

Chapter 6

Basic Data on the ICT Field

Section 1 ICT Industry Trends

1. Economic size of the ICT industry

(1) Market size (domestic production)

- ICT industry market accounted for about 9.9 percent of all industries, making it the largest industry

The ICT industry’s market size in 2015 was 95.7 trillion yen (based on nominal domestic production), accounting for 9.9 percent of all industries and making it the largest industry in the country (Figure 6-1-1-1). Looking at the industry’s performance over time finds that its production value cooled off for several years after 2000 in response to the collapse of the IT bubble. The industry entered positive growth territory again starting in 2005, but its production value plummeted between 2008 and 2009 due to the global financial crisis. ICT’s production value continued to slide even after 2010 until signs of recovery finally started to appear in the years after 2012 (Figure 6-1-1-2).

Looking at the transitions in market size (based on real domestic production) of the main industries in constant 2011 values reveals that the ICT industry fell down by the 2008 – 2009 global financial crisis to 91.3 trillion yen in 2012 but trended gradual upward after 2013 (Figure 6-1-1-2). The ICT industry’s market size (based on real domestic production) in 2015 was 95.7 trillion yen.

The industry’s average annual growth rate from 2000 to 2015 was 0.6 percent.

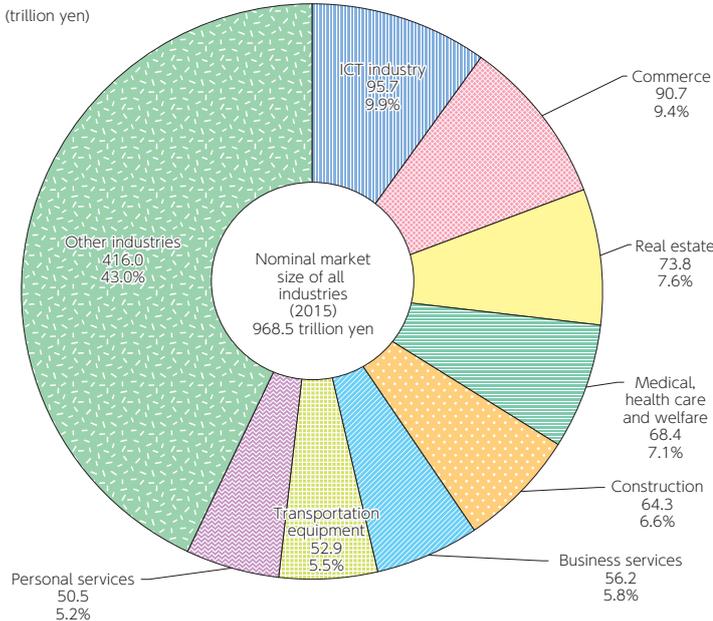
(2) Gross domestic product (GDP)

- The real GDP of the ICT industry in 2015 accounted for 9.3 percent of all industries

The nominal GDP of the ICT industry rose in 2015 by 4.9 percent year-on-year to 44.2 trillion yen. Conversely, the real GDP of the ICT industry in constant 2011 values increased 1.8 percent year-on-year in 2015 to 44.4 trillion yen. (Figure 6-1-1-3).

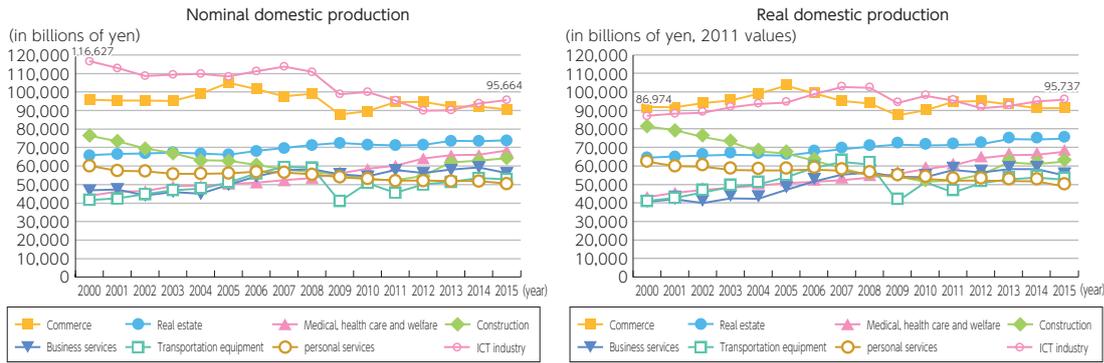
Looking at the size of nominal GDP of the main industries finds that the ICT industry’s nominal GDP accounts for 8.9 percent of the combined nominal GDPs of all industries and is the third largest after the commerce and real estate industries. The growth rate of the ICT industry in terms of nominal GDP rebounded to plus 4.9 percent over 2014 and 2015. Examining the real GDPs of the main industries finds that the ICT industry’s real GDP accounts for 9.3 percent of all industries, making it the third largest industries following commerce and real estate industries (Figure 6-1-1-4).

Figure 6-1-1-1 Market sizes of major industries (based on nominal domestic production) (breakdown) (2015)



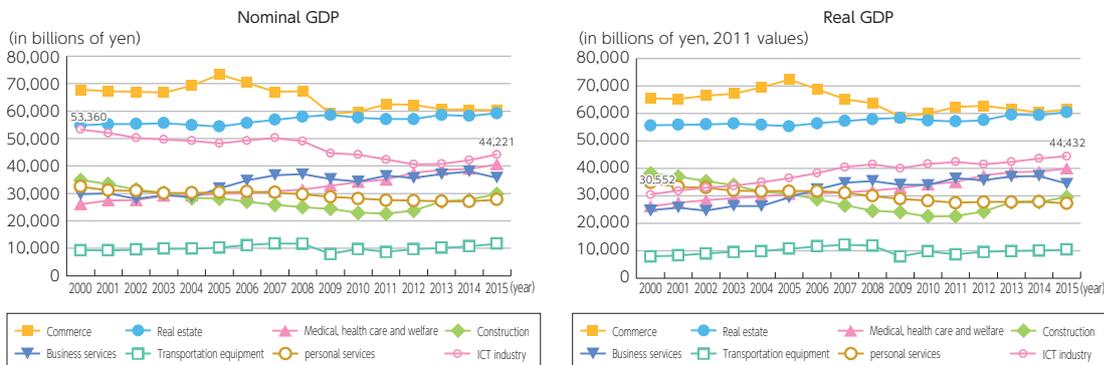
(Source) "Study on Economic Analysis of ICT," MIC (2017)

Figure 6-1-2 Trends in market sizes of major industries (based on nominal domestic production and real domestic production)



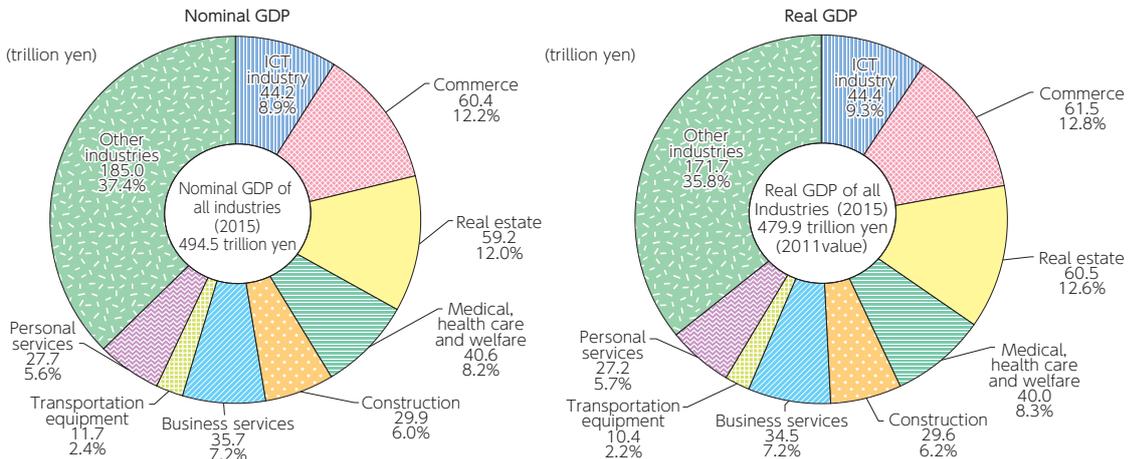
(Source) "Study on Economic Analysis of ICT," MIC (2017)

Figure 6-1-3 Transitions in the nominal GDP and real GDP of major industries



(Source) "Study on Economic Analysis of ICT," MIC (2017)

Figure 6-1-4 Nominal GDP and real GDP of major industries



(Source) "Study on Economic Analysis of ICT," MIC (2017)

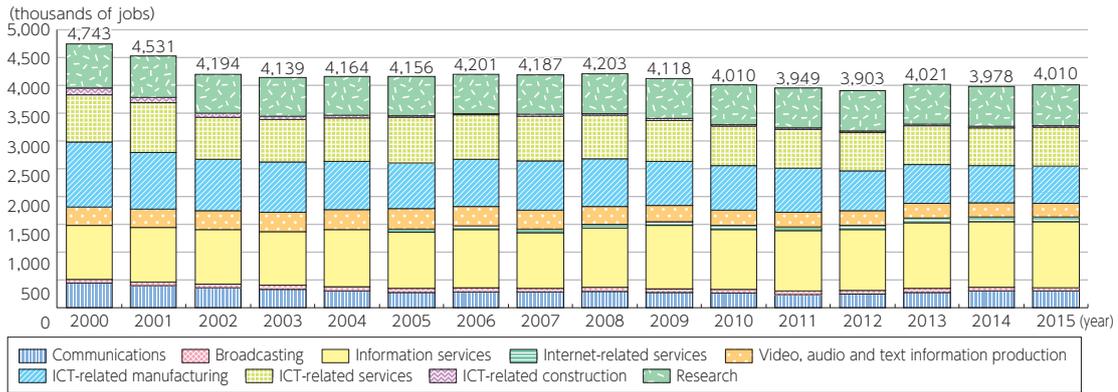
(3) Employment

- ICT industry employment totaled 4.01 million in 2015 accounting for 6.0 percent of total employment in all industries

The ICT industry employed 4.01 million people in 2015 (up 0.8 percent from the previous year), accounting for 6.0 percent of total employment in all industries. Employment declined by 6.1 percent from 2014 in the

Broadcasting sector, by 3.5 percent in the video, audio and text information production sector, and by 1.4 percent in the communications sector. But employment in the research sector and the ICT-related services sector increased, by 3.3 percent and 2.6 percent respectively (Figure 6-1-5).

Figure 6-1-1-5 Transitions in ICT industry employment



(Source) "Study on Economic Analysis of ICT," MIC (2017)

2. ICT industry contributions to the national economy

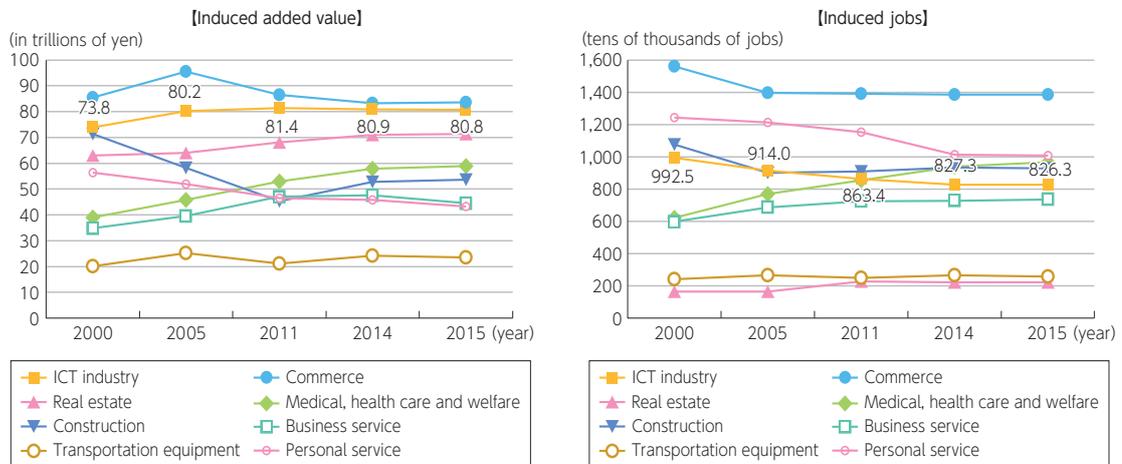
(1) ICT industry's economic spillover effects

- The ICT industry contributes the largest class economic spillover effects of all industries in terms of added value and job inducements

The ICT industry's real domestic production in 2015 was 95.7 trillion yen. The industry's economic spillover effects,³⁵ estimated to be 80.8 trillion yen in added value and 8.263 million jobs. By comparison, in 2000 the ICT

industry's real domestic production value was 87 trillion yen, which contributed 73.8 trillion yen in added value and 9.925 million jobs. Because technological innovation has a large impact on the ICT industry, the industry is believed to be a stronger driver of added value than employment (Figure 6-1-2-1).

Figure 6-1-2-1 Transitions in economic spillover effects (induced added value and jobs) from major industries' production activities



(Source) "Study on Economic Analysis of ICT," MIC (2017)

3. Research and development in the ICT field

(1) Research and development spending

- The ICT industry³⁶ spent 3.9591 trillion yen on research in FY 2015, accounting for 28.9 percent of all corporate research spending

According to the "2016 Research Investigation Report on Science and Technology", Japan's total scientific and

technological research spending (i.e., research spending) in FY 2015 stood at 18.9391 trillion yen (the combined research spending by enterprises, nonprofit organizations, public agencies, universities, etc.).

Corporate research spending, which accounts for

³⁵ There are two methods of calculating economic spillover effects: (1) calculating the economic spillover effects for all Japan's industries brought about by each industry sector's final demand, focusing on the goods and services that constitute the industry sector's final demand and (2) calculating the economic spillover effects for all Japan's industries brought about by each industry sector's production activities (total of final demand and intermediate demand), focusing on the industry sector itself. The latter method was used here.

³⁶ ICT industry here refers to the ICT equipment and appliance manufacturing industry, the electrical equipment and appliance manufacturing industry, the electronic component, device, and circuitry manufacturing industry, and the information and communications industry (including the information services, communications, broadcasting, Internet-related services, and other ICT sectors).

about 70 percent of all research spending, was 13.6857 trillion yen. Of this amount, 3.9591 trillion yen (28.9 percent) was spent on research by the ICT industry. The ICT equipment and appliance manufacturing segment was largest research spender in the ICT industry (Figure 6-1-3-1).

(2) Technology trading

● The ICT industry posted a surplus in technology exports³⁷ in FY 2015

The value received from Japan's technology exports in FY 2015 totaled 3.9498 trillion yen, to which the ICT industry contributed 570.8 billion yen, or 14.5 percent. On the other side of technology trades, the costs of technology imports was 602.6 billion yen, of which the ICT industry paid out 274.1 billion yen, or 45.5 percent. Both Japan and the ICT industry posted export surpluses in technology trading.

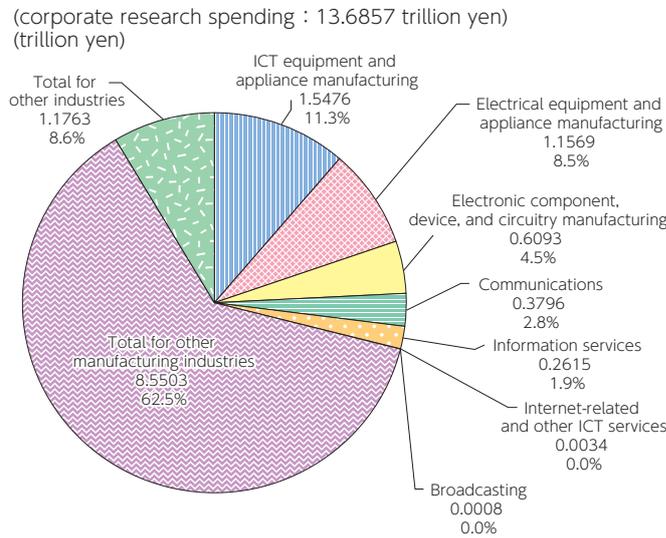
The ICT equipment and appliance manufacturing segment accounted for the largest share of the ICT industry's technology imports and exports (Figure 6-1-3-2).

(3) Number of researchers

● The ICT industry employed 169,717 researchers, or 34.9 percent of all corporate researchers in Japan

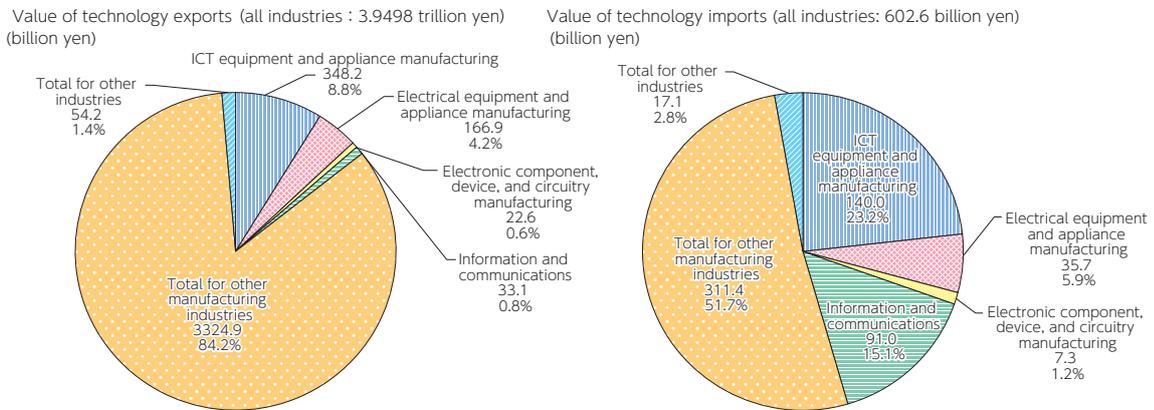
There were 847,093 researchers in Japan on March 31, 2016 (the total of all researchers at enterprises, non-profit organizations, public agencies, universities, etc.). Enterprises employed 486,198 researchers, or about 60 percent of the total. The ICT industry employed 169,717 researchers, or 34.9 percent of all enterprise researchers in Japan. The ICT equipment and appliance manufacturing segment had the most researchers of any ICT industry sector (Figure 6-1-3-3).

Figure 6-1-3-1 Breakdown of corporate research spending by industry (FY 2015)



(Source) Prepared from the "2016 Research Investigation Report on Science and Technology," MIC

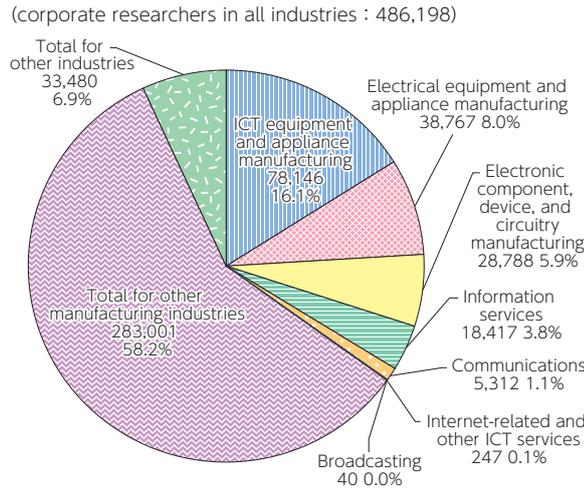
Figure 6-1-3-2 Technology trading by industry (FY 2015)



(Source) Prepared from the "2016 Research Investigation Report on Science and Technology," MIC

³⁷ The value of technology trade is the equivalent value received from the provision (export) of patents, knowledge, technical direction, and other forms of technology transfers to other countries or the equivalent value paid to receive (import) the same forms of technology transfers from other countries.

Figure 6-1-3-3 Corporate researchers by industry (as of March 31, 2016)



(Source) Prepared from the "2016 Research Investigation Report on Science and Technology," MIC

4. State of ICT enterprise operations

The Basic Survey on the Information and Communications Industry is a general statistical survey (started in 2010) that MIC and the Ministry of Economy, Trade and Industry jointly conduct under the Statistics Act (Law No. 53 of 2007) to clarify the operations of enterprises belonging to the ICT industry — a Large Category G in the Japan Standard Industry Classification — and to obtain basic data for ICT industry policies. The following sections provide an overview of the 2016 survey that pertains to ICT enterprises.

(1) Summary of enterprises engaging in ICT business operations (activity-base results)

a. General summary of the survey results

- 5,474 enterprises were engaged in ICT business operations with sales in excess of 48 trillion yen

Sales attributed to ICT business operations in FY 2015 totaled 48.0504 trillion yen (total sales by the enterprises were 71.9513 trillion yen). By sector, the telecommuni-

cations sector accounted for 34.6 percent of all sales (down 1.9 percentage points from the previous year), the software sector 31.5 percent (down 0.5 points), and the information processing services sector 11.7 percent (up 0.5 points) (Figure 6-1-4-1).

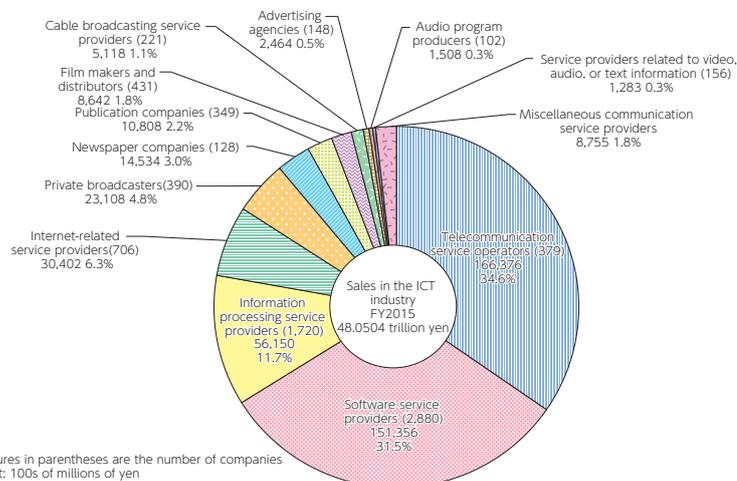
The number of enterprises engaging in ICT business operations (irrespective of whether ICT business operations are the enterprise's mainstay operations) stood at 5,474. Operating profits were 5.9992 trillion yen, ordinary income was 6.1655 trillion yen, and the enterprises held 9,806 subsidiaries and associated companies.

b. Breakdown of sales

- Enterprises capitalized at less than 100 million yen accounted for more than 50 percent of all enterprises in 8 of the 12 ICT industry sectors

A breakdown of ICT industry enterprises by capital size discovers that enterprises capitalized at less than 100 million yen accounted for more than 50 percent of all enterprises in 8 of the 12 ICT industry sectors. Of par-

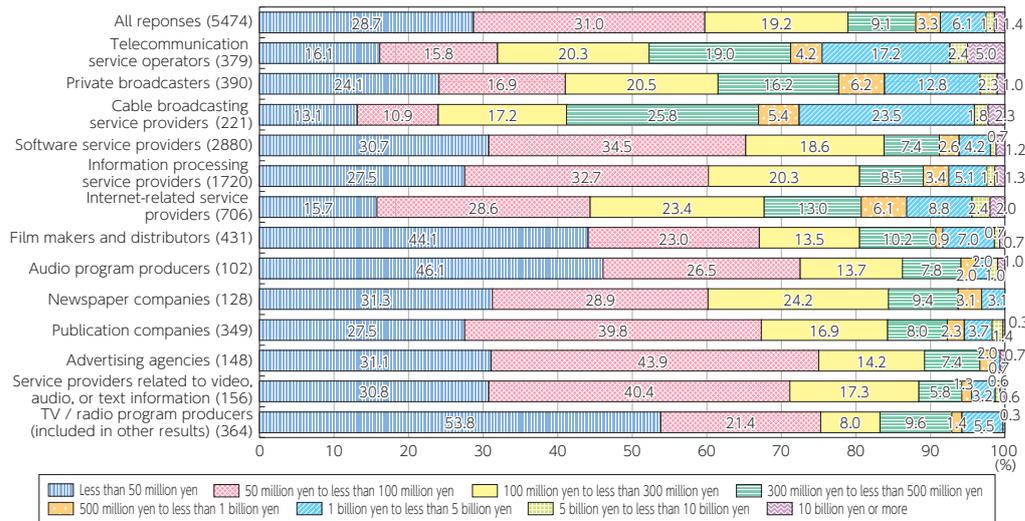
Figure 6-1-4-1 ICT industry sales



(Note) "Miscellaneous communication service providers" refers to enterprises that selected "other" as the primary business in the breakdown of sales attributable to ICT business operations.

(Source) "2016 Basic Survey on the Information and Communications Industry," MIC / METI

Figure 6-1-4-2 Breakdown of ICT industry enterprises by capital size



(Source) "2016 Basic Survey on the Information and Communications Industry," MIC / METI

ticular note is the video information production and distribution sector and the audio information production sector, where enterprises capitalized at less than 50 mil-

lion yen accounted for more than 40 percent of all enterprises in the respective sectors (Figure 6-1-4-2).

5. Telecommunication market trends

(1) Market size

- Mobile communications accounted for more than 50 percent of sales in the telecommunications sector, while, by service category, the data transmission services' share is the highest

Sales in the telecommunications sector in FY 2015 were 14.0342 trillion yen (an increase of 2.5 percent from the previous year) (Figure 6-1-5-1). Fixed-line communications accounted for 29.5 percent of all sales in FY 2015,

and mobile communications for 54.5 percent (Figure 6-1-5-2). Looking at sales by service category finds voice transmission services accounted for 29.2 percent and data transmission services for 54.8 percent (Figure 6-1-5-3). The average revenue per user (ARPU) among the main mobile communication service providers was 4,430 yen for NTT Docomo, 6,340 yen for KDDI, and 4,500 yen for SoftBank (Figure 6-1-5-4).

6. Broadcasting market trends

(1) Size of the broadcasting market

a. Broadcaster sales

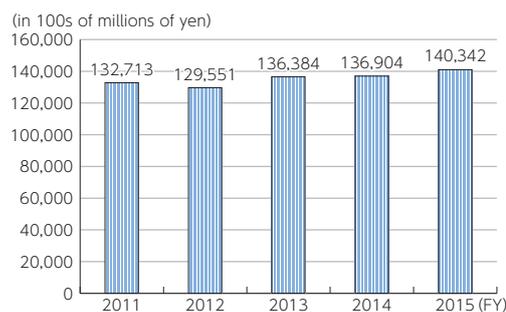
- Broadcaster sales totaled 3.9152 trillion yen in FY 2015

Japanese broadcasters are divided into 2 categories: Japan Broadcasting Corp., a public broadcaster known as NHK, which depends on reception fee revenues, and private broadcasters that depend on advertisements or

paid programming. Apart from these categories, the Open University of Japan provides broadcasting services for educational purposes.

The entire broadcasting sector's sales, including revenues from broadcasting and non-broadcasting operations, increased in FY 2015 (by 1.0 percent from the previous year) to 3.9152 trillion yen. By category,

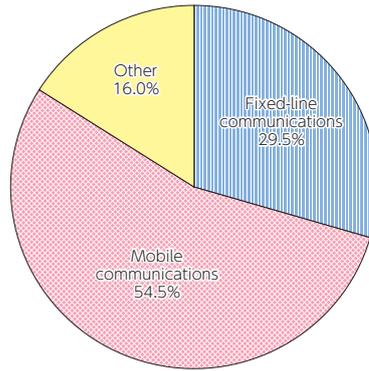
Figure 6-1-5-1 Transitions in telecommunications sector sales



(Note) Comparisons must be made with caution, as sales represent the simple sum of figures from all responding carriers and the number of responding carriers differs from year to year.

Prepared from "2016 Basic Survey on the Information and Communications Industry," MIC / METI

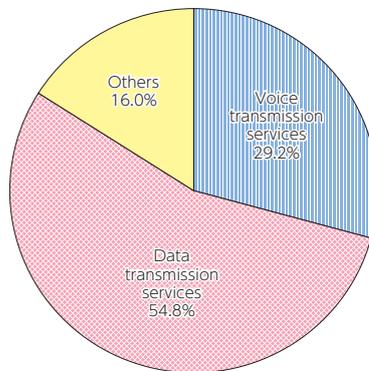
Figure 6-1-5-2 Telecom carriers' sales breakdown by fixed-line communications and mobile communications



(Note) Calculating excluding sales breakdown "Unknown"

Prepared from "2016 Basic Survey on the Information and Communications Industry," MIC / METI

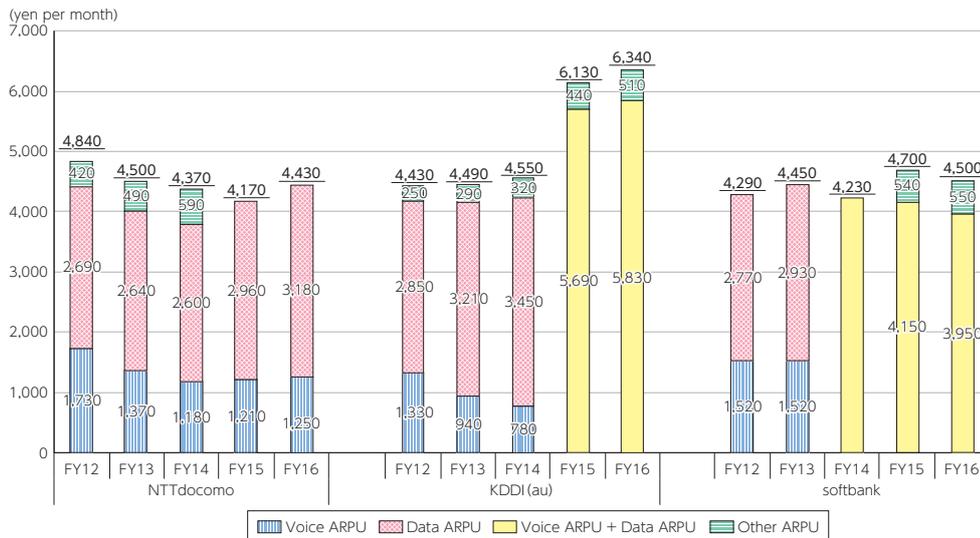
Figure 6-1-5-3 Telecom carriers' sales breakdown by service category



(Note) Calculating excluding sales breakdown "Unknown"

Prepared from "2016 Basic Survey on the Information and Communications Industry," MIC / METI

Figure 6-1-5-4 Transitions in mobile ARPU in the past five years for 3 domestic mobile operators



(Notes) *Each company's ARPU is calculated and released based on the respective company's criteria. The figures were not calculated using the same method.

*Due to rounding, the total of individual ARPU figures may not equal the total ARPU figures.

*NTT Docomo includes Smart ARPU, KDDI includes value added ARPU, and SoftBank includes service ARPU.

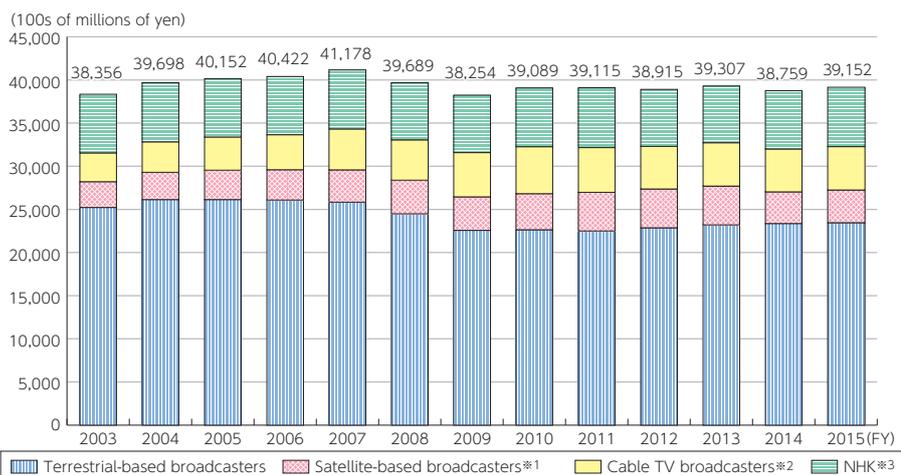
*The ARPU figures for KDDI after FY 2012 were taken from au Communications ARPU under the personal segment. Applied discount amounts were subtracted from the voice ARPU.

*SoftBank ARPU figures included communication modules until FY 2011.

*SoftBank Mobile took over SoftBank BB, SoftBank Telecom, and Y!Mobile on April 1, 2015 (name changed to SoftBank on July 1, 2015).

Prepared from financial statements from each company

Figure 6-1-6-1 Transitions in and breakdown of the broadcasting sector market size (total sales)



fiscal year		2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Private broadcaster	Terrestrial-based broadcasters	25,229	26,153	26,138	26,091	25,847	24,493	22,574	22,655	22,502	22,870	23,216	23,375	23,461
	Community broadcasters included in total above*4	141	140	140	144	148	150	123	116	120	115	124	127	126
	Satellite-based broadcasters*1	2,995	3,158	3,414	3,525	3,737	3,905	3,887	4,185	4,490	4,510	4,491	3,661	3,809
	Cable TV broadcasters*2	3,330	3,533	3,850	4,050	4,746	4,667	5,134	5,437	5,177	4,931	5,030	4,975	5,003
NHK*3	6,803	6,855	6,749	6,756	6,848	6,624	6,659	6,812	6,946	6,604	6,570	6,748	6,879	
total		38,356	39,698	40,152	40,422	41,178	39,689	38,254	39,089	39,115	38,915	39,307	38,759	39,152

(※1) Figures for satellite-based broadcasters represent operating revenues from satellite-based broadcasting services.

(※2) Cable TV broadcasters until FY 2010 were business enterprises providing independent broadcasting services with facilities licensed under the former licensing scheme (under the former Act on Cable Television Broadcasting. Note that facilities registered under the former Act on Broadcast on Telecommunications Services included those that use the same broadcasting method as facilities licensed under the former licensing scheme). From FY 2011 on, cable TV broadcasters were registered business enterprises with wired telecommunication facilities providing independent broadcasting services. (Both exclude business operators using IP multicasts.)

(※3) Figures for NHK represent ordinary operating income.

(※4) Community broadcasting operators that also provide cable TV broadcasting services are excluded.

Prepared from MIC materials and the "NHK financial statements" for each fiscal year

terrestrial-based private broadcasters' sales were 2.3461 trillion yen (up 0.4 percent from the previous year), satellite-based private broadcasters' sales were 380.9 billion yen (up 4.0 percent), cable TV broadcasters' sales were 500.3 billion yen (up 0.6 percent), and NHK's ordinary

operating income was 687.9 billion yen (up 1.9 percent).

In terms of market share, terrestrial-based private broadcasters accounted for 72.7 percent (down 0.3 percentage points from the previous year) of private broadcasters' sales. (Figure 6-1-6-1).

7. Content market trends

(1) Size of Japan's content market

- The Japanese content market was valued at 11.5081 trillion yen, over 50 percent of which was attributable to video content, about 40 percent to text-based content, and less than 10 percent to audio-based content

The Japanese content market was valued at 11.5081 trillion yen in 2015. By content segment, video content accounted for over 54.3 percent of the market, text-based content, about 39.2 percent, and audio-based content, 6.5 percent.³⁸(Figure 6-1-7-1).

The overall size of the content market in 2015 has remained essentially unchanged since 2011. The size of each content segment as well stayed flat between 2011

and 2012, after 2013 the video content segment expanded while the text-based content segment contracted (Figure 6-1-7-2).

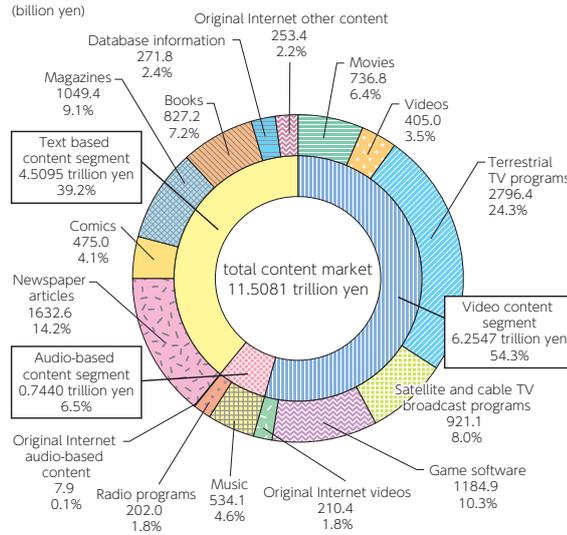
(2) Trends in the online content market

- The market for online content, which is downloaded or streamed via the Internet to computers or mobile phones, grew to 2.9633 trillion yen, accounting for 25.7 percent of the entire content market

As part of the overall content market, the market for online content, which is downloaded or streamed via the Internet to computers or mobile phones, reached 2.9633 trillion yen. By content segment, the video content segment accounted for 55.7 percent of the online con-

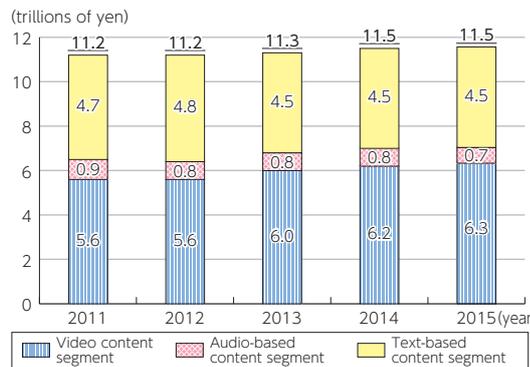
³⁸ The market size was measured and analyzed by assessing the primary nature of the content works and recalculating the value at each distribution level, such as primary distribution or multiuse. The value of content was not calculated by media channel.

Figure 6-1-7-1 Breakdown of Japan's content market (2015)



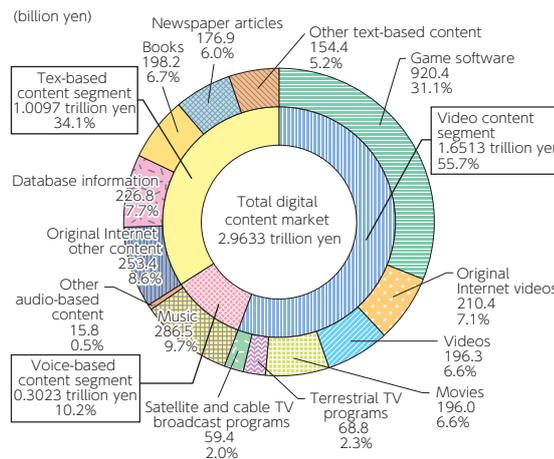
(Source) "Survey on the Production and Distribution of Media Content," Institute for Information and Communications Policy, MIC

Figure 6-1-7-2 Transitions in Japan's content market size (by content segment)



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

Figure 6-1-7-3 Breakdown of the online content market (2015)



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

tent market, the text-based content segment, 34.1 percent, and the audio-based content segment, 10.2 percent. (Figure 6-1-7-3).

The online content market has been growing steadily since 2011. The market by content segment shows that the video content segment which more than doubled

from 2011 to 2015 in particular due to the hot game software portion increase, has been driving the online content's market expansion (Figure 6-1-7-4).

● The 2016 mobile content industry's market increased 14.5 percent from the previous year to 5.0619 trillion yen

The Japanese mobile content industry's market,³⁹which

is made up of the mobile content market⁴⁰ and the mobile commerce market, continued to expand in 2016, reaching 5.0619 trillion yen (14.5 percent increase year-on-year), due to the growth and proliferation of smartphones and tablets. By individual segments, the mobile content market reached 1.8757 trillion yen (up 20.0 percent) and the mobile commerce market reached 3.1862 trillion yen (up 11.4 percent) (Figure 6-1-7-5).

(3) Trends in the broadcast content market

● **Export value of Japanese broadcast content was 28.85 billion yen in FY 2015**

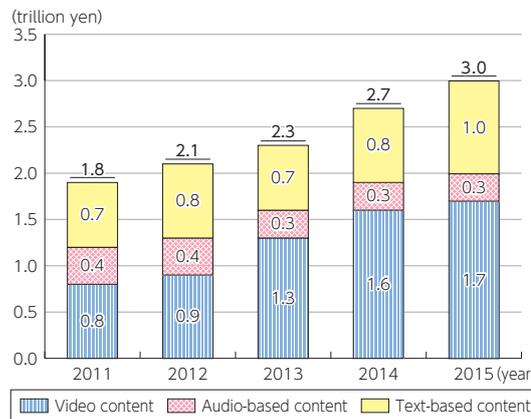
The export value of Japanese broadcast content in FY 2015 was 28.85 billion yen. Note that from FY 2010 onward, Internet distribution rights, video and DVD rights, format and restaging rights, merchandising rights, and similar rights, in addition to program broadcast rights, have been included in the export value of broadcast content (Figure 6-1-7-6). The traditional method of export-

ing broadcast content had been to sell the program broadcast rights. But today, methods have diversified, so that revenue streams other than program broadcast rights account for more than half of all revenue.

● **Cartoons and animations account for over 70 percent of export value by program category, followed by dramatic programs and variety shows, and Asia accounts for more than 50 percent of exports, followed by North America and Europe**

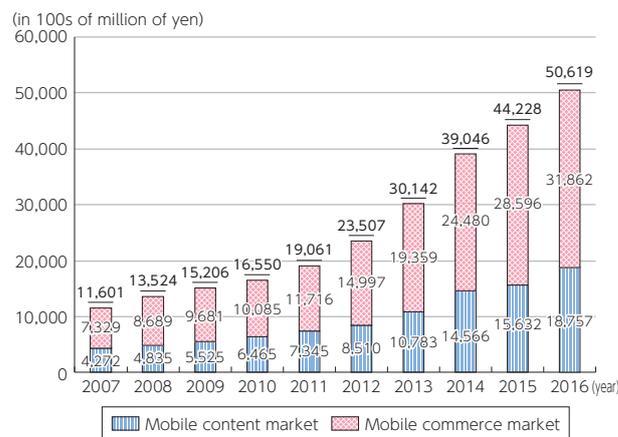
Looking at the broadcast content export value by program category finds cartoons and animations account for 76.6 percent of total, variety shows, 10.8 percent, and dramatic programs, 10.0 percent, followed by documentaries and sports programs (Figure 6-1-7-7). The largest export market for broadcast content was Asia, at 56.4 percent of the total, followed by North America at 27.6 percent, Europe at 12.0 percent, and South and Central America. Diverse export destinations for Japanese broadcast content are developing, particularly in Asia.

Figure 6-1-7-4 Transitions in the online content market size (by content segment)



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

Figure 6-1-7-5 Mobile content industry market size

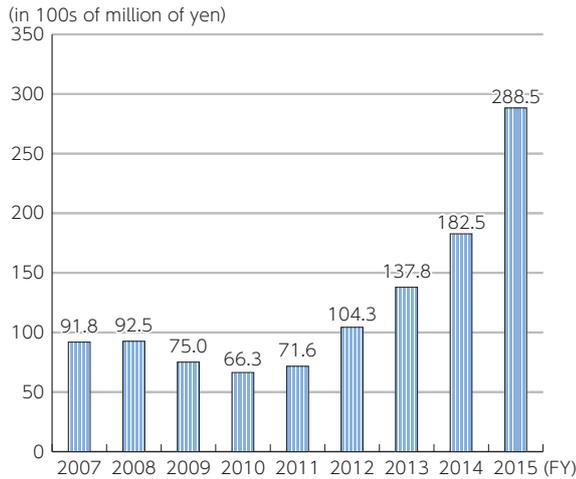


(Source) "Study Report on Technical Factors and Systems Pertaining to Open Platforms Promoting Mobile Content Business," MIC

³⁹ The mobile content market refers to the market for digital content provided over the mobile Internet (including ringtones, music streaming, videos, games, and fortune-telling). The mobile commerce market refers to the sales of physical goods (mail-order sales, etc.), sales of services (ticket sales), and transaction fees (including stock brokerage commissions, auction fees, and other payments) conducted over the mobile Internet.

⁴⁰ In 2010, the scope of the mobile content market was expanded to encompass the open platform market (such as smartphones).

Figure 6-1-7-6 Export value of Japanese broadcast content



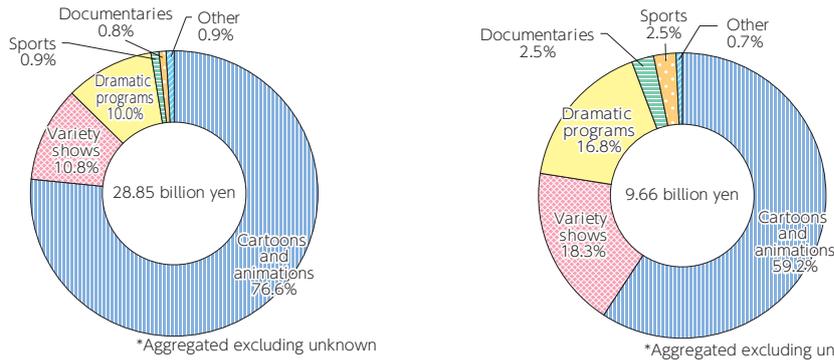
(Notes) *Export value of broadcast content: total export value of program broadcast rights, Internet distribution rights, video and DVD rights, format and restaging rights, merchandising rights, and similar rights.

*From FY 2010 onward, the export value from other revenue streams has been included along with program broadcast rights in the export value of broadcast content. Figures prior to FY 2010 are the export value for program broadcast rights only.

Source: "Survey on the State of Overseas Expansion of Broadcast Content (FY 2013, 2014, 2015)," Institute for Information and Communications Policy, MIC

Figure 6-1-7-7 Export value of Japanese broadcast content by program category

Export value of broadcast content (by program category) Export value of program broadcast rights (by program category)



(Source) "Survey on the State of Overseas Expansion of Broadcast Content (FY 2015)," Institute for Information and Communications Policy, MIC

Section 2 ICT Service Usage Trends

1. Internet usage trends

(1) State of ICT device proliferation

a. State of major ICT device proliferation (households)

- Ownership gap between smartphones and computers is closing to just 1.2 percentage points

The household ICT device penetration rate of 2016 was 94.7 percent for mobile terminals⁴¹ and 73.0 percent for computers. The penetration rate for smartphones, which are included in the mobile terminals category, has remained flat to 71.8 percent (down 0.2 percentage points from a year earlier), reducing the ownership gap with computers from 4.8 percentage points to just 1.2 percentage points, due to the decline of computer penetration rate (Figure 6-2-1-1).

(2) State of Internet proliferation

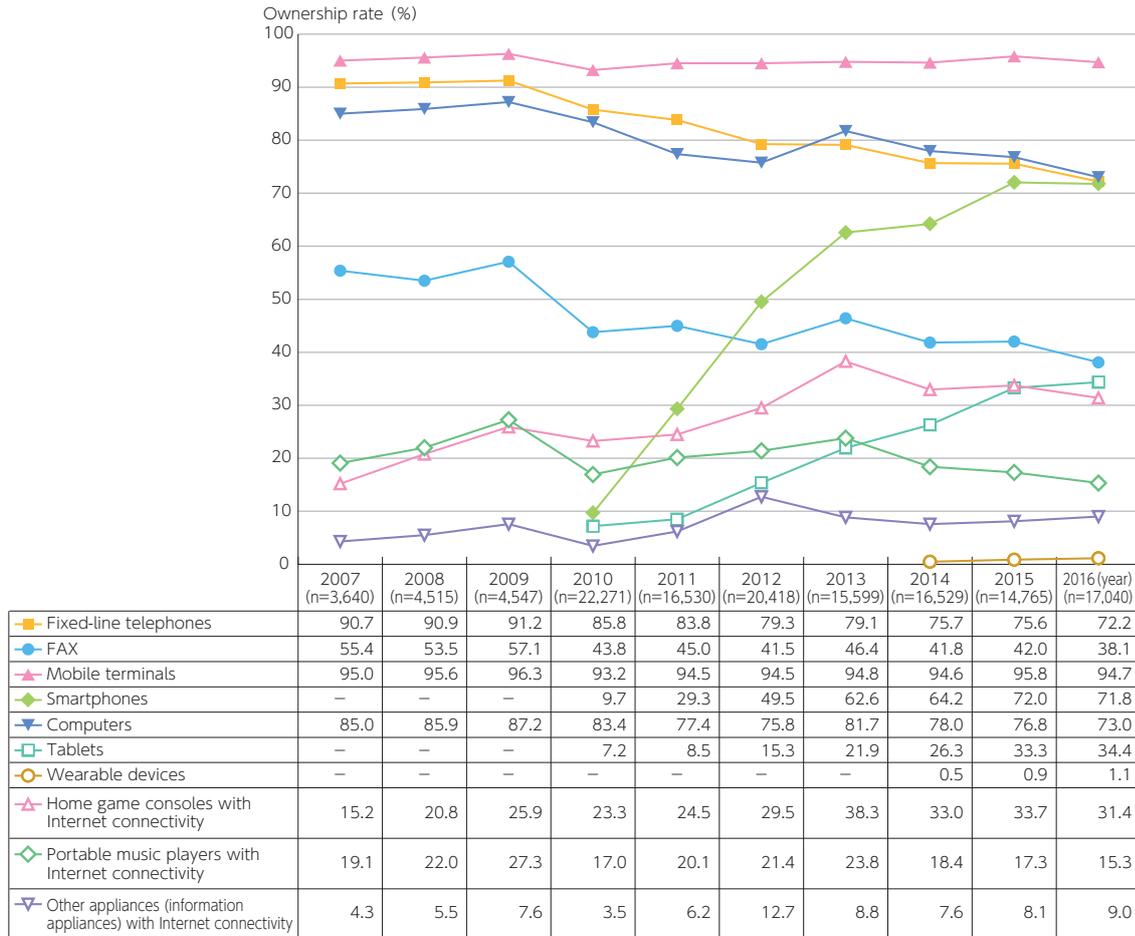
a. State of Internet usage

- Both the number of Internet users and the Internet population penetration rate rose

The number of Internet users⁴² of 2016 was 100.84 million, an increase of 380,000 from 2015. The Internet penetration rate as a percent of the general population was 83.5 percent (up 0.5 points) (Figure 6-2-1-2). Those using computers to access the Internet accounted for 58.6 percent (up 1.8 points) of all Internet users, the largest portion, followed by 57.9 percent (up 3.6 points) for smartphones and 23.6 percent (up 5.3 points) for tablets (Figure 6-2-1-3).

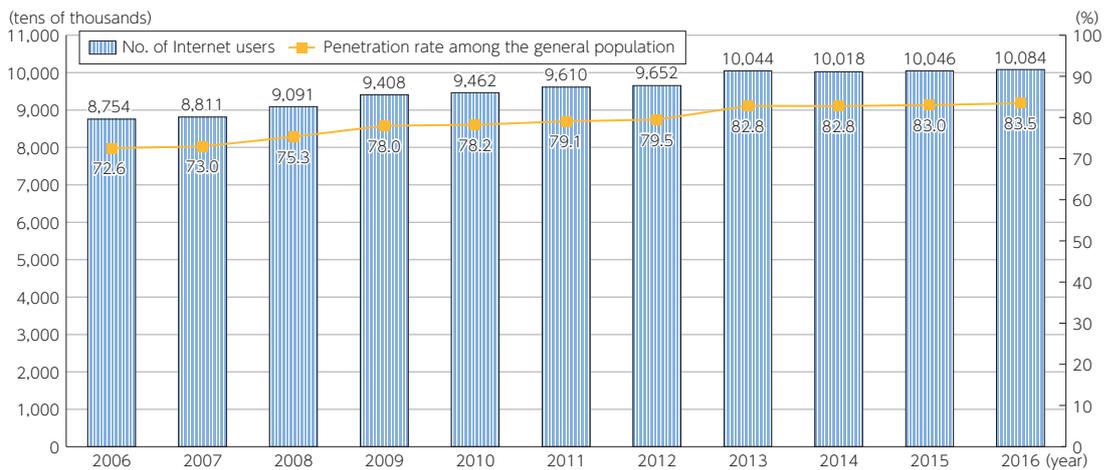
⁴¹ The figures for mobile terminals includes, mobile phones and PHS handsets, personal digital assistants, or PDAs, since the end of 2009 to the end of 2012 and smartphones since the end of 2010.

Figure 6-2-1-1 Transitions in household ownership rates for ICT devices



(Source) "Communications Usage Trend Survey," MIC

Figure 6-2-1-2 Transitions in the number of Internet users and the penetration rate among the general population



(Source) "Communications Usage Trend Survey," MIC

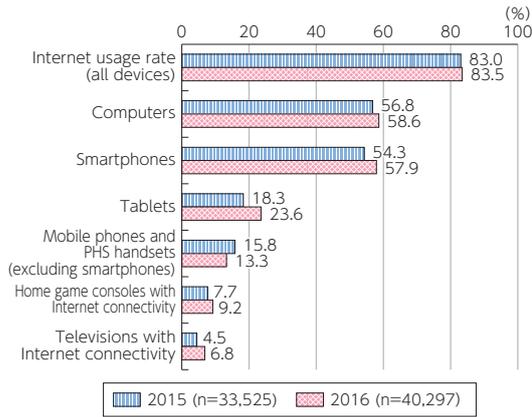
b. Purposes of using the Internet

- "Sending and receiving emails" was the most common purpose of using the Internet

Among all age groups, the most common purpose of using the Internet was "sending and receiving emails." Viewing the results by age group finds that larger num-

⁴² (1) The survey covers an age range of 6 and up. (2) The estimated number of Internet users is based on the results to a question on whether the respondents, aged 6 or older, had used the Internet in the year covered by the survey. The number of Internet users was calculated by multiplying the estimated population aged 6 or older (estimated from Population Census and death table data) by the Internet usage rate obtained in the survey for people aged 6 or older. Internet access devices include computers, mobile phones / PHS handsets, smartphones, tablets, game consoles, and all other devices (irrespective of device ownership). The purposes of using the Internet cover all possible purposes including personal, work, and school. (3) The Communications Usage Trend Survey does not include the number of 'no answer' responses in the calculations (except for Figure 6-2-1-1).

Figure 6-2-1-3 Internet usage by device



(Note) Figures indicate the percentage of people who accessed the Internet using the corresponding device during the past one year.

(Source) "Communications Usage Trend Survey," MIC

ber of users in all age groups use the Internet for "sending and receiving emails," the number of users varies by age groups for "using social media," and "using video posting / sharing sites" (Figure 6-2-1-4).

(3) Challenges for safe, secure Internet usage

a. Matters of concern with Internet usage and problems with ICT networks

- **Individuals are concerned about personal information, and enterprises are concerned about personnel shortage**

The percentage of individuals who feel insecure with the Internet which includes respondents of both "insecure" and "somewhat feel insecure" reached 61.6%,

some 60% feel insecure (Figure 6-2-1-5). Among households with concerns about using the Internet, 87.8 percent cited "personal information and internet access histories will be disclosed or exposed externally without permission" as a concern. This was followed, in order, by "computer virus infections" (67.4 percent) and "False billing and other types of Internet fraud" (51.6 percent) (Figure 6-2-1-6).

Among enterprises, 48.8 percent, the highest response rate, mentioned "concern about virus infections" as a problem when using the Internet, internal LANs, or other networks, indicating heightened security concerns among enterprises (Figure 6-2-1-7).

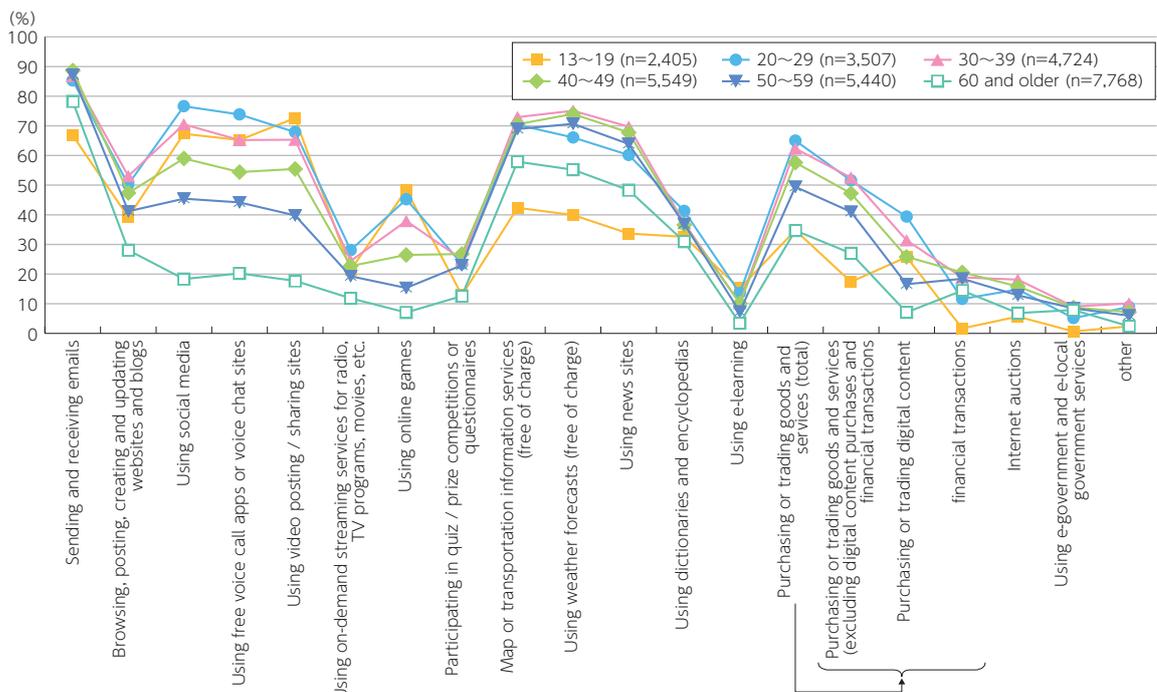
b. Information security measures

- **Almost 70 percent of households and almost all of enterprises have implemented some form of information security measures**

Looking at the state of information security measures taken by households that use the Internet finds that 67.7 percent of households have taken some form of information security measures. The leading security measures were "install or update security software" (47.7 percent) and "sign up for or renew a security service" (24.6 percent) (Figure 6-2-1-8).

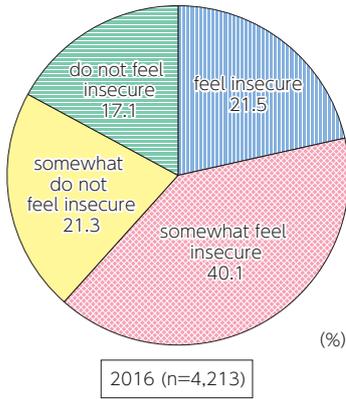
Looking at the state of information security measures implemented by enterprises that use ICT networks finds that 98.4 percent of enterprises have implemented some form of information security measures, almost all the enterprises. The leading security measure was "install anti-virus programs on computers and other devices (operating systems, software, etc.)," which is done by 88.2 percent of enterprises. This was followed, in order,

Figure 6-2-1-4 Applications / purposes of using the Internet by age group



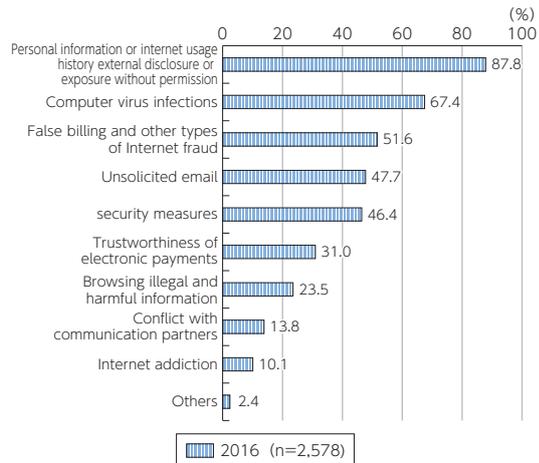
(Source) "Communications Usage Trend Survey," MIC

Figure 6-2-1-5 Percentage to feel insecurity with Internet usage at individuals (multiple answers permitted)



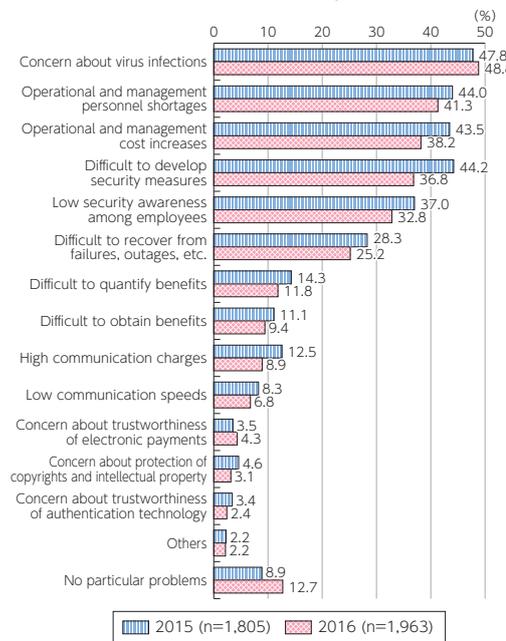
(Source) "Communications Usage Trend Survey," MIC

Figure 6-2-1-6 Matters of concern with Internet usage of individuals



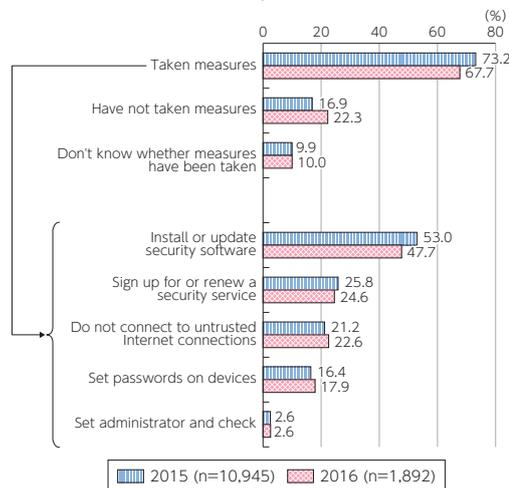
(Source) "Communications Usage Trend Survey," MIC

Figure 6-2-1-7 Problems with Internet and intranet LAN usage at enterprises (multiple answers permitted)



(Source) "Communications Usage Trend Survey," MIC

Figure 6-2-1-8 Implementation of information security measures at households (multiple answers permitted)



(Source) "Communications Usage Trend Survey," MIC

by “install anti-virus programs on servers” (66.8 percent) and “control access with IDs and passwords” (55.3 percent) (Figure 6-2-1-9).

c. Personal information protection measures

- Nearly 90 percent of all enterprises have implemented personal information protection measures

The percentage of enterprises that have implemented some form of personal information protection measures was 86.0 percent. The most cited protection measure, given by 49.5 percent of enterprises, was “enhance internal training” followed, in order, by “appoint a personal information protection and management officer” (47.8 percent) (Figure 6-2-1-10).

(4) Cloud service usage trends of enterprises

a. State of cloud service usage

- The percentage of enterprises using cloud services rose from 2015

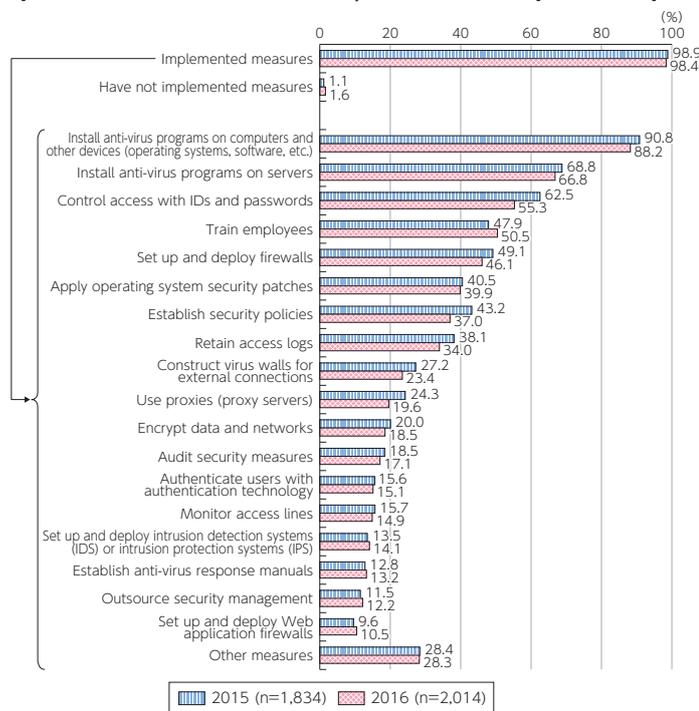
Of enterprise respondents to the survey, 46.9 percent said they had used cloud services either partially or extensively, up 2.3 percentage points from 44.6 percent at 2015 (Figure 6-2-1-11).

b. Breakdown of cloud service usage

- The most frequently used cloud service is “email”

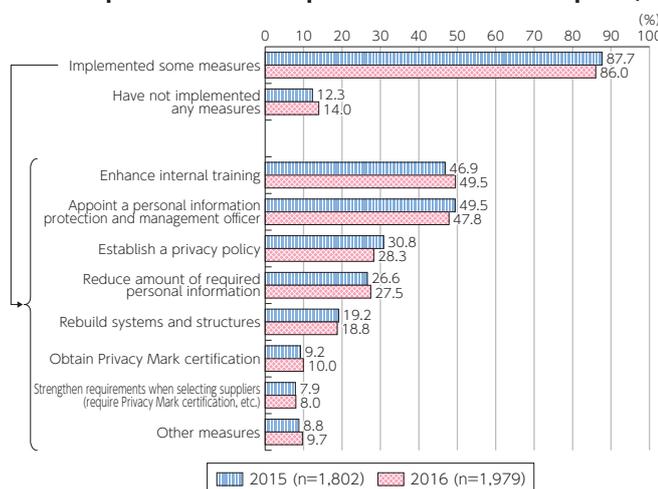
The most frequently used cloud service is “email,” cited by 51.7 percent of respondents, followed, in order, by 50.7 percent for “file storage and data sharing” and 46.7 percent for “server usage” (Figure 6-2-1-12).

Figure 6-2-1-9 Implementation of information security measures at enterprises (multiple answers permitted)



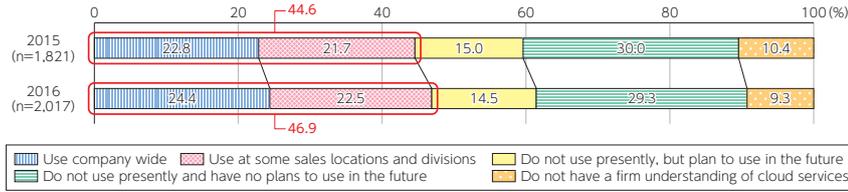
(Source) “Communications Usage Trend Survey,” MIC

Figure 6-2-1-10 Implementation of personal information protection measures at enterprises (multiple answers permitted)



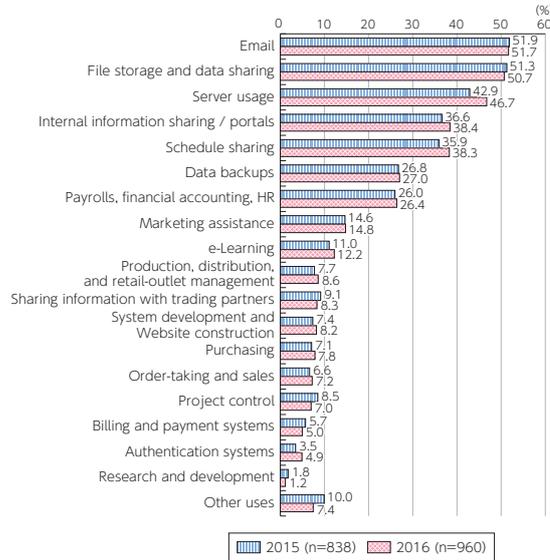
(Source) “Communications Usage Trend Survey,” MIC

Figure 6-2-1-11 State of cloud service usage



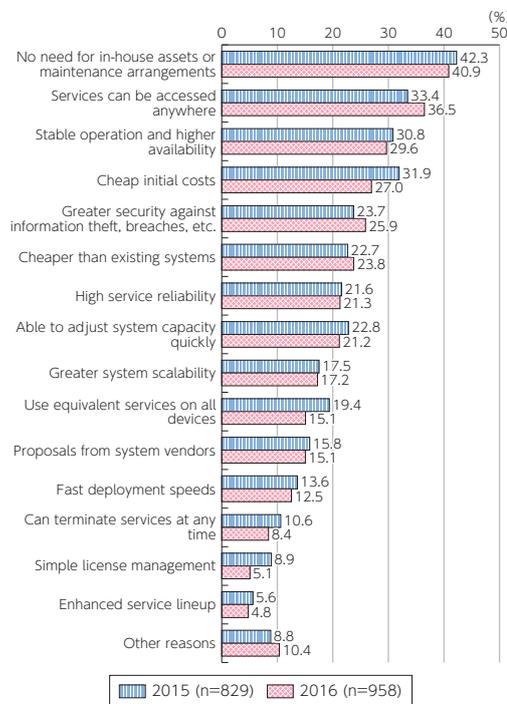
(Source) "Communications Usage Trend Survey," MIC

Figure 6-2-1-12 Breakdown of cloud service usage



(Source) "Communications Usage Trend Survey," MIC

Figure 6-2-1-13 Reasons for introducing cloud services



(Source) "Communications Usage Trend Survey," MIC

c. Reasons for introducing cloud services

- “No need for in-house assets or maintenance arrangements” was the most frequently cited reason for introducing cloud services, chosen by about 40 percent

“No need for in-house assets or maintenance arrangements” was the most frequently cited reason for intro-

ducing cloud services, chosen by 40.9 percent of respondents, followed, in order, by “services can be accessed anywhere” (36.5 percent) and “stable operation and higher availability” (29.6 percent). Respondents mainly cited functional and cost reasons for introducing cloud services (Figure 6-2-1-13).

2. State of telecommunication service provision and usage

(1) State of provision

a. Overview

(i) Subscriptions to telecommunication services

- Subscriptions to fixed-line communications are trending downward while subscriptions to mobile communications and OABJ-IP phone services have increased steadily

Subscriptions to fixed-line communication services (including NTT East and West subscriber telephone services (including ISDN), non-NTT telephone services,⁴³ and cable TV-based telephone services but excluding OABJ-IP phone services) have been declining, while those to mobile communication services (mobile phone and PHS handset services) and OABJ-IP phone services have been growing steadily. Subscriptions to 050-IP phone services have been flat in recent years.

There were about 7.2 times more mobile communication subscriptions than fixed-line communication subscriptions (Figure 6-2-2-1).

(ii) State of broadband usage

- Subscriptions to mobile ultra-high-speed broadband services have leaped dramatically year by year

The number of subscriptions to fixed-line broadband services⁴⁴ at the end of FY 2016 stood at 38.69 million

(up 2.3 percent from the previous year). Subscriptions to mobile ultra-high-speed broadband services broke down into 102.19 million for 3.9G and 4G (LTE) services (up 17.0 percent) and 47.89 million for BWA services (up 36.3 percent) (Figure 6-2-2-2).

b. Mobile communications

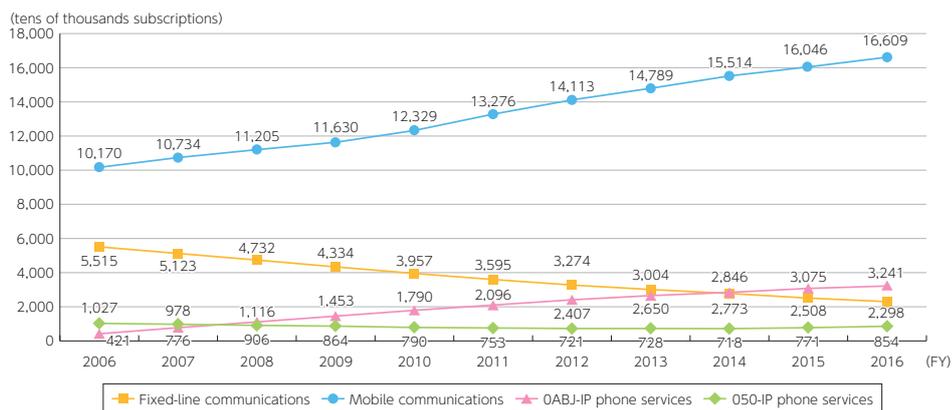
- Subscriptions to mobile communication services have risen each year; subscriptions to MVNO services counted as mobile communication subscriptions also surged

Subscriptions to mobile communication services⁴⁵ (mobile phones, PHS handsets, and BWA) at the end of FY 2016 totaled 167.92 million (an increase of 3.6 percent from the previous year). The net growth was 5.84 million subscriptions, which continues the upward trend (Figure 6-2-2-3).

The carrier (Group) shares by mobile communication subscription numbers were 44.6 percent for NTT Docomo (up 1 percentage points from the previous year), 29.4 percent for the KDDI Group (up 0.5 percentage points), and 26.0 percent for the SoftBank Group (down 1.5 percentage points) (Figure 6-2-2-4).

Subscriptions to MVNO services⁴⁶ counted as subscriptions to mobile communication services (mobile

Figure 6-2-2-1 Transitions in subscriptions to telecommunication services



(Notes) *Subscriptions to mobile communication services cover mobile phone and PHS services.

*Figures for mobile communication services from FY 2013 forward are the figures after adjusting for internal group transactions. After adjusting for internal group transactions refers the adjustments made to count 1 mobile phone device as 1 contract and not 2 contracts so as not to diverge from the actual state of affairs, when an MNO receives mobile phone or BWA services as an MVNO from another MNO in the same group and provides these services together with its own services to 1 mobile phone device.

Prepared from “Announcement of Quarterly Data on Telecommunication Service Contracts and Market Shares (4Q of FY 2016 (March 31, 2017)),” MIC

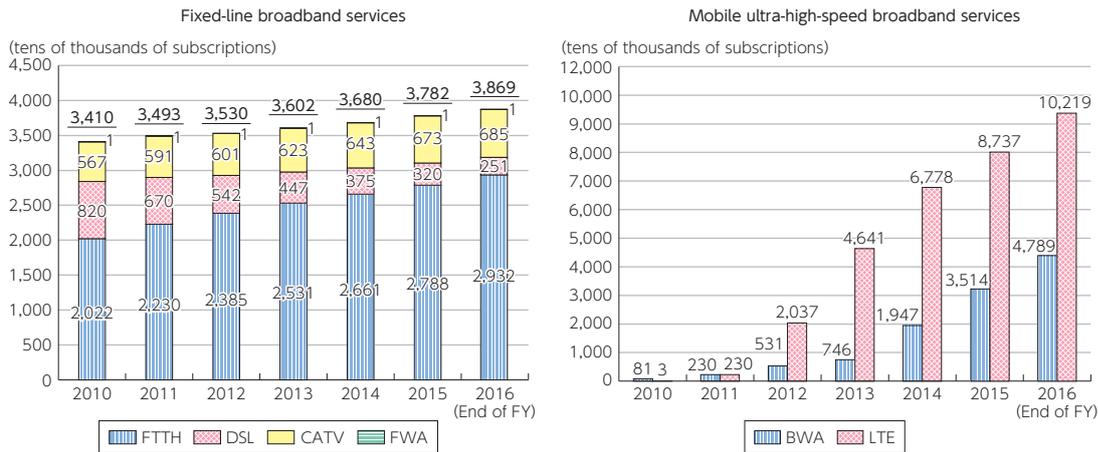
⁴³ Non-NTT services are subscriber phone services provided by telecom carriers other than NTT East and West and cover direct subscriber telephone and ISDN services and new-type non-NTT telephone and ISDN services.

⁴⁴ Figures for subscriptions to fixed-line broadband services cover FTTH, DSL, cable TV, and FWA services.

⁴⁵ Figures after adjusting for internal group transactions.

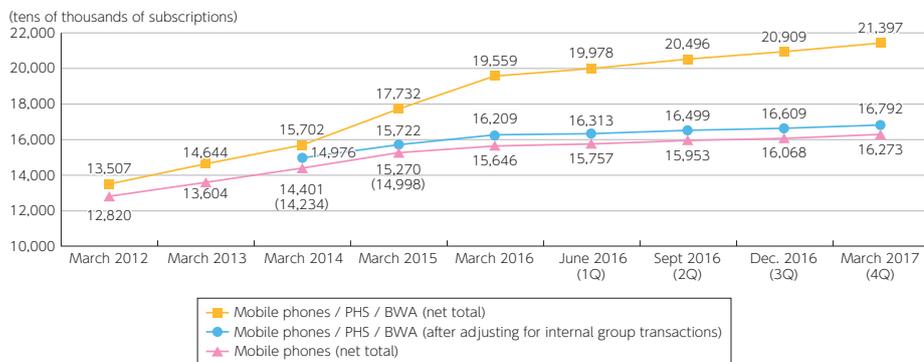
⁴⁶ Figures after subtracting subscriptions to MVNOs that are MNOs.

Figure 6-2-2-2 Transitions in broadband service subscriptions



Prepared from "Announcement of Quarterly Data on Telecommunication Service Contracts and Market Shares (4Q of FY 2016 (March 31, 2017))," MIC

Figure 6-2-2-3 Transitions in mobile phone subscriptions



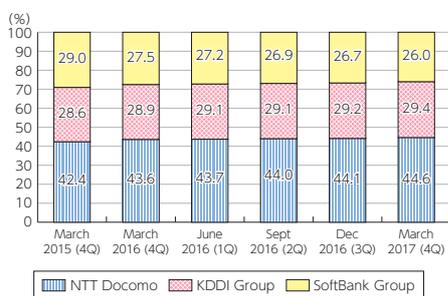
*(Note) After adjusting for internal group transactions refers the adjustments made to count 1 mobile phone device as 1 contract and not 2 contracts so as not to diverge from the actual state of affairs, when an MNO receives mobile phone or BWA services as an MVNO from another MNO in the same group and provides these services together with its services to 1 mobile phone device.

*The figures in parenthesis are the figures after adjustment within intragroup related to the number of mobile phone subscriptions.

*Figures of the past years are different from those in the last year's publication due to amendments by the target enterprises.

Prepared from "Announcement of Quarterly Data on Telecommunication Service Contracts and Market Shares (4Q of FY 2016 (March 31, 2017))," MIC

Figure 6-2-2-4 Transitions in carrier shares in mobile communication subscriptions (after adjusting for internal group transactions)



KDDI Group share includes KDDI, Okinawa Cellular, and UQ Communications; SoftBank Group share includes SoftBank, Y!Mobile, and Wireless City Planning.

Prepared from "Announcement of Quarterly Data on Telecommunication Service Contracts and Market Shares (4Q of FY 2016 (March 31, 2017))," MIC

phones, PHS handsets, and BWA) continue to increase, reaching 15.86 million (an increase of 25.0 percent from the previous year) at the end of FY 2016 (Figure 6-2-2-5)

(2) State of telecommunication usage

a. Traffic conditions

(i) Internet traffic

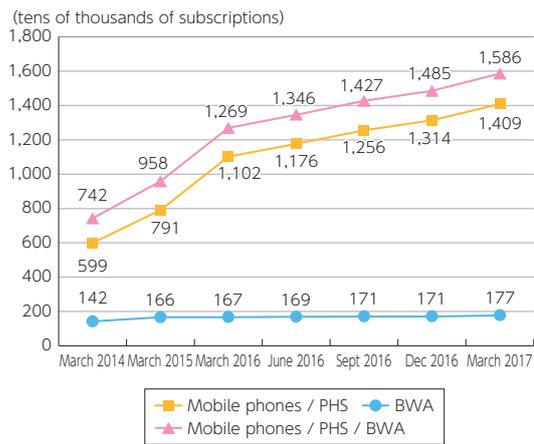
● Total download traffic by broadband service subscribers in Japan reached an average of 8.3 Tbps during November 2016, 52.2 percent increase from the same month of a year ago

(a) Transitions in traffic by broadband subscribers

Traffic by ISP5⁴⁷ broadband service subscribers continues to grow, with download traffic (A1 OUT) reaching a monthly average of 3396.6 Gbps in November 2016 (45.4 percent increase from the same month a year ago). Download traffic (A1 OUT) widened its gap with upload traffic (A1 IN: 602.5 Gbps), from 5.2 times last fiscal year to 5.6 times. Thus, most traffic is download traffic (Figure 6-2-2-6).

⁴⁷ ISP5 is the total for five cooperating ISPs, namely the Internet Initiative Japan (IIJ), NTT Communications, K-Opticom, KDDI, and SoftBank.

Figure 6-2-2-5 Transitions in subscriptions to MVNO services (excluding MVNOs that are MNO)



Prepared from "Announcement of Quarterly Data on Telecommunication Service Contracts and Market Shares (4Q of FY 2016 (March 31, 2017))," MIC

(b) Transitions in traffic exchanged between ISPs

The traffic exchanged with major domestic internet exchanges (IX)s⁴⁸ (B1), the traffic exchanged with domestic ISPs without passing through major domestic Internet exchanges (IX) (B2) and traffic exchanged with overseas ISPs (B3), data inflow has exceeded outflow in all types. The gap has been increasing (Figure 6-2-2-6).

(c) Estimations in traffic passing over the Internet in Japan

We estimated the total download traffic by broadband service subscribers in Japan from A1 — the traffic of ISP5 broadband service subscribers (DSL, FTTH, CATV, FWA) — and the percentage of ISP5 subscriptions among all broadband subscriptions in Japan. This estimate found that an average of approximately 8.3 Tbps of traffic passed over the Internet during November 2016. This was a 52.2 percent increase from the same month 1 year ago, continuing the increase in traffic over the Internet (Figure 6-2-2-6).

(ii) Mobile communication traffic

● Mobile communication traffic increased at a pace of about 1.4 times over the last year

The rapid increase in traffic, particularly data communications, in recent years is a significant factor in radio spectrum congestion in the frequencies assigned to mobile communication systems. In view of this, five mobile communication carriers (NTT Docomo, KDDI, SoftBank, UQ Communications, and Wireless City Planning) worked together to tabulate and analyze data on mobile communication traffic volumes (non-voice traffic). According to this group's figures, as of March 2016 mobile communication traffic increased about 1.4 times over the last year, reaching an average of 1815.6 Gbps (Figure 6-2-2-7).

Figure 6-2-2-6 Tabulations and estimates of Internet traffic in Japan^{*1,2}

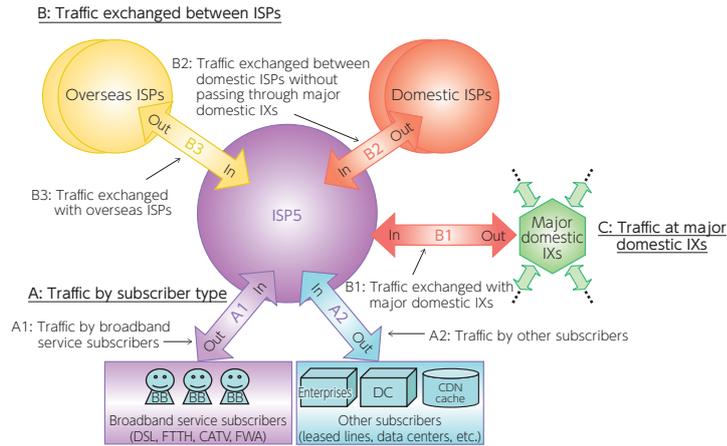
[Traffic tabulations and estimates]

Year	Month	Total traffic by broadband service subscribers in Japan (estimated) [Gbps] ^{*3}		Traffic per broadband service subscriber (estimated) [kbps]		(A1) Traffic by broadband service subscribers (DSL, FTTH, CATV, FWA, etc.) [Gbps]		(A2) Traffic by other subscribers (leased lines, data centers, etc.) [Gbps]		(B1) Traffic exchanged between major domestic IXs and ISP5 [Gbps]		(B2) Traffic exchanged between domestic ISPs and ISP5 without passing through major domestic IXs [Gbps]		(B3) Traffic exchanged between overseas ISPs and ISP5 [Gbps]		(X) ISP5 share (calculated from subscription numbers) ^{*4}
		in	out	in	out	in	out	in	out	in	out	in	out			
2012	May	658	1,730	18.8	49.3	287.8	756.6	251.5	243.0	118.4	98.6	317.4	145.1	528.7	178.8	43.82%
	November	666	1,905	18.9	54.0	294.0	840.3	268.3	257.2	103.2	83.2	316.6	135.7	571.3	201.6	43.99%
2013	May	770	2,275	21.7	64.2	347.8	1,027.8	300.3	286.4	114.5	85.5	423.3	161.3	633.9	231.6	44.52%
	November	834	2,584	23.3	72.3	370.0	1,146.3	336.5	326.2	138.9	94.9	520.8	186.2	714.5	259.7	44.28%
2014	May	905	2,892	25.2	80.4	398.9	1,274.5	359.2	317.2	163.6	101.5	614.9	214.3	808.3	282.3	44.02%
	November	930	3,552	25.7	98.2	407.6	1,557.0	496.1	426.1	192.3	104.6	765.1	246.5	924.6	340.6	43.80%
2015	May	1,086	4,582	29.3	123.5	457.0	1,928.9	525.6	440.2	198.9	117.5	955.6	287.5	941.5	308.1	43.10%
	November	1,051	5,423	28.0	144.5	452.9	2,336.1	581.1	503.0	251.9	137.1	1,306.4	366.6	1,059.7	307.9	42.48%
2016	May	1,324	6,876	34.8	180.5	551.5	2,863.3	652.7	570.5	277.0	112.6	1,765.1	453.8	1,080.1	292.4	41.64%
	November	1,464	8,254	37.9	213.5	602.5	3,396.6	1,246.0	653.6	311.0	113.6	1,989.2	518.2	1,221.9	353.8	41.15%

(Notes) *1 ISP5 is the total for five cooperating ISPs, namely the Internet Initiative Japan (IIJ), NTT Communications, K-Opticom, KDDI, and SoftBank.
 *2 the Total traffic by broadband service subscribers in Japan (estimated), the Traffic per broadband service subscriber (estimated) For A1, and A2 columns, In stands for uploads and Out stands for downloads.
 *3 Total traffic by broadband service subscribers in Japan was estimated from the traffic of ISP5 broadband service subscribers (A1) and the ISP5 share of all subscriptions (X).
 *4 Estimation by linear interpolation using the data of "Announcement of Quarterly Data on Telecommunication Service Contracts and Market Shares"

⁴⁸ Total for IXs run by Internet Multifeed, Equinix Japan, Japan Internet Exchange, BBIX, and WIDE Project.

Types of tabulated traffic



*A1 includes the following types of traffic:

- Some traffic on public wireless LAN services from some ISP carriers
- Some traffic on femtocell services from some mobile communication carriers

*Clarified that from November 2016, traffic by CDN cache and traffic by customer ISPs connecting with cooperating ISPs which provide transit are handled as A2.

*B2 includes traffic exchanged via the following:

- private peering with domestic ISPs
- transit provided by domestic ISPs
- public peering at other domestic IXs than major domestic IXs

*B3 includes traffic exchanged via the following; however, clarified that from November 2016, among the traffic, the traffic at domestic connection points are handled as B2.

- private peering with overseas ISPs
- transit provided by overseas ISPs
- traffic exchanged via public peering at overseas IXs.

Prepared from "Announcement Japan's Internet Traffic Tabulations and Estimates for November 2016," MIC

Figure 6-2-2-7 Transitions in the monthly average mobile communication traffic in Japan

Tabulated Month	June 2015			September 2015			December 2015			March 2016			June 2016			September 2016			December 2016			March 2017		
	up	down	total	up	down	total	up	down	total	up	down	total	up	down	total	up	down	total	up	down	total	up	down	total
Average (Gbps)	141.1	891.2	1032.3	154.6	1027.1	1181.6	169.1	1047.9	1216.9	184.5	1144.1	1328.7	196.7	1227.9	1424.6	217.5	1345.0	1562.5	225.0	1411.6	1636.6	249.0	1566.6	1815.6

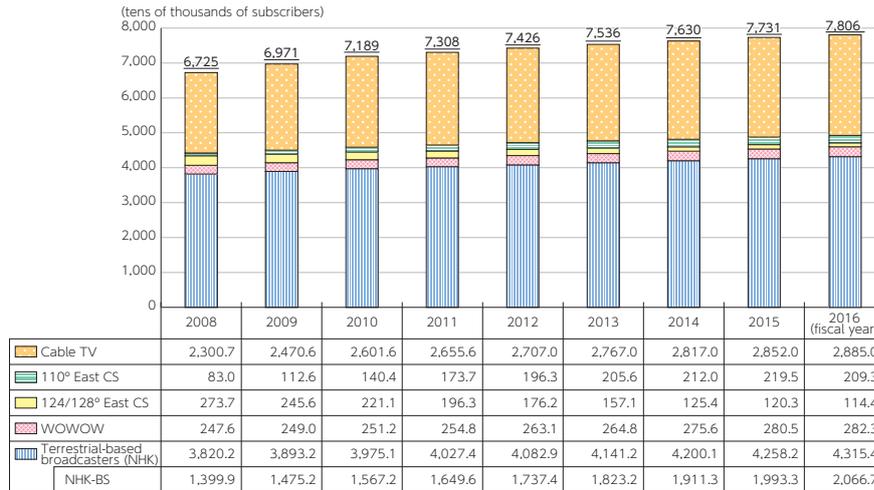
Prepared from "Information and Communications Statistics Database," MIC

3. State of broadcasting service provision and usage

- Subscriptions to NHK terrestrial, NHK-BS, WOWOW, 110° East CS, and cable TV services in FY 2016 increased from the previous year
- Subscriptions to all broadcasting services, except

124/128° East CS broadcasts, increased in FY 2016 (Figure 6-2-3-1).

Figure 6-2-3-1 Subscribers to broadcasting services



(Notes) NHK terrestrial subscribers are the number of all NHK subscription contracts.

NHK-BS subscribers are the number of NHK satellite contracts.

WOWOW subscribers are the number of WOWOW contracts.

CS digital and 110° CS subscribers are the number of Sky PerfectTV contracts.

Cable TV subscribing households are the number of subscribing households to business enterprises providing independent broadcasting services with facilities licensed under the former licensing scheme, until FY 2010, and to registered business enterprises with wired telecommunication facilities providing independent broadcasting services, from FY 2011 on. (Both exclude broadcasts using IP multicasts.)

Prepared using materials from Japan Electronics and Information Technology Industries Association, materials from Japan Cable Laboratories, materials from NHK, and "State of Satellite Broadcasting" and "State of Cable Television" from MIC

4. Promoting ICT applications in government services

(1) Promoting e-government

- The online usage rate increased for procedures handled by national administrative bodies

The usage rate of applications, notifications, and other national administrative procedures filed online⁴⁹ versus all applications, notifications, and procedures filed was 47.3 percent (261,316,784 procedures were filed online, an increase of 1.9 percentage points from the previous fiscal year). The online usage rate of the improvement promotion procedures⁵⁰ frequently used by citizens and

enterprises was 43.3 percent (174,681,859 procedures were filed online, an increase of 2.1 percentage points from the previous fiscal year) (Figure 6-2-4-1).

(2) Promoting ICT applications in local governments

- The usage rate of local government procedures selected for online-usage promotion increased over the previous fiscal year

The online usage rate of local government administrative procedures⁵¹ was 49.1 percent in FY 2015 (Figure 6-2-4-2).

Figure 6-2-4-1 Transitions in the online usage of applications, notifications, and procedures handled by national administrative bodies

fiscal year	All application, notification, and other procedure filings		Filings done online		Online usage rate [%]	
		Improvement promotion procedures		Improvement promotion procedures		Improvement promotion procedures
2015	552,359,761	403,222,027	261,316,784	174,681,859	47.3	43.3
2014	497,521,456	394,918,846	226,076,760	162,577,184	45.4	41.2
		(Priority procedures)		(Priority procedures)		(Priority procedures)
2013	475,409,156	432,579,446	209,558,511	199,656,173	44.1	46.2
2012	458,496,901	421,297,165	188,960,305	181,479,301	41.2	43.1

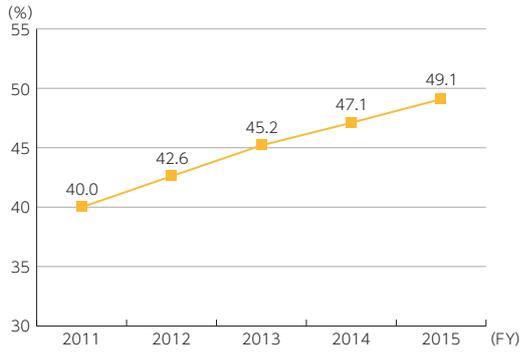
(Source) Prepared from "State of Online Administrative Procedures in FY 2015," MIC press materials

⁴⁹ The total number of applications, notifications, and procedures filed is for those procedures placed online.

⁵⁰ Improvement promotion procedures are frequently used procedures that are filed 1 million or more times a year by citizens or enterprises or that are mainly used iteratively or continuously by enterprises even if annual filings are less than 1 million. In FY 2014, the improvement promotion procedures accounted for 79.4 percent of all filings made for applications, notifications, and procedures available online. Improvement promotion procedures excluded procedures with high usage rates (90 percent or more) from the priority procedures selected in the New Online Usage Plan, which operated until FY 2013.

⁵¹ The targeted procedures were those selected for online-usage promotion under the E-Local Government Online Usage Advancement Policy.

Figure 6-2-4-2 Transitions in the usage of local government procedures selected for online-usage promotion



fiscal year	Total procedure filings for the year	Filings done online	Online usage rate [%]
2011	337,590,000	135,031,153	40.0
2012	349,000,000	148,496,598	42.6
2013	367,327,000	165,922,189	45.2
2014	368,733,000	173,807,766	47.1
2015	384,473,000	188,831,889	49.1

(Note) The total yearly filings are an estimate for the entire country calculated based on the total number of filings and the populations in the jurisdictions of local governments that had already placed the targeted procedures online.

(Source) "State of Online Administrative Procedures in FY 2015," MIC

Section 3 Radio Spectrum Usage Trends

1. State of radio spectrum usage and number of radio stations

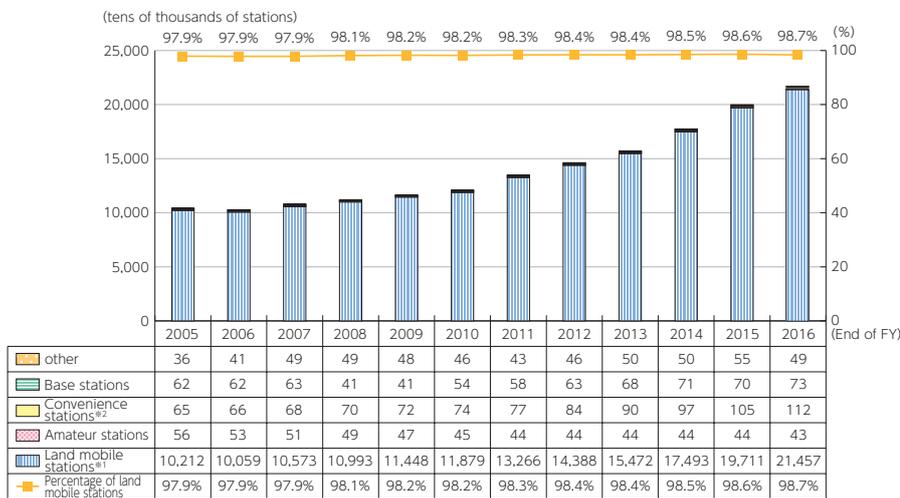
(1) Radio stations

● The number of radio stations in Japan has increased steadily since 2006

The number of radio stations (excluding PHS and wireless LAN handsets and other radio stations for which no license is required) at the end of FY 2016 increased by 8.8 percent from a year earlier to 217.35 million, including 214.57 million mobile phones and other

land mobile stations, a jump of 8.9 percent. Mobile phones and other mobile land stations accounted for a huge 98.7 percent of all radio stations. The number of convenience stations climbed by 6.7 percent to 1.12 million (Figure 6-3-1-1).

Figure 6-3-1-1 Transitions in the number of radio stations



(※1) "Land mobile station" refers to a radio station that is operated either while in motion on land or while stationary in an unspecified location (such as mobile phones).

(※2) "Convenience station" refers to a radio station used for simple radio communications.

2. Radio surveillance to eliminate interference with key radio communications

- There were 603 reports of interference with key radio communications in FY 2016, and 1,364 actions were taken against illegal radio stations

In the interests of eliminating radio interference and obstructions and maintaining a favorable radio spectrum usage environment, officials at the 11 Regional Bureaus of Telecommunications and elsewhere use illegal radio station search vehicles and sensor stations installed in towers and on building rooftops in major urban areas nationwide to investigate the sources of radio signals that interfere with fire and emergency services radio, aeronautical and maritime radio, mobile phones, and other key radio communications. Officials also crack down on illegal radio stations and undertake public awareness activities to ensure more people use the radio spectrum properly.

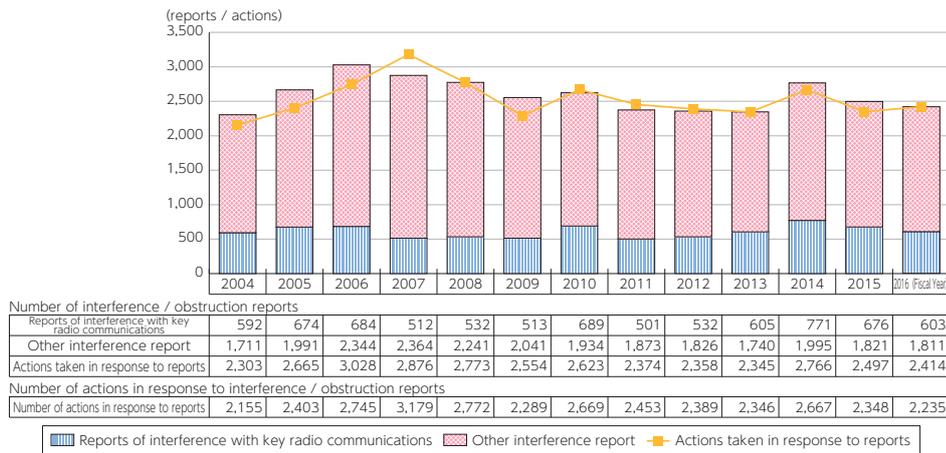
Since FY 2010, radio authorities have been working to promptly eliminate interference with key radio communications with a system that accepts interference reports

around the clock. Radio authorities also monitor short-wave radio and cosmic radio waves at international radio surveillance facilities registered with the International Telecommunication Union (ITU).

In FY 2016, there were 2,414 reports of radio interference or obstructions of all kinds, 83 fewer (3.3 percent) than the previous year. Among these, there were 603 reports of interference with key radio communications, 73 fewer (10.8 percent) than the previous year. In response to these reports, 2,235 actions were taken in FY 2016 (Figure 6-3-2-1).

In FY 2016, 4,441 illegal radio stations were detected, 711 fewer (13.8 percent) than the previous year. In response, 1,364 actions⁵² were taken in FY 2016, a decrease of 1,022 actions (42.8 percent) from the previous year. These actions included 168 indictments (12.3 percent of all actions) and 1,196 directives (87.7 percent of all actions).

Figure 6-3-2-1 Transitions in the number of radio station interference / obstruction reports and the number of actions taken in response



⁵² The number of actions includes incomplete actions remaining from the previous fiscal year.