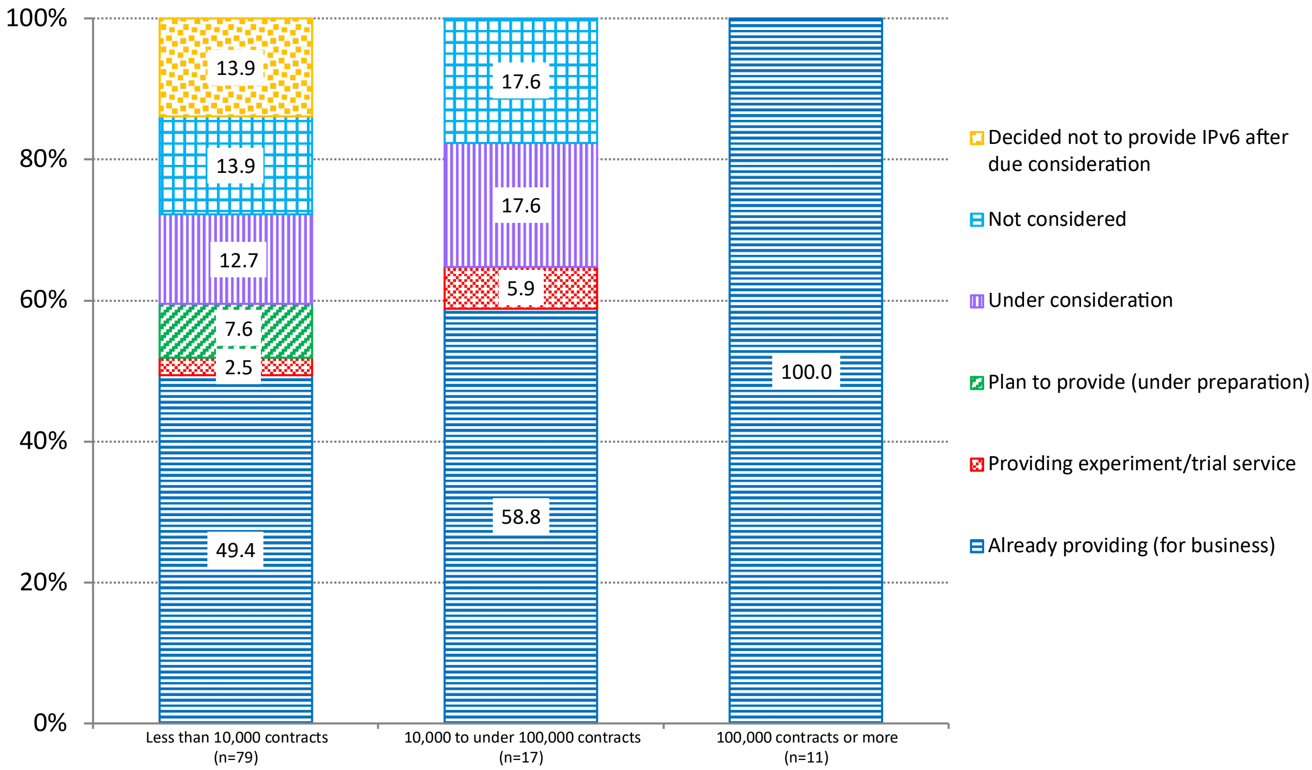
(Source) Prepared from MIC, "The 3rd Report of the Study Group on Advanced Use of Internet with IPv6"
https://www.soumu.go.jp/main_sosiki/joho_tsusin/policyreports/chousa/ipv6_internet/01kiban04_02000029.html

38. IPv6 diffusion rate at FLET'S Hikari Next



(Source) Prepared by MIC from "Survey on the spread of IPv6 in access networks" of the IPv6 Promotion Council
https://v6pc.jp/jp/spread/ipv6spread_03.phtml

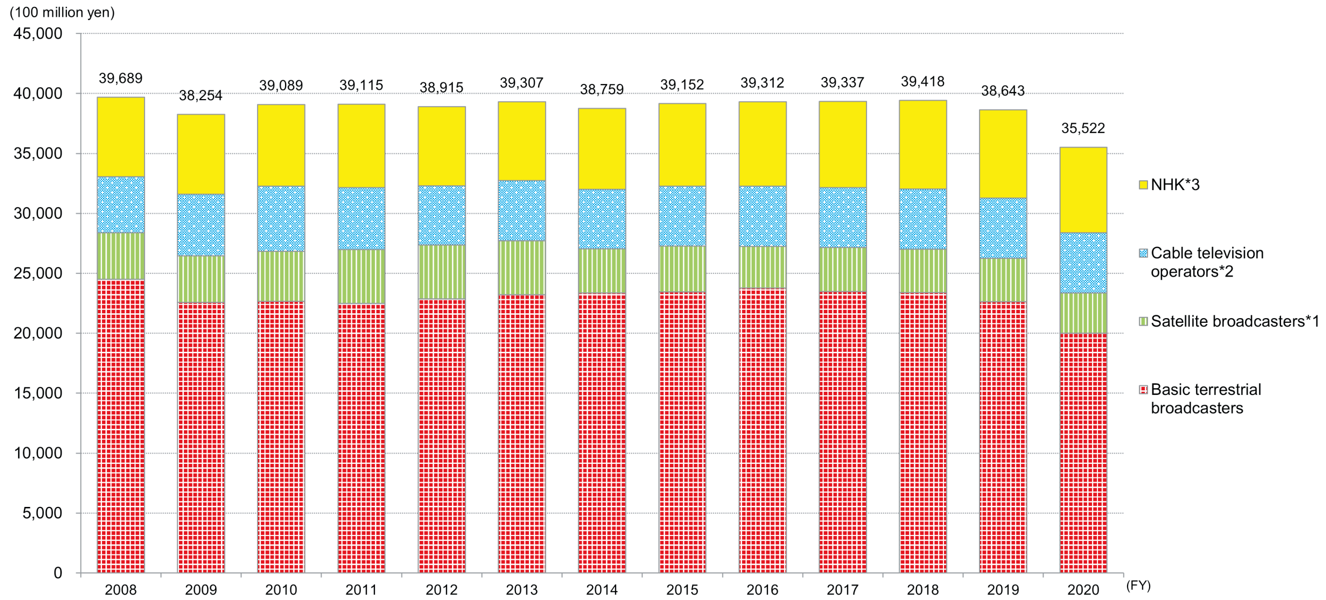
39. Status of IPv6 service provision (by ISP size) (January 2022)



(Source) Prepared from MIC questionnaire survey

Section3

1. Changes in and breakdown of the size of the broadcasting sector market (total sales) (Figure 3-3-1-1 in White Paper)

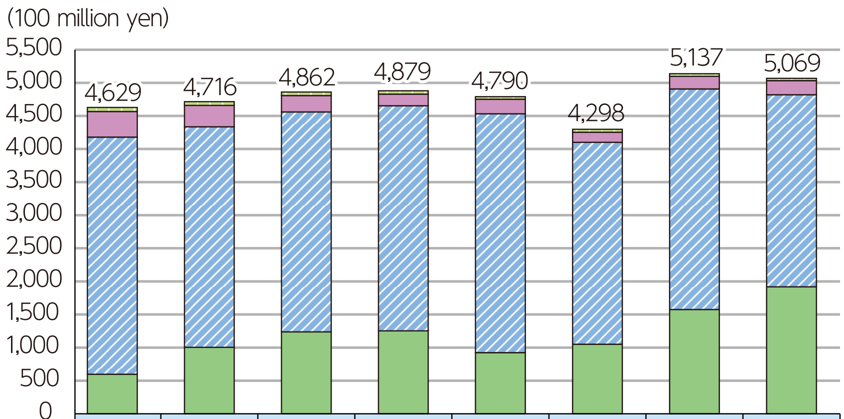


FY			2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Private broadcasters	Basic terrestrial broadcasters		24,493	22,574	22,655	22,502	22,870	23,216	23,375	23,461	23,773	23,471	23,396	22,640	19,993
		(community broadcasters of the above*4)	150	123	116	120	115	124	127	126	136	136	143	145	130
	Satellite broadcasters*1		3,905	3,887	4,185	4,490	4,510	4,491	3,661	3,809	3,463	3,697	3,619	3,623	3,386
	Cable television operators*2		4,667	5,134	5,437	5,177	4,931	5,030	4,975	5,003	5,031	4,992	5,030	5,008	5,006
NHK*3			6,624	6,659	6,812	6,946	6,604	6,570	6,748	6,879	7,045	7,177	7,373	7,372	7,137
Total			39,689	38,254	39,089	39,115	38,915	39,307	38,759	39,152	39,312	39,337	39,418	38,643	35,522

*1 Business income pertaining to satellite broadcasting is counted.
*2 Up to fiscal 2010: corporations for profit that had facilities that were approved under the former Cable Television Broadcasting Act and conducted independent broadcasting (including facilities registered under the Act on Broadcast on Telecommunications Services and with broadcasting method equivalent to the said facilities) are counted. From fisscal 2011: registered general commercial broadcasters conducting independent broadcasting using wire telecommunication equipment (excluding business operators using IP multicast method in either case) are counted.
*3 The values of NHK are ordinary business income.
*4 Excluding community broadcasters combining cable television business, etc.

(Source) Prepared from MIC “Income and Expenditure of Private Broadcasters“ of each fiscal year and NHK financial statements for each fiscal year

2. Changes in sales of cable television by service



	2013	2014	2015	2016	2017	2018	2019	2020 (FY)
Rebroadcast for poor reception	62	56	54	49	39	45	39	34
Pay service	387	324	249	177	219	151	193	214
Basic service	3,582	3,331	3,323	3,401	3,608	3,051	3,331	2,903
Other plus unknown	598	1,005	1,236	1,253	924	1,051	1,575	1,917
Total	4,629	4,716	4,862	4,879	4,790	4,298	5,137	5,069

*Sales are total of the sales of all responding business operators. Comparison must be made carefully because the number of respondents varies depending on the year

(Source) Prepared from MIC/METI “Basic Survey on the Information and Communications Industry”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

3. Sales of the communication/broadcasting industries

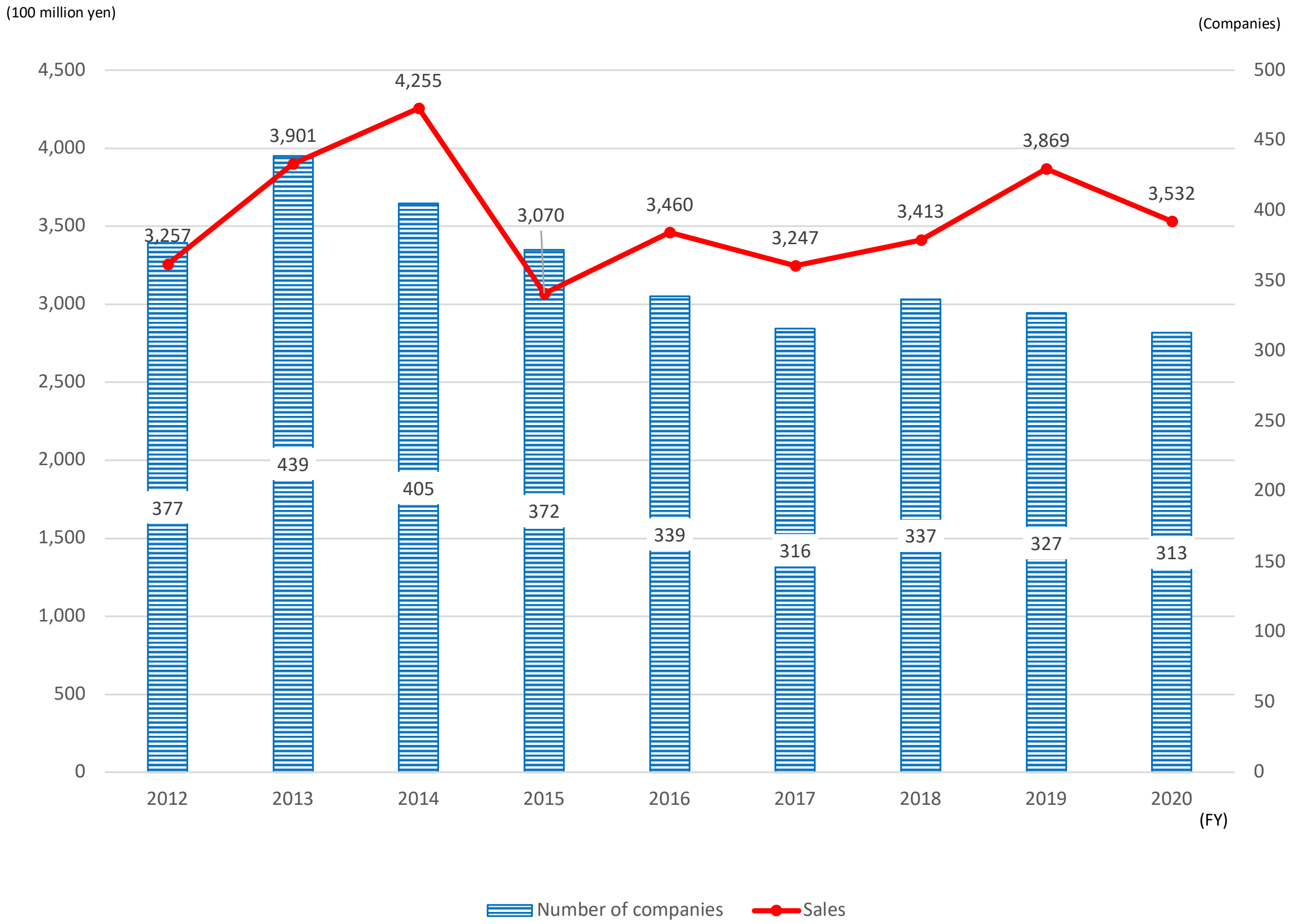
(Companies, trillion yen)

Category	FY2020	
	Number of companies	Sales
Total of the communications/broadcasting industries	1,009	18.5
Telecommunications	443	15.2
Broadcasting	566	3.2
Private broadcasting	373	2.0
Cable television broadcasting	192	0.5
NHK	1	0.7

Note: Values of NHK are based on published materials

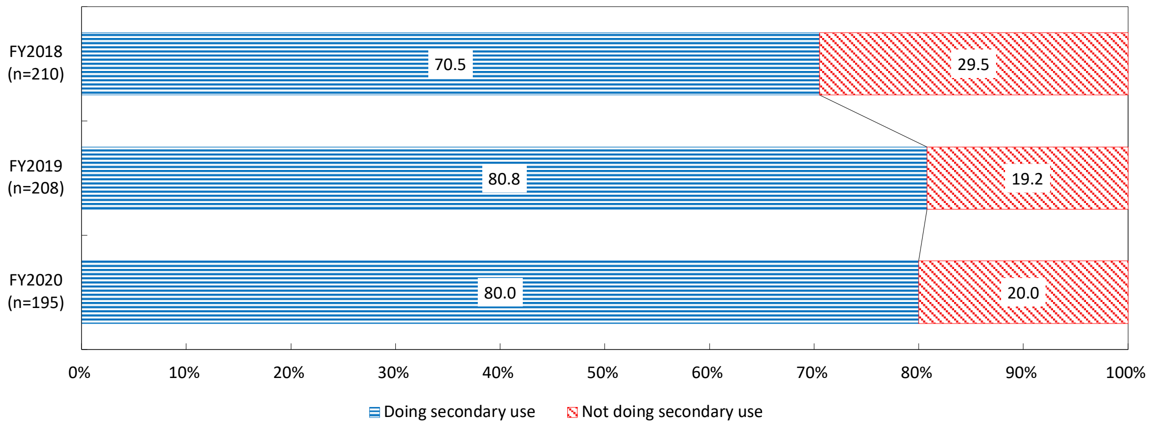
(Source) MIC/METI “2021 Basic Survey on the Information and Communications Industry”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

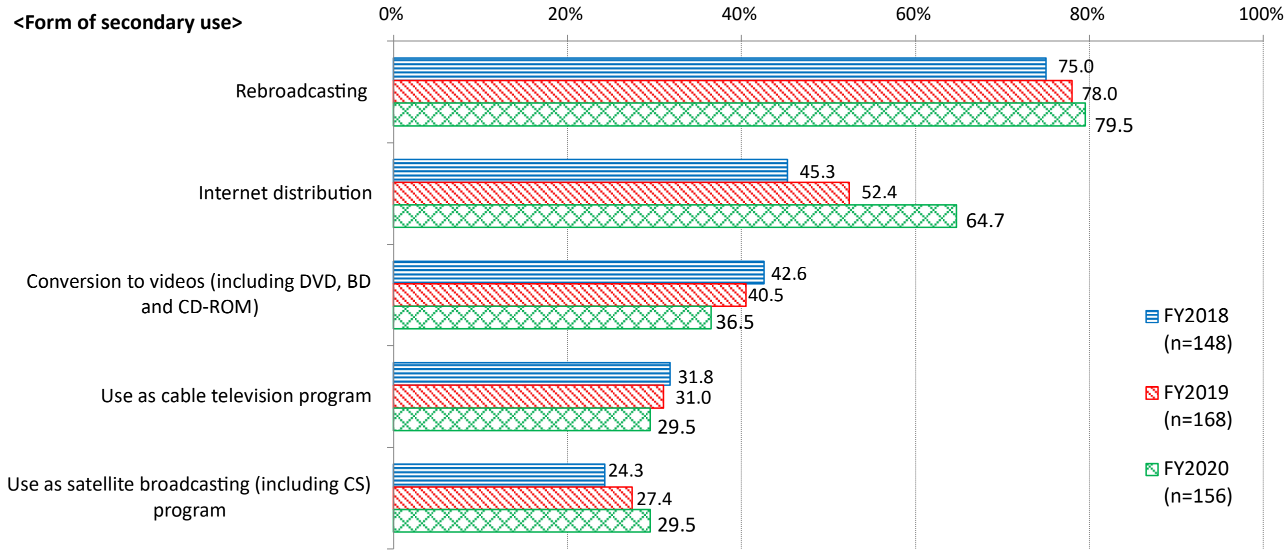
4. Changes in the number of companies and sales of the broadcast program production industry



(Source) Prepared from MIC / METI "Basic Survey on the Information and Communications Industry"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

5. Status and form of secondary use of television broadcast programs (top five answers of multiple answers)





(Source) MIC/METI “2021 Basic Survey on the Information and Communications Industry”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

6. Number of companies and sales by service (activity base)

	Number of companies			Sales (100 million yen)			Sales per company (100 million yen)		
	FY2019	FY2020	Year-on-year (%)	FY2019	FY2020	Year-on-year (%)	FY2019	FY2020	Year-on-year (%)
Total	530	558	5.3	27,953	34,289	22.7	52.7	61.5	16.5
Web information retrieval service	63	64	1.6	1,478	1,483	0.4	23.5	23.2	-1.2
Shopping site management and auction site management	65	55	-15.4	4,977	6,473	30.1	76.6	117.7	53.7
e-bulletin board, blog service, SNS management	15	21	40.0	254	239	-5.9	17.0	11.4	-32.8
Web content distribution	138	142	2.9	8,213	9,316	13.4	59.5	65.6	10.2
Income from IPTV service of the above	12	10	-16.7	523	360	-31.2	43.6	36.0	-17.5
Cloud computing service	112	117	4.5	903	2,223	146.2	8.1	19.0	135.6
Electronic certification	12	11	-8.3	106	133	25.4	8.8	12.1	36.7
Information network security services	69	74	7.2	871	1,156	32.6	12.6	15.6	23.7
Accounting/payment agencies	26	29	11.5	2,029	2,653	30.7	78.1	91.5	17.2
Server management contractors	71	70	-1.4	374	313	-16.2	5.3	4.5	-15.0
Other internet-related services	136	163	19.9	8,748	10,300	17.7	64.3	63.2	-1.8

*1 Total number of companies and the sum of breakdown may not agree due to companies operating multiple businesses.
*2 “Shopping site management and auction site management” refer to “Internet shopping site management and internet auction site management”

(Source) MIC/METI “2021 Basic Survey on the Information and Communications Industry”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

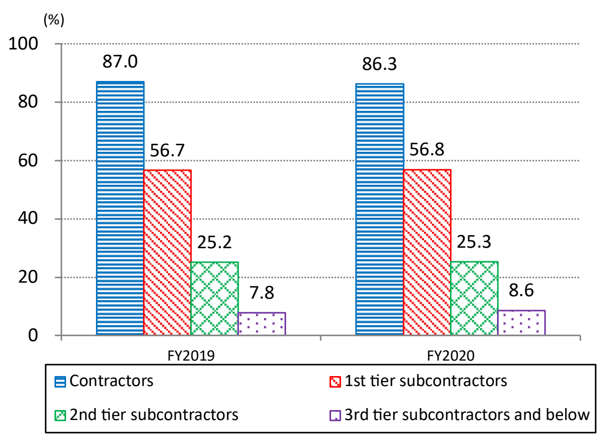
7. Number of companies and sales by business type (activity base)

	Number of companies			Sales (100 million yen)			Sales per company (100 million yen)		
	FY2019	FY2020	Year-on-year (%)	FY2019	FY2020	Year-on-year (%)	FY2019	FY2020	Year-on-year (%)
Total	3,660	3,735	2.0	189,984	187,928	-1.1	51.9	50.3	-3.1
Entrusted software development	2,383	2,382	0.0	90,544	87,673	-3.2	38.0	36.8	-3.1
Embedded software	238	253	6.3	3,495	3,452	-1.2	14.7	13.6	-7.1
Packaged software	704	714	1.4	11,886	11,640	-2.1	16.9	16.3	-3.4
Game software	79	85	7.6	6,596	7,699	16.7	83.5	90.6	8.5
Information processing service	1,084	1,098	1.3	46,493	45,805	-1.5	42.9	41.7	-2.7
Information provision service	207	212	2.4	3,815	3,834	0.5	18.4	18.1	-1.9
Market survey, opinion poll, social research	105	98	-6.7	1,813	1,698	-6.3	17.3	17.3	0.3
Other information services	1,140	1,118	-1.9	25,341	26,126	3.1	22.2	23.4	5.1

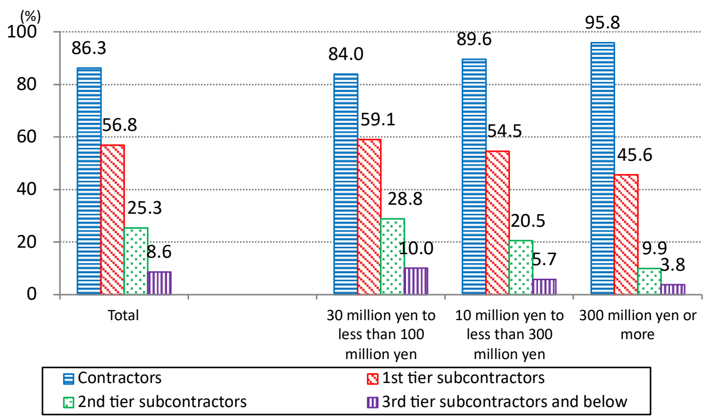
(Source) Prepared form MIC/METI “2021 Basic Survey on the Information and Communications Industry”
http://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

8. Status of contracting and subcontracting

Ratio of the number of contractors/subcontractors



Ratio of the number of companies by amount of capital



*Question on contracting/subcontracting allowed multiple answers. The number of responding enterprises was aggregated.

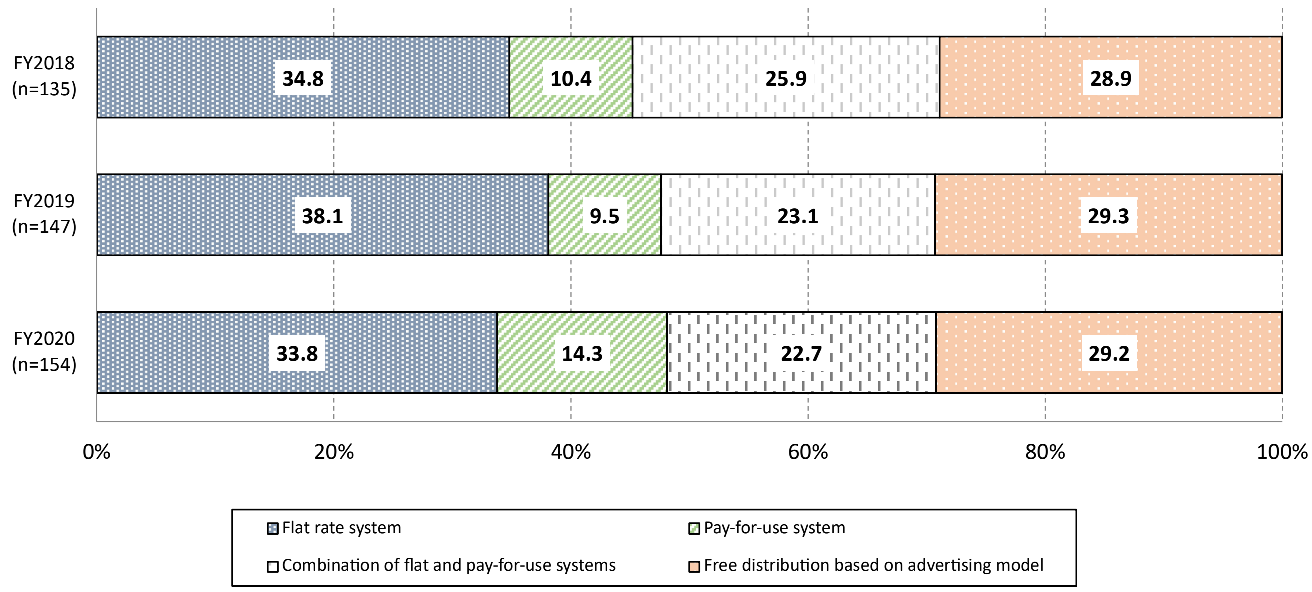
(Source) Prepared form MIC/METI “2021 Basic Survey on the Information and Communications Industry”
http://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

9. Number of companies and sales by business type (activity base)

		Number of companies			Sales (100 million yen)			Sales per company (100 million yen)		
		FY2019	FY2020	Year-on-year (%)	FY2019	FY2020	Year-on-year (%)	FY2019	FY2020	Year-on-year (%)
Total		749	757	1.1	26,541	26,004	-2.0	35.4	34.4	-3.1
	Film/video production	121	125	3.3	1,189	964	-18.9	9.8	7.7	-21.5
	Animation production	33	33	0.0	719	652	-9.3	21.8	19.8	-9.3
	Record production	22	24	9.1	1,213	1,248	2.9	55.2	52.0	-5.7
	Newspapers	115	115	0.0	8,867	8,281	-6.6	77.1	72.0	-6.6
	Publishers	313	317	1.3	8,002	8,449	5.6	25.6	26.7	4.3
	Advertisement production	187	172	-8.0	2,243	3,224	43.8	12.0	18.7	56.3
	Film, video, television program distribution	46	43	-6.5	1,591	1,389	-12.7	34.6	32.3	-6.6
	Services associated with video picture, sound information, character information production	226	236	4.4	2,718	1,796	-33.9	12.0	7.6	-36.7

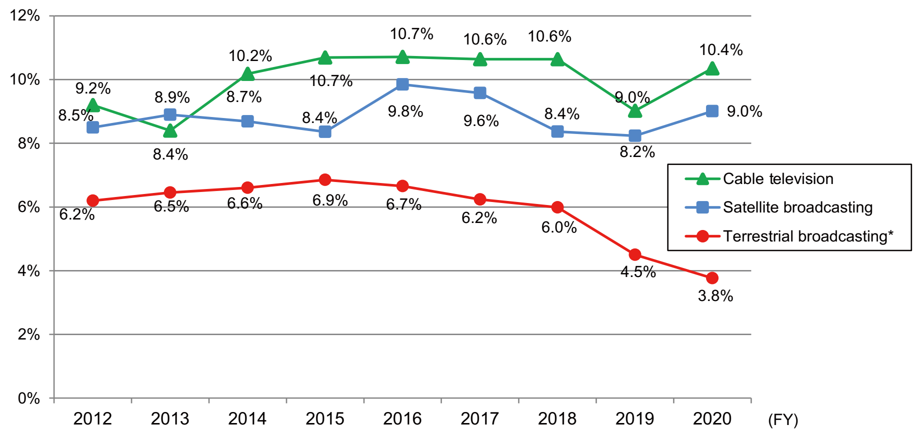
(Source) Prepared form MIC/METI “2021 Basic Survey on the Information and Communications Industry”
http://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

10. Charging system of video/music distribution



(Source) Prepared form MIC/METI “2021 Basic Survey on the Information and Communications Industry”
http://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

12. Changes in operating profits on sales of private broadcasters (Figure 3-3-1-2 in White Paper)



*Basic terrestrial broadcast excluding community broadcast

(Source) Prepared from MIC, “Income and Expenditure of Private Broadcasters “of each fiscal year, etc.

13. Changes in the number of private broadcasters (Figure 3-3-1-3 in White Paper)

At the end of fiscal year				2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Terrestrial	Television broadcast (Single operation)	VHF		16	93	93	94	94	98	94	94	95	95	95	96
		UHF		77											
	Basic satellite broadcasting	Medium -wave (AM) broadcasting		13	13	13	14	14	14	14	14	15	15	15	16
		Ultrashort wave (FM) broadcasting		298	307	319	332	338	350	356	369	377	384	384	388
			Community broadcasting of the above	246	255	268	281	287	299	304	317	325	332	334	338
		Short wave		1	1	1	1	1	1	1	1	1	1	1	1
	Television/radio broadcasting (combined operation)			34	34	34	33	33	33	33	33	32	32	32	31
	Text broadcasting (single operation)			1	1	0	0	0	0	0	0	0	0	0	0
	Multimedia broadcasting					1	1	1	4	4	4	6	6	2	2
	Subtotal			440	449	461	475	481	500	502	515	526	533	529	534
Satellite	Basic satellite broadcasting	BS broadcasting		20	20	20	20	20	20	19	19	22	22	20	22
		110 degrees east longitude CS broadcasting		13	13	22	23	23	23	23	20	20	20	20	20
	General satellite broadcasting			91	82	65	45	7	5	4	4	4	4	4	4
	Subtotal			113	108	92	72	46	44	41	39	41	41	39	42
Cable television	General cable broadcasting pertaining to registration (limited to operators of voluntary broadcasting)	Broadcasting using former authorized facilities (limited to operators of voluntary broadcasting)		502	556	545	539	520	510	508	504	492	471	464	-
		Broadcasting using former cable services		26											
			IP multicast broadcasting of the above	5	5	4	3	3	3	5	5	5	5	5	-
	Subtotal			528	556	545	539	520	510	508	504	492	471	464	-

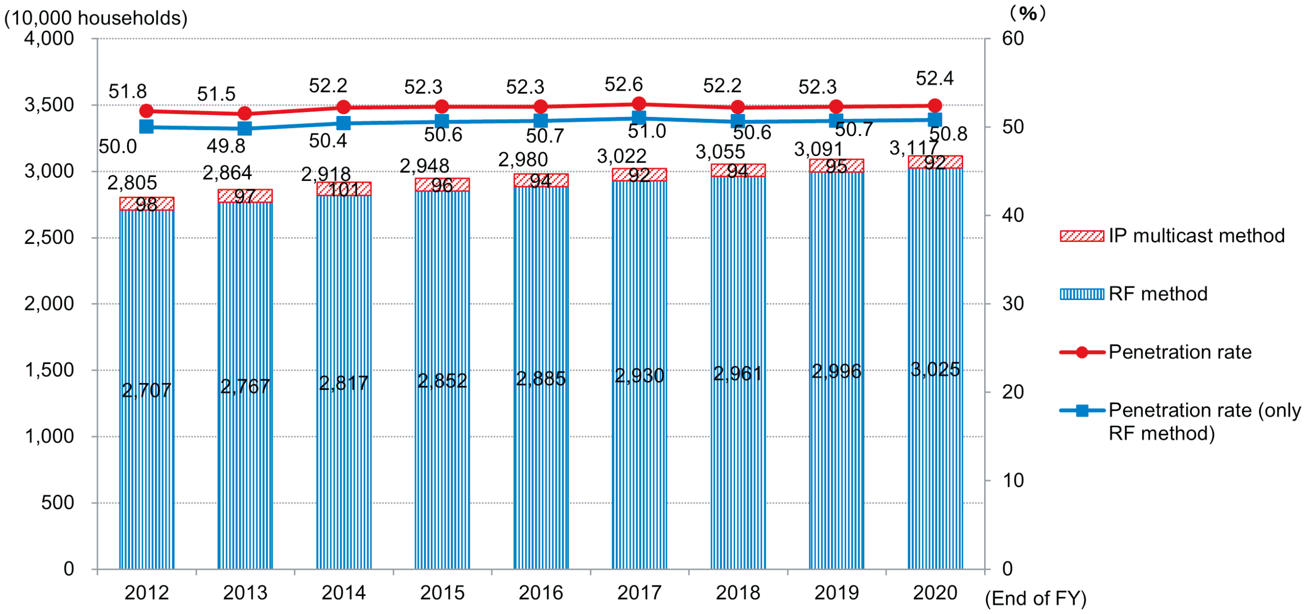
*1 The number of television broadcasters (single operation) at the end of fiscal 2015 includes five operators conducting basic terrestrial broadcasting for mobile reception (one of them combined basic terrestrial broadcasting)
*2 Regarding satellite broadcasters, BS broadcasting and 110 degrees east longitude CS broadcasting are counted as basic satellite broadcasting, while other satellite broadcasting is counted as general satellite broadcasting based on the Broadcast Act amended and enforced in June 2011.
*3 Because some of the satellite broadcasters combine more than two of “BS broadcasting, “110 degrees east longitude CS broadcasters” and “general satellite broadcasting,” sum of the values of the columns does not agree with the value of subtotal. Only operating broadcasters are included in fiscal 2011 and after.
*4 Cable television operators include: former approved facility operators under the former Cable Television Broadcasting Act and registered operators under the former Act on Broadcast on Telecommunications Services up to fiscal 2010, and: registered general broadcasters conducting independent broadcasting using wire telecommunication equipment under the Broadcast Act in fiscal 2011 and after (IP multicast broadcasting is included in former broadcasting using cable service up to fiscal 2010, and; in registered general broadcasters conducting independent broadcasting using wire telecommunications equipment in fiscal 2011 and after)

(Source) Prepared from MIC, “Current State of Cable Television” (only the values of cable television operators)

15. Major satellites used for satellite broadcasting in Japan (at the end of fiscal 2021) (Figure 3-3-1-5 in White Paper)

Broadcasting type	Satellites	Orbit (east longitude)	Start of operation
Basic satellite broadcasting	BSAT-3a	110 degrees	Oct. 2007
	BSAT-3b	110 degrees	Jul. 2011
	BSAT-3c/JCSAT-110R	110 degrees	Sep. 2011
	JCSAT-110A	110 degrees	Apr. 2017
	BSAT-4a	110 degrees	Dec. 2018
	BSAT-4b	110 degrees	Sep. 2020
General satellite broadcasting	JCSAT-4B	124 degrees	Aug. 2012
	JCSAT-3A	128 degrees	Mar. 2007

16. Changes in the number and ratio of the subscribed households receiving service through wire telecommunications equipment for independent broadcasting pertaining to registration (Figure 3-3-1-6 in White Paper)



*1 Penetration ratio was calculated based on the number of households in the basic resident register.
*2 Number of the subscribed households and penetration ratio of: facilities that were authorized under the former Cable Television Broadcasting Act and conducted independent broadcasting (including facilities registered under the former Act on Broadcast on Telecommunications Services and with broadcasting method equivalent to the said facilities) up to fiscal 2010, and; wire telecommunications equipment for independent broadcasting pertaining to its registration in fiscal 2011 and after
*3 "Number of households" in RF method refers to the total number of households connected to wire telecommunications equipment pertaining to its registration (including the households with radio disturbance)

(Source) Prepared from MIC, "Actual State of Cable Television"

17. Domestic broadcasting by NHK (end of fiscal 2021) (Figure 3-3-1-7 in White Paper)

Category			Number of channels
Terrestrial broadcasting	Television broadcasting		2
	Radio broadcasting	Medium-wave (AM) broadcasting	2
		Ultrashort wave (FM) broadcasting	1
Satellite broadcasting (BS broadcasting)	Television broadcasting		4

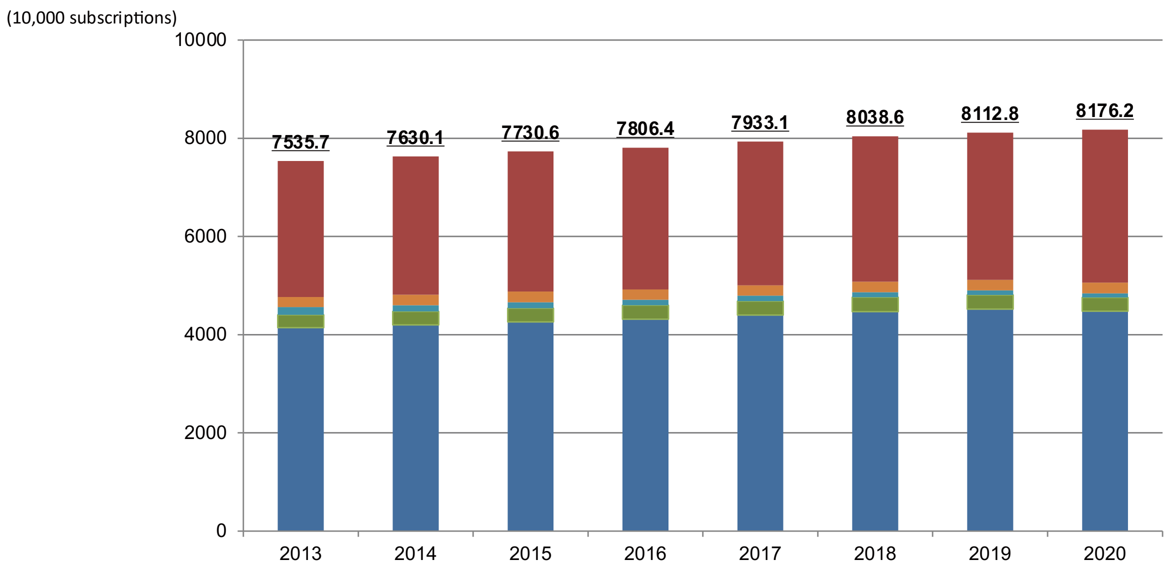
*1 Number of broadcast waves of radio broadcasting is also listed as channels.
*2 With the end of analog television broadcasting on March 31, 2021, all television broadcasting has moved to digital broadcasting.

18. State of international television/radio broadcasting by NHK (as planned in April 2022) (Figure 3-3-1-8 in White Paper)

	Television		Radio
	For overseas Japanese	For foreigners	For overseas Japanese and foreigners
Broadcasting hours	Around 5 hours a day	24 hours a day	56 hours 19 minutes in total per day
Budget	21.1 billion yen (FY2022 NHK budget)		5.2 billion yen (same as on the left)
Language	Japanese	English	18 languages
Service area	Almost all over the world		Almost all over the world
Satellites used / Transmission facilities	Foreign satellites, CATV, etc.		Domestic transmitting stations, overseas relay stations, etc.

*Hours of international television broadcasting for foreigners include the hours of JIB (Japan International Broadcasting)

19. Number of subscribers with broadcasting services (Figure 3-3-1-9 in White Paper)

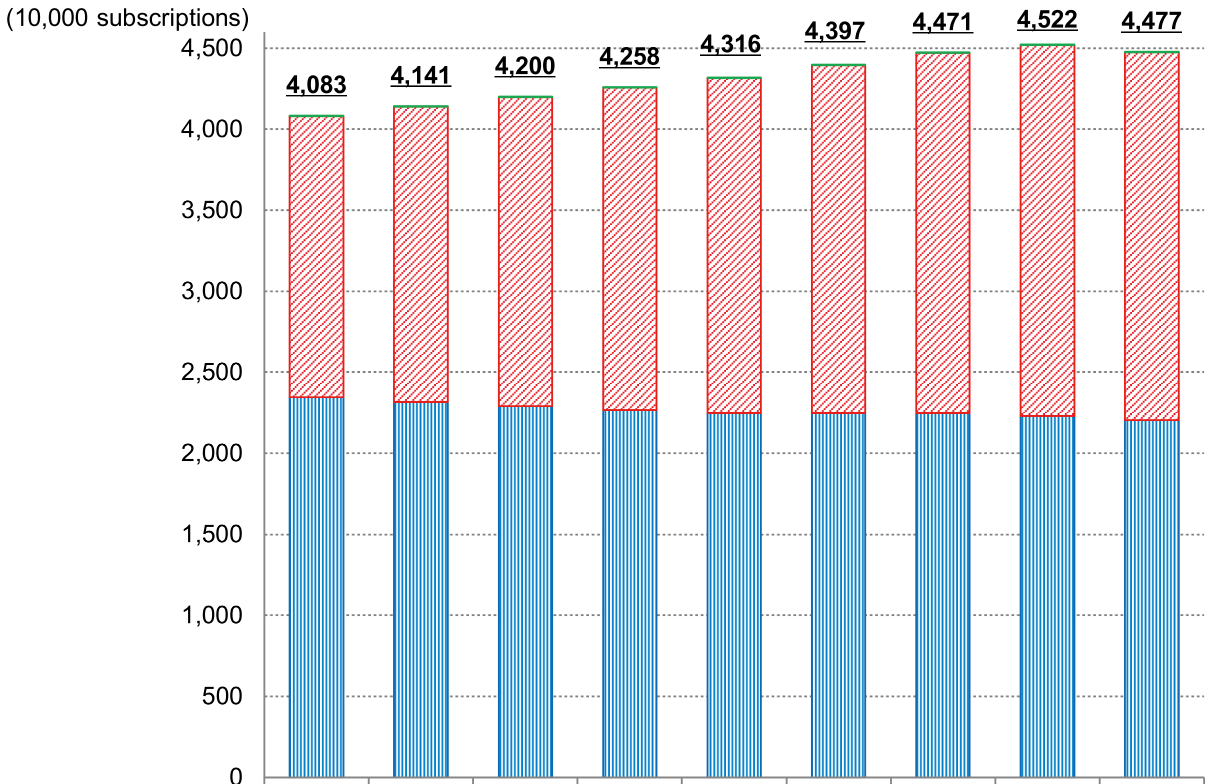


(FY)	2013	2014	2015	2016	2017	2018	2019	2020
Cable television	2,767.0	2,817.0	2,852.0	2,885.0	2,930.3	2,960.7	2,995.9	3,117.1
110 degrees east longitude CS	205.6	212.0	219.5	209.3	208.4	213.7	215.8	218.3
124/128 degrees east longitude CS	157.1	125.4	120.3	114.4	109.4	102.7	93.1	84.4
WOWOW	264.8	275.6	280.5	282.3	287.6	290.1	285.5	279.1
NHK	4,141.2	4,200.1	4,258.3	4,315.4	4,397.4	4,471.4	4,522.5	4,477.3
Satellite contract, etc.	1,823.2	1,911.3	1,993.3	2,066.7	2,147.6	2,221.5	2,289.1	2,274.2

*1 The number of cable television subscribers is the number of the households subscribed: with former facilities that were approved under the former Cable Television Broadcasting Act and conducted independent broadcasting (including facilities registered under the former Act on Broadcast on Telecommunications Services and with broadcasting method equivalent to the said facilities) up to fiscal 2010; and with wire telecommunications equipment for independent broadcasting pertaining to registration in fiscal 2011 and after (excluding IP-multicast broadcasting in either case)
*2 The number of subscribers with 110 degrees east longitude CS is the number of contracts with SKY Perfect!
*3 The number of subscribers with 124/128 degrees east longitude CS is the number of contracts with SKY Perfect! Premium Service
*4 The number of subscribers with WOWOW is the number of contracts with WOWOW.
*5 Number of NHK terrestrial broadcasting is the number of all receiver contracts with NHK.
*6 The number of subscribers with satellite contract, etc. is the number of satellite contracts and special contracts with NHK.

(Source) Prepared from materials of the Japan Electronics and Information Technology Industries Association, the Japan Cable Laboratories, NHK and MIC “Current State of Satellite Broadcasting” and “Current State of Cable TV”

20. Changes in the number of receiving contracts with NHK (Figure 3-3-1-10 in White Paper)

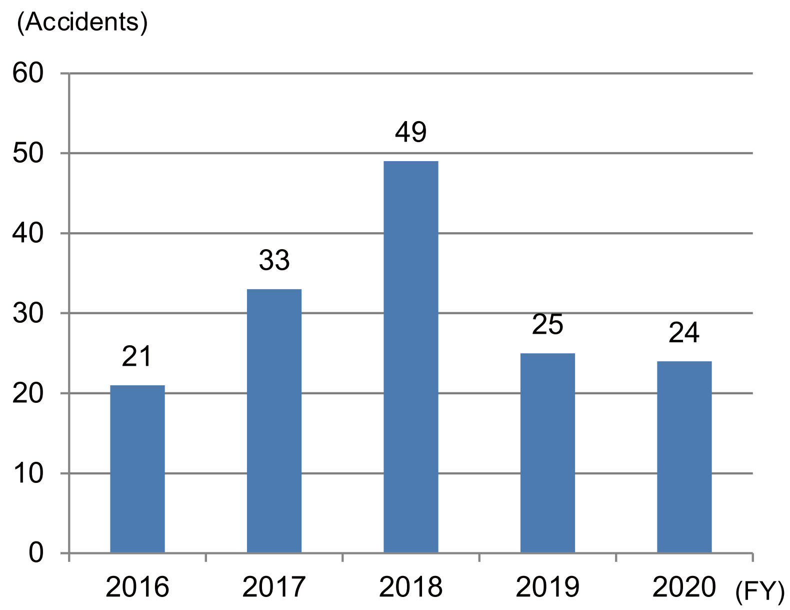


	2012	2013	2014	2015	2016	2017	2018	2019	2020
Special contract	1	1	1	1	1	1	1	1	1
Satellite contract	1,736	1,822	1,910	1,992	2,066	2,146	2,220	2,288	2,273
Terrestrial contract	2,346	2,318	2,289	2,265	2,249	2,250	2,250	2,233	2,203
Total	4,083	4,141	4,200	4,258	4,316	4,397	4,471	4,522	4,477

(FY)

(Source) Prepared from NHK material

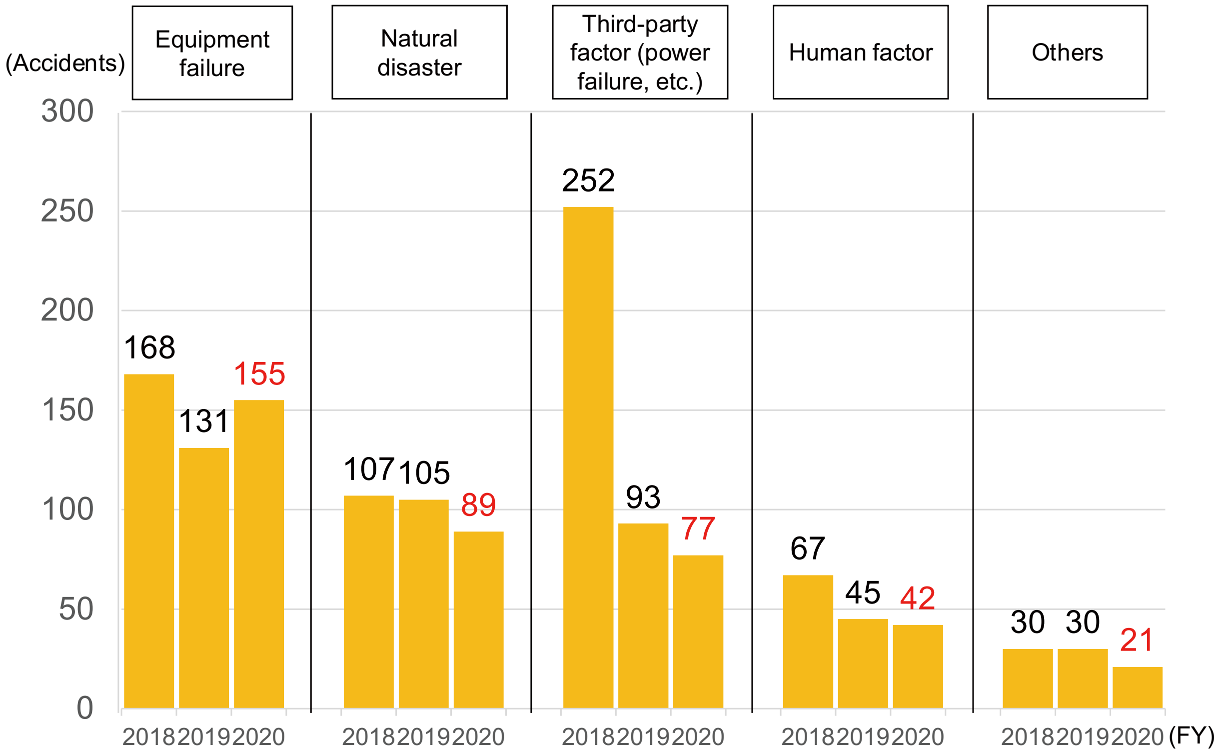
21. Changes in the number of serious accidents* (Figure 3-3-1-11 in White Paper)



*Some of the values of the last edition are corrected.

(Source) Prepared from MIC, “Occurrences of off-the-air accidents” (fiscal 2020)

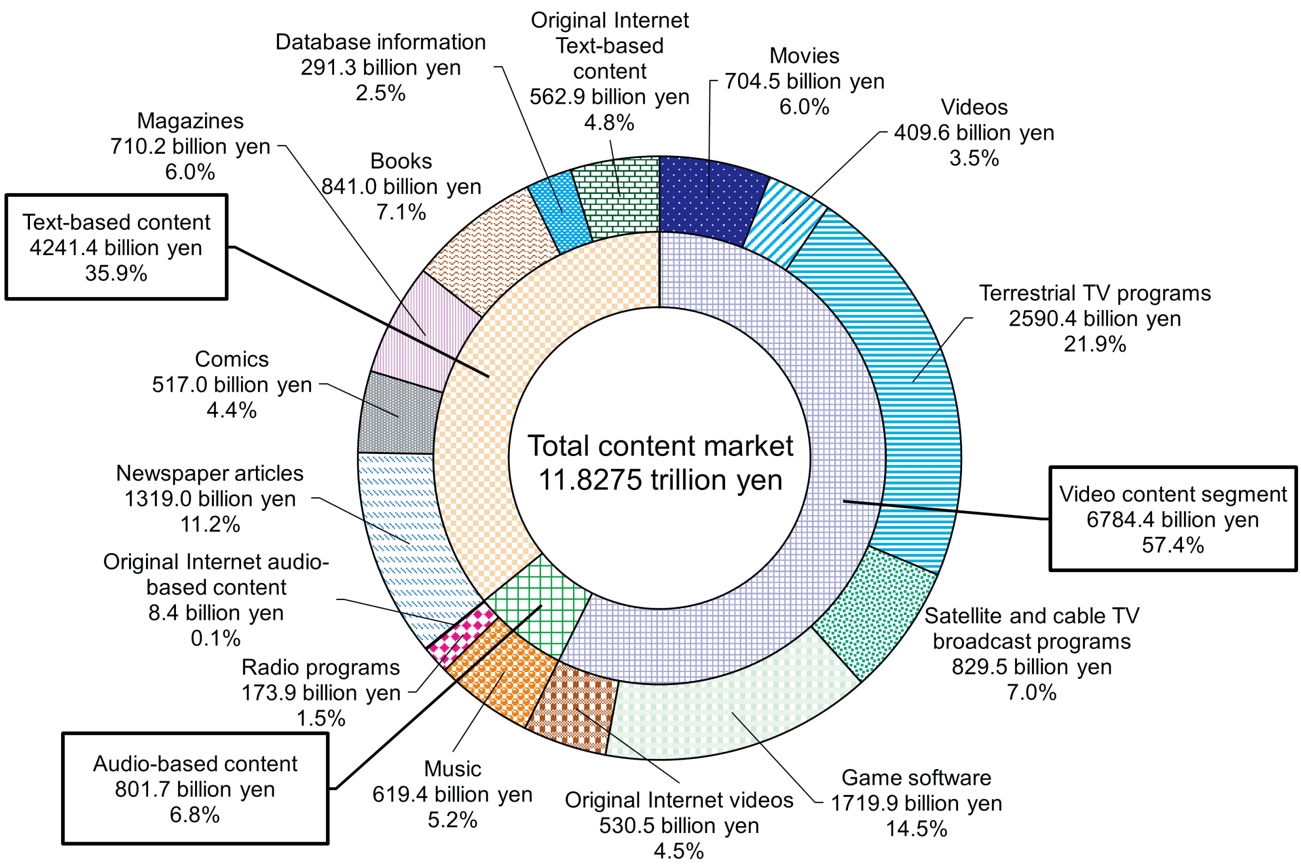
22. Changes in the number of off-the-air accidents by cause* (Figure 3-3-1-12 in White Paper)



*Some of the values of the last edition are corrected.

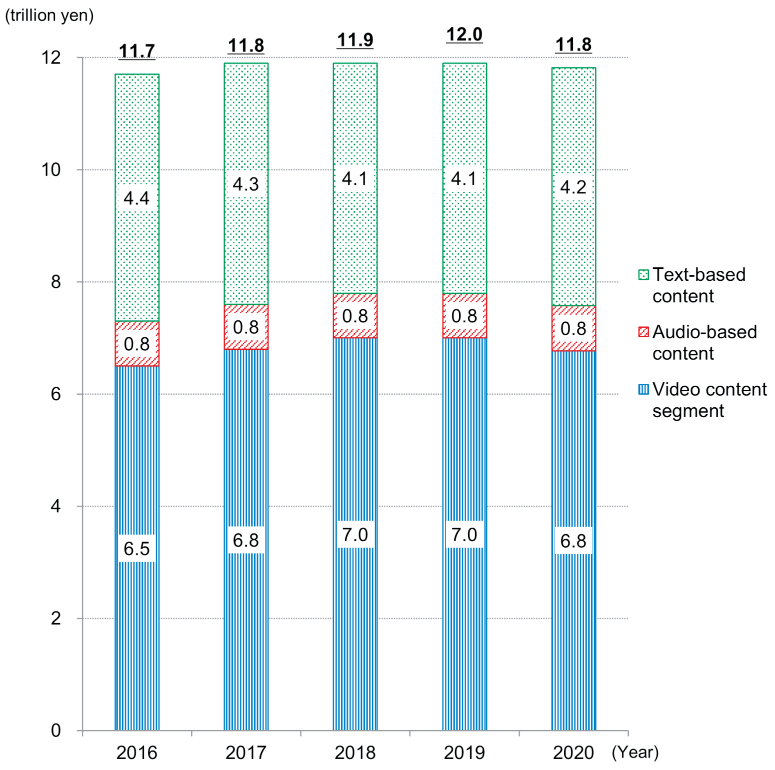
(Source) Prepared from MIC, “Occurrences of off-the-air accidents” (fiscal 2020)

23. Breakdown of Japan’s content market (2020) (Figure 3-3-2-1 in White Paper)



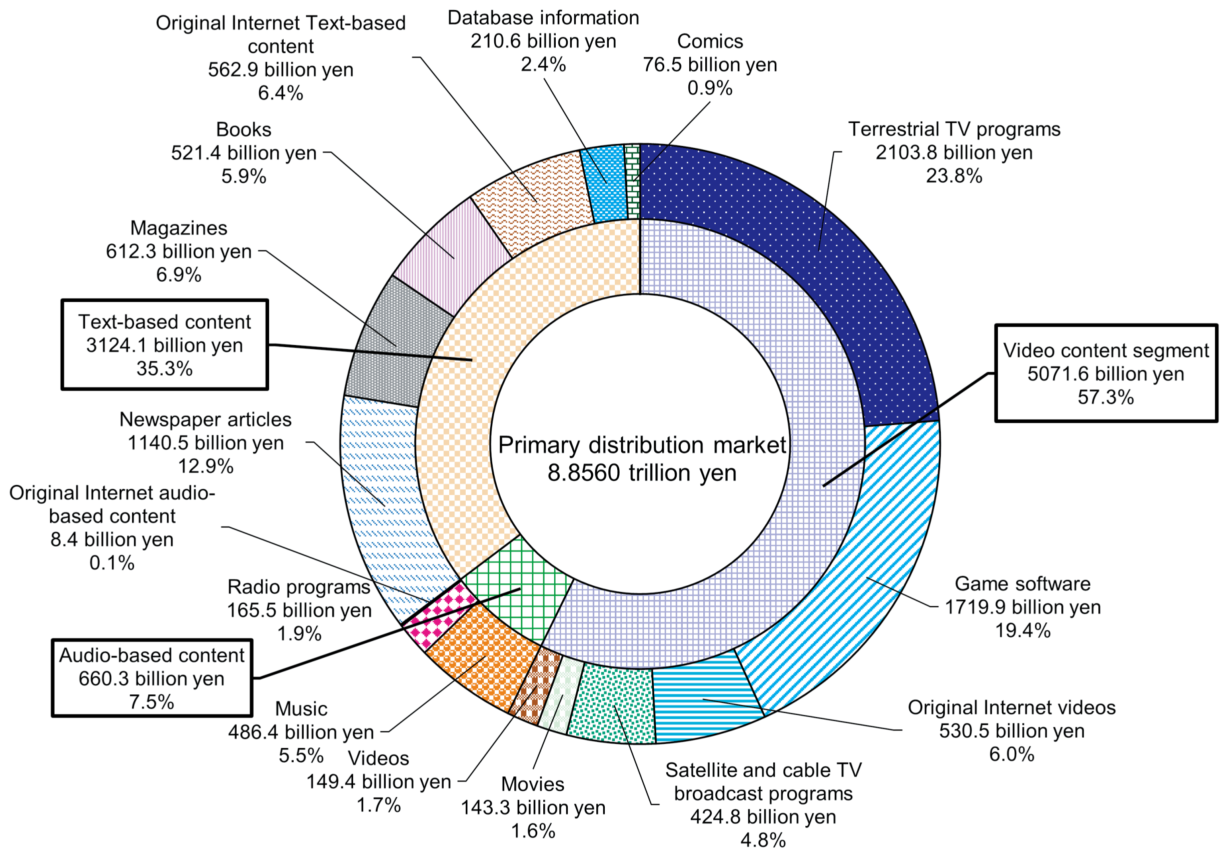
(Source) Institute for Information and Communications Policy, MIC, “Survey on the Production and Distribution of Media Content”

24. Changes in the size of the content market of Japan (by content segment) (Figure 3-3-2-2 in White Paper)



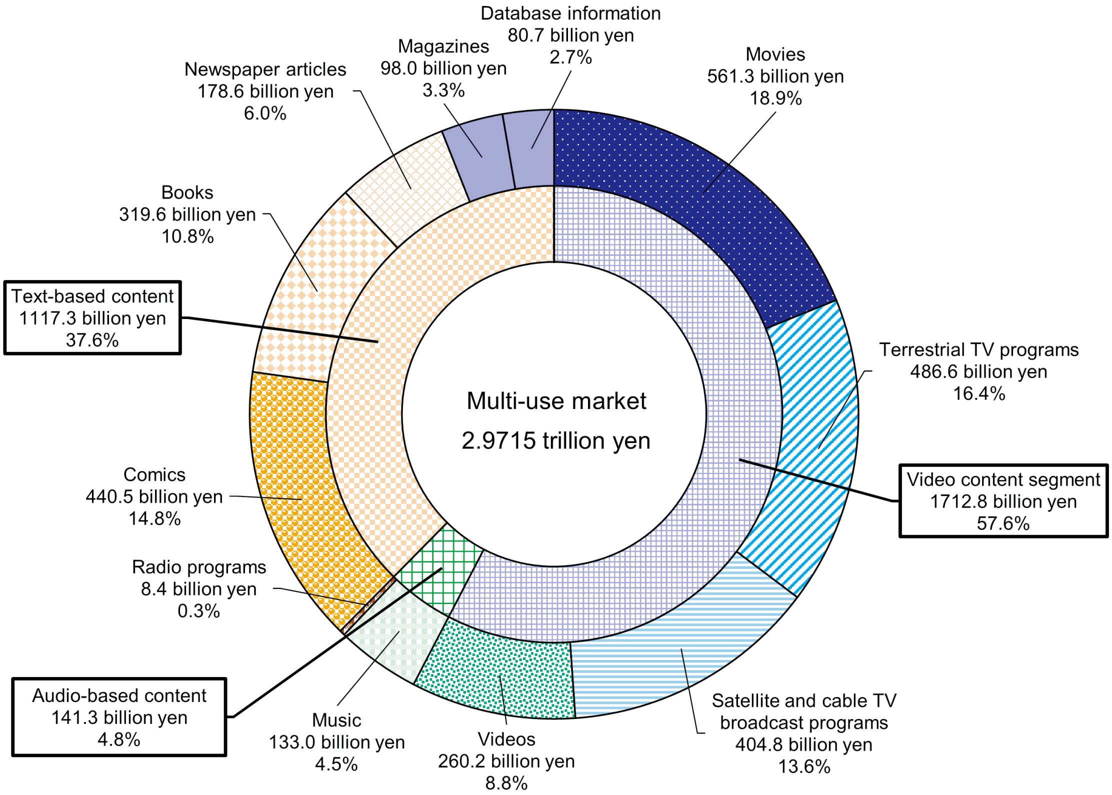
(Source) Institute for Information and Communications Policy, MIC, "Survey on the Production and Distribution of Media Content"

25. Breakdown of the primary distribution market (2020) (Figure 3-3-2-3 in White Paper)



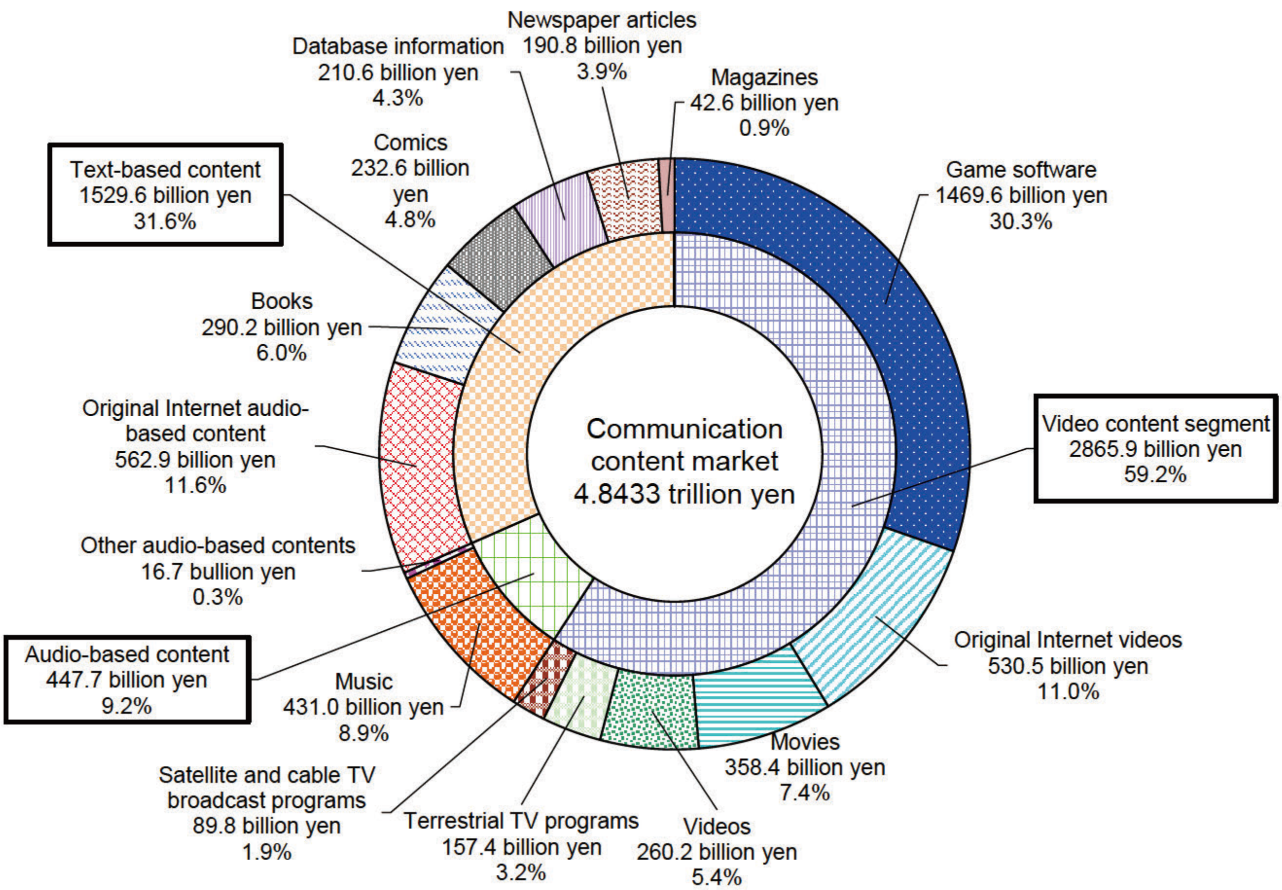
(Source) Institute for Information and Communications Policy, MIC, "Survey on the Production and Distribution of Media Content"

26. Breakdown of the multi-use market (2020) (Figure 3-3-2-4 in White Paper)



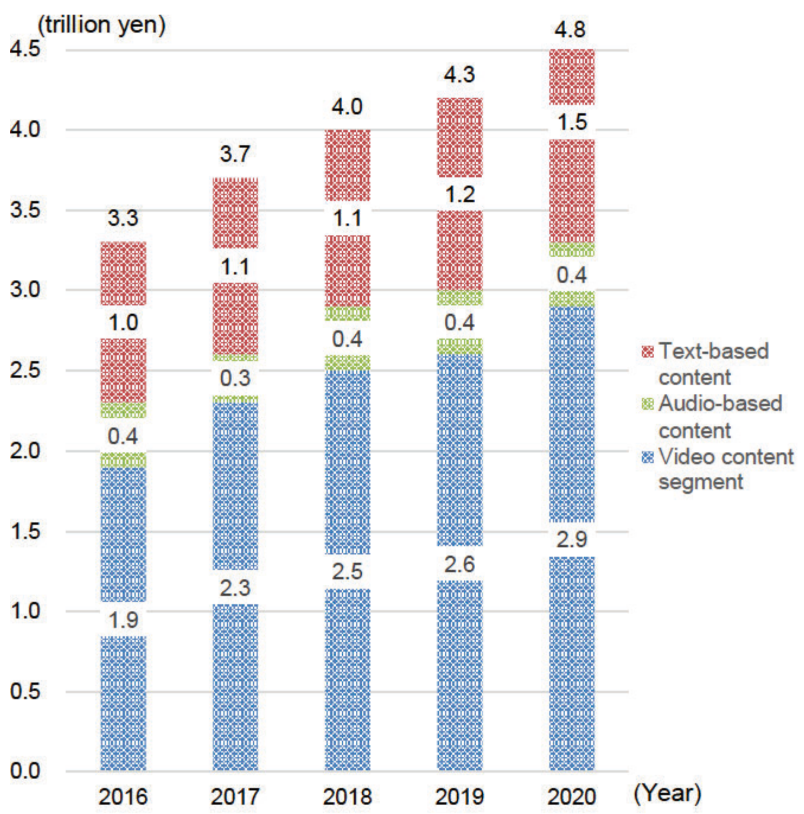
(Source) Institute for Information and Communications Policy, MIC, “Survey on the Production and Distribution of Media Content”

27. Breakdown of the communication content market (2020) (Figure 3-3-2-5 in White Paper)



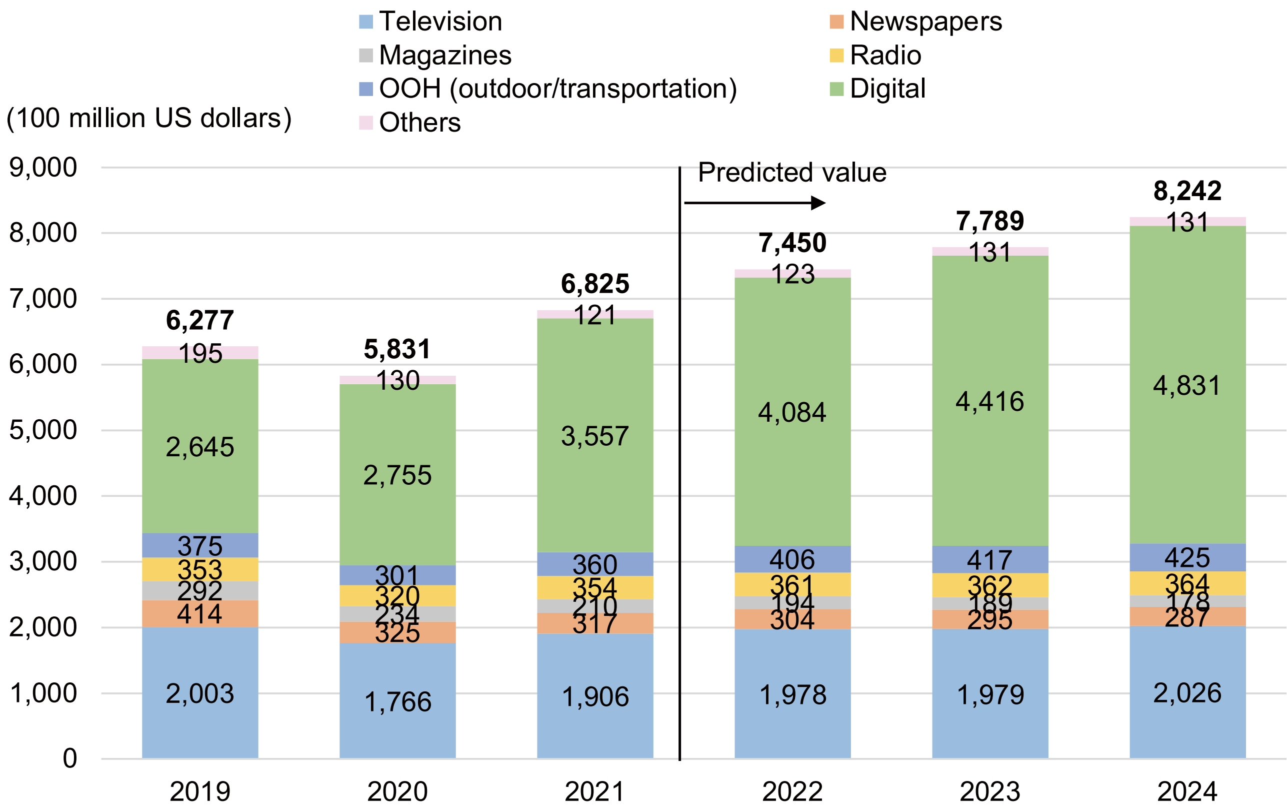
(Source) Institute for Information and Communications Policy, MIC, “Survey on the Production and Distribution of Media Content”

28. Changes in the market size of communication content (by content segment) (Figure 3-3-2-6 in White Paper)



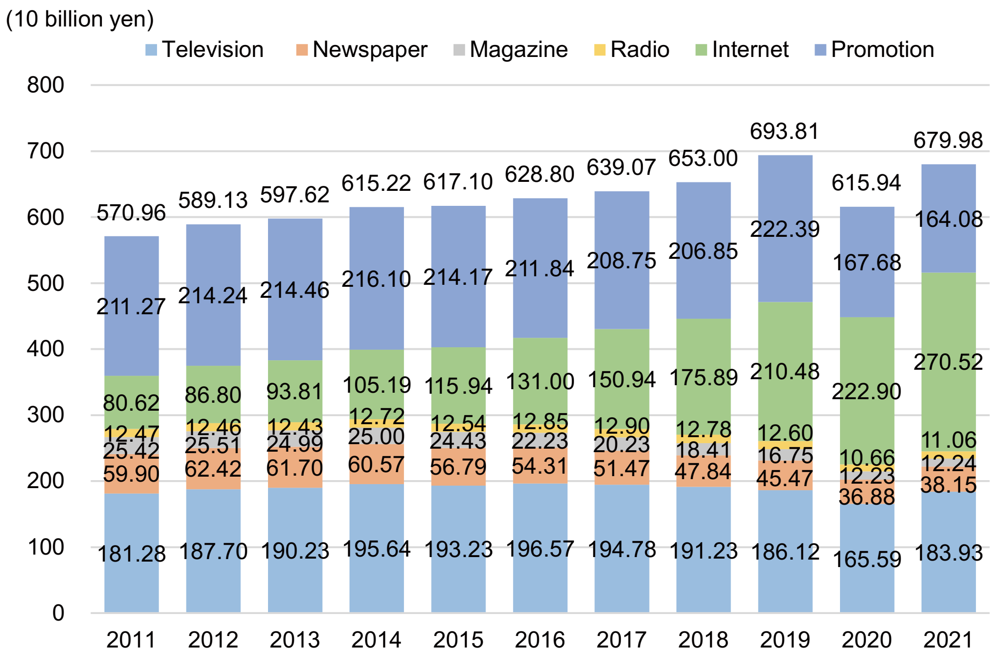
(Source) Institute for Information and Communications Policy, MIC, "Survey on the Production and Distribution of Media Content"

29. Changes in and projections of advertisement expenses by media in the world (Figure 3-3-2-7 in White Paper)



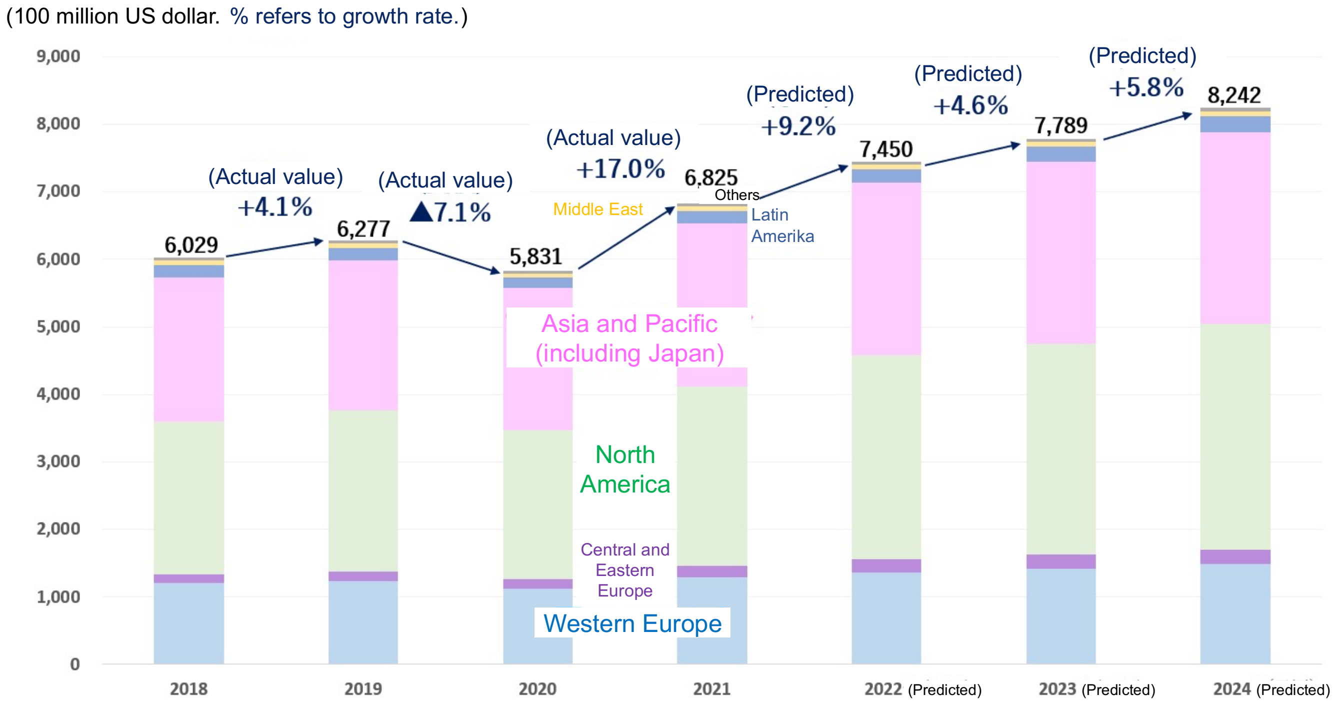
(Source) Prepared from Dentsu Group, "Projection of the growth rate of the advertisement expenses in the world (2021-2024)"

30. Changes in advertising expenditures by media in Japan (Figure 3-3-2-8 in White Paper)



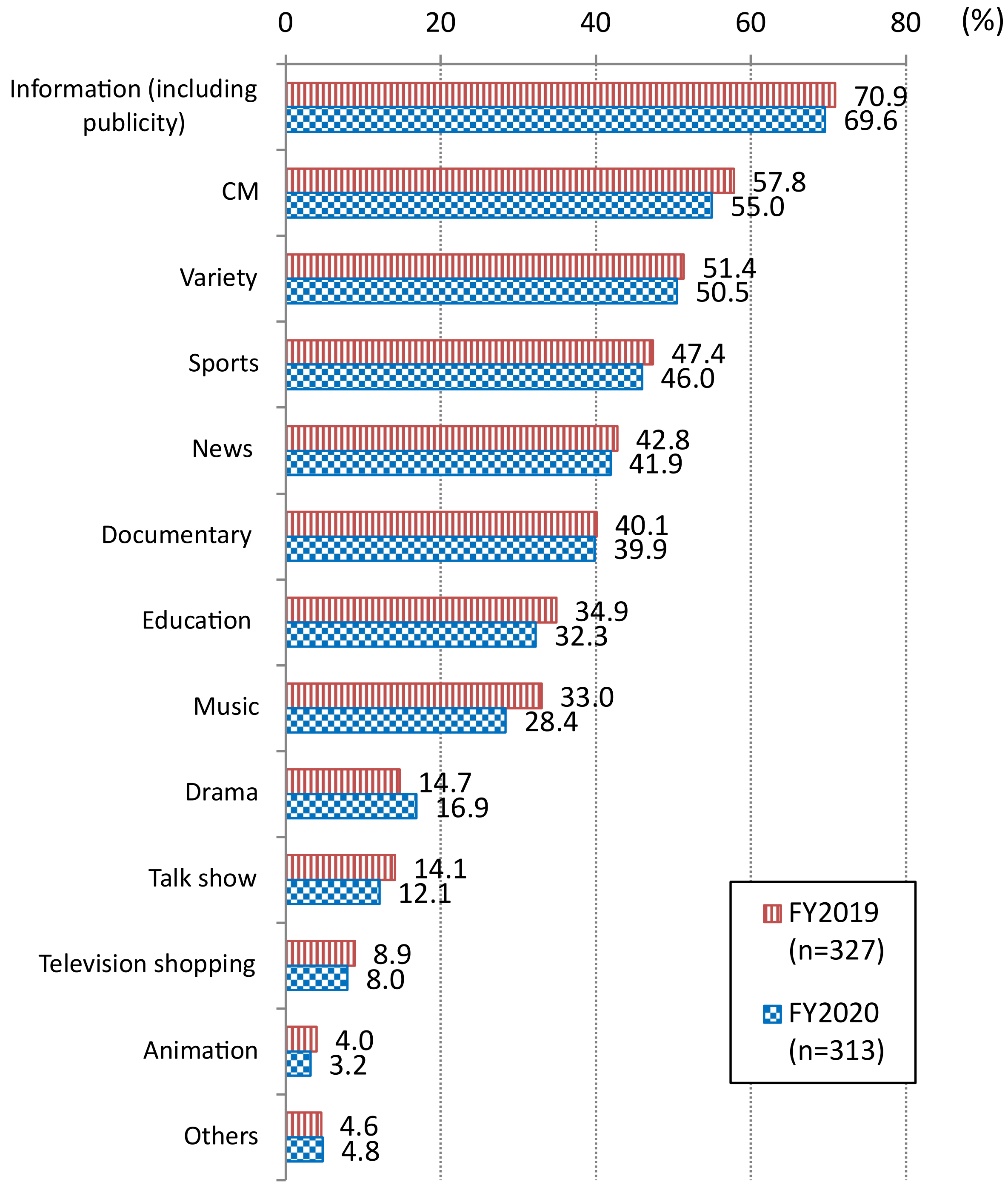
(Source) Prepared from Dentsu, “Advertisement Expenses in Japan (annual)”

31. Changes in and projections of total global advertisement expenses



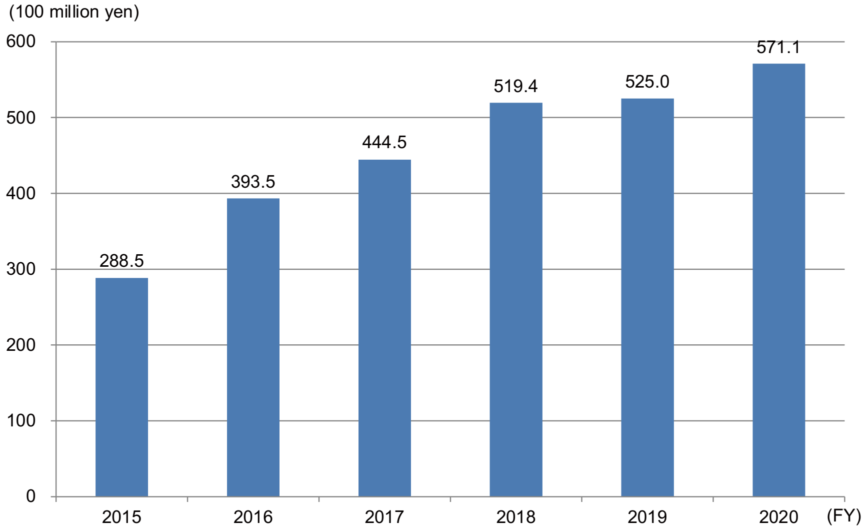
(Source) Dentsu Group, “Global advertisement spend growth rate forecast (2021-2024)”
https://www.group.dentsu.com/jp/news/release/000643.html

32. Ratio of the types of broadcast programs produced (multiple answers)



(Source) MIC/METI “2021 Basic Survey on the Information and Communications Industry”
httpss://www.soumu.go.jp/johotsusintokei/statistics/statistics07.html

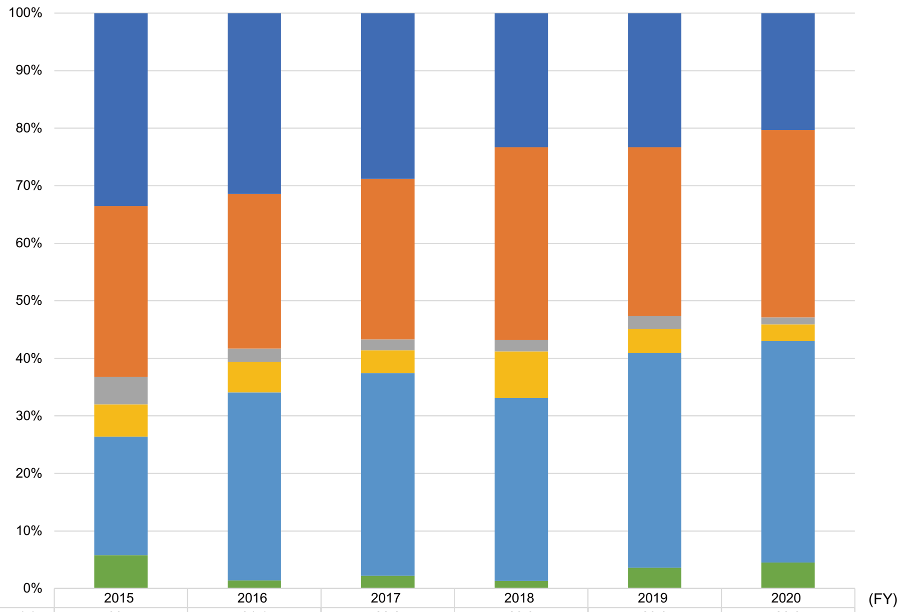
33. Changes in the export value of Japanese broadcast content (Figure 3-3-2-9 in White Paper)



*1 Export value of broadcast content: total of the overseas sales of program broadcasting right, internet distribution right, video/DVD release right,TV formatting/remaking right and merchandizing right
*2 Calculated based on questionnaire surveys of NHK, key private stations, sub key private stations in Osaka, local stations, satellite broadcasters,CATV operators, productions, and others.
*3 After fisical 2016, there have been changes such as clear inclusion of right to turn into a game in calculation.

(Source) Prepared from MIC, annual “Present Data Analysis on Overseas deployment of broadcast content”

34. Changes in the ratio of the export value of Japanese broadcast content by type of right (Figure 3-3-2-10 in White Paper)



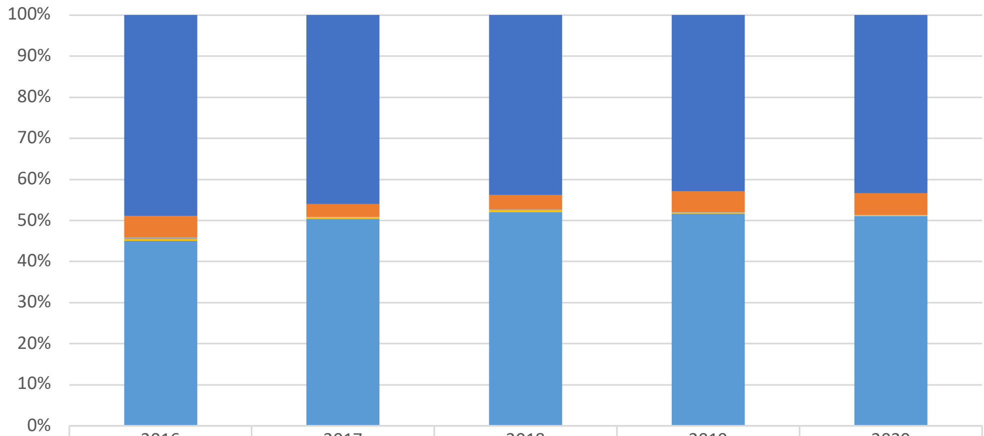
(FY)	2015	2016	2017	2018	2019	2020
Program broadcasting right	33.5	31.4	28.8	23.3	23.3	20.3
Internet distribution right	29.7	26.9	27.9	33.5	29.3	32.6
Video/DVD release right	4.8	2.3	1.9	2.0	2.3	1.2
TV formatting/remaking right	5.6	5.3	4.0	8.1	4.2	2.9
Merchandizing right	20.6	32.7	35.2	31.8	37.3	38.5
Others	5.8	1.4	2.2	1.3	3.6	4.5

*1 Merchandizing right and video/DVD release right do not include overseas sales of characters and other merchandise and medium itself such as videos and DVDs.
*2 In cases where clear division is not possible, for example, when multiple rights including program broadcasting right were sold or the question on category was not answered, the sales are classified as program broadcasting right.
*3 After fisical 2016, there have been changes such as clear inclusion of right to turn into a game in calculation.

(Source) Prepared from MIC, annual “Present Data Analysis on Overseas deployment of broadcast content”

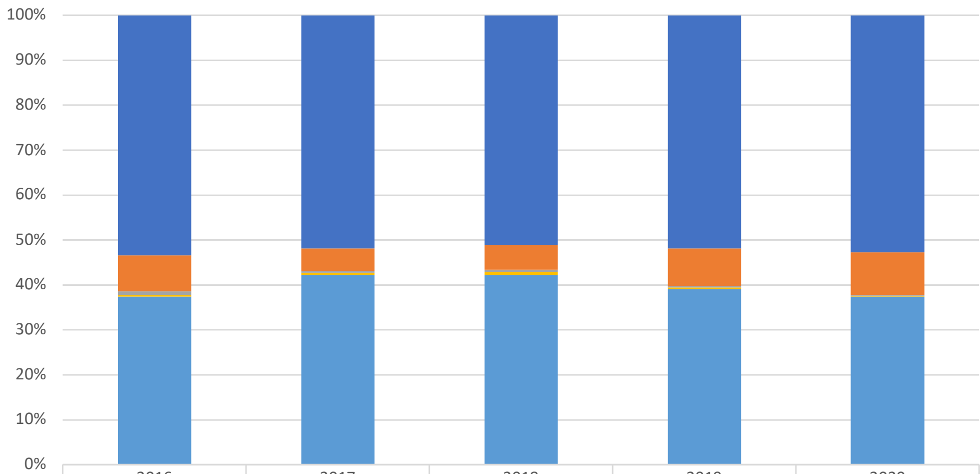
35. Changes in ratio of Japan’s exports of broadcast content by entity

Total exports of broadcast content



	2016	2017	2018	2019	2020 (FY)
NHK and key private stations	49.0	46.0	43.9	42.9	43.3
Semi-key private stations in Osaka	5.2	3.1	3.4	5.1	5.4
Local stations	0.5	0.2	0.3	0.2	0.1
Satellite broadcast stations	0.3	0.3	0.4	0.2	0.1
Productions, etc.	45.2	50.4	52.1	51.7	51.1

When limited to exports of program distribution rights

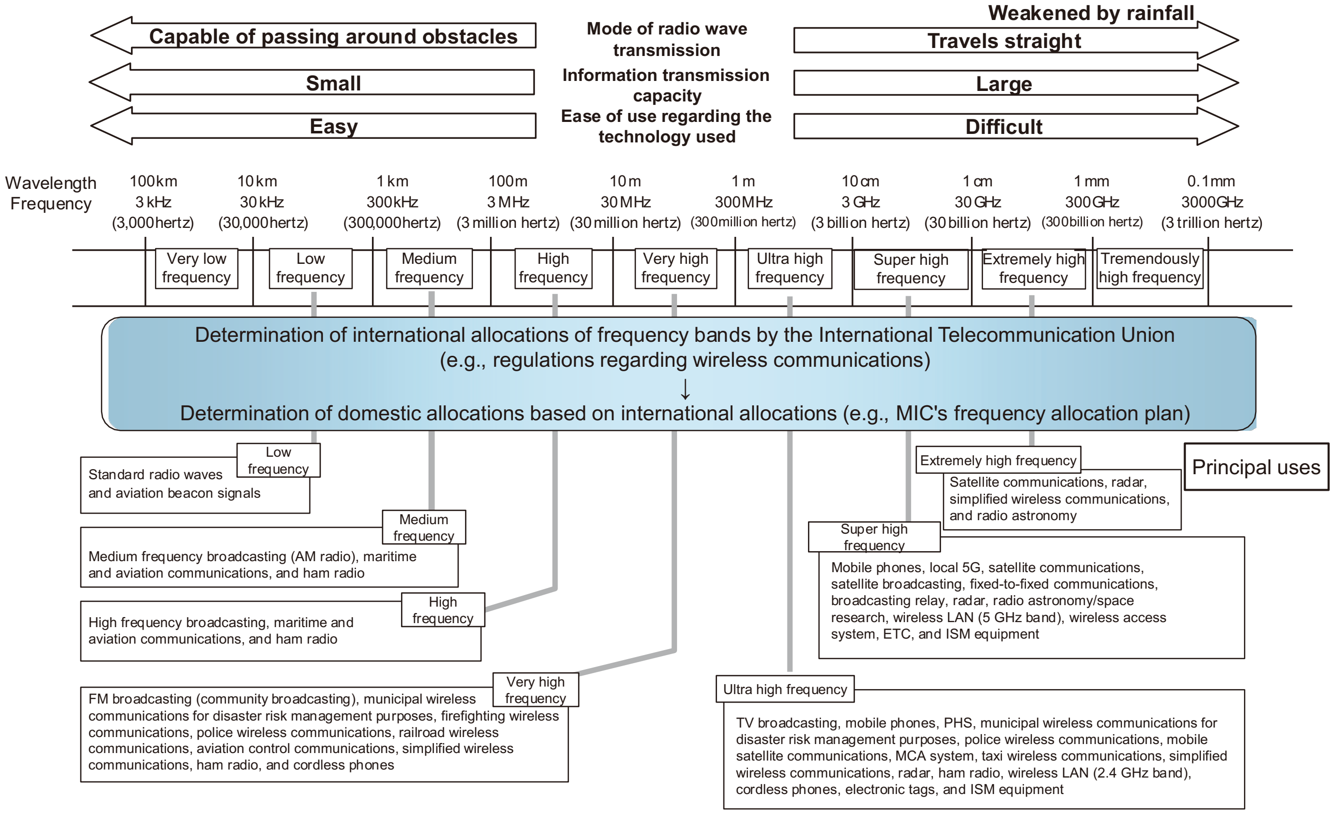


	2016	2017	2018	2019	2020 (FY)
NHK and key private stations	53.4	51.9	51.1	51.9	52.7
Semi-key private stations in Osaka	8.0	5.0	5.5	8.4	9.5
Local stations	0.8	0.4	0.5	0.2	0.2
Satellite broadcast stations	0.4	0.4	0.6	0.4	0.2
Productions, etc.	37.4	42.3	42.3	39.1	37.4

(Source) Prepared from MIC, annual “Analysis of Current Situation of Overseas Export of Broadcasting Content”
https://www.soumu.go.jp/menu_news/s-news/01ryutsu04_02000185.html

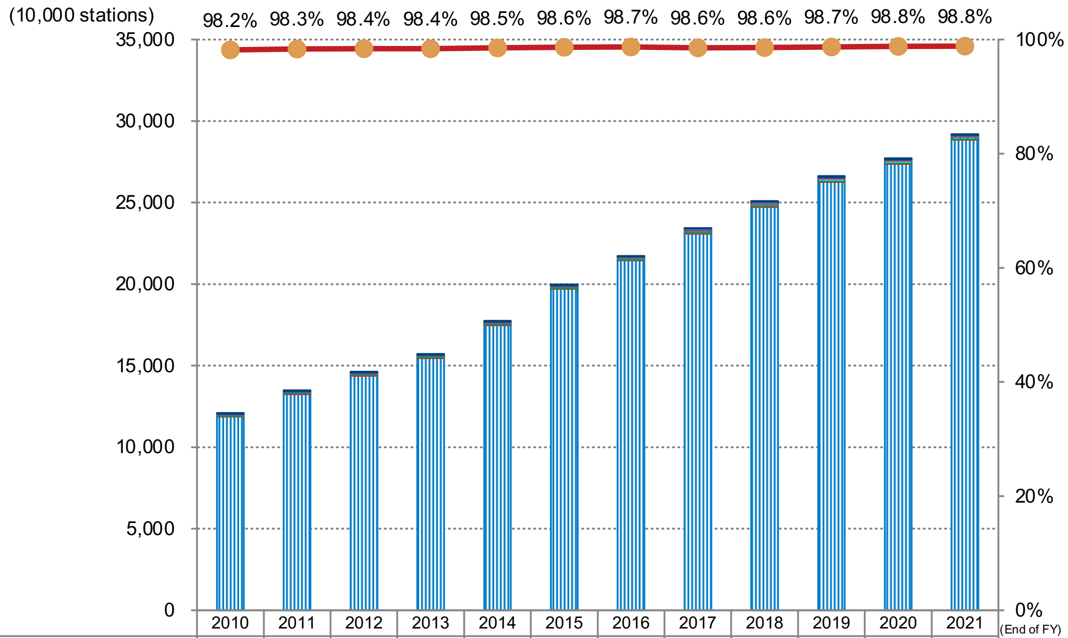
Section4

1. Major usages and radio wave characteristics in Japan by spectrum (Figure 3-4-1-1 in White Paper)



Spectrum	Wave length	Characteristics
Very low frequency	10 to 100km	Propagating along ground surface, waves of this spectrum can go over low hills. Being capable of propagating in water, the spectrum can be used for seabed exploration
Low frequency	1 to 10km	Being capable of propagating to very distant places, the spectrum is used by standard frequency stations to inform radio clock, etc. of time and frequency standard.
Medium frequency	100 to 1000m	Capable of propagating through reflection off the E-layer of the ionosphere that is formed at the height of about 100km, the spectrum is used mainly for radio broadcasting.
High frequency	10 to 100m	Capable of reaching the other side of the globe by being reflected off the F-layer of the ionosphere that is formed at the height of about 200 to 400km and by repeating reflection between F-layer and the ground surface. Widely used for ocean ship and international flight plane communication, international broadcasting and amateur radio.
Very high frequency	1 to 10m	Waves of this spectrum propagate rather straight and are not easily reflected off the ionosphere, but are capable of reaching the other side of mountains and buildings to a certain extent. The spectrum is widely used for a variety of mobile communications including emergency and fire emergency radio.
Ultra-high frequency	10cm to 1m	Waves of this spectrum have stronger tendency to propagate straight compared with very high frequency, but are capable of reaching the other side of mountains and buildings to a certain extent. The spectrum is widely used mostly for a variety of mobile communication systems including mobile phones, and digital television broadcasting and microwave ovens. .
Super high frequency	1 to 10cm	Due to the strong tendency to propagate straight, this spectrum is suitable for emission to a specific direction. It is mainly used for fixed trunk circuits, satellite communication, satellite broadcasting and wireless LAN.
Extremely high frequency	1 to 10mm	With strong tendency to propagate straight, waves of the spectrum can transmit very large information quantity, but not very far in bad weather due to rain or fog. For this reason, the spectrum is used for relatively short-distance radio access communication and image transmission systems, simplicity radio, car collision prevention radar and radio telescopes for astronomical observation.
Tremendously high frequency	0.1 to 1mm	The spectrum has nature similar to light. It is rarely used for communication but used for radio telescopes for astronomical observation as is the case of Extremely high frequency.

2. Changes in the number of radio stations (Figure 3-4-2-1 in White Paper)



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Other	46	43	46	50	50	55	49	49	55	59	61	51
Base stations	54	58	63	68	71	70	73	125	132	117	95	108
Convenience stations*2	74	77	84	90	97	105	112	118	125	132	137	142
Amateur stations	45	44	44	44	44	44	43	43	41	40	39	38
Land mobile stations*1	11,879	13,266	14,388	15,472	17,493	19,711	21,457	23,109	24,748	26,278	27,379	28,859
Percentage of land mobile stations	98.2%	98.3%	98.4%	98.4%	98.5%	98.6%	98.7%	98.6%	98.6%	98.7%	98.8%	98.8%

*1 Land mobile station: radio stations operated when moving on land or stopping at unspecified points (e.g. mobile phone terminals)
*2 Simplicity radio station: radio stations for simple radio communication

3. Major geostationary satellites used for communication services in Japan (at the end of fiscal 2021)

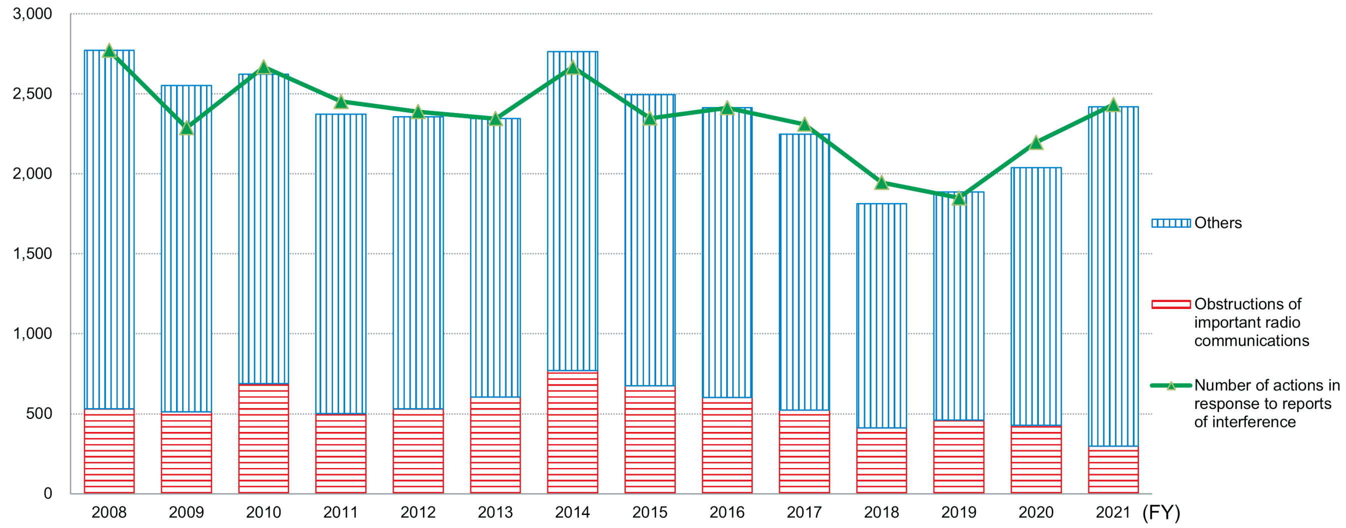
		Satellite name	Orbit (east longitude)	Operating company	Band used
		JCSAT-85	85.15°	Sky Perfect JSAT	Ku
		Intelsat 15		Intelsat	
	●	JCSAT-110A	110°	Sky Perfect JSAT	Ku
	●	JCSAT-4B	124°	Sky Perfect JSAT	Ku
	●	JCSAT-3A	128°	Sky Perfect JSAT	C, Ku
		JCSAT-5A	132°	Sky Perfect JSAT	S, C, Ku
◎		N-STAR d		NTT Docomo	
◎		N-STAR e	136°	NTT Docomo	S, C
	●	SUPERBIRD-C2	144°	Sky Perfect JSAT	Ku
	●	JCSAT-1C	150°	Sky Perfect JSAT	Ku, Ka
	●	JCSAT-2B	154°	Sky Perfect JSAT	C, Ku
	●	SUPERBIRD-B3	162°	Sky Perfect JSAT	Ku, Ka
		Horizons-3e	169°	Sky Perfect JSAT, Intelsat	C, Ku

Satellites with ◎ are mainly used for mobile communications. Satellites with ● are also used for broadcasting.
JCSAT-85 and Intelsat 15 are the name of the same satellite. Similarly, JCSAT-5A and N-STAR d are the name of the same satellite.

4. Major non-geostationary satellites used for communication services in Japan (at the end of fiscal 2021)

Satellite name	Altitude/number of satellites	Operating business	Agency in Japan	Service area	Service content	Service launch time
ORBCOMM	825km high/41 satellites	ORBCOMM	ORBCOMM Japan	Global	Data communication and positioning	March, 1999
Iridium	780km high/66 satellites	Iridium	KDDI Satcom Global Cubic-i Furuno Marlink Overseas Communications ICOM Navicom Aviation Japan Digital Communications	Global	Voice, data communication, short burst data, open port	June, 2005
Globalstar	1414km high/32 satellites	Globalstar	IPMotion	Global	Voice, data communication, positioning	July, 2018

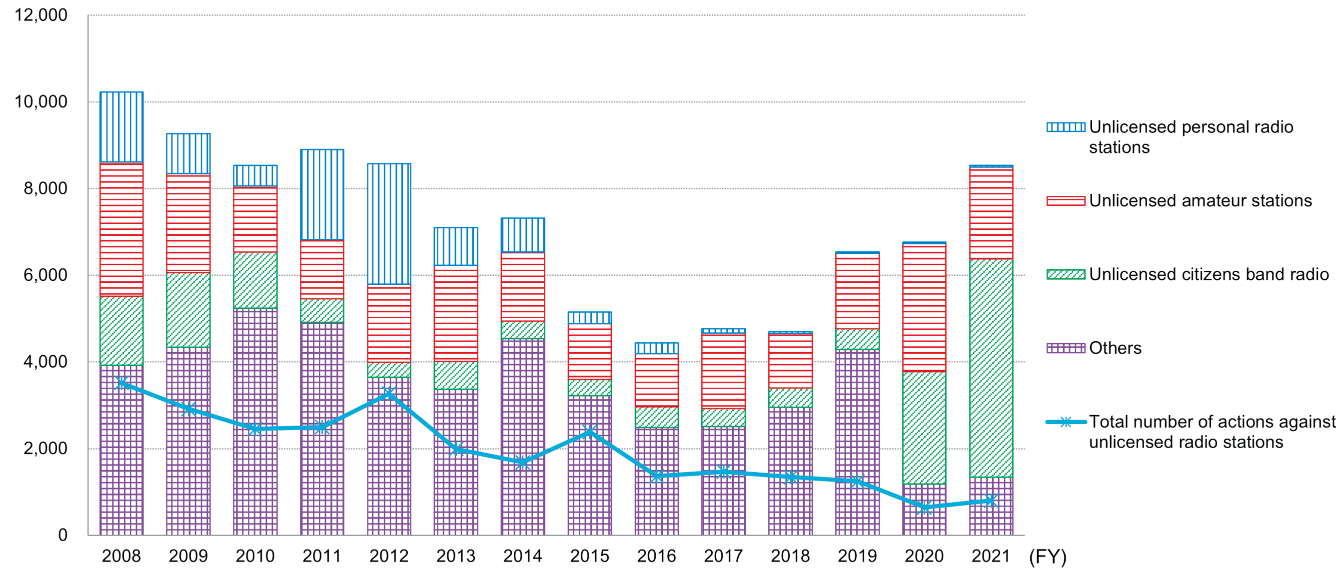
5. Changes in the number of reports of and actions against interference or obstructions to radio stations (Figure 3-4-4-1 in White Paper)



Number of reports of interference or obstruction

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Obstructions of important radio communications	532	513	689	501	532	605	771	676	603	522	412	461	429	298
Others	2,241	2,041	1,934	1,873	1,826	1,740	1,995	1,821	1,811	1,727	1,401	1,425	1,610	2,121
Total	2,773	2,554	2,623	2,374	2,358	2,345	2,766	2,497	2,414	2,249	1,813	1,886	2,039	2,419
Number of actions in response to reports of interference or obstructions														
Number of actions in response to reports of interference	2,772	2,289	2,669	2,453	2,389	2,346	2,667	2,348	2,414	2,310	1,946	1,850	2,198	2,434

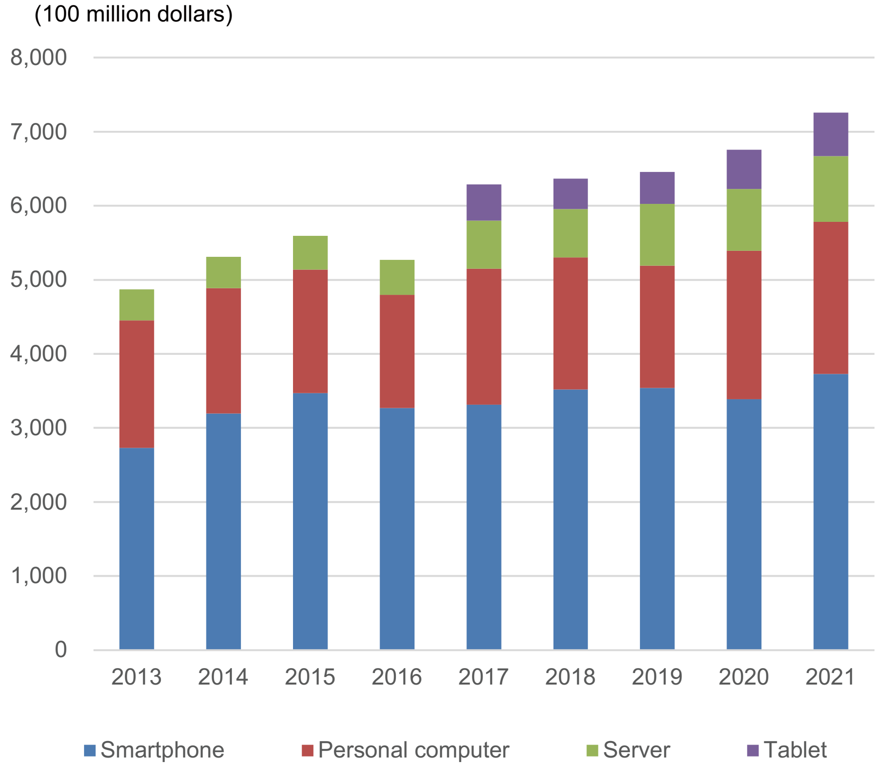
6. Changes in the number of unlicensed radio stations found and the number of actions taken (Figure 3-4-4-2 in White Paper)



Number of unlicensed radio stations found		2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Stations found	Unlicensed personal radio stations	1,617	920	479	2,081	2,788	865	784	265	245	99	40	28	25	32
	Unlicensed amateur stations	3,097	2,283	1,525	1,367	1,803	2,225	1,592	1,291	1,229	1,749	1,253	1,739	2,959	2,126
	Unlicensed citizens band radio	1,592	1,729	1,295	538	342	642	404	375	478	414	443	477	2,594	5,035
	Others	3,926	4,338	5,239	4,917	3,648	3,369	4,541	3,221	2,489	2,508	2,958	4,293	1,187	1,341
	Total	10,232	9,270	8,538	8,903	8,581	7,101	7,321	5,152	4,441	4,770	4,694	6,537	6,765	8,534
Number of actions against unlicensed radio stations															
Number of actions	Prosecution	330	340	262	249	231	228	215	230	168	168	208	189	62	49
	Guidance	3,190	2,578	2,190	2,247	3,038	1,764	1,465	2,156	1,196	1,300	1,136	1,058	581	752
	Total	3,520	2,918	2,452	2,496	3,269	1,992	1,680	2,386	1,364	1,468	1,344	1,247	643	801

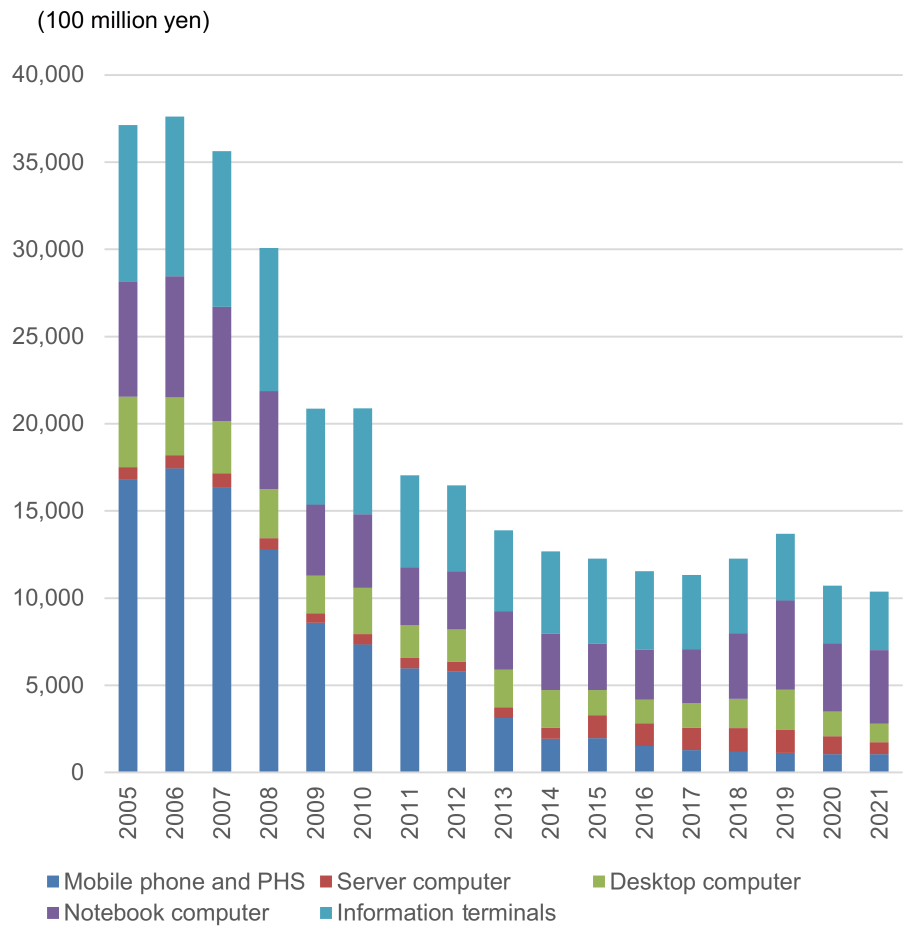
Section5

1. Changes in shipment of information terminals in the world (Figure 3-5-1-1 in White Paper)



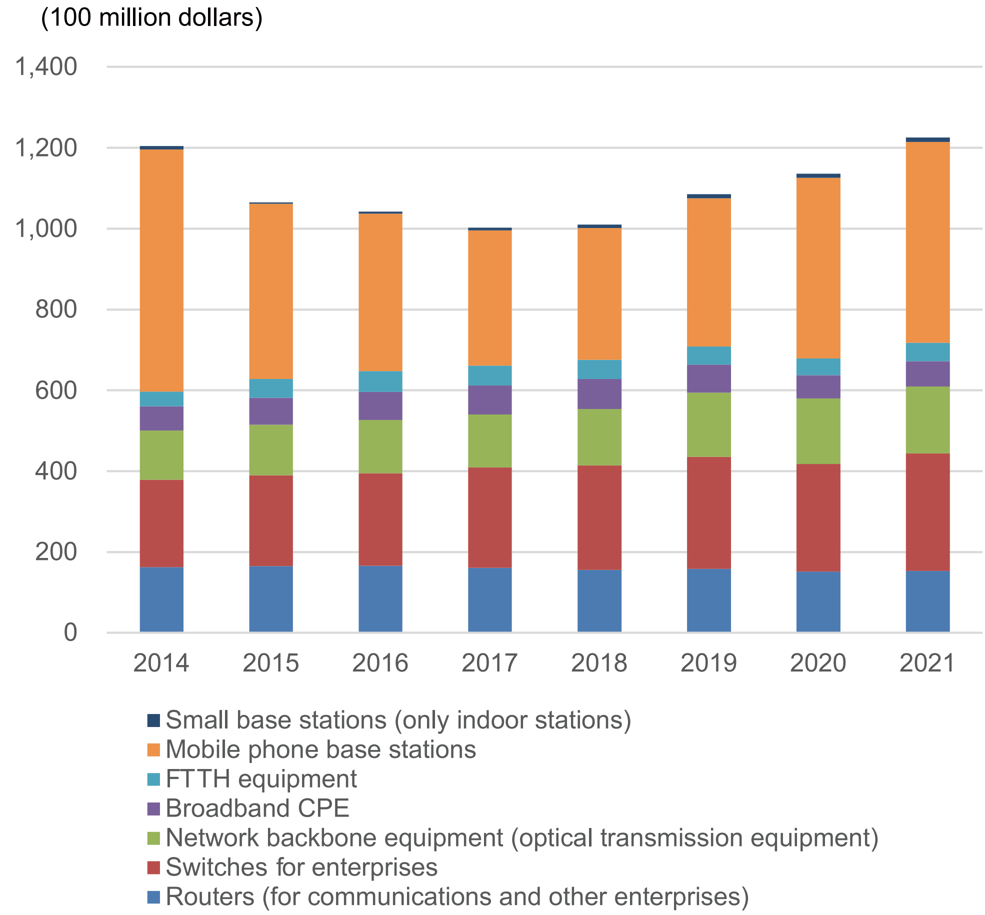
(Source) Omdia

2. Changes in Japan’s production of information terminals (Figure 3-5-1-2 in White Paper)



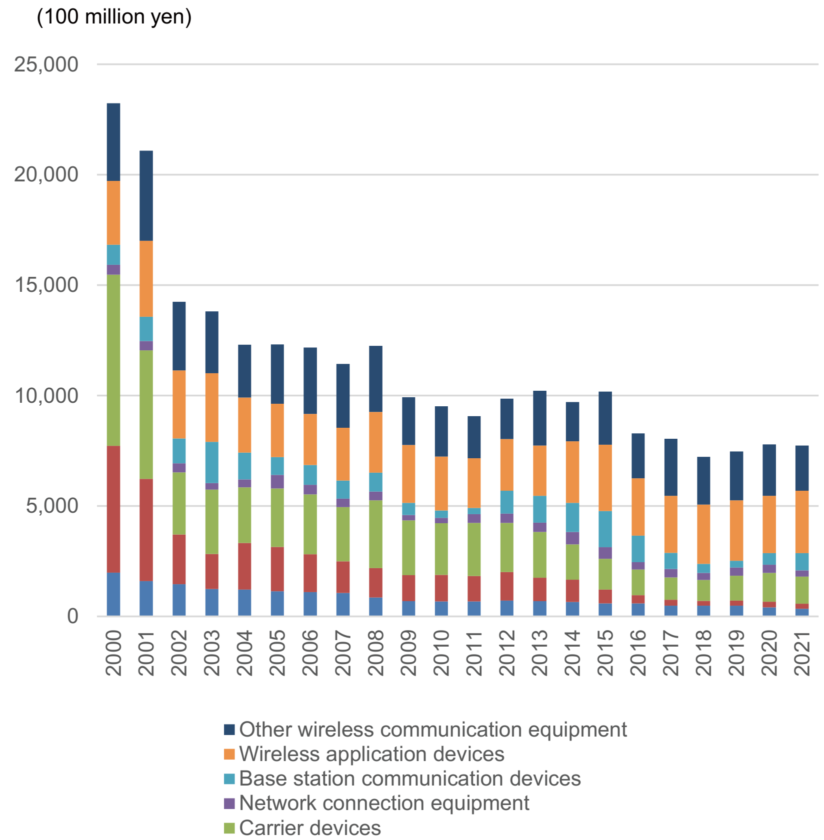
(Source) METI “Current Survey of Production – Machinery”

3. Changes in the global shipments of network equipment (Figure 3-5-2-1 in White Paper)



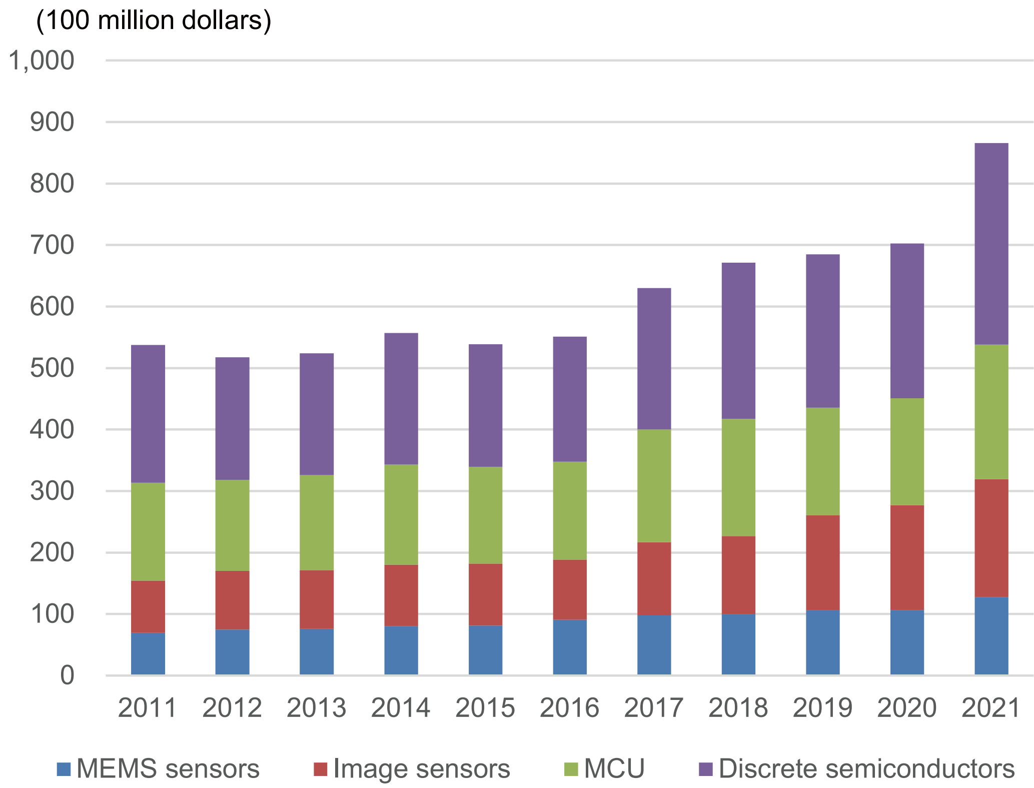
(Source) Omdia

4. Changes in Japan’s production of network equipment (Figure 3-5-2-2 in White Paper)



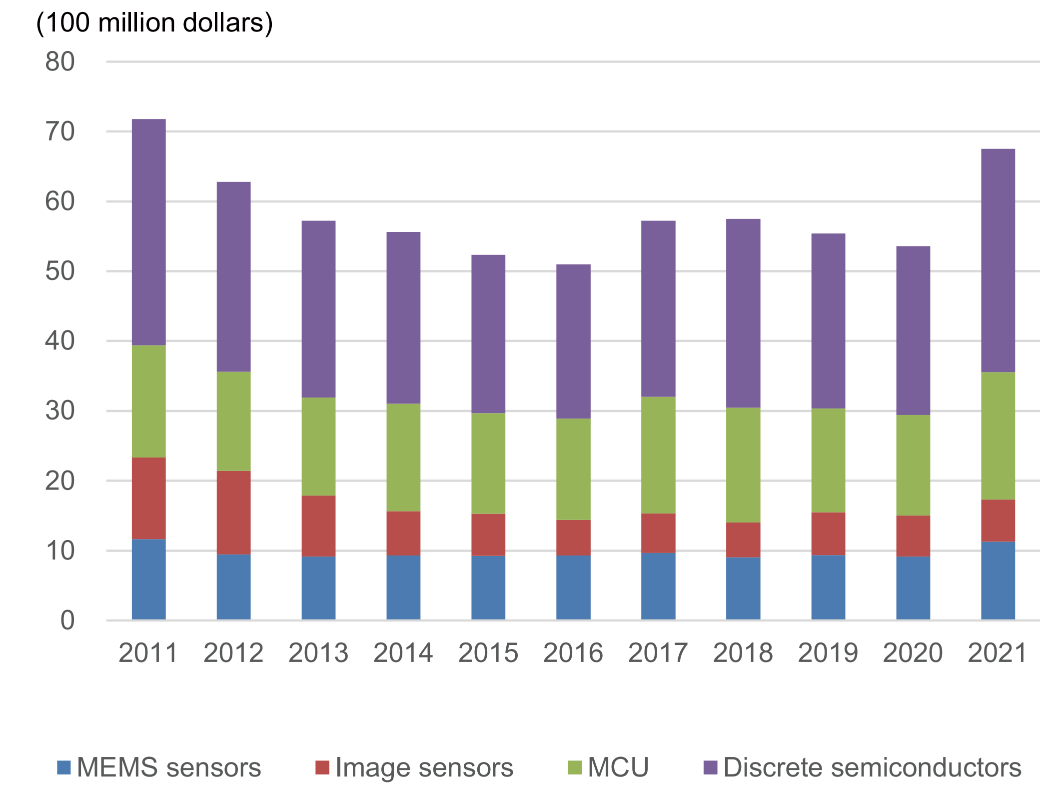
(Source) METI “Current Survey of Production – Machinery”

5. Changes in global semiconductor shipments (Figure 3-5-3-1 in White Paper)



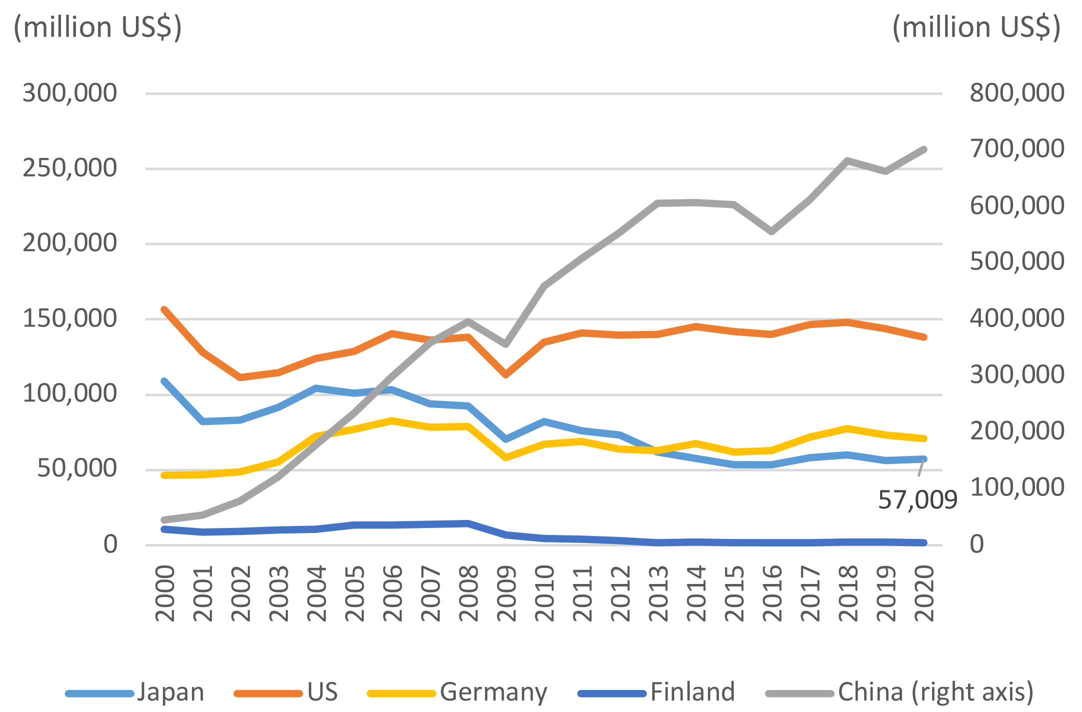
(Source) Omdia

6. Changes in Japan's semiconductor shipments (Figure 3-5-3-2 in White Paper)



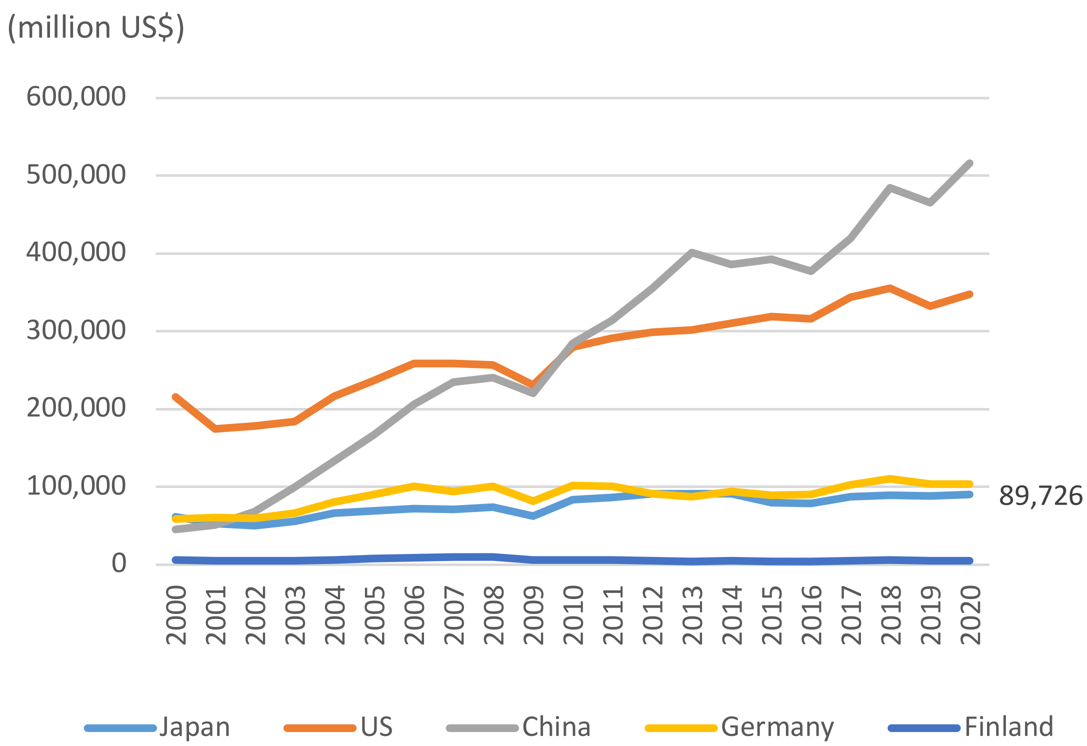
(Source) Omdia

7. Changes in ICT exports of various countries



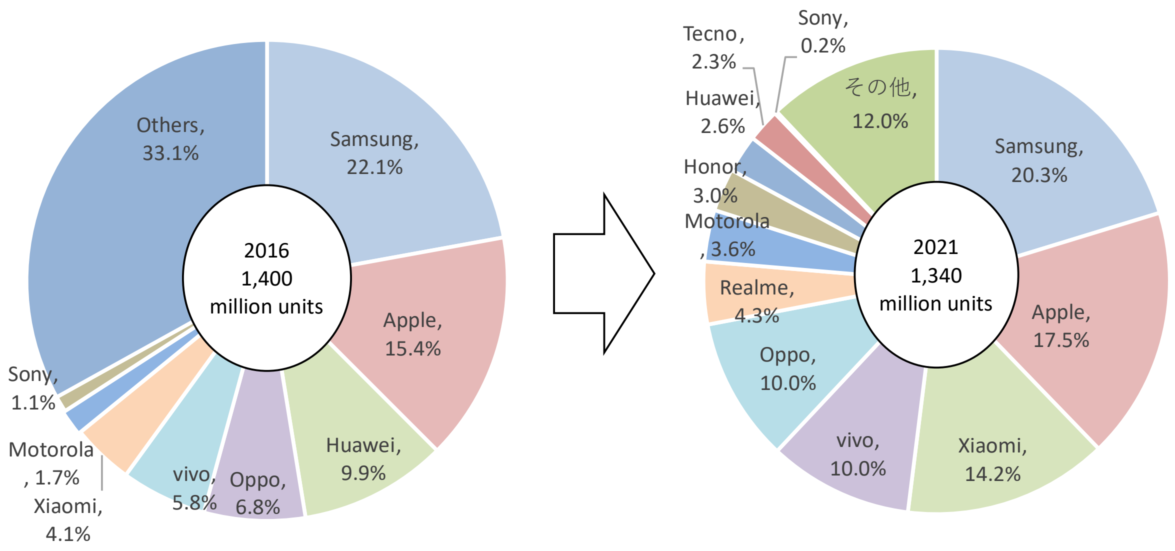
(Source) UNCTAD, "UNCTAD STAT"
https://unctadstat.unctad.org/EN/Index.html

8. Changes in ICT imports of various countries



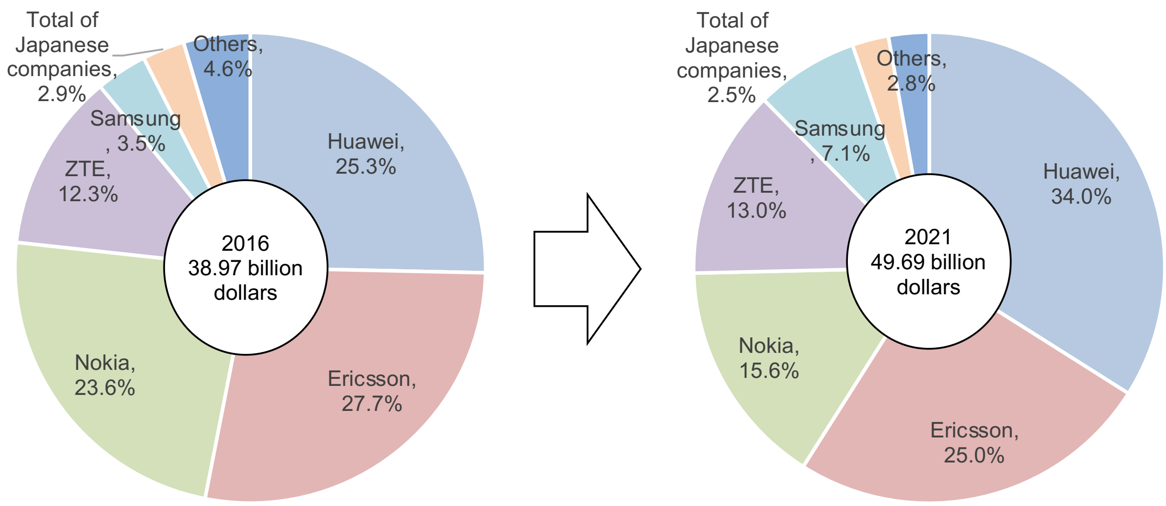
(Source) UNCTAD, "UNCTAD STAT"
https://unctadstat.unctad.org/EN/Index.html

9. Changes in the global smartphone market share



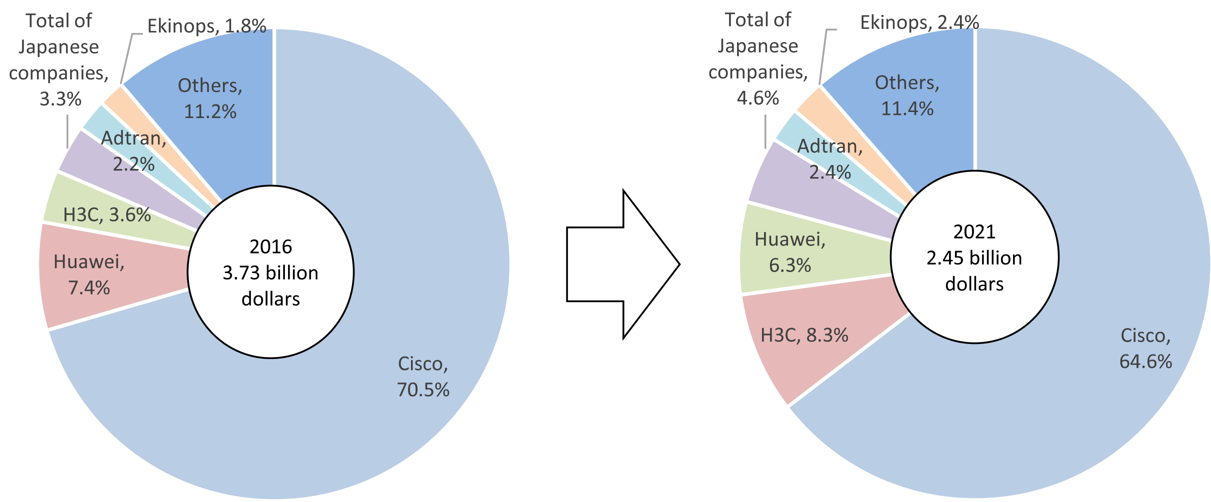
(Source) Omdia

10. Changes in macro cell base station share in the global market (Figure 3-5-5-1 in White Paper)



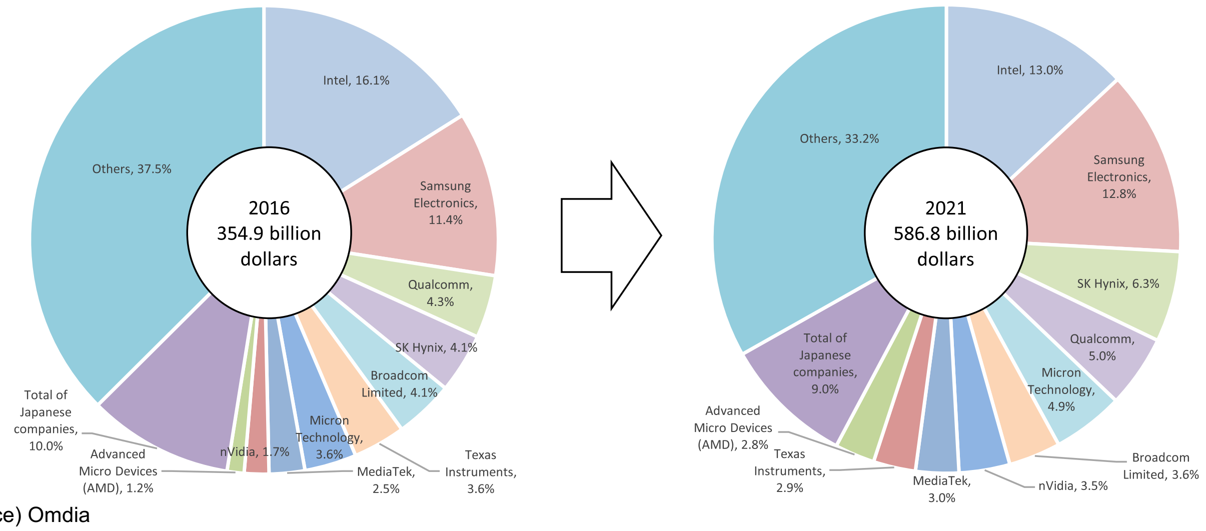
(Source) Omdia

11. Changes in the global market share of routers for business



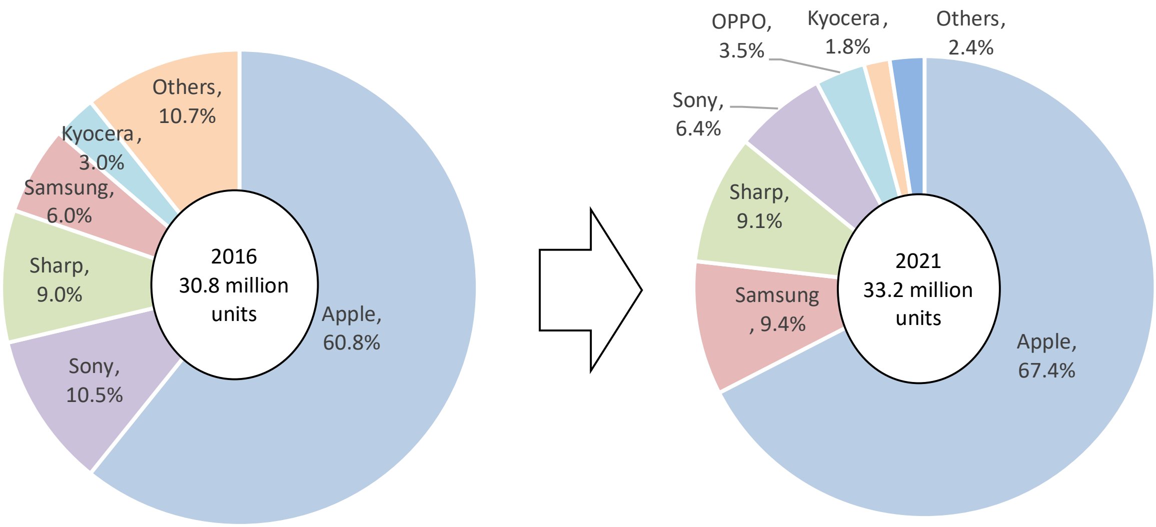
(Source) Omdia

12. Changes in the global semiconductor market share



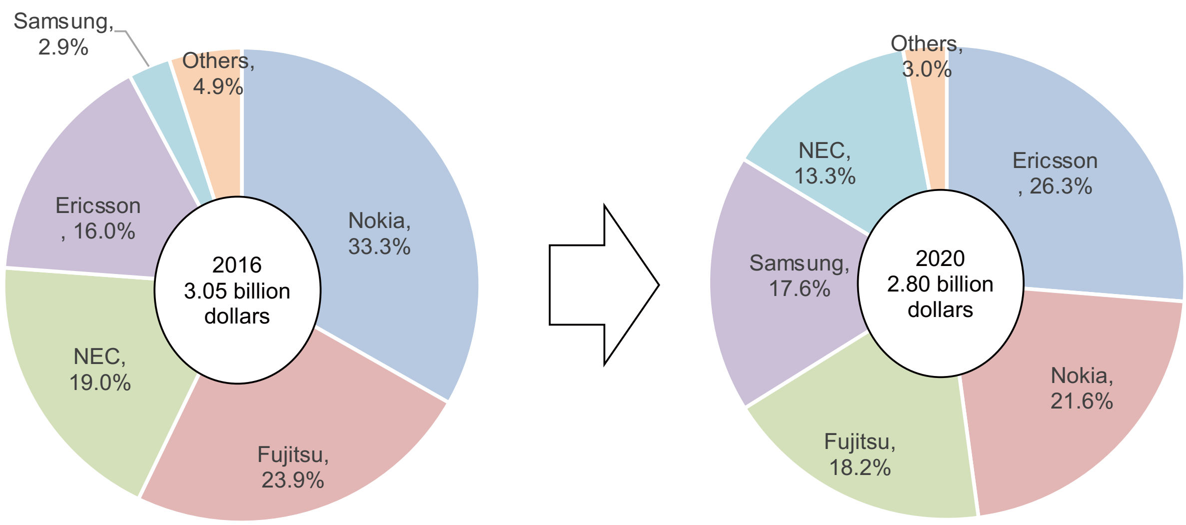
(Source) Omdia

13. Changes in share of the Japanese smartphone market



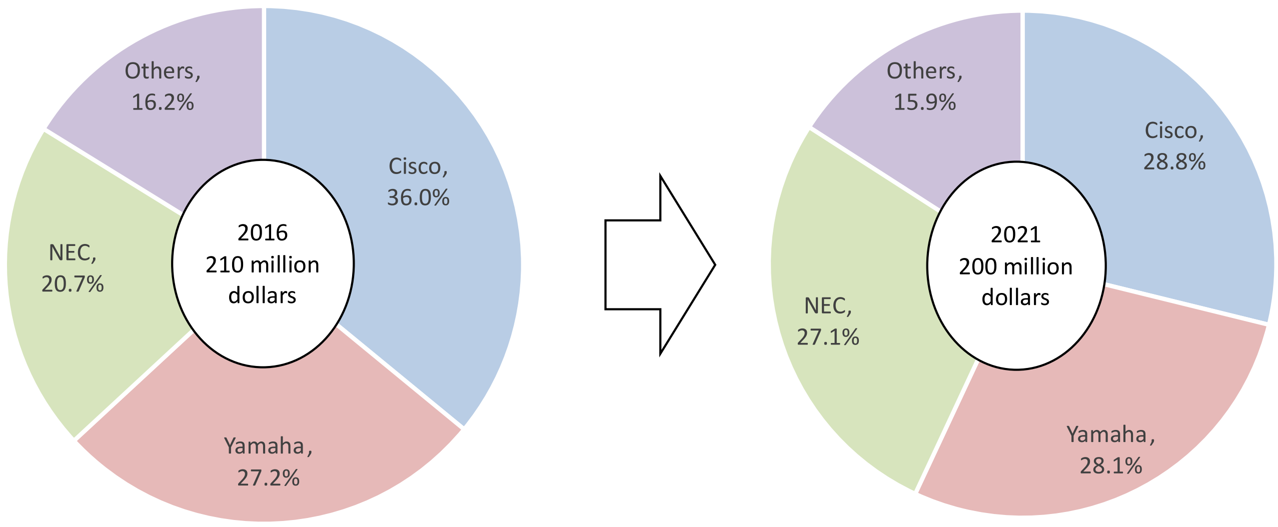
(Source) Omdia

14. Changes in the macro cell base station share in the Japanese market (Figure 3-5-5-2 in White Paper)



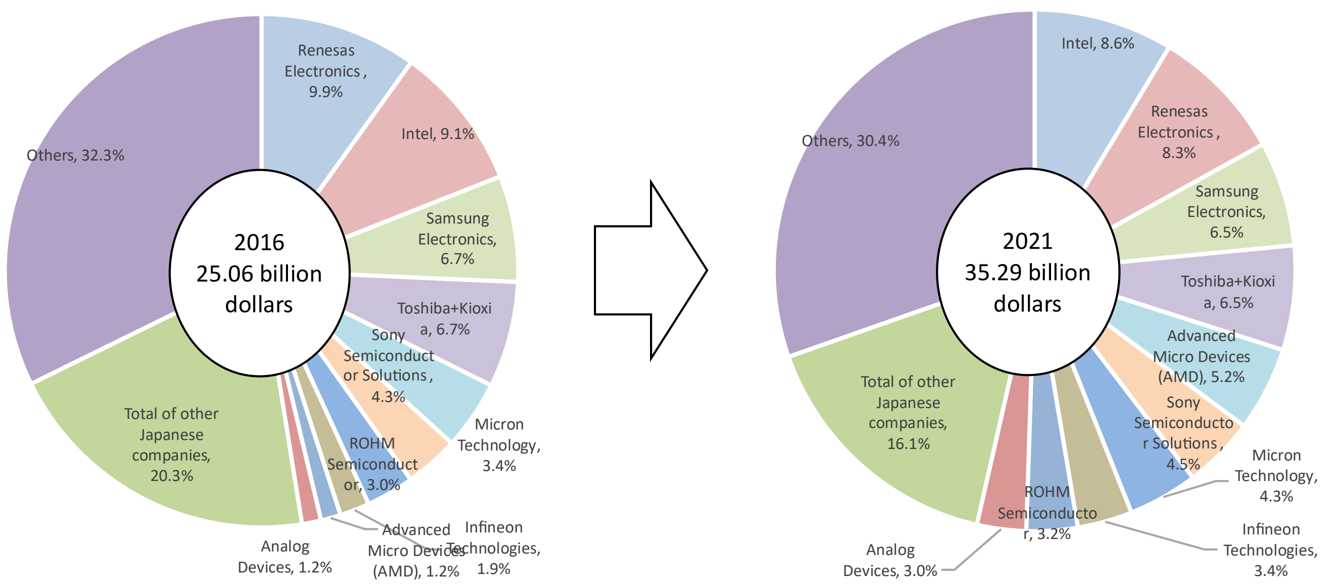
(Source) Omdia

15. Changes in market share of routers for business in Japan



(Source) Omdia

16. Changes in share in the Japanese semiconductor market



(Source) Omdia

Section6

1. Changes in the top 15 companies in terms of market capitalization in the global ICT market (Figure 3-6-1-1 in White Paper)

2017

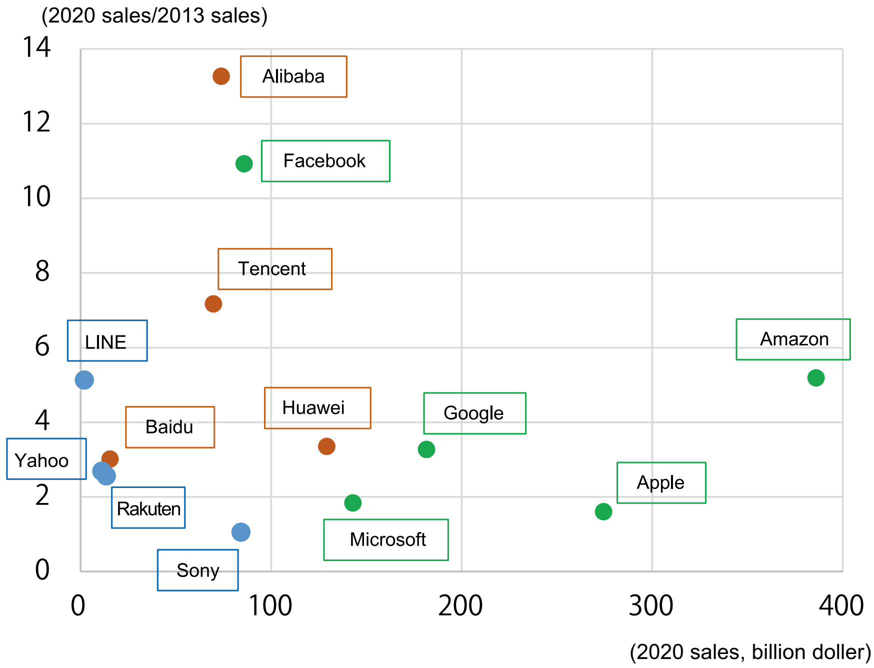
Company name	Major business	Country	Market capitalization (100 million dollars)
Apple	Hardware, software, services	US	8,010
Alphabet/Google	Search engine	US	6,800
Amazon.com	e-commerce	US	4,760
Facebook	SNS	US	4,410
Tencent	SNS	China	3,350
Alibaba	e-commerce	China	3,140
Priceline Group	Online booking	US	920
Uber	Mobility	US	700
Netflix	Media	US	700
Baidu China	Search engine	China	660
Salesforce	Cloud service	US	650
Paypal	Payment	US	610
Ant Financial	Payment	China	600
JD.com	e-commerce	China	580
Didi Kuaidi	Mobility	China	500

2022

Company name	Major business	Country	Market capitalization (100 million dollars)
Apple	Hardware, software, services	US	28,282
Microsoft	Cloud service	US	23,584
Alphabet/Google	Search engine	US	18,215
Amazon.com	Cloud service, e-commerce	US	16,353
Meta Platforms /Facebook	SNS	US	9,267
NVIDIA	Semiconductor	US	6,817
Taiwan Semiconductor Manufacturing	Semiconductor	Taiwan	5,946
Tencent	SNS	China	5,465
Visa	Payment	US	4,588
Samsung Electronics	Hardware	Korea	4,473
Mastercard	Payment	US	3,637
Alibaba	e-commerce	China	3,589
Walt Disney	Media	US	2,811
Cisco Systems	Hardware, security	US	2,578
Broadcom	Hardware, semiconductor	US	2,557

(Source) For 2017, MIC (2018) “Current State and Challenges of Platform Services“; for 2022, Wright Investors’ Service, Inc (as of January 14, 2022)

2. Sales of platformers of Japan, the US and China (Figure 3-6-1-2 in White Paper)



*Sales of 2019 for LINE

(Source) Prepared from Statista data

3. Regulations to ensure a competitive environment of the markets in Japan and abroad

Region	Summary of efforts
Japan	● The Act on Improving Transparency and Fairness of Digital Platforms (Act No. 38 of 2020) was enforced in February 2021. The Act requires digital platform providers to disclose terms and conditions of trading, develop procedures and systems in a voluntary manner and submit a report on businesses that they have conducted.
US	● In July 2019, Department of Justice (DoJ) announced a large -scale investigation of monopoly by online platformers ● In July 2020, the House Judiciary Committee held a public hearing of GAFA regarding the antitrust law. ● In June 2021, bipartisan representatives submitted a bill to strengthen regulation on GAFA. ● In October 2021, bill to strengthen regulation on GAFA was submitted also to the Senate.
China	● In December 2020, the Central Economic Work Conference included strengthening of regulation on platformers in its eight major tasks and stated “strengthen antitrust and prevent disordered capital expansion.”*
Europe	● In December 2020, the European Commission announced bills of Digital Markets Act (DMA) and the Digital Services Act (DSA) with regulation of GAFA and other leading IT services in mind. ● In September 2020, the Cabinet of Germany decided a proposal for revision of its competition act to expand the authority of law enforcement of the federal cartel office.

* https://www.tkfd.or.jp/research/detail.php?id=3908

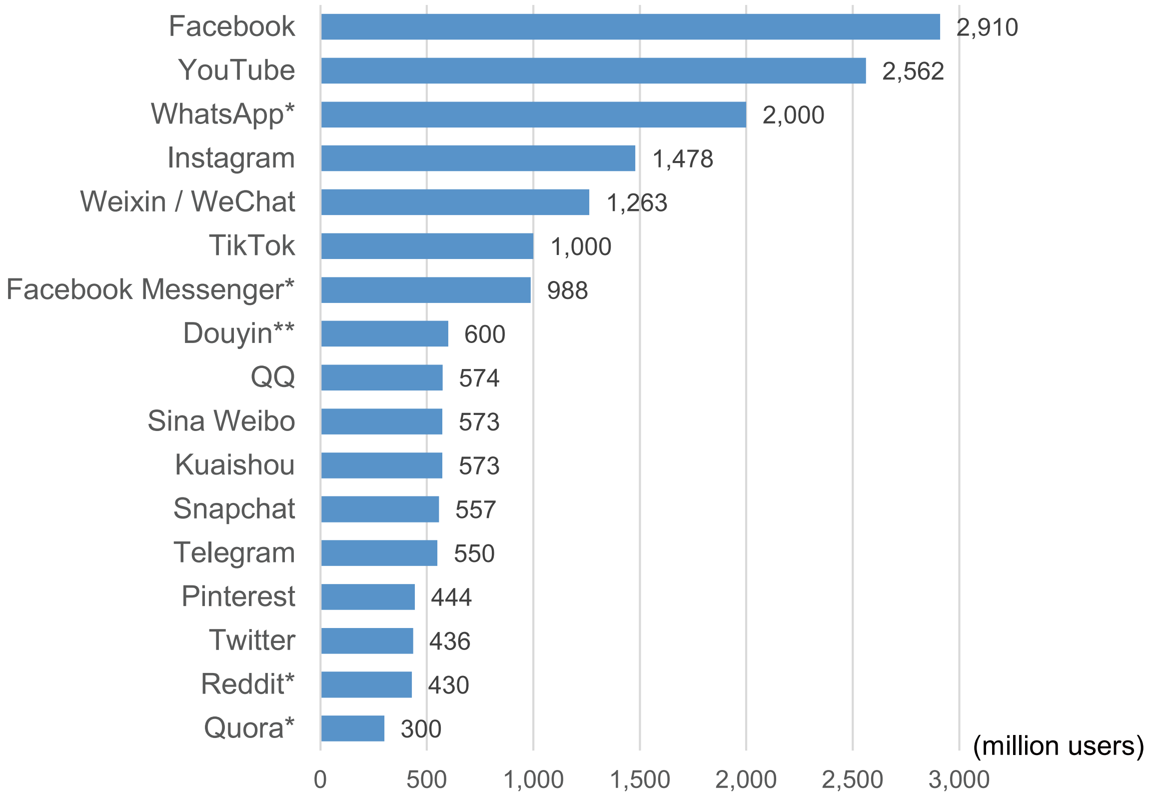
(Source) MIC (2022) “Survey Study on the Trends in the Market Environment Surrounding ICT”

4. Regulation on illegal/harmful contents on the Internet in Japan and abroad

Region	Summary of regulations
Japan	● In July 2020, MIC Study Group on Platform Services conducted hearings of platform operators concerning their measures against slanders and released "urgent recommendations" in August 2020. Based on the recommendations, MIC formulated and released "policy package for dealing with slander on the Internet" in September 2020 ● In April 2021, in order to facilitate relief of victims of infringement by slander, etc. on the internet, MIC promulgated an Act to amend the "Act on the Limitation of Liability for Damages of Specified Telecommunications Service Providers and the Right to Demand Disclosure of Identification Information of the Sender (Provider Liability Limitation Act) (Act No. 137 of November 30, 2001). The amendment includes: (1) establishment of new judicial proceedings (non-contentious proceedings) for early preservation of specific communication logs; and (2) clarification of information at the time of log-in which is subject to disclosure.
US	● Communications Decency Act (CDA) of 1996 Section 230 grants providers exemption from liability for outgoing content. In recent years, however, the US Congress asked platform business operators to attend its public hearing, where discussions were made on measures against illegal/harmful content on the internet and on Section 230 of the act. ● In May 2020, then President Trump signed "Executive Order on Preventing Online Censorship" and the Federal Communication Commission (FCC) discussed amendment of Section 230 of the CDA. In January 2021 upon the election defeat of the former President Trump, FCC changed the plan and announced that it would not clarify Section 230 of the CDA. ● Democratic Party raises concerns about the lack of moderation among technology enterprises and the broad exemption provided by Section 230 of the CDA concerning transmission/dissemination of fake news and illegal/harmful content.
Europe	● In December 2020, the European Commission announced the Digital Services Act (DSA) providing accountability of all mediation service providers (platform providers) regarding distribution of illegal content, and measures for user protection according to the size of the business operator: Provisions of the act include obligations for very large online platforms to implement risk analysis and assessment of their service, take measures to reduce the risks, implement external audit and release the result, add recommender system and transparency of online advertisement. Violations are punishable with a fine of up to 6% of the platform's total turnover of the previous year. ● In May 2021, the European Commission released "Guidance on Strengthening the Code of Practice on Disinformation" to strengthen the code of practice, which includes expansion of the scope of signatories, demonetization of disinformation, expansion of the scope of the fact checks and strengthening of the monitoring framework. ● By December 2021, the number of signatories of the Code of Practice increased from 16 to 66 (including expected signatories) after the release of the Guidance. Renewal process of the Code of Practice was extended to the end of March 2022. ● In January 2022, a bill to amend the DSA was approved by the European Parliament and will be enacted when it is approved by the EU Council.
UK	● In April 2019, The Department for Digital, Culture, Media & Sport (DCMS) and the Home Office of the UK released the "Online Harms White Paper" specifying future measures of the government to ensure safe internet environments in the country, and developed statutory duty of care with the aim of requiring response to harmful content/acts on the internet. Platform providers are required to perform the duty of care. ● In December 2020, the Full Government Response to the result of public comments for the white paper was released to provide phased regulation according to the scale of the service (Specific exemptions have been introduced for low-risk services. High-risk and wide-range services are classified as Category 1 to strengthen the regulation on the enterprises providing the services.) ● May 2021, draft Online Safety Bill (OSB) was released. ● After the release of the OSB, the UK parliament joint committee and DCMS subcommittee studied and discussed the draft OSB and released the results from the end of 2021 to early 2022. ● On March 8, 2022, DCMS issued a statement to add illegal/harmful paid advertisement to the OSB regulation subjects. ● On March 17, 2022, the OSB amended based on the result of the study was submitted to the parliament.
Germany	● In October 2017, the Network Enforcement Act came into effect. The act requires social networking services with more than 2 million domestic registrants to release a transparency report once every six months. The report should list the number of violation notifications, number of deletions, efforts to prevent illegal posting, an internal system to handle the report and other matters. ● In April 2021, the Act to amend the Network Enforcement Act was enforced to impose on SNS providers the obligation not only to remove postings regarding specific serious cases but also to inform the investigating authority about the content falling under offence, IP address assigned to the contributor and other matters.
France	● In June 2020, a law to regulate hate content on the internet was promulgated and enforced. Penalty for violation of existing obligations of providers regarding measures against illegal content was increased from 75,000 Euro to 250,000 Euro (up to 1.25 million Euro for a corporation) ● In January 2022, the Enlightenment in Digital Age committee compiled a report for the purpose of study on means to control disinformation and submitted the report to the President of the Republic on 11th of the same month. The report summarizes information disorders in the digital age and the state of knowledge on the resulting confusions in democratic life, which is followed by 30 recommendations to address the issues

(Source) MIC (2022) "Survey Study on the Trends in the Market Environment Surrounding ICT"

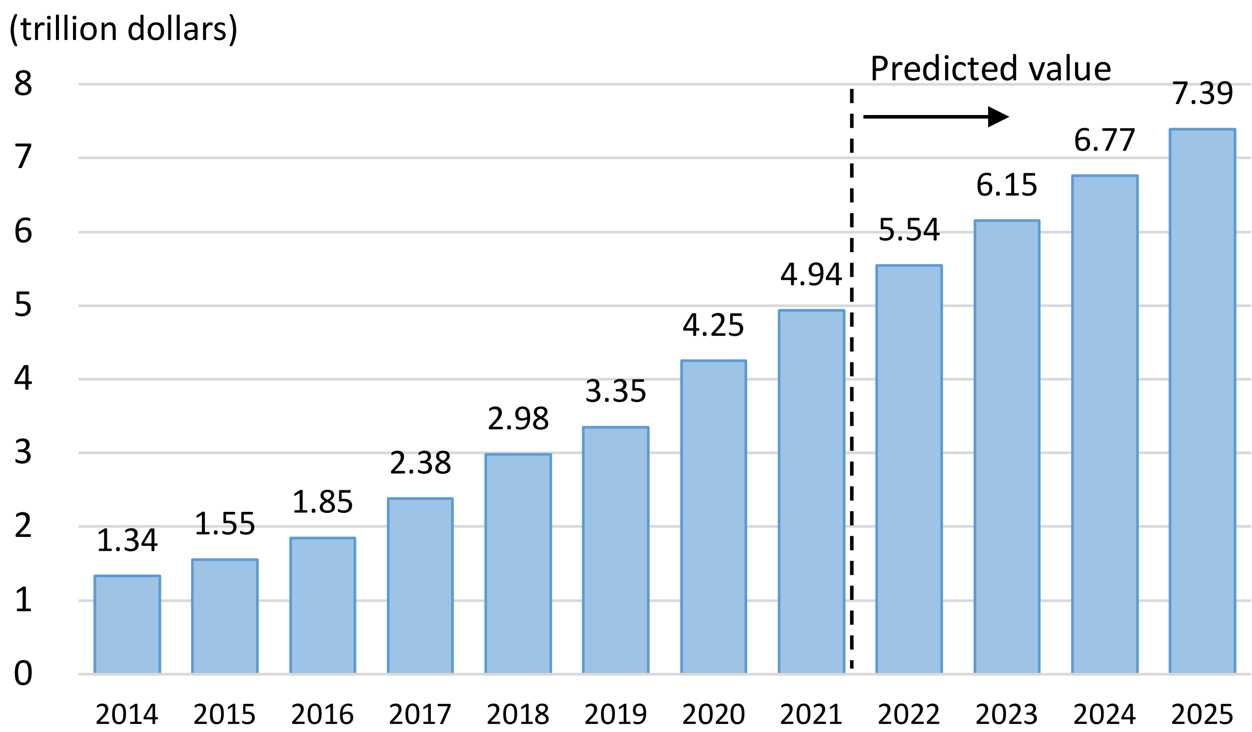
5. Monthly number of active users of major social media in the world (January 2022) (Figure 3-6-2-1 in White Paper)



*The latest data is data from over one year ago
** Number of daily active users

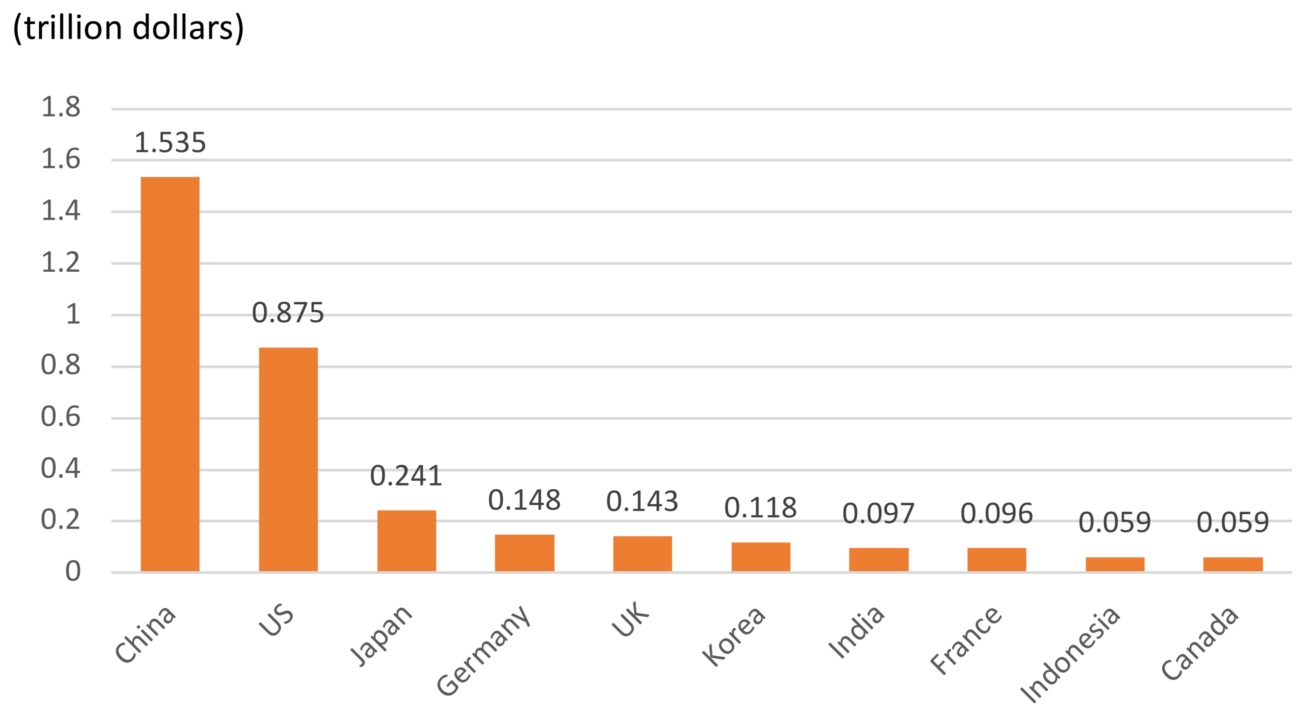
(Source) Statista (We Are Social; Hootsuite; DataReportal)

6. Changes and forecasts for the global EC market sales



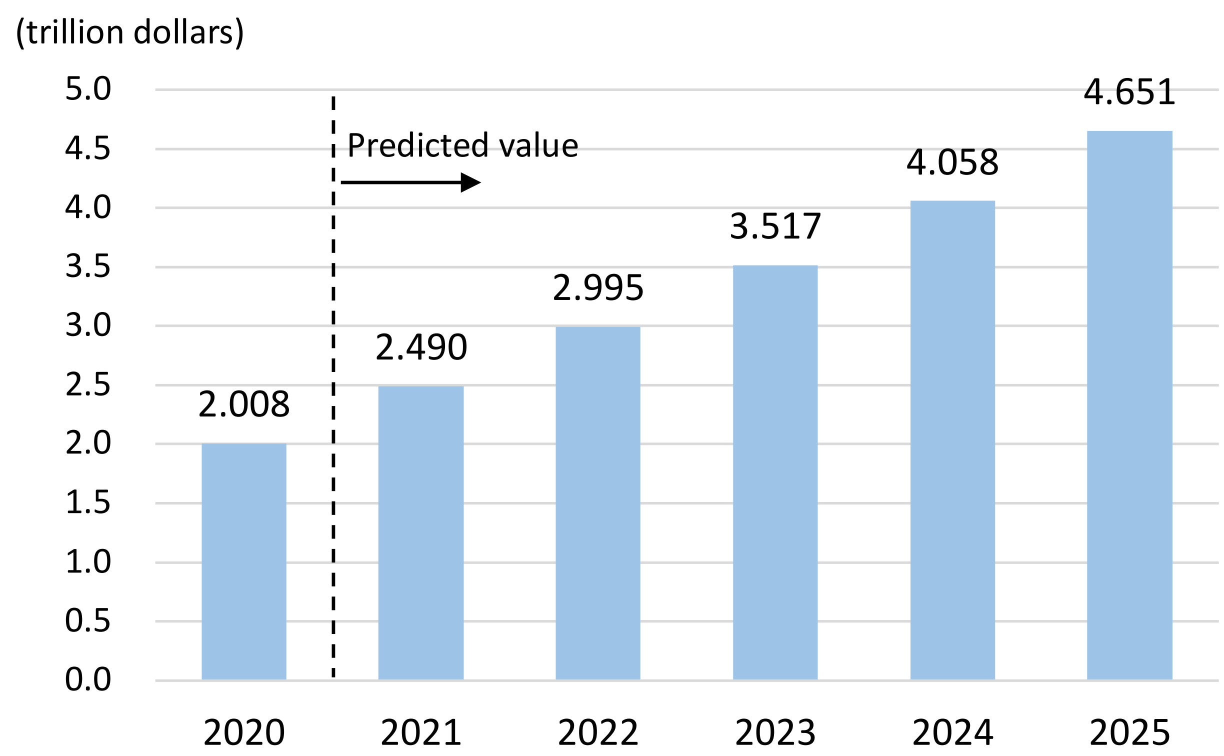
(Source) Statista (eMarketer)
https://www.statista.com/statistics/379046/worldwide-retail-e-commerce-sales/

7. Forecasts for the EC market sales by country (2022)



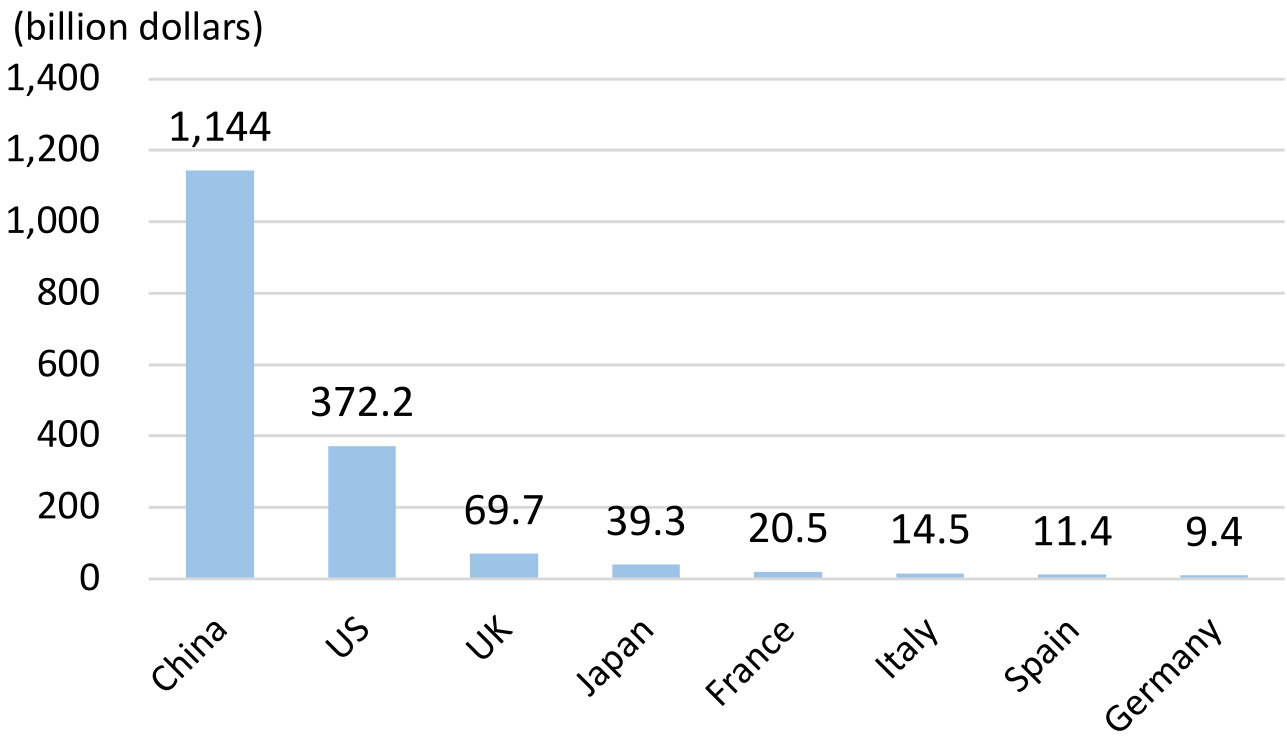
(Source) Statista, "Digital Market Outlook"
https://www.statista.com/forecasts/1283912/global-revenue-of-the-e-commerce-market-country

8. Changes and forecasts for transaction values of global mobile payment



(Source) Statista, “Digital Payments report 2021”
https://www.statista.com/study/41122/fintech-report-digital-payments/

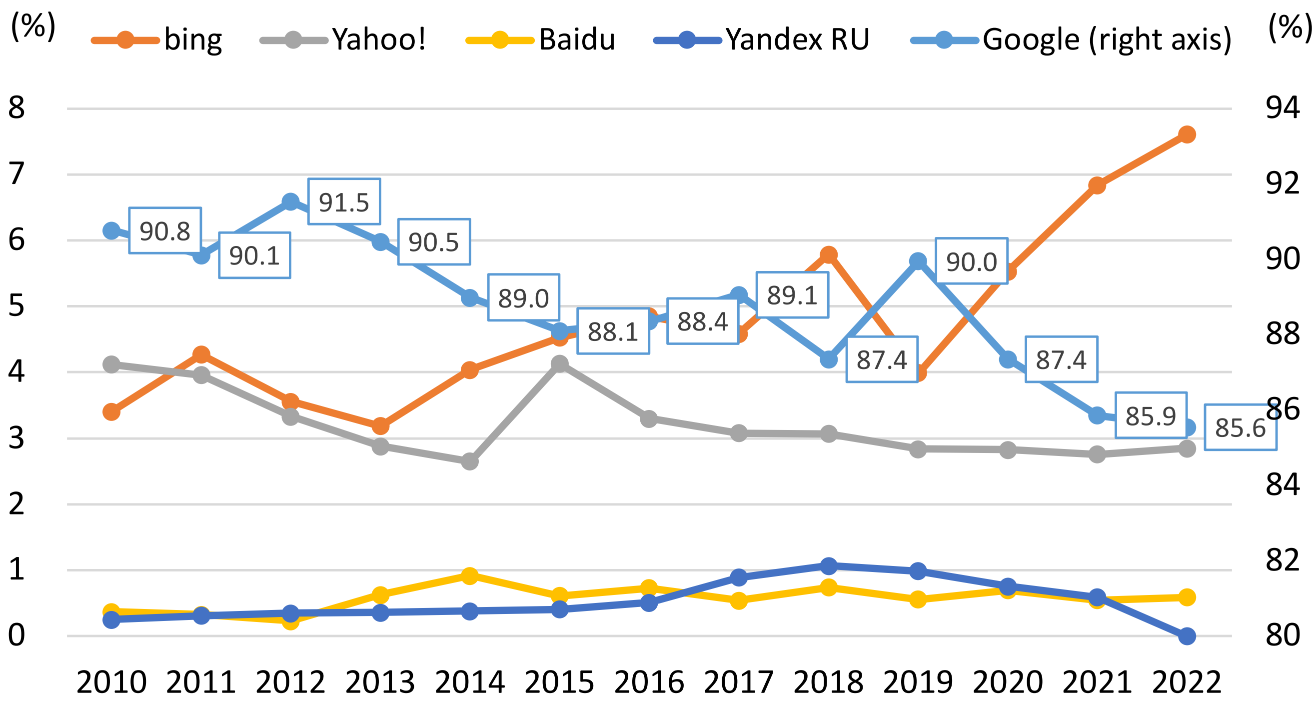
9. Transaction values of mobile payment in each country (2020)



*Data of Japan Website of Payments Japan
https://paymentsjapan.or.jp/code-payments/20220418/
https://www.itmedia.co.jp/business/articles/2106/02/news082.html

(Source) Statista, "Digital Payments report 2021"
https://www.statista.com/study/41122/fintech-report-digital-payments/

10. Changes in the global share of search engines



(Source) Statista (StatCounter)
https://www.statista.com/statistics/216573/worldwide-market-share-of-search-engines/

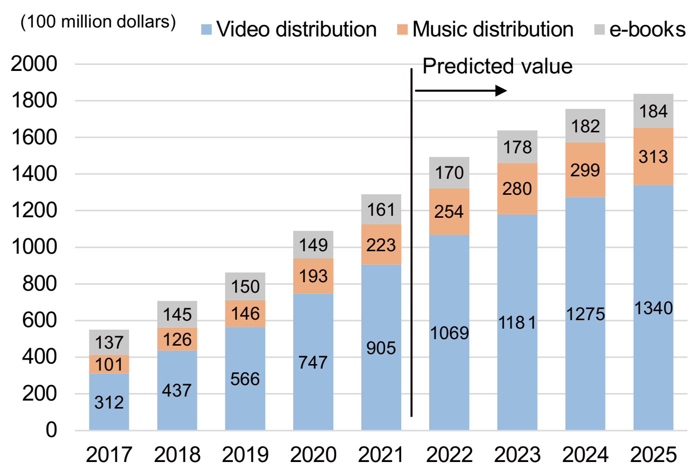
11. Search engine share in Japan (by terminal used)

	Personal computers (as of Sept. 2021)	Smartphones (as of March 2022)
Google	75.7	75.2
Yahoo!	14.2	24.2
Bing	9.6	0.3
Others	0.5	0.3

%

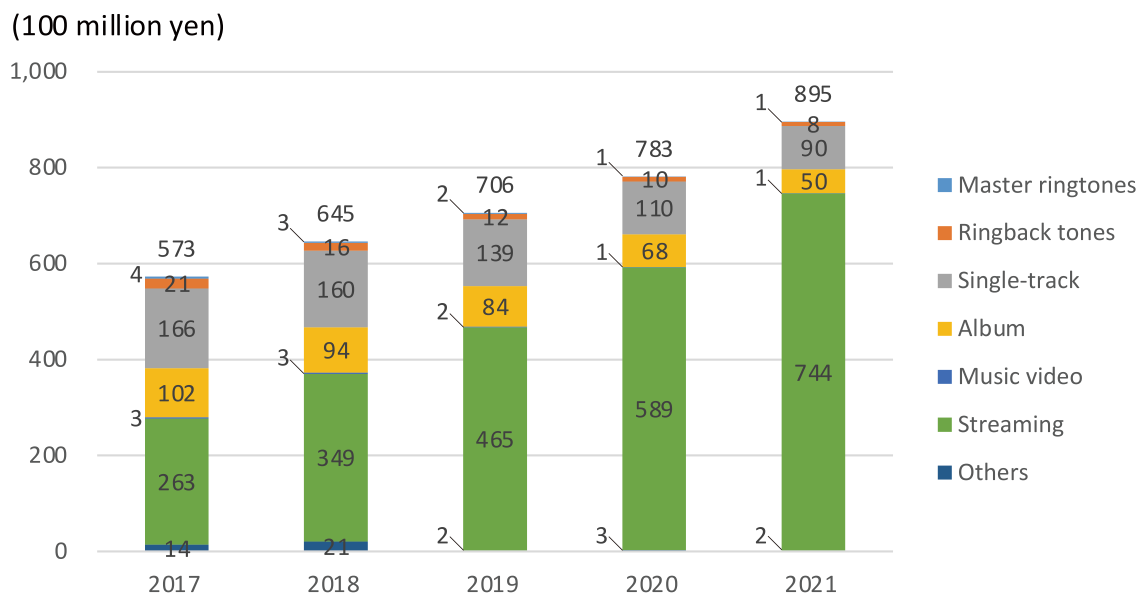
(Source) Statista (StatCounter)
Personal computers https://www.statista.com/statistics/1270637/japan-leading-desktop-search-engines/
Smartphones https://www.statista.com/statistics/1270599/japan-leading-mobile-search-engines/

12. Changes and forecasts for the size of the global video distribution, music distribution and e-book markets (Figure 3-6-6-1 in White Paper)



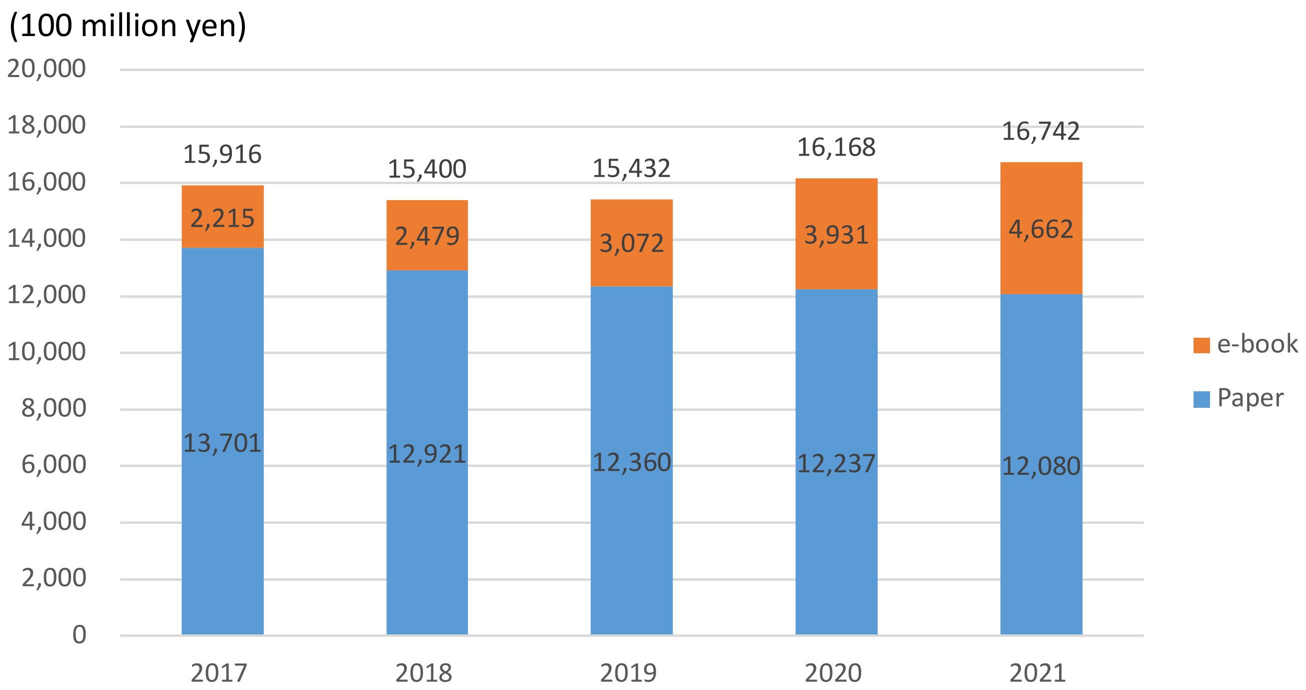
(Source) Omdia, Statista “Digital Market Outlook”

14. Changes in the music distribution market in Japan



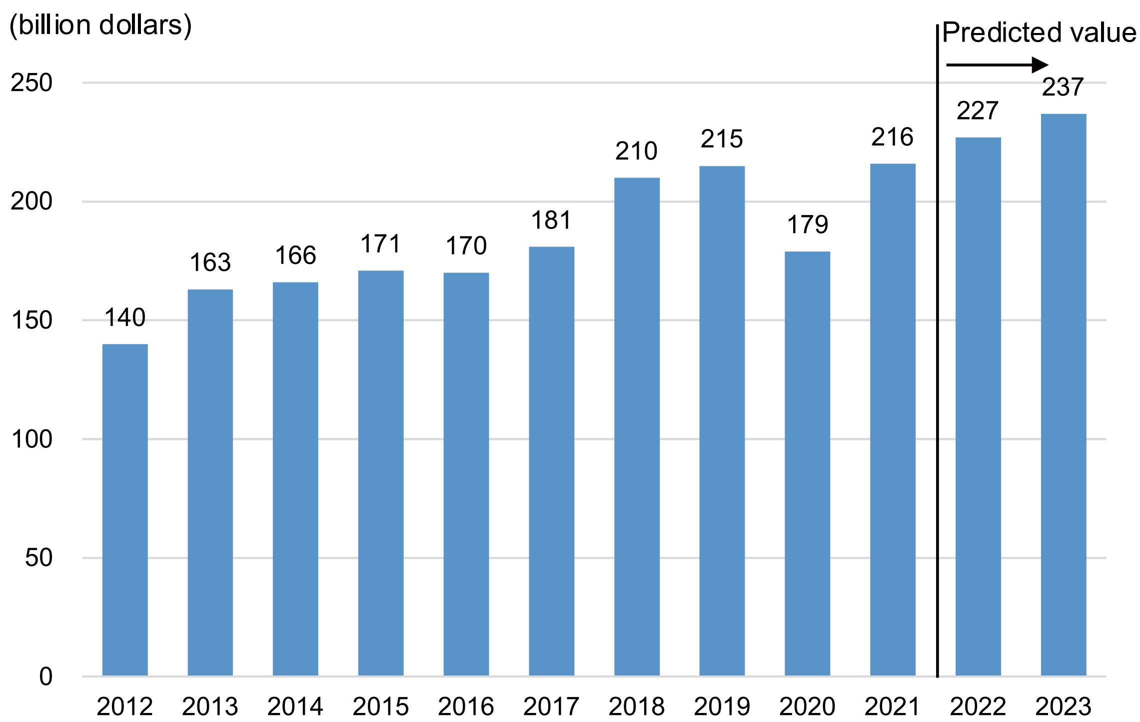
(Source) Prepared from The Recording Industry Association of Japan, "The Recording Industry in Japan 2022"
https://www.riaj.or.jp/news/id=306

15. Changes in the e-book market in Japan



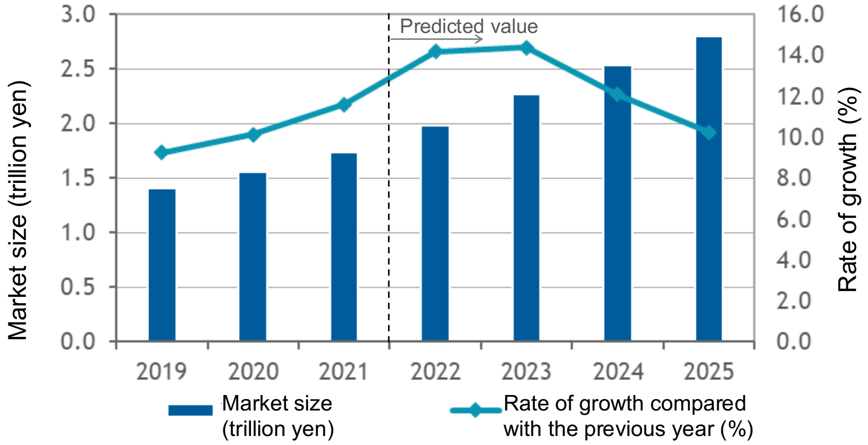
(Source) The All Japan Magazine and Book Publisher's and Editor's Association/The Research Institute for Publications (2022), "Monthly Report of Publications"
https://shuppankagaku.com/wp/wp-content/uploads/2022/01/ニュースリリース 2201.pdf

16. Changes and forecasts for the size (expenditure) of the global data center system market (Figure 3-6-7-1 in White Paper)



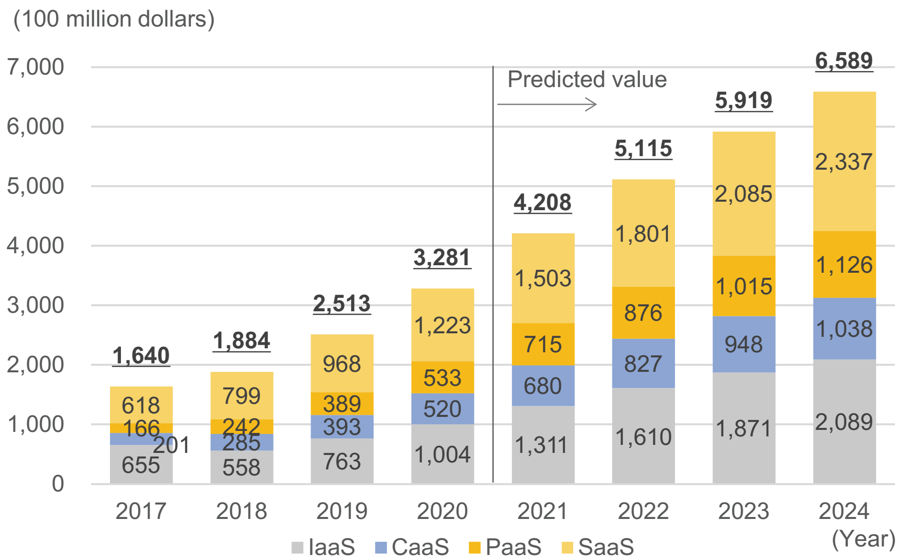
(Source) Statista (Gartner)

17. Changes and forecasts for the size (sales) of the data center service market in Japan (Figure 3-6-7-2 in White Paper)



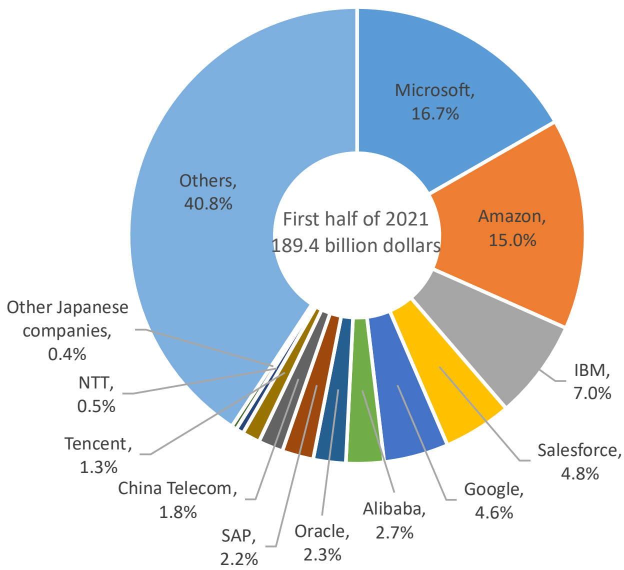
(Source) IDC Japan

19. Changes and forecasts for the size (sales) of the global public cloud service market (Figure 3-6-8-1 in White Paper)



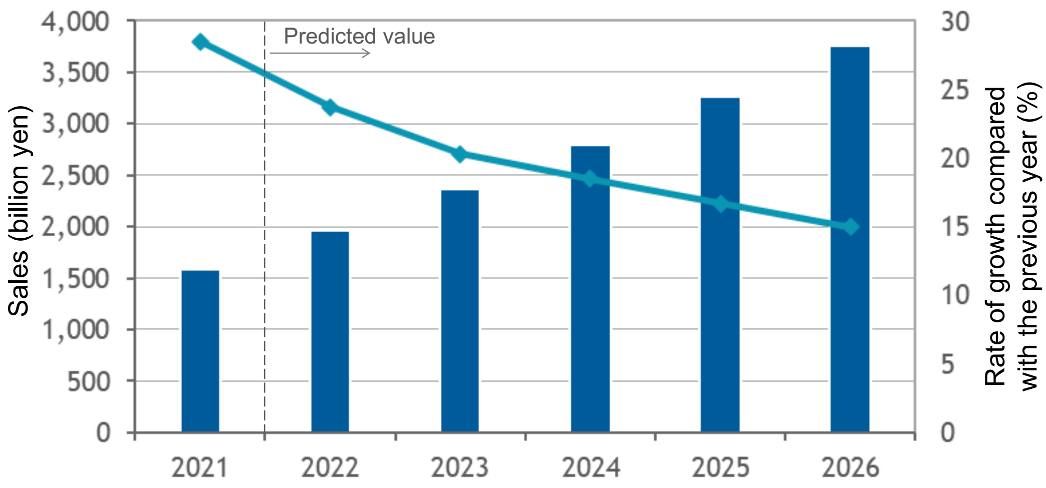
(Source) Omdia

20. Market shares of the global public cloud service



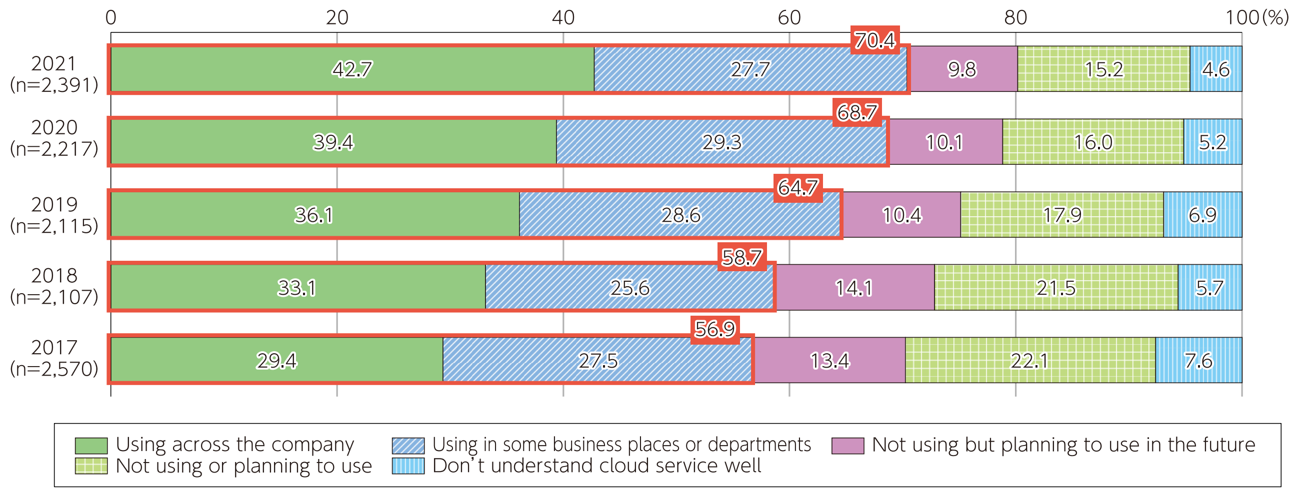
(Source) Omdia

21. Changes and forecasts for the market size (sales) of public cloud service in Japan



(Source) IDC Japan
https://www.idc.com/getdoc.jsp?containerId=prJPJ48986422

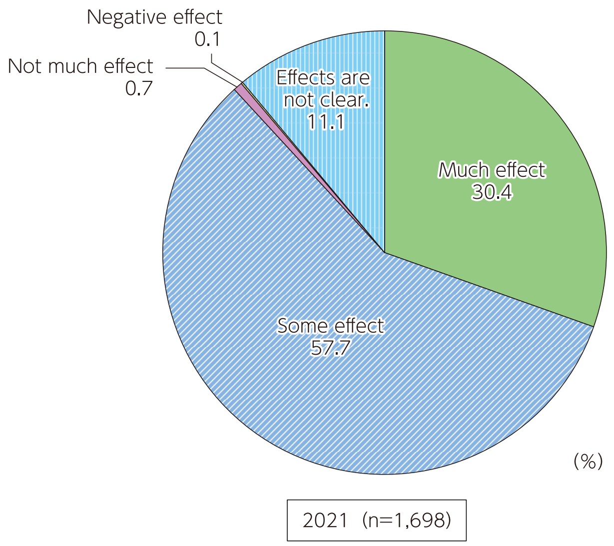
22. Usage status of cloud services



	Number of companies totaled	The number of companies totaled after adjustment	Use state of cloud service							
			Using	Using across the company	Using in some business places or departments	Not using	Not using but planning to use in the future	Not using or planning to use	Don't understand cloud service well	No answer
Total	2,396	2,396	1,683	1,021	661	598	234	364	110	5
Industrial classification										
Construction	354	100	75	54	22	21	11	11	3	-
Manufacturing	379	633	444	263	180	169	65	104	21	-
Transportation/postal services	389	224	136	57	79	70	26	43	18	1
Wholesale/retail	350	485	352	221	131	101	36	66	28	4
Finance/insurance	174	28	25	19	6	3	1	2	-	-
Real estate	177	37	31	22	9	4	3	2	2	-
Information and communications	258	130	120	89	31	10	5	5	-	1
Services, other	315	758	500	296	204	221	88	133	38	-

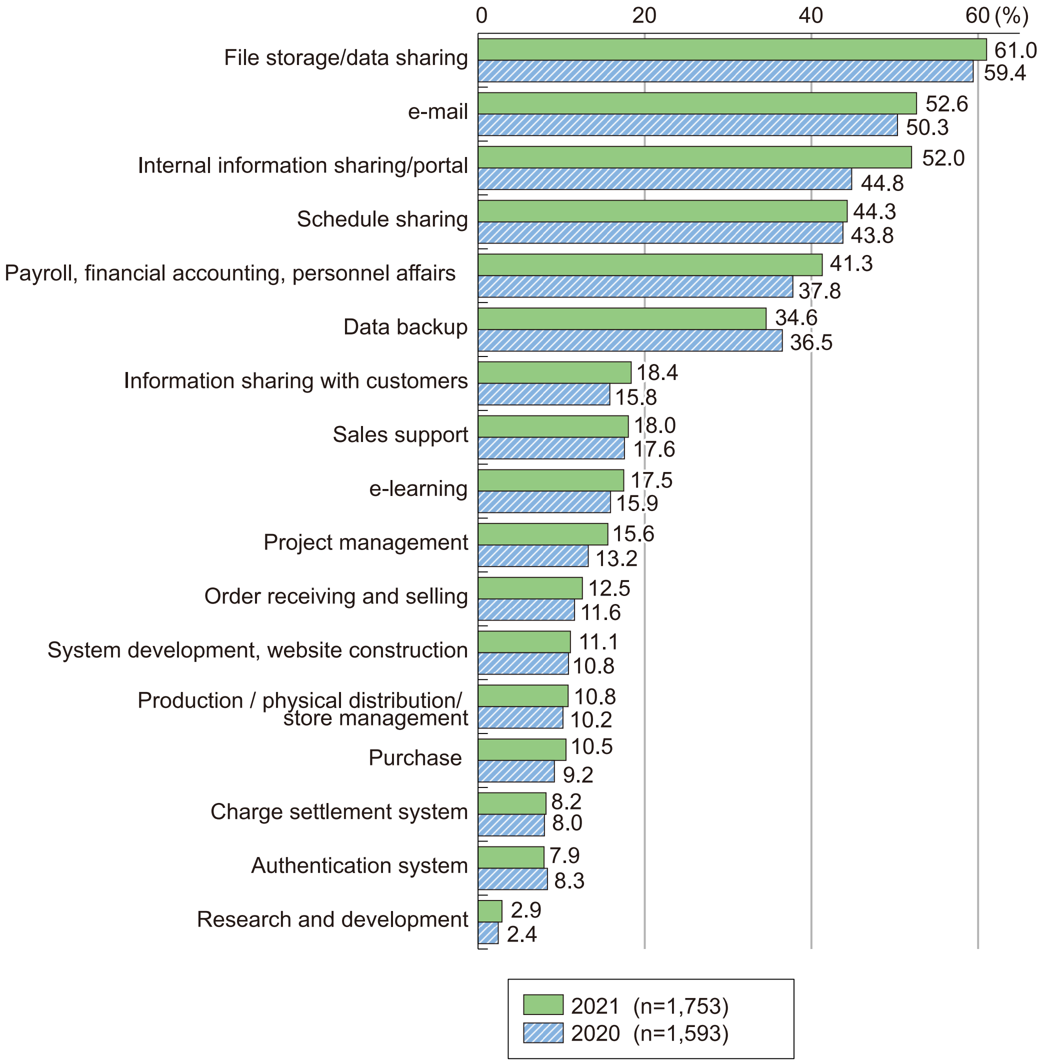
(Source) MIC, “Communications Usage Trend Survey”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

23. Effects of cloud service



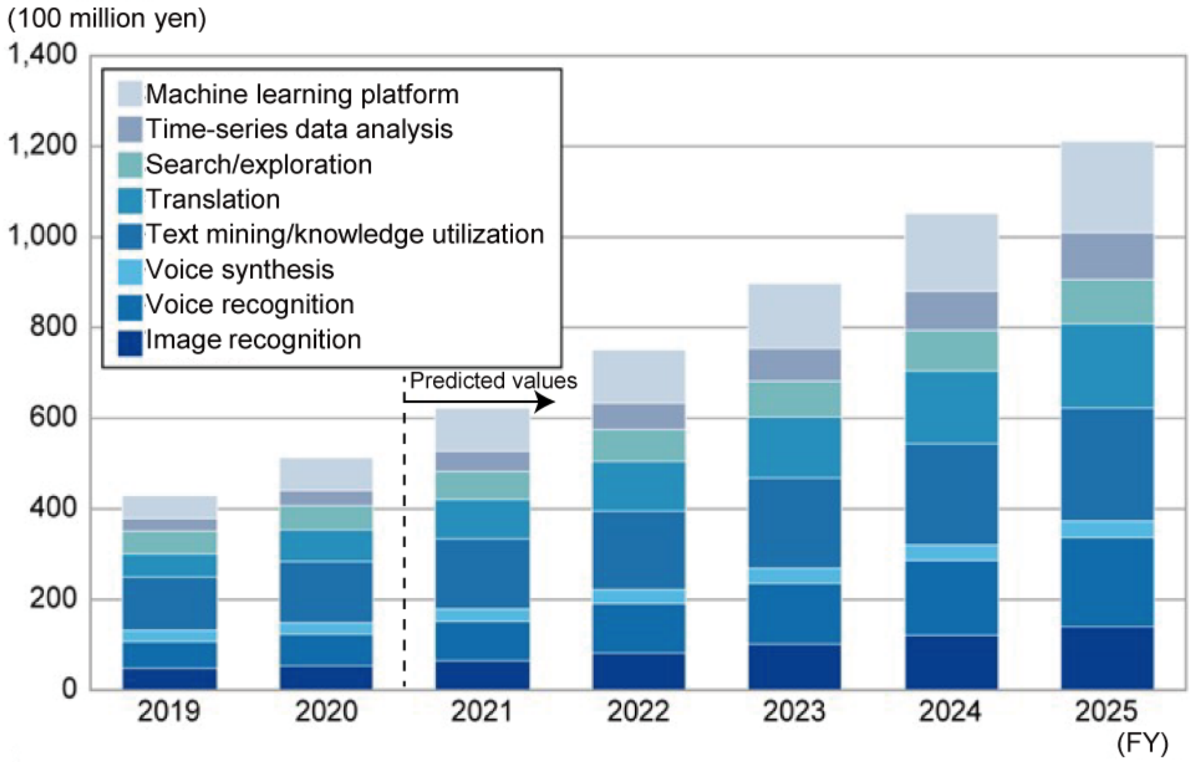
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

24. Breakdown of cloud service usage



(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.htm

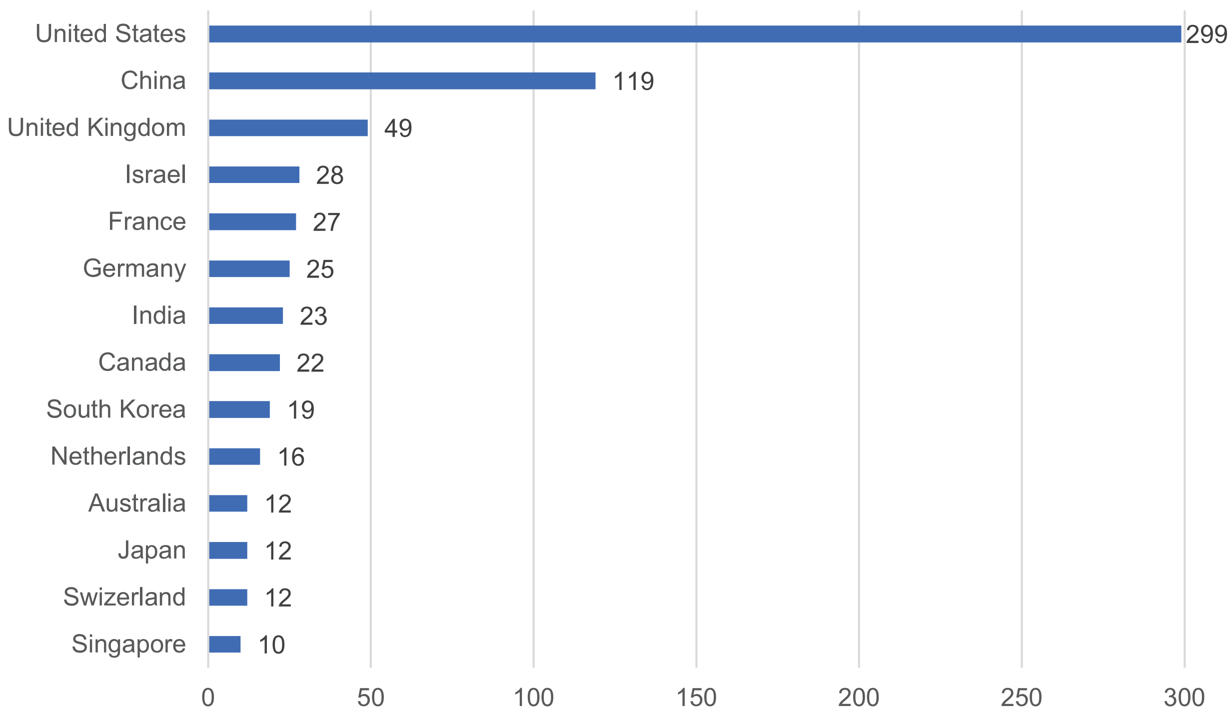
25. Changes and forecasts for the size of Japan's eight major AI markets (Figure 3-6-9-1 in White Paper)



*Sales of venders as converted on fiscal year base

(Source) ITR, "ITR Market View: 2021 AI Market"

26. Number of newly funded AI companies (by country in 2021) (Figure 3-6-9-2 in White Paper)



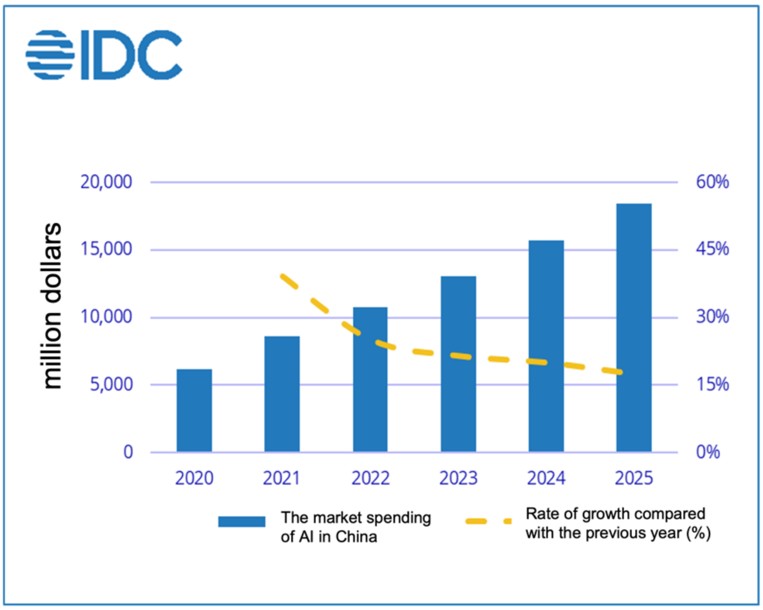
(Source) Stanford University, "Artificial Intelligence Index Report 2022"

27. Major AI-related enterprises in the world

Headquarters site	Enterprise	Reason of selection as target
US	IBM Microsoft NVIDIA	High global market share and expanding business areas
Europe (Holland)	NXP	No.3 in AI chip set ranking (No. 1 outside the United States)
Japan	Toshiba	The world No. 3 in AI-related patent applications
China	Baidu	The largest number of AI patents in China, expanding business area

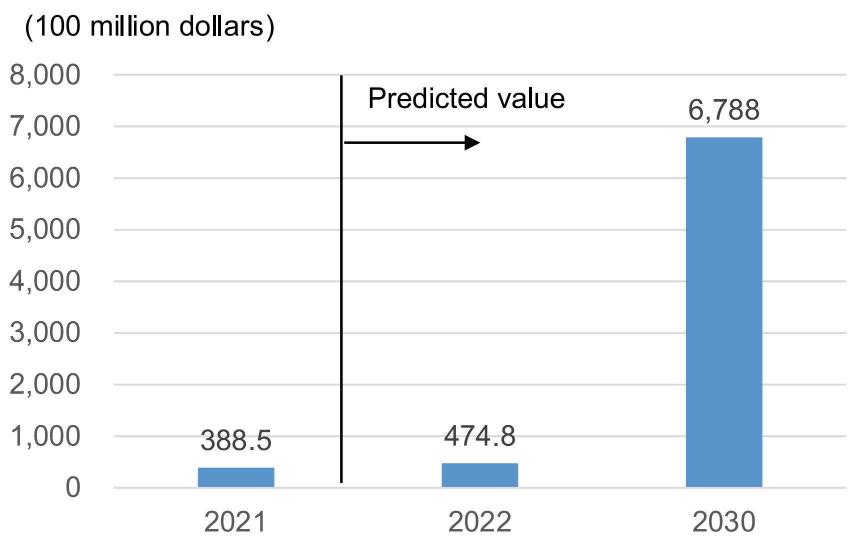
(Source) MIC (2022), “Survey Study on the Trends in the Market Environment Surrounding ICT”

28. Forecasts for the AI market in China (in terms of spending)



(Source) IDC's Worldwide Artificial Intelligence Spending Guide Taxonomy, 2022: Release V1, 2022
https://www.idc.com/getdoc.jsp?containerId=US48479322

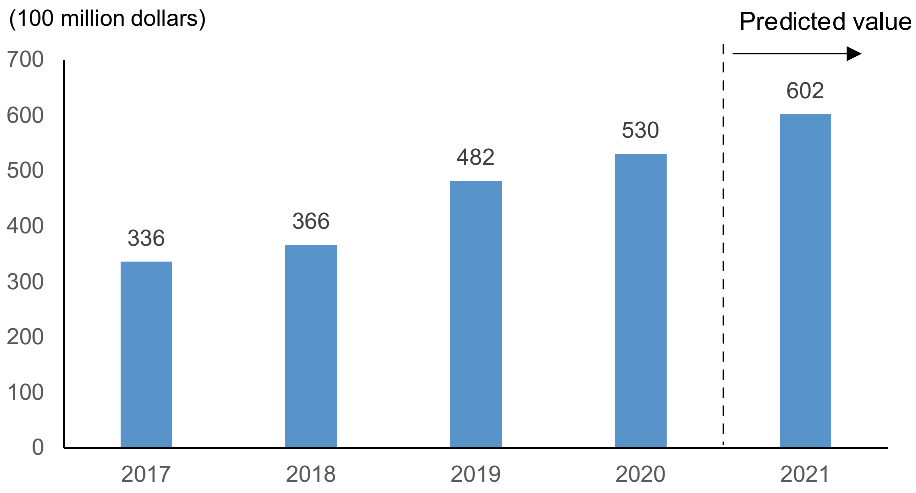
29. Changes and forecasts for the size (sales) of the global metaverse market (Figure 3-6-10-1 in White Paper)



(Source) Statista (Grand View Research)

Section7

1. Changes and forecasts for the size of the global cyber security market (Figure 3-7-1-1 in White Paper)



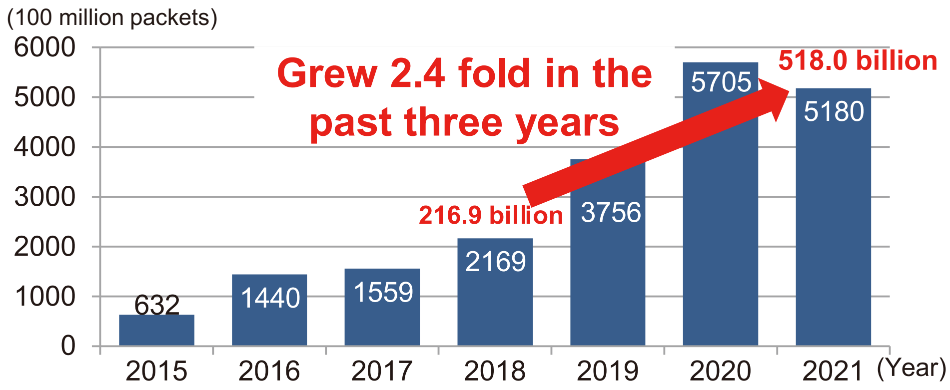
(Source) Prepared from Estimation by Canalys

2. Major global cyber security operator (Figure 3-7-1-2 in White Paper)

Operators	Global market share			
	2017	2018	2019 (Q1)	2020 (Q1)
Cisco	9.4%	9.9%	10%	9.1%
Palo Alto Networks	5.9%	6.9%	7%	7.8%
Check Point	6.4%	6.1%	6%	5.4%
Symantec	7.5%	6.1%	6%	4.7%
Fortinet	5.1%	5.5%	5%	5.9%

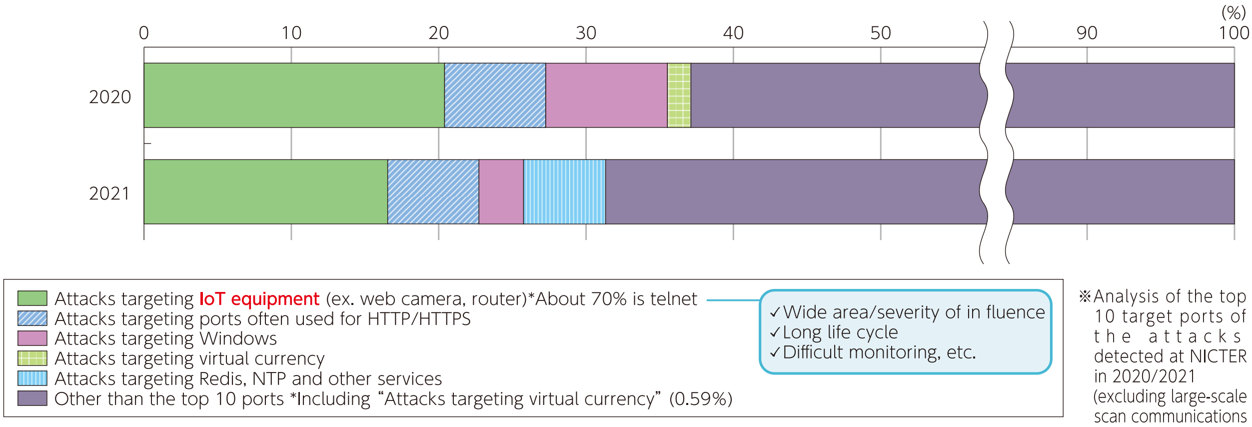
(Source) Prepared from Estimation by Canalys

3. Changes in the number of cyber-attack-related communications detected by NICTER (Figure 3-7-2-1 in White Paper)



(Source) NICT, NICTER Observation Report 2021

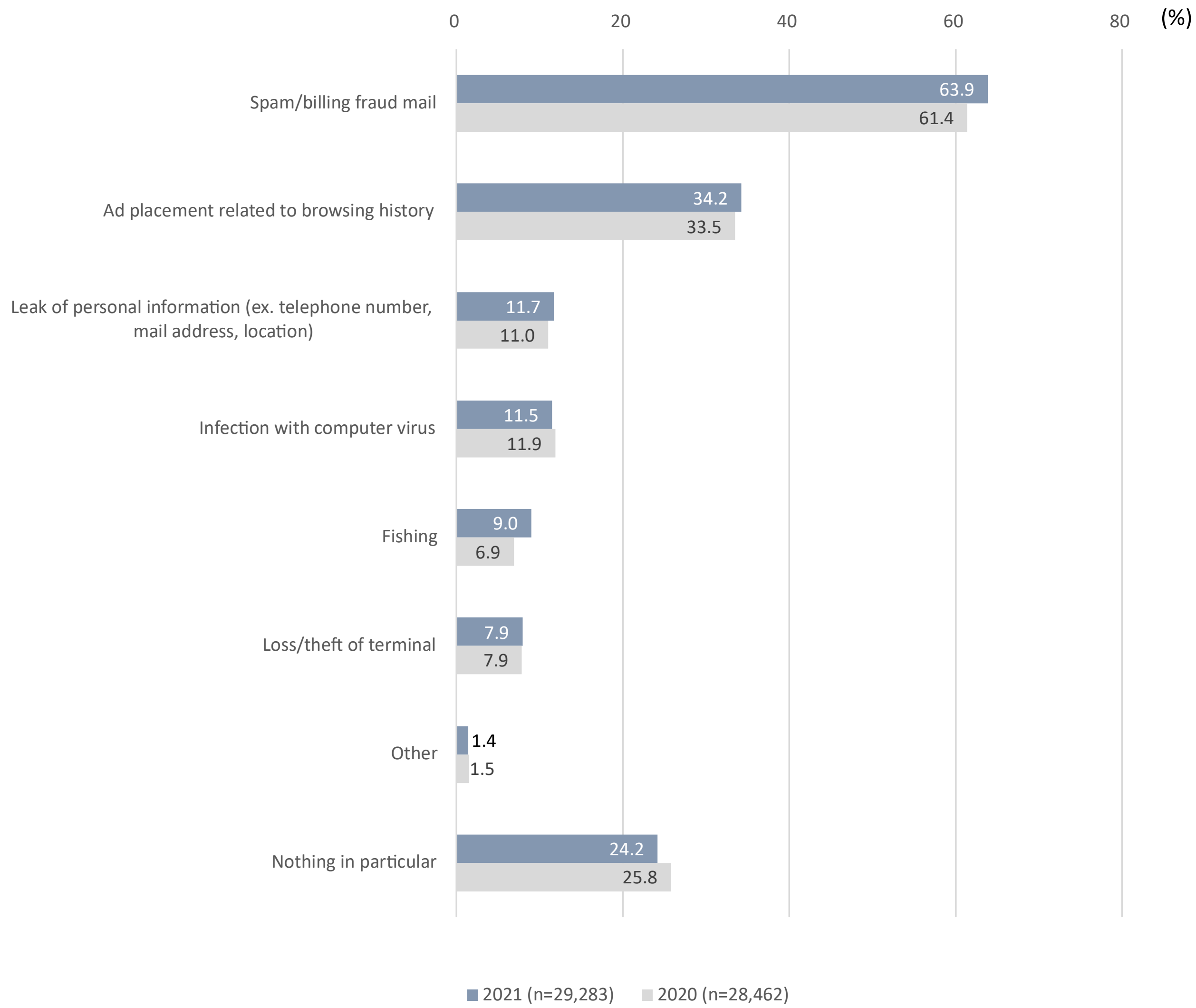
4. Targets of cyber-attack-related communications detected by NICTER



※Analysis of the top 10 target ports of the attacks detected at NICTER in 2020/2021 (excluding large-scale scan communications for the purpose of survey)

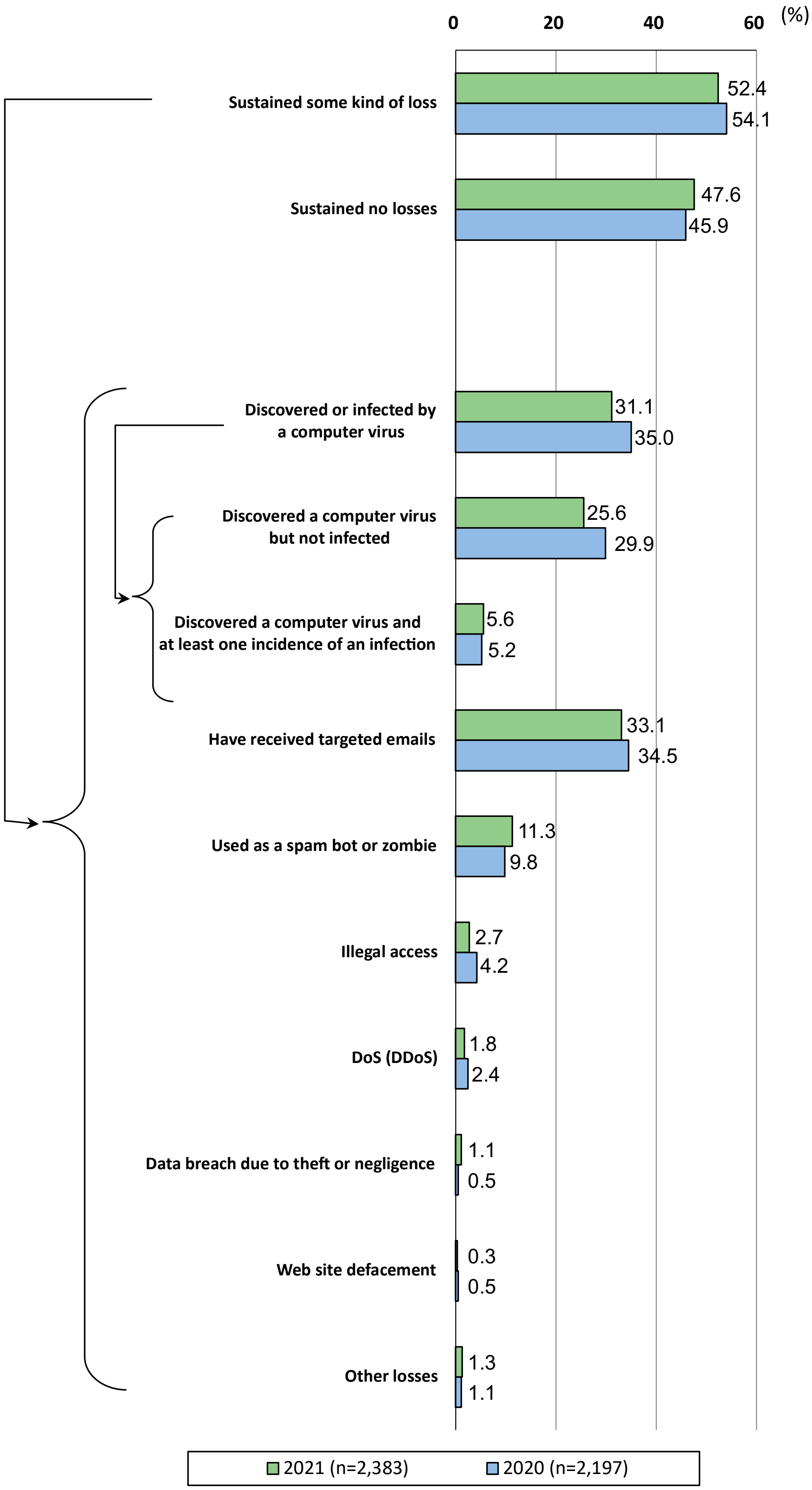
(Source) Prepared from the National Institute of Information and Communications Technology, "NICTER Observation Report 2021"

5. Damage when using personal information and communication equipment (multiple answers)



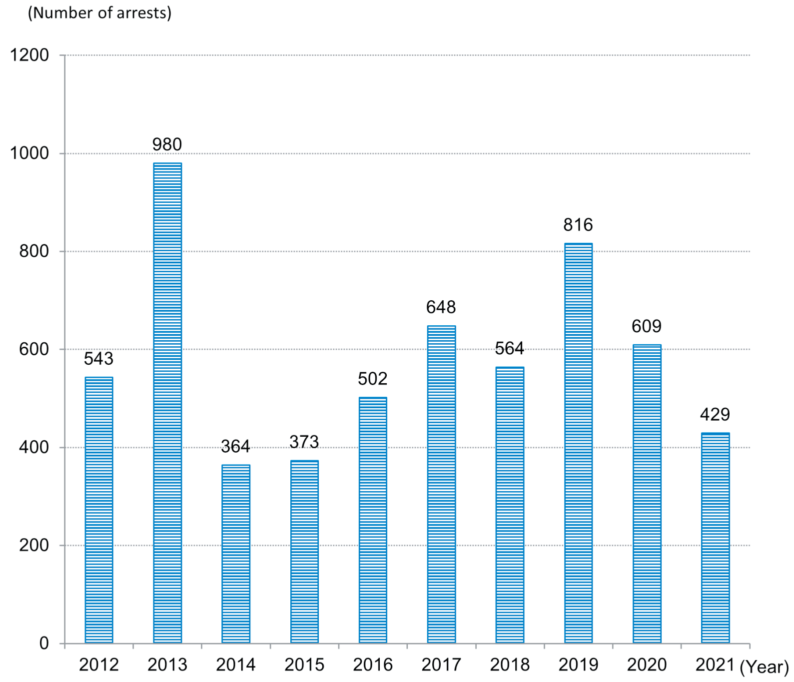
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

6. Security intrusion when using an information and communication network in enterprises (multiple answers)



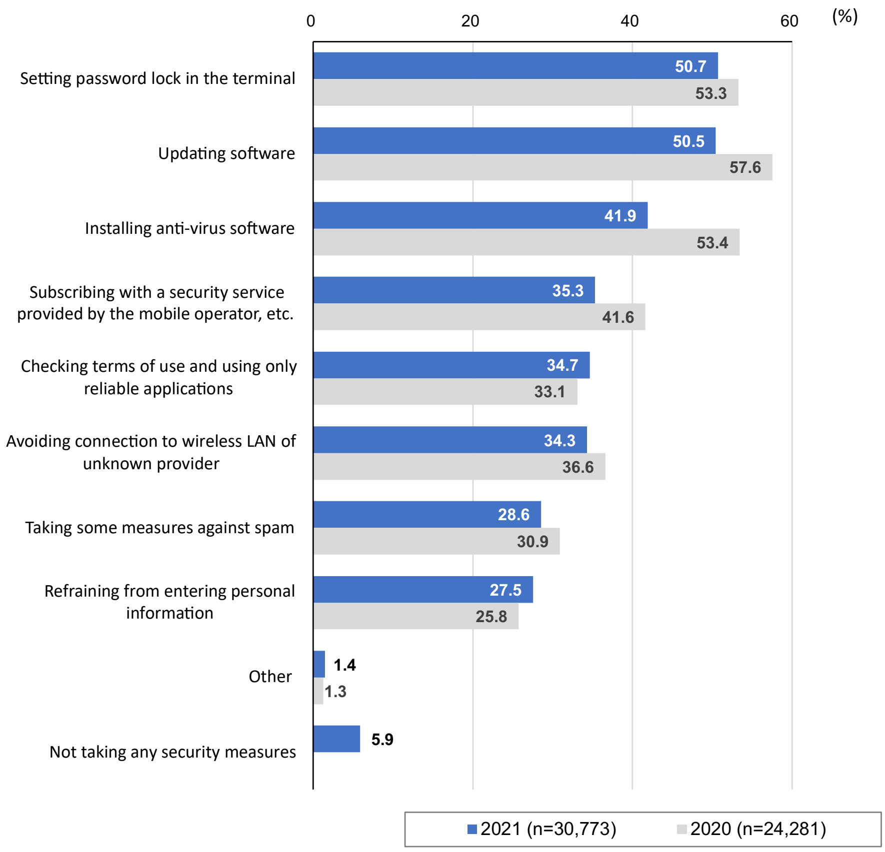
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

7. Changes in the number of arrests for violation of the Unauthorized Access Prohibition Act (Figure 3-7-2-2 in White Paper)



(Source) Prepared from NPA/MIC/METI, “State of Occurrence of Unauthorized Access and R&D of Technologies related to Access Control Functions”

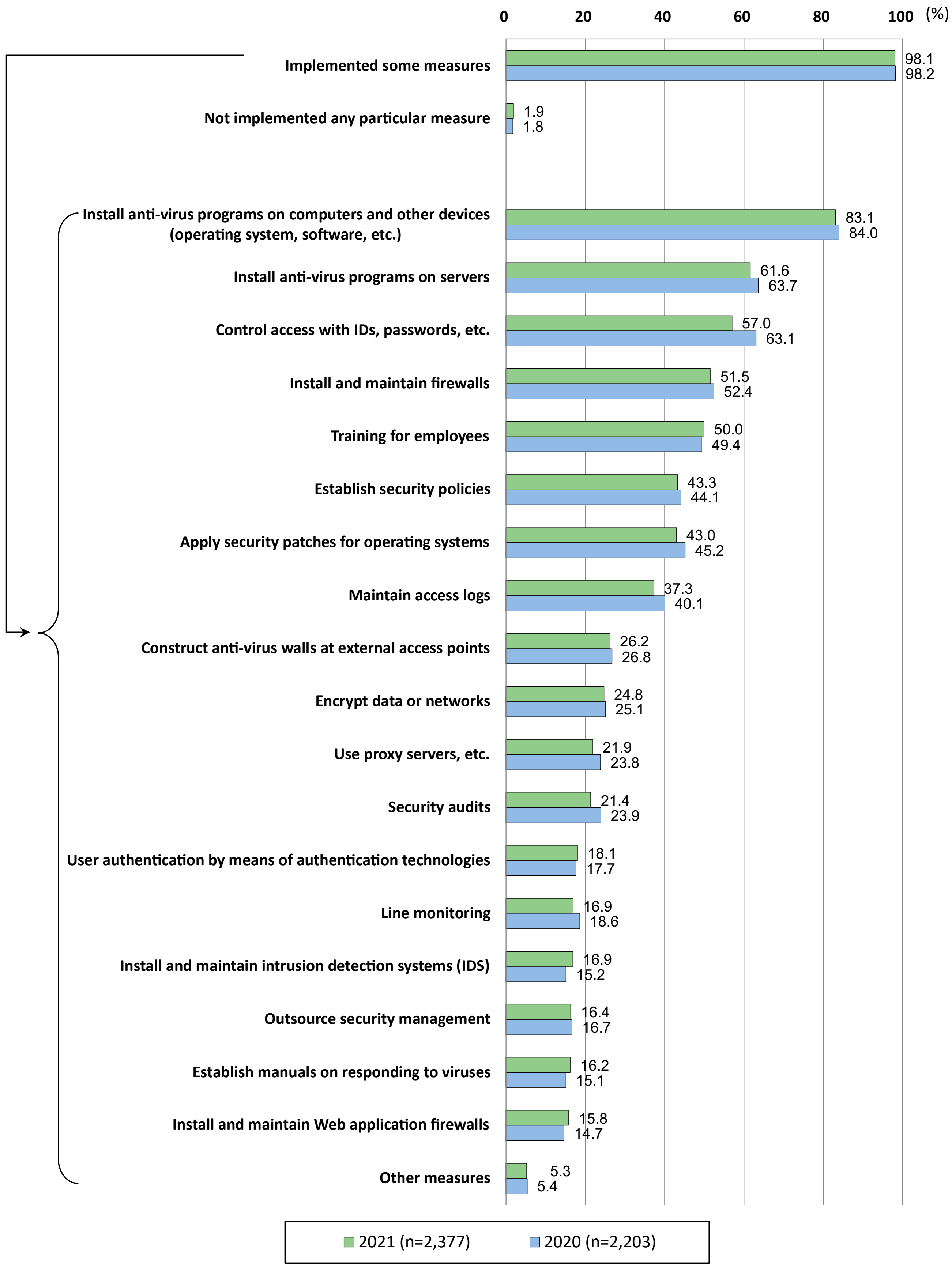
8. Implementation status of information security measures by individuals (multiple answers)



*In 2020, only answers of the respondents taking a security measure were aggregated.

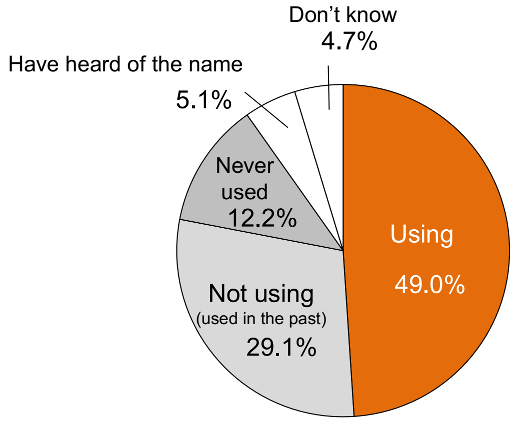
(Source) MIC, “Communications Usage Trend Survey”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

9. Implementation status of information security measures by enterprises (multiple answers)



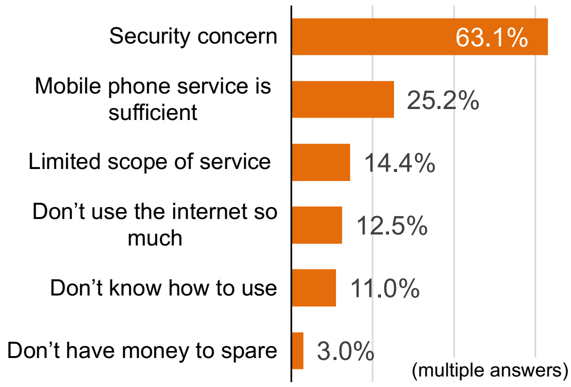
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

10. Using or not using public wireless LAN



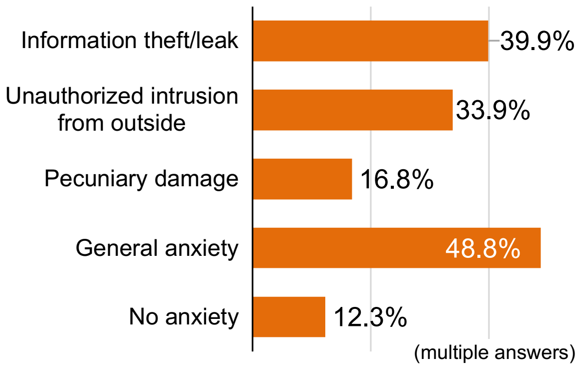
(Source) Prepared from MIC, "Fiscal 2021 Result of Survey of Wireless LAN Users"

11. Reasons for not using public wireless LAN (multiple answers)



(Source) Prepared from MIC, "Fiscal 2021 Result of Survey of Wireless LAN Users"

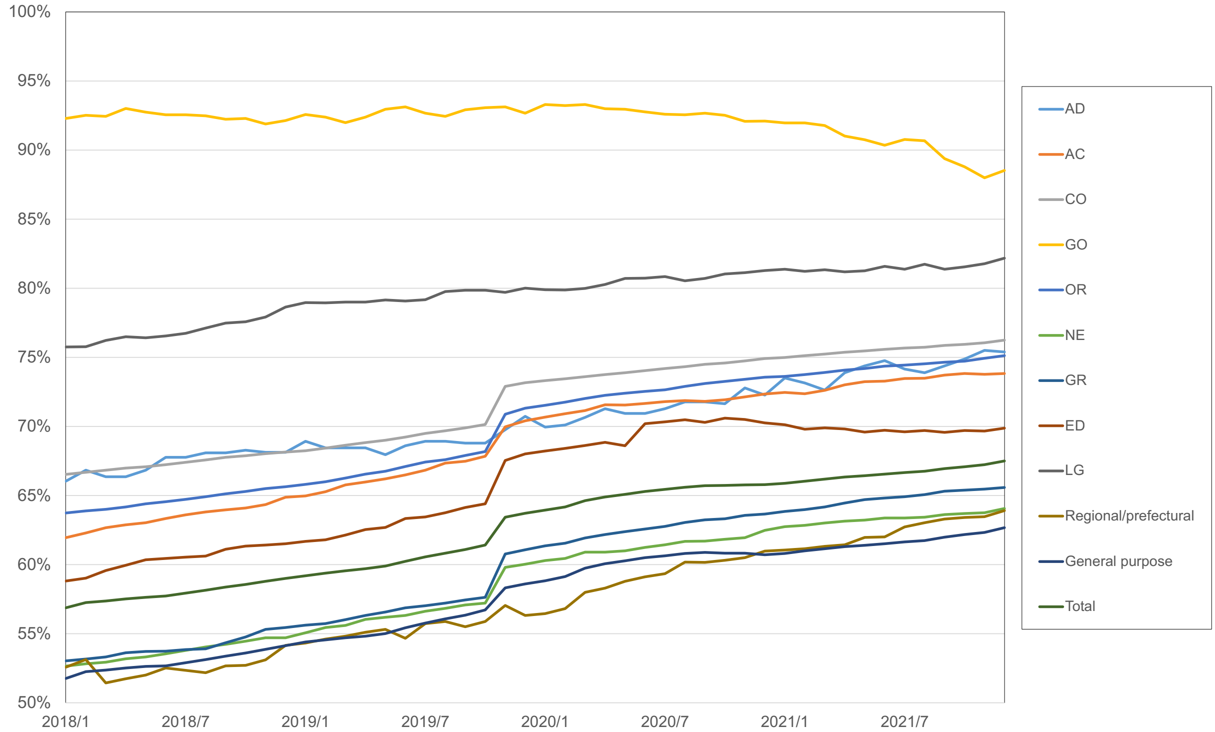
12. Anxiety about security of public wireless LAN (multiple answers)



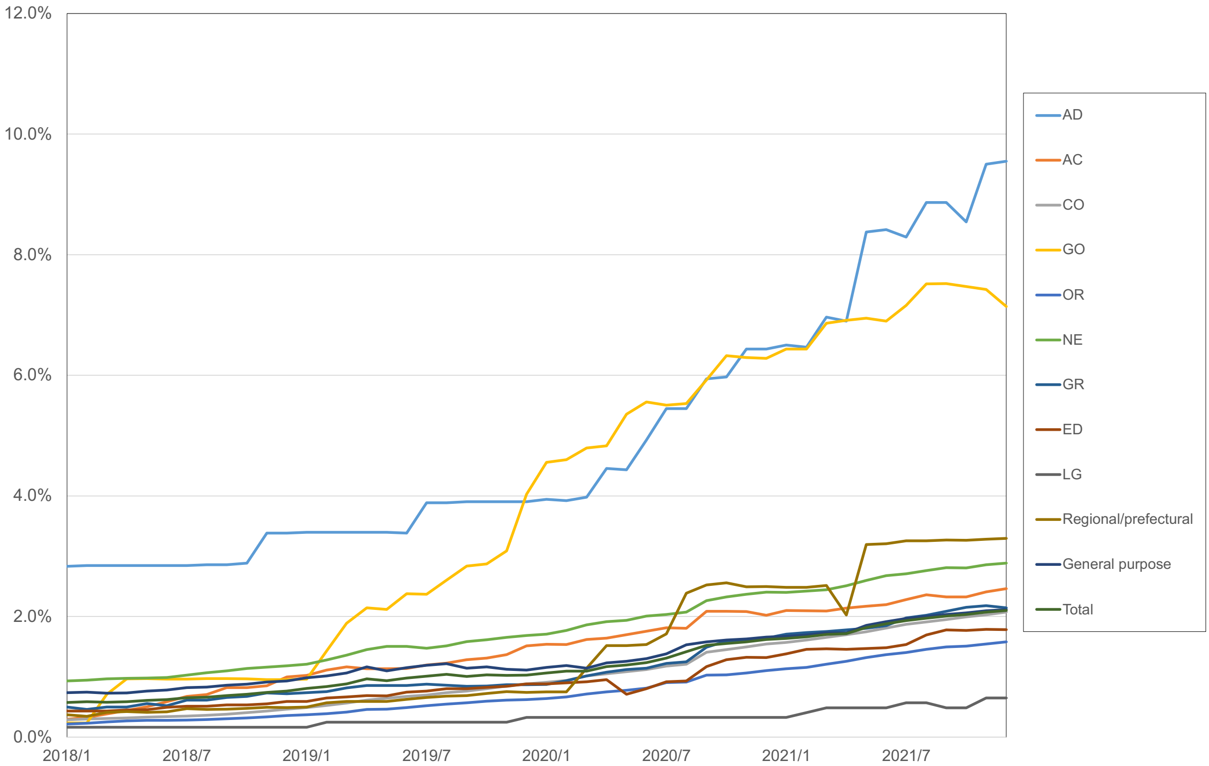
(Source) Prepared from MIC, "Fiscal 2021 Result of Survey of Wireless LAN Users"

13. State of introduction of sender domain authentication technologies to IP domains

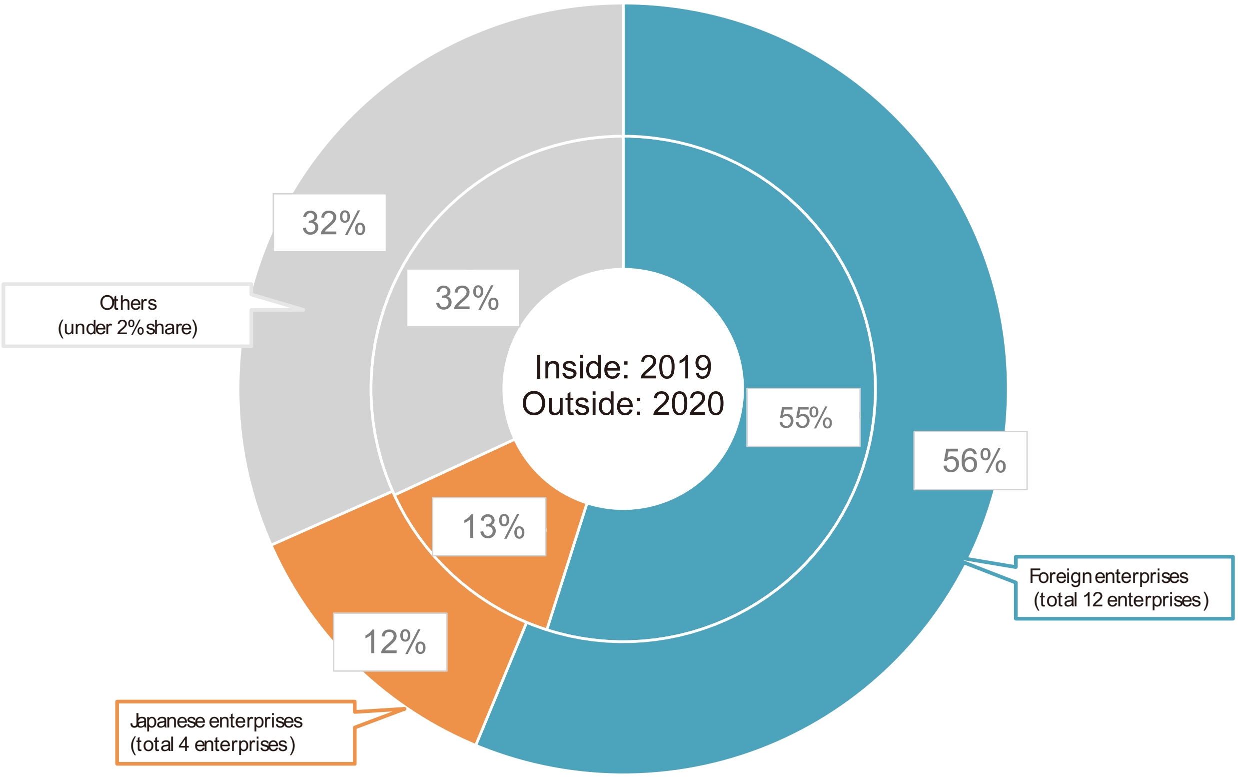
SPF setting state
(Ratio of the domain names setting SDF to the domain names with MX record)



DMARC setting state
(Ratio of the domain names setting DMARC to the domain names with MX record)



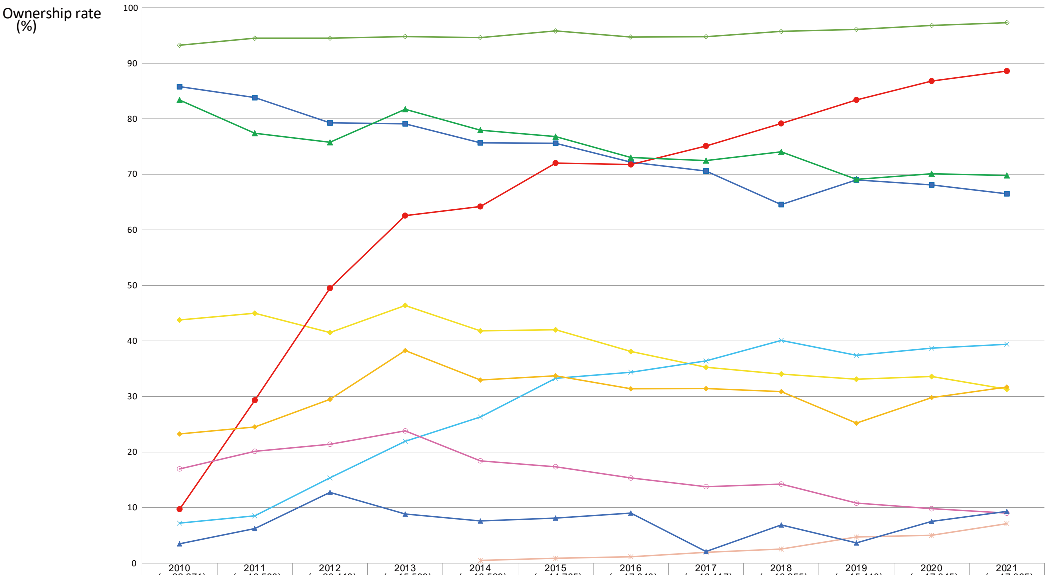
14. Domestic information security product market share (sales) (2019 to 2020) (Figure 3-7-2-3 in White Paper)



(Source) Prepared from IDC Japan, July 2021, “Japan IT Security Products Market Shares, 2020: External Threat Measures and Internal Threat Measures Drive the Market” (JPJ46567421)

Section8

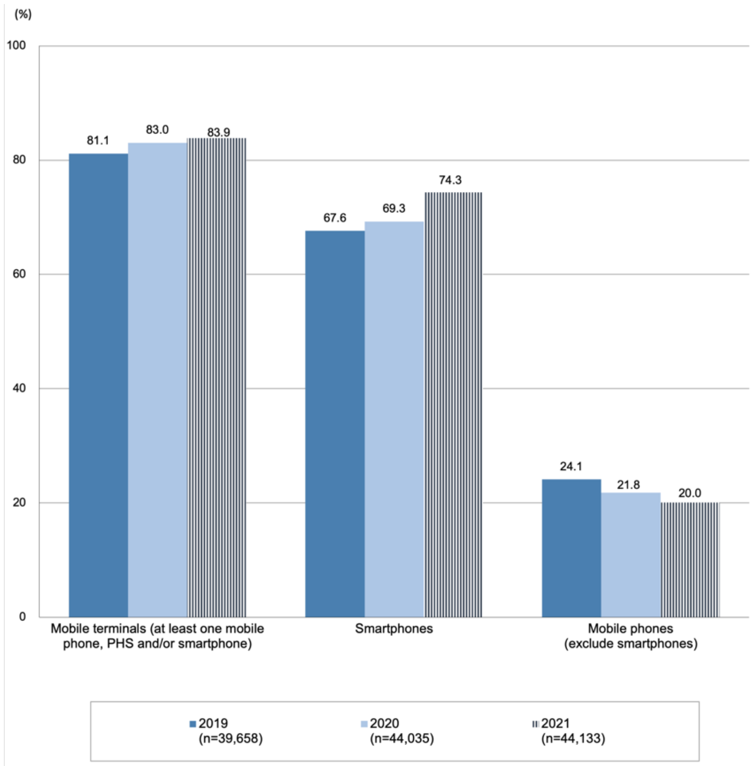
1. Changes in the rate of household ownership of information communication equipment (Figure 3-8-1-1 in White Paper)



	2010 (n=22,271)	2011 (n=16,530)	2012 (n=20,418)	2013 (n=15,599)	2014 (n=16,529)	2015 (n=14,765)	2016 (n=17,040)	2017 (n=16,117)	2018 (n=16,255)	2019 (n=15,410)	2020 (n=17,345)	2021 (n=17,365)
Fixed-line telephone	85.8	83.8	79.3	79.1	75.7	75.6	72.2	70.6	64.5	69.0	68.1	66.5
FAX	43.8	45.0	41.5	46.4	41.8	42.0	38.1	35.3	34.0	33.1	33.6	31.3
Mobile devices (overall)	93.2	94.5	94.5	94.8	94.6	95.8	94.7	94.8	95.7	96.1	96.8	97.3
Smartphones	9.7	29.3	49.5	62.6	64.2	72.0	71.8	75.1	79.2	83.4	86.8	88.6
Computers	83.4	77.4	75.8	81.7	78.0	76.8	73.0	72.5	74.0	69.1	70.1	69.8
Tablets	7.2	8.5	15.3	21.9	26.3	33.3	34.4	36.4	40.1	37.4	38.7	39.4
Wearable devices	—	—	—	—	0.5	0.9	1.1	1.9	2.5	4.7	5.0	7.1
Home game consoles	23.3	24.5	29.5	38.3	33.0	33.7	31.4	31.4	30.9	25.2	29.8	31.7
Portable music players	17.0	20.1	21.4	23.8	18.4	17.3	15.3	13.8	14.2	10.8	9.8	9.0
Smat appliances	3.5	6.2	12.7	8.8	7.6	8.1	9.0	2.1	6.9	3.6	7.5	9.3

(Source) MIC, “Communications Usage Trend Survey”

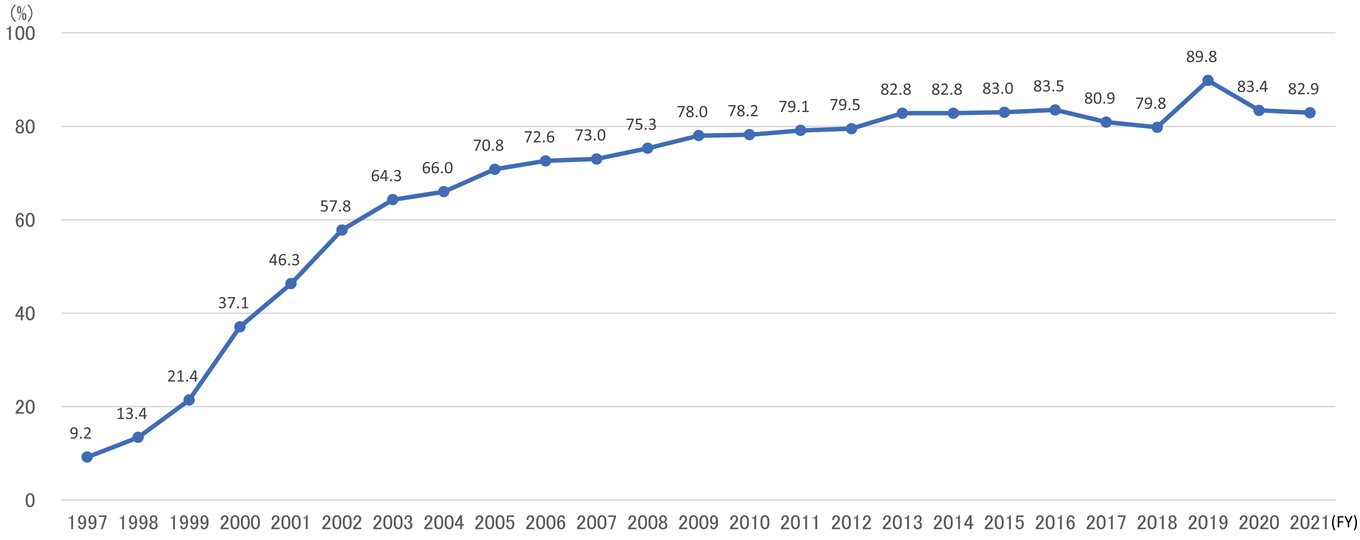
2. Possession of mobile terminals



*“All mobile terminals” and “Mobile phone (excluding smartphone)” of 2019 and 2020 include PHS.
*“Smartphone” of 2019 and 2020 does not include 5G.

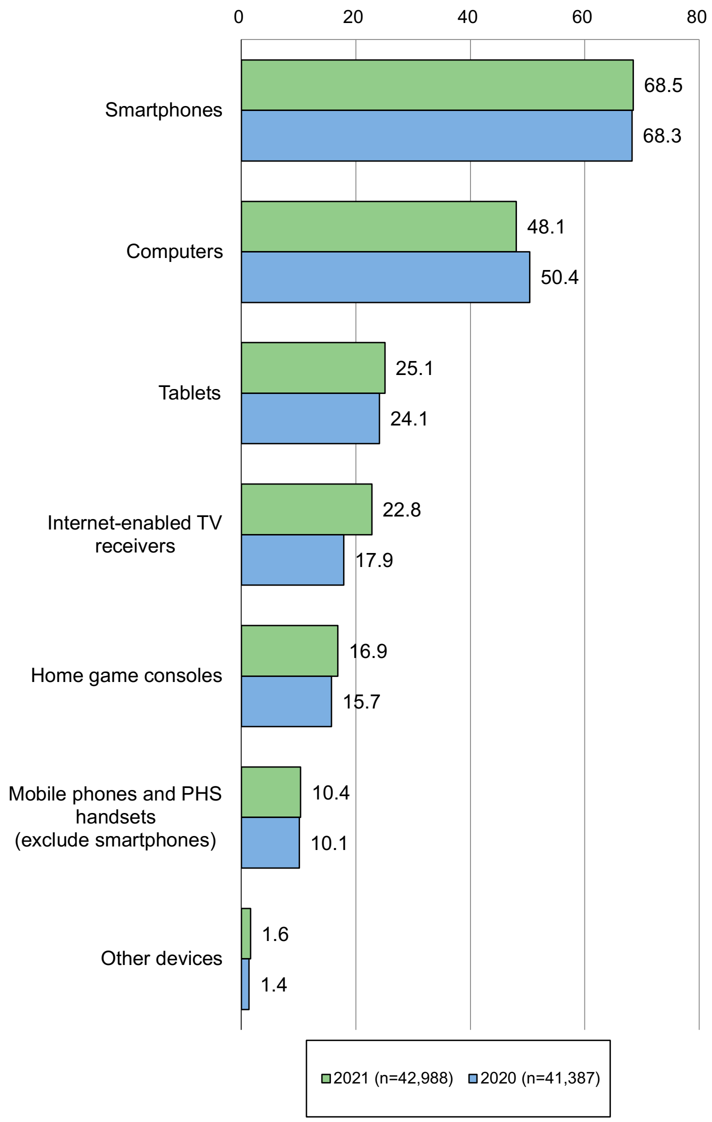
(Source) MIC, “Communications Usage Trend Survey”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

3. Changes in the internet usage rate (individuals) (Figure 3-8-1-2 in White Paper)



(Source) MIC, “Communications Usage Trend Survey”

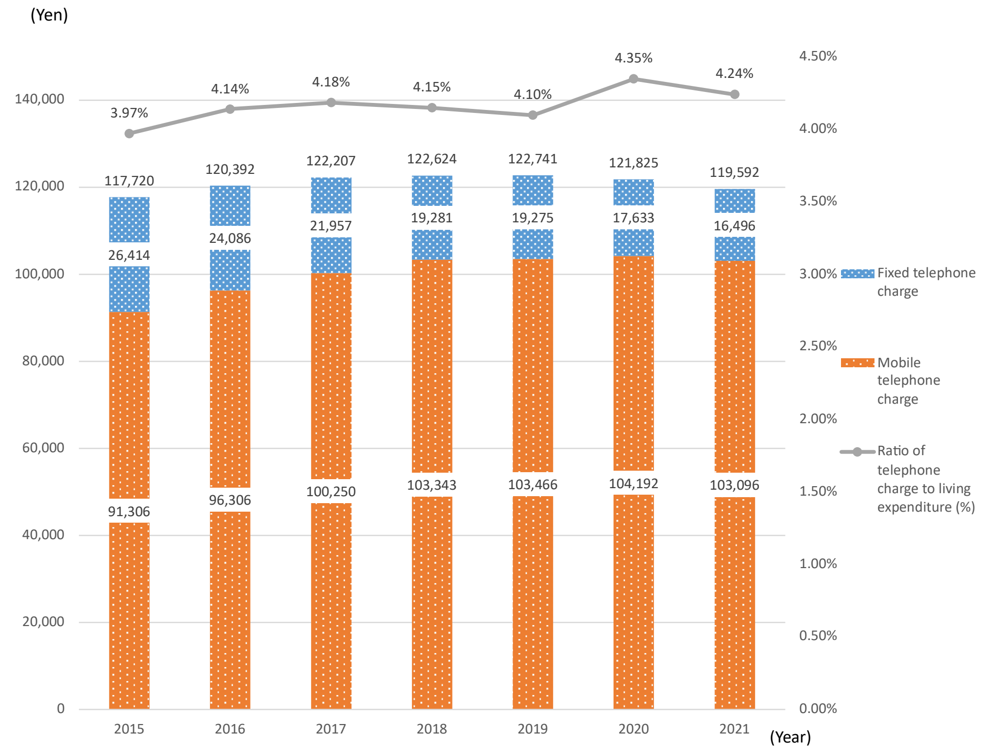
4. Type of terminals for using the internet (individuals)



*Ratio of people who used the internet with the terminal in the past one year.
*“Mobile phone (excluding smartphone)” of 2020 includes PHS.

(Source) MIC, “Communications Usage Trend Survey”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

5. Changes in telephone charge and its ratio to living expenditure



*"Telephone charge" is sum of "Fixed telephone charge" and "Mobile telephone charge".
*Because the result of the Family Income and Expenditure Survey includes changes due to the impact of the revision of the household account book used for the survey conducted in 2018, time-series comparison requires caution.

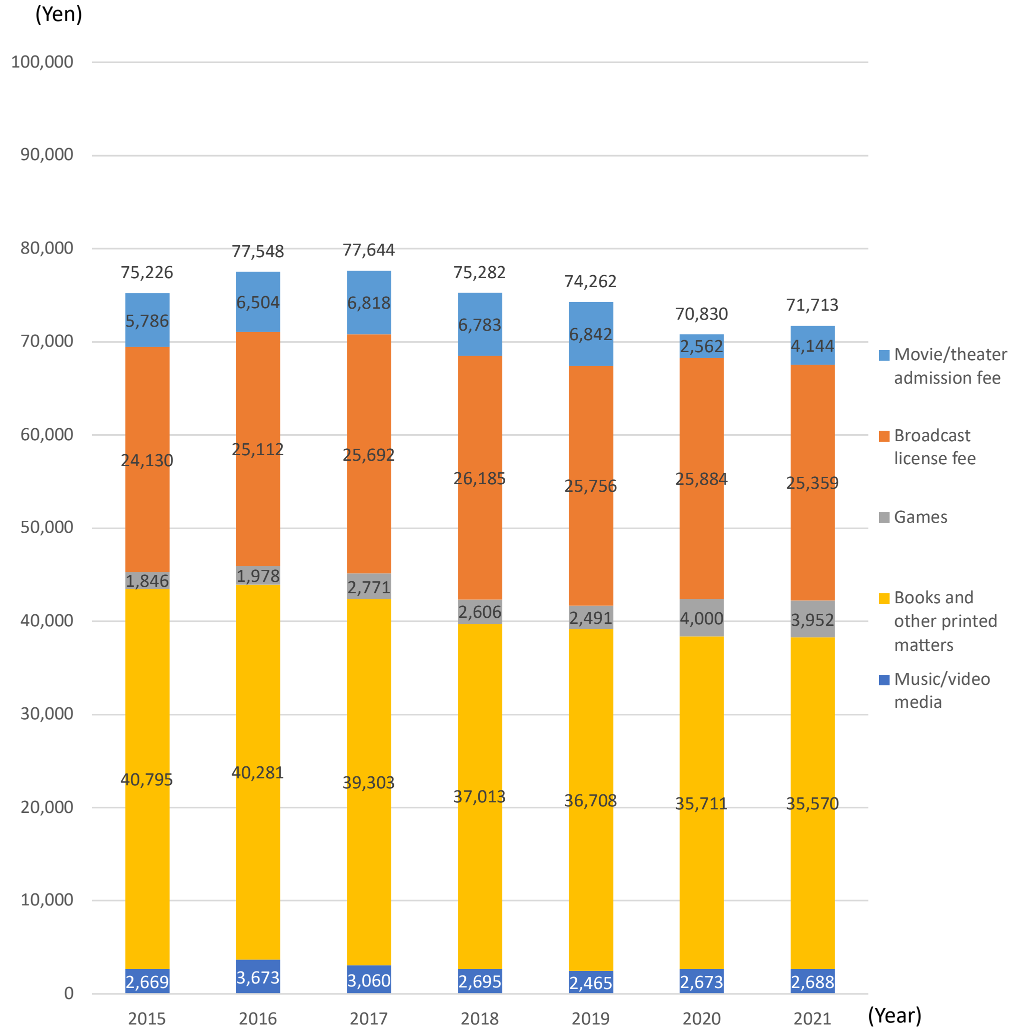
(Source) Prepared from MIC, "Family Income and Expenditure Survey" (all households)
https://www.stat.go.jp/data/kakei/index.html

6. Household expenditure for broadcast services

*Total of the items may not agree with the sum of breakdown due to rounding.
*Because the result of the Family Income and Expenditure Survey includes changes due to the impact of the revision of the household account book used for the survey conducted in 2018, time-series comparison requires caution.

(Source) Prepared from MIC, "Family Income and Expenditure Survey" (all households)
https://www.stat.go.jp/data/kakei/index.html

7. Annual content-related expenditure per household



*"Game" is sum of "Game device" and "Game software, etc."
*Because the result of the Family Income and Expenditure Survey includes changes due to the impact of the revision of the household account book used for the survey conducted in 2018, time-series comparison requires caution.

(Source) Prepared from MIC, "Family Income and Expenditure Survey" (all households)
https://www.stat.go.jp/data/kakei/index.html

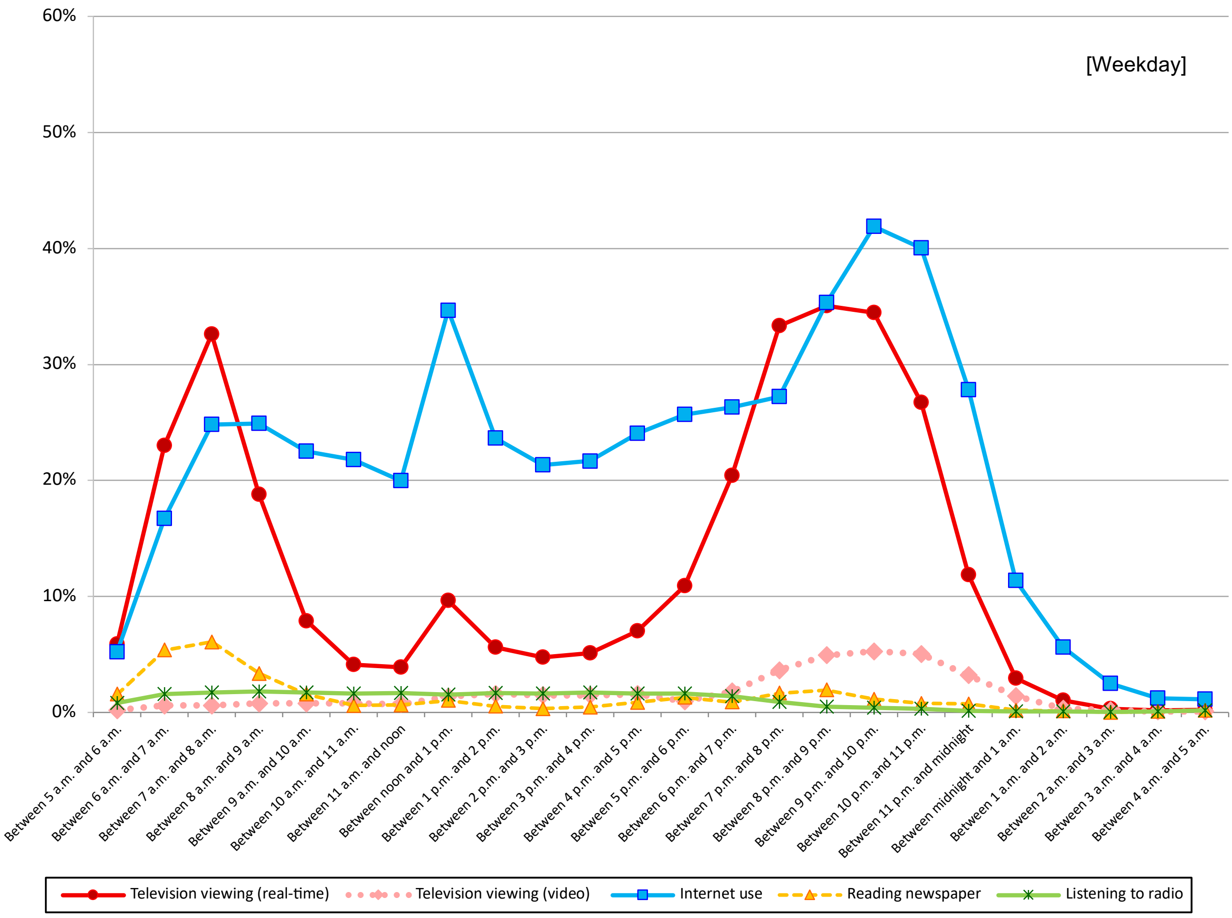
8. Average usage time and doers' ratio of major media (Figure 3-8-1-3 in White Paper)

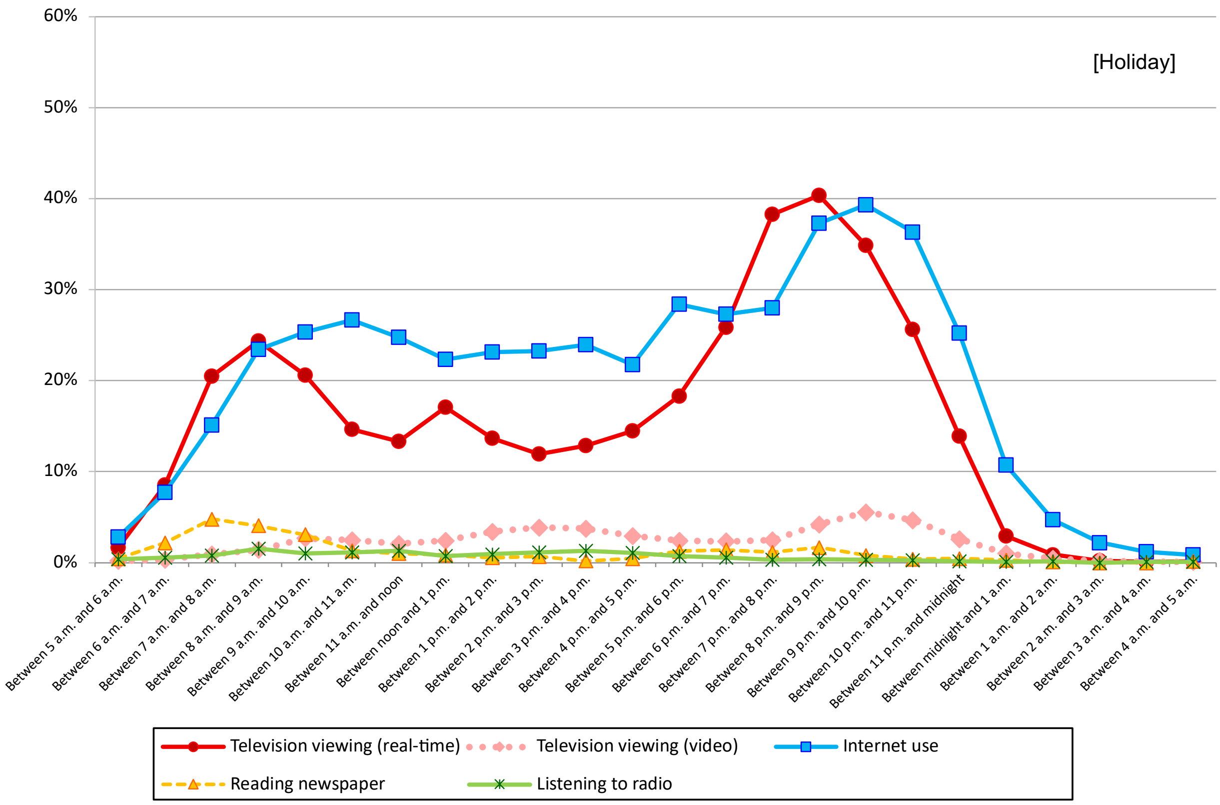
Weekday		Average usage time (minute)					Doers' ratio (%)				
		Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening	Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening
All age groups	2017	159.4	17.2	100.4	10.2	10.6	80.8%	15.9%	78.0%	30.8%	6.2%
	2018	156.7	20.3	112.4	8.7	13.0	79.3%	18.7%	82.0%	26.6%	6.5%
	2019	161.2	20.3	126.2	8.4	12.4	81.6%	19.9%	85.5%	26.1%	7.2%
	2020	163.2	20.2	168.4	8.5	13.4	81.8%	19.7%	87.8%	25.5%	7.7%
	2021	146.0	17.8	176.8	7.2	12.2	74.4%	18.6%	89.6%	22.1%	6.2%
10s	2017	73.3	10.6	128.8	0.3	1.5	60.4%	13.7%	88.5%	3.6%	1.4%
	2018	71.8	12.7	167.5	0.3	0.2	63.1%	15.2%	89.0%	2.5%	1.1%
	2019	69.0	14.7	167.9	0.3	4.1	61.6%	19.4%	92.6%	2.1%	1.8%
	2020	73.1	12.2	224.2	1.4	2.3	59.9%	14.8%	90.1%	2.5%	1.8%
	2021	57.3	12.1	191.5	0.4	3.3	56.7%	16.3%	91.5%	1.1%	0.7%
20s	2017	91.8	13.9	161.4	1.4	2.0	63.7%	14.4%	95.1%	7.4%	3.0%
	2018	105.9	18.7	149.8	1.2	0.9	67.5%	16.5%	91.4%	5.3%	0.7%
	2019	101.8	15.6	177.7	1.8	3.4	65.9%	14.7%	93.4%	5.7%	3.3%
	2020	88.0	14.6	255.4	1.7	4.0	65.7%	13.6%	96.0%	6.3%	3.1%
	2021	71.2	15.1	275.0	0.9	7.0	51.9%	13.7%	96.5%	2.6%	3.0%
30s	2017	121.6	15.3	120.4	3.5	4.3	76.5%	15.5%	90.6%	16.6%	2.3%
	2018	124.4	17.4	110.7	3.0	9.4	74.1%	19.1%	91.1%	13.0%	4.3%
	2019	124.2	24.5	154.1	2.2	5.0	76.7%	21.9%	91.9%	10.5%	2.2%
	2020	135.4	19.3	188.6	1.9	8.4	78.2%	19.4%	95.0%	8.8%	6.0%
	2021	107.4	18.9	188.2	1.5	4.8	65.8%	20.9%	94.9%	5.9%	3.2%
40s	2017	150.3	19.8	108.3	6.3	12.0	83.0%	17.3%	83.5%	28.3%	7.9%
	2018	150.3	20.2	119.7	4.8	16.6	79.2%	18.8%	87.0%	23.1%	7.4%
	2019	145.9	17.8	114.1	5.3	9.5	84.0%	18.9%	91.3%	23.6%	6.0%
	2020	151.0	20.3	160.2	5.5	11.7	86.2%	23.0%	92.6%	24.1%	6.0%
	2021	132.8	13.6	176.8	4.3	12.9	77.8%	15.3%	94.6%	17.9%	5.4%
50s	2017	202.0	19.1	77.1	16.3	19.5	91.7%	16.1%	76.6%	48.1%	9.1%
	2018	176.9	20.8	104.3	12.9	17.2	88.5%	20.6%	82.0%	43.9%	9.3%
	2019	201.4	22.5	114.0	12.0	18.3	92.8%	21.9%	84.2%	38.5%	12.2%
	2020	195.6	23.4	130.0	11.9	26.9	91.8%	20.7%	85.0%	39.4%	13.4%
	2021	187.7	18.7	153.6	9.1	23.6	86.4%	20.9%	89.4%	33.8%	11.1%
60s	2017	252.9	20.0	38.1	25.9	17.3	94.2%	16.6%	45.6%	59.9%	9.5%
	2018	248.7	27.3	60.9	23.1	22.8	91.6%	19.7%	59.0%	52.8%	11.7%
	2019	260.3	23.2	69.4	22.5	27.2	93.6%	21.2%	65.7%	57.2%	13.4%
	2020	271.4	25.7	105.5	23.2	18.5	92.9%	22.3%	71.3%	53.7%	12.1%
	2021	254.6	25.8	107.4	22.0	14.4	92.0%	23.0%	72.8%	55.1%	10.0%

Holiday		Average usage time (minute)					Doers' ratio (%)				
		Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening	Television viewing (real-time)	Television viewing (recorded program)	Internet use	Newspaper reading	Radio listening
All age groups	2017	214.0	27.2	123.0	12.2	5.6	83.3%	22.2%	78.4%	30.7%	4.5%
	2018	219.8	31.3	145.8	10.3	7.5	82.2%	23.7%	84.5%	27.6%	5.1%
	2019	215.9	33.0	131.5	8.5	6.4	81.2%	23.3%	81.0%	23.5%	4.6%
	2020	223.3	39.6	174.9	8.3	7.6	80.5%	27.6%	84.6%	22.8%	4.7%
	2021	193.6	26.3	176.5	7.3	7.0	75.0%	21.3%	86.7%	19.3%	4.2%
10s	2017	120.5	20.6	212.5	0.5	3.6	66.2%	19.4%	92.1%	3.6%	1.4%
	2018	113.4	28.6	271.0	0.9	0.7	67.4%	27.7%	91.5%	3.5%	2.1%
	2019	87.4	21.3	238.5	0.1	0.0	52.8%	17.6%	90.1%	0.7%	0.0%
	2020	93.9	29.8	290.8	0.9	0.0	54.9%	25.4%	91.5%	1.4%	0.0%
	2021	73.9	12.3	253.8	0.0	0.0	57.4%	14.9%	90.8%	0.0%	0.0%
20s	2017	120.3	26.6	228.8	2.4	2.9	67.6%	24.5%	97.7%	7.9%	2.3%
	2018	151.0	32.8	212.9	2.1	2.1	66.5%	24.9%	95.7%	6.2%	2.4%
	2019	138.5	23.0	223.2	0.9	1.2	69.7%	19.9%	91.0%	3.3%	1.9%
	2020	132.3	26.5	293.8	2.0	1.9	64.3%	20.2%	97.7%	6.6%	2.3%
	2021	90.8	17.2	303.1	0.7	1.8	49.3%	14.0%	97.2%	2.3%	1.4%
30s	2017	166.9	26.4	136.0	3.8	2.8	79.4%	21.8%	90.5%	14.1%	1.9%
	2018	187.2	26.6	150.2	3.5	3.9	79.8%	19.1%	92.6%	11.7%	3.5%
	2019	168.2	31.0	149.5	2.5	2.0	78.3%	23.3%	90.1%	9.9%	2.0%
	2020	198.1	45.0	191.3	1.6	7.4	77.2%	31.6%	91.2%	5.6%	3.2%
	2021	147.6	30.3	212.3	1.5	3.2	69.6%	22.7%	92.3%	4.0%	1.2%
40s	2017	213.3	31.6	109.2	7.6	4.7	83.8%	25.2%	84.4%	29.6%	5.0%
	2018	213.9	39.0	145.3	6.4	8.2	82.7%	25.9%	90.4%	25.3%	3.4%
	2019	216.2	37.5	98.8	6.0	5.0	83.7%	25.5%	84.7%	20.2%	3.7%
	2020	232.7	41.5	154.5	5.2	4.2	85.3%	28.5%	89.3%	19.9%	3.1%
	2021	191.1	28.5	155.7	4.9	6.3	79.0%	21.0%	91.0%	14.8%	3.4%
50s	2017	265.7	30.8	82.4	16.1	7.4	93.4%	23.3%	73.3%	44.6%	5.8%
	2018	260.8	22.9	115.0	15.3	10.4	91.9%	21.5%	80.7%	42.2%	7.0%
	2019	277.5	48.0	107.9	12.9	6.6	90.3%	30.6%	77.3%	37.4%	6.5%
	2020	256.5	49.8	127.8	12.5	16.3	91.6%	31.4%	81.5%	36.6%	7.7%
	2021	242.6	28.9	119.0	9.2	14.2	84.8%	24.9%	82.2%	29.6%	8.1%
60s	2017	320.7	23.6	44.6	33.0	10.2	96.7%	18.1%	46.1%	62.8%	7.9%
	2018	315.3	34.6	64.3	26.1	14.1	93.0%	24.4%	63.2%	56.9%	10.0%
	2019	317.6	28.1	56.1	21.8	18.5	94.5%	19.0%	60.7%	51.7%	10.3%
	2020	334.7	37.2	83.7	22.0	10.9	91.8%	25.9%	63.1%	50.4%	9.2%
	2021	326.1	31.4	92.7	22.3	11.2	93.5%	25.4%	71.0%	50.4%	8.0%

(Source) Institute for Information and Communications Policy, MIC, "FY2021 Survey on Usage Time of Information and Communication Media and Information Behavior"

9. Doers' ratio of major media by time zone (all age groups) (2022)





(Source) Institute for Information and Communications Policy, MIC, "FY2021 Survey on Usage Time of Information and Communication Media and Information Behavior"

10. Internet usage time and doers' ratio with major equipment

Weekday

		Average time of internet use (minute)			Internet doers' ratio (%)		
		PC	Mobile	Tablet	PC	Mobile	Tablet
All age groups	2017	33.5	64.7	5.3	25.3%	69.3%	7.2%
	2018	34.0	72.9	6.3	24.6%	74.3%	7.5%
	2019	35.4	85.4	6.3	24.1%	80.2%	7.4%
	2020	58.1	105.8	9.7	30.2%	81.6%	8.4%
	2021	57.6	110.0	12.4	30.7%	83.5%	10.4%
10s	2017	8.5	114.9	6.3	8.6%	78.8%	7.2%
	2018	8.3	144.7	9.5	9.2%	81.2%	8.2%
	2019	13.1	150.1	5.8	9.2%	87.7%	6.3%
	2020	34.0	186.8	6.4	15.5%	84.5%	8.1%
	2021	14.7	154.2	19.9	11.0%	84.0%	12.8%
20s	2017	43.9	114.7	6.3	27.5%	90.3%	7.9%
	2018	21.8	122.0	4.6	17.2%	89.0%	6.7%
	2019	30.5	147.3	5.5	20.1%	91.5%	7.8%
	2020	73.8	177.4	15.6	31.0%	93.9%	7.5%
	2021	76.1	201.0	16.9	32.3%	94.0%	10.2%
30s	2017	43.5	75.7	6.3	30.7%	84.9%	8.0%
	2018	28.5	76.2	5.4	22.8%	87.5%	6.0%
	2019	48.3	98.5	6.2	24.3%	89.3%	6.7%
	2020	64.4	114.0	9.4	30.8%	90.8%	7.0%
	2021	56.1	121.0	13.2	31.0%	91.3%	10.3%
40s	2017	46.0	63.5	4.5	27.6%	75.2%	7.0%
	2018	45.1	69.8	6.4	29.9%	81.6%	8.8%
	2019	35.5	69.4	7.7	27.0%	86.2%	8.1%
	2020	59.0	98.2	8.0	30.1%	89.3%	7.7%
	2021	67.6	101.0	10.3	36.6%	89.7%	9.4%
50s	2017	30.2	43.3	6.4	31.2%	66.1%	8.1%
	2018	51.9	53.1	5.4	34.8%	69.3%	8.0%
	2019	44.0	68.3	5.8	31.8%	77.2%	9.4%
	2020	62.9	64.6	9.2	36.9%	74.2%	10.6%
	2021	65.7	79.1	6.3	34.2%	81.1%	7.9%
60s	2017	18.3	16.0	3.0	19.4%	32.9%	5.3%
	2018	31.2	23.3	7.3	23.7%	46.0%	7.4%
	2019	30.2	31.7	6.1	23.6%	56.7%	5.7%
	2020	46.9	54.1	9.7	29.6%	61.5%	8.9%
	2021	46.1	50.3	13.2	28.8%	63.6%	13.0%

Holiday

		Average time of internet use (minute)			Internet doers' ratio (%)		
		PC	Mobile	Tablet	PC	Mobile	Tablet
All age groups	2017	26.2	88.6	9.1	18.9%	70.3%	7.7%
	2018	27.5	107.7	8.7	18.9%	76.9%	8.6%
	2019	22.2	99.4	8.9	15.0%	75.9%	6.7%
	2020	31.1	126.4	12.5	18.9%	77.9%	8.7%
	2021	30.5	126.8	13.8	18.9%	80.5%	8.9%
10s	2017	26.3	172.3	17.3	13.7%	79.9%	10.8%
	2018	3.7	242.4	12.3	4.3%	85.1%	9.9%
	2019	32.8	197.1	11.0	12.0%	85.9%	6.3%
	2020	28.9	247.5	18.9	12.0%	85.2%	9.2%
	2021	27.6	200.6	23.4	13.5%	82.3%	10.6%
20s	2017	42.9	179.8	10.9	21.3%	92.6%	7.9%
	2018	29.7	177.3	6.6	12.9%	93.3%	8.6%
	2019	29.4	186.9	9.6	12.8%	87.2%	6.6%
	2020	40.2	230.7	16.3	15.0%	94.4%	7.0%
	2021	52.0	251.3	12.8	20.5%	96.3%	6.5%
30s	2017	26.7	97.8	12.9	19.5%	85.9%	7.6%
	2018	27.7	108.6	8.5	14.4%	89.1%	7.8%
	2019	29.2	108.8	11.1	13.0%	87.7%	5.9%
	2020	31.1	137.1	9.6	15.6%	84.8%	8.0%
	2021	32.5	147.2	15.6	17.4%	89.1%	8.5%
40s	2017	24.8	77.0	5.8	19.3%	74.8%	7.2%
	2018	28.9	102.4	12.1	22.2%	84.0%	9.9%
	2019	14.6	73.8	7.9	15.0%	80.1%	6.7%
	2020	26.0	109.8	12.3	19.9%	84.7%	8.0%
	2021	23.4	110.8	13.4	14.8%	87.3%	8.3%
50s	2017	20.5	51.8	8.5	19.0%	66.3%	7.4%
	2018	39.1	74.2	5.0	27.8%	69.3%	8.5%
	2019	22.2	74.6	10.4	19.4%	68.3%	7.6%
	2020	34.1	77.2	14.8	24.4%	70.4%	11.5%
	2021	24.9	75.8	8.8	21.5%	73.4%	7.7%
60s	2017	20.0	21.2	4.6	18.8%	35.5%	7.2%
	2018	25.0	30.8	8.1	22.4%	50.2%	7.4%
	2019	14.0	32.4	5.3	15.5%	55.2%	6.9%
	2020	28.4	46.5	6.9	21.3%	55.7%	8.2%
	2021	28.0	47.3	14.1	23.6%	59.4%	12.3%

(Source) Institute for Information and Communications Policy, MIC, "FY2021 Survey on Usage Time of Information and Communication Media and Information Behavior"

11. Usage time and doers’ ratio of major means of communication

Weekday

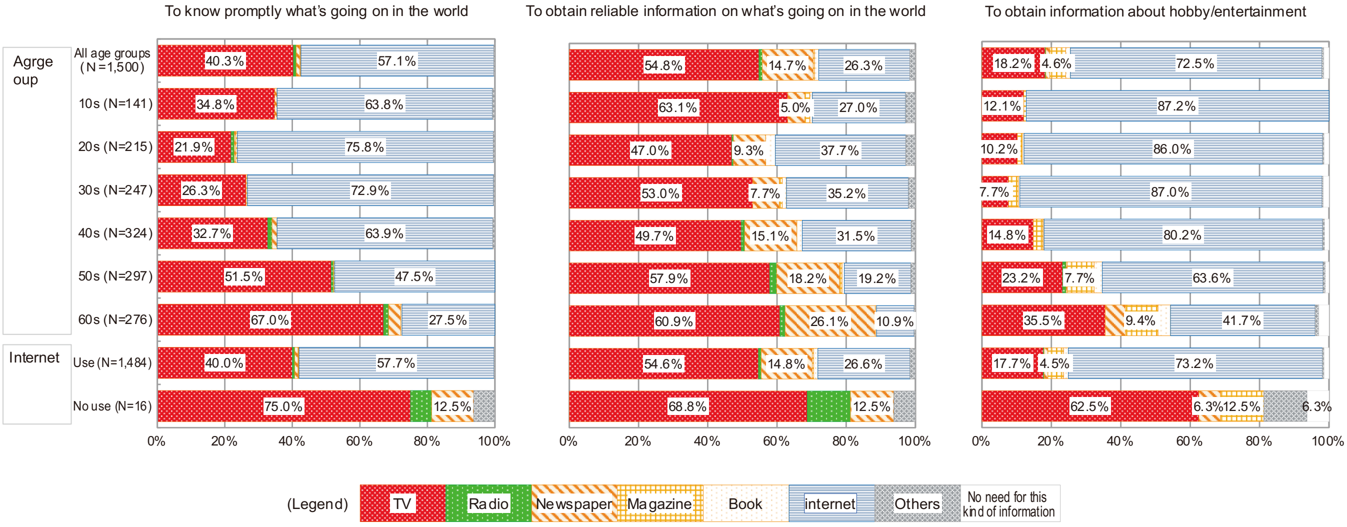
Age group	Year	Average usage time (minute): Mobile-phone call	Fixed-phone call	Internet call	Social media	e-mail	Doers’ ratio (%): Mobile-phone call	Fixed-phone call	Internet call	Social media	e-mail
All age groups	2017	5.6	1.0	2.4	27.0	30.4	16.6%	3.5%	4.5%	37.1%	46.2%
	2018	5.0	0.7	2.2	26.7	30.8	15.8%	2.4%	4.3%	38.8%	46.4%
	2019	6.2	1.5	3.1	32.3	34.6	19.8%	3.4%	5.4%	44.0%	48.4%
	2020	7.4	2.3	3.8	37.9	40.8	18.4%	3.4%	5.5%	47.0%	49.5%
	2021	6.4	1.1	4.2	40.2	35.7	17.0%	2.5%	5.0%	50.0%	47.9%
10s	2017	0.6	0.3	4.0	54.0	17.8	1.8%	0.7%	5.0%	60.4%	26.3%
	2018	3.1	0.0	5.1	71.6	13.5	6.4%	0.7%	6.4%	55.3%	22.7%
	2019	3.3	0.4	9.2	64.1	16.0	8.5%	1.4%	9.2%	63.0%	24.6%
	2020	6.7	0.0	8.8	72.3	18.4	9.9%	0.4%	9.9%	61.3%	22.9%
	2021	8.4	0.0	5.3	64.4	19.6	11.0%	0.0%	7.4%	62.8%	23.1%
20s	2017	7.4	0.3	6.8	61.4	34.6	16.4%	0.9%	8.6%	66.2%	44.2%
	2018	3.1	0.0	6.1	51.9	21.4	8.6%	0.2%	7.4%	63.6%	39.0%
	2019	6.3	0.1	7.8	71.4	25.9	16.1%	0.9%	9.0%	65.9%	36.0%
	2020	4.8	4.1	7.9	84.6	39.6	10.8%	2.6%	8.2%	69.5%	42.3%
	2021	6.0	1.7	14.0	84.1	20.1	12.6%	0.5%	9.3%	72.1%	30.5%
30s	2017	5.0	0.5	2.4	25.8	35.9	17.6%	2.3%	7.1%	45.4%	52.7%
	2018	4.3	1.3	1.6	23.5	32.0	16.5%	2.9%	4.9%	49.0%	54.3%
	2019	7.2	3.6	2.2	35.3	45.3	17.4%	2.2%	6.3%	51.2%	50.8%
	2020	6.4	2.1	2.9	40.9	39.7	20.8%	2.2%	6.8%	54.2%	51.2%
	2021	4.3	2.7	5.1	46.2	36.0	17.4%	3.4%	5.1%	60.5%	45.3%
40s	2017	7.0	2.0	1.2	24.7	43.3	17.8%	2.8%	3.7%	34.9%	54.5%
	2018	4.9	0.6	1.6	23.2	39.6	18.1%	1.9%	4.2%	42.3%	49.1%
	2019	6.1	1.3	1.3	19.5	34.1	21.8%	3.2%	3.8%	45.6%	56.9%
	2020	10.7	3.1	2.1	27.5	44.8	18.7%	3.4%	3.1%	51.1%	56.3%
	2021	8.4	0.7	1.5	32.2	39.9	17.1%	2.2%	3.1%	53.1%	56.6%
50s	2017	7.4	1.4	1.8	14.4	28.6	21.7%	5.8%	3.3%	27.1%	54.5%
	2018	7.5	0.1	0.3	15.8	43.2	17.8%	1.7%	1.5%	28.5%	56.9%
	2019	5.9	1.0	0.9	23.9	45.8	22.5%	4.5%	2.9%	38.3%	55.0%
	2020	6.1	1.5	1.3	20.1	45.4	20.0%	4.5%	4.5%	37.3%	55.4%
	2021	4.7	0.8	1.7	25.7	50.9	16.3%	3.0%	4.4%	38.9%	58.1%
60s	2017	3.9	1.0	0.4	4.2	16.4	17.1%	6.4%	1.2%	9.5%	35.4%
	2018	5.7	1.3	1.1	4.5	23.5	20.2%	5.5%	3.5%	10.2%	43.8%
	2019	7.3	1.7	1.7	8.2	30.5	25.5%	6.2%	4.3%	16.0%	51.0%
	2020	8.4	2.0	3.5	12.9	44.5	24.3%	5.5%	3.9%	21.5%	53.0%
	2021	6.8	0.7	1.2	13.3	34.5	23.7%	4.5%	3.4%	25.2%	55.4%

Holiday

Age group	Year	Average usage time (minute): Mobile-phone call	Fixed-phone call	Internet call	Social media	e-mail	Doers’ ratio (%): Mobile-phone call	Fixed-phone call	Internet call	Social media	e-mail
All age groups	2017	4.3	0.2	4.1	31.2	20.6	17.2%	1.5%	6.5%	38.1%	39.5%
	2018	4.6	0.2	3.4	35.6	23.6	16.5%	1.5%	6.1%	39.1%	42.9%
	2019	4.0	0.3	3.7	36.2	22.4	16.8%	1.3%	4.7%	42.9%	40.9%
	2020	6.2	0.3	2.8	44.2	22.0	14.9%	1.3%	5.1%	44.9%	37.5%
	2021	3.8	0.2	3.7	45.1	18.3	13.5%	1.1%	5.0%	46.5%	37.9%
10s	2017	1.1	0.5	5.4	75.8	18.6	7.2%	1.4%	10.1%	61.9%	25.9%
	2018	6.2	0.5	10.9	98.7	27.7	10.6%	1.4%	10.6%	58.2%	26.2%
	2019	3.0	0.4	13.8	83.4	20.6	9.9%	1.4%	13.4%	64.1%	19.7%
	2020	8.4	0.0	8.7	85.4	14.5	9.2%	0.0%	10.6%	60.6%	18.3%
	2021	6.3	1.5	6.8	74.2	22.5	8.5%	0.7%	6.4%	60.3%	24.8%
20s	2017	6.6	0.0	12.7	77.8	28.2	17.6%	0.0%	13.4%	70.8%	39.8%
	2018	2.8	0.0	8.1	64.6	20.5	12.4%	0.0%	10.5%	64.1%	36.8%
	2019	3.4	0.3	10.7	81.1	20.5	12.8%	0.5%	7.6%	67.3%	32.2%
	2020	3.4	0.0	4.3	110.8	27.0	9.9%	0.0%	6.1%	70.0%	32.9%
	2021	3.4	0.1	12.3	114.2	6.8	10.7%	0.5%	7.4%	71.2%	21.9%
30s	2017	3.8	0.0	4.0	24.1	18.0	19.1%	0.0%	7.3%	43.9%	43.1%
	2018	5.5	0.0	1.2	38.4	23.1	18.3%	0.0%	5.4%	52.5%	47.5%
	2019	5.3	0.0	2.1	38.4	26.4	17.0%	0.0%	4.0%	52.6%	41.5%
	2020	3.5	0.0	2.7	43.8	14.3	13.6%	0.0%	5.2%	51.2%	34.0%
	2021	2.8	0.0	3.9	50.5	14.1	11.3%	0.0%	4.5%	58.7%	32.4%
40s	2017	4.3	0.1	2.4	25.5	23.8	18.4%	1.2%	5.9%	36.4%	46.4%
	2018	3.8	0.1	2.4	27.3	22.4	15.1%	1.2%	6.2%	40.7%	41.0%
	2019	2.5	0.2	0.6	19.5	19.3	17.2%	0.6%	2.1%	42.3%	43.6%
	2020	4.2	0.1	1.3	28.2	24.3	14.7%	0.6%	3.1%	47.2%	42.6%
	2021	4.0	0.0	2.0	32.0	18.2	13.0%	0.6%	6.2%	50.9%	41.7%
50s	2017	4.7	0.3	1.2	14.8	19.4	18.6%	2.3%	2.7%	27.9%	43.8%
	2018	4.0	0.4	1.6	20.2	28.8	17.0%	2.6%	3.7%	25.6%	48.9%
	2019	5.7	0.2	0.6	24.0	21.6	19.1%	1.4%	2.9%	34.5%	45.7%
	2020	6.6	0.3	2.0	22.5	22.4	17.1%	2.4%	4.9%	34.5%	42.2%
	2021	3.0	0.1	0.8	22.7	21.6	14.5%	1.3%	3.0%	31.0%	45.8%
60s	2017	4.3	0.4	1.8	3.9	16.0	17.4%	3.3%	3.0%	9.2%	31.6%
	2018	5.7	0.5	1.0	6.1	20.9	21.7%	3.0%	3.3%	11.7%	47.8%
	2019	3.7	0.7	1.3	9.1	25.3	20.3%	3.8%	3.8%	14.8%	49.3%
	2020	11.8	1.0	1.4	14.3	25.9	20.9%	3.9%	4.3%	20.6%	43.3%
	2021	4.4	0.3	0.4	11.3	25.3	19.6%	2.9%	3.6%	21.0%	48.9%

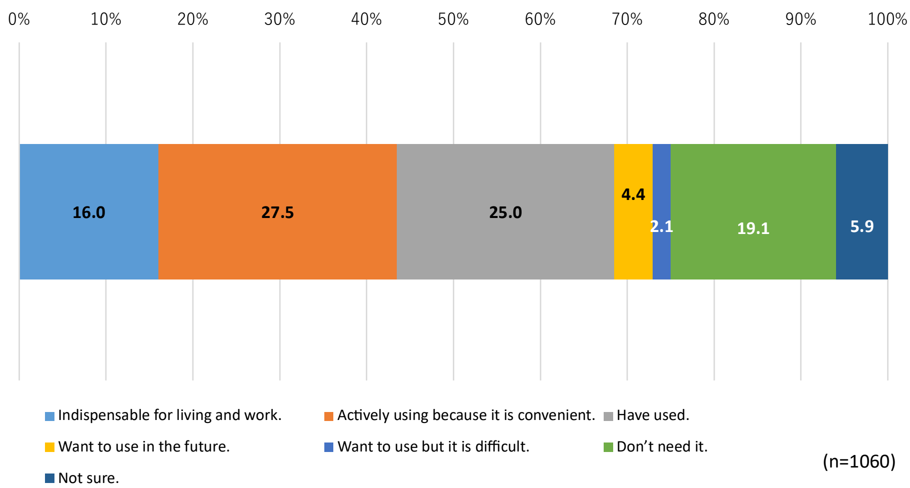
(Source) Institute for Information and Communications Policy, MIC, “FY2021 Survey on Usage Time of Information and Communication Media and Information Behavior”

12. Media use by purpose (most used media of all age groups, by age group and by use of the internet) (Figure 3-8-1-4 in White Paper)



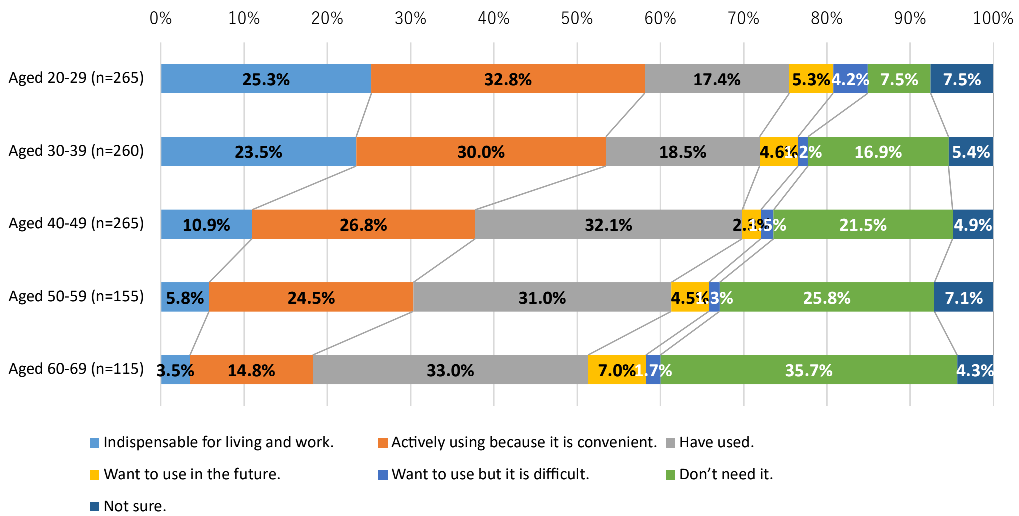
(Source) Institute for Information and Communications Policy, MIC, "FY2021 Survey on Usage Time of Information and Communication Media and Information Behavior"

13. SNS usage (Japan)



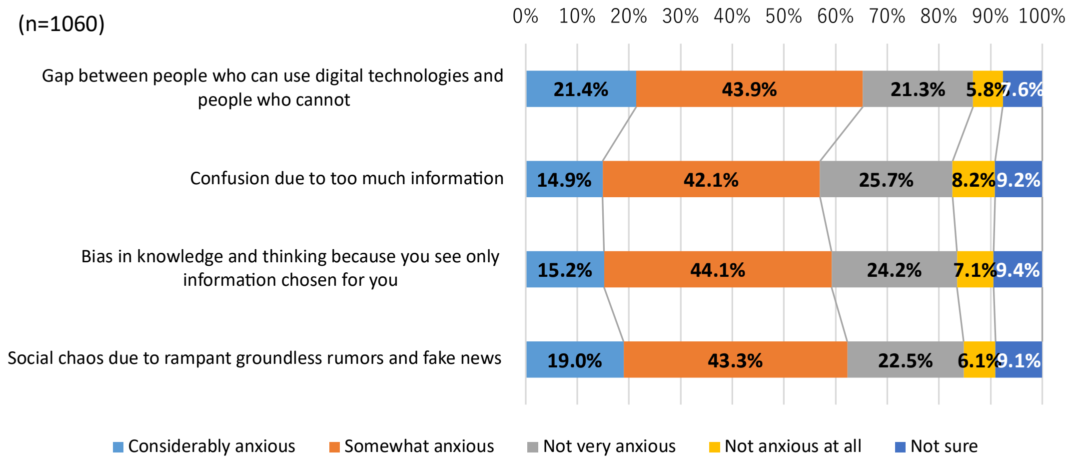
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

14. SNS usage (Japan, by age group)



(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

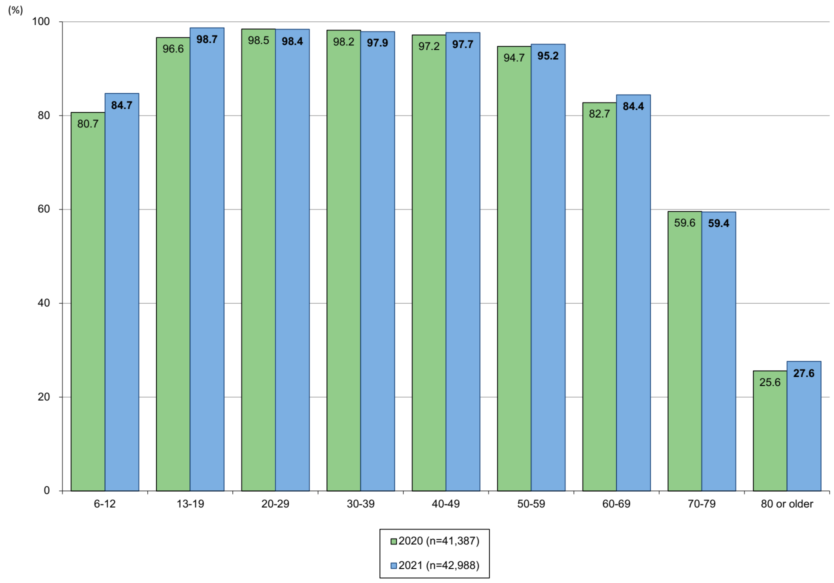
15. Questionnaire survey on concerns about use of digital technologies for information gathering (Japan)



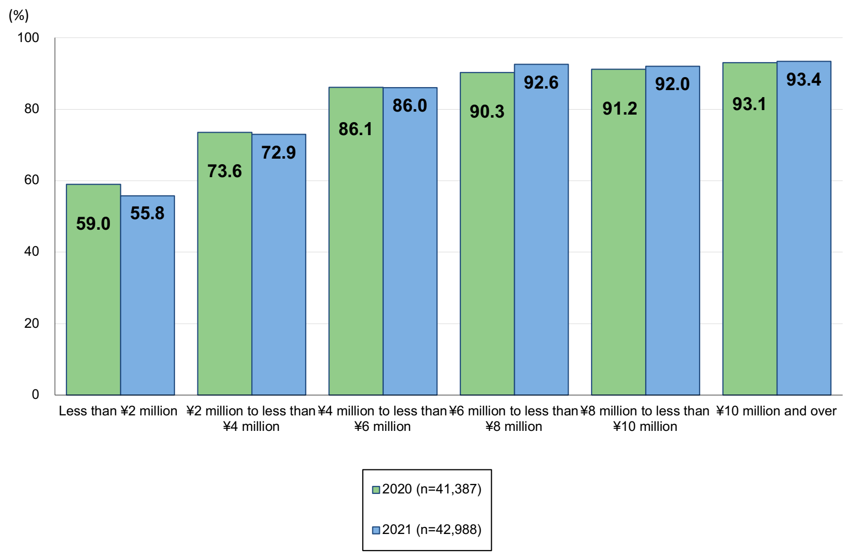
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

17. Internet usage rate by attributes

(By age group)



(By household income)



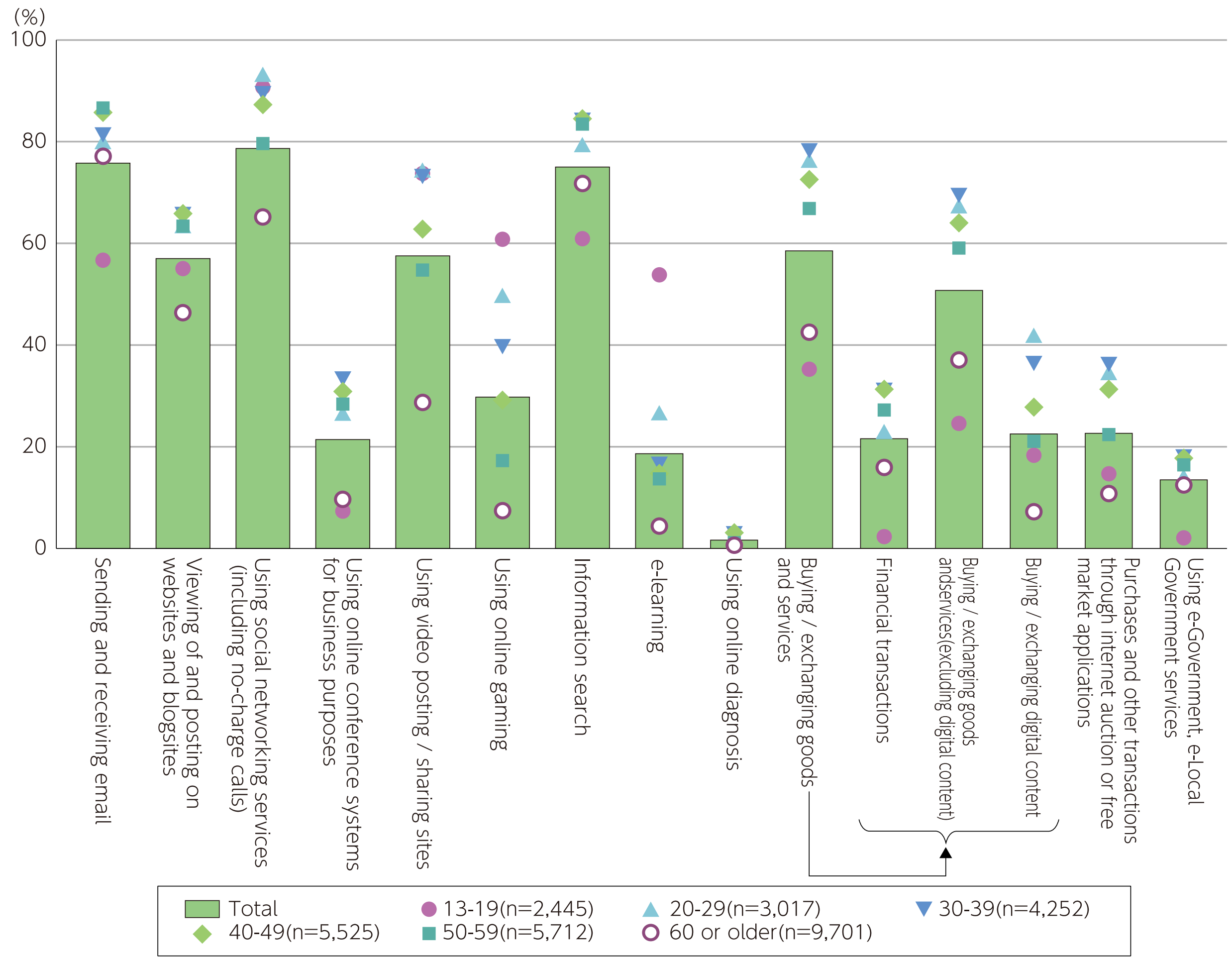
(Source) MIC, “Communications Usage Trend Survey”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

18. Internet usage rate by prefecture and usage status by device (individuals)(2021)

Prefecture (n)	Percentage of internet users				
	Total	Computers	Mobile phones	Smartphones	Tablets
Hokkaido (711)	82.2	43.5	9.8	65.4	22.0
Aomori (910)	71.6	31.0	6.4	55.8	14.9
Iwate (1,049)	72.5	34.2	10.2	55.7	15.9
Miyagi (859)	82.1	45.6	8.6	69.1	26.5
Akita (969)	74.7	39.3	9.2	58.1	18.4
Yamagata (1,242)	74.8	37.0	8.9	57.5	14.7
Fukushima (1,037)	73.5	35.4	12.3	56.9	16.1
Ibaraki (847)	78.2	40.4	8.9	64.8	21.2
Tochigi (1,031)	79.7	41.3	9.1	63.9	20.5
Gunma (1,168)	79.0	41.5	10.5	64.2	21.1
Saitama (892)	85.4	48.3	10.2	70.2	27.3
Chiba (845)	85.5	50.6	9.4	72.0	21.6
Tokyo (794)	87.0	59.6	10.3	74.5	33.6
Kanagawa (805)	91.1	62.7	16.2	77.4	32.6
Niigata (1,252)	77.1	40.4	9.8	61.1	19.5
Toyama (1,181)	79.5	45.7	8.8	62.6	20.7
Ishikawa (1,136)	80.5	45.7	5.4	64.0	21.4
Fukui (1,042)	81.1	44.5	10.7	64.3	24.0
Yamanashi (1,056)	80.3	46.5	8.8	63.7	19.7
Nagano (989)	81.5	46.9	9.5	64.0	23.2
Gifu (1,113)	81.6	41.0	8.7	64.8	24.0
Shizuoka (1,026)	80.7	44.0	7.7	65.4	22.6
Aichi (920)	85.6	49.2	9.4	72.6	28.6
Mie (941)	82.0	45.1	11.9	66.9	24.5
Shiga (867)	86.7	49.4	10.3	71.4	24.9
Kyoto (896)	86.1	55.9	10.5	71.4	26.2
Osaka (798)	85.8	53.1	9.7	73.0	26.5
Hyogo (771)	82.1	47.6	10.2	68.7	23.5
Nara (916)	83.3	48.4	10.6	69.4	21.4
Wakayama (845)	76.2	39.1	11.7	63.2	22.7
Tottori (957)	77.6	43.6	10.1	61.0	21.4
Shimame (981)	75.2	38.6	8.7	58.5	21.0
Okayama (874)	80.4	45.5	8.9	64.0	22.7
Hiroshima (917)	80.9	46.2	10.9	64.0	21.6
Yamaguchi (812)	80.3	43.3	8.0	64.7	21.2
Tokushima (755)	76.7	41.1	8.8	60.9	22.0
Kagawa (937)	78.6	44.4	7.9	64.6	22.7
Ehime (736)	78.4	41.8	9.1	64.5	20.2
Kochi (701)	74.4	36.1	7.8	58.5	17.5
Fukuoka (814)	85.7	44.4	15.1	71.7	27.5
Saga (937)	77.9	38.4	10.1	61.1	20.4
Nagasaki (781)	71.4	32.0	7.8	59.3	17.3
Kumamoto (875)	75.5	34.4	9.2	59.2	17.2
Oita (836)	80.0	42.5	11.3	63.5	23.9
Miyazaki (770)	75.2	39.0	9.8	62.3	21.4
Kagoshima (843)	78.0	37.1	8.1	65.7	20.9
Okinawa (554)	79.0	41.1	12.5	58.6	21.8
Total (42,988)	82.9	48.1	10.4	68.5	25.1

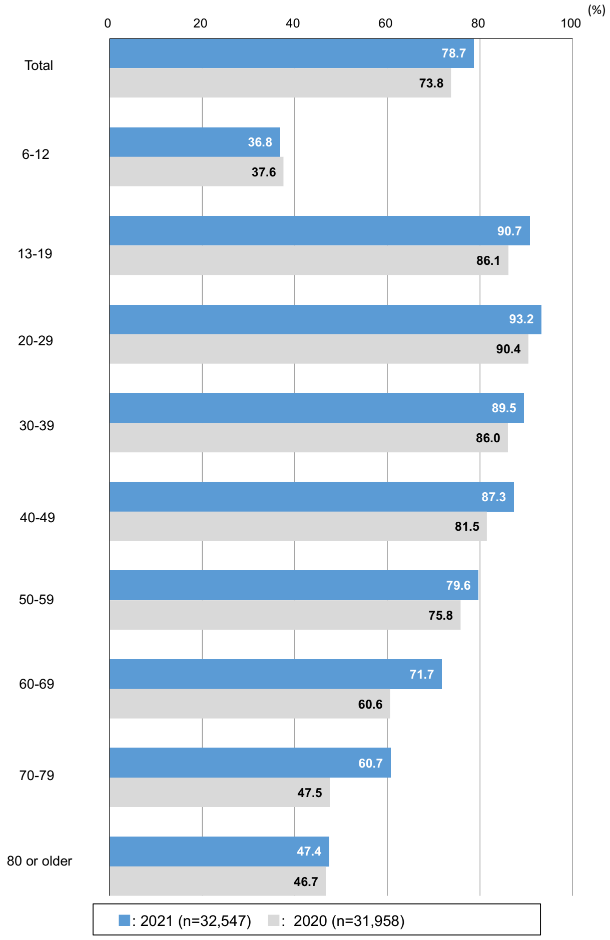
(Source) MIC, “Communications Usage Trend Survey”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

19. Purpose of internet usage by age group (multiple answers) (2021)



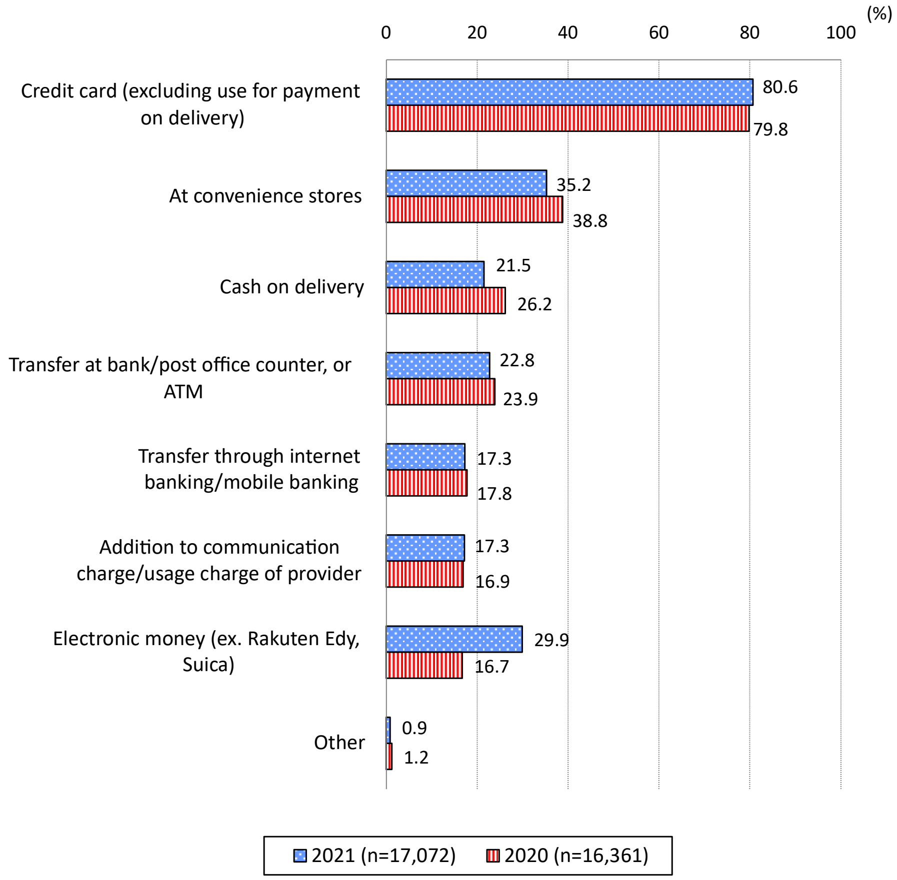
(Source) MIC, “Communications Usage Trend Survey”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

20. SNS usage state by age group



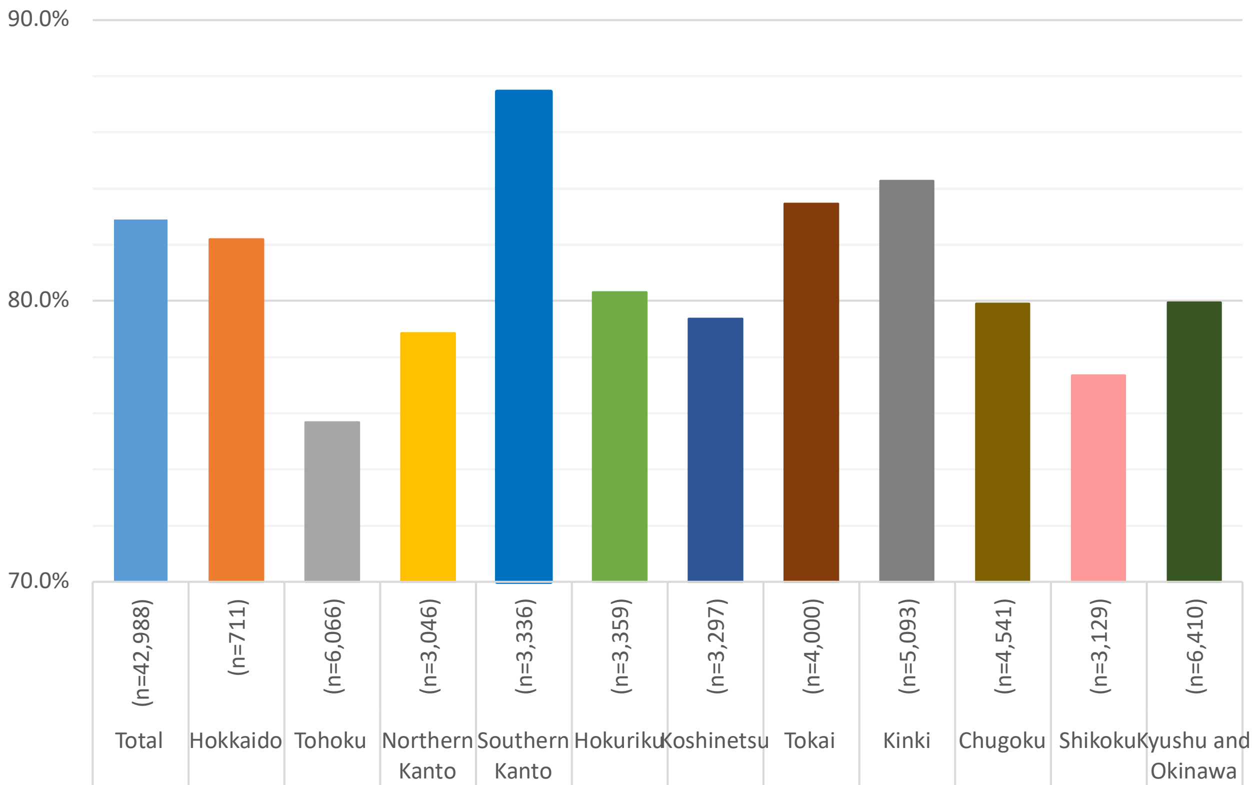
(Source) MIC, “Communications Usage Trend Survey”
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

21. Payment method of internet purchase (multiple answers)



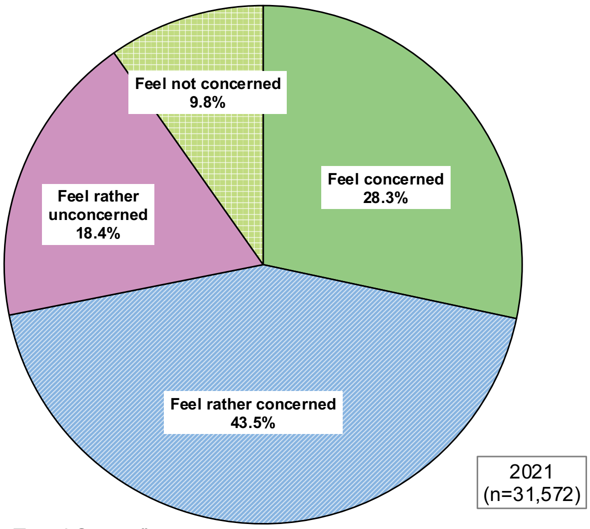
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

22. Internet usage rate by region



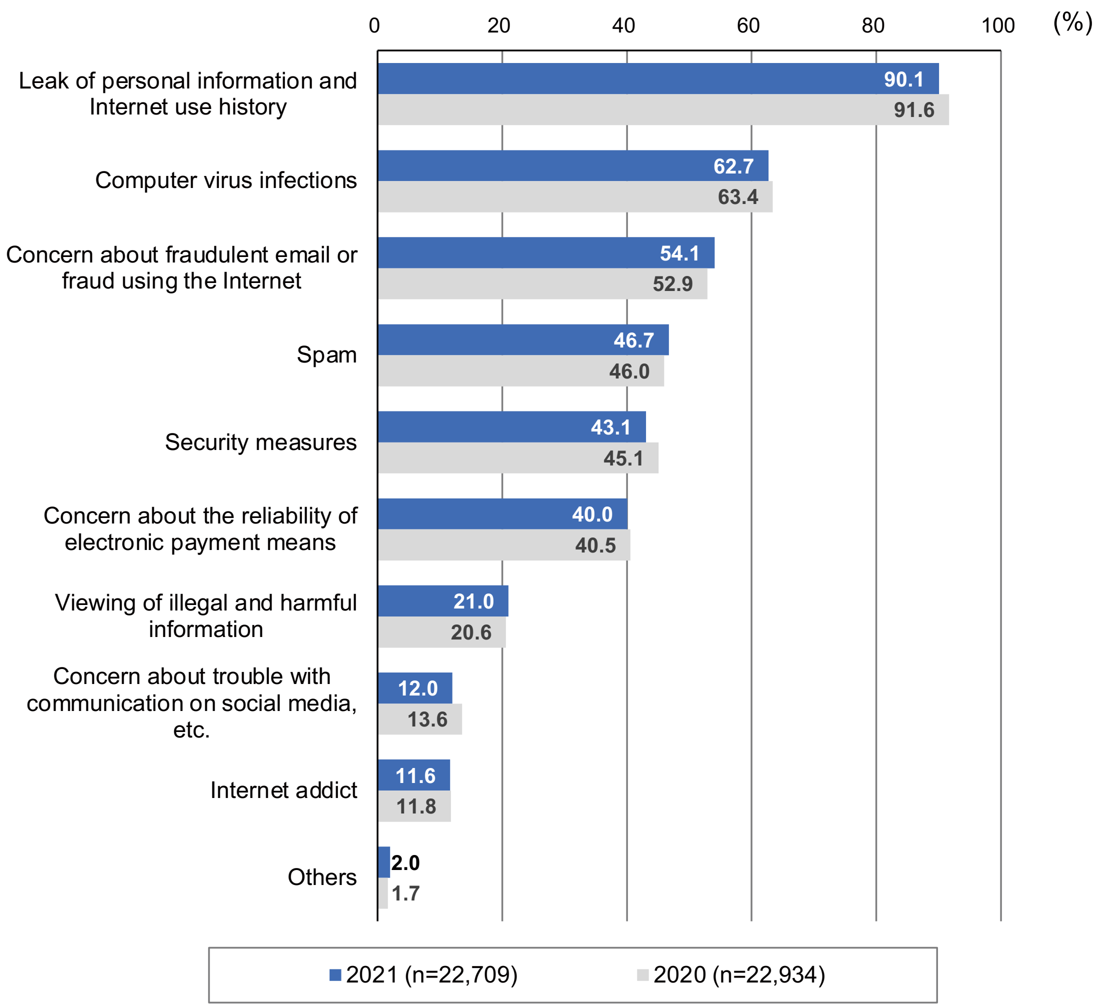
(Source) MIC, "Communications Usage Trend Survey"
https://www.soumu.go.jp/johotsusintokei/statistics/statistics05.html

23. Responses of individuals regarding concerns about using the Internet (Figure 3-8-1-6 in White Paper)



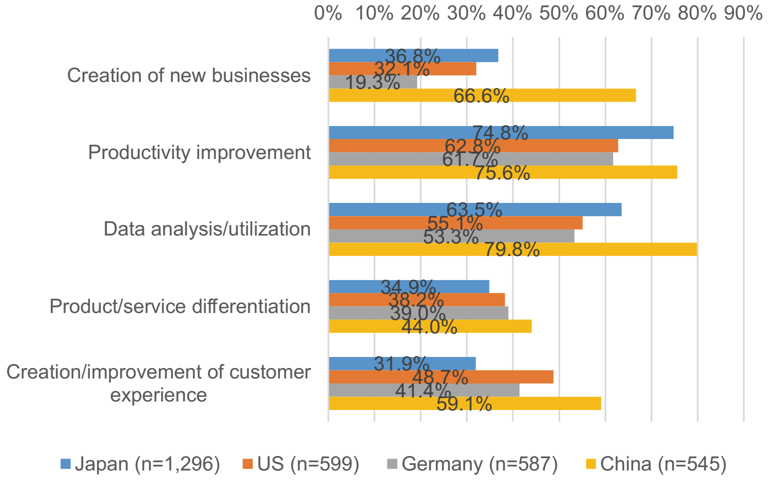
(Source) MIC "Communications Usage Trend Survey"

24. Content of the concern when using internet (multiple answers) (Figure 3-8-1-7 in White Paper)



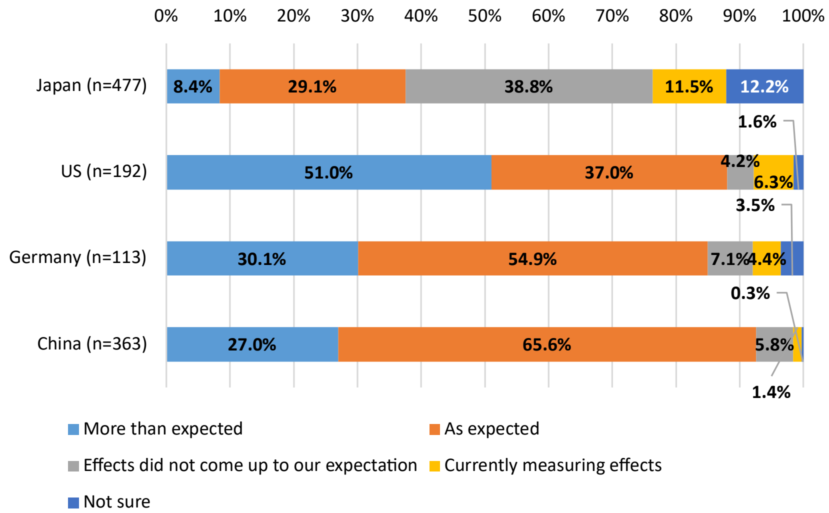
(Source) MIC "Communications Usage Trend Survey"

26. Purpose of digitalization (by country) (Figure 3-8-2-2 in White Paper)



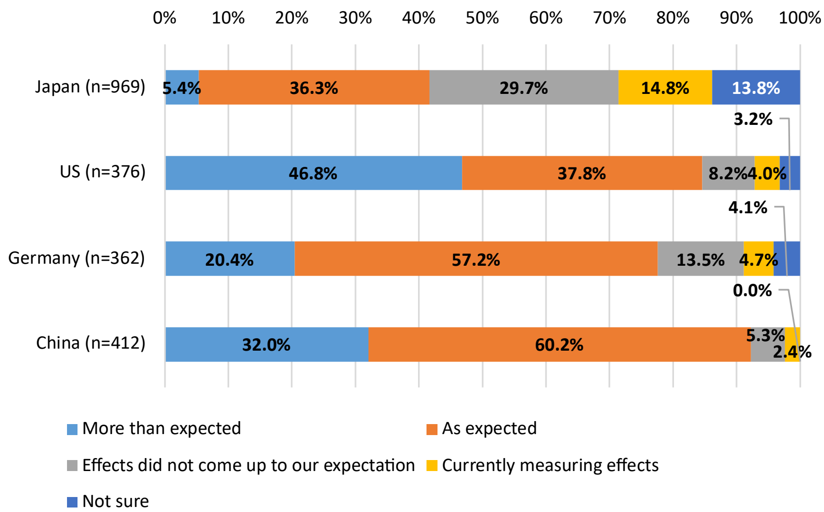
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

27. Effect of digitalization aimed at creation of new businesses (by country)



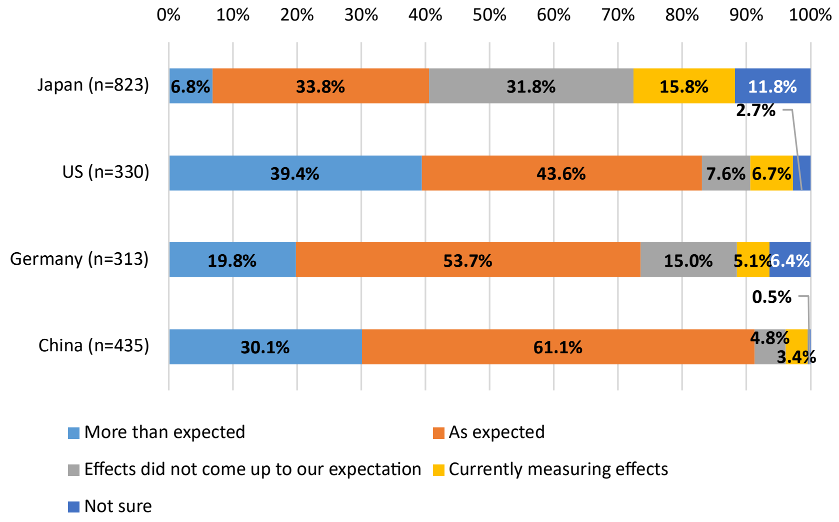
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and and Abroad"

28. Effect of digitalization aimed at productivity improvement (by country)



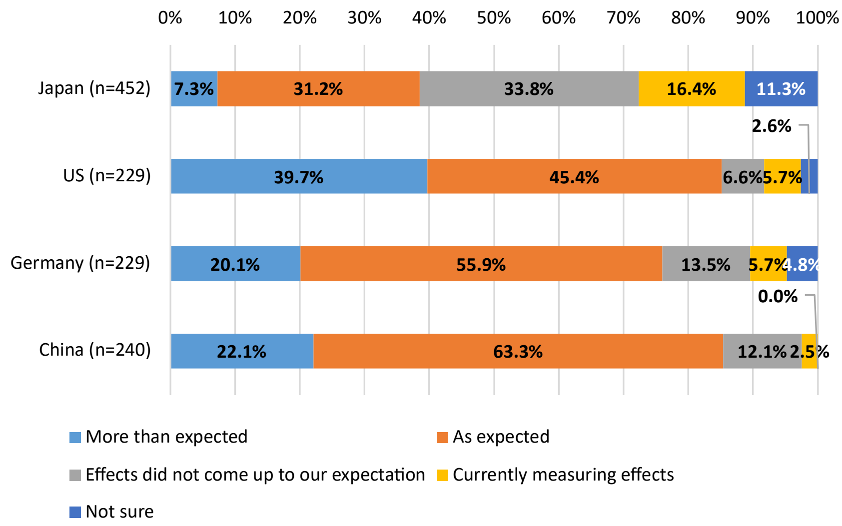
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

29. Effect of digitalization aimed at data analysis/utilization (by country)



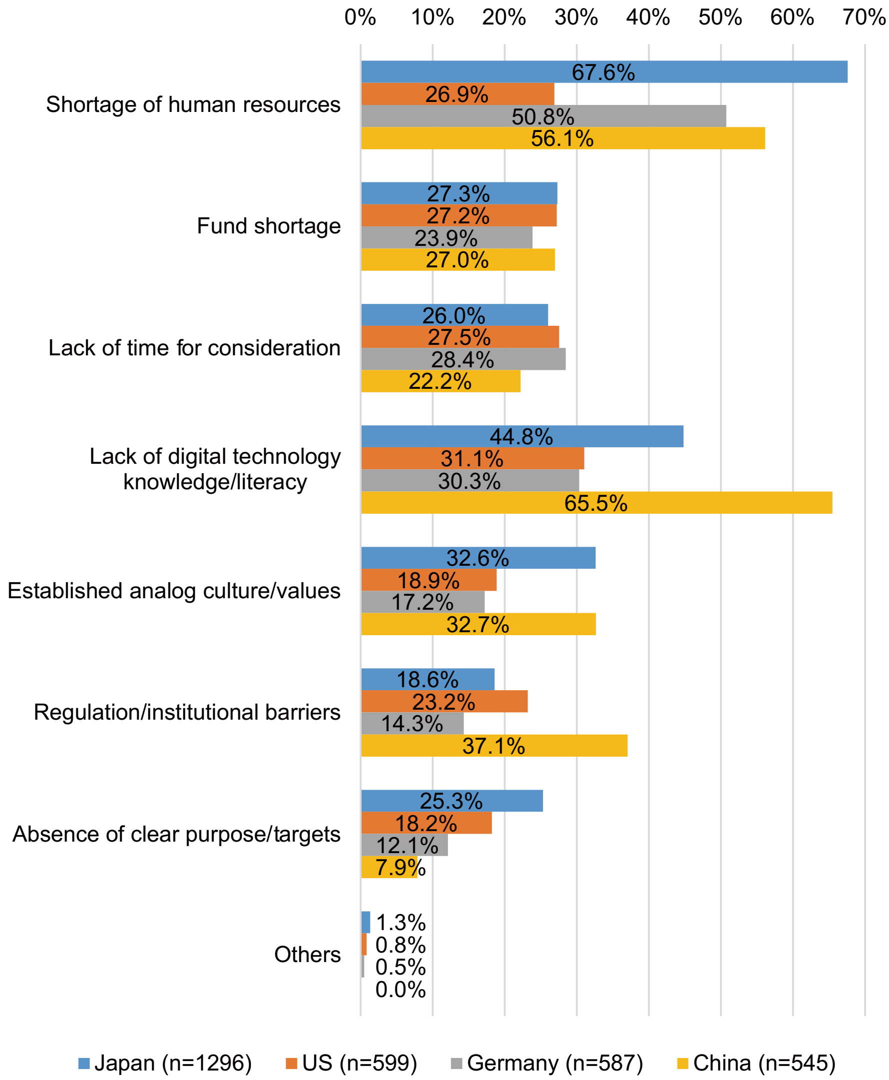
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

30. Effect of digitalization aimed at product/service differentiation (by country)



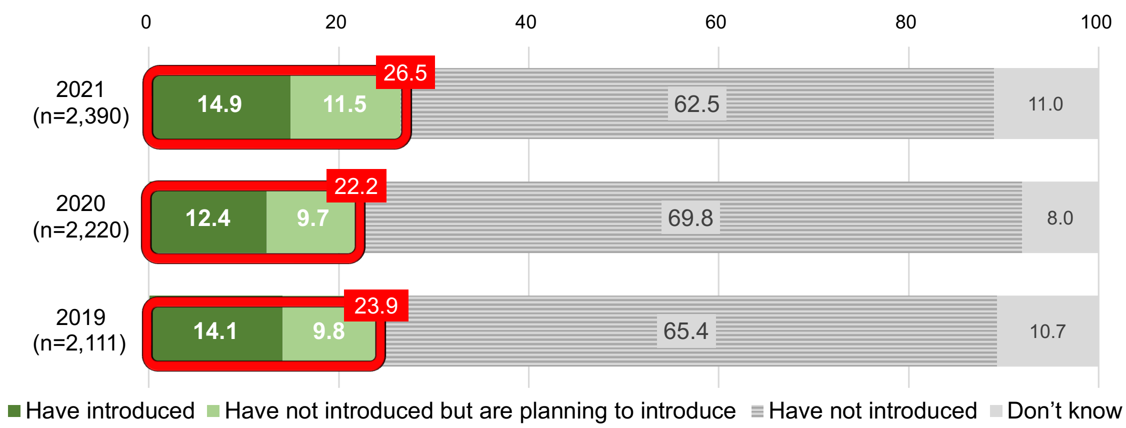
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

31. Challenge/barrier of digitalization (by country)



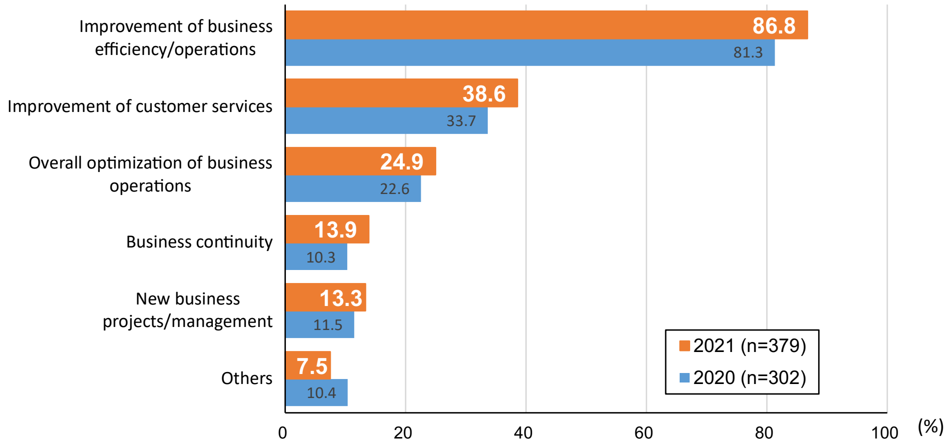
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

32. Introduction of IoT/ AI and other systems/ services



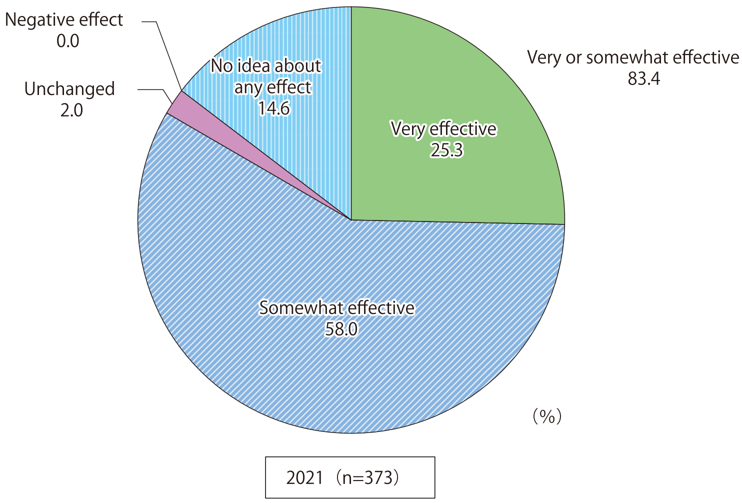
(Source) MIC, "Communications Usage Trend Survey"

33. Purpose of data collection/analysis using IoT, AI and other systems/services



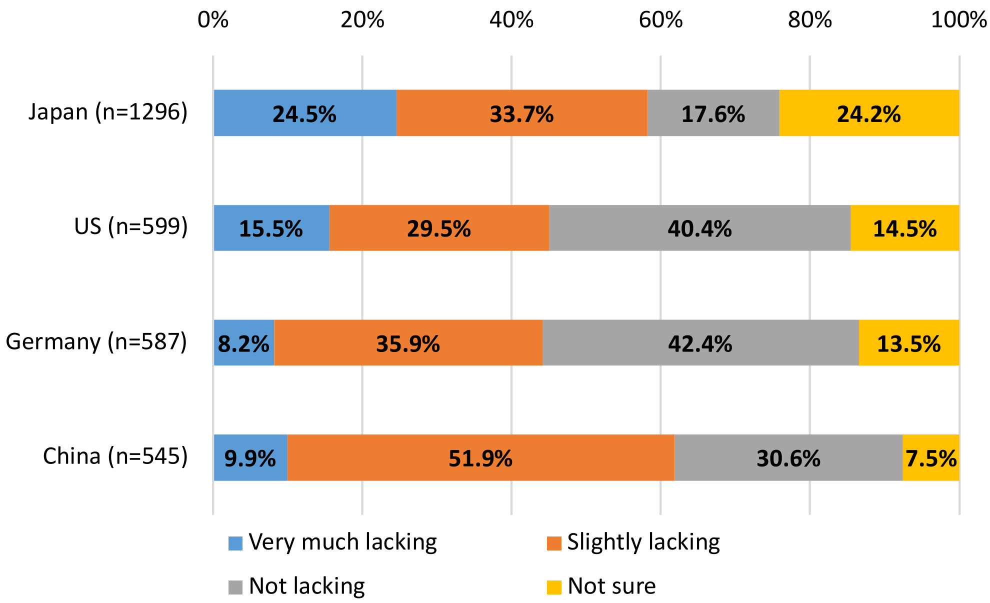
(Source) MIC, “Communications Usage Trend Survey”

34. Effects of introducing IoT, AI and other systems/services



(Source) MIC, “Communications Usage Trend Survey”

35. Shortage in digital human resources (CIO, CDO and other leaders of digitalization. By country)

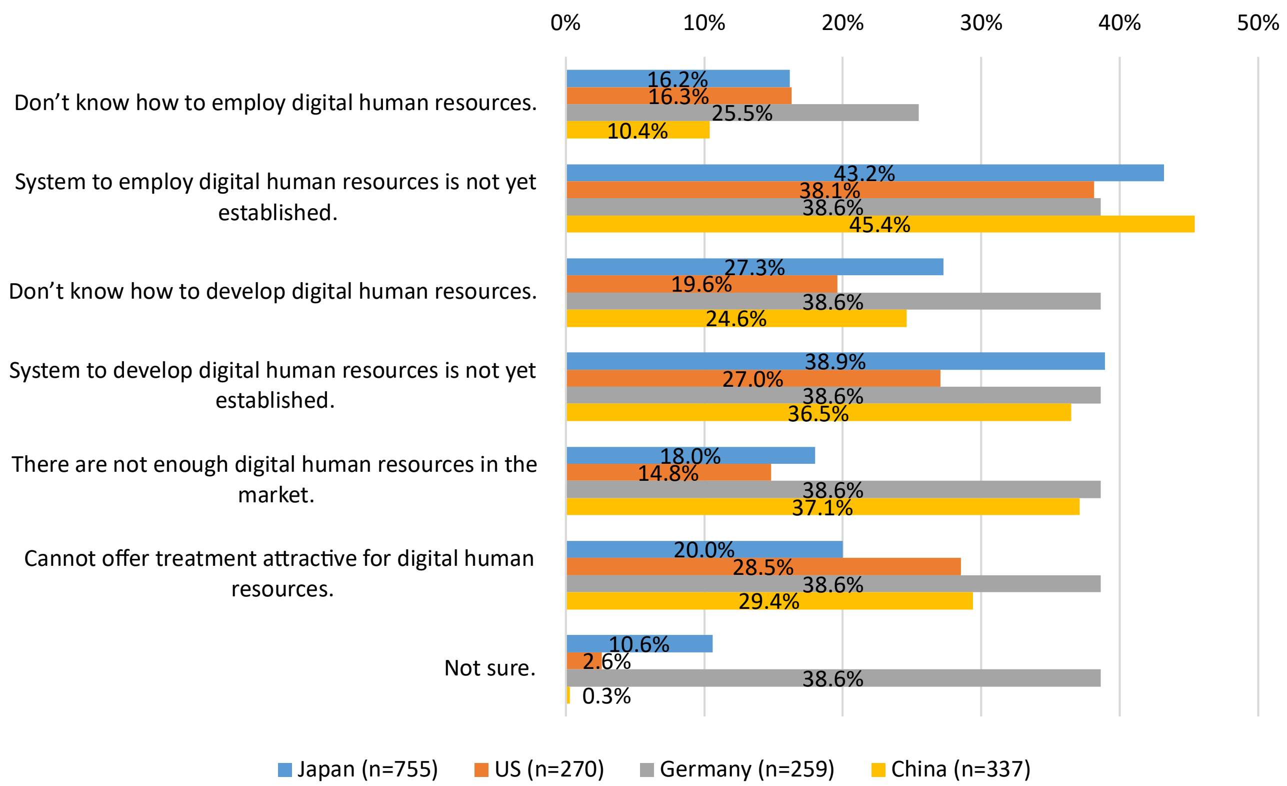


(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

36. Shortage in digital human resources (AI/data analysis experts. By country)

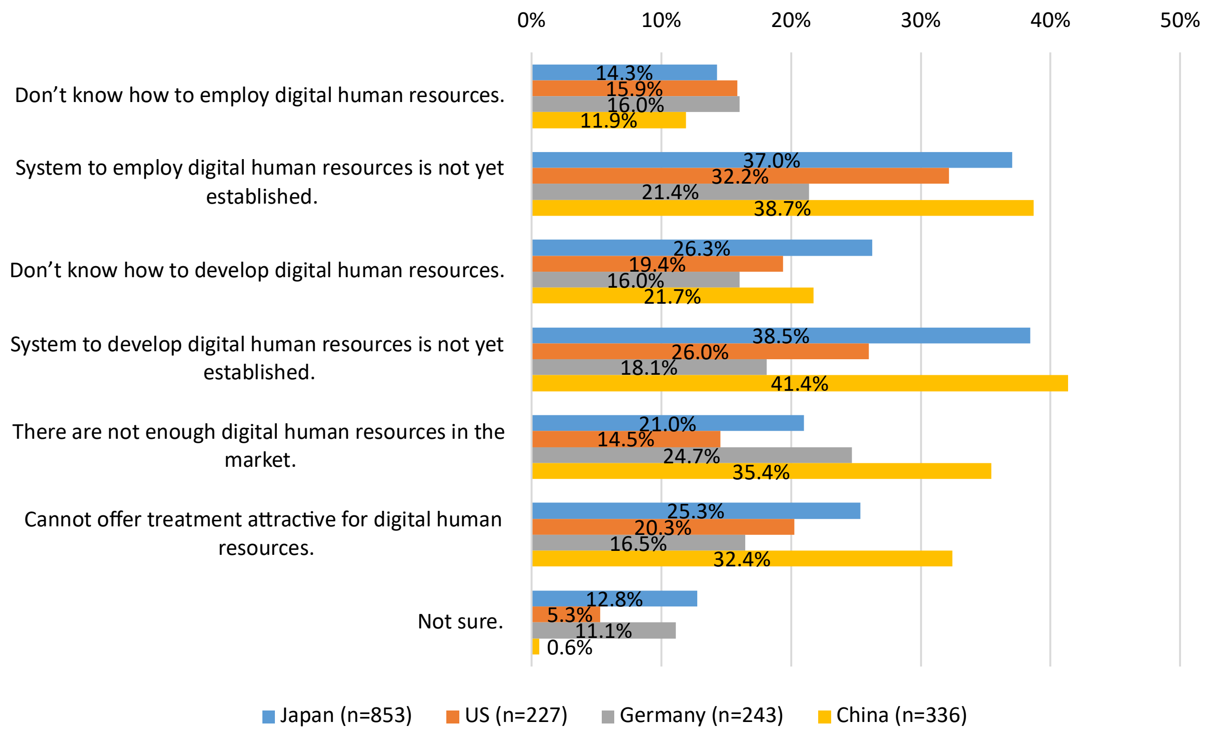
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

37. Reasons for shortage in digital human resources (CIO, CDO and other leaders of digitalization. By country)



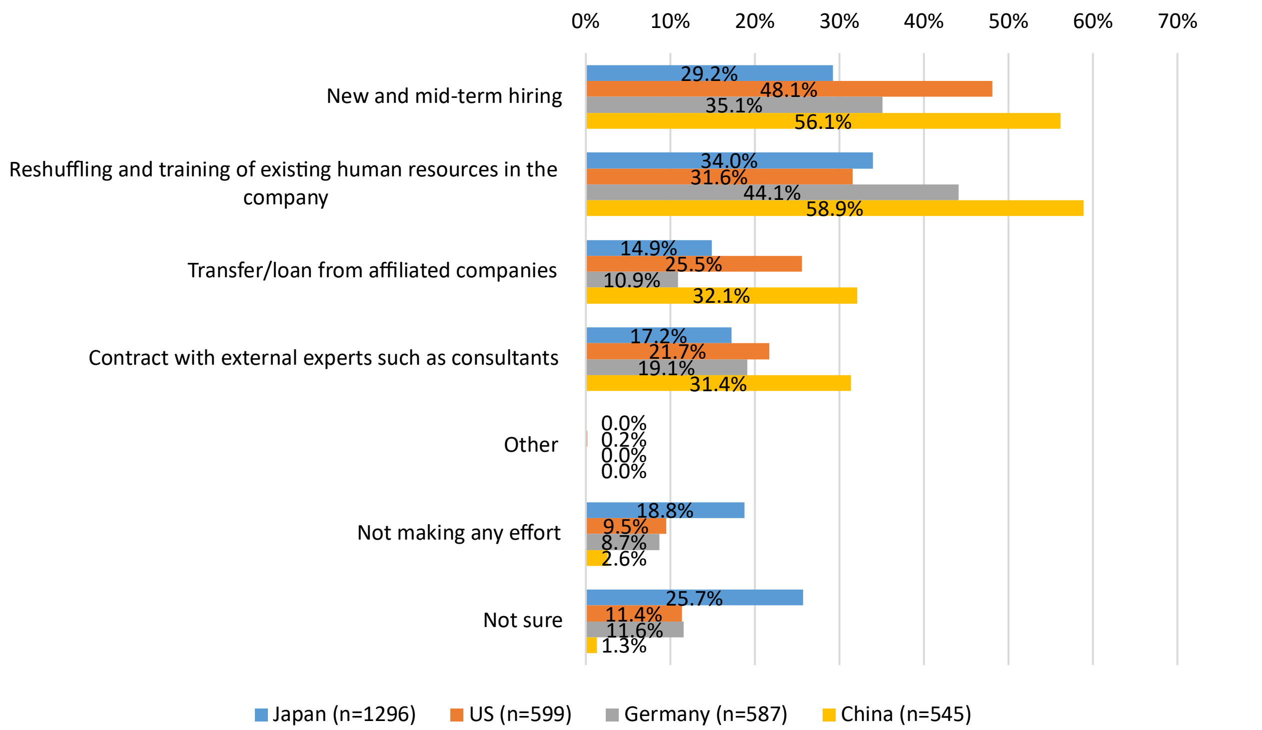
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

38. Reasons for shortage in digital human resources (AI, data analysis experts. By country)



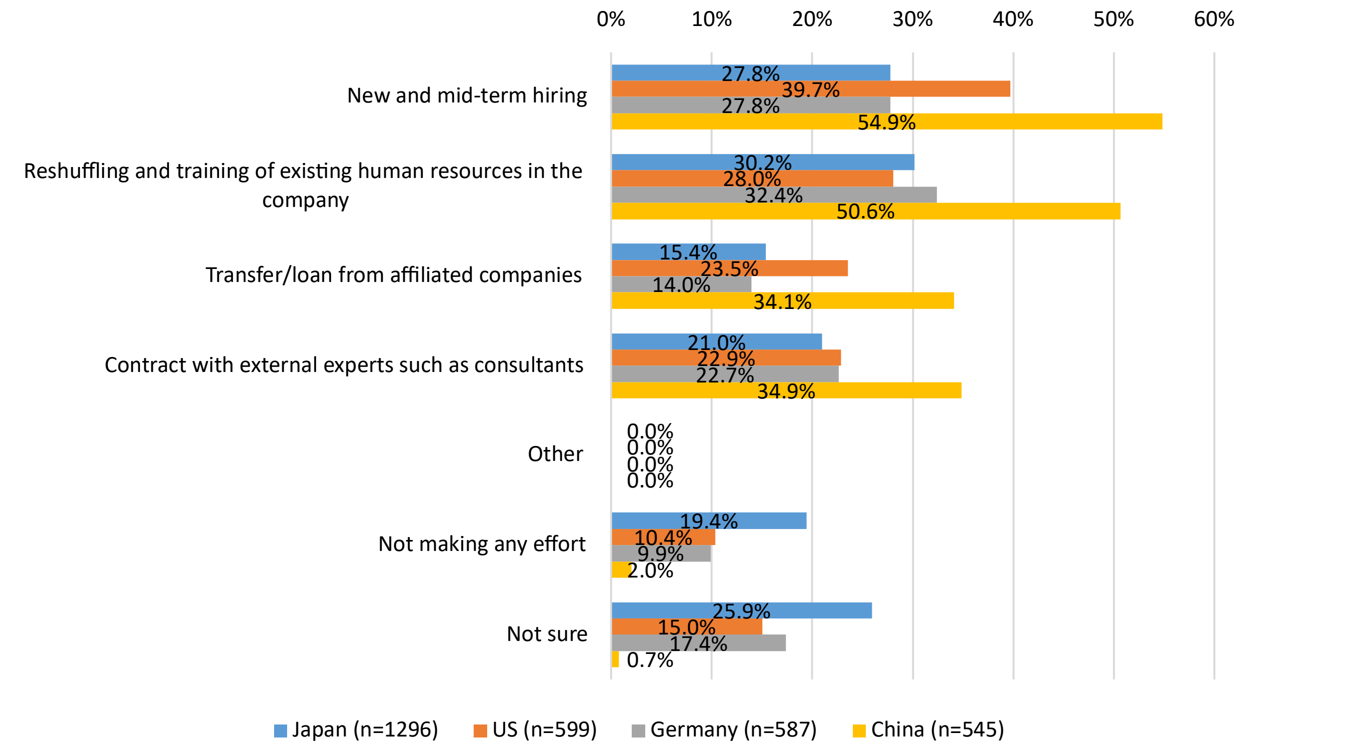
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

39. Efforts to secure digital human resources (CIO, CDO and other leaders of digitalization. By country)



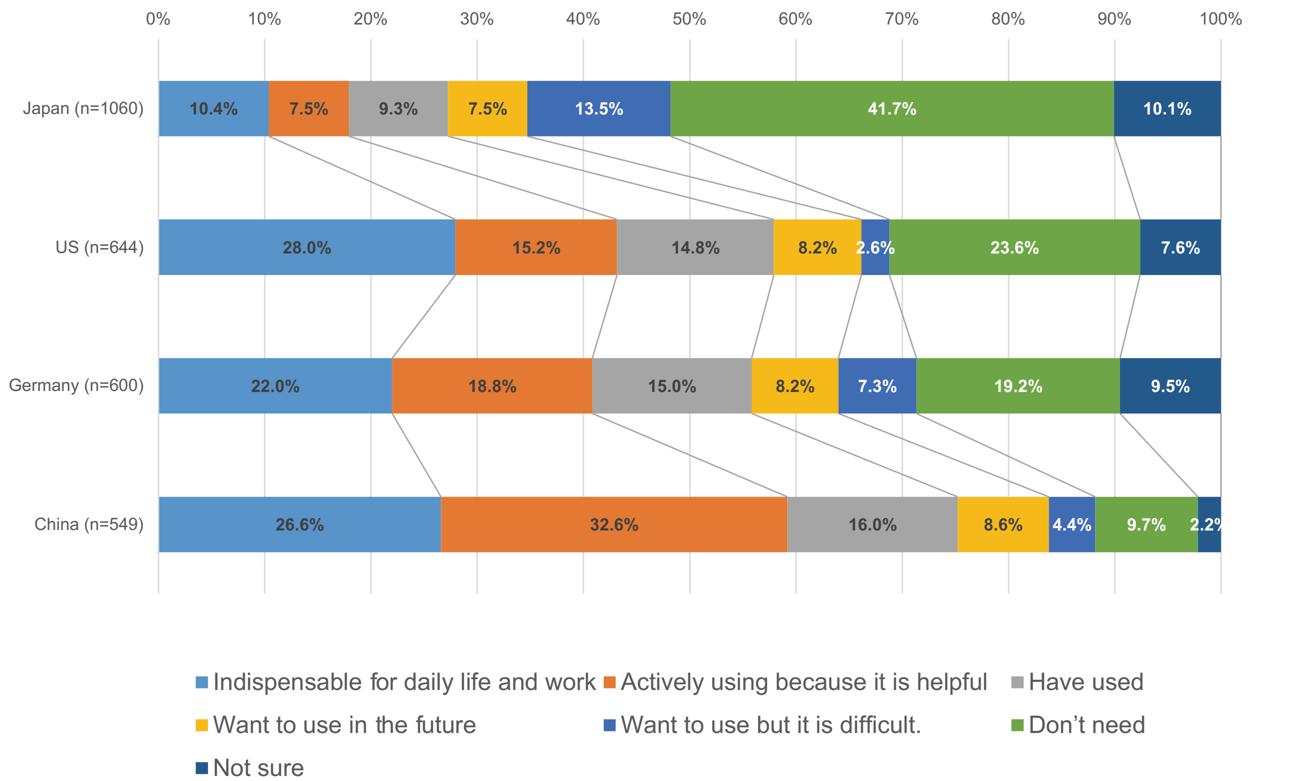
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

40. Efforts to secure digital human resources (AI/data analysis experts. By country)



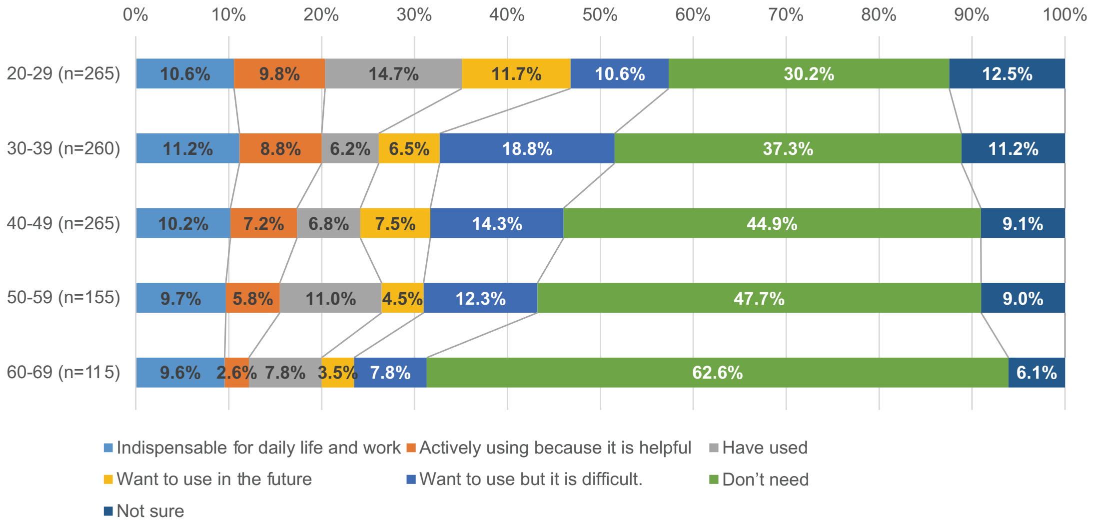
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

41. Telework use situation (by country) (Figure 3-8-2-4 in White Paper)



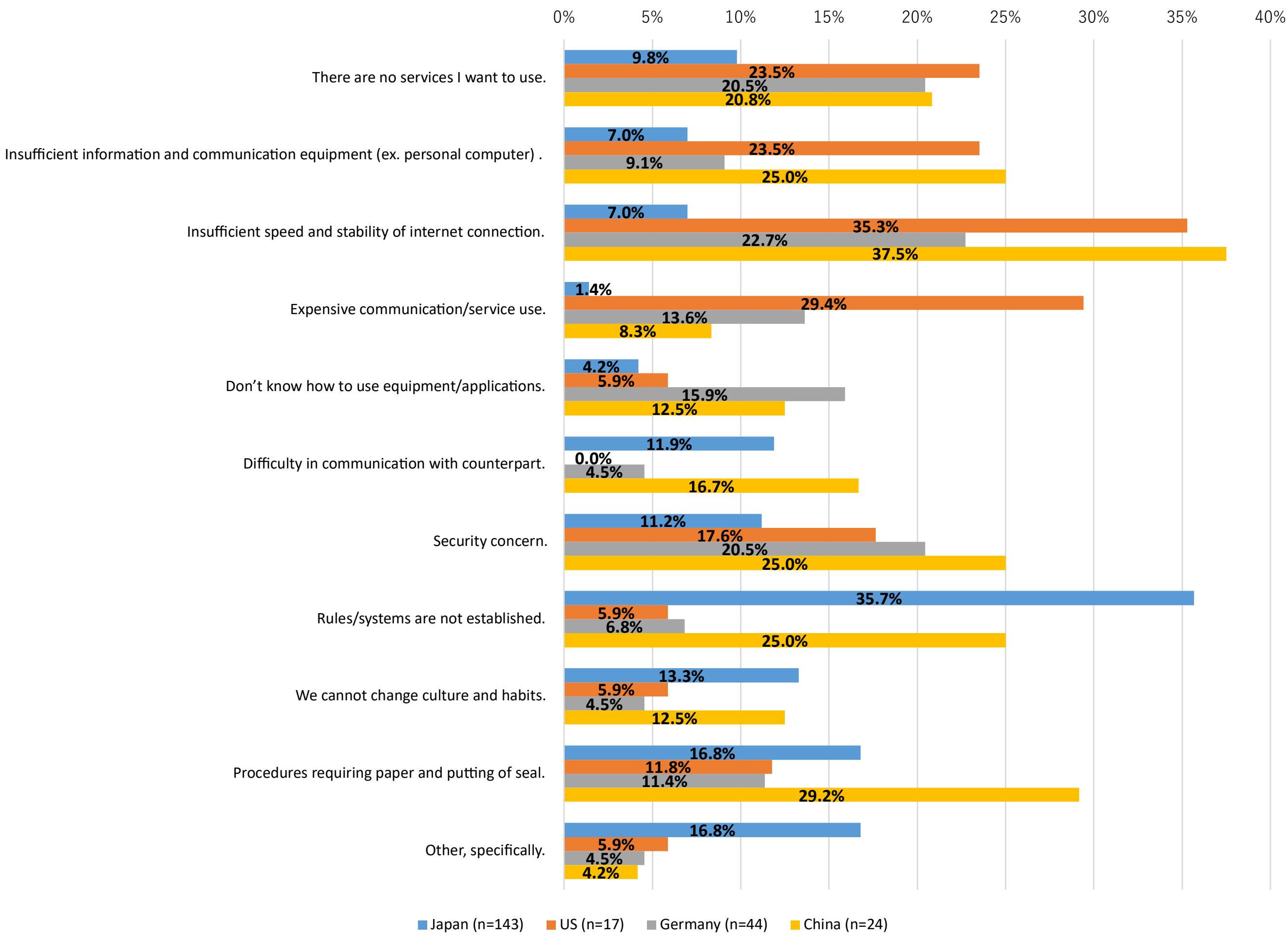
(Source) MIC (2022) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

42. Telework use situation in Japan (by age group) (Figure 3-8-2-5 in White Paper)



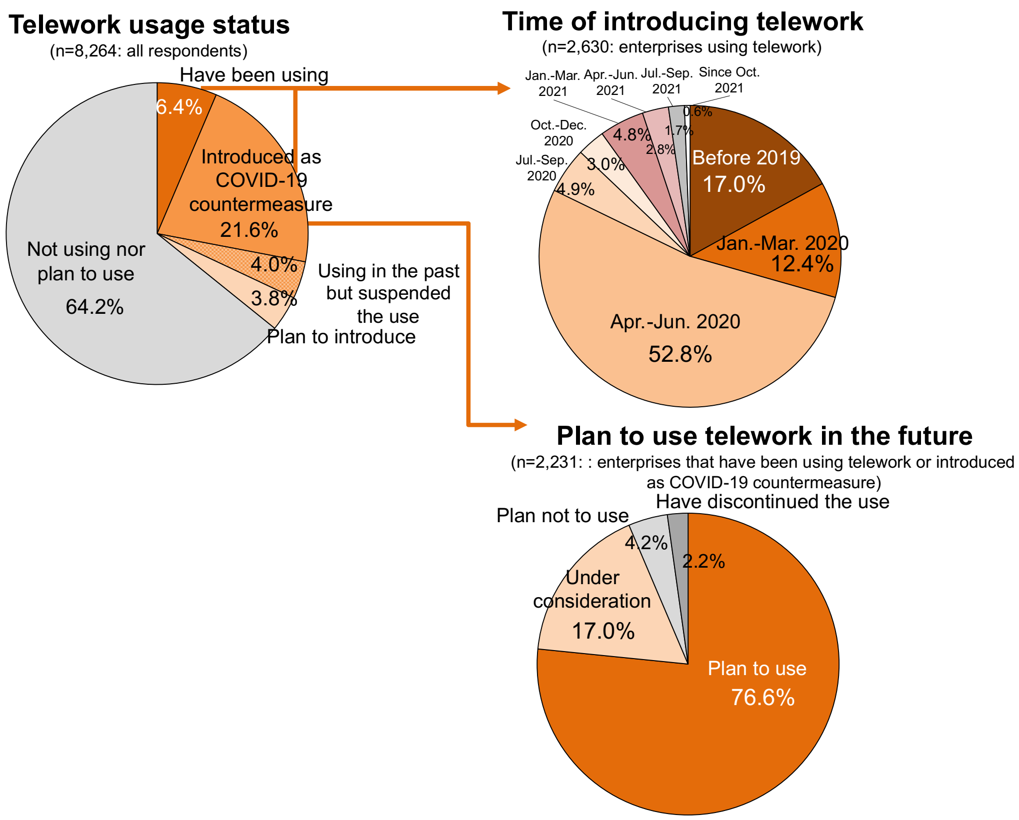
(Source) MIC (2022) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

43. Questionnaire survey on reasons of difficulty to use telework (by country)



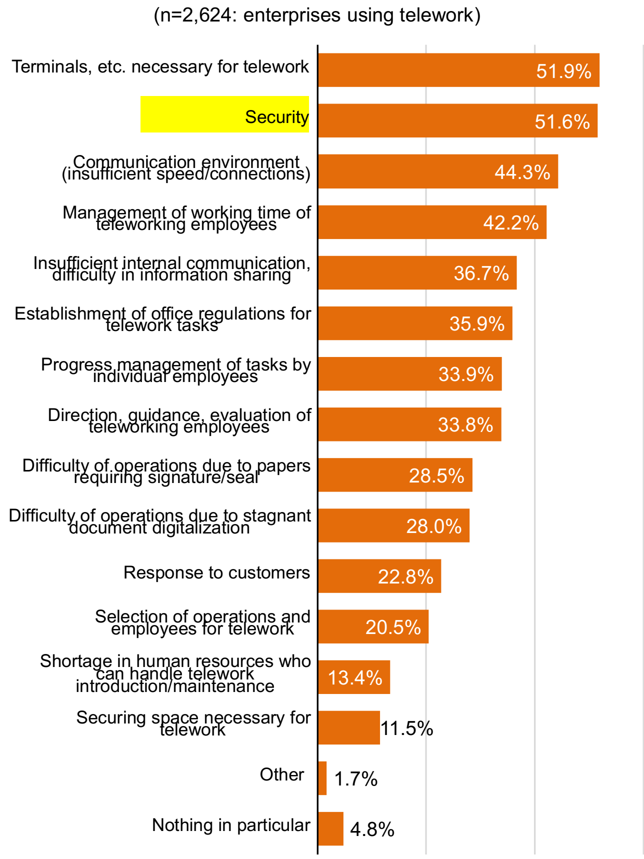
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

44. Telework usage status



(Source) Prepared from MIC “Fiscal 2021 Result of Survey on Actual Condition of Telework Security”

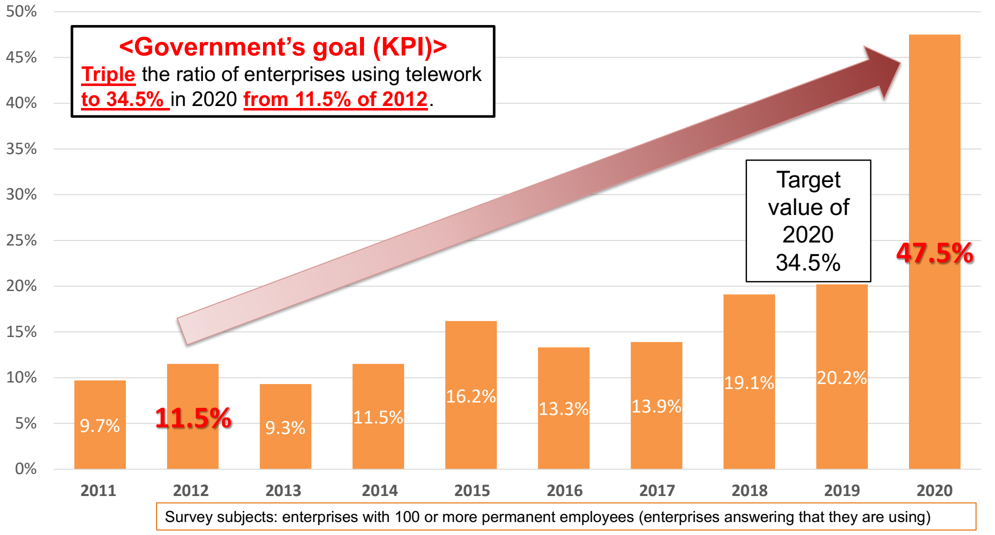
45. Challenges for introducing telework (multiple answers)



(Source) Prepared from MIC “Fiscal 2021 Result of Survey on Actual Condition of Telework Security”

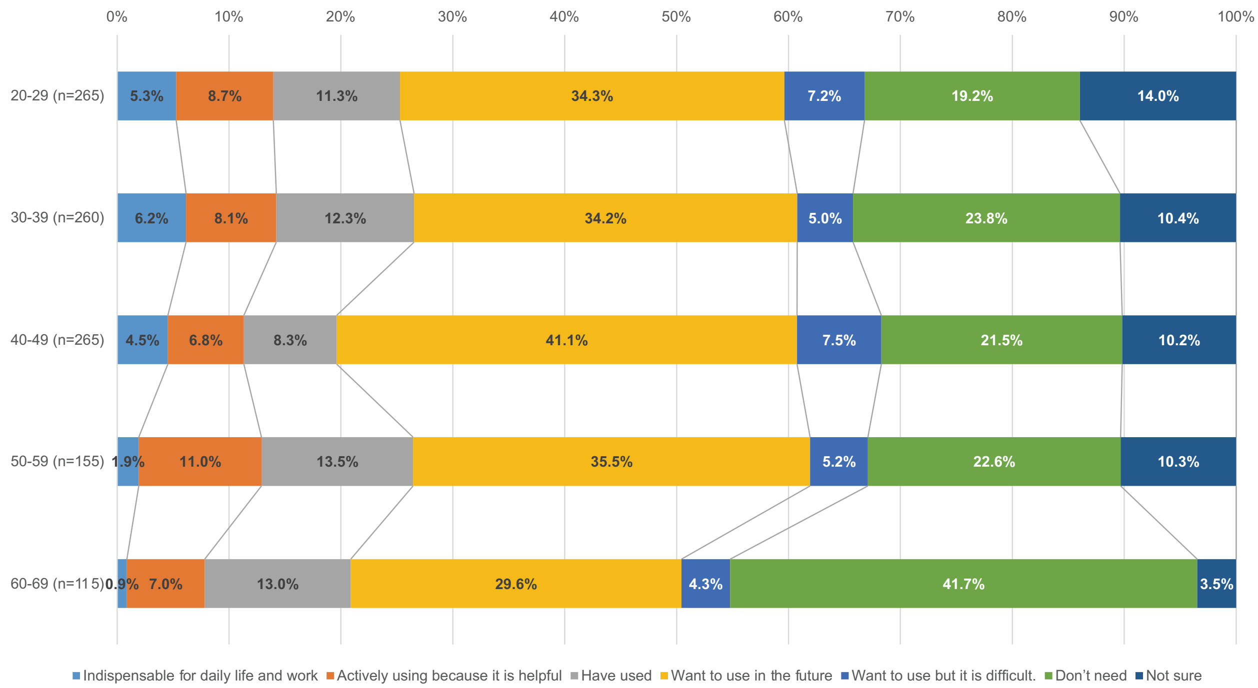
46. Changes in telework introduction rate

● Ratio of enterprises using telework has increased to 47.5% exceeding the 34.5% that is the government's goal for 2020.



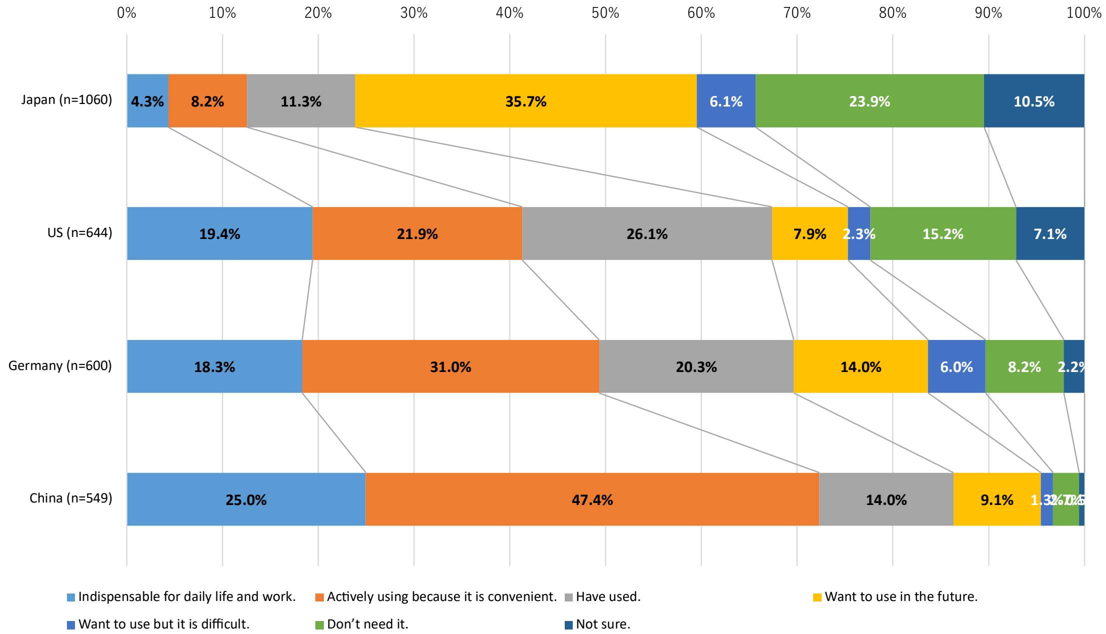
(Source) MIC, "Communications Usage Trend Survey" (published on June 18, 2021) as of the end August 2020

47. Use situation of electronic administrative services in Japan (by age group) (Figure 3-8-3-1 in White Paper)



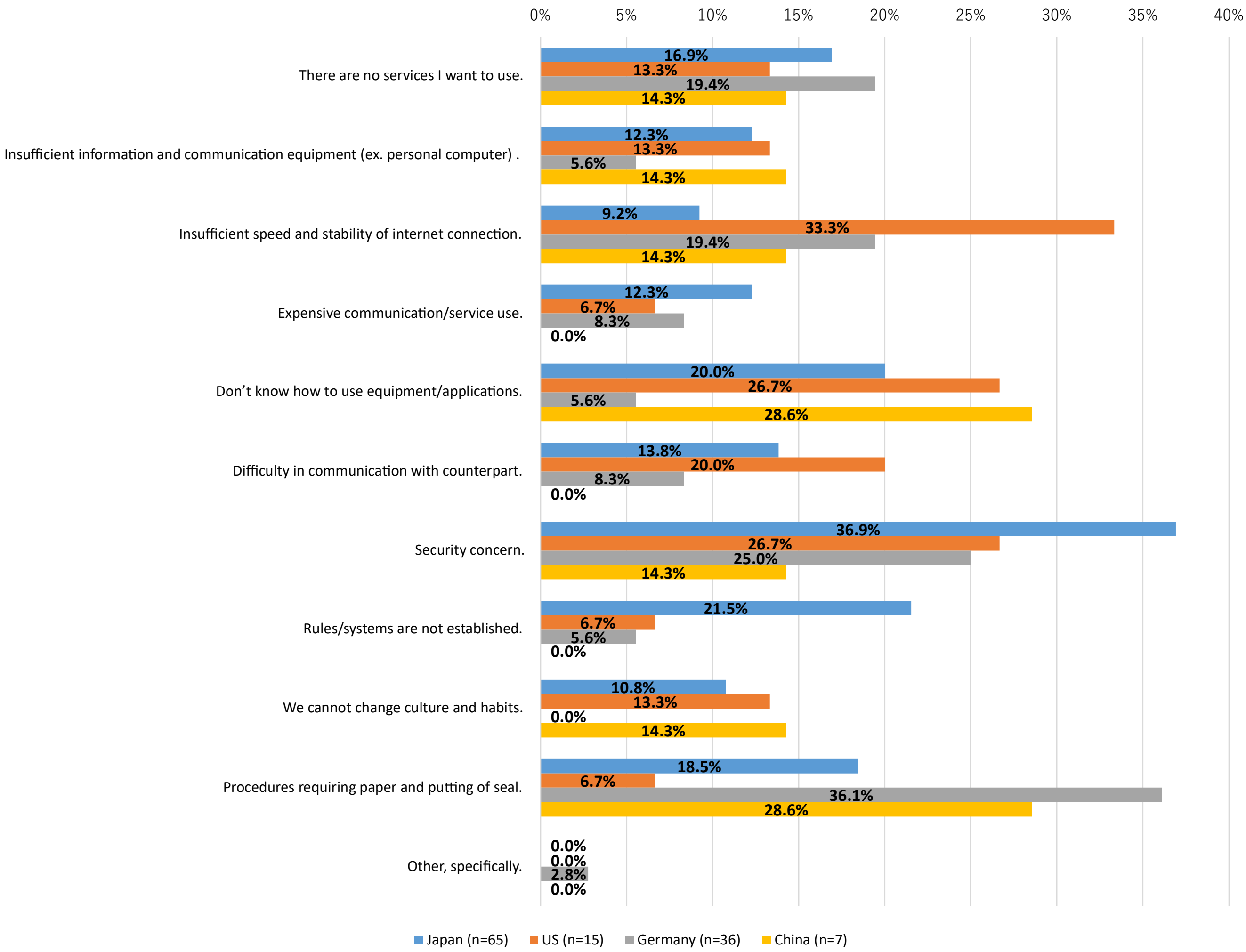
(Source) MIC (2022) "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

48. Usage situation of electronic administrative services (by country)



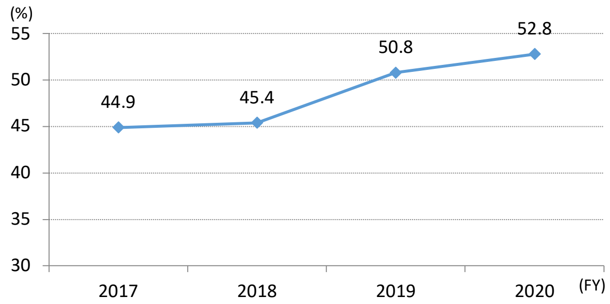
(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

49. Reasons for difficulty to use electronic administrative services (by country)



(Source) MIC (2022), "Survey Research on R&D on the Latest Information and Communications Technologies and the Trends of Use of Digital Technologies in Japan and Abroad"

51. Changes in online usage situation of 58 priority procedures to be preferentially digitalized by local governments(*1)

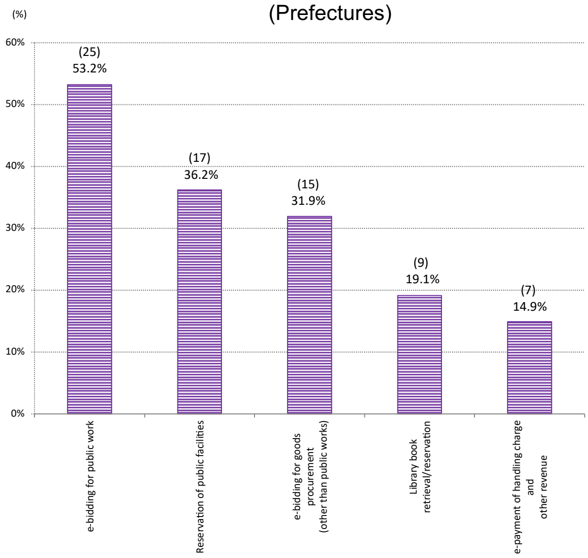


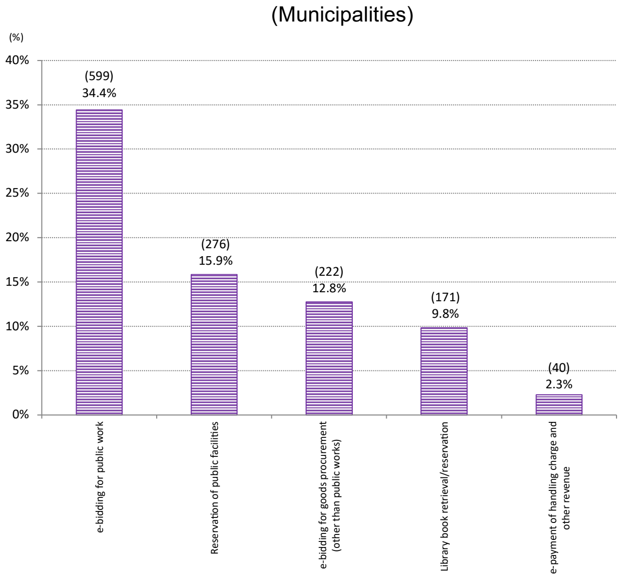
FY	Annual number of all procedures (*2)	Number of online use (*3)	Rate of online use (%)
2017	460,861,000	206,990,000	44.9
2018	473,848,000	215,065,000	45.4
2019	472,618,000	240,074,000	50.8
2020	469,638,000	247,915,000	52.8

*1 58 procedures to be preferentially digitalized by local governments are specified in the “Digital Government Action Plan” (decided by the Cabinet on December 25, 2020).
*2 Annual number of all procedures is a nationwide estimate calculated based on the number of all procedures and population of the governments that have already digitalized target procedures.
*3 The number of online use is an estimates for calculation of more accurate online use rate as is the case with the annual number of all procedures taken.

(Source) Prepared from MIC (2022), “fiscal 2020 status of online use of administrative procedures at local governments”
https://www.soumu.go.jp/main_content/000804027.pdf

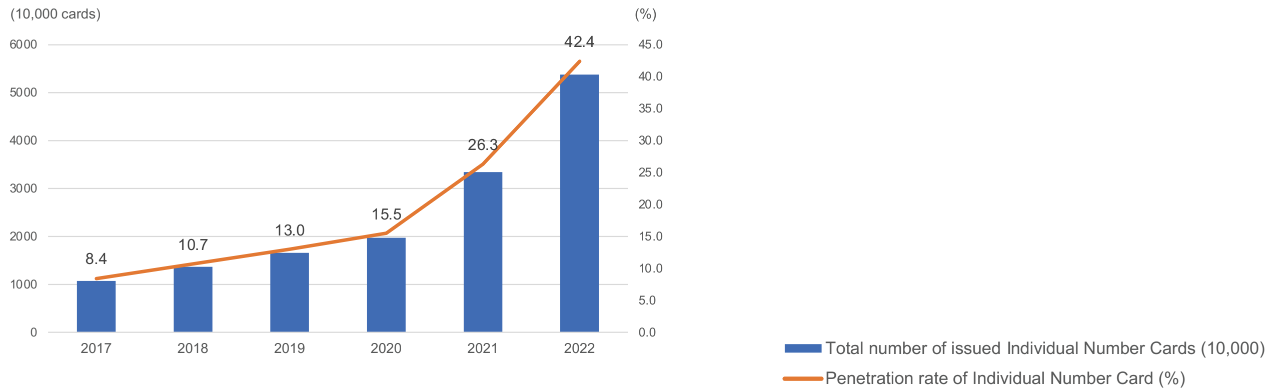
52. Joint use of various online systems (fiscal 2021)





(Source) MIC, “Summary of promotion of digital transformation/computerization of local governments – result of the 2021 survey of status of administration computerization at local governments”
https://www.soumu.go.jp/main_content/000804041.pdf

53. Penetration rate of Individual Number Card (Figure 3-8-3-2 in White Paper)



*Number of issued card as of March of each year

(Source) Prepared from MIC, “issuance status of Individual Number Card”

Section9

1. Financial status of the Japan Post Group (Figure 3-9-1-2 in White Paper)

(100 million yen)

Fiscal year	2016	2017	2018	2019	2020	2021
Ordinary revenue	133,265	129,203	127,749	119,501	117,204	112,647
Ordinary profit	7,952	9,161	8,306	8,644	9,141	9,914
Current profit	-289	4,606	4,794	4,837	4,182	5,016

(Source) Prepared from “Summary of Settlement of Accounts” of Japan Post Holding

2. Changes in operating profit/loss of Japan Post (consolidated) (Figure 3-9-1-3 in White Paper)

(100 million yen)

Fiscal year	2016	2017	2018	2019	2020	2021
Postal/physical distribution	120	419	1,213	1,475	1,237	1,022
Post office counter service	633	397	596	445	377	245
International physical distribution	56	102	103	-86	35	287
Japan Post (consolidated)	534	865	1,820	1,790	1,550	1,482

*The business segment “financial counter service” was renamed to “post office counter service” in the fiscal term ending March 2022.

(Source) Prepared from Japan Post Holdings, “Summary of Settlement of Accounts”

3. Balance of postal service

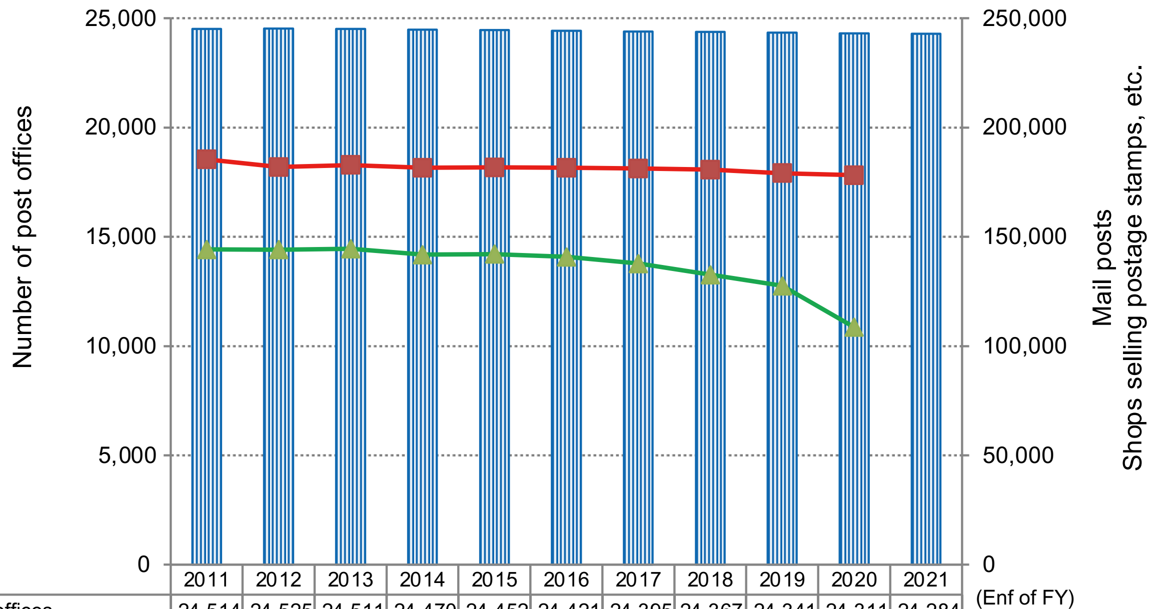
(100 million yen)

FY	2015	2016	2017	2018	2019	2020
Operating profit	123	128	242	455	376	240

*Balance of the postal service of Japan Post Co., Ltd.

(Source) Prepared from Japan Post Co., Ltd., “Status of postal service balance”

4. Changes in the number of postal-service-related facilities (Figure 3-9-1-4 in White Paper)



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Post offices	24,514	24,525	24,511	24,470	24,452	24,421	24,395	24,367	24,341	24,311	24,284
Mail posts	185,409	181,895	182,839	181,521	181,692	181,523	181,221	180,774	179,129	178,211	-
Shops selling postage stamps, etc. and places selling stamps	144,155	144,153	144,504	141,888	142,104	140,881	137,790	132,613	127,633	108,624	-

(Source) Prepared from materials disclosed by Japan Post Group, and Japan Post’s website “Information on the number of postal offices (open data)”

5. Breakdown of the number of post offices (end of fiscal 2021)

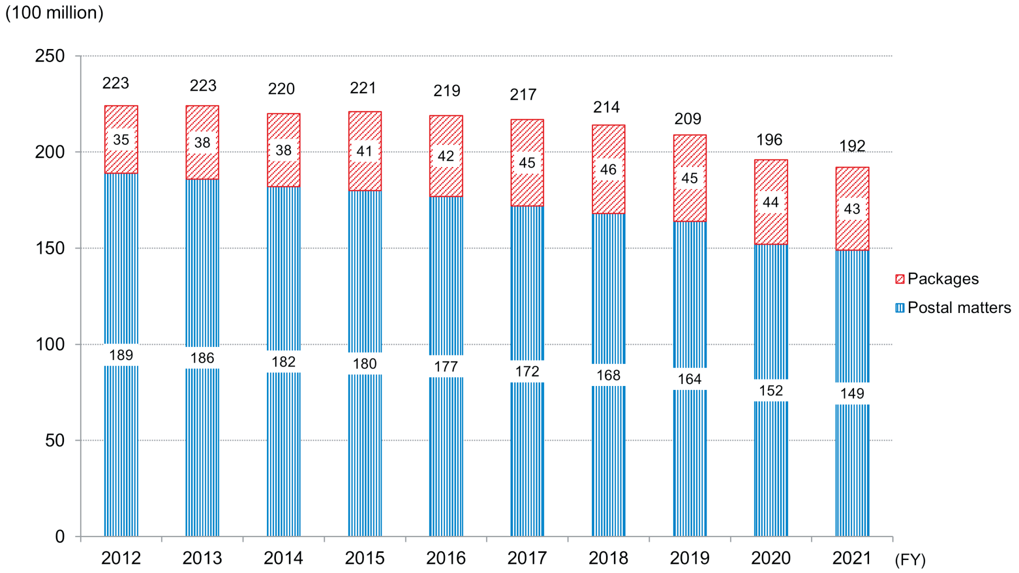
(Unit: offices)

Post offices in operation				Currently closed post offices				Total
Directly managed post offices		Simple post office	Subtotal	Directly managed post offices		Simple post offices	Subtotal	
Post offices	Branch offices			Post offices	Branch offices			
20,041	9	3,676	23,726	95	0	463	558	24,284

*"Simple post office" refers to post offices operating based on a contract.
*"Currently closed post office" refers to post offices temporarily closed and suspending counter services.
*30 of the 95 "directly managed post offices" of "currently closed post offices" are temporarily closed due to the impact of the Great East Japan Earthquake.
*10 of the 463 "simple post offices" of "currently closed post offices" are temporarily closed due to the impact of the Great East Japan Earthquake.

(Source) Prepared from Japan Post Co., Ltd. Website, "Information on the number of postal offices (open data)"
https://www.post.japanpost.jp/notification/storeinformation/index02.html

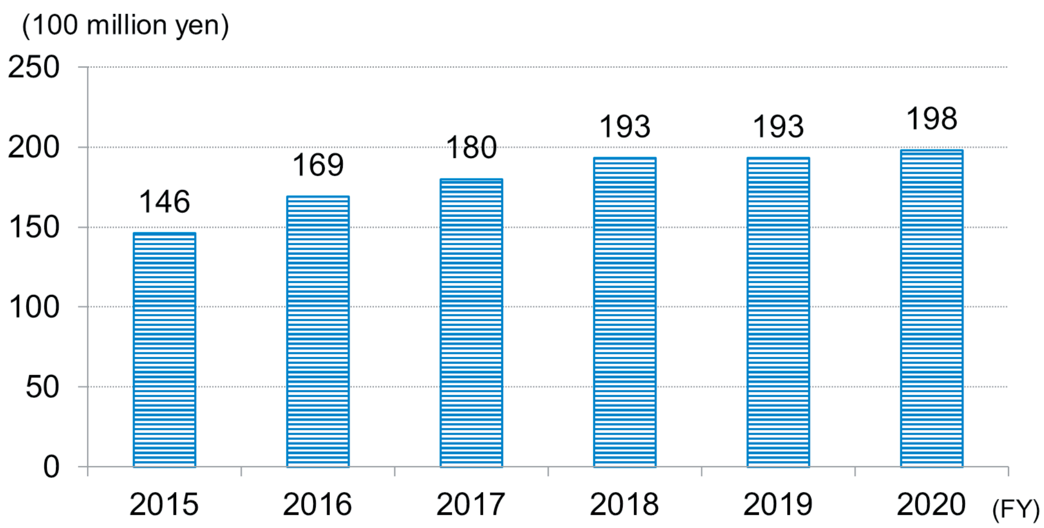
6. Changes in the total number of accepted postal matters (Figure 3-9-1-5 in White Paper)



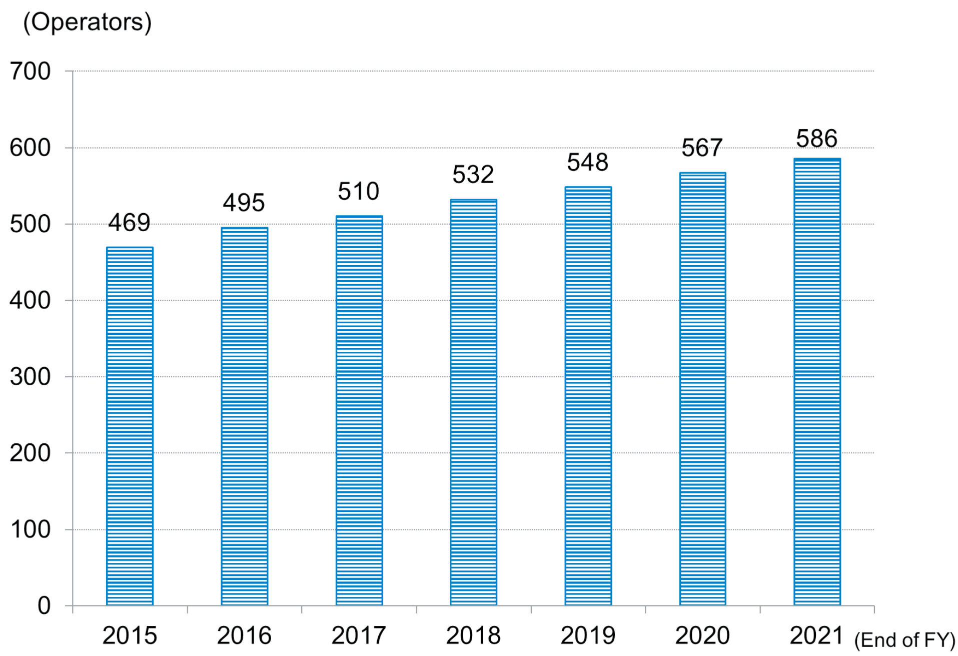
* Yu-pack and Yu-mail are not small parcels under the Postal Act, but freight under the Motor Truck Transportation Business Act

(Source) Japan Post material, annual "Number of accepted postal matters, etc."

7. Changes in the sales of correspondence delivery service operators (Figure 3-9-2-1 in White Paper)



8. Changes in the number of correspondence delivery service operators (Figure 3-9-2-2 in White Paper)



9. Changes in the number of business operators by type of service (specified correspondence delivery service)

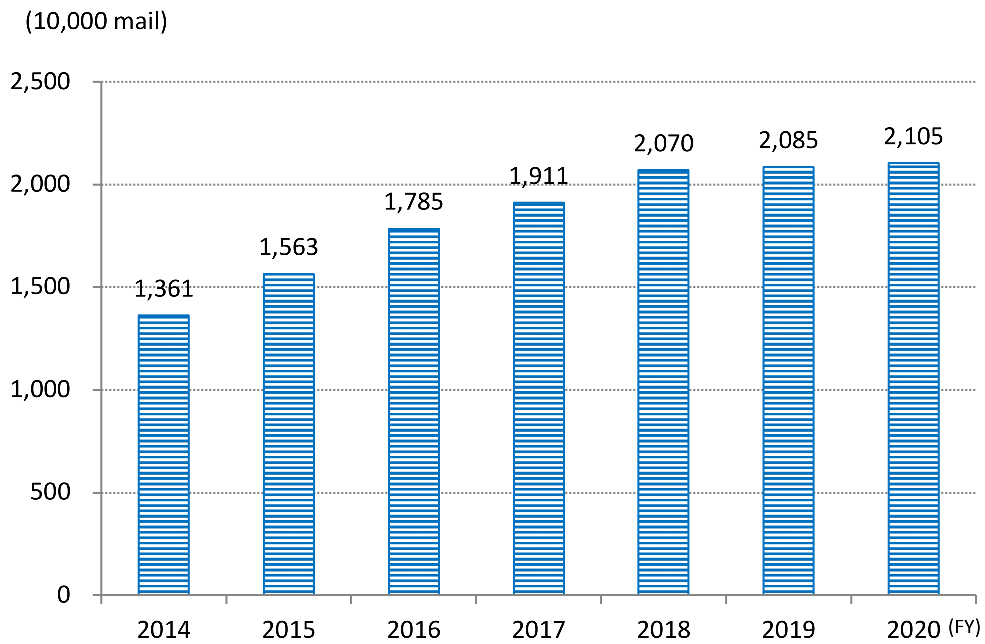
(Unit: business operators)

(End of FY)	2014	2015	2016	2017	2018	2019	2020	2021
Class 1 Service	377	412	436	449	467	482	500	519
Class 2 Service	112	112	113	112	110	108	107	104
Class 3 Service	227	245	262	268	283	291	298	308

*The numbers do not agree with the number of the businesses who entered the market because some of them provide more than two types of services.

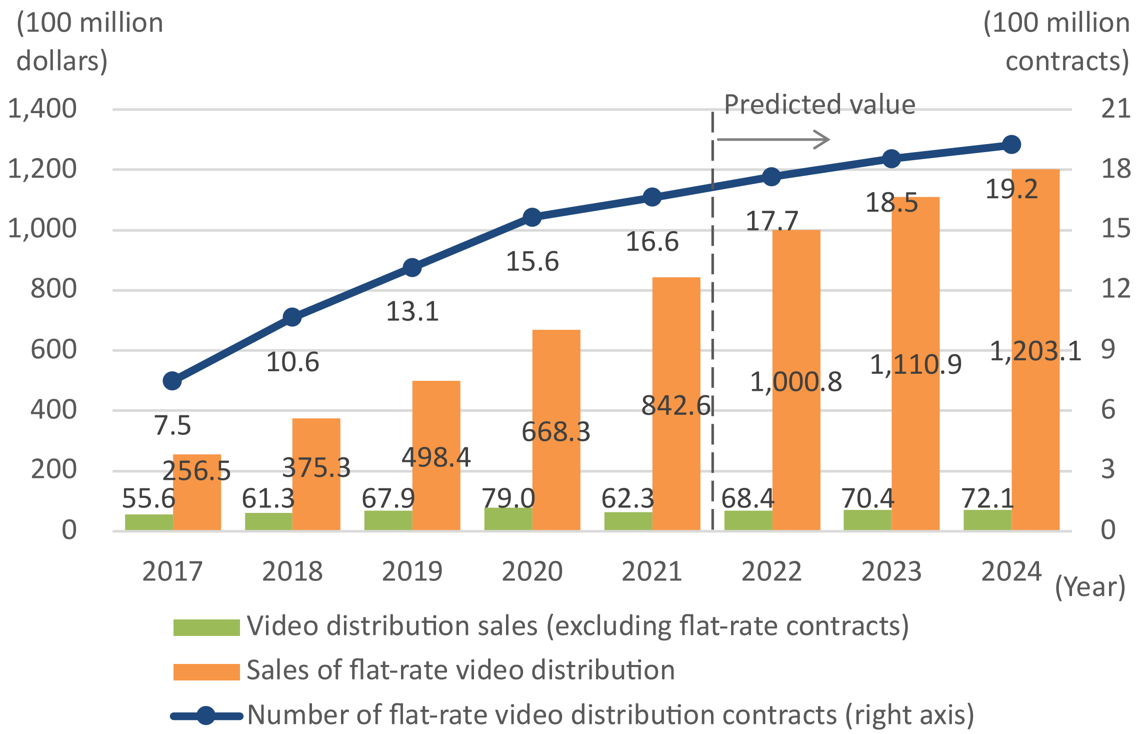
・Class 1 Service: delivery of correspondence mail whose sum of the length, width and height is over 73cm or whose weight is over 4kg
・Class 2 Service: delivery of correspondence mail within 3 hours from the time of its receipt
・Class 3 Service: delivery of correspondence mail the postage of which exceed 800 yen in Japan

10. Changes in the amount of accepted correspondence mail



Related data

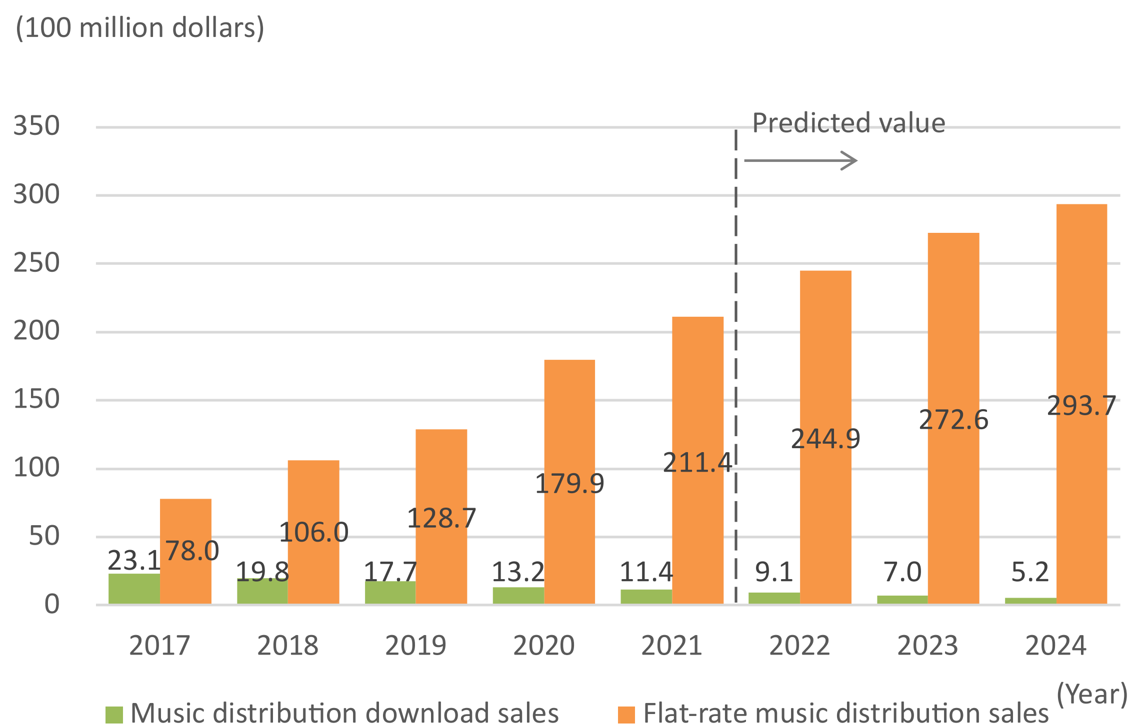
1. Changes and forecasts for the size of the global video distribution markets and the number of contracts



* Regarding the number of contracts for subscription video streaming services (right axis), the figures of 2020 have been revised downward from the figures in the 2021 White Paper on Information and Communications, due to the change in the aggregation target to continuous use contracts.

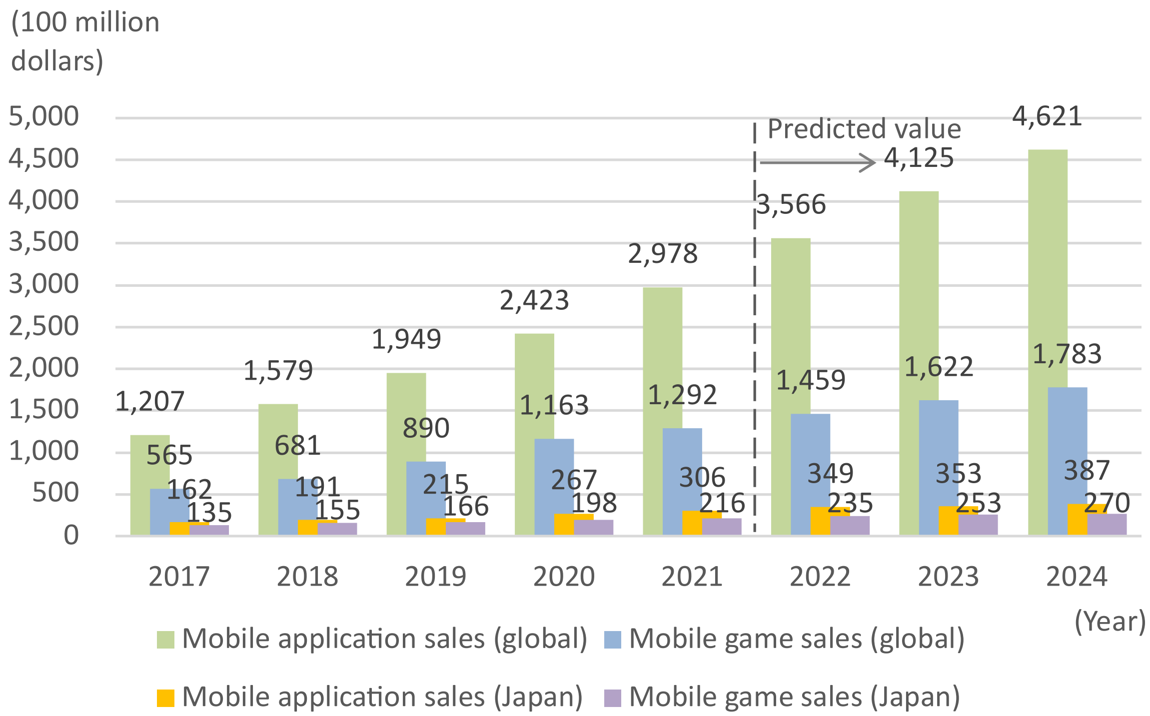
（Source）Omdia

2. Changes and forecasts for the size of the global music distribution market



（Source）Omdia

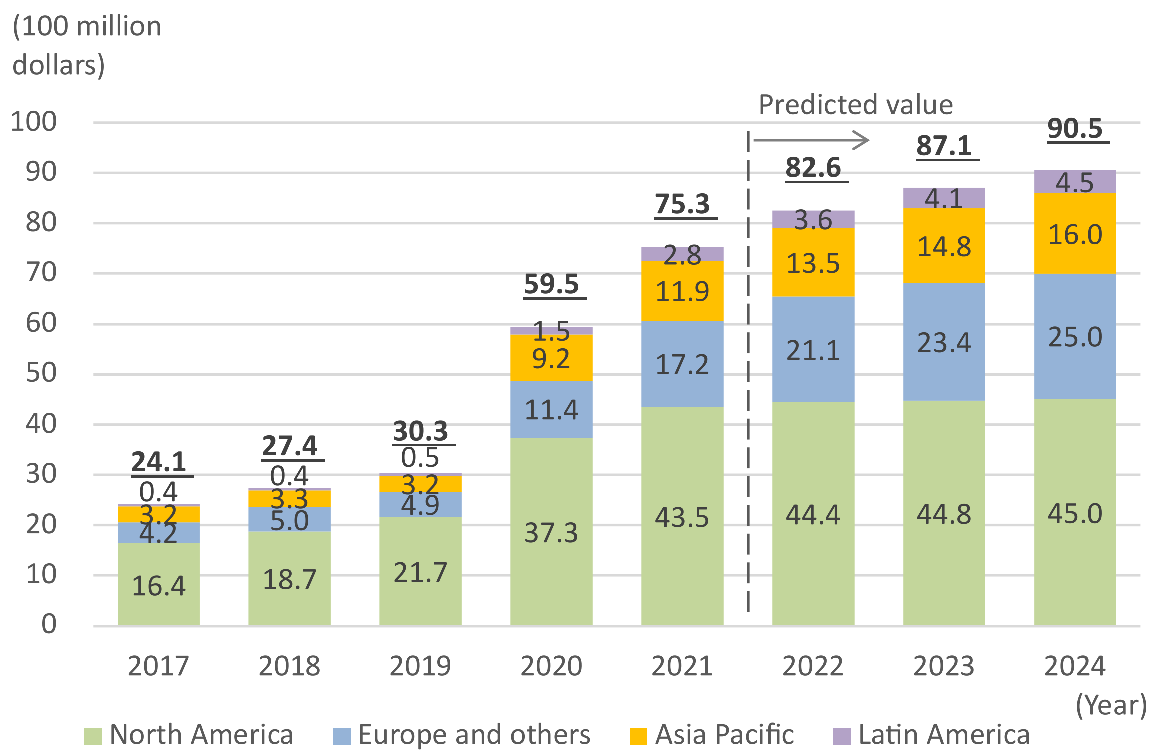
3. Changes and forecasts for the size of the global mobile application market



* Due to adding advertising revenue to aggregation targets, each figure from 2017 to 2020 has been revised downward from the figures in the 2021 White Paper on Information and Communications.

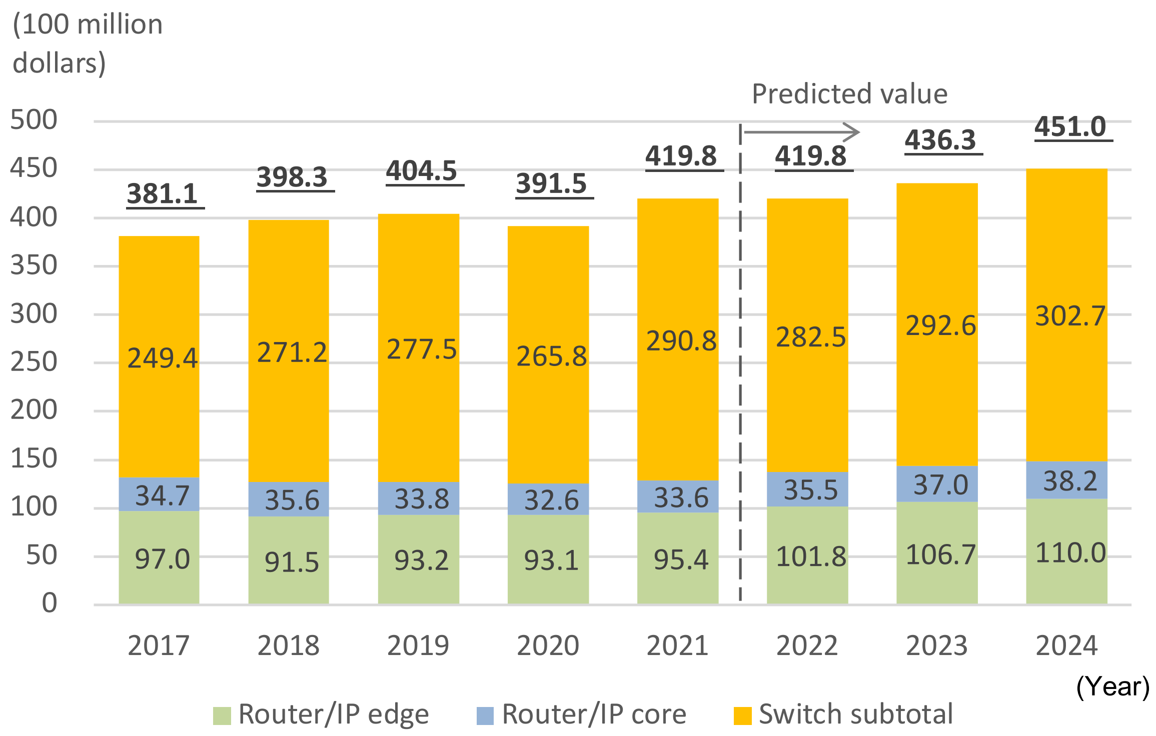
（Source）Omdia

4. Changes and forecasts for the size of the global Web conference market



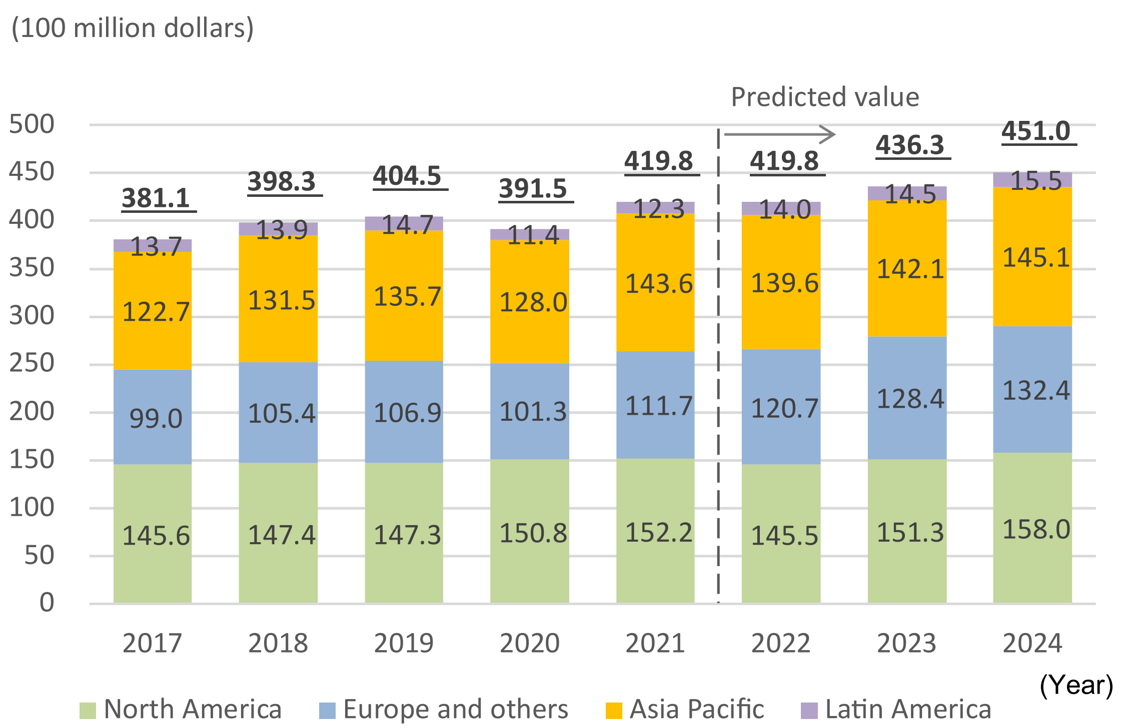
（Source）Omdia

5. Changes and forecasts for the size of the global router/switch market (by category)



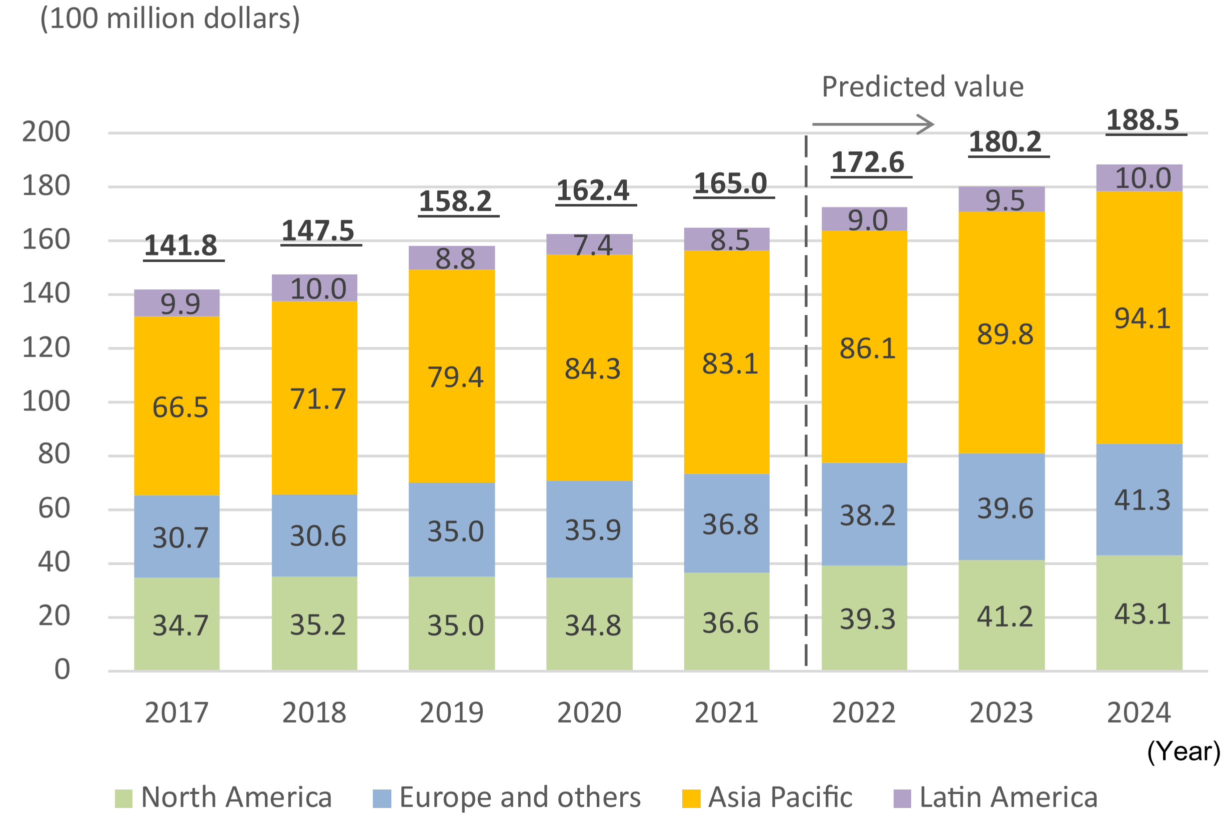
（Source）Omdia

6. Changes and forecasts for the size of the global router/switch market (by region)



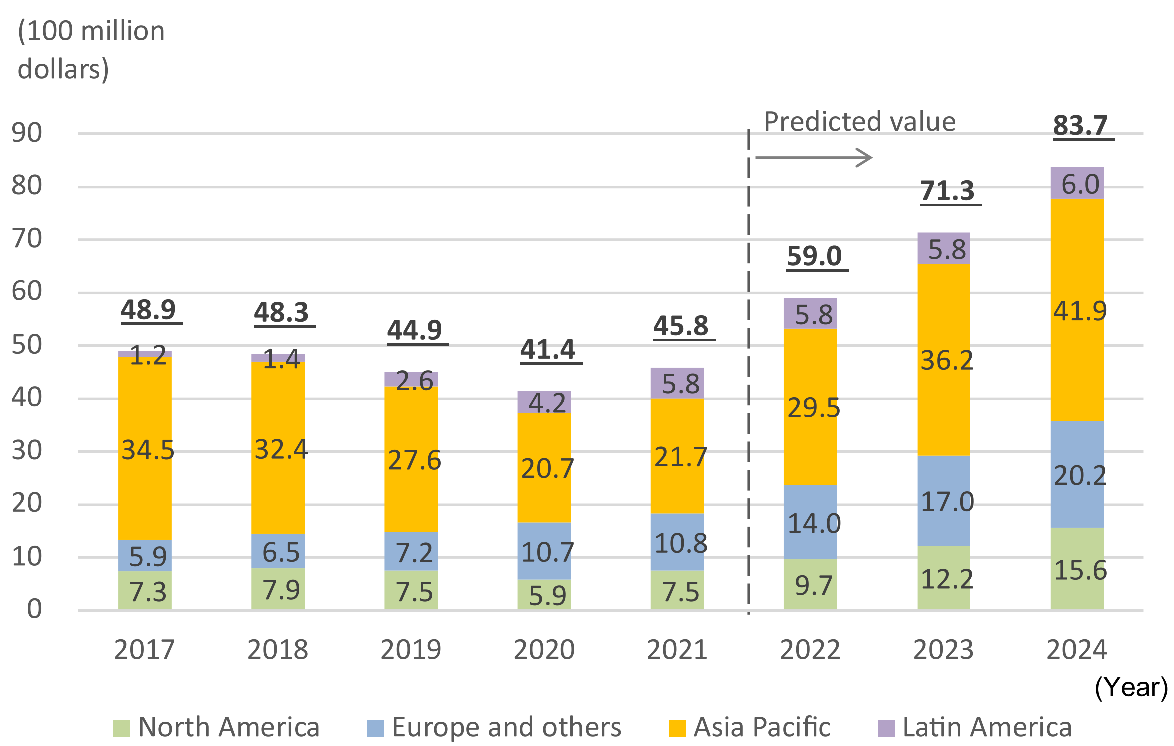
（Source）Omdia

7. Changes and forecasts for the size of the global optical transmission equipment market



（Source）Omdia

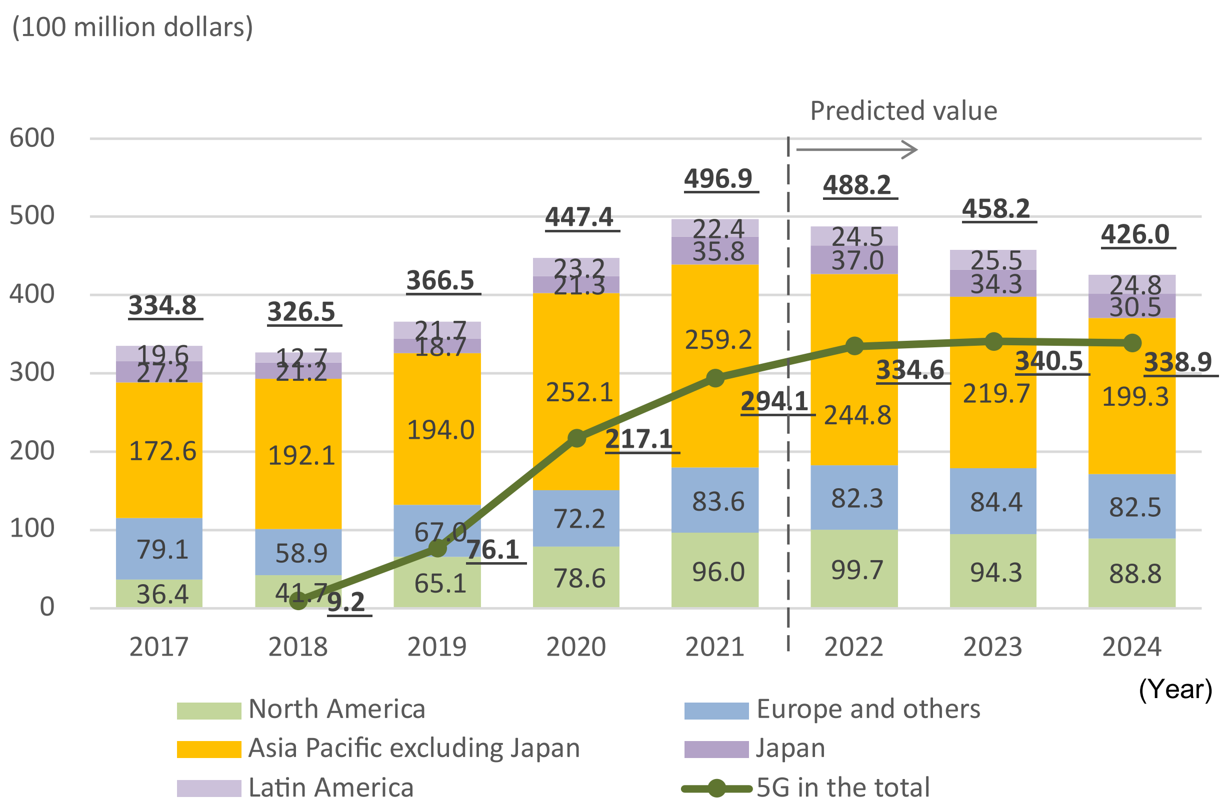
8. Changes and forecasts for the size of the global FTTH equipment market



* It targets FTTH CPE (Consumer Premise Equipment) including Broadband Gateway, ONT and PON.

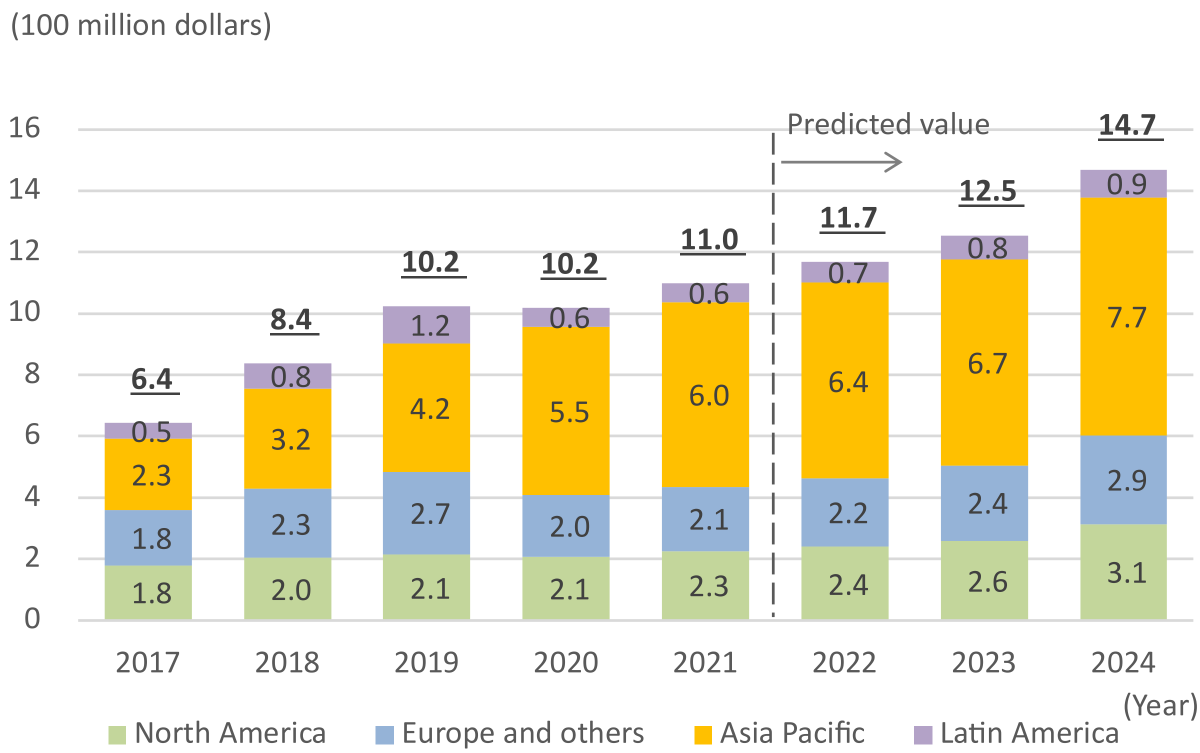
（Source）Omdia

9. Changes and forecasts for the size of the global macrocell base station market



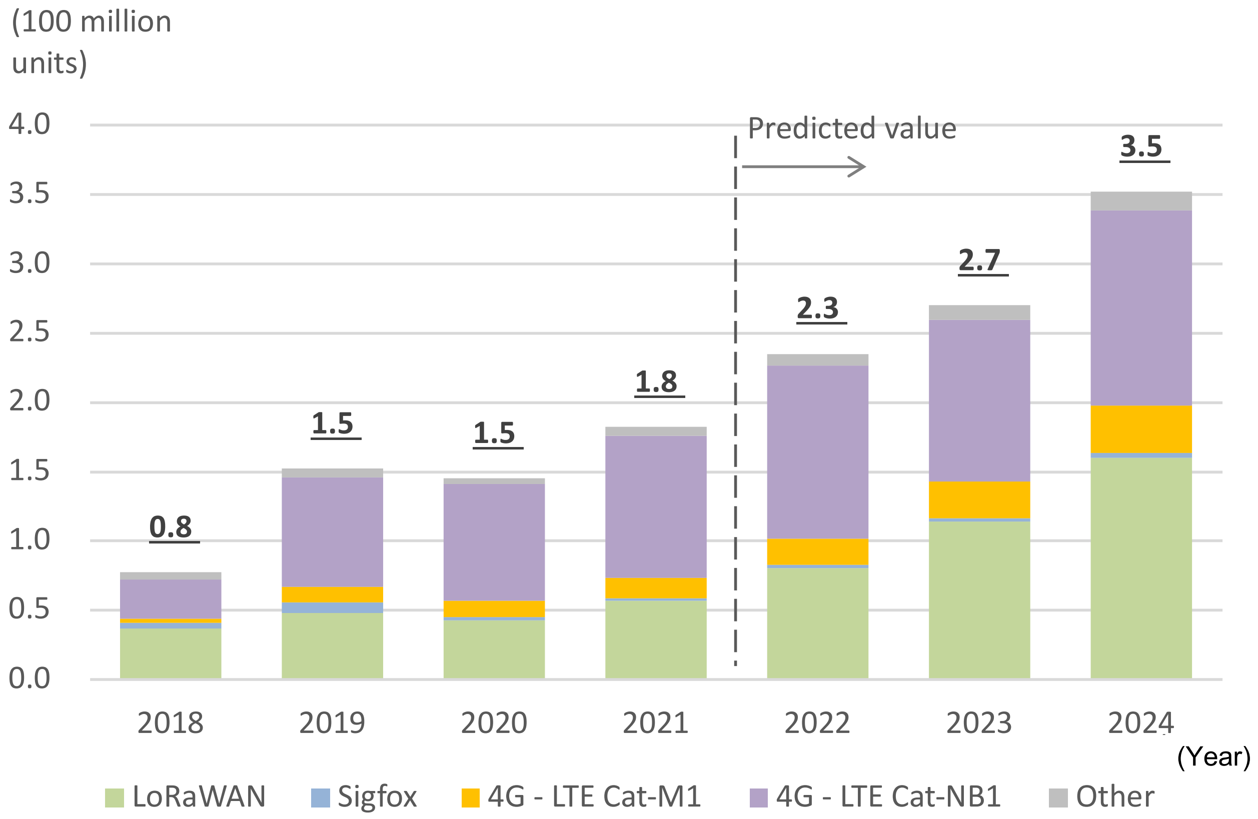
（Source）Omdia

10. Changes and forecasts for the size of the global indoor small cell market



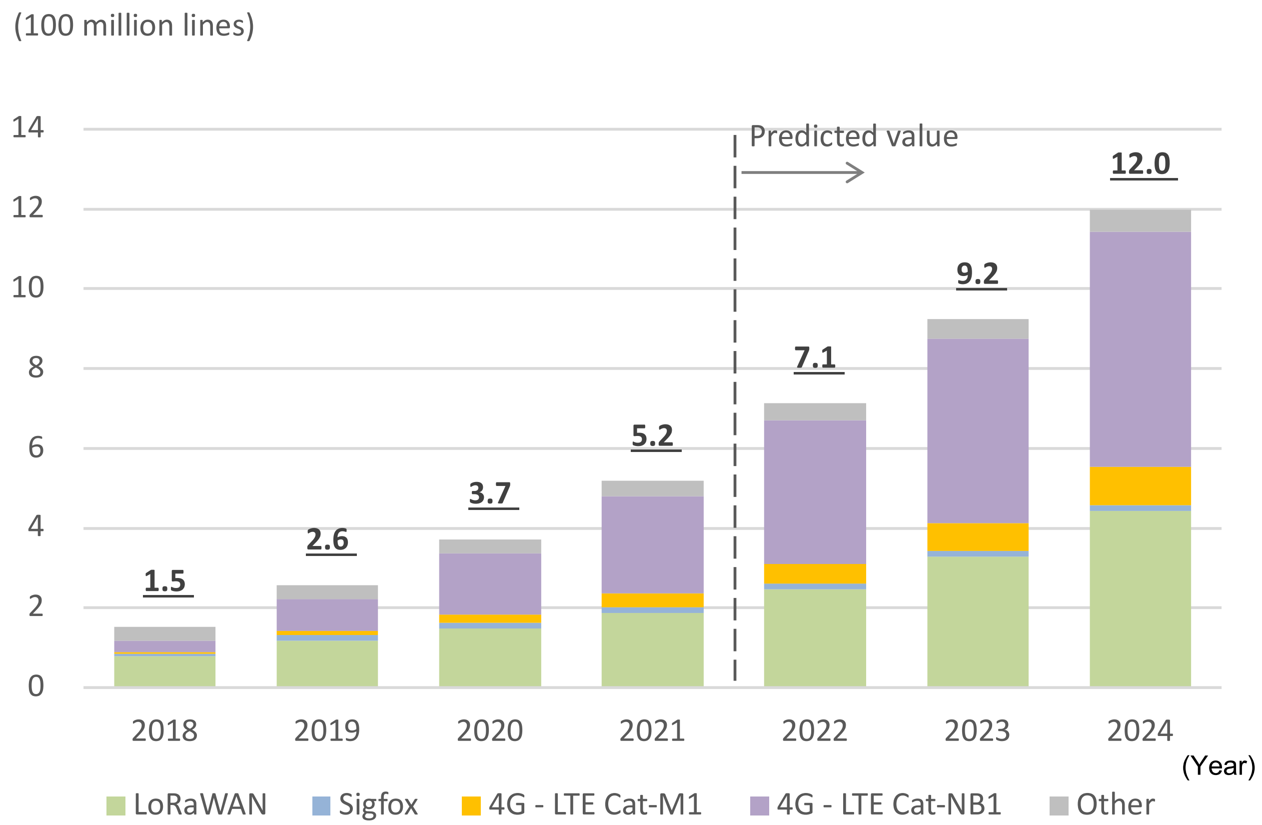
（Source）Omdia

11. Changes and forecasts for the number of global shipments of IC for LPWA module



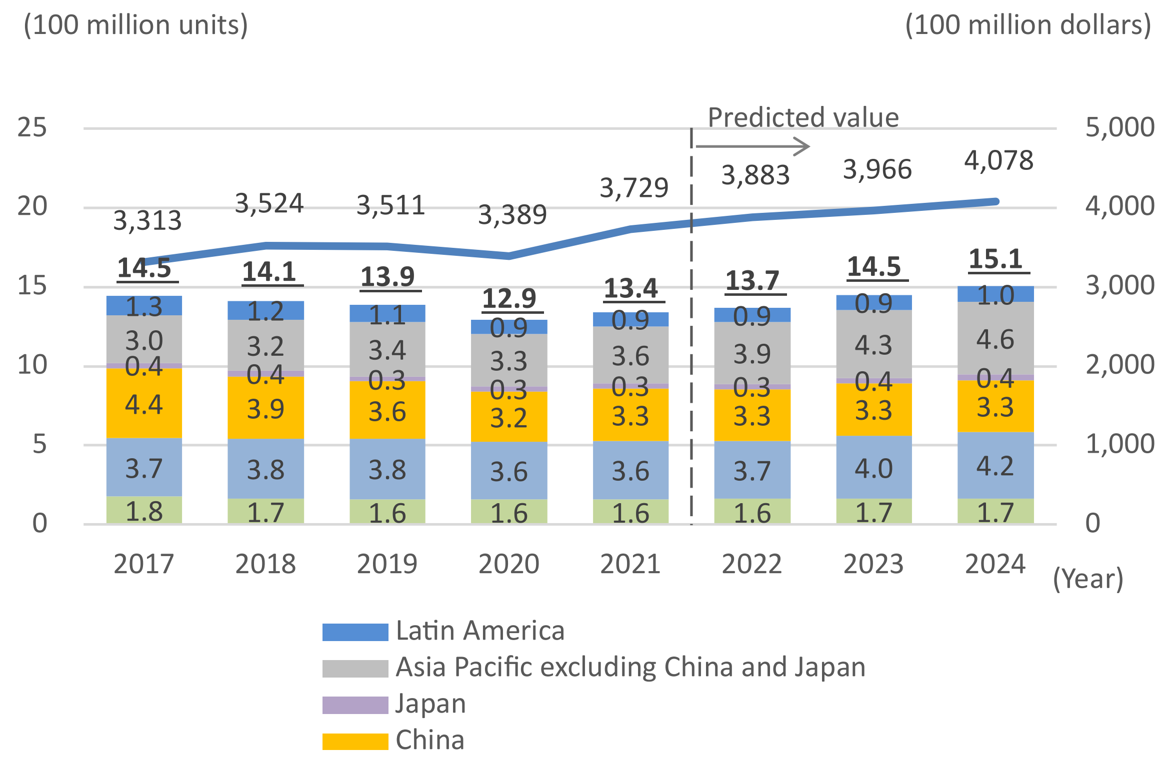
（Source）Omdia

12. Changes and forecasts for the number of global LPWA connection lines



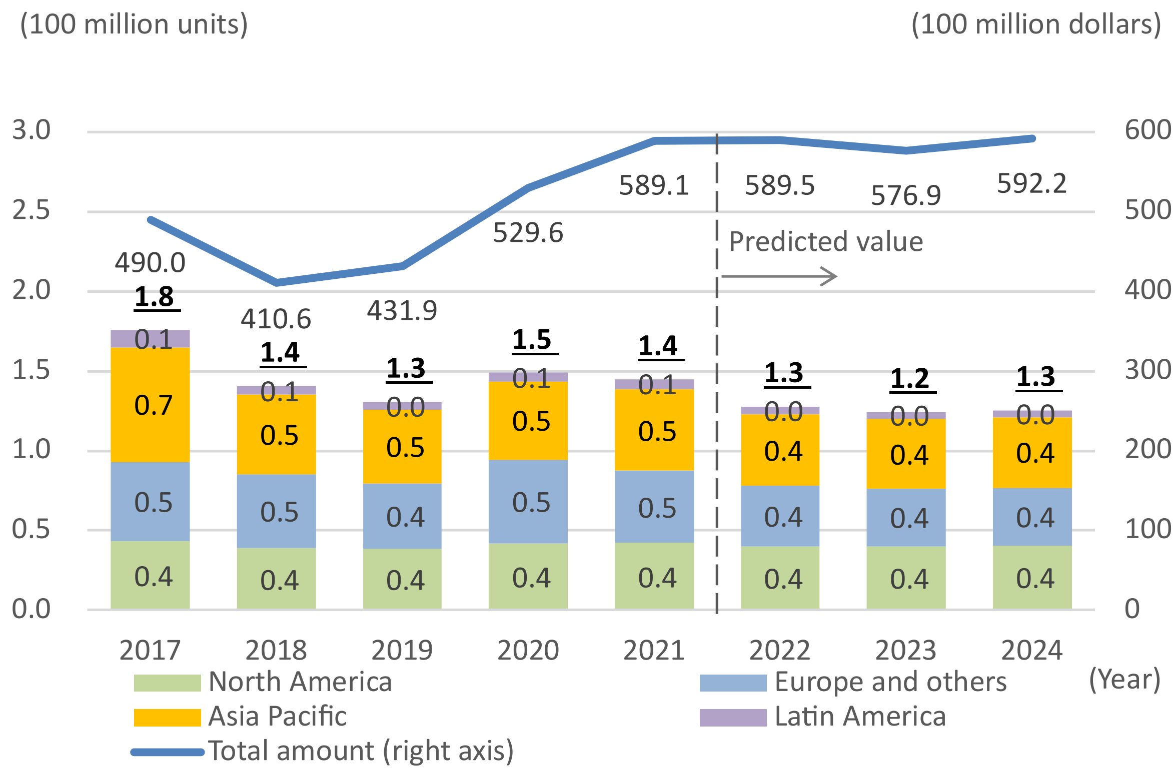
（Source）Omdia

13. Changes and forecasts for the size of the global smartphone market and the number of shipments



（Source）Omdia

14. Changes and forecasts for the size of the global tablet market and the number of shipments

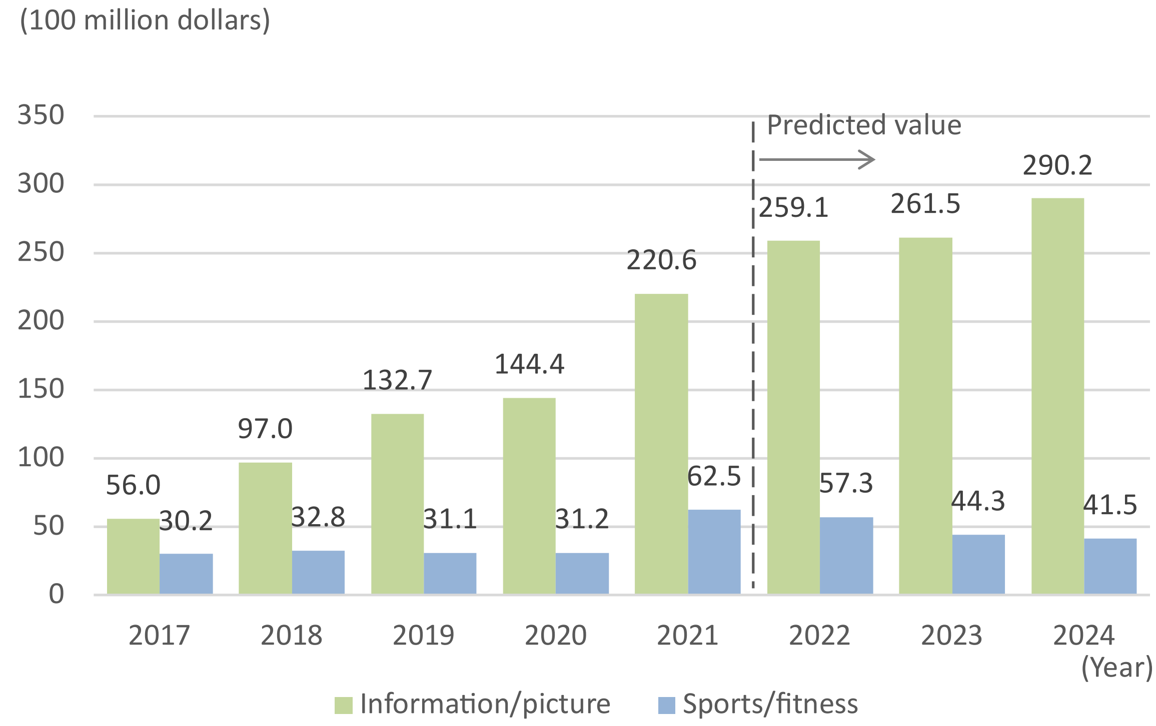


* Regarding the number of shipments, the figures of 2018 have been revised downward from the ones in the 2021 White Paper on Information and Communications, due to the change in the aggregation of part of the aggregation target to the personal computer item.

* Regarding the market size, the figures from 2017 to 2020 have been revised upward from the ones in the 2021 White Paper on Information and Communications, due to tablet terminals in addition to the existing tablet PCs. The number of shipments has already included tablets.

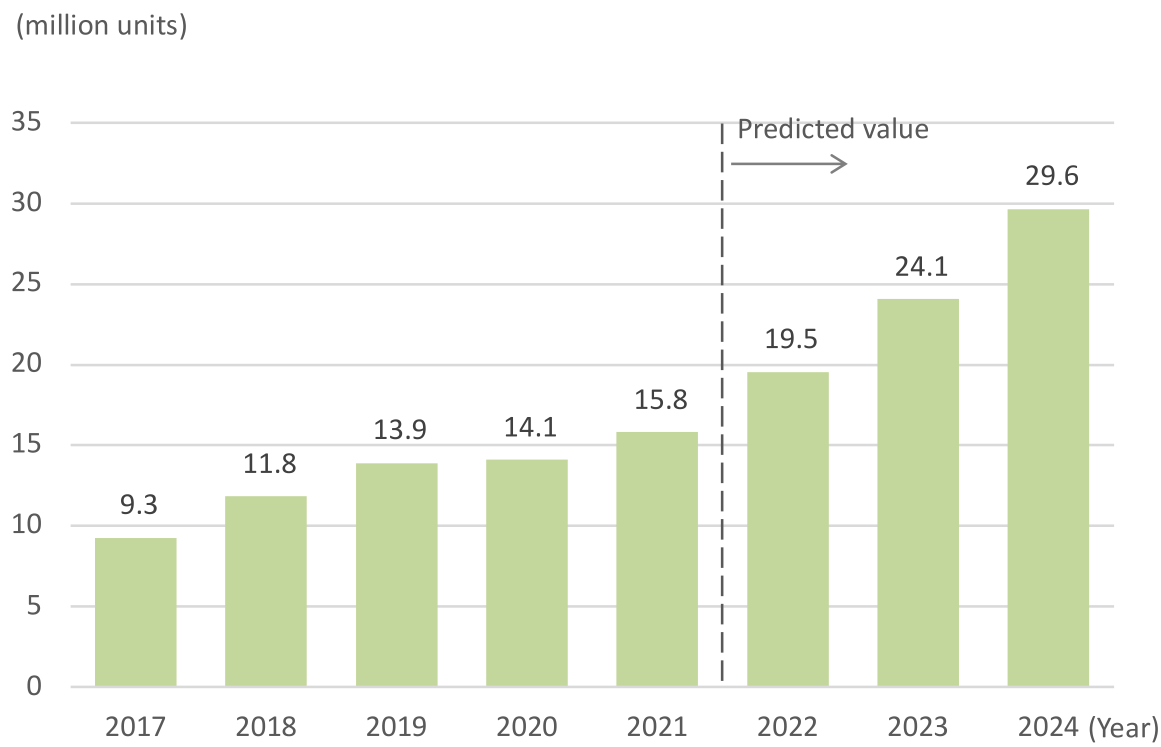
（Source）Omdia

15. Changes and forecasts for the size of the global wearable terminal market



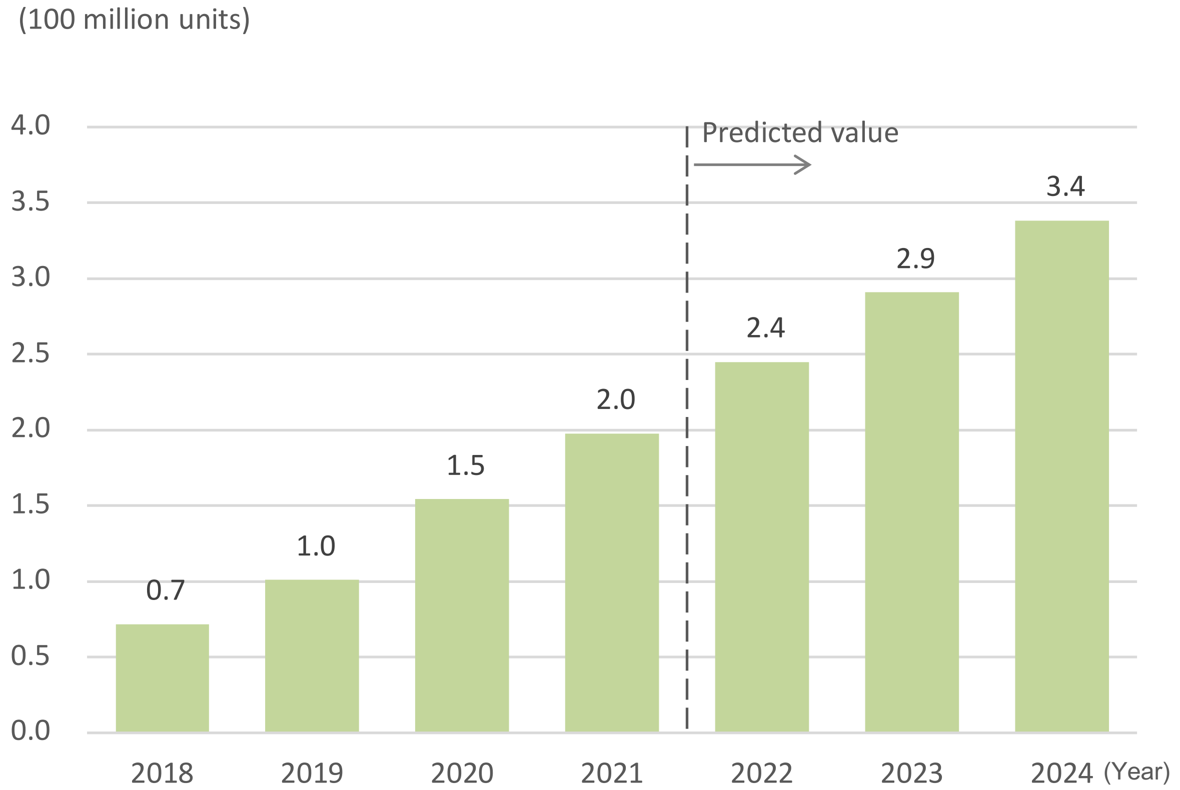
(Source) Omdia

16. Changes and forecasts for the size of the global domestic/consumer robot market and the number of shipments



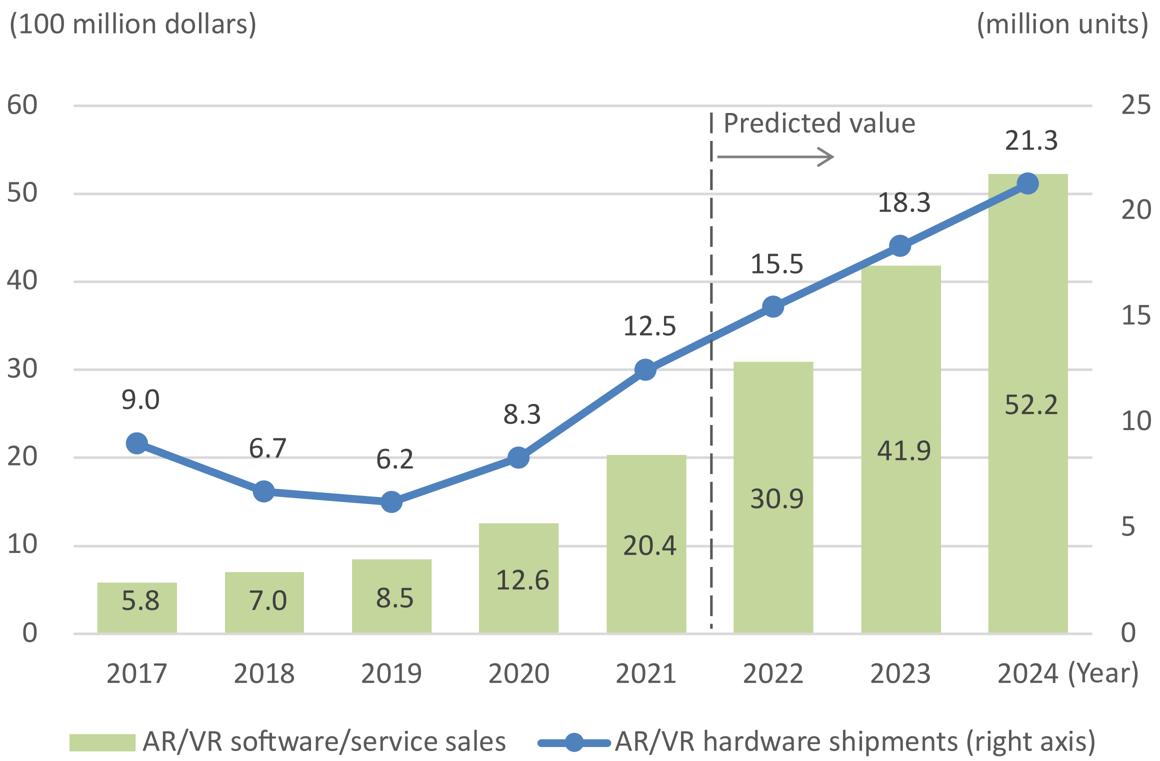
(Source) Omdia

17. Changes and forecasts for the number of global AI speaker (smart speaker) shipments



（Source）Omdia

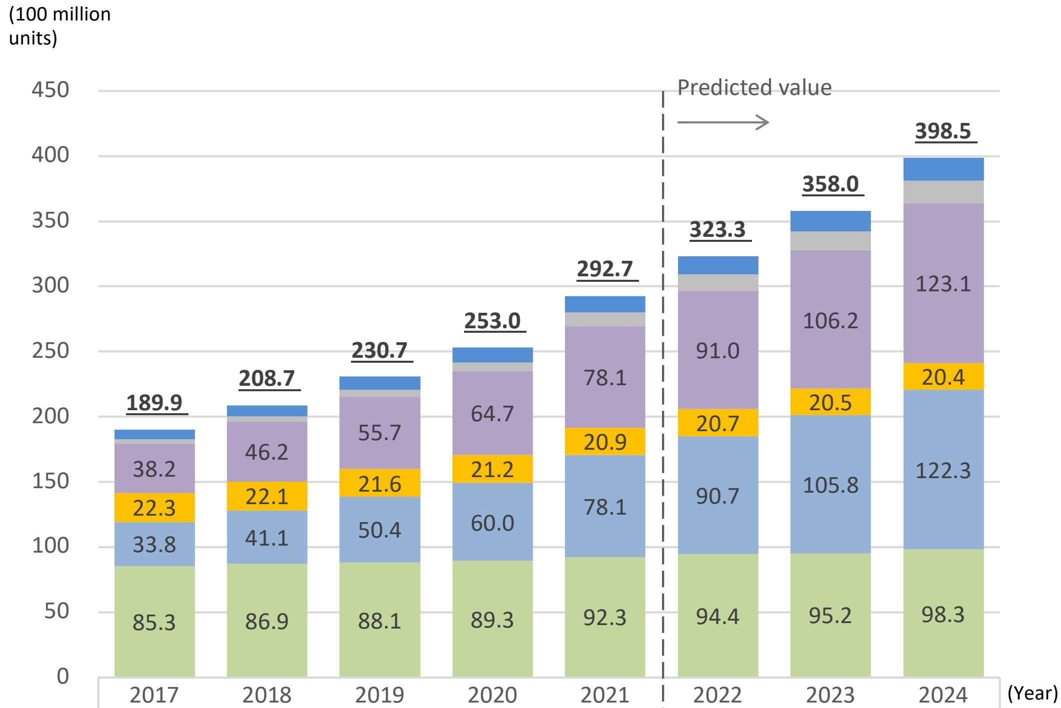
18. Changes and forecasts for the size of the global AR/VR market and the number of shipments



* Both figures of AR/VR software/service sales and AR/VR hardware shipments (right axis) for 2017 to 2020 have been revised downward from the ones the 2021 White Paper on Information and Communications, due to the elimination of duplication between regions.

（Source）Omdia

19. Changes and forecasts for the number of global IoT devices



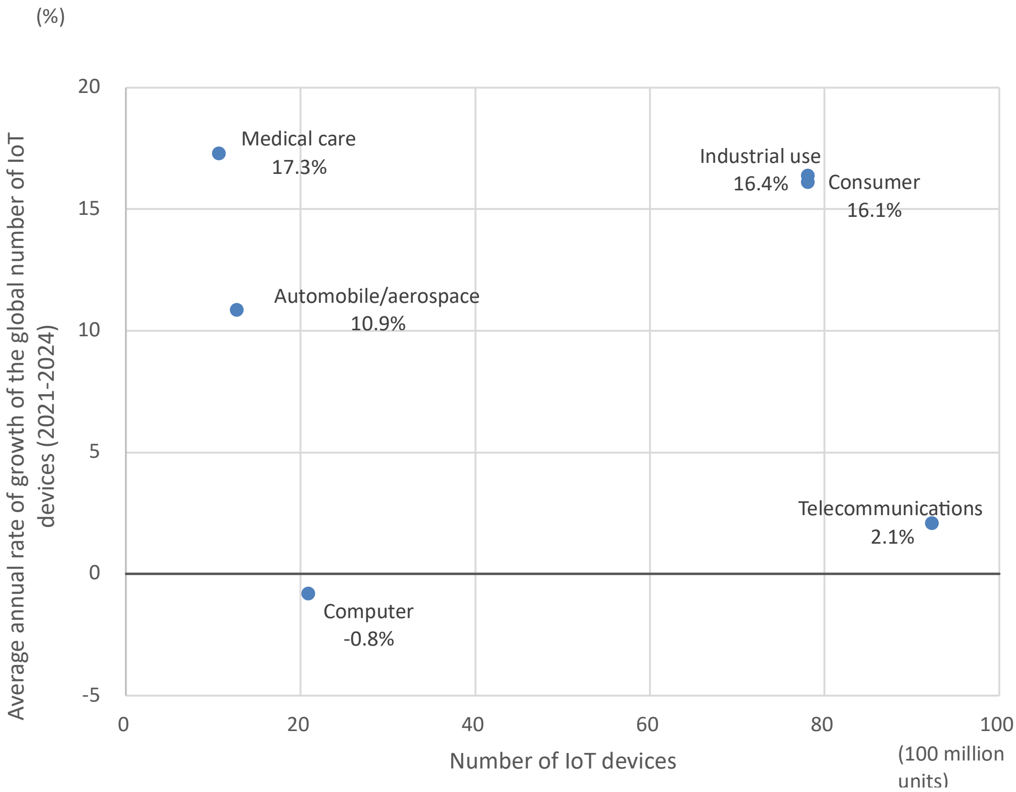
	2017	2018	2019	2020	2021	2022	2023	2024
Total	189.9	208.7	230.7	253.0	292.7	323.3	358.0	398.5
Automobile/aerospace	7.1	8.5	9.8	11.3	12.7	14.2	15.7	17.3
Medical care	3.3	4.0	5.1	6.5	10.7	12.5	14.6	17.2
Industrial use	38.2	46.2	55.7	64.7	78.1	91.0	106.2	123.1
Computer	22.3	22.1	21.6	21.2	20.9	20.7	20.5	20.4
Consumer	33.8	41.1	50.4	60.0	78.1	90.7	105.8	122.3
Telecommunications	85.3	86.9	88.1	89.3	92.3	94.4	95.2	98.3

* According to Omdia's definition, an IoT device is a device that has a unique IP address and can connect to the Internet, or a terminal that is used as the end of a sensor network.

* Definition for categorization
“Telecommunications”: Fixed-communication infrastructure network equipment, 2G, 3G and 4G band cellular communication, Wi-Fi WIMAX and other wireless communication infrastructure and terminals
“Consumer”: Home appliances (white goods, digital devices), printer and other computer peripherals, portable audio devices, smart toys, sports/fitness, etc.
“Computer”: Laptop personal computers, desktop personal computers, servers, workstations, mainframe super computers and other computing equipment
“Industrial use”: Automation (IA/BA), lighting, energy-related use, security, inspection/measurement equipment and other equipment for industrial use other than automation
“Medical care”: Diagnostic imaging apparatus and other medical equipment, consumer healthcare equipment, other test equipment (blood glucose meter, electrocardiograph and other wearable examination equipment). Other test equipment is subject to aggregation from 2021 figures.
“Automobile, Military, Aerospace”: Equipment connectable to the internet for the control system and for information system, Military/aerospace equipment: (ex. monitoring system for military use, electric/instrumentation equipment for aircraft cockpit, equipment for passenger system)

（Source）Omdia

20. Global number and growth-rate forecasts for IoT devices by sector/industry



（Source）Omdia

Chapter 4

Section1

2. Basic approach toward the realization of Society 5.0 (Figure 4-1-2-2 in White Paper)

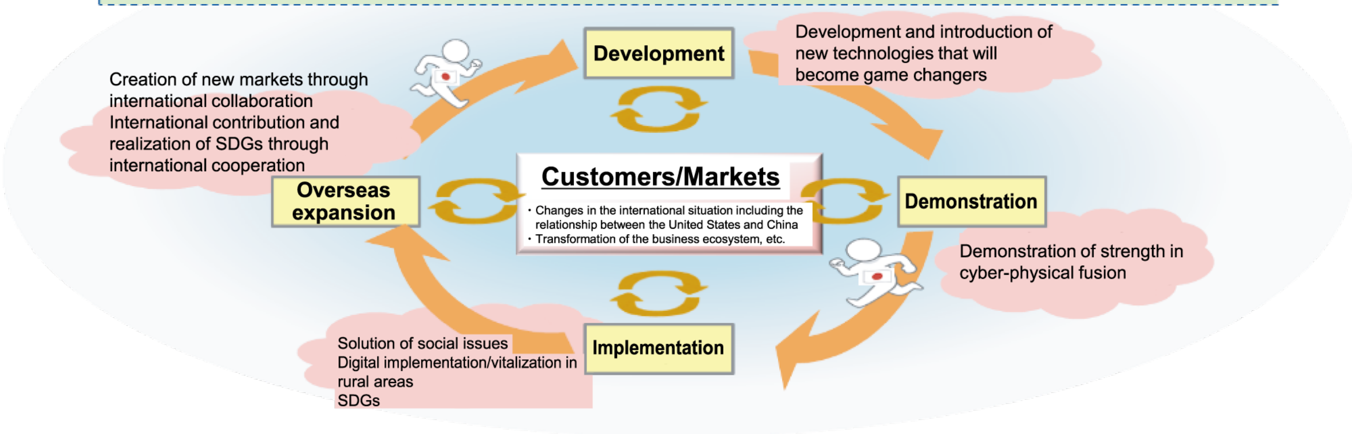
Information and communications policies to support Society 5.0 and economic security

In order to ensure the independence, existence and prosperity of Japan, we aim to ensure strategic autonomy and to acquire strategic indispensability of the information and communications industry which is playing an increasing role as a strategic core industry.

(1) Advancement and maintenance of information and communications infrastructure that supports Society 5.0
(2) Maintaining and strengthening of international competitiveness of the information and communications industry (R&D, solutions, human resources)
(3) Construction of a free and highly reliable information space

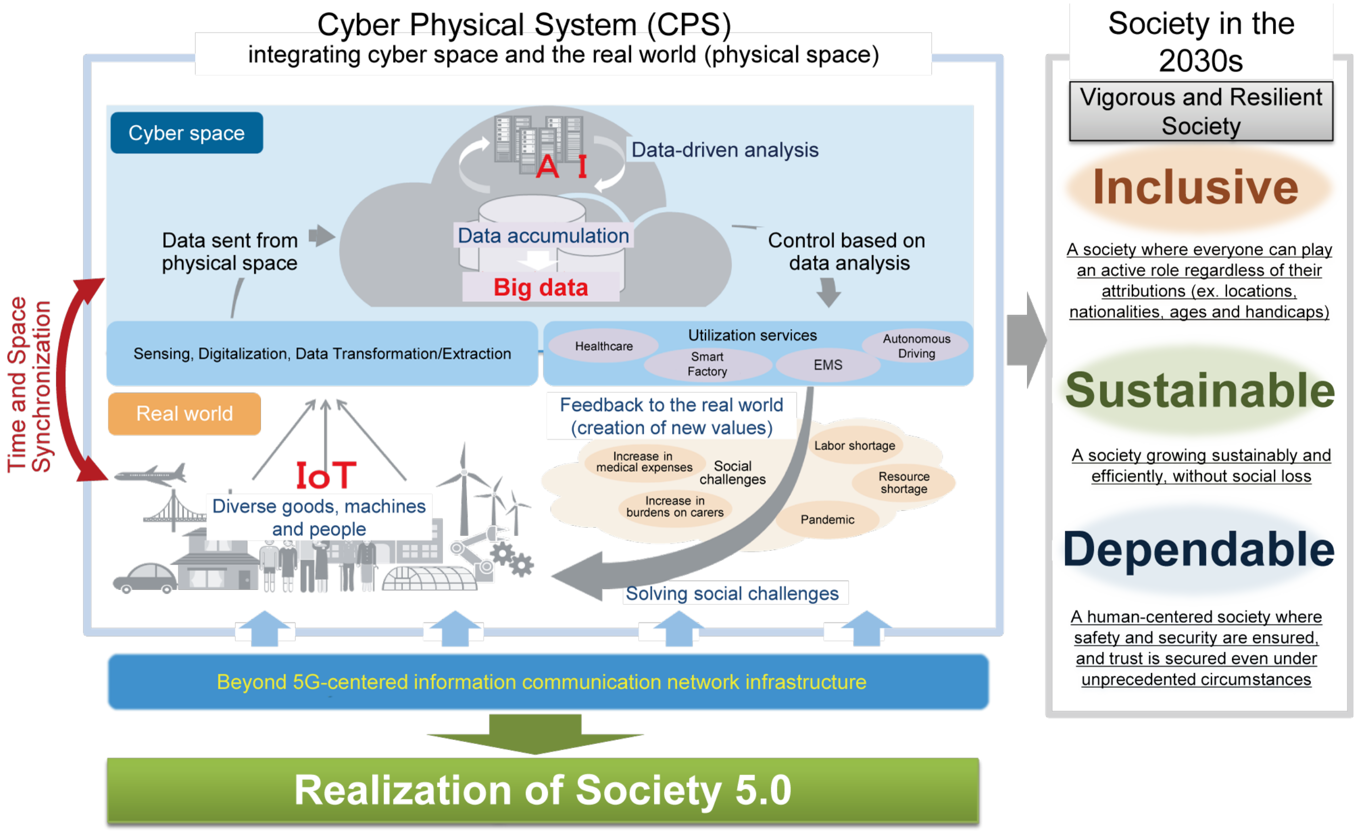
Resilient and vigorous society in the 2030s (Society 5.0)

- ✓ **Inclusive: society where everyone can be active**
- ✓ **Sustainable: society which sustainably growing**
- ✓ **Dependable: society that enables activities with security**



Section7

1. Society expected in the 2030s (Figure 4-7-1-1 in White Paper)



(Source) Beyond 5G Promotion Strategy (MIC in June 2020)

2. Science, Technology, and Innovation Basic Plan (Cabinet Decision in March 2021) for the entire government

Recognition of the Current Situation

Changes in the Situation at Home and Abroad

- ○ Beginning of a reorganization of the world order and increasingly intense leadership competition among countries surrounding science, technology, and innovation (STI)
- ○ Manifestation of global agenda threats such as the climate crisis
- ○ Information monopoly by IT platformers and uneven distribution of great wealth

Accelerate

Expansion of the Novel Coronavirus Infection

- ○ Major Changes in the International Community
  - Rapid social changes in order to prevent the spread of the infection and to maintain economic activities
  - Disruption of the supply chain pressing each country to review the sustainability and resilience of its economy
- ○ Rapidly Changing Life in Japan
  - Transition to a new lifestyle such as work-from-home and online education

Review of STI Policies

- ○ Digitalization for digitalization's sake and relative decline in research capabilities
  - Digitalization focuses on improving efficiency of existing operations and the original power of ICT is not being fully utilized.
  - Decline of international standing for research papers and severe research environment continues
- ○ Revision of the Basic Act on Science and Technology
  STI policies should contribute to comprehensive understanding and problem solving of human beings and society through the "convergence of knowledge" that fuses the natural sciences with humanities and social science

Balancing response to global issues with the reform of social structures in Japan is essential

Society That Japan Aims for (Society 5.0)

Sustainable and Resilient Society That Ensures the Safety and Security of the People

Securing Sustainability

- □ Realization of a **sustainable global environment** with a focus on achieving the SDGs
- □ Realization of a society in which **future generations can live in abundance while satisfying the needs of the present generation**

Securing Resilience

- □ Realization of **comprehensive security** against threats such as disasters, infections, cyber terrorism, increasingly severe security environment, and disruption of the supply chain

A Society in Which Each Individual Can Realize Diverse Happiness (Well-Being)

[Realization of Economic Affluence and Qualitative Affluence]

- □ Realization of an educational, labor, and employment environment that enables everyone to **develop their own abilities** and **diverse work styles**
- □ Realization of an environment that allows people to **participate in society in health throughout their life** in an age of a 100-year lifespan
- □ Realization of a society that allows people to continue to have their dreams and **always participate in society with a positive view of their presence**

Incorporate **traditional Japanese values** of trust and sharing into this vision for society and transmit it to the world as **Society 5.0**.

Contribute to the international community and attract global **human resources** and **investment**

What is Necessary to Realize Society 5.0

Transformation into a sustainable and resilient society through the fusion of cyberspace and physical space × Creation of "knowledge" as a source of value creation by designing a new society × Development of human resources to support a new society

Push through social transformation and advance investment looking ahead into the future (knowledge and human resources)

STI Policy for the Realization of Society 5.0

- ➢ Draw up policies based on **backcasting** from the future vision and **forecasting** from the current situation while utilizing **convergence of knowledge** and **evidence**, and flexibly improve them through evaluation.
- ➢ Aim for a total government R&D investment of approximately 30 trillion yen and a total public and private R&D investment of a pproximately 120 trillion yen.

Transformation into a sustainable and resilient society that ensures the safety and security of the people

(1) Creation of new value through the **fusion of cyber space and physical space**

- Digitalizing the government, launching a Digital Agency, and completing a data strategy (developing a base registry, etc.)
- **Maintaining and developing next generation infrastructure and technologies** for **Beyond 5G**, supercomputers, **space systems**, **quantum technologies**, **semiconductors**, etc.

(2) Advancement of social changes and discontinuous innovation aimed at **overcoming issues on a global scale**

- Promoting R&D to achieve **carbon neutrality** (utilizing funds, etc.) and transitioning to a circular economy

(3) Building of a resilient, **safe and secure** society

- **Identifying and R&D of important technologies** for responding to threats and advancing **social implementation and technology outflow countermeasures**.

(4) Formation of an innovation ecosystem that is the foundation for creating new value-sharing industries

- Advancing an SBIR system and entrepreneurial education, forming start-up hub cities, and strengthening a cocreation system through industry, academia, and government collaboration

(5) Urban and regional development (development of smart cities) as the foundation for succeeding to the next generation

- Creating smart cities and super cities, their nationwide spread through a public-private collaboration platform, and international deployment at expos.

(6) R&D for solving various social issues, advancement of social implementation, and utilization of convergence of knowledge

- Social implementation through the utilization of convergence of knowledge, **review** and formulation of evidence-based **national strategies**, and **advancement of R&D**
- Advancing SIP and moonshot R&D, market gain through the utilization of intellectual property and standards, and advancing new science and technology diplomacy

* **AI technologies**; biotechnologies; **quantum technologies**; **materials**; **space**; ocean; **environmental energy**; health and medical care; food; agriculture, forestry, and fisheries; etc.

Demand from society

Injection of knowledge and human resources

Development of frontiers of knowledge and strengthening research capabilities as sources of value creation

(1) Rebuilding the environment to produce diverse and outstanding research

- Improving the treatment of doctoral students and expanding their career paths and securing posts for young researchers
- Promoting active participation of female researchers. strengthening basic research and academic research, and advancing joint international research and international brain circulation
- Strengthening the humanities and social sciences and creating convergence of knowledge (strengthening funding and DX of research in the humanities and social sciences)

(2) Construction of new research systems (promotion of open science and data-driven research, etc.)

- Managing and utilizing research data and acceleration of research utilizing smart labs, AI, etc.
- Maintaining and sharing research institutions, facilities, and equipment and fostering of new research communities and environment cultivated by research DX

(3) Promotion of university reform and expanding functions for strategic management

- Developing diverse and unique university groups (transition to a true management entities and further growth as research universities that are on par with top international universities)
- Creating a 10 trillion yen university fund

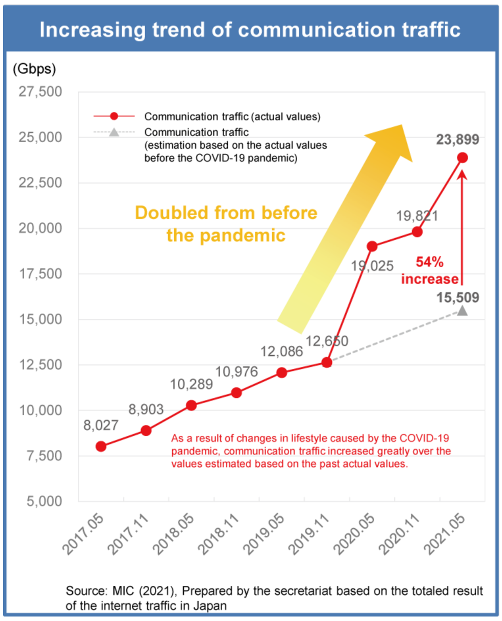
Education and human resource development to realize diverse happiness for each individual and ability to face challenges

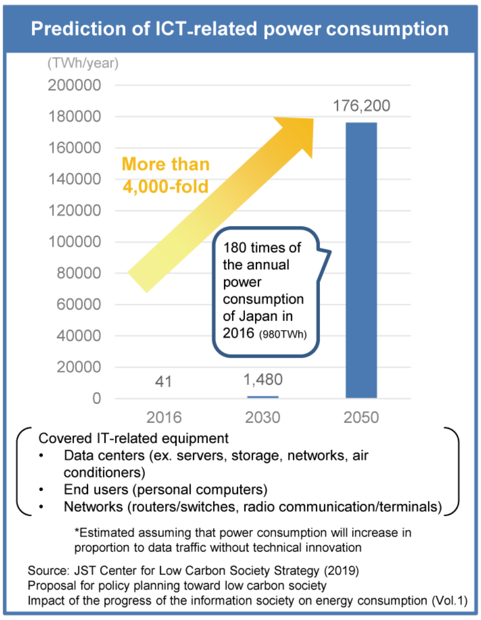
Transition to an education and human resources development system that enhances people's ability to explore and attitude to continue learning

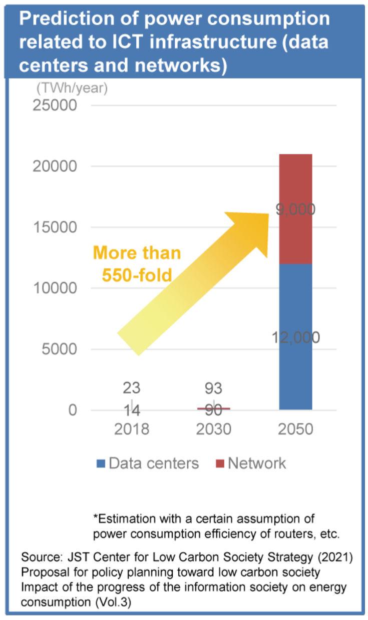
- Advancing STEAM education from the elementary and secondary education stage and the GIGA School Concept, and reducing teachers' burden
- Providing diverse curricula and programs at universities, etc. and fostering an environment and culture that promotes recurrent education

(Source) Prepared by MIC from Cabinet Office materials

3. Trends of communication traffic and energy consumption in the ICT sector (Figure 4-7-1-2 in White Paper)





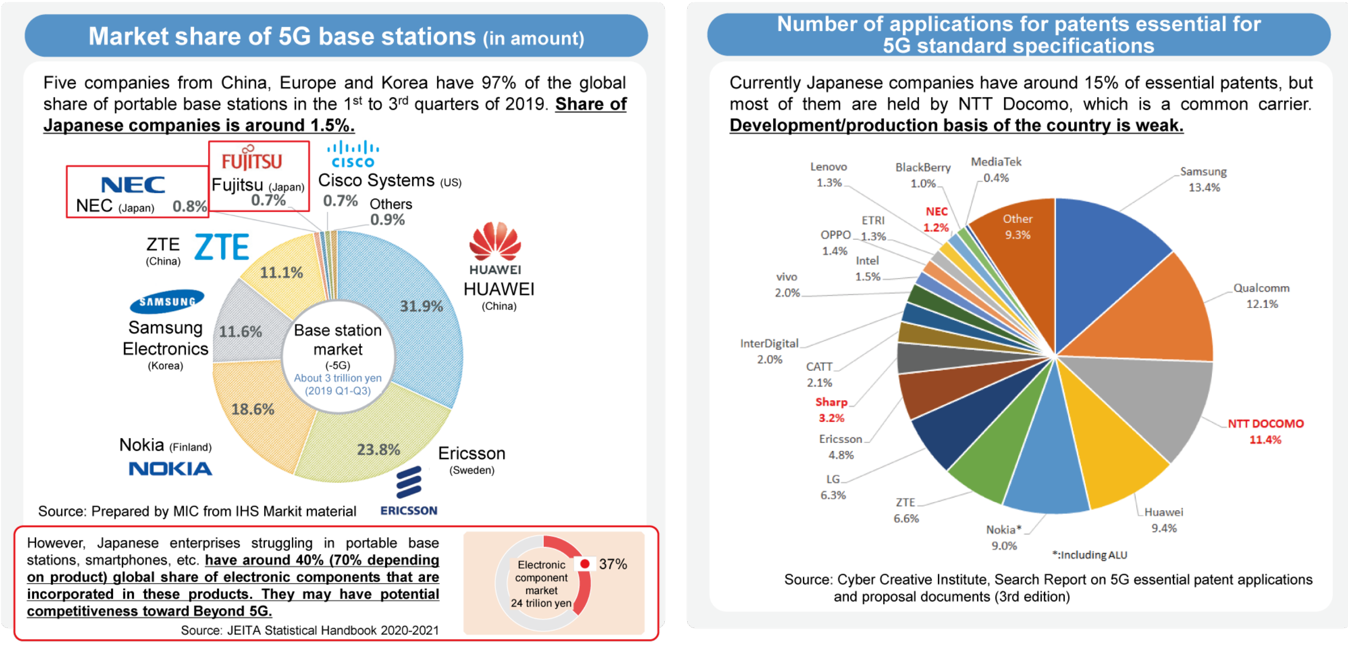


(Source) MIC, the Department of Information and Communications Technology of the Information and Communications Council, materials of the 27th technology strategy committee

4. Beyond 5G R&D by the governments of other countries (Figure 4-7-2-1 in White Paper)

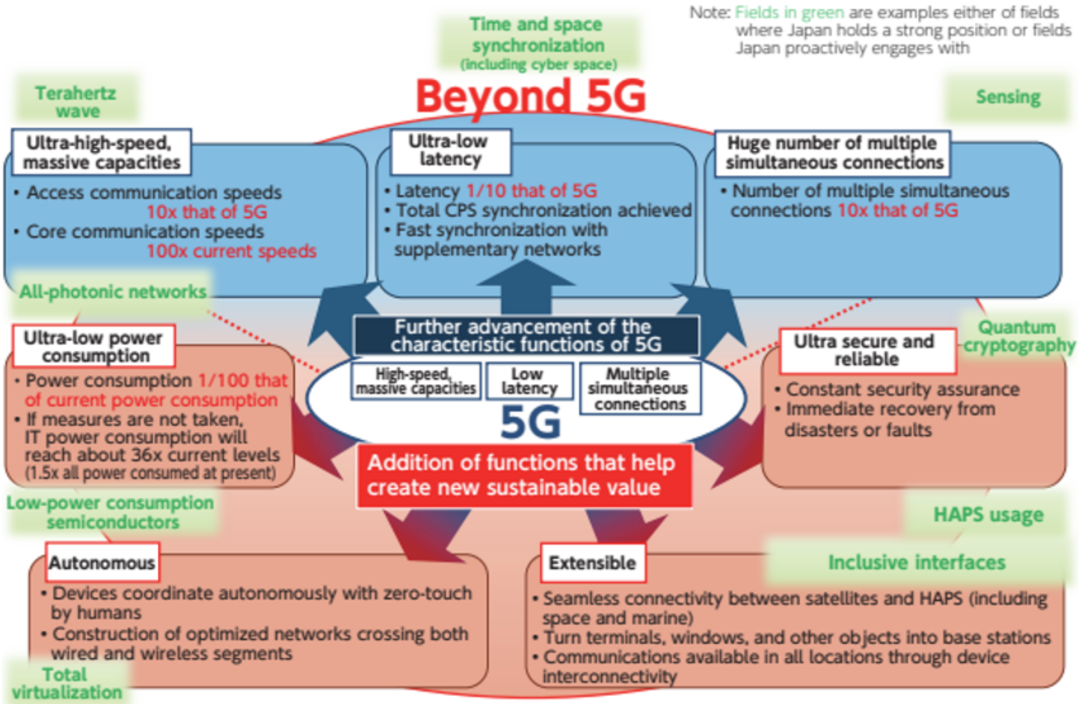
The United States		● **Next G Alliance that is an industry group to promote 6G set up a Roadmap WG and a Green G WG** and started studies to clarify the elements necessary for promotion of 6G and other new technologies and realization of a sustainable ecosystem through new technologies. (March 2021) ● The government expressed **2.5 billion dollar** (4.5 billion dollar in total from Japan and the U.S.) **investment** in the next generation mobile communication network, etc. in the **U.S.-Japan Joint Leaders' Statement** (April 2021) ● **Next G Alliance formulated 6G Roadmap** and recommended government support in three areas: "consistent policy framework for success of 6G", "support for 6G research and development" and "policies to incentivize private investment in 6G" (February 2022) ● Federal Communications Commission (FCC) reorganized the Technological Advisory Commission (TAC) with 6G as a new focus (February 2022). ● National Science Foundation (NSF) announced projects adopted for RINGS that is 6G R&D support partnership (April 2022)
Europe		**EU, Germany and Finland governments invest 1.85 billion Euro (about 240 billion yen) in total in 6G R&D** (as of March 2022)
	EU	● 6G R&D project Hexa-X started, funded by Horizon 2020 (from January 2021 to June 2023) ● EU decided **900 million Euro investment in 6G R&D** in the next R&D program **Horizon Europe (2021-2027)** (March 2021) Combined with 1.1 billion Euro from the private sector, SNS JU secured 2 billion Euro (260 billion yen) in total (March 2022) and already made 240 million Euro (31 billion yen) contributions to Work Program (2021 to 2022) (December 2021)
	Germany	● Decided to **invest 700 million Euro** in total in 6G technology R&D (2021 to 2025) (April 2021). 250 million Euro (about 33 billion yen) of the amount is invested in construction of 6G R&D hub (June 2021)
	Finland	● Started **6Genesis Flagship Program** and budgeted **250 million Euro (about 33 billion yen) in eight years from 2019 to 2026** (May 2018) ● Held the 1st **6G Wireless Summit** (March 2019)
China		● Established a 6G promotion organization 2IMT-2030(6G)" and started 6G R&D (June 2019) ● Released a digital economy plan to enhance 6G R&D as part of the 14th five-year plan (January 2022) ● Tsinghua University announced a success of 1TB/sec transmission experiment at a Beijing Olympic venue (February 2022)
Korea		● Ministry of Science and ICT (MSIT) announced a 6G R&D action plan, including **220 billion won (about 21 billion yen) investment by 2025** (June 2021). ● Started to formulate "the Next-Generation Network Development Strategy" that includes 6G (January 2022) ● Discussed cooperation in ICT including 6G with the United States, Finland and Indonesia (March 2022)

5. International competitiveness of Japan in the communication infrastructure market (Figure 4-7-2-2 in White Paper)



(Source) MIC, the Department of Information and Communications Technology of the Information and Communications Council, materials of the 34th technology strategy committee

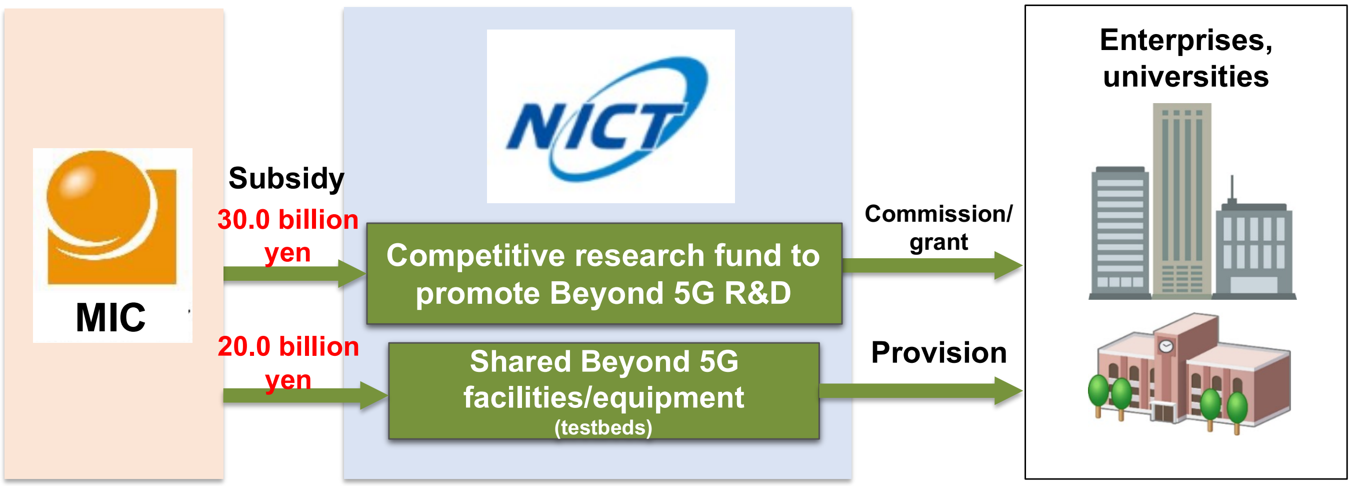
6. Functions required for Beyond 5G



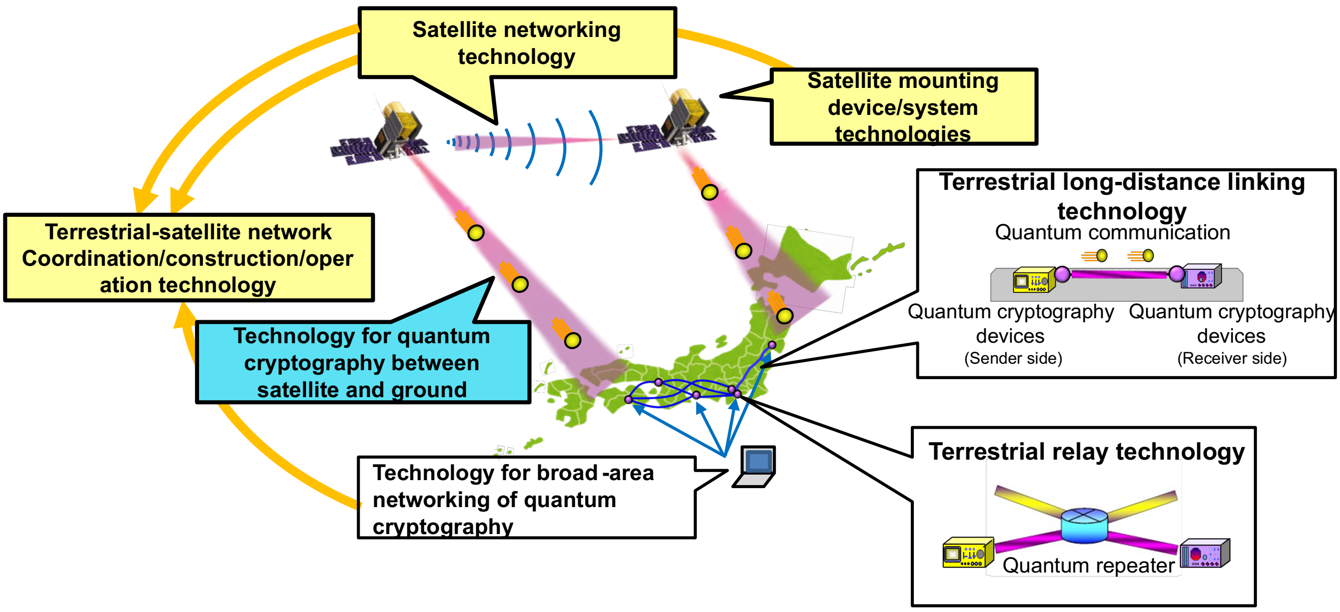
*1 Abbreviation for Cyber Physical System that refers to a system to collect and observe data of real (physical) space with sensors, process and analyze the data in the cyber space and feed back the results to the real space for creation of new values.

*2 Abbreviation for High Altitude Platform Station, which refers to unmanned aircraft, etc. that is mounted with mobile phone base station and flies at high altitude including stratosphere.

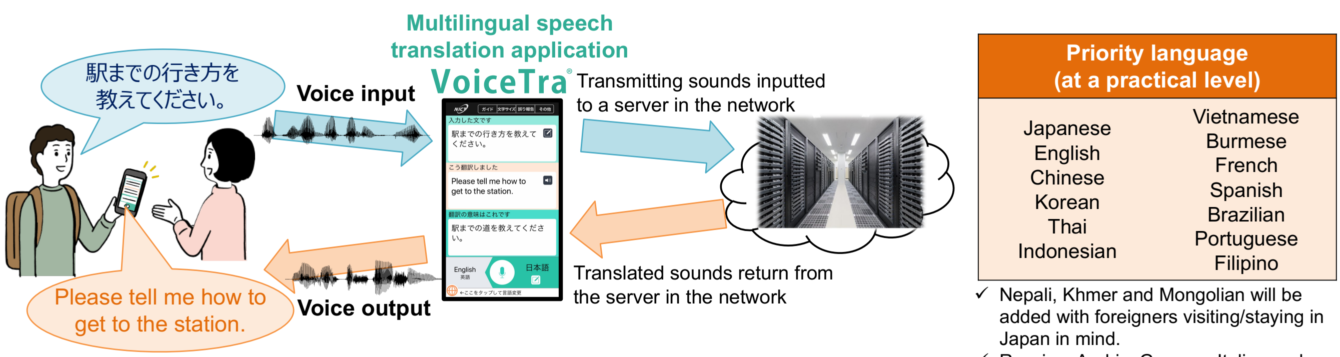
7. Schema of the Beyond 5G R&D Promotion Project (Fund)



8. Image of global quantum cryptography network



9. Multilingual translation technology



- ✓ Nepali, Khmer and Mongolian will be added with foreigners visiting/staying in Japan in mind.
- ✓ Russian, Arabic, German, Italian and Hindi will be added with economic security in mind.

10. Efforts to further advance the multilingual translation technology

Mission

Eliminate language barriers in the world

—Evolution from "serial translation" to "simultaneous interpretation" and further progress in social implementation—

Vision

1 Realize global and stress-free exchange

- Further advance multilingual translation technology and its social implementation to eliminate "language barriers" in the wor ld and realize a society where everybody freely exchanges with people around the world.

2 Strengthen business capabilities and realize a true convivial society

- Make AI capable of simultaneous interpretation at international conferences and business discussions to expand business oppor tunities of enterprises and promote overseas collaborations, etc.
- Eliminate language barriers in exchange with and daily life of foreigners visiting or staying in Japan who are expected to in crease across the country including rural areas.

3 Enhance Japan's presence

- Toward EXPO Osaka, Kansai in 2025, realize multilingual real -time talks and simultaneous interpretation between exhibitors and visitors of pavilions and lectures.
- Offer "Omotenashi" to people gathering from around the world to increase value and appeal of Japan in economic/social activit ies at home and abroad.

Target

2020 **Translation to support daily life and business** (Conversation Level)

2025 **Simultaneous translation that considers context, intention of the speaker, etc.** (Discussion Level)

- Highly accurate, prompt and practical simultaneous interpretation that considers the context (flow of conversation/sentence), intention of the speaker, surrounding conditions, cultural background and other factors
- Expand the priority languages for the multilingual translation technology based on the "Comprehensive Measures for Acceptance and Coexistence of Foreign Nationals"

2030 **Simultaneous interpretation capable of severe negotiations** (Negotiation Level)

Action

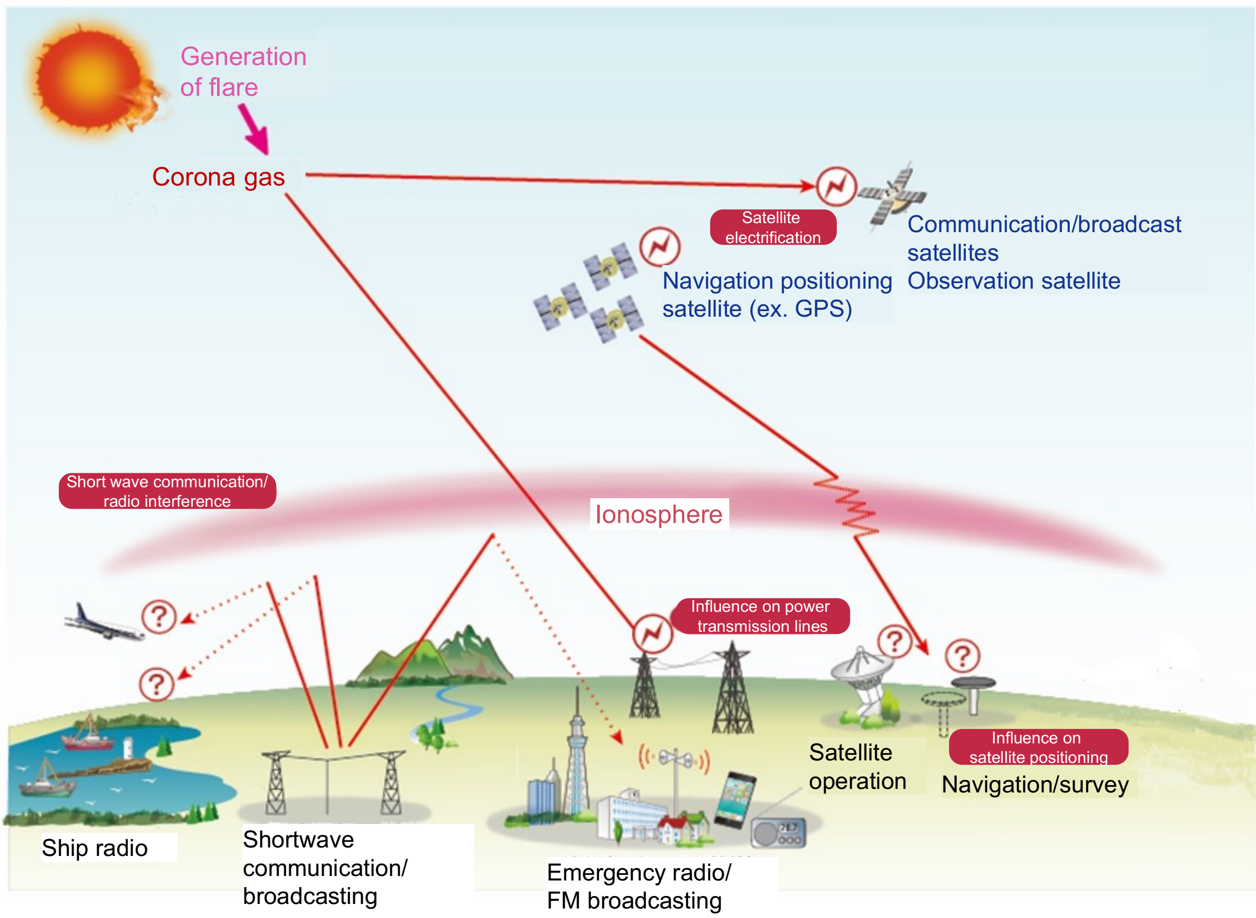
Share a roadmap to achieve the goals toward 2025 and promote specific actions in an industry-academia-government cooperation.

Project 1

Project 2 Develop the world's top level AI research base to support advanced natural language processing technology.

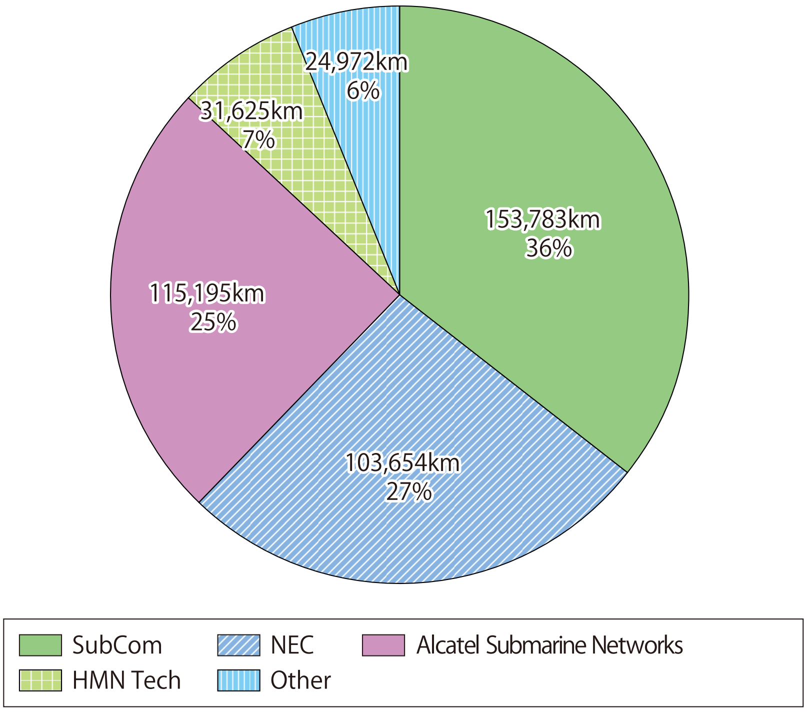
Project 3 Social implementation of simultaneous interpretation system toward 2025 EXPO in Japan

11. Influence of solar flares on the earth



Section8

1. Submarine optical cable share of major suppliers



DATA

Data 1 Transitions in nominal domestic production value by industry in Japan

(Unit: billion yen)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commerce	95,066	94,495	94,484	94,401	98,147	104,080	100,830	97,088	98,423	87,497	89,265	94,238	94,890	93,093	93,583	96,107	95,559	94,227	95,349	93,989	90,117
Real estate	68,103	68,783	69,132	69,654	68,976	68,470	70,167	71,642	73,071	73,984	72,798	72,178	73,900	77,585	78,908	80,719	80,635	80,636	80,235	80,510	80,226
Medical care/welfare	44,522	46,886	47,107	49,865	50,026	51,138	51,489	52,406	53,409	55,576	57,828	59,268	63,071	64,746	64,948	67,587	69,217	69,348	70,114	70,931	69,034
Construction	76,490	73,501	69,459	66,962	63,053	62,863	60,634	58,388	56,798	55,698	52,819	52,290	53,781	60,259	60,512	60,664	61,755	64,393	63,006	64,657	62,285
Business-oriented services	46,855	47,406	44,087	46,114	45,011	49,904	54,539	57,791	58,527	55,979	54,744	58,274	57,596	60,288	62,520	64,738	67,639	69,027	73,149	74,340	71,865
Transportation Machinery	41,787	42,566	44,838	46,983	47,983	51,152	56,013	59,497	59,250	41,051	50,886	45,572	49,914	51,231	53,267	55,378	54,610	57,703	58,868	57,776	49,737
Personal services	60,080	57,463	57,232	55,701	55,867	56,098	56,873	56,517	55,512	53,957	53,055	52,039	52,569	52,807	53,330	54,301	54,089	54,129	53,847	56,320	41,913
Information and telecommunications industry	120,381	116,700	112,435	113,047	113,717	112,575	115,128	117,322	113,878	101,052	101,590	96,230	92,835	94,929	100,574	104,765	104,332	106,835	109,287	109,283	104,776
All industries	955,537	941,882	923,480	930,132	944,838	972,377	992,868	1,009,953	1,018,288	911,679	931,850	931,711	942,503	966,186	995,021	1,007,888	1,001,409	1,025,510	1,045,909	1,048,675	981,095

Data 2 Transitions in real domestic production value by industry in Japan

(Unit: billion yen at 2015 prices)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commerce	94,169	94,108	96,260	97,767	101,479	106,054	101,870	97,667	96,338	89,909	92,708	97,397	98,412	97,129	95,618	96,107	95,659	94,457	94,142	92,488	89,186
Real estate	65,834	66,396	66,881	67,527	67,246	66,908	68,546	69,933	71,090	72,089	71,376	71,255	73,372	77,476	78,773	80,719	80,809	80,947	80,633	80,822	80,475
Medical care/welfare	44,020	46,379	47,858	49,182	50,214	51,731	52,042	52,929	54,107	55,918	58,260	60,114	64,017	65,754	65,955	67,587	68,308	67,490	66,642	66,803	64,926
Construction	85,887	83,541	79,871	76,787	71,537	70,395	66,238	61,891	57,951	57,318	54,321	55,188	57,201	62,774	60,878	60,664	61,015	62,819	60,060	60,320	57,736
Business-oriented services	44,277	45,766	43,484	46,384	45,915	51,266	56,149	59,881	60,745	58,088	57,677	61,503	60,626	63,024	63,635	64,738	66,989	67,767	71,316	71,691	68,056
Transportation Machinery	41,356	43,108	46,169	49,055	50,553	54,496	59,502	62,918	61,516	41,306	51,836	46,246	51,286	53,101	53,922	55,378	54,864	58,424	59,776	58,679	49,943
Personal services	65,177	62,552	62,239	60,378	60,140	60,204	60,623	59,740	57,941	56,175	55,217	54,130	54,603	54,565	54,825	54,301	53,592	53,293	52,453	54,257	40,212
Information and telecommunications industry	90,611	92,071	92,451	95,043	96,931	97,866	101,867	105,300	104,457	95,684	98,304	95,244	93,485	96,296	100,645	104,765	104,893	106,964	109,021	109,639	104,798
All industries	972,518	967,171	961,599	970,384	981,462	1,003,039	1,013,654	1,023,042	1,007,550	927,025	956,943	954,051	974,792	992,744	1,000,923	1,007,888	1,008,760	1,019,888	1,023,202	1,020,480	961,676

Data 3 Transitions in nominal GDP by industry of Japan

(Unit: billion yen)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commerce	68,113	67,535	67,358	67,131	69,620	73,642	70,812	67,673	68,085	60,066	60,810	63,702	64,092	62,828	63,109	64,760	64,203	63,123	63,688	62,307	61,005
Real estate	58,225	58,663	58,818	59,118	58,399	57,829	59,092	60,160	61,182	61,766	60,599	59,907	61,468	64,670	65,913	67,570	67,299	67,099	66,565	66,530	66,871
Medical care/welfare	26,323	27,706	27,821	29,433	29,512	30,151	30,399	30,982	31,617	32,944	34,324	35,226	37,721	38,964	39,327	41,176	42,511	42,933	43,752	43,471	41,755
Construction	34,482	33,007	31,072	29,840	27,989	27,796	26,826	25,847	25,157	24,684	23,422	23,200	23,916	26,858	27,033	27,162	27,643	28,816	28,188	29,108	28,668
Business-oriented services	29,861	30,265	28,195	29,542	28,885	32,080	34,946	36,910	37,258	35,519	34,622	36,734	36,536	38,485	40,160	41,844	43,371	43,906	46,152	48,080	47,239
Transportation Machinery	10,994	10,980	11,336	11,636	11,637	12,143	13,216	13,952	13,809	9,508	11,712	10,423	11,485	11,858	12,402	12,969	12,677	13,276	13,423	13,243	11,793
Personal services	32,982	31,546	31,421	30,582	30,675	30,803	31,081	30,740	30,049	29,067	28,443	27,764	27,760	27,598	27,580	27,786	27,917	28,178	28,270	28,249	21,997
Information and telecommunications industry	62,058	59,872	57,582	56,902	56,324	55,210	56,219	57,164	55,545	50,038	49,426	47,161	45,683	46,393	48,539	49,896	49,605	50,602	51,710	52,261	50,957
All industries	533,395	524,272	511,924	510,994	512,953	521,958	526,336	529,176	528,710	486,522	486,732	486,119	493,062	507,190	522,726	533,183	532,150	539,911	547,645	552,447	533,333

Data 4 Transitions in real GDP by industry of Japan

(Unit: billion yen at 2015 prices)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commerce	68,020	67,708	68,982	69,783	72,142	75,092	71,542	68,026	66,545	61,585	62,967	65,591	66,284	65,429	64,421	64,760	64,326	63,388	63,047	61,647	60,606
Real estate	58,406	58,658	58,838	59,157	58,661	58,118	59,209	60,069	60,718	61,223	60,273	59,826	61,558	64,952	65,990	67,570	67,531	67,531	67,155	67,167	67,472
Medical care/welfare	26,234	27,635	28,510	29,294	29,903	30,801	30,948	31,438	32,098	33,132	34,478	35,532	38,129	39,463	39,882	41,176	41,227	40,350	39,464	38,525	35,799
Construction	38,570	37,427	35,698	34,238	31,821	31,238	29,272	27,237	25,397	25,014	23,607	23,882	24,968	27,636	27,030	27,162	27,240	27,963	26,657	26,655	26,046
Business-oriented services	27,751	28,837	27,544	29,535	29,390	32,986	36,061	38,387	38,870	37,102	36,771	39,137	38,731	40,421	40,972	41,844	42,866	42,926	44,714	46,000	44,025
Transportation Machinery	9,269	9,706	10,442	11,144	11,536	12,491	13,705	14,561	14,305	9,651	12,169	10,908	12,075	12,480	12,651	12,969	12,874	13,737	14,083	14,087	12,278
Personal services	36,084	34,535	34,268	33,151	32,928	32,871	32,815	32,055	30,817	29,613	28,848	28,025	28,187	28,086	28,137	27,786	27,547	27,517	27,205	26,646	20,415
Information and telecommunications industry	33,878	35,295	36,585	37,162	38,530	40,227	42,008	44,208	45,206	43,315	44,526	45,040	44,836	46,226	48,087	49,896	50,042	50,986	52,005	53,385	51,656
All industries	505,301	503,604	501,795	504,432	509,256	520,561	522,593	524,943	518,941	490,380	498,627	501,720	513,613	524,541	529,697	533,183	533,024	535,800	536,135	535,755	514,961

Data 5 Transitions in the number of employees by industry of Japan

(Unit: 10,000 employees)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Commerce	1,371	1,336	1,248	1,199	1,189	1,174	1,166	1,169	1,152	1,141	1,149	1,150	1,124	1,148	1,114	1,100	1,190	1,198	1,210	1,205	1,191
Real estate	70	63	62	61	59	59	62	86	83	81	82	86	86	88	90	96	97	97	101	100	107
Medical care/welfare	452	471	495	509	551	582	585	588	595	603	617	628	669	717	734	769	761	764	783	797	809
Construction	646	619	603	589	574	560	573	590	593	594	591	613	590	566	530	498	607	610	617	618	603
Business-oriented services	487	500	515	554	572	587	575	567	572	568	587	616	624	656	681	711	663	678	717	722	729
Transportation Machinery	98	96	97	97	99	100	104	110	108	99	99	99	99	103	102	108	111	113	115	112	110
Personal services	861	863	871	874	886	881	916	906	912	876	857	849	886	800	812	861	769	789	815	838	830
Information and telecommunications industry	486	462	431	426	429	428	432	431	431	424	415	410	407	420	415	415	418	418	421	425	424
All industries	7,119	7,062	6,937	6,867	6,819	6,795	6,855	6,881	6,843	6,724	6,691	6,659	6,695	6,774	6,746	6,857	6,962	7,045	7,187	7,269	7,232

Data 6 Transitions in nominal domestic production value by sector of the information and communication industry of Japan

(Unit: billion yen)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1. Telecommunications sector	**16,700**	**16,878**	**16,906**	**17,172**	**16,309**	**14,685**	**15,430**	**16,169**	**15,990**	**16,063**	**15,686**	**15,722**	**15,036**	**15,295**	**15,505**	**16,354**	**17,480**	**17,844**	**18,082**	**18,028**	**17,731**
Fixed-line communications	10,659	10,689	10,735	10,635	9,306	7,038	7,241	7,765	7,740	7,853	7,423	7,014	6,320	6,424	6,707	7,312	8,209	8,338	8,161	7,942	7,881
Mobile communications	5,788	5,940	5,884	6,256	6,716	7,350	7,868	8,062	7,892	7,837	7,876	8,301	8,288	8,415	8,328	8,544	8,762	8,999	9,393	9,262	9,039
Services associated with telecommunications	253	249	287	281	288	297	321	341	357	373	388	407	428	456	471	497	508	508	527	824	811
2. Broadcasting sector	**3,306**	**3,392**	**3,419**	**3,495**	**3,614**	**3,678**	**3,788**	**3,937**	**3,877**	**3,837**	**3,799**	**3,561**	**3,664**	**4,320**	**4,618**	**4,724**	**4,790**	**4,763**	**4,847**	**4,741**	**4,493**
Public broadcasting	699	703	705	706	700	669	667	674	659	657	666	682	677	683	712	743	759	775	796	801	783
Private broadcasting	2,269	2,336	2,329	2,373	2,478	2,544	2,616	2,682	2,607	2,527	2,432	2,178	2,125	2,584	2,665	2,544	2,632	2,613	2,607	2,498	2,270
Cable broadcasting	338	353	385	416	437	466	506	581	611	653	701	701	861	1,052	1,241	1,437	1,400	1,375	1,444	1,442	1,440
3. Information services sector	**13,606**	**15,319**	**16,012**	**16,269**	**16,921**	**17,403**	**18,066**	**18,467**	**18,907**	**18,061**	**17,415**	**16,845**	**17,003**	**17,498**	**18,084**	**18,500**	**18,802**	**19,444**	**19,811**	**20,572**	**20,797**
Software	8,954	10,053	10,150	9,956	10,012	10,028	10,696	10,916	11,174	10,444	9,940	9,640	9,875	10,259	10,691	11,130	11,281	11,856	12,134	12,679	13,092
Information processing/provision service	4,653	5,266	5,862	6,313	6,909	7,375	7,370	7,550	7,733	7,617	7,475	7,205	7,129	7,239	7,394	7,370	7,521	7,588	7,677	7,892	7,705
4. Internet-related Services sector	**0**	**0**	**0**	**0**	**0**	**1,216**	**1,229**	**1,348**	**1,472**	**1,452**	**1,633**	**1,904**	**2,015**	**2,421**	**2,847**	**3,551**	**3,834**	**3,953**	**4,078**	**4,164**	**4,451**
Internet-related Services	0	0	0	0	0	1,216	1,229	1,348	1,472	1,452	1,633	1,904	2,015	2,421	2,847	3,551	3,834	3,953	4,078	4,164	4,451
5. Video picture, sound information, character information production sector	**7,699**	**7,669**	**7,563**	**7,524**	**7,677**	**7,752**	**7,566**	**7,396**	**7,152**	**6,837**	**6,540**	**6,182**	**6,549**	**6,650**	**6,901**	**6,845**	**6,924**	**6,906**	**6,756**	**6,306**	**5,845**
Video picture, sound information, character information production (excluding news providers)	1,988	2,029	1,980	2,044	2,158	2,181	2,207	2,228	2,234	2,244	2,279	2,251	2,617	2,712	2,923	3,009	3,191	3,367	3,386	3,012	2,694
Newspapers	2,555	2,527	2,432	2,397	2,391	2,386	2,251	2,117	1,979	1,810	1,657	1,494	1,597	1,703	1,780	1,867	1,840	1,791	1,738	1,717	1,583
Publishers	2,336	2,338	2,429	2,434	2,565	2,604	2,518	2,450	2,325	2,149	1,971	1,797	1,763	1,778	1,830	1,864	1,778	1,618	1,491	1,413	1,423
News providers	820	775	723	649	563	580	590	601	615	633	633	640	572	459	369	104	115	130	141	163	146
6. ICT-related manufacturing sector	**40,154**	**34,392**	**30,951**	**32,098**	**32,182**	**30,564**	**31,853**	**32,185**	**30,572**	**23,017**	**25,900**	**22,230**	**18,226**	**17,661**	**19,176**	**20,430**	**19,019**	**20,458**	**21,268**	**20,476**	**18,512**
Communication cable manufacturing	365	452	389	372	259	237	299	296	293	263	309	259	256	247	242	241	216	220	250	244	302
Cable communication equipment and appliance manufacturing	2,616	1,786	1,367	1,149	1,083	968	941	889	928	684	670	607	651	633	550	549	495	490	567	565	427
Wireless communication equipment and appliance manufacturing	3,214	2,906	2,529	3,098	2,901	2,786	2,909	3,028	2,716	2,016	2,104	1,939	1,768	1,634	1,601	1,649	1,551	1,533	1,571	1,612	1,380
Other telecommunication equipment and appliance manufacturing	426	439	339	379	432	393	430	496	539	530	533	469	483	460	477	408	441	443	446	475	368
Radio and television receiver / video equipment manufacturing	2,835	2,632	2,785	3,031	3,009	2,644	2,779	2,850	2,718	2,403	2,817	1,725	874	650	607	596	469	455	399	363	206
Electrical audio equipment and appliance manufacturing	1,901	1,644	1,602	1,636	1,435	1,186	1,225	961	736	545	522	417	206	218	282	337	264	238	227	208	230
Computer and peripheral device manufacturing	7,453	6,734	5,206	4,560	4,250	3,681	3,535	3,775	3,327	2,462	2,498	2,183	1,857	1,733	1,849	1,919	1,694	1,802	1,960	2,055	1,671
Semiconductor element manufacturing	1,211	1,000	957	1,100	1,124	1,065	1,064	1,144	1,402	1,119	1,229	1,091	906	921	990	826	751	770	771	742	750
Integrated circuit manufacturing	5,045	4,012	3,576	3,982	4,184	4,177	4,381	4,447	3,820	3,006	3,531	3,232	2,701	2,780	3,139	3,584	3,482	3,686	4,010	4,183	3,801
Liquid crystal panel manufacturing	1,487	1,299	1,019	1,423	1,600	1,583	1,673	1,724	1,856	1,280	1,591	1,506	1,115	1,045	1,796	2,190	1,599	1,705	1,349	1,223	1,041
Flat panel/electron tube manufacturing	504	435	435	441	389	307	403	395	382	331	275	224	117	103	69	73	73	81	102	100	90
Other electronic component manufacturing	10,416	8,756	8,684	9,098	9,565	9,569	10,582	10,487	9,992	6,963	8,417	7,271	6,068	6,029	6,387	6,863	6,762	7,834	8,360	7,497	7,042
Office and business equipment manufacturing	2,425	2,093	1,889	1,643	1,764	1,777	1,447	1,516	1,706	1,280	1,281	1,193	1,098	1,075	1,045	1,045	1,059	996	1,011	953	1,041
Information recording media manufacturing	255	203	174	187	188	192	184	176	158	134	123	113	126	133	141	152	163	205	246	257	163
7. ICT-related service sector	**21,797**	**21,700**	**20,704**	**20,056**	**20,295**	**20,393**	**19,857**	**19,637**	**17,982**	**15,425**	**15,036**	**14,143**	**14,513**	**14,541**	**15,199**	**15,527**	**15,492**	**15,176**	**15,182**	**15,596**	**13,745**
ICT equipment leasing businesses	4,863	4,840	4,799	4,250	4,365	4,263	3,994	3,849	3,153	2,505	2,354	2,279	2,450	2,579	2,749	2,837	2,737	2,756	2,829	3,218	3,071
Advertising	9,133	9,101	8,471	8,526	8,782	9,083	8,869	8,768	8,005	6,444	6,262	6,078	6,474	6,405	6,978	7,213	7,440	7,459	7,436	7,386	6,406
Printing, publishing, binding businesses	7,134	7,017	6,728	6,541	6,384	6,296	6,238	6,277	6,087	5,715	5,642	5,113	4,930	4,925	4,898	4,972	4,794	4,444	4,402	4,409	4,053
Film and theatre businesses	666	742	706	738	765	752	757	744	738	762	777	673	659	633	574	505	521	517	516	582	215
8. ICT-related construction sector	**1,445**	**1,412**	**913**	**574**	**443**	**312**	**246**	**402**	**377**	**287**	**250**	**224**	**234**	**264**	**211**	**172**	**194**	**179**	**179**	**168**	**167**
Telecom facilities construction businesses	1,445	1,412	913	574	443	312	246	402	377	287	250	224	234	264	211	172	194	179	179	168	167
9. Research	**15,673**	**15,938**	**15,965**	**15,858**	**16,274**	**16,572**	**17,092**	**17,783**	**17,551**	**16,074**	**15,331**	**15,419**	**15,595**	**16,277**	**18,033**	**18,660**	**17,797**	**18,112**	**19,083**	**19,233**	**19,035**
Research	15,673	15,938	15,965	15,858	16,274	16,572	17,092	17,783	17,551	16,074	15,331	15,419	15,595	16,277	18,033	18,660	17,797	18,112	19,083	19,233	19,035
ICT industry total	**120,381**	**116,700**	**112,435**	**113,047**	**113,717**	**112,575**	**115,128**	**117,322**	**113,878**	**101,052**	**101,590**	**96,230**	**92,835**	**94,929**	**100,574**	**104,765**	**104,332**	**106,835**	**109,287**	**109,283**	**104,776**

Data 7 Transitions in real domestic production value by sector of the information and communication industry of Japan

(Unit: billion yen at 2015 prices)

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1. Telecommunications sector	**11,960**	**12,965**	**13,690**	**14,124**	**13,358**	**11,642**	**12,674**	**13,682**	**13,863**	**14,344**	**14,689**	**14,972**	**14,217**	**14,381**	**14,108**	**16,354**	**17,873**	**18,404**	**18,597**	**19,004**	**18,683**
Fixed-line communications	8,701	9,485	10,102	10,245	9,160	7,045	7,270	7,813	7,821	7,957	7,534	7,133	6,384	6,442	6,492	7,312	8,293	8,499	8,348	8,227	8,088
Mobile communications	3,045	3,264	3,332	3,622	3,928	4,312	5,095	5,539	5,695	6,026	6,775	7,435	7,404	7,477	7,145	8,544	9,064	9,386	9,712	9,922	9,754
Services associated with telecommunications	215	216	256	258	270	285	309	330	347	361	381	404	429	461	471	497	515	518	537	855	841
2. Broadcasting sector	**3,376**	**3,436**	**3,621**	**3,717**	**3,747**	**3,793**	**3,874**	**4,020**	**4,015**	**4,163**	**4,097**	**3,785**	**3,831**	**4,487**	**4,703**	**4,724**	**4,723**	**4,699**	**4,820**	**4,723**	**4,694**
Public broadcasting	670	674	676	676	670	640	639	645	631	629	637	653	649	666	731	743	759	775	796	801	788
Private broadcasting	2,356	2,401	2,551	2,615	2,628	2,669	2,709	2,769	2,747	2,854	2,730	2,403	2,289	2,736	2,715	2,544	2,566	2,550	2,579	2,496	2,513
Cable broadcasting	350	361	394	427	449	484	527	605	636	680	729	729	892	1,085	1,256	1,437	1,399	1,375	1,444	1,425	1,393
3. Information services sector	**12,661**	**14,517**	**15,440**	**16,173**	**16,898**	**17,474**	**18,009**	**18,329**	**18,682**	**18,185**	**17,607**	**17,152**	**17,331**	**17,933**	**18,103**	**18,500**	**18,670**	**19,177**	**19,379**	**19,918**	**19,715**
Software	8,324	9,549	9,824	10,031	10,135	10,216	10,762	10,880	10,996	10,574	10,150	9,934	10,243	10,704	10,810	11,130	11,117	11,554	11,689	12,070	12,196
Information processing/provision service	4,337	4,968	5,616	6,142	6,763	7,257	7,247	7,450	7,686	7,611	7,456	7,218	7,088	7,230	7,293	7,370	7,553	7,623	7,690	7,848	7,519
4. Internet-related Services sector	**0**	**0**	**0**	**0**	**0**	**1,144**	**1,185**	**1,336**	**1,473**	**1,363**	**1,607**	**1,919**	**1,975**	**2,387**	**2,863**	**3,551**	**3,643**	**3,804**	**4,058**	**4,069**	**4,439**
Internet-related Services	0	0	0	0	0	1,144	1,185	1,336	1,473	1,363	1,607	1,919	1,975	2,387	2,863	3,551	3,643	3,804	4,058	4,069	4,439
5. Video picture, sound information, character information production sector	**9,433**	**9,311**	**9,090**	**9,000**	**9,121**	**9,127**	**8,786**	**8,460**	**8,068**	**7,576**	**7,169**	**6,703**	**7,146**	**7,191**	**7,228**	**6,845**	**6,979**	**6,926**	**6,717**	**6,109**	**5,560**
Video picture, sound information, character information production (excluding news providers)	3,322	3,270	3,096	3,108	3,188	3,133	3,019	2,905	2,792	2,675	2,627	2,509	2,882	2,949	3,085	3,009	3,269	3,419	3,411	2,956	2,601
Newspapers	2,691	2,661	2,561	2,525	2,518	2,513	2,369	2,225	2,070	1,887	1,713	1,540	1,693	1,811	1,834	1,867	1,845	1,798	1,721	1,648	1,502
Publishers	2,560	2,557	2,651	2,654	2,789	2,827	2,725	2,641	2,492	2,276	2,075	1,879	1,895	1,918	1,913	1,864	1,750	1,579	1,446	1,345	1,316
News providers	860	824	781	713	627	655	672	690	714	738	753	775	676	513	396	104	115	129	139	160	141
6. ICT-related manufacturing sector	**19,723**	**17,843**	**17,461**	**19,153**	**20,031**	**20,143**	**22,408**	**23,562**	**23,574**	**18,578**	**22,095**	**20,115**	**17,443**	**17,260**	**18,929**	**20,430**	**19,563**	**20,706**	**21,502**	**21,552**	**19,191**
Communication cable manufacturing	296	359	303	304	219	202	247	249	254	240	296	269	274	246	230	241	232	223	247	239	290
Cable communication equipment and appliance manufacturing	1,930	1,420	1,144	1,005	965	873	866	834	875	647	665	623	665	640	549	549	495	490	562	548	409
Wireless communication equipment and appliance manufacturing	1,487	1,264	1,209	1,531	1,464	1,494	1,724	1,980	1,923	1,478	1,641	1,633	1,667	1,576	1,576	1,649	1,730	1,657	1,671	1,736	1,481
Other telecommunication equipment and appliance manufacturing	439	457	353	394	430	383	421	489	535	527	533	469	484	462	472	408	442	445	449	478	366
Radio and television receiver / video equipment manufacturing	327	340	430	586	692	712	846	1,020	1,185	1,234	1,683	1,287	753	635	576	596	464	460	410	377	215
Electrical audio equipment and appliance manufacturing	1,383	1,251	1,294	1,405	1,271	1,102	1,171	926	736	556	545	433	213	229	289	337	265	241	230	210	230
Computer and peripheral device manufacturing	2,305	2,423	2,198	2,227	2,281	2,140	2,158	2,499	2,373	1,940	2,075	1,948	1,808	1,756	1,855	1,919	1,713	1,833	1,995	2,185	1,804
Semiconductor element manufacturing	705	598	591	711	750	749	793	881	1,114	937	1,085	1,016	856	916	976	826	748	772	772	742	738
Integrated circuit manufacturing	2,083	1,952	1,908	2,203	2,399	2,454	2,761	3,006	2,719	2,249	2,807	2,689	2,462	2,500	3,036	3,584	3,591	3,450	3,968	4,684	4,306
Liquid crystal panel manufacturing	303	408	339	532	624	824	1,250	1,227	1,354	1,048	1,412	1,358	1,061	1,007	1,765	2,190	1,681	1,796	1,428	1,299	1,107
Flat panel/electron tube manufacturing	214	190	201	214	195	159	248	252	311	242	204	289	146	117	74	73	75	84	103	99	87
Other electronic component manufacturing	6,155	5,393	5,883	6,580	7,168	7,424	8,500	8,691	8,507	6,124	7,735	6,787	5,794	5,919	6,305	6,863	6,925	8,062	8,430	7,419	6,861
Office and business equipment manufacturing	1,861	1,604	1,450	1,288	1,399	1,448	1,248	1,349	1,538	1,222	1,291	1,201	1,131	1,120	1,083	1,045	1,040	986	991	1,279	1,137
Information recording media manufacturing	236	186	159	171	174	180	175	159	150	133	122	113	130	137	143	152	163	205	246	255	160
7. ICT-related service sector	**17,039**	**17,295**	**16,853**	**16,950**	**17,522**	**18,084**	**17,951**	**18,038**	**17,034**	**15,276**	**15,383**	**14,664**	**15,313**	**15,584**	**15,849**	**15,527**	**15,425**	**15,029**	**14,936**	**15,213**	**13,661**
ICT equipment leasing businesses	1,535	1,822	2,007	2,073	2,433	2,718	2,715	2,790	2,517	2,167	2,231	2,297	2,648	2,826	2,883	2,837	2,824	2,827	2,888	3,301	3,155
Advertising	8,370	8,335	7,954	8,063	8,305	8,591	8,448	8,384	7,835	6,699	6,656	6,505	6,948	7,038	7,437	7,213	7,327	7,294	7,201	7,074	6,482
Printing, publishing, binding businesses	6,490	6,414	6,196	6,082	6,022	6,021	6,028	6,118	5,946	5,645	5,713	5,181	5,048	5,076	4,942	4,972	4,757	4,397	4,337	4,265	3,814
Film and theatre businesses	644	725	696	732	762	754	760	747	737	766	783	681	669	644	587	505	517	511	510	573	209
8. ICT-related construction sector	**1,614**	**1,595**	**1,043**	**654**	**495**	**337**	**255**	**404**	**372**	**287**	**249**	**231**	**244**	**270**	**209**	**172**	**193**	**176**	**173**	**158**	**156**
Telecom facilities construction businesses	1,614	1,595	1,043	654	495	337	255	404	372	287	249	231	244	270	209	172	193	176	173	158	156
9. Research	**14,804**	**15,109**	**15,252**	**15,273**	**15,759**	**16,123**	**16,726**	**17,468**	**17,377**	**15,911**	**15,408**	**15,703**	**15,986**	**16,801**	**18,655**	**18,660**	**17,823**	**18,043**	**18,838**	**18,893**	**18,698**
Research	14,804	15,109	15,252	15,273	15,759	16,123	16,726	17,468	17,377	15,911	15,408	15,703	15,986	16,801	18,655	18,660	17,823	18,043	18,838	18,893	18,698
ICT industry total	**90,611**	**92,071**	**92,451**	**95,043**	**96,931**	**97,866**	**101,867**	**105,300**	**104,457**	**95,684**	**98,304**	**95,244**	**93,485**	**96,296**	**100,645**	**104,765**	**104,893**	**106,964**	**109,021**	**109,639**	**104,798**

Data 8 Transitions in nominal GDP by sector of the information and communication industry of Japan

(Unit: billion yen)

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1. Telecommunications sector		**9,485**	**9,502**	**9,454**	**9,560**	**8,942**	**8,204**	**8,548**	**8,893**	**8,726**	**8,696**	**8,421**	**8,374**	**8,000**	**8,128**	**8,231**	**8,675**	**9,263**	**9,439**	**9,541**	**9,558**	**9,287**
	Fixed-line communications	6,014	5,990	5,992	5,941	5,115	4,080	4,138	4,373	4,294	4,291	3,995	3,716	3,361	3,429	3,592	3,931	4,430	4,516	4,438	4,257	4,191
	Mobile communications	3,300	3,346	3,274	3,438	3,644	3,938	4,216	4,320	4,228	4,199	4,220	4,448	4,417	4,460	4,391	4,480	4,565	4,657	4,830	4,878	4,678
	Services associated with telecommunications	171	166	188	181	183	185	194	201	204	206	207	210	222	239	248	264	268	266	273	422	418
2. Broadcasting sector		**1,428**	**1,486**	**1,523**	**1,580**	**1,654**	**1,703**	**1,719**	**1,758**	**1,701**	**1,660**	**1,623**	**1,508**	**1,550**	**1,776**	**1,877**	**1,908**	**1,919**	**1,903**	**1,940**	**1,877**	**1,828**
	Public broadcasting	351	358	363	368	369	357	356	360	352	351	356	365	351	342	345	347	357	367	380	363	376
	Private broadcasting	868	907	918	950	1,009	1,052	1,047	1,040	976	915	850	732	710	856	876	829	856	849	846	789	713
	Cable broadcasting	209	221	242	262	276	294	315	358	372	393	417	412	489	577	657	732	706	687	714	725	740
3. Information services sector		**8,416**	**9,439**	**9,847**	**9,989**	**10,374**	**10,654**	**11,075**	**11,342**	**11,634**	**11,127**	**10,740**	**10,405**	**10,313**	**10,420**	**10,571**	**10,630**	**10,764**	**11,120**	**11,300**	**11,795**	**11,983**
	Software	5,479	6,134	6,175	6,039	6,056	6,047	6,521	6,727	6,958	6,572	6,321	6,193	6,309	6,519	6,755	6,994	7,055	7,379	7,516	7,964	8,257
	Information processing/provision service	2,938	3,305	3,672	3,950	4,318	4,607	4,554	4,615	4,675	4,554	4,419	4,212	4,005	3,901	3,816	3,636	3,709	3,741	3,784	3,831	3,726
4. Internet-related Services sector		0	0	0	0	0	**560**	**535**	**552**	**566**	**521**	**545**	**588**	**592**	**676**	**752**	**886**	**962**	**998**	**1,036**	**1,078**	**1,165**
	Internet-related Services	0	0	0	0	0	560	535	552	566	521	545	588	592	676	752	886	962	998	1,036	1,078	1,165
5. Video picture, sound information, character information production sector		**3,411**	**3,404**	**3,352**	**3,339**	**3,403**	**3,445**	**3,291**	**3,145**	**2,974**	**2,781**	**2,597**	**2,393**	**2,569**	**2,641**	**2,776**	**2,774**	**2,822**	**2,828**	**2,780**	**2,551**	**2,477**
	Video picture, sound information, character information production (excluding news providers)	935	968	957	1,001	1,071	1,097	1,065	1,031	988	948	916	860	1,004	1,045	1,130	1,169	1,238	1,305	1,311	1,126	1,097
	Newspapers	1,187	1,169	1,121	1,100	1,093	1,086	993	904	817	722	637	554	617	684	743	809	804	788	771	767	708
	Publishers	867	864	894	893	937	948	916	891	845	781	716	652	655	677	713	743	722	669	628	576	597
	News providers	422	403	380	345	302	315	317	319	324	330	327	328	293	235	189	54	58	65	71	82	75
6. ICT-related manufacturing sector		**16,500**	**13,448**	**11,790**	**11,840**	**11,382**	**10,309**	**10,776**	**10,873**	**10,372**	**7,804**	**8,786**	**7,593**	**6,350**	**6,185**	**6,740**	**7,226**	**6,703**	**7,163**	**7,406**	**7,172**	**6,760**
	Communication cable manufacturing	154	175	137	118	73	59	82	88	95	92	115	103	99	92	86	83	72	71	78	77	96
	Cable communication equipment and appliance manufacturing	913	637	498	427	410	374	361	337	349	255	248	222	233	220	187	181	162	160	184	192	144
	Wireless communication equipment and appliance manufacturing	1,039	922	802	970	895	859	904	937	869	653	696	652	613	574	569	581	542	531	538	564	497
	Other telecommunication equipment and appliance manufacturing	189	196	152	170	195	178	191	217	232	224	221	191	200	193	204	177	191	192	193	199	156
	Radio and television receiver / video equipment manufacturing	971	879	899	948	900	760	810	847	825	729	855	557	313	235	223	223	175	172	152	141	79
	Electrical audio equipment and appliance manufacturing	556	478	463	470	409	336	357	288	226	172	169	139	67	71	90	106	83	75	71	67	74
	Computer and peripheral device manufacturing	1,736	1,610	1,282	1,147	1,084	950	905	969	869	647	652	574	515	479	522	556	492	525	574	619	494
	Semiconductor element manufacturing	609	501	478	547	557	525	488	485	547	398	395	313	273	290	325	282	253	256	252	252	264
	Integrated circuit manufacturing	3,225	2,377	1,951	1,987	1,892	1,694	1,793	1,837	1,592	1,264	1,498	1,383	1,139	1,154	1,283	1,442	1,411	1,503	1,647	1,726	1,611
	Liquid crystal panel manufacturing	609	509	382	508	544	510	528	533	561	379	460	425	334	330	598	767	557	591	465	420	358
	Flat panel/electron tube manufacturing	198	162	152	145	119	87	114	112	108	93	77	63	37	36	27	31	31	34	43	43	39
	Other electronic component manufacturing	5,494	4,322	3,992	3,871	3,744	3,417	3,753	3,694	3,496	2,419	2,904	2,491	2,083	2,073	2,200	2,368	2,297	2,619	2,750	2,437	2,489
	Office and business equipment manufacturing	699	595	530	455	482	479	411	453	536	421	440	428	388	375	360	355	359	337	341	313	377
	Information recording media manufacturing	106	85	73	78	79	80	78	75	68	59	54	50	57	62	67	74	79	98	117	122	81
7. ICT-related service sector		**10,795**	**10,680**	**10,205**	**9,688**	**9,723**	**9,634**	**9,188**	**8,908**	**7,954**	**6,756**	**6,451**	**5,917**	**6,066**	**6,143**	**6,394**	**6,554**	**6,474**	**6,317**	**6,343**	**6,694**	**6,028**
	ICT equipment leasing businesses	3,610	3,540	3,457	3,015	3,050	2,931	2,729	2,613	2,126	1,678	1,567	1,507	1,614	1,692	1,797	1,847	1,780	1,790	1,835	2,080	2,048
	Advertising	3,139	3,083	2,827	2,803	2,843	2,896	2,747	2,635	2,333	1,820	1,711	1,606	1,716	1,704	1,864	1,934	1,992	1,993	1,984	2,050	1,784
	Printing, publishing, binding businesses	3,713	3,685	3,566	3,498	3,444	3,427	3,321	3,268	3,096	2,839	2,737	2,419	2,385	2,436	2,475	2,567	2,490	2,323	2,316	2,331	2,116
	Film and theatre businesses	333	372	355	372	386	380	391	393	398	419	436	385	350	311	258	206	212	210	208	234	80
8. ICT-related construction sector		**727**	**694**	**438**	**268**	**202**	**138**	**113**	**190**	**184**	**144**	**129**	**119**	**126**	**145**	**118**	**98**	**110**	**101**	**101**	**95**	**94**
	Telecom facilities construction businesses	727	694	438	268	202	138	113	190	184	144	129	119	126	145	118	98	110	101	101	95	94
9. Research		**11,295**	**11,221**	**10,974**	**10,636**	**10,644**	**10,563**	**10,975**	**11,502**	**11,435**	**10,549**	**10,134**	**10,264**	**10,115**	**10,279**	**11,079**	**11,146**	**10,588**	**10,733**	**11,263**	**11,440**	**11,335**
	Research	11,295	11,221	10,974	10,636	10,644	10,563	10,975	11,502	11,435	10,549	10,134	10,264	10,115	10,279	11,079	11,146	10,588	10,733	11,263	11,440	11,335
ICT industry total		**62,058**	**59,872**	**57,582**	**56,902**	**56,324**	**55,210**	**56,219**	**57,164**	**55,545**	**50,038**	**49,426**	**47,161**	**45,683**	**46,393**	**48,539**	**49,896**	**49,605**	**50,602**	**51,710**	**52,261**	**50,957**

Data 9 Transitions in real GDP by sector of the information and communication industry of Japan

(Unit: billion yen at 2015 prices)

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1. Telecommunications sector		**5,267**	**5,790**	**6,190**	**6,405**	**5,913**	**5,150**	**5,617**	**6,218**	**6,454**	**6,838**	**7,140**	**7,486**	**7,208**	**7,404**	**7,377**	**8,675**	**9,556**	**9,912**	**10,083**	**10,548**	**10,279**
	Fixed-line communications	4,423	4,904	5,274	5,432	4,875	4,030	4,092	4,326	4,259	4,260	3,964	3,688	3,333	3,397	3,456	3,931	4,515	4,685	4,659	4,591	4,460
	Mobile communications	705	748	755	811	870	944	1,340	1,701	1,999	2,381	2,975	3,592	3,653	3,767	3,673	4,480	4,768	4,952	5,140	5,504	5,368
	Services associated with telecommunications	138	138	162	161	168	175	185	191	196	197	201	207	222	241	248	264	273	274	284	454	450
2. Broadcasting sector		**1,131**	**1,194**	**1,304**	**1,391**	**1,455**	**1,525**	**1,562**	**1,632**	**1,634**	**1,694**	**1,682**	**1,571**	**1,594**	**1,828**	**1,906**	**1,908**	**1,899**	**1,884**	**1,933**	**1,910**	**2,076**
	Public broadcasting	301	306	310	314	315	304	304	309	303	303	307	316	311	317	345	347	359	371	385	372	394
	Private broadcasting	614	665	749	812	861	920	934	955	948	986	944	830	779	918	898	829	832	823	828	819	981
	Cable broadcasting	216	223	245	265	279	301	324	368	383	406	430	425	504	593	663	732	708	691	720	719	701
3. Information services sector		**7,735**	**8,829**	**9,376**	**9,808**	**10,235**	**10,571**	**10,907**	**11,115**	**11,340**	**11,045**	**10,702**	**10,439**	**10,401**	**10,610**	**10,550**	**10,630**	**10,682**	**10,958**	**11,044**	**11,417**	**11,245**
	Software	5,010	5,747	5,911	6,035	6,097	6,145	6,540	6,678	6,818	6,622	6,419	6,344	6,515	6,781	6,820	6,994	6,928	7,141	7,164	7,502	7,541
	Information processing/provision service	2,725	3,082	3,465	3,773	4,138	4,426	4,367	4,437	4,522	4,423	4,282	4,095	3,886	3,830	3,730	3,636	3,754	3,818	3,880	3,915	3,704
4. Internet-related Services sector		0	0	0	0	0	**483**	**477**	**511**	**534**	**467**	**518**	**580**	**571**	**658**	**752**	**886**	**916**	**964**	**1,037**	**1,029**	**1,216**
	Internet-related Services	0	0	0	0	0	483	477	511	534	467	518	580	571	658	752	886	916	964	1,037	1,029	1,216
5. Video picture, sound information, character information production sector		**5,158**	**5,036**	**4,841**	**4,742**	**4,744**	**4,688**	**4,355**	**4,042**	**3,718**	**3,369**	**3,072**	**2,763**	**2,933**	**2,935**	**2,946**	**2,774**	**2,851**	**2,853**	**2,790**	**2,478**	**2,322**
	Video picture, sound information, character information production (excluding news providers)	2,178	2,122	1,989	1,976	2,005	1,950	1,777	1,612	1,455	1,304	1,192	1,054	1,188	1,192	1,223	1,169	1,280	1,350	1,358	1,106	1,042
	Newspapers	1,328	1,298	1,234	1,202	1,184	1,166	1,063	963	863	758	661	570	653	728	766	809	806	793	765	742	671
	Publishers	1,159	1,139	1,162	1,144	1,183	1,179	1,114	1,059	979	876	782	693	713	736	748	743	706	645	598	549	538
	News providers	494	477	456	420	373	393	400	408	420	431	436	446	378	279	209	54	58	65	70	81	72
6. ICT-related manufacturing sector		**-2,522**	**-2,697**	**-1,688**	**-1,376**	**-281**	**1,167**	**1,920**	**2,703**	**3,741**	**3,511**	**5,071**	**5,768**	**5,419**	**5,600**	**6,411**	**7,226**	**6,953**	**7,345**	**7,634**	**8,065**	**7,273**
	Communication cable manufacturing	27	30	23	21	14	11	27	41	56	67	99	105	104	90	82	83	77	72	77	73	83
	Cable communication equipment and appliance manufacturing	520	406	346	321	325	308	311	304	324	243	254	241	248	230	189	181	161	157	177	172	125
	Wireless communication equipment and appliance manufacturing	-640	-751	-542	-645	-510	-205	-104	-65	142	192	298	365	441	471	525	581	626	613	632	671	587
	Other telecommunication equipment and appliance manufacturing	237	240	180	196	207	179	194	222	239	232	231	200	207	199	204	177	192	194	196	202	155
	Radio and television receiver / video equipment manufacturing	-1,167	-1,043	-1,112	-1,228	-1,165	-894	-932	-903	-746	-542	-359	125	181	179	187	223	176	179	163	152	86
	Electrical audio equipment and appliance manufacturing	203	218	261	322	326	313	348	286	237	186	189	156	74	77	94	106	83	76	73	67	72
	Computer and peripheral device manufacturing	-1,738	-1,823	-1,253	-997	-579	-117	-48	62	162	196	287	362	398	411	483	556	502	542	594	705	586
	Semiconductor element manufacturing	149	138	148	192	217	231	240	262	324	267	303	278	249	281	317	282	250	252	246	236	233
	Integrated circuit manufacturing	-533	-409	-312	-258	-170	-61	92	275	407	468	747	872	846	908	1,162	1,442	1,454	1,405	1,625	2,174	2,022
	Liquid crystal panel manufacturing	-483	-537	-353	-409	-308	-180	-179	-84	10	86	222	316	278	293	566	767	611	677	558	504	444
	Flat panel/electron tube manufacturing	-63	-55	-57	-59	-53	-42	-36	-7	28	50	67	128	64	51	32	31	32	36	44	43	37
	Other electronic component manufacturing	442	459	609	837	1,074	1,284	1,670	1,913	2,073	1,636	2,249	2,134	1,866	1,952	2,128	2,368	2,363	2,719	2,810	2,326	2,306
	Office and business equipment manufacturing	434	360	313	267	278	275	274	335	427	375	434	439	406	395	375	355	348	324	320	617	459
	Information recording media manufacturing	89	69	58	62	63	65	65	61	59	54	51	49	58	63	68	74	79	99	119	123	77
7. ICT-related service sector		**5,883**	**6,019**	**5,933**	**6,045**	**6,386**	**6,722**	**6,773**	**6,905**	**6,623**	**6,056**	**6,211**	**5,981**	**6,305**	**6,500**	**6,604**	**6,554**	**6,456**	**6,246**	**6,216**	**6,540**	**5,945**
	ICT equipment leasing businesses	650	746	813	889	1,139	1,362	1,426	1,521	1,448	1,284	1,398	1,501	1,725	1,840	1,876	1,847	1,848	1,859	1,908	2,181	2,157
	Advertising	1,989	1,977	1,884	1,907	1,961	2,026	2,026	2,044	1,942	1,687	1,703	1,691	1,820	1,858	1,979	1,934	1,924	1,876	1,813	1,827	1,733
	Printing, publishing, binding businesses	2,985	2,998	2,944	2,935	2,952	2,997	2,969	2,982	2,867	2,693	2,696	2,418	2,418	2,495	2,490	2,567	2,474	2,303	2,289	2,296	1,978
	Film and theatre businesses	259	298	292	314	334	337	352	358	365	392	414	370	341	307	260	206	211	208	207	236	77
8. ICT-related construction sector		**884**	**851**	**542**	**330**	**243**	**160**	**124**	**199**	**187**	**147**	**129**	**122**	**131**	**148**	**117**	**98**	**109**	**99**	**96**	**87**	**86**
	Telecom facilities construction businesses	884	851	542	330	243	160	124	199	187	147	129	122	131	148	117	98	109	99	96	87	86
9. Research		**10,342**	**10,274**	**10,087**	**9,816**	**9,835**	**9,762**	**10,273**	**10,881**	**10,976**	**10,190**	**10,001**	**10,330**	**10,274**	**10,544**	**11,425**	**11,146**	**10,620**	**10,725**	**11,171**	**11,311**	**11,215**
	Research	10,342	10,274	10,087	9,816	9,835	9,762	10,273	10,881	10,976	10,190	10,001	10,330	10,274	10,544	11,425	11,146	10,620	10,725	11,171	11,311	11,215
ICT industry total		**33,878**	**35,295**	**36,585**	**37,162**	**38,530**	**40,227**	**42,008**	**44,208**	**45,206**	**43,315**	**44,526**	**45,040**	**44,836**	**46,226**	**48,087**	**49,896**	**50,042**	**50,986**	**52,005**	**53,385**	**51,656**

Data 10 Transitions in the number of employees by sector of the information and communication industry of Japan

(Unit: 1,000 employees)

		2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
1. Telecommunications sector		**421**	**375**	**338**	**313**	**285**	**255**	**269**	**268**	**287**	**271**	**265**	**249**	**220**	**209**	**194**	**151**	**148**	**150**	**149**	**170**	**180**
	Fixed-line communications	235	213	185	179	168	156	161	153	157	135	122	101	92	99	91	66	59	56	52	68	65
	Mobile communications	143	128	117	105	91	76	83	89	101	107	112	116	95	74	65	45	55	59	63	67	80
	Services associated with telecommunications	43	34	36	29	26	24	25	27	28	29	31	32	34	36	38	39	34	34	35	35	35
2. Broadcasting sector		**66**	**67**	**72**	**70**	**70**	**73**	**73**	**72**	**70**	**69**	**67**	**66**	**68**	**73**	**72**	**69**	**69**	**67**	**66**	**71**	**70**
	Public broadcasting	14	14	14	14	14	15	14	14	14	14	14	14	14	14	13	13	13	13	13	14	13
	Private broadcasting	32	33	37	37	38	37	37	36	34	33	32	32	34	35	34	33	33	32	32	32	32
	Cable broadcasting	19	20	22	19	18	21	22	22	22	22	21	19	21	24	24	23	23	22	20	25	25
3. Information services sector		**977**	**981**	**981**	**969**	**1,029**	**1,011**	**1,050**	**1,001**	**1,072**	**1,135**	**1,081**	**1,080**	**1,076**	**1,146**	**1,131**	**1,120**	**1,142**	**1,130**	**1,129**	**1,150**	**1,142**
	Software	644	667	652	637	668	646	668	646	718	780	741	740	744	815	806	799	820	804	800	821	814
	Information processing/provision service	333	314	329	332	361	365	381	355	354	356	341	340	333	330	325	321	322	325	328	329	328
4. Internet-related Services sector		0	0	0	0	0	**62**	**61**	**61**	**64**	**66**	**68**	**72**	**83**	**103**	**108**	**118**	**124**	**129**	**138**	**151**	**157**
	Internet-related Services	0	0	0	0	0	62	61	61	64	66	68	72	83	103	108	118	124	129	138	151	157
5. Video picture, sound information, character information production sector		**322**	**327**	**336**	**342**	**364**	**367**	**351**	**339**	**319**	**293**	**278**	**260**	**277**	**287**	**290**	**287**	**295**	**293**	**287**	**258**	**236**
	Video picture, sound information, character information production (excluding news providers)	139	140	143	145	161	163	156	149	140	127	126	120	135	141	145	140	154	160	160	139	122
	Newspapers	75	77	78	77	78	77	75	71	67	63	57	53	53	53	52	53	53	52	52	48	46
	Publishers	80	87	94	101	108	110	108	106	100	91	82	74	77	80	81	82	77	70	64	60	58
	News providers	28	23	22	19	17	16	13	13	13	13	13	13	12	12	12	12	12	12	11	11	10
6. ICT-related manufacturing sector		**1,156**	**988**	**920**	**914**	**875**	**820**	**851**	**886**	**845**	**786**	**797**	**793**	**730**	**722**	**693**	**682**	**692**	**701**	**713**	**710**	**700**
	Communication cable manufacturing	7	6	6	5	4	4	4	4	5	5	5	4	5	5	4	4	5	5	4	4	4
	Cable communication equipment and appliance manufacturing	47	36	26	22	18	18	18	21	20	21	21	21	21	19	18	16	16	15	15	15	14
	Wireless communication equipment and appliance manufacturing	65	66	64	62	57	50	58	64	56	52	58	56	51	47	50	42	41	42	44	41	38
	Other telecommunication equipment and appliance manufacturing	14	21	13	13	13	13	14	17	17	20	22	22	22	21	20	18	19	20	17	19	19
	Radio and television receiver / video equipment manufacturing	74	51	67	78	66	51	54	51	47	44	45	45	38	31	26	23	20	22	22	22	21
	Electrical audio equipment and appliance manufacturing	61	45	42	37	36	32	31	32	26	24	23	22	15	14	14	13	11	10	10	9	9
	Computer and peripheral device manufacturing	133	113	83	76	72	61	66	78	76	74	74	74	64	62	53	48	45	44	42	41	34
	Semiconductor element manufacturing	89	58	57	50	46	44	48	53	37	36	37	39	34	35	22	28	24	24	23	24	23
	Integrated circuit manufacturing	125	108	114	125	120	112	108	104	104	98	100	96	90	89	79	69	70	69	79	86	79
	Liquid crystal panel manufacturing	41	37	30	27	26	26	27	30	30	29	30	29	25	26	24	22	22	23	23	23	21
	Flat panel/electron tube manufacturing	12	10	9	9	8	8	7	7	9	7	5	5	3	3	2	2	2	2	2	2	2
	Other electronic component manufacturing	414	372	352	360	369	365	374	374	359	322	318	322	303	318	330	356	375	386	393	388	399
	Office and business equipment manufacturing	66	57	50	42	34	29	35	47	56	51	55	56	53	51	47	38	38	36	35	34	34
	Information recording media manufacturing	8	8	7	7	7	7	6	5	4	4	3	2	3	3	4	4	4	4	3	3	3
7. ICT-related service sector		**855**	**895**	**760**	**767**	**784**	**822**	**800**	**804**	**784**	**740**	**711**	**698**	**695**	**701**	**684**	**681**	**687**	**678**	**677**	**683**	**692**
	ICT equipment leasing businesses	74	75	81	88	94	102	104	111	102	96	101	110	109	109	109	111	115	110	112	112	112
	Advertising	246	249	246	225	217	224	213	207	204	180	153	138	151	164	175	188	191	191	193	198	199
	Printing, publishing, binding businesses	513	546	409	430	448	472	460	462	455	442	436	429	413	403	375	359	357	352	347	346	372
	Film and theatre businesses	22	25	24	24	24	24	24	23	22	22	21	21	23	25	24	24	25	24	24	27	10
8. ICT-related construction sector		**123**	**98**	**74**	**59**	**45**	**29**	**22**	**33**	**30**	**34**	**30**	**27**	**26**	**25**	**24**	**22**	**27**	**27**	**28**	**28**	**27**
	Telecom facilities construction businesses	123	98	74	59	45	29	22	33	30	34	30	27	26	25	24	22	27	27	28	28	27
9. Research		**943**	**895**	**829**	**829**	**838**	**840**	**847**	**847**	**844**	**848**	**848**	**850**	**890**	**929**	**954**	**1,016**	**1,000**	**1,002**	**1,023**	**1,035**	**1,035**
	Research	943	895	829	829	838	840	847	847	844	848	848	850	890	929	954	1,016	1,000	1,002	1,023	1,035	1,035
ICT industry total		**4,862**	**4,625**	**4,311**	**4,263**	**4,289**	**4,278**	**4,325**	**4,311**	**4,315**	**4,243**	**4,145**	**4,095**	**4,067**	**4,196**	**4,150**	**4,146**	**4,184**	**4,176**	**4,210**	**4,254**	**4,240**

ADDITIONAL NOTES

Annotation 1　Survey on Trends of Use of Digital Technologies in Japan and Abroad

(1)　Summary of questionnaire survey

i　Daily life of people

Situation of digital technology usage in workstyle, information collection and public services was surveyed targeting general citizens of Japan, the United States, Germany and China.

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Extracting method</td><td>Online questionnaire survey</td></tr>
<tr><td>Survey period</td><td>Feb to Mar 2022</td></tr>
<tr><td>Targets</td><td>Extracted from the monitors held by the questionnaire survey company with consideration to age-group balance</td></tr>
<tr><td>Main survey
Number of valid responses</td><td>
<table>
<tr><th></th><th>20s</th><th>30s</th><th>40s</th><th>50s</th><th>60s</th><th>Total</th></tr>
<tr><td>Japan</td><td>265</td><td>260</td><td>265</td><td>155</td><td>115</td><td>1,060</td></tr>
<tr><td>US</td><td>157</td><td>177</td><td>171</td><td>52</td><td>87</td><td>644</td></tr>
<tr><td>Germany</td><td>142</td><td>173</td><td>146</td><td>100</td><td>39</td><td>600</td></tr>
<tr><td>China</td><td>132</td><td>144</td><td>144</td><td>93</td><td>36</td><td>549</td></tr>
<tr><td>Total</td><td>696</td><td>754</td><td>726</td><td>400</td><td>277</td><td>2,853</td></tr>
</table>
*People under 20 and over 70 are not included in the scope of this survey.</td></tr>
<tr><td>Major survey items</td><td>-Basic attribute (age)
-Telework use situation
-Use situation of social networking service (SNS)
-Use situation of electronic administrative services</td></tr>
</table>

ii Corporate activities

Situation of digital technology usage in terms of technology/data, organization and human resources was surveyed targeting enterprises of Japan, the United States, Germany and China.

<table>
<tr><th>Item</th><th>Description</th></tr>
<tr><td>Extracting method</td><td>Online questionnaire survey</td></tr>
<tr><td>Survey period</td><td>Feb to Mar 2022</td></tr>
<tr><td>Targets</td><td>Extracted from the monitors (with citizenship of the respective country and working for a company with more than 10 employees) held by the questionnaire survey company</td></tr>
<tr><td>Main survey
Number of valid responses</td><td>
<table>
<tr><th></th><th>Big company</th><th>SME</th><th>Total</th></tr>
<tr><td>Japan</td><td>798</td><td>498</td><td>1,296</td></tr>
<tr><td>US</td><td>311</td><td>288</td><td>599</td></tr>
<tr><td>Germany</td><td>326</td><td>261</td><td>587</td></tr>
<tr><td>China</td><td>398</td><td>147</td><td>545</td></tr>
<tr><td>Total</td><td>1,833</td><td>1,194</td><td>3,027</td></tr>
</table>
*Based on the “definition of SME” of the Small and Medium Enterprise Agency[1] and the result of a commissioned survey of the last year[2], Enterprises with 300 or more employees are classified as “large enterprise” while enterprises with less than 300 employees are classified as “SME” in “manufacturing,” “construction,” “electricity, gas, heat supply and water,” “finance and insurance,” “real estate, goods rental and leasing,” “transportation and postal services” and “information and telecommunications”; Enterprises with 100 or more employees are classified as “large enterprise” while enterprises with less than 100 employees are classified as “SME” in “wholesale/retail” and “ services and other,”</td></tr>
<tr><td>Major survey items</td><td>-Basic attributes (business type, number of employees)
-Data/technologies used for digitalization
-Effects of digitalization
-Shortage status of digital human resources and efforts to secure them
-Challenges of digitalization</td></tr>
</table>

(2)　Analysis of digital usage trend in Japan and abroad

i　Daily life of people

Situation of digital technology usage in workstyle, information collection and public services was assessed based on the questionnaire result of (1) (i) above, and characteristics and challenges of digital usage in Japan were identified through comparison of the countries.

ii　Corporate activities

Efforts for digitalization in terms of technology/data, organization and human resources was assessed based on the questionnaire result of (1) (ii) above, and characteristics and challenges of digital usage in Japanese enterprises were identified through comparison of the countries.

1　“Definition of small and medium enterprises” (Small and Medium Enterprise Agency) https://www.chusho.meti.go.jp/soshiki/teigi.html

2　“Survey study on the economic impact of digital transformation” MIC, 2021
https://www.soumu.go.jp/johotsusintokei/linkdata/r03_02_houkoku.pdf

Annotation 2 Survey on Economic Analysis of ICT
(Scope of the information and communications industry of Japan）

Scope of the information and communications industry of Japan

Scope of the information and communications industry		Sectors of the Input-Output Table of the Information Communications Industry
1. Telecommunications		
	Fixed-line telecommunications	Fixed-line telecommunications
	Mobile telecommunications	Mobile telecommunications
	Services associated with telecommunications	Services associated with telecommunications
2. Broadcasting		
	Public broadcasting	Public broadcasting
	Private broadcasting	Private television/multiplex broadcasting
		Private radio broadcasting
		Private satellite broadcasting
	Cable broadcasting	Cable television broadcasting
		Cable radio broadcasting
3. Information services		
	Software	Software
	Information processing/provision services	Information processing service
		Information provision service
4. Internet-related Services		
	Internet-related Services	Internet-related Services
5. Video picture, sound information, character information production		
	Video picture, sound information, character information production	Video picture, sound information, character information production (excluding news providers)
	Newspapers	Newspapers
	Publishers	Publishers
	News providers	News providers
6. ICT-related manufacturing		
	Computer and peripheral device manufacturing	Personal computer
		Computers (excluding personal computers)
		Peripheral devices of computer
	Cable communication equipment and appliance manufacturing	Cable communication equipment
	Wireless communication equipment and appliance manufacturing	Mobile phones
		Wireless communication equipment (excluding mobile phones)
	Other telecommunication equipment and appliance manufacturing	Other telecommunication equipment
	Flat panel/electron tube manufacturing	Flat panels/electron tubes
	Semiconductor element manufacturing	Semiconductor elements
	Integrated circuit manufacturing	Integrated circuits
	Liquid crystal panel manufacturing	Liquid crystal panels
	Other electronic component manufacturing	Other electronic components
	Radio and television receiver / video equipment manufacturing	Radio and television receivers
		Video equipment and digital cameras
	Communication cable manufacturing	Communication cables and optical fiber cables
	Office and business equipment manufacturing	Office and business equipment
	Electrical audio equipment and appliance manufacturing	Electrical audio equipment and appliances
	Information recording media manufacturing	Information recording media
7. ICT-related services		
	ICT equipment leasing business	Computer and related equipment leasing
		Office and business equipment leasing (excluding computers)
		Communication equipment and appliance leasing
	Advertising business	Advertising
	Printing, publishing, binding business	Printing, publishing, binding
	Film and theatre business	Film, theatre and entertainment places
8. IT-related construction		
	Telecom facilities construction	Telecom facilities construction
9. Research		
	Research	Research

Annotation 3 Survey on economic analysis of ICT (comparison of nominal and real domestic production values (2019-2020))

The table below compares the nominal and real domestic production values. In the right columns, the “ ● ” symbol signifies that the real value is larger than the nominal value, and the “ ○ ” symbol signifies that the nominal value is larger than the real value.

Information Communication of IO77 sector		Nominal values (million yen)		Real values (million yen)		Comparison	
		2019	2020	2019	2020	2019	2020
1	Fixed-line telecommunications	7,942,323	7,880,709	8,227,434	8,088,358	●	●
2	Mobile telecommunications	9,261,603	9,039,258	9,921,823	9,754,105	●	●
3	Services associated with telecommunications	823,607	811,297	854,964	840,512	●	●
4	Public broadcasting	801,450	782,737	801,450	788,255	○	●
5	Private television/multiplex broadcasting	2,070,342	1,876,602	2,086,337	2,141,018	●	●
6	Private radio broadcasting	116,354	101,181	115,948	99,490	○	○
7	Private satellite broadcasting	310,941	291,852	293,895	272,250	○	○
8	Cable television broadcasting	541,443	540,726	531,869	518,433	○	○
9	Cable radio broadcasting	900,708	899,515	893,117	875,015	○	○
10	Software	12,679,392	13,091,893	12,069,864	12,195,522	○	○
11	Information processing service	6,738,527	6,597,812	6,724,268	6,458,433	○	○
12	Information provision service	1,153,808	1,107,482	1,123,963	1,060,988	○	○
13	Internet-related Services	4,164,134	4,450,950	4,069,186	4,439,112	○	○
14	Newspapers	1,717,334	1,582,639	1,648,113	1,501,555	○	○
15	Publishers	1,412,902	1,422,582	1,344,833	1,316,455	○	○
16	News providers	163,270	145,996	160,199	140,990	○	○
17	Video picture, sound information, character information production (excluding news providers)	3,012,404	2,693,680	2,955,747	2,601,325	○	○
18	Personal computer	904,757	699,293	901,077	725,224	○	●
19	Computers (excluding personal computers)	79,477	66,252	81,696	68,489	●	●
20	Peripheral devices of computer	1,070,634	905,667	1,202,397	1,009,944	●	●
21	Cable communication equipment	565,476	426,993	548,299	408,706	○	○
22	Mobile phones	109,137	101,193	127,387	119,604	●	●
23	Wireless communication equipment (excluding mobile phones)	1,502,428	1,278,917	1,608,452	1,361,878	●	●
24	Other telecommunication equipment	474,573	368,175	478,160	366,191	●	○
25	Semiconductor elements	742,097	749,575	741,726	737,710	○	○
26	Integrated circuits	4,182,839	3,801,206	4,684,467	4,306,096	●	●
27	Liquid crystal panels	1,222,719	1,040,657	1,299,369	1,106,874	●	●
28	Flat panels/electron tubes	100,205	89,685	99,156	87,377	○	○
29	Other electronic components	7,497,123	7,042,281	7,418,609	6,861,035	○	○
30	Radio and television receivers	57,347	21,844	64,637	25,845	●	●
31	Video equipment and digital cameras	305,637	183,826	312,327	188,750	●	●
32	Communication cables and optical fiber cables	244,122	301,959	239,011	290,103	○	○
33	Office and business equipment	952,581	1,041,176	1,279,240	1,137,140	●	●
34	Electrical audio equipment and appliances	207,664	229,834	210,116	230,064	●	●
35	Information recording media	256,797	163,460	255,476	160,345	○	○
36	Computer and related equipment leasing	2,122,269	2,031,065	2,200,632	2,118,177	●	●
37	Office and business equipment leasing (excluding computers)	539,556	506,934	550,426	518,823	●	●
38	Communication equipment and appliance leasing	556,673	532,750	549,664	518,154	○	○
39	Advertising	7,386,286	6,405,589	7,074,241	6,482,316	○	●
40	Printing, publishing, binding	4,409,255	4,052,846	4,265,313	3,813,864	○	○
41	Film, theatre and entertainment places	582,029	215,424	573,073	209,376	○	○
42	Telecom facilities construction	168,275	167,325	157,960	155,804	○	○
43	Research	19,232,954	19,034,700	18,892,881	18,698,133	○	○

Annotation 4　List of domestic production of 77 sector

ICT goods/services		General goods/services	
1	Fixed-line telecommunications	44	Agriculture, forestry and fisheries
2	Mobile telecommunications	45	Mining
3	Services associated with telecommunications	46	Food and beverage
4	Public broadcasting	47	Textile products
5	Private television/multiplex broadcasting	48	Pulp, paper and wood products
6	Private radio broadcasting	49	Chemicals
7	Private satellite broadcasting	50	Petroleum and coal products
8	Cable television broadcasting	51	Plastic and rubber products
9	Cable radio broadcasting	52	Ceramics, stone and clay products
10	Software	53	Steel
11	Information processing service	54	Non-ferrous metals
12	Information provision service	55	Metal products
13	Internet-related Services	56	General-purpose machinery
14	Newspapers	57	Miscellaneous manufacturing products
15	Publishers	58	Production machinery
16	News providers	59	Business-oriented machinery
17	Video picture, sound information, character information production (excluding news providers)	60	Electric machine
18	Personal computer	61	Transportation machine
19	Computers (excluding personal computers)	62	Construction
20	Peripheral devices of computer	63	Electric power, gas and heat supply
21	Cable communication equipment	64	Water
22	Mobile phones	65	Waste treatment
23	Wireless communication equipment (excluding mobile phones)	66	Commerce
24	Other telecommunication equipment	67	Finance and insurance
25	Semiconductor elements	68	Real estate
26	Integrated circuits	69	Transportation and postal services
27	Liquid crystal panels	70	Public administration
28	Flat panels/electron tubes	71	Education
29	Other electronic components	72	Medical care and welfare
30	Radio and television receivers	73	Membership-based associations, n.e.c.
31	Video equipment and digital cameras	74	Business service
32	Communication cables and optical fiber cables	75	Personal service
33	Office and business equipment	76	Office supplies
34	Electrical audio equipment and appliances	77	Not elsewhere classified
35	Information recording media		
36	Computer and related equipment leasing		
37	Office and business equipment leasing (excluding computers)		
38	Communication equipment and appliance leasing		
39	Advertising		
40	Printing, publishing, binding		
41	Film, theatre and entertainment places		
42	Telecom facilities construction		
43	Research		

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