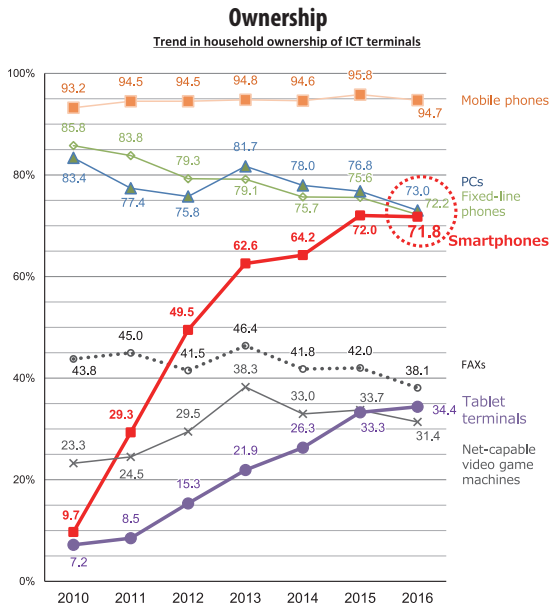


Key Points of the 2017 White Paper on Information and Communications in Japan

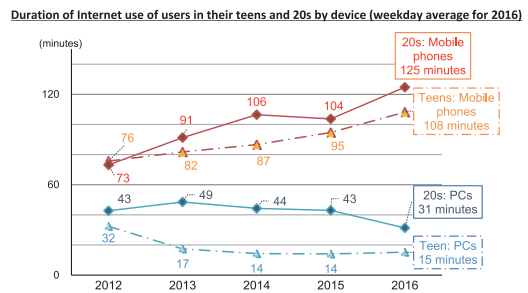
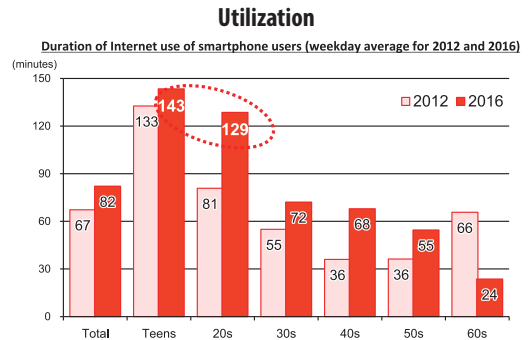
Part 1 Special Theme — Data-driven Economy and Social Change

Chapter 1 Present and Future of Smartphone Economy

- In recent years, the smartphone ownership ratio increased rapidly, coming close to the ratios for PCs and fixed-line phones. Hours of use of mobile phones by young people, the heaviest users, are more than four times longer than those of PCs.
- Companies providing services for smartphones are accumulating generated data, and there is the possibility of new value creation through the utilization of such data.

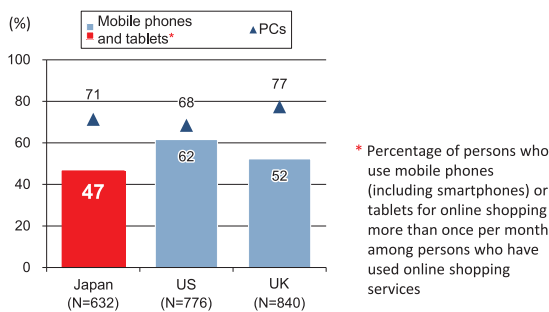


As a smartphone is a device owned personally, it may be appropriate to focus on ownership on an individual basis, not on a household basis. However, for the purpose of comparison with other types of information and communications equipment, household ownership is adopted here. See the main text of the White Paper for ownership on an individual basis.

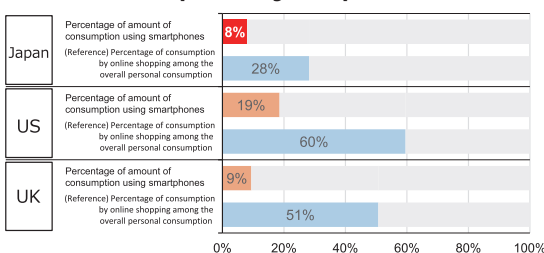


- Smartphones and tablets are less utilized for online shopping compared to PCs. Japan lags behind the United States and the United Kingdom in the utilization of smartphones and tablets in this field.
- Compared with these two countries, smartphone users in Japan are less willing to utilize various FinTech services and services in the sharing economy, and it is a future challenge to increase users of those services as a whole for economic revitalization.

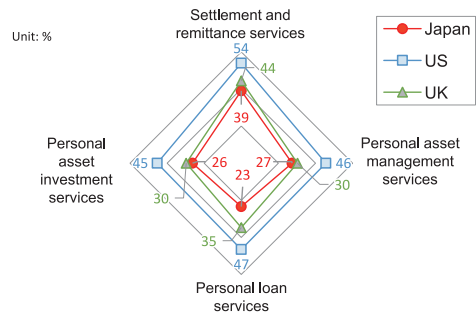
Persons using online shopping more than once per month



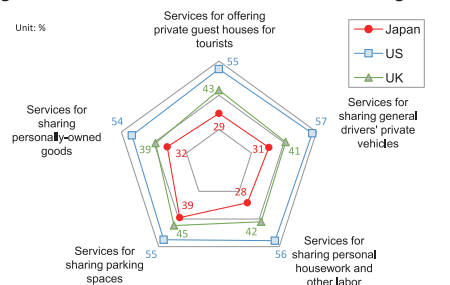
Amount of consumption using smartphones (direct effect)



Willingness to utilize various FinTech services

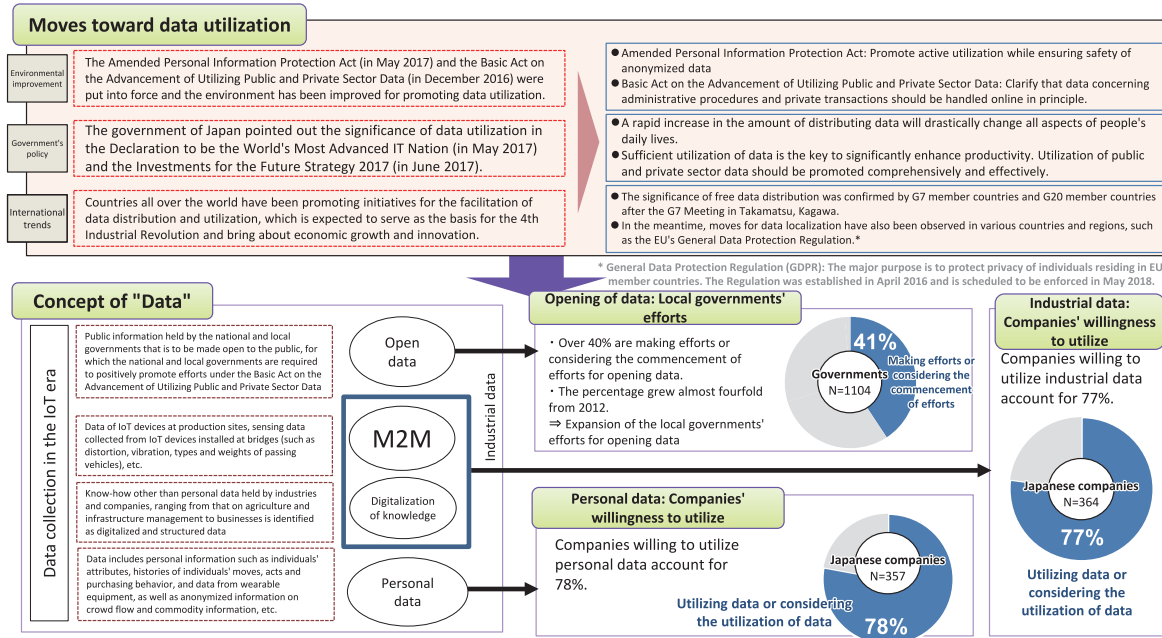


Willingness to utilize various services in the sharing economy



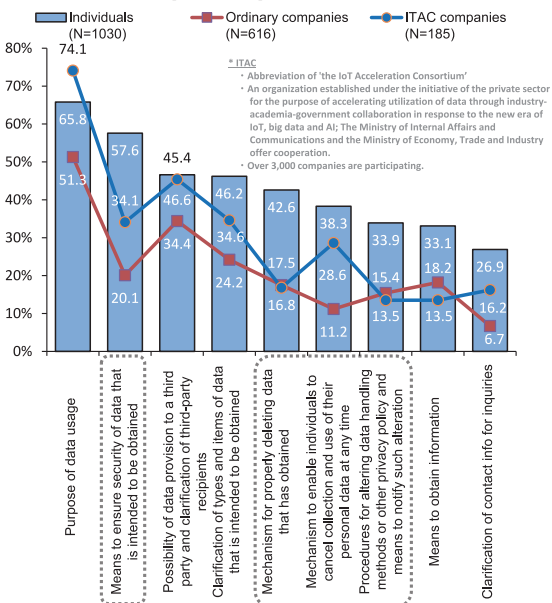
Chapter 2 Advent of the Age of Big Data Utilization

- There is the possibility that data utilization will increase rapidly from now on and this year marks the very first year of the age of big data utilization.
- It is necessary to eliminate a gap between companies' positive attitudes and people's anxiety and promote the utilization of data while ensuring safety.



- There is a gap in awareness between individuals and companies concerning information that companies should provide to the relevant individuals upon obtaining provided personal data. In particular, the gap is significant with regard to means for ensuring security and a mechanism for deleting data.
- There are a group of users who consider it unavoidable to provide information for receiving services and a group of users who have strong fears for illegal use and leakage of information.

Information that companies should provide upon obtaining provided personal data



Individuals' awareness concerning provision of their personal information

Comments (positive attitude toward information provision)

- ✓ I am concerned about the provision of personal information, but I think that **the convenience of using the Internet** surpasses any negative aspects.
- ✓ In the case of online shopping sites, etc., information provision is **unavoidable to some extent**. I **do not care** if the company takes security measures to avoid information leakage.
- ✓ We provide personal information and receive services. It is just a game of **give and take**.

↕

Comments (negative attitude toward information provision)

- ✓ It may be unavoidable to provide personal information to some extent, but **I am afraid** that the information I provide may be **used illegally** for advertisement mails or otherwise **leaked**.
- ✓ I feel **anxious** because I cannot check how strictly our **personal information is managed**.
- ✓ It depends on what kind of **personal information is utilized for what purposes**, but I fear any wrongful use.

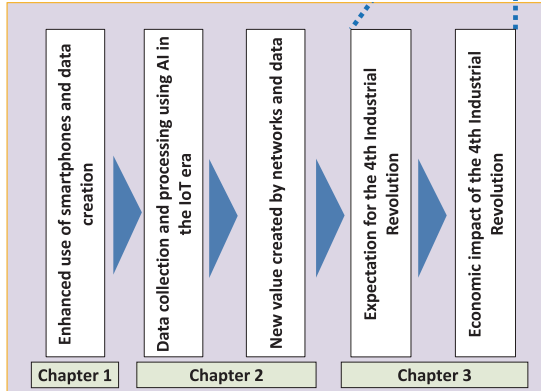
Chapter 3 Changes Brought About by the 4th Industrial Revolution

- The utilization of IoT makes it possible to collect big data at low cost. Furthermore, new value can be created through analysis of data using AI.
- Expectation for the the 4th Industrial Revolution has been increasing for realizing Society 5.0.

Characteristics of Industrial Revolutions

Definition by the World Economic Forum (WEF)			
1st Industrial Revolution	2nd Industrial Revolution	3rd Industrial Revolution	4th Industrial Revolution
18th century to early 19th century Mechanization in light industry, such as steam engines and spinning machinery	Late 19th century Oil, electric power, and heavy chemical industries	Late 20th century Emergence of the Internet, rapid dissemination of ICT	21st century Industrial revolution through extreme automatization and connectivity

From data utilization to the 4th Industrial Revolution



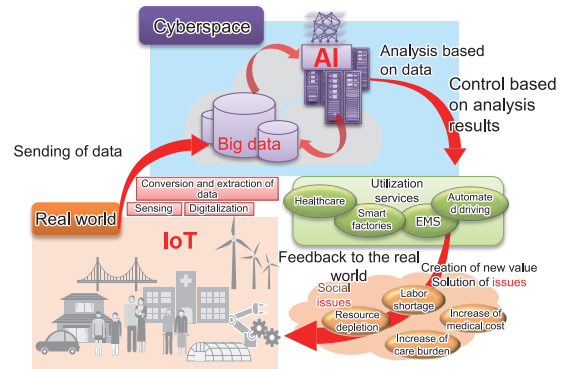
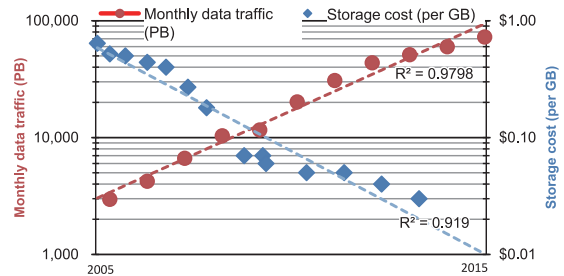
* The 4th Industrial Revolution envisaged in the White Paper on Information and Communications in Japan

- Reduction of production cost through enhancing efficiency
- Creation of new services and markets
- Digitalization of all accumulated systems and know-how and sharing of data
- Responses to new needs and customization in accordance with individual needs, etc.

* "Society 5.0": The fifth new society in human history, following hunting and gathering society, agrarian society, industrialized society, and information society, wherein new value and services are created one after another to enrich people's lives

- Regarding initiatives for the 4th Industrial Revolution, many Japanese companies are still at the deliberation stage. By type of business, companies making efforts for the 4th Industrial Revolution are eminently notable in the information and communications industry.
- Japanese companies especially lag behind in willingness to make investments for the 4th Industrial Revolution. It is a future challenge to develop a favorable environment such as through fostering human resource and establishing systems and rules.

Rapidly increasing data distribution (whole world)

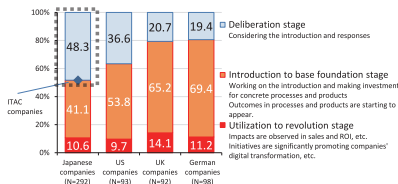


* Statement concerning the relation between the 4th Industrial Revolution and Society 5.0 in the Growth Strategy 2017 (June 2017)

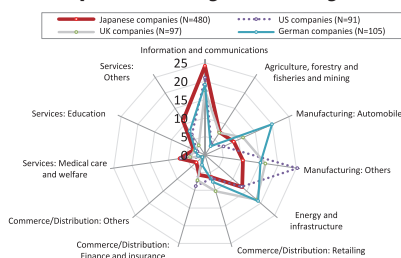
The key to achieve medium- to long-term growth is to incorporate the innovation in the 4th Industrial Revolution (IoT, big data, AI, robots, sharing economy, etc.), which has emerged rapidly in recent years, into all industries and social life as a whole, thereby realizing Society 5.0 that can solve various social problems.

At present

Companies' stages toward the 4th Industrial Revolution

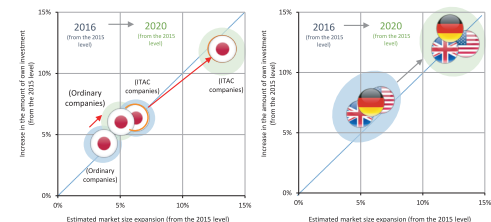


Types of business wherein the 4th Industrial Revolution is expected to bring about changes

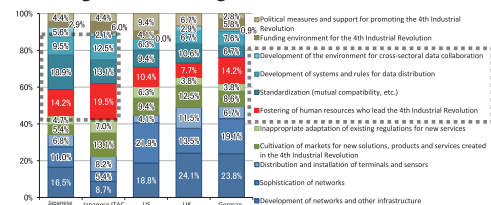


In the future

Market forecast and willingness to make investment in relation to the 4th Industrial Revolution

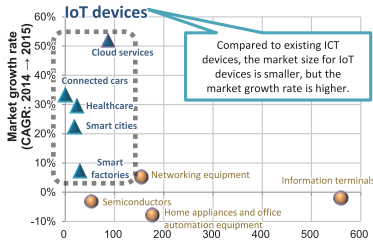


Challenges in achieving the 4th Industrial Revolution

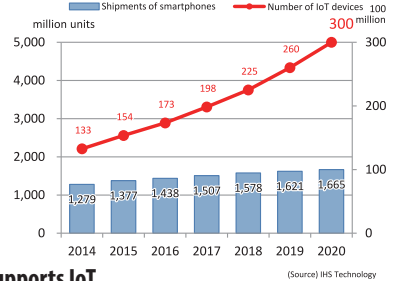


- The number of IoT devices, which connect things to the Internet, is increasing more sharply compared to smartphones, and is expected to reach 30 billion units by 2020.
- As a communication technology to connect these devices, Low Power Wide Area (LPWA) networks are attracting attention, in addition to 5G.

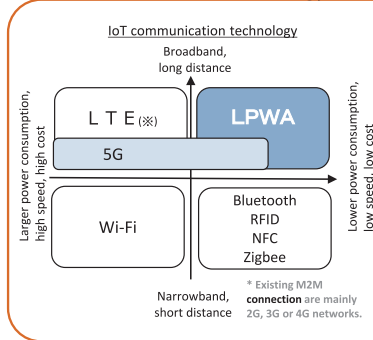
World market size and market growth rate



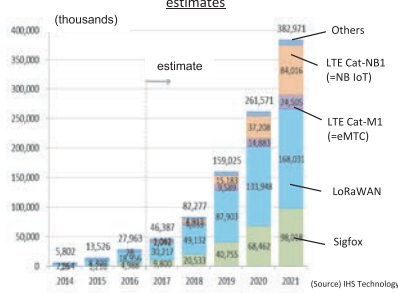
Trend in the Number of IoT devices and shipments of smartphones in the world including estimates



LPWA - Communication technology that supports IoT



Trend in world demand for LPWA connectivity including estimates



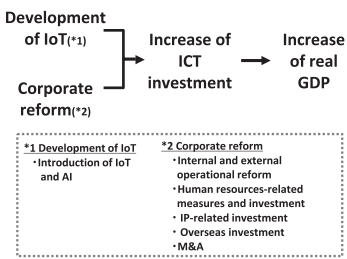
Examples of the use of LPWA networks

Region	Category	Examples	Participants
Japan	Demonstration	Fukuoka-shi commenced a demonstration experiment concerning the collection of gas and water meter data this July, with the aim of clarifying problems for the commercial use of LPWA networks. (L)	7 companies including Azbil and IBM Japan
	Practical use	A delivery pizza company has introduced a system to remotely control temperature in the refrigerators to store pizza dough. (S)	Kyocera Communication Systems
Overseas	Industry	The company provides monitoring services using LPWA networks to check deterioration in water infrastructure. (L)	Senet (US)
	Consumers	The company develops a device to enable consumers to place delivery orders only by pushing a button on the device. (S)	La Poste (France)

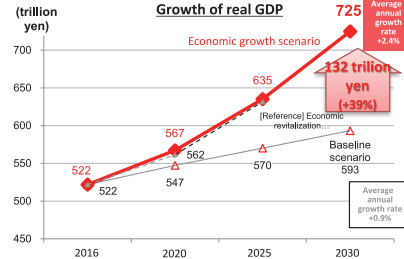
L: LoRaWAN S: Sigfox

- In order to have IoT and AI surely bring about economic growth, corporate reform is indispensable in addition to the development of IoT through making relevant investment and inputting services.
- If the development of IoT and corporate reform both progress steadily, IoT and AI are expected to create new demand and increase real GDP by 132 trillion yen to 725 trillion yen in 2030.

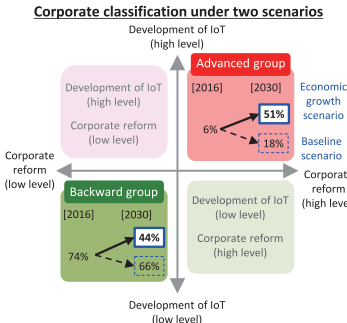
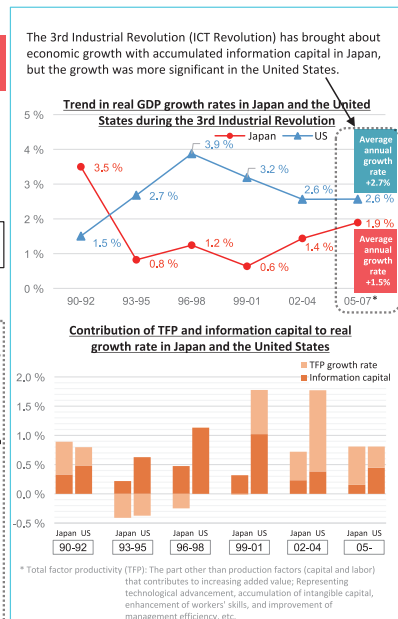
Economic growth up to 2030



Impact of the development of IoT



[Reference] Verification of the 3rd Industrial Revolution (1990 -)



Estimates by the Cabinet Office

The Cabinet Office submits the Economic and Fiscal Projections for Medium to Long Term Analysis to the Council on Economic and Fiscal Policy twice a year. For a period up to 2025, two scenarios (economic revitalization scenario and baseline scenario) are created.

- Economic revitalization scenario: Assuming a real growth rate of 2% and a nominal growth rate of 3% or more over the medium and long term
- Baseline scenario: Assuming growth at the recent potential growth rate for the time being and a real growth rate of almost 1% and a nominal growth rate of around 1.5% over the medium and long term

Estimates of the White Paper on Information and Communications in Japan

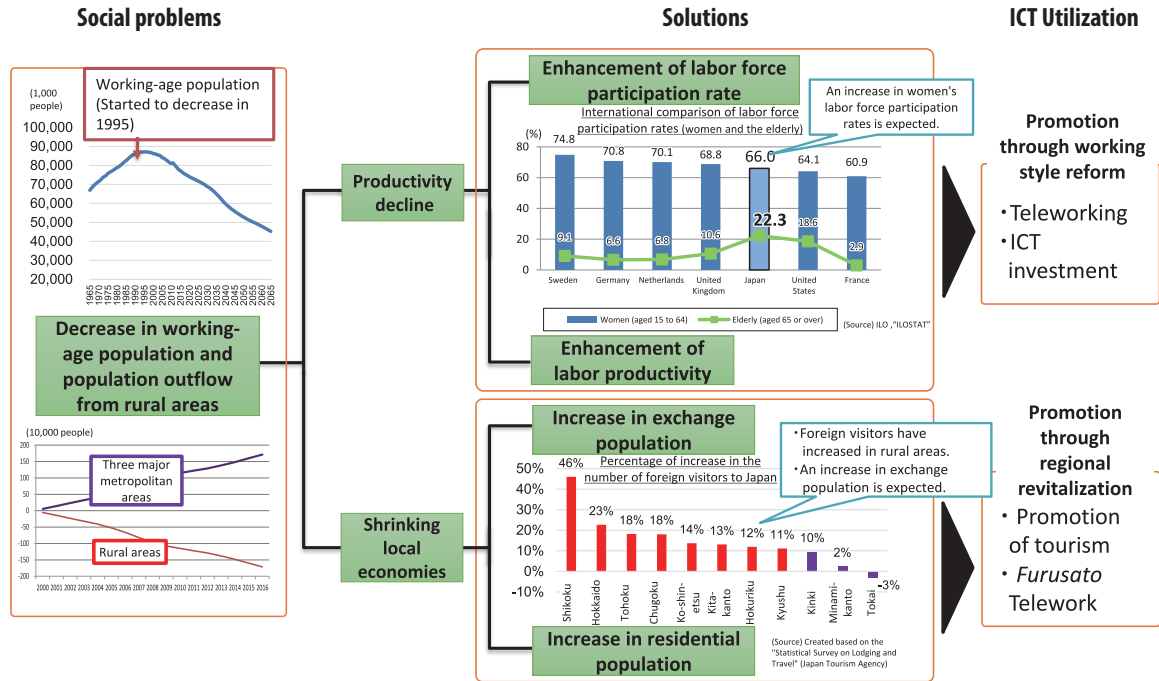
The Ministry of Internal Affairs and Communications independently estimates economic growth in the White Paper on the premise of the development of IoT and corporate reform, while referring to the estimates by the Cabinet Office.

- Economic growth scenario: Assuming that the progress of the development of IoT and corporate reform accelerates companies' productivity enhancement and creation of demand through the development of new products and services, which will change variables in the baseline scenario.

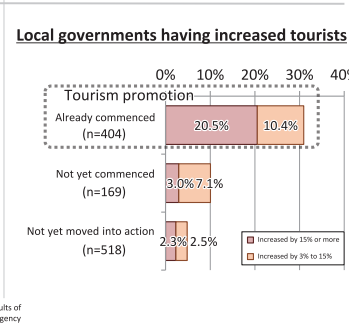
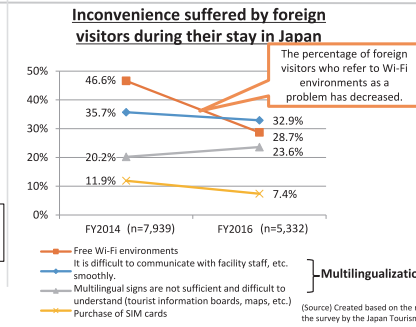
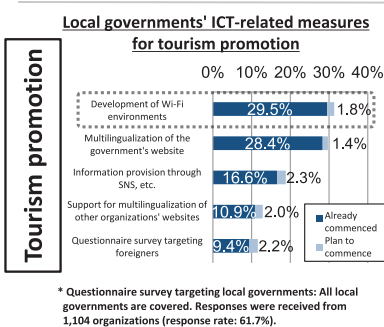
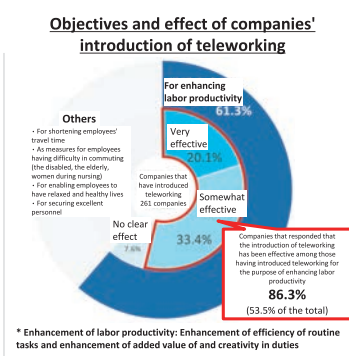
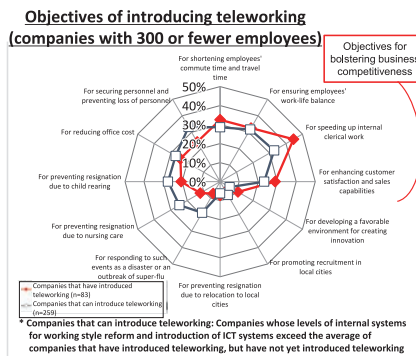
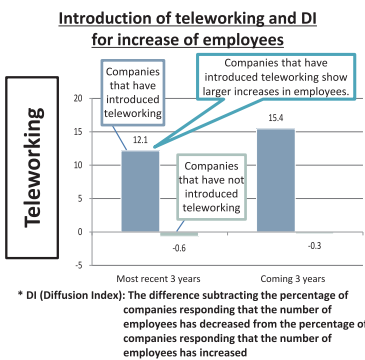
Items	2016	2020	2025	2030	
Economic growth scenario	Real GDP	100	109	122	139
	Real ICT investment	100	139	197	285
Baseline scenario	Real GDP	100	105	109	114
	Real ICT investment	100	114	129	146

Chapter 4 ICT Utilization Useful for Solving Social Problems

- A shrinking economy due to a decrease in working-age population is a serious problem facing Japan and the impact is especially notable in rural areas.
- ICT is expected to be fully utilized in the process of working style reform and regional revitalization, which are necessary for solving such problem.



- Companies that have introduced teleworking are apt to increase employees. Teleworking is expected to not only facilitate labor force participation but also enhance labor productivity.
- Local governments' tourism promotion measures, such as the development of Wi-Fi environments, have increased foreign tourists or have otherwise produced certain positive results. They are expected to make further efforts, centered on multilingualization.



Chapter 5

The 2016 Kumamoto Earthquake and ICT Utilization

- As a result of efforts to strengthen communication and broadcasting infrastructure after the Great East Japan Earthquake and the expansion of the use of smartphones, ICT was fully utilized at the time of the 2016 Kumamoto Earthquake for communicating and sharing information in disaster-stricken areas. LINE was the third most frequently used means for collecting information at the time of the earthquake, following mobile phones and terrestrial broadcasting.
- It is expected that new ICT tools will be more positively utilized in the future, in such forms as indirect public notices by the use of the L-Alert and the analysis of big data of SNS information (disaster information analyzer (DISAANA)).

1 Information communication and sharing in disaster-stricken areas and roles of ICT

Ensure safety and relief through strengthening communication and broadcasting infrastructure

Reinforcement of facilities has produced an effect

Thanks to efforts for strengthening infrastructure based on lessons learned from the Great East Japan Earthquake, the broadcasting and communication infrastructure in disaster-stricken areas continued to function well. Base stations which had suspended transmission resumed services for mobile phones within two weeks and broadcasting was restarted within 72 hours, supporting communications among residents and business continuation of local governments and companies. Based on these results as well, efforts for strengthening infrastructure should be further promoted.

Dissemination of smartphones enabling responses to diverse information needs

LINE was ranked the third as means for collecting information

Smartphones, which have disseminated rapidly after the Great East Japan Earthquake, are highly evaluated as effective with their capacity to respond to diverse information needs through the use of the verbal communication function, email function, LINE and other SNS, and diverse Internet applications. It is also necessary to develop an environment highly resilient to disasters for their utilization (free access to Wi-Fi networks and lending of battery chargers at the time of a disaster, etc.).

Improvement of environment for utilizing ICT during evacuation, etc.

Increased use of Wi-Fi networks at the time of a disaster

Under the emergency system, "0000JAPAN," approximately 55,000 APs at the largest were made available all over the Kyushu area, and tablets were fully utilized at shelters for collecting information. In this manner, information was shared efficiently through active utilization of ICT. People who had known of "0000JAPAN" and used the system accounted for 23%. It is a challenge to utilize the system more promptly and flexibly at the time of a disaster while devising better utilization of ICT envisaging concrete usage such as for communicating information on shelters necessary for properly establishing and operating shelters.

2 Active utilization of new ICT tools and expected effects

Active utilization SNS information and big data (DISAANA/D-SUMM)

New possible means of collecting information

It is considered to also be effective for local governments to utilize big data tools (DISAANA, D-SUMM), with which needs and other information of disaster victims can be collected directly from SNS.

Indirect public notices using the L-Alert, as well as news tickers and data broadcasting

Usefulness of the L-Alert

Approximately 45% of the respondents highly evaluated indirect public notices using terrestrial broadcasting, such as news tickers and data broadcasting, during the restoration period after the earthquake (terrestrial broadcasting was ranked second among useful communication means following mobile phones). While improving the information input function and information transmission system of the L-Alert, it is necessary to enhance the effectiveness of indirect public notices utilizing the L-Alert in order to improve convenience and ensure efficient and effective information communication.

Identity verification using individual number cards at the time of a disaster

Utilization of individual number cards at the time of a disaster

Cited problems concerning the handling of personal information at the time of a disaster include cumbersome procedures for providing personal information and negative effects of information collection in handwriting. Identity verification using individual number cards is one option for solving these problems and achieving simpler information management.

3 Business continuation at the time of a disaster and ICT

Less than 40% use cloud services

Local government and companies, etc. have come to be aware of the importance of business continuation at the time of a disaster, and all companies that provided responses said that they have taken measures for data backup. However, only 36.1% of them are using cloud services. 46.2% of companies that have multiple business bases are making efforts for system redundancy as concrete costly measures, while such percentage is only 25.0% for companies that have only a single business base. Measures and the scope of efforts for system redundancy thus vary depending on the size of the company. Therefore, efforts should be made for developing and operating a common infrastructure to enable diverse organizations to utilize ICT, thereby strengthening disaster resilience of a society as a whole.

Part 2 Basic Data and Policy Directions

Chapter 6 Basic Data on the ICT Field

ICT Industry Trends

- Japan's ICT industry's market size was 95.7 trillion yen, accounting for about 9.9 percent of all industries, the largest share of any industry.
- The ICT industry's real GDP accounted for 9.3 percent of all industries in 2015, making it the third largest of all major industries than 'commerce' and 'real estate'.

Figure: Market sizes of major industries (based on nominal domestic production) (2015)

(trillion yen)

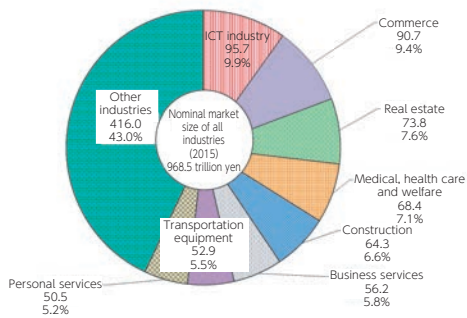
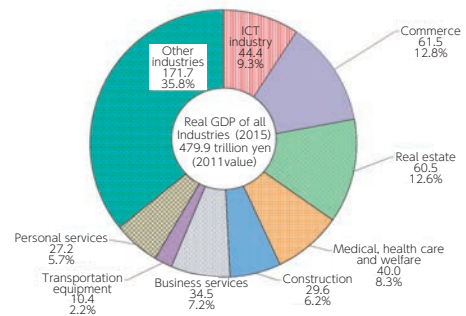


Figure: Real GDP of major industries (2015)

(trillion yen)



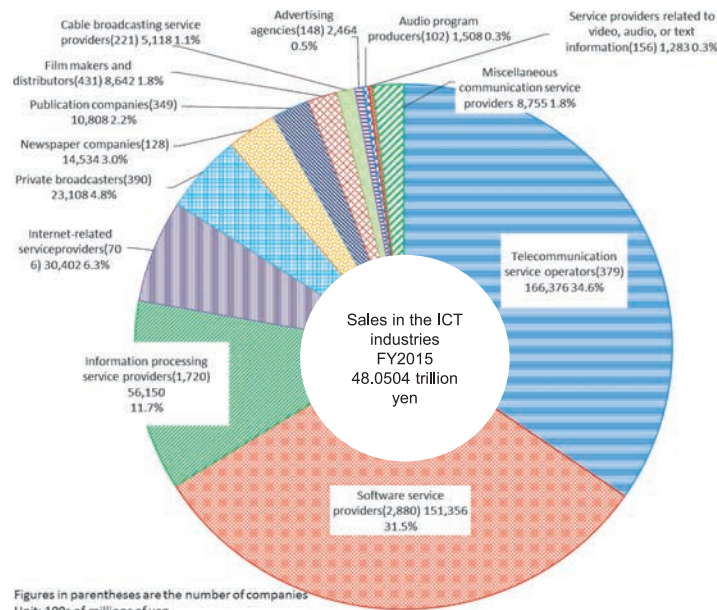
Research and development in the ICT field

- The ICT industry spent 3.9591 trillion yen on research in FY 2015, accounting for 28.9 percent of all corporate research spending, and employed 169,717 researchers, or 34.9 percent of all corporate researchers in Japan.

State of ICT enterprise operations

- There were 5,474 enterprises engaged a ICT business with FY 2015 sales of 48.0504 trillion yen.

Figure: ICT industry sales



Figures in parentheses are the number of companies
Unit: 100s of millions of yen

(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

Internet usage trends

- The number of Internet users at the end of 2016 rose 0.2 percent year-on-year to 100.84 million. The penetration rate among the general population was 83.5 percent, the same as last year-end. The percentage of households owning smartphones is 71.8 percent reducing the ownership gap with computers to just 1.2 percentage points.

Figure: Transitions in the number of Internet users and the penetration rate among the general population

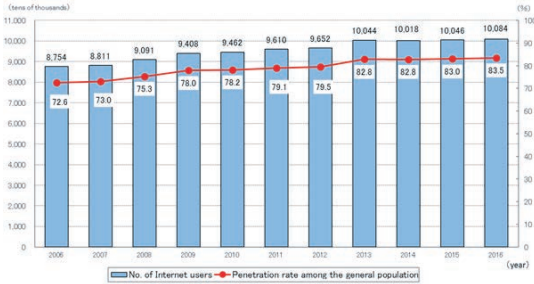
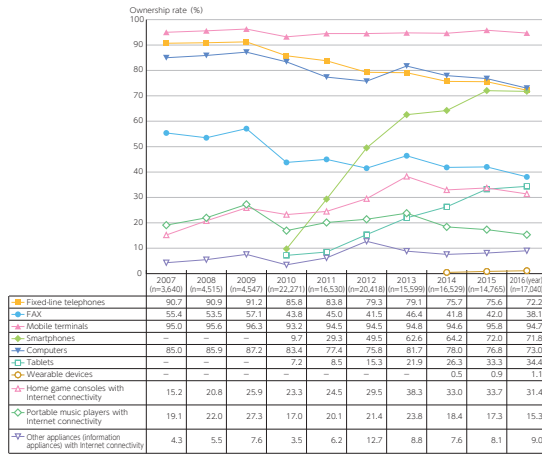


Figure: Transitions in household ownership rates for ICT devices



Cloud service usage trends

- The percentage of enterprises using cloud services at the end of 2016 rose to 46.9 percent from 44.6 percent at the end of 2015.

Figure: State of cloud service usage in Japan

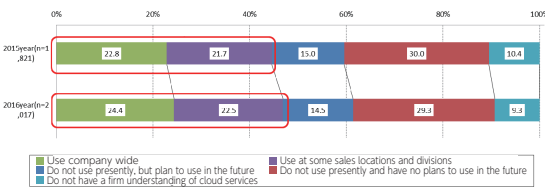
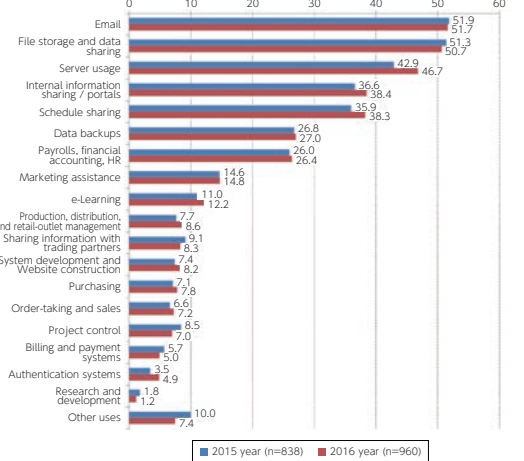


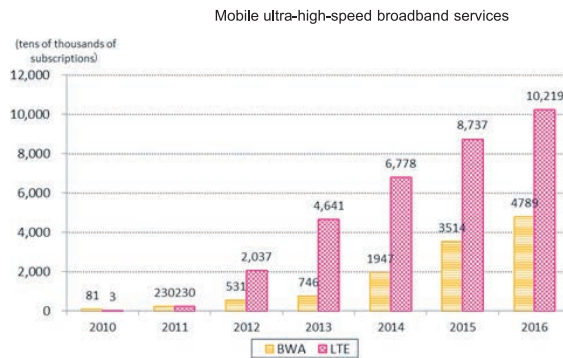
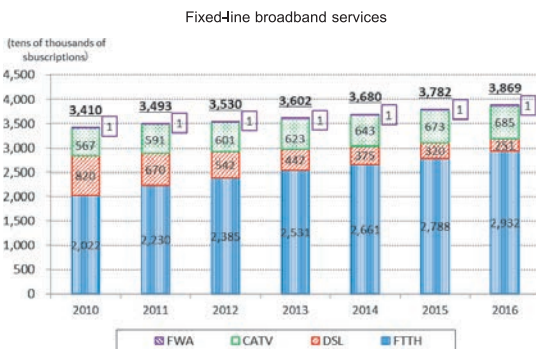
Figure: Breakdown of cloud service usage



Telecommunications business

- Subscriptions to fixed-line broadband services at the end of FY 2016 stood at 38.69 million, and subscriptions to mobile ultra-high-speed broadband services broke down into 102.19 million for 3.9G and 4G mobile phone (LTE) services and 47.89 million for BWA services.

Figure: Transitions in broadband service subscriptions



Broadcasting business and content market

- Broadcaster sales in FY 2015 were 3.9152 trillion yen. The share of terrestrial-based broadcasters continued to expand from the previous fiscal year.
- The Japanese content market was valued at 11.5081 trillion yen, which broke down to 54.3 percent from video content, 39.2 percent from text-based content, and 6.5 percent from audio-based content.
- The export value of Japanese broadcast content was 28.85 billion yen in FY 2015.

Figure: Transitions in and breakdown of the broadcasting sector market size (total sales)

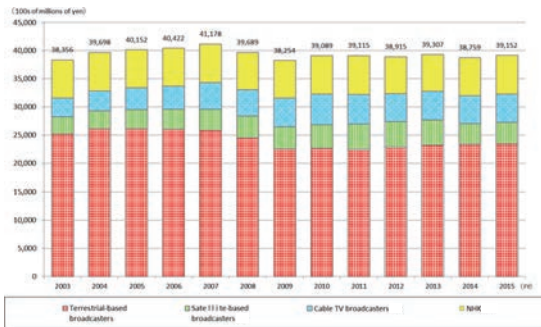


Figure: Breakdown of Japan's content market (2015)

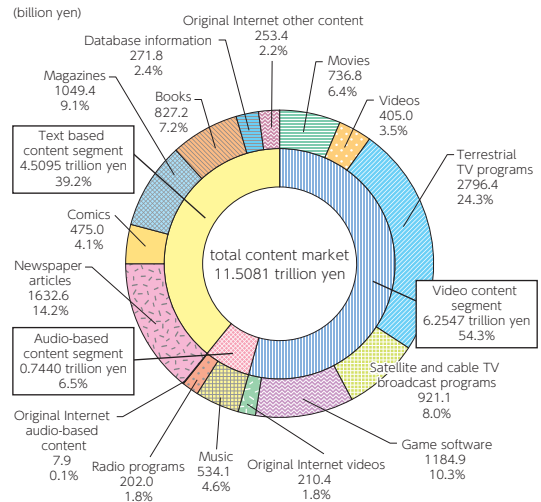
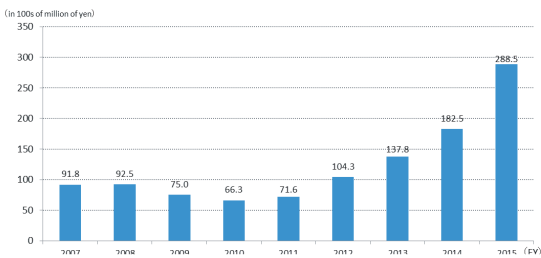


Figure: Export value of Japanese broadcast content

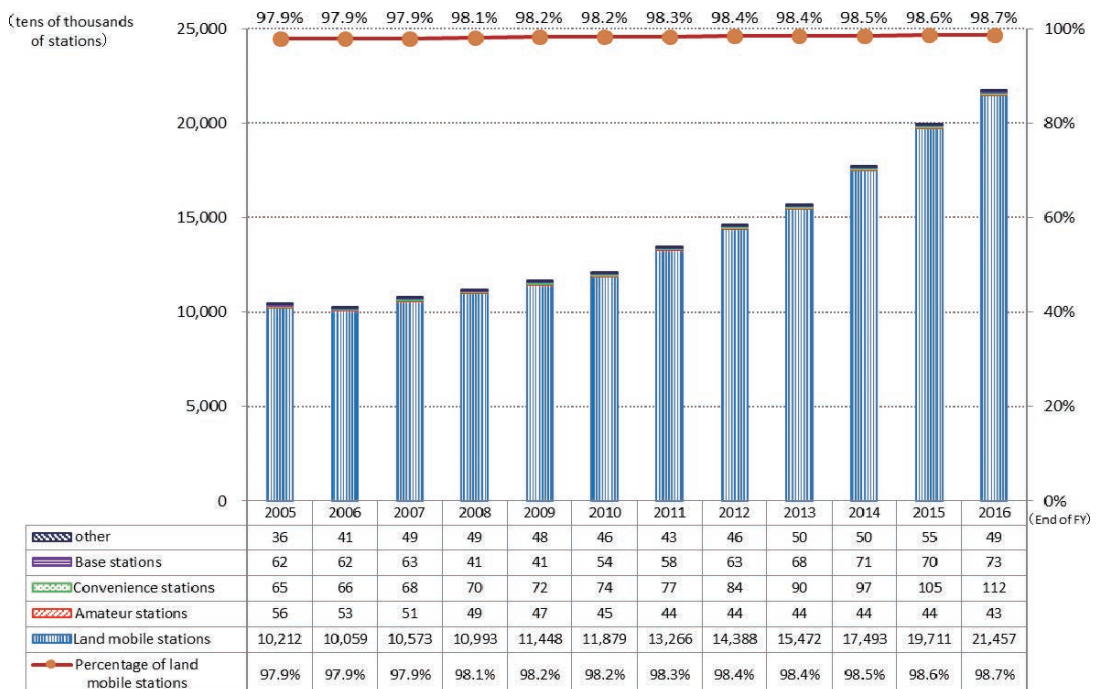


(Notes) Export value of broadcast content: total export value of program broadcast rights, Internet distribution rights, video and DVD rights, format and restaging rights, merchandising rights, and similar rights. From FY 2010 onward, the export value from other revenue streams has been included along 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.

Radio spectrum use

- The number of radio stations in Japan continued to increase, reaching 217.35 million at the end of FY 2016 (a year-on-year increase of 8.8 percent). This total included 214.57 million mobile phones and other land mobile stations (a year-on-year increase of 8.9 percent). This category accounted for a huge 98.7 percent of all radio stations.

Figure: Transitions in the number of radio stations



Chapter 7

ICT Policy Directions

■ Comprehensive strategy promotions

- The Japanese cabinet decided the Growth Strategy 2017 in June 2017. In the Strategy, the direction of ICT policy to be tackled towards further growth of Japan was shown, such as establishment of data utilization infrastructure and system development, promotion of utilization of individual number cards, implementation and utilization of 5th generation mobile communication system (5G).

■ Developments in telecommunications business policy

- MIC policies in this area include promoting mobile services, increasing the use of optical networks, revising and enhancing consumer protection rules, and ensuring the correct handling of personal and user information.

■ Developments in radio policy

- MIC policies in this area include promoting effective radio spectrum use, promoting advanced Intelligent Transport Systems, and establishing radio usage environments.

■ Developments in broadcasting policy

- Some of MIC's policy efforts in this area include encouraging the distribution of broadcast content, advancing broadcast services, and reinforcing broadcast networks.

■ Promoting ICT use and application

- MIC promotes ICT use and application in education, healthcare, and other fields as well as regional stimulation using ICT platforms, including promoting the establishment of free public Wi-Fi installations, ICT human resources development, and cyber security measures.

■ Promoting ICT research and development

- MIC will promote research and development from FY 2016 onward based on the July 2015 interim report by the Information and Communications Council. R&D topics include common IoT platform technologies, next-generation optical network technologies, multilingual voice-based translation technologies, artificial intelligence, and space communications technologies.

■ Promoting international ICT strategies

- MIC encourages the overseas adoption of Japan's standard for terrestrial digital TV (ISDB-T) and the export of Japanese ICT systems (such as disaster-response systems) to Asia and Central and South American countries, as well as promotes various multilateral and bilateral contributions and collaborations.

■ Developments in postal service administration

- MIC ensures the universality of postal services. MIC is also putting energy into the overseas deployment of postal infrastructure systems using Japan's superb postal business knowledge.