

(Unofficial translation)

2017 White Paper on Information and  
Communications in Japan  
(Outline)

Special Theme: Data-driven Economy and Social Change

July 2017

Ministry of Internal Affairs and Communications

## Special Theme: Data-driven Economy and Social Change

- **In the data-driven economy**, diverse **data is created, collected, distributed, analyzed and utilized** to the utmost in order to solve various problems in society through redesigning all socioeconomic activities even including the stage of manufacturing process .
- **Smartphones**, digital equipment closely connected to individuals' lives, create a mass of human data. On the premise of the development of Internet of Things (IoT), the scope of available **big data** expands, and a significant social and economic change that may be referred to as the **4th Industrial Revolution** will be brought about. [Chapter 1 to Chapter 3]
- Information and communication technology (ICT), which is a general-purpose technology applicable in diverse fields, will also contribute to **solving various social problems, such as population declines, shrinking local economies, and disasters**. [Chapter 4 and Chapter 5]

### Chapter 1 Present and Future of Smartphone Economy

**Section 1** Advent of Smartphone Society

**Section 2** New Services Facilitating Expansion of Smartphone Economy

**Section 3** Online Platform and Data Utilization

### Chapter 2 Advent of the Age of Big Data Utilization

**Section 1** Expanding Distribution and Utilization of Data

**Section 2** Problems in Distribution and Utilization of Data

**Section 3** Broadening International Discussion

**Section 4** Future Outlook Compilation and Recommendations

### Chapter 3 Changes Brought About by the 4th Industrial Revolution

**Section 1** Global Trends Brought About by the 4th Industrial Revolution

**Section 2** Initiatives and Challenges for the 4th Industrial Revolution

**Section 3** Development of IoT in the Information and Communications Industry

**Section 4** Verification of Effect of ICT Investment Using Input-Output Table

**Section 5** Data-driven Economic Growth

### Chapter 4 ICT Utilization Useful for Solving Social Problems

**Section 1** Advent of Depopulating Society and Countermeasures

**Section 2** Working Style Reform and ICT Utilization

**Section 3** Regional Revitalization and ICT Utilization

**Section 4** Potential of Expanding ICT Utilization

### Chapter 5 The 2016 Kumamoto Earthquake and ICT Utilization

**Section 1** ICT Utilization at the time of Disasters

**Section 2** Results of the Survey on ICT Utilization at the time of the 2016 Kumamoto Earthquake

**Section 3** The 2016 Kumamoto Earthquake and New Means of Sharing Disaster Information

**Section 4** Lessons from the 2016 Kumamoto Earthquake and ICT

**Section 5** Promotion of Computerization in Disaster Prevention Field

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

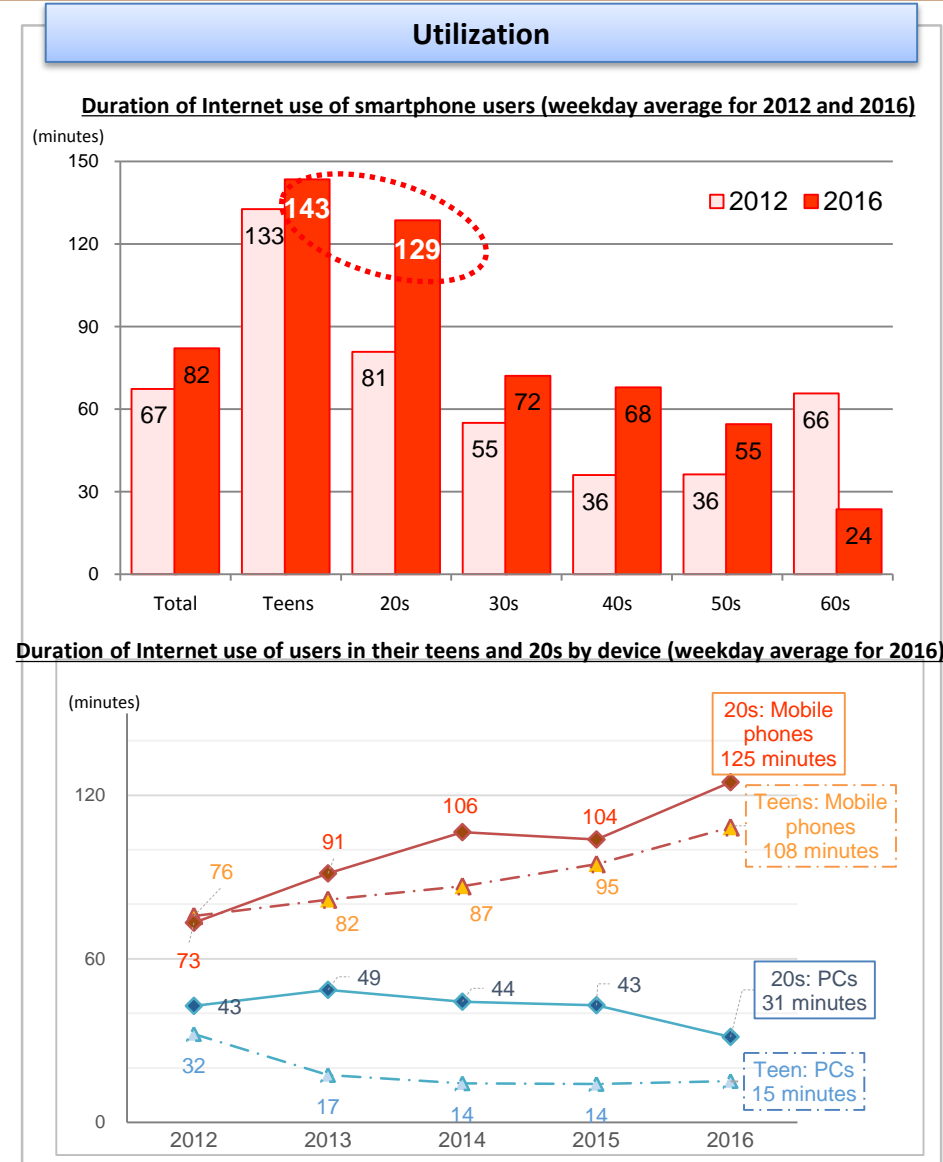
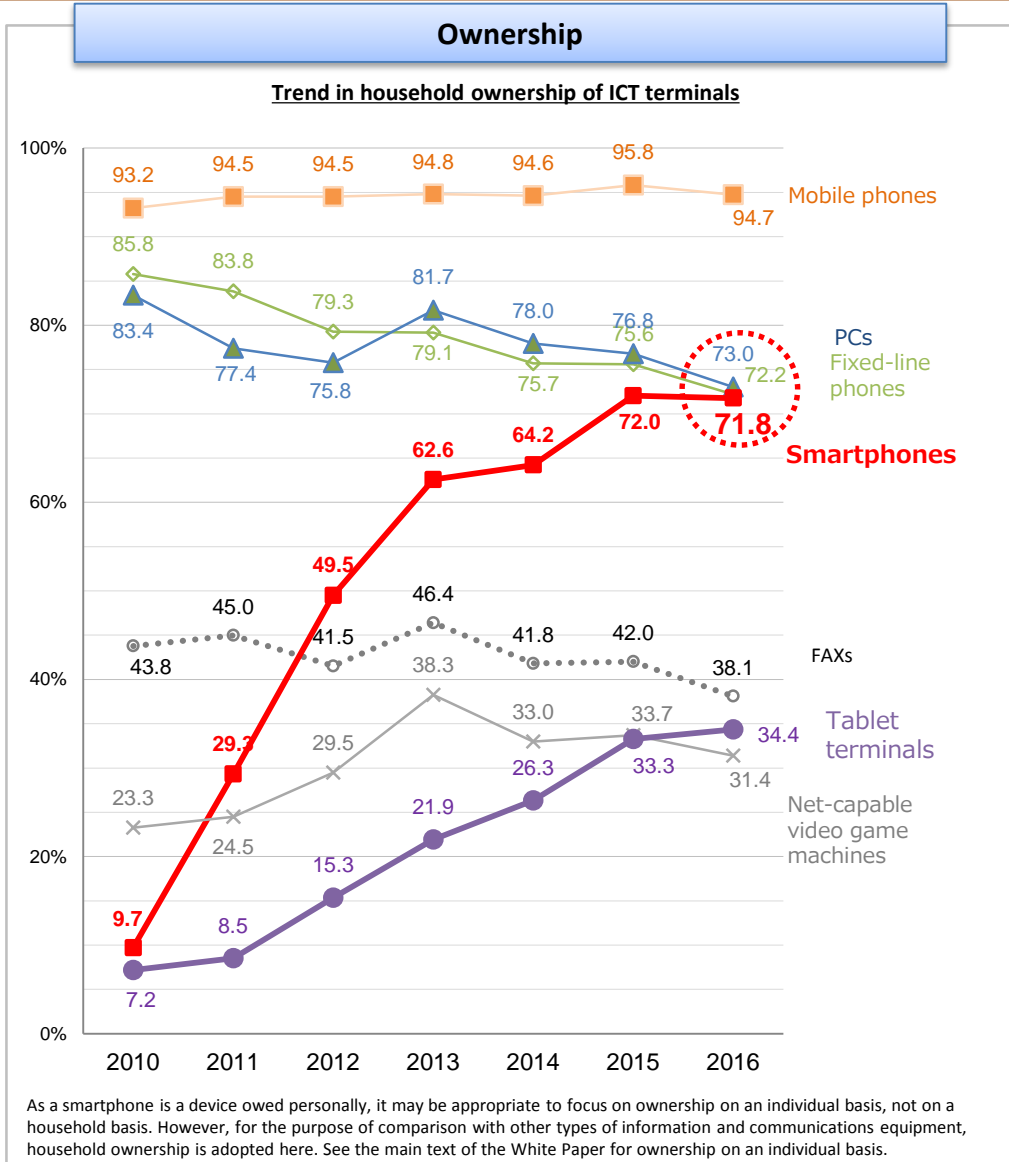
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## Key points

## Major figures

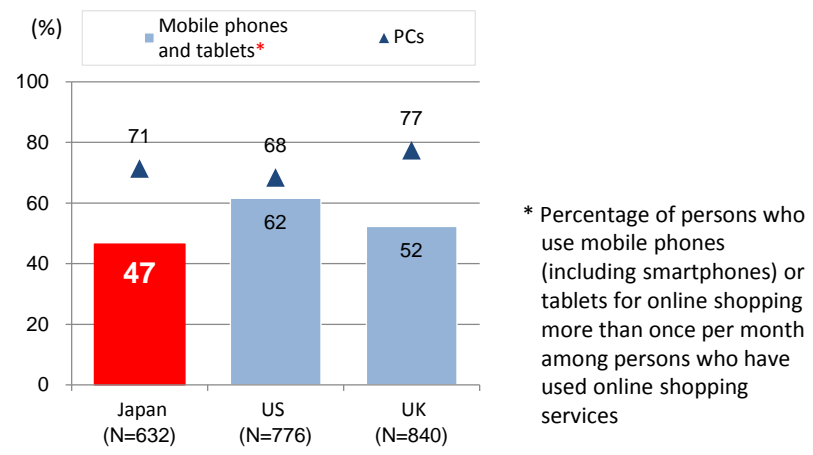
<p><b>Chapter 1</b> Present and Future of Smartphone Economy</p>	<ul style="list-style-type: none"> <li>Along with <b>the dissemination and the increase of hours of use of smartphones</b>, consumption of online services using smartphones has further increased and <b>companies have come to accumulate larger amounts of</b> generated data, which suggests the possibility of new value creation through the utilization of such data. (Page 3)</li> <li>On the other hand, compared with the United States and the United Kingdom, <b>people are less willing to utilize new services</b>, such as FinTech and <b>sharing services</b>, in Japan, and it is a future challenge to increase users of those services as a whole. (Page 4)</li> </ul>	<p>[Increase in smartphone ownership ratio] <b>71.8%</b> ← 10% (2010) (households)</p> <p>[Willingness to utilize private guest houses during travels] Japan: <b>29%</b> us: <b>55%</b></p>
<p><b>Chapter 2</b> Advent of the Age of Big Data Utilization</p>	<ul style="list-style-type: none"> <li>'The Amended Personal Information Protection Act' and 'the Basic Act on the Advancement of Utilizing Public and Private Sector Data' have been put into force and international discussion has deepened concerning free distribution of information. The environment is thus being developed for the commencement of the utilization of big data. <b>Companies also show a positive stance for data utilization.</b> (Page 5)</li> <li>Many people have provided personal data but <b>have a strong sense of anxiety over data provision.</b> (Page 6)</li> <li>Companies need to make efforts to <b>eliminate the gap in awareness between individuals and companies.</b> (Page 7)</li> </ul>	<p>[Companies willing to utilize data] <b>78%</b> (personal data); <b>77%</b> (industrial data)</p> <p>[Percentage of individuals having a sense of anxiety over provision of personal data] <b>86.1%</b></p>
<p><b>Chapter 3</b> Changes Brought About by the 4th Industrial Revolution</p>	<ul style="list-style-type: none"> <li>Regarding initiatives for the 4th Industrial Revolution, the percentage of companies still <b>at the deliberation stage, far from the introduction or utilization stage, is larger</b> in Japan than in Europe and the United States. (Page 9)</li> <li>In the economic growth scenario premised on the simultaneous progress of the development of IoT and corporate reform (at an average annual growth rate of 2.4), it is estimated that <b>real GDP will reach 725 trillion yen by 2030.</b> (Page 11)</li> </ul>	<p>[Companies at the deliberation stage] <b>48.3%</b> (37% in the US, and around 20% in the UK and Germany)</p> <p>[GDP in 2030 estimated in the growth scenario] <b>725 trillion yen</b> ← 522 trillion yen (2016)</p>
<p><b>Chapter 4</b> ICT Utilization Useful for Solving Social Problems</p>	<ul style="list-style-type: none"> <li>Companies that have introduced teleworking are apt to increase employees. Teleworking is expected to not only facilitate labor force participation but also <b>contribute to enhancing labor productivity.</b> (Page 13)</li> <li><b>As local governments have been taking measures for promoting tourism, such as through developing Wi-Fi environments</b>, the percentage has decreased for foreign visitors who refer to the lack of free Wi-Fi environments as an inconvenience during their stay in Japan. (Page 13) Local governments that have actively taken tourism promotion measures, such as the information provision and the development of Wi-Fi-environments for tourists, are enjoying increased foreign tourists and other outcomes.</li> </ul>	<p>[Companies successfully enhancing productivity by introducing teleworking] <b>86.3%</b> of companies that have introduced teleworking with the aim of enhancing productivity</p> <p>[Local governments that have developed a Wi-Fi system as part of their tourism promotion measures] <b>29.5%</b></p>
<p><b>Chapter 5</b> The 2016 Kumamoto Earthquake and ICT Utilization</p>	<ul style="list-style-type: none"> <li>As a result of efforts to strengthen communication and broadcasting infrastructure after the Great East Japan Earthquake and <b>the expansion of the use of smartphones, ICT was fully utilized at the time of the 2016 Kumamoto Earthquake</b> for communicating and sharing information in disaster-stricken areas. SNS, digital terrestrial broadcasting, etc. were better utilized as means for collecting information compared to occasions of past disasters. (Page 14)</li> <li>It is expected that <b>new ICT tools will be more positively utilized</b> in the future, in such forms as indirect public notices based on the analysis of big data of SNS information (disaster information analyzer (DISAANA)) and by the use of the L-Alert. (Page 14)</li> <li>Whether operation systems have been made redundant for business continuation even at the time of a disaster <b>varies depending on the size of the company.</b></li> </ul>	<p>[Means helpful for collecting information] Digital terrestrial broadcasting: <b>45%</b></p> <p>[Companies making efforts for system redundancy] Companies having multiple bases: <b>46.2%</b> Companies having a single base: <b>25.0%</b></p>

- 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.

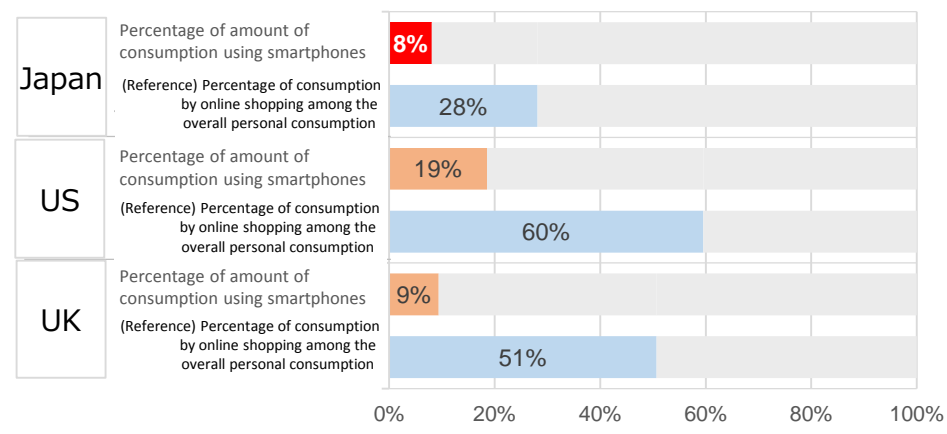


- **Smartphones and tablets are less utilized for online shopping compared to PCs.** Japan lags behind the United States and the United Kingdom in the utilization of smartphones and tablets in this field.
- Compared with these two countries, smartphone users in Japan are less willing to utilize **various 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.

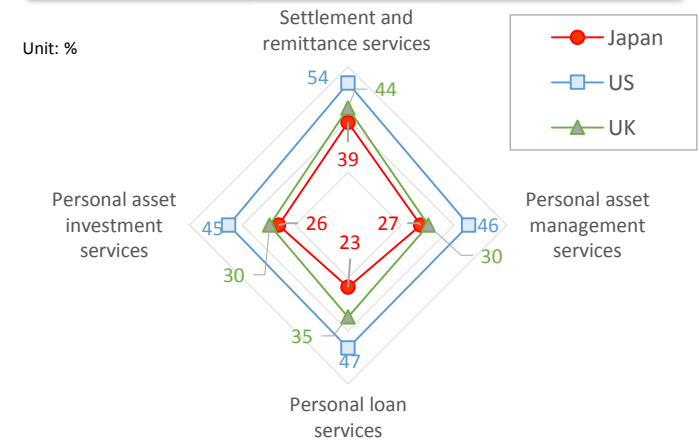
## Persons using online shopping more than once per month



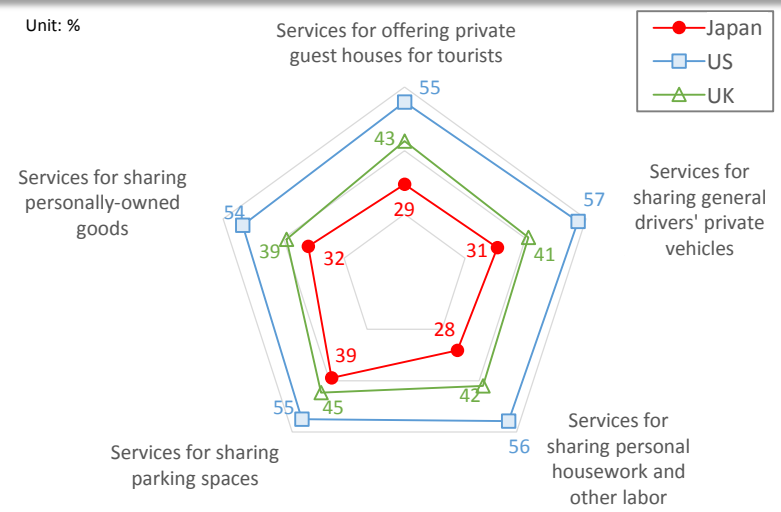
## Amount of consumption using smartphones (direct effect)



## Willingness to utilize various FinTech services



## Willingness to utilize various services in the sharing economy



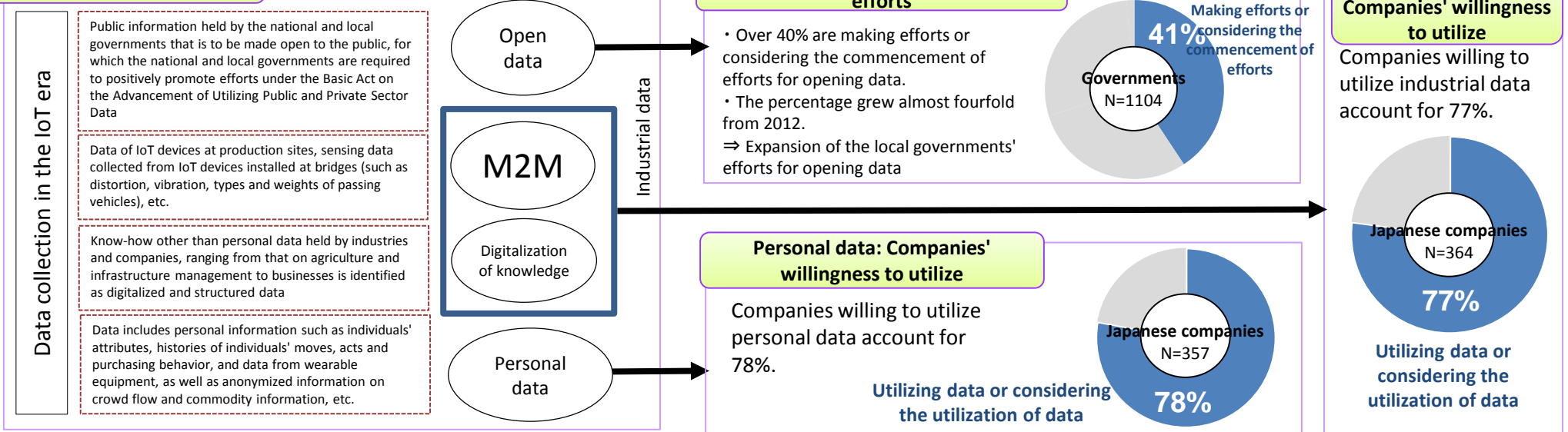
- **There is the possibility that** data utilization will increase rapidly from now on and **this year marks the very first year of the age of big data utilization.**
- It is necessary to **eliminate a gap between companies' positive attitudes and people's anxiety** and promote the utilization of data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

## Moves toward data utilization

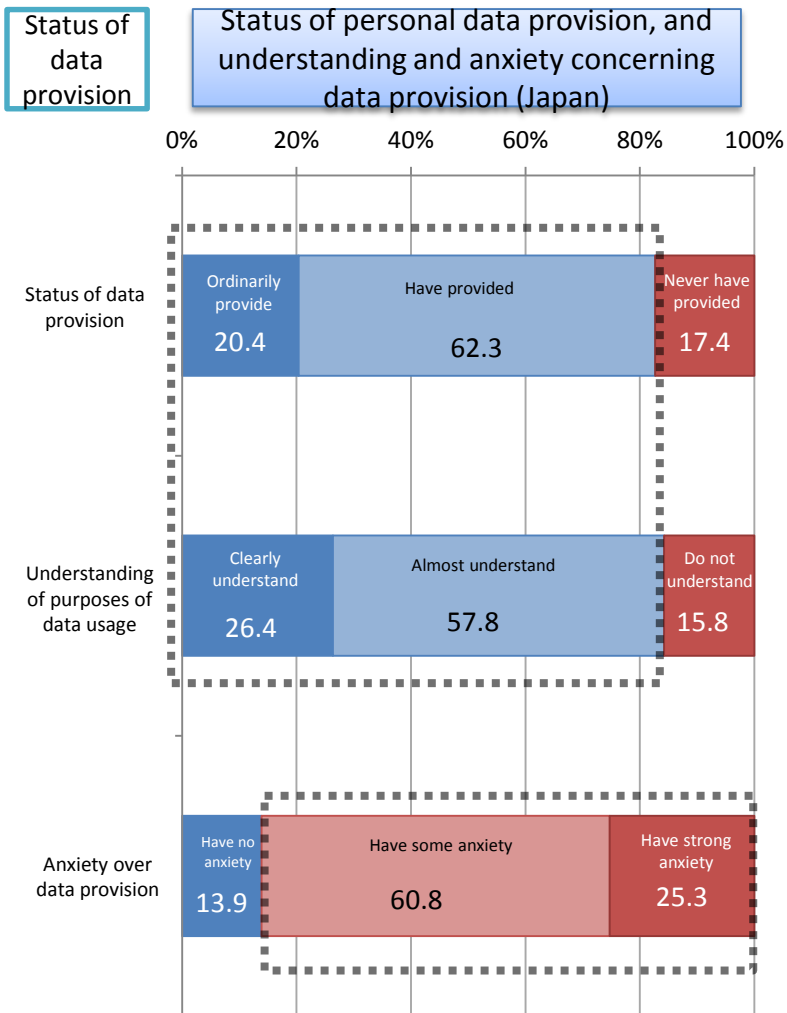
Environmental improvement	The Amended Personal Information Protection Act (in May 2017) and the Basic Act on the Advancement of Utilizing Public and Private Sector Data (in December 2016) were put into force and the environment has been improved for promoting data utilization.	➔	<ul style="list-style-type: none"> <li>● Amended Personal Information Protection Act: Promote active utilization while ensuring safety of anonymized data</li> <li>● Basic Act on the Advancement of Utilizing Public and Private Sector Data: Clarify that data concerning administrative procedures and private transactions should be handled online in principle.</li> </ul>
Government's policy	The government of Japan pointed out the significance of data utilization in the Declaration to be the World's Most Advanced IT Nation (in May 2017) and the Investments for the Future Strategy 2017 (in June 2017).		<ul style="list-style-type: none"> <li>● A rapid increase in the amount of distributing data will drastically change all aspects of people's daily lives.</li> <li>● Sufficient utilization of data is the key to significantly enhance productivity. Utilization of public and private sector data should be promoted comprehensively and effectively.</li> </ul>
International trends	Countries all over the world have been promoting initiatives for the facilitation of data distribution and utilization, which is expected to serve as the basis for the 4th Industrial Revolution and bring about economic growth and innovation.		<ul style="list-style-type: none"> <li>● The significance of free data distribution was confirmed by G7 member countries and G20 member countries after the G7 Meeting in Takamatsu, Kagawa.</li> <li>● In the meantime, moves for data localization have also been observed in various countries and regions, such as the EU's General Data Protection Regulation.*</li> </ul>

\* General Data Protection Regulation (GDPR): The major purpose is to protect privacy of individuals residing in EU member countries. The Regulation was established in April 2016 and is scheduled to be enforced in May 2018.

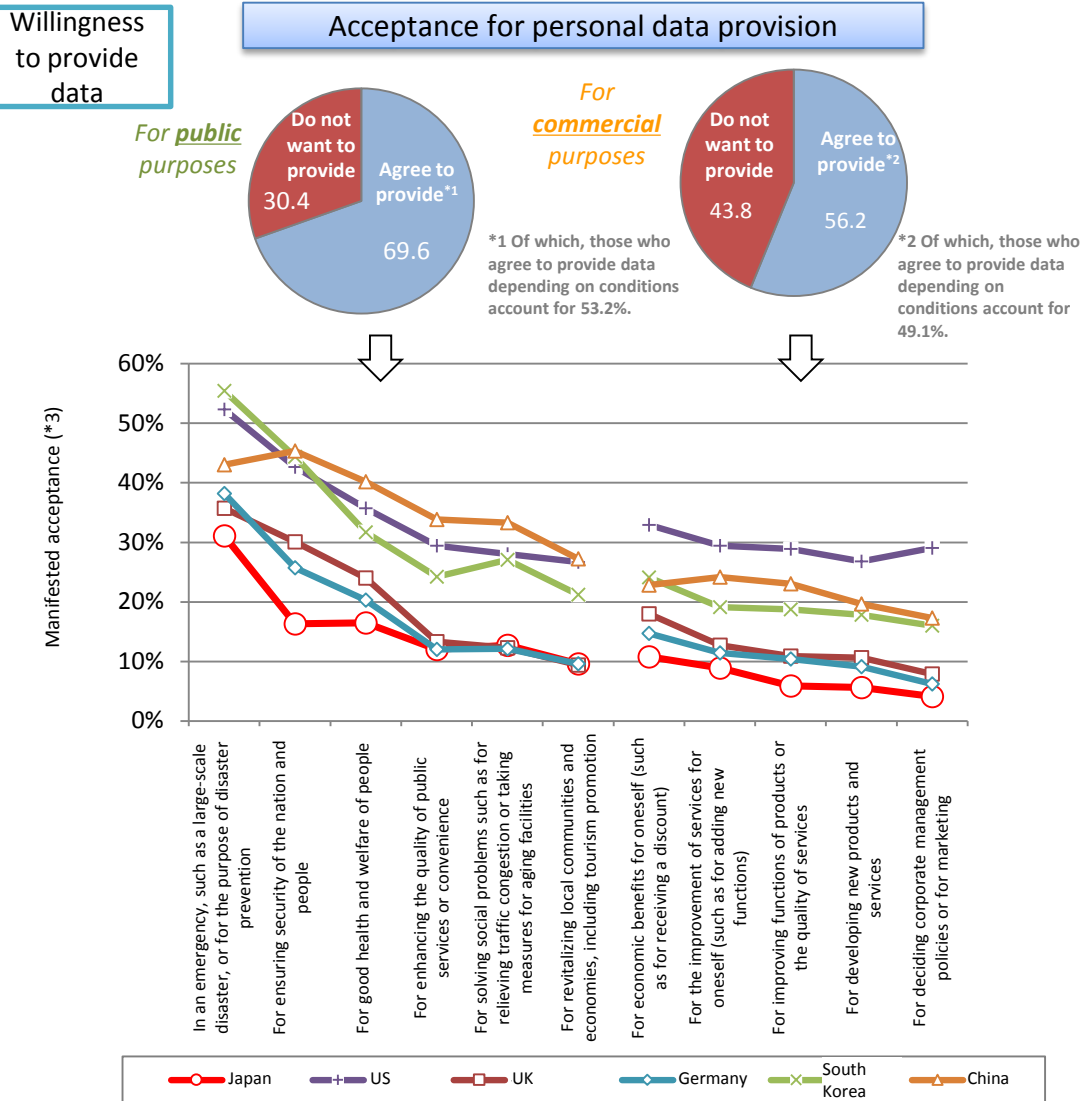
## Concept of "Data"



- In Japan, general users **who agree to provide personal data and show their understanding account for over 80%, but those expressing a sense of anxiety also account for over 80%.**
- In Japan, **acceptance for personal data provision is higher in the case of provision for public purposes than in the case of provision for commercial purposes.** People's attitude varies depending on the types of information they provide.
- Japanese users take **a stricter stance** for personal data provision **than those in the United States, the United Kingdom, Germany, China and South Korea.**



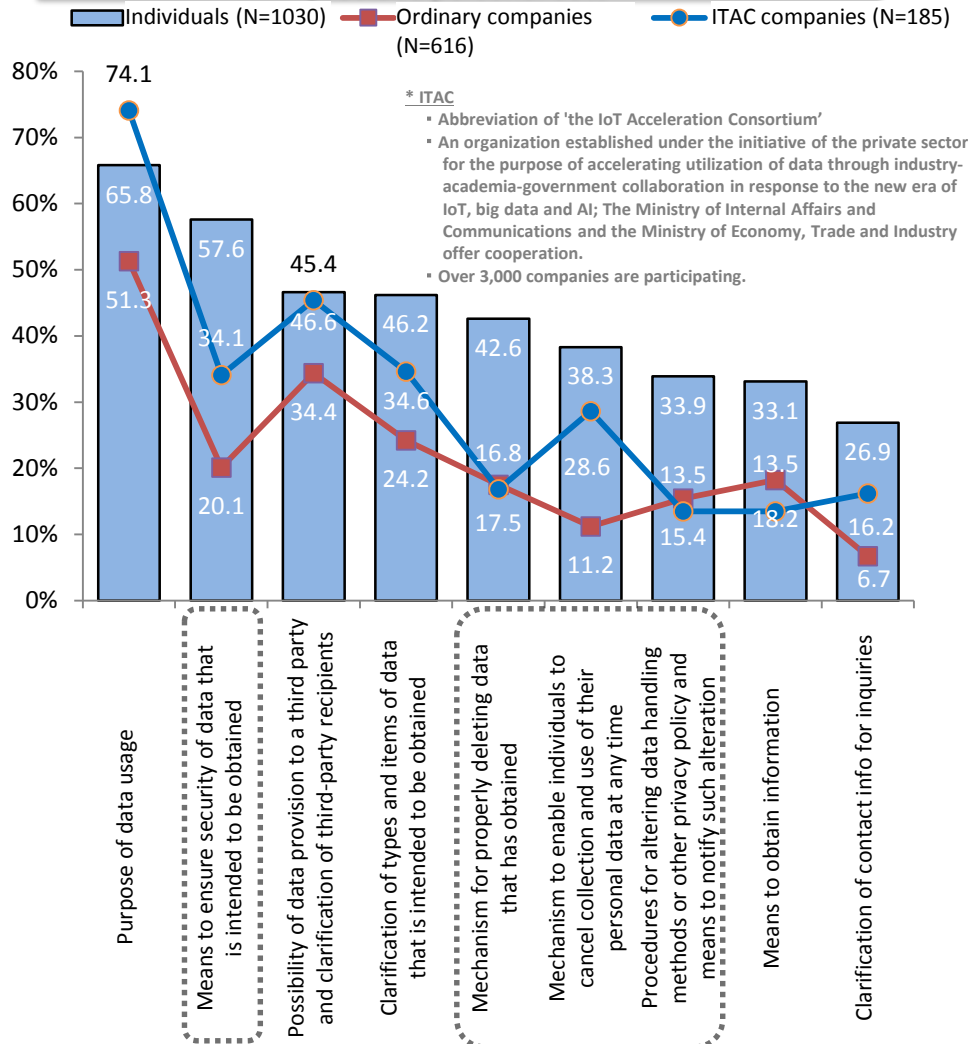
\* Comparison with the results of surveys in the United States, the United Kingdom, Germany, China and South Korea shows no significant difference in the status of data provision and understanding of data usage. However, the percentage of people having a sense of anxiety is higher in Japan and South Korea than in the other countries.



\*3 The percentage of the respondents, excluding those responding that they do not want to provide data in any case, who responded that they agree to provide data

- 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.

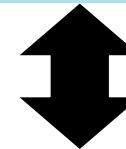
## Information that companies should provide upon obtaining provided personal data



## 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.



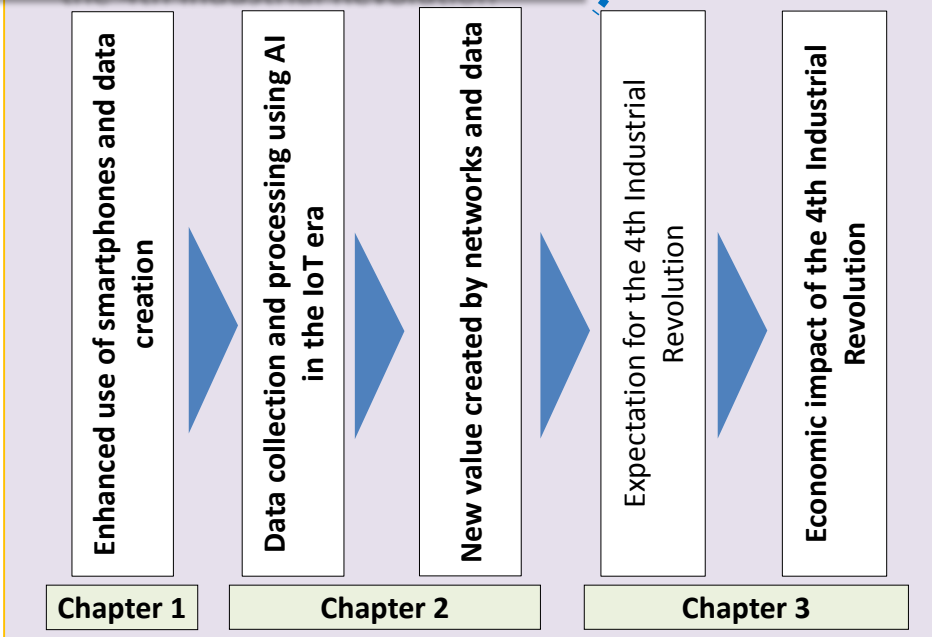
- The utilization of IoT makes it possible to collect big data at low cost. Furthermore, new value can be created through analysis of data using AI.
- Expectation for the **the 4th Industrial Revolution** has been increasing for realizing **Society 5.0**.

## Characteristics of Industrial Revolutions

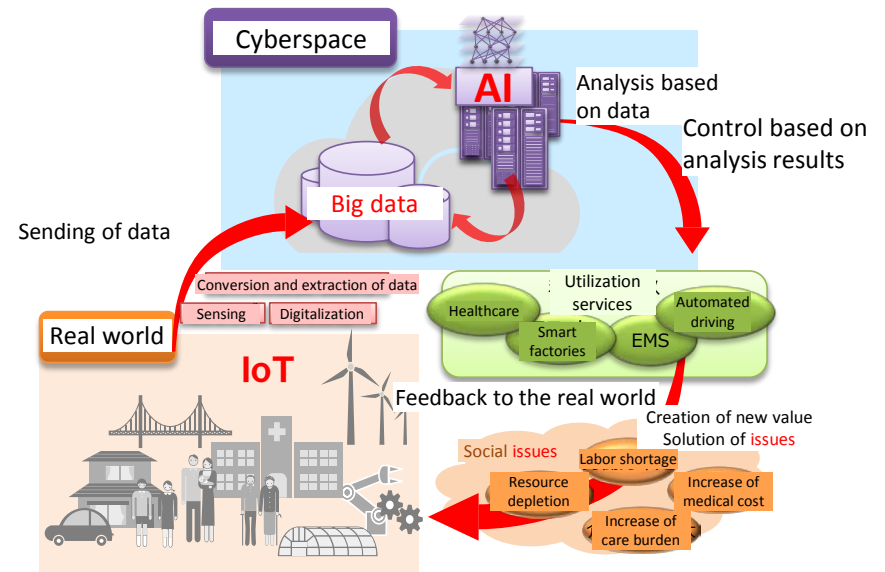
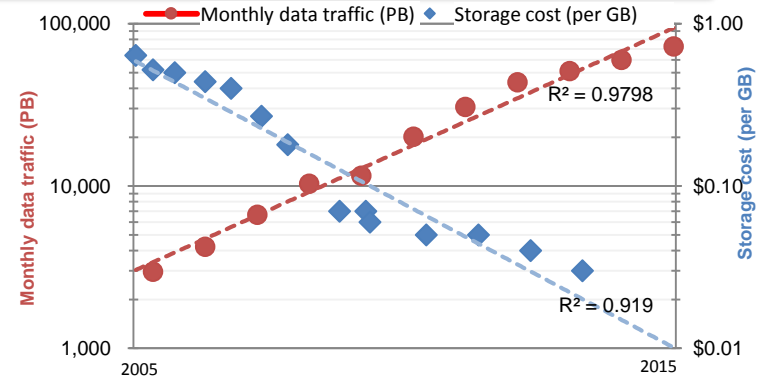
### Definition by the World Economic Forum (WEF)

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



## Rapidly increasing data distribution (whole world)



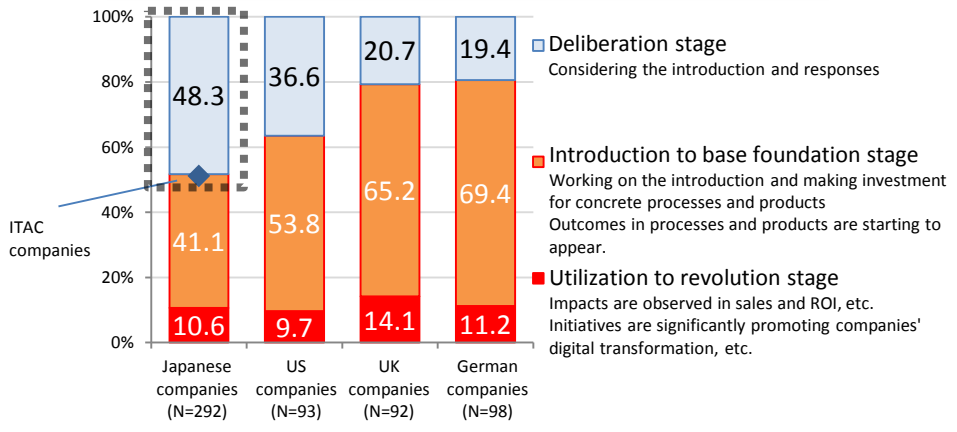
\* The 4th Industrial Revolution envisaged in the White Paper on Information and Communications in Japan  
 - Reduction of production cost through enhancing efficiency    - Digitalization of all accumulated systems and know-how and sharing of data  
 - Creation of new services and markets    - Responses 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

\* 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.

- 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.

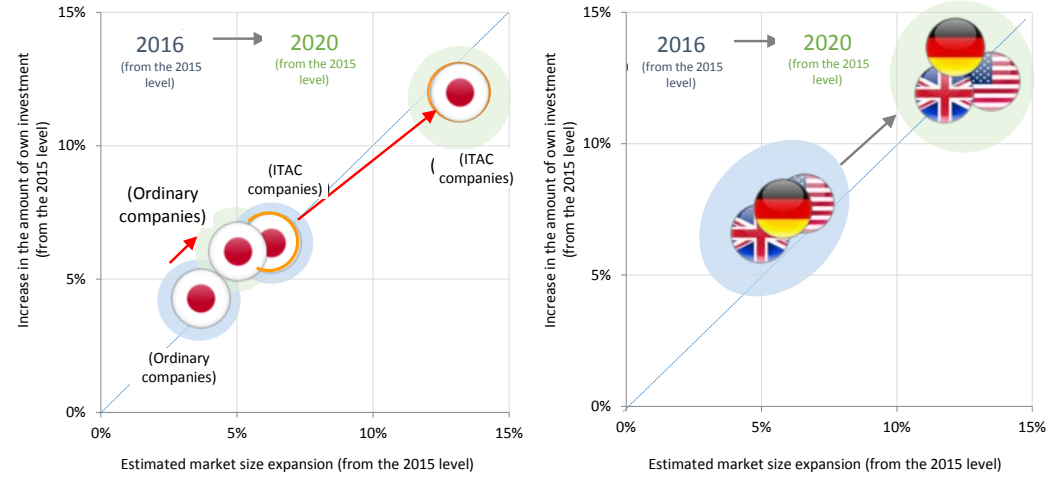
### At present

#### Companies' stages toward the 4th Industrial Revolution

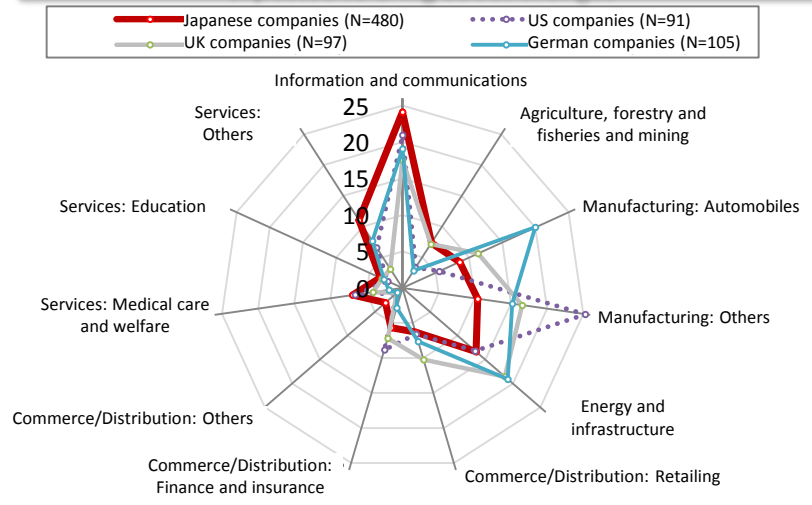


### In the future

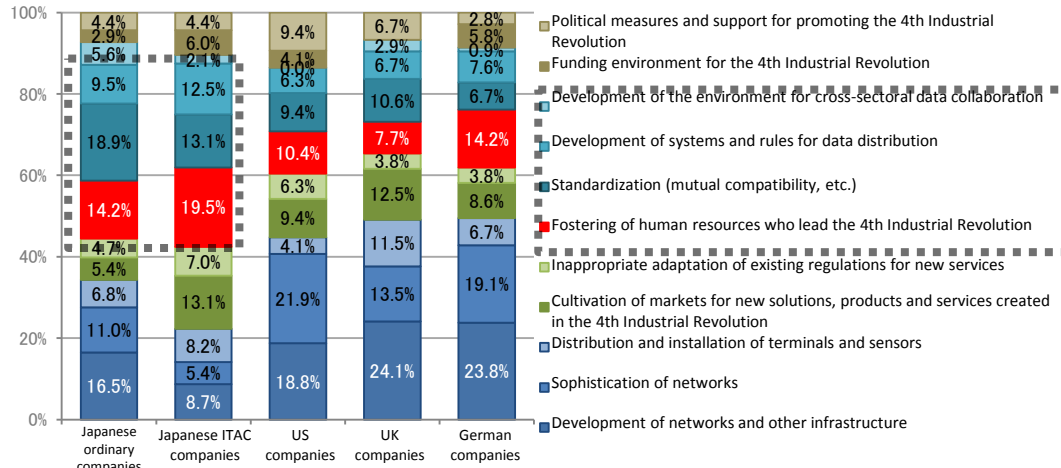
#### Market forecast and willingness to make investment in relation to the 4th Industrial Revolution



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

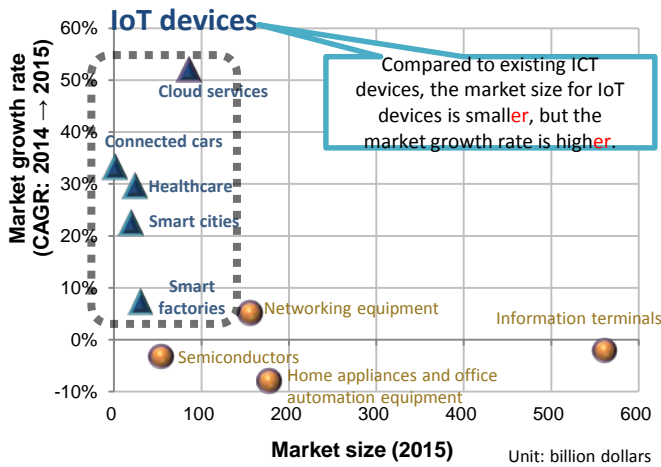


#### Challenges in achieving the 4th Industrial Revolution

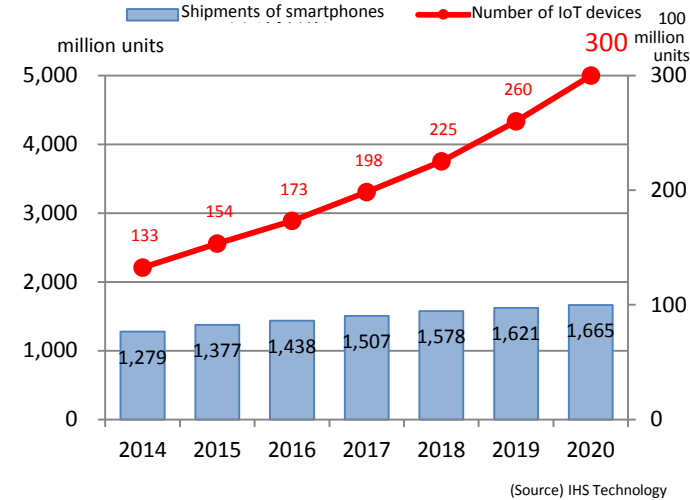


- The number of IoT devices, which connect things to the Internet, is increasing more sharply compared to smartphones, and is expected to reach **30 billion units by 2020**.
- As a communication technology to connect these devices, **Low Power Wide Area (LPWA) networks are attracting attention**, in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



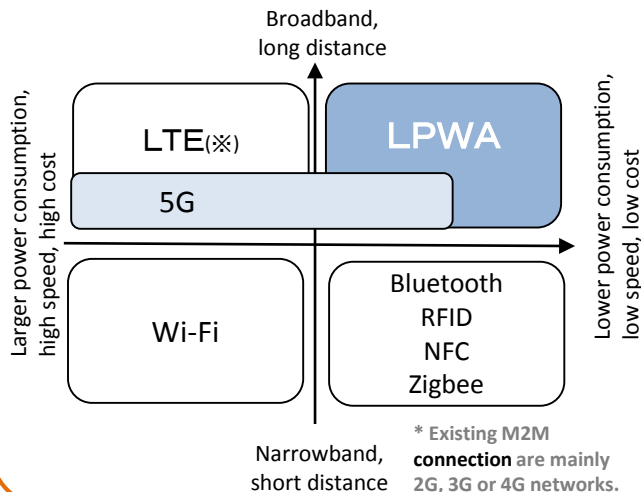
### Exhibition of IoT devices



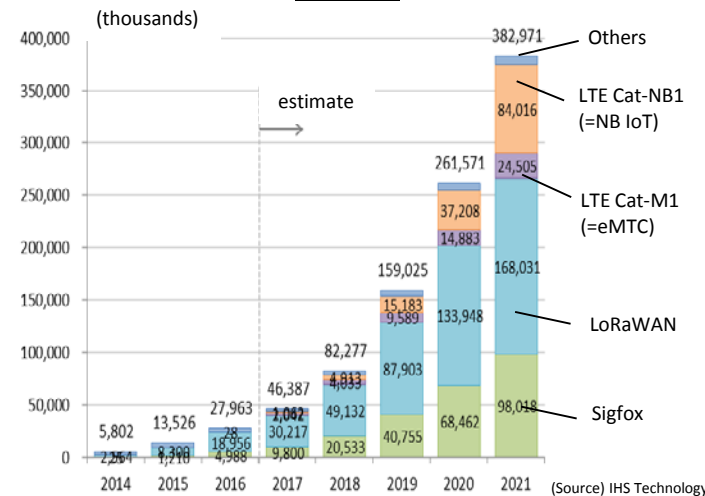
Exhibition by the LoRa Alliance at the Mobile World Congress (MWC) 2017

### LPWA - Communication technology that supports IoT

#### IoT communication technology



### Trend in world demand for LPWA connectivity including estimates



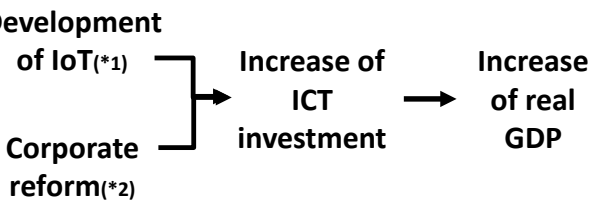
### Examples of the use of LPWA networks

	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

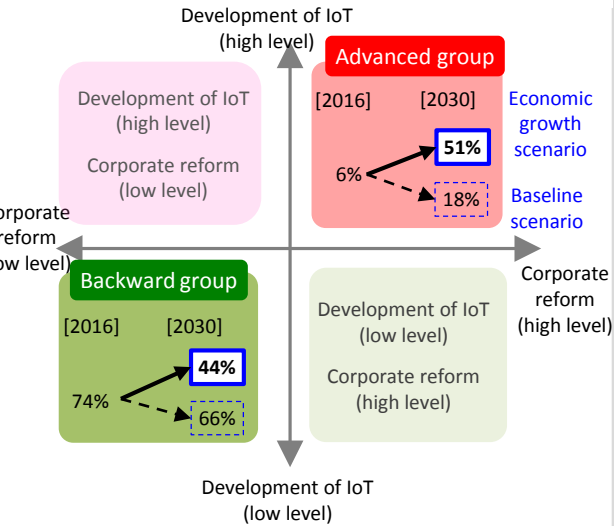
- In order to have IoT and AI surely bring about economic growth, **corporate reform** is indispensable **in addition to the development of IoT** through making relevant investment and inputting services.
- If the development of IoT and corporate reform both progress steadily, IoT and AI are expected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

## Economic growth up to 2030

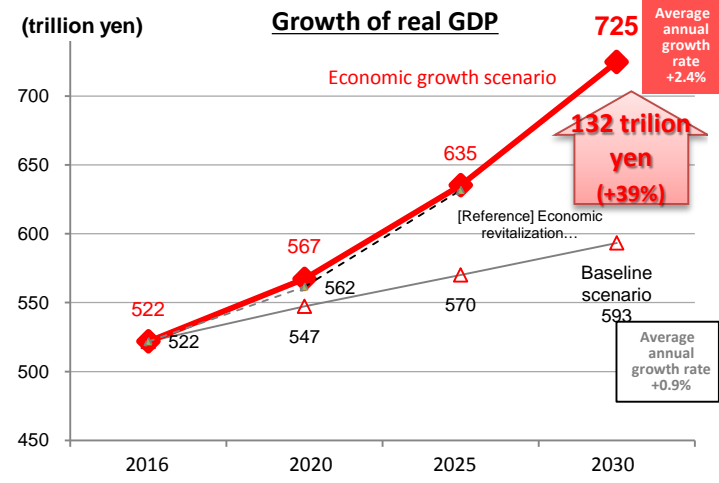


- \*1 Development of IoT and AI**
  - Introduction of IoT and AI
- \*2 Corporate reform**
  - Internal and external operational reform
  - Human resources-related measures and investment
  - IP-related investment
  - Overseas investment
  - M&A

## Corporate classification under two scenarios



## Impact of the development of IoT



● **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

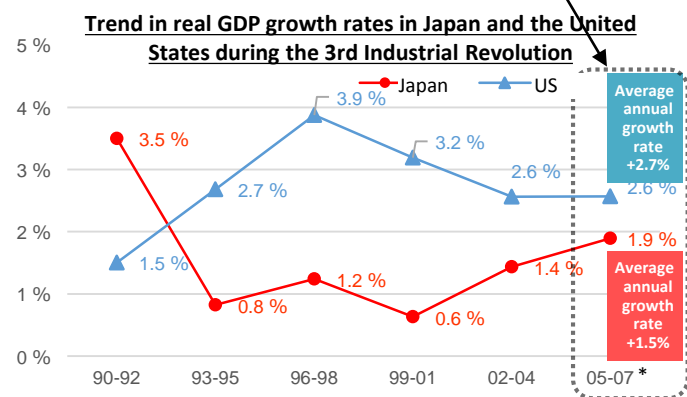
● **Estimates of the White Paper on Information and Communications in Japan**  
The Ministry of Internal Affairs and Communications independently estimates economic growth in the White Paper on the premise of the development of IoT and corporate reform, while referring to the estimates by the Cabinet 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

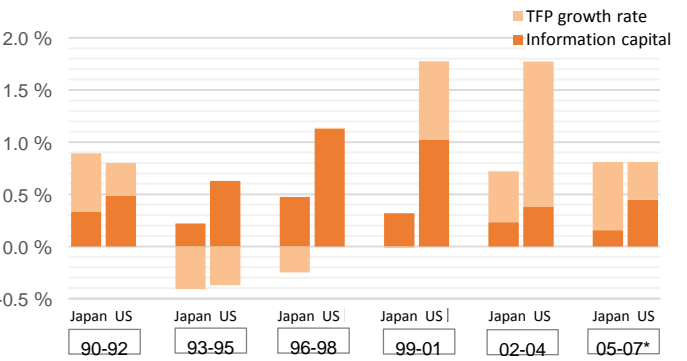
	Items	2016	2020	2025	2030
Economic growth scenario	Real GDP	100	109	122	139
	Real ICT investment	100	139	197	285
Baseline scenario	Real GDP	100	105	109	114
	Real ICT investment	100	114	129	146

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

The 3rd Industrial Revolution (ICT Revolution) has brought about economic growth with accumulated information capital in Japan, but the growth was more significant in the United States.



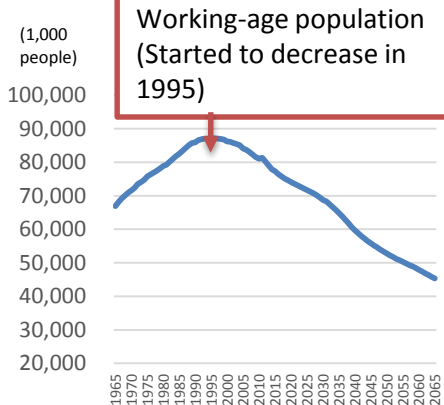
## Contribution of TFP and information capital to real growth rate in Japan and the United States



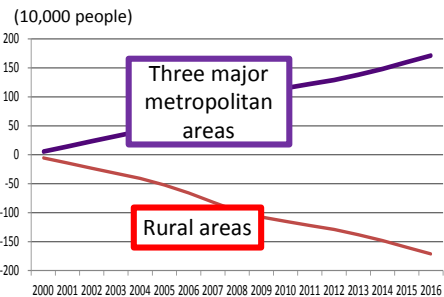
\* Total factor productivity (TFP): The part other than production factors (capital and labor) that contributes to increasing added value; Representing technological advancement, accumulation of intangible capital, enhancement of workers' skills, and improvement of management efficiency, etc.

- **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.

## Social problems

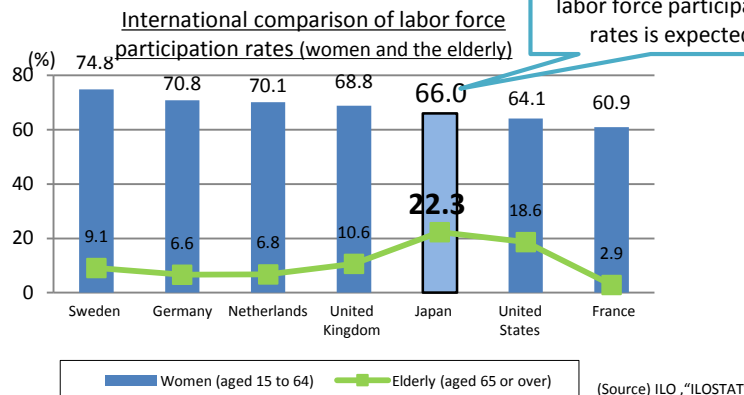


## Decrease in working-age population and population outflow from rural areas



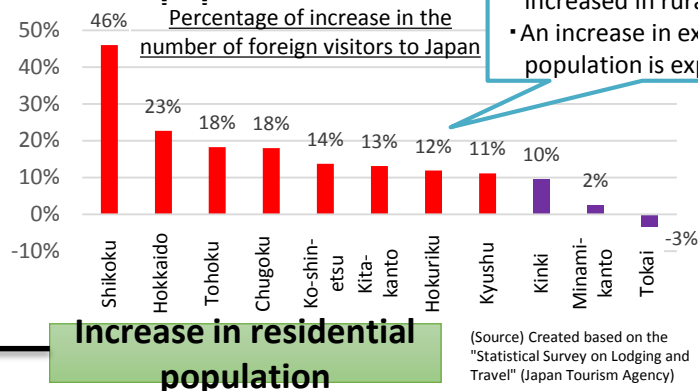
## Solutions

### Enhancement of labor force participation rate



### Enhancement of labor productivity

### Increase in exchange population



### Increase in residential population

## ICT Utilization

### Promotion through working style reform

- Teleworking
- ICT investment

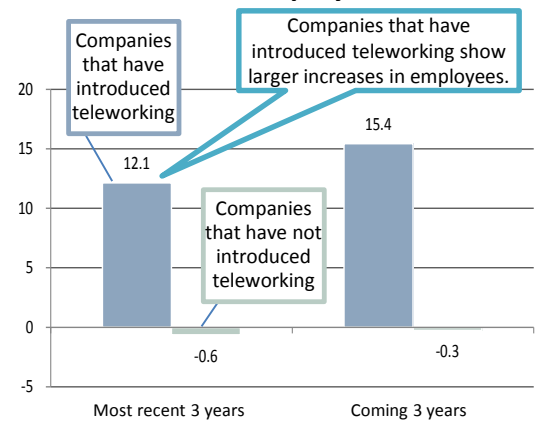
### Promotion through regional revitalization

- Promotion of tourism
- *Furusato* Telework

- 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.

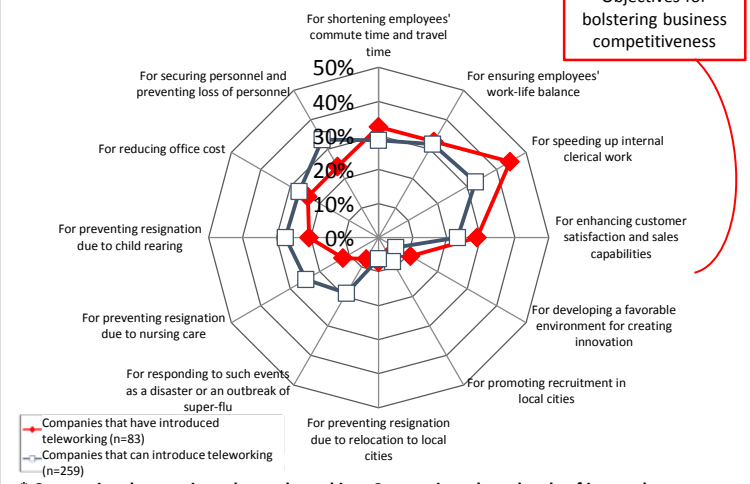
**Teleworking**

### Introduction of teleworking and DI for increase of employees



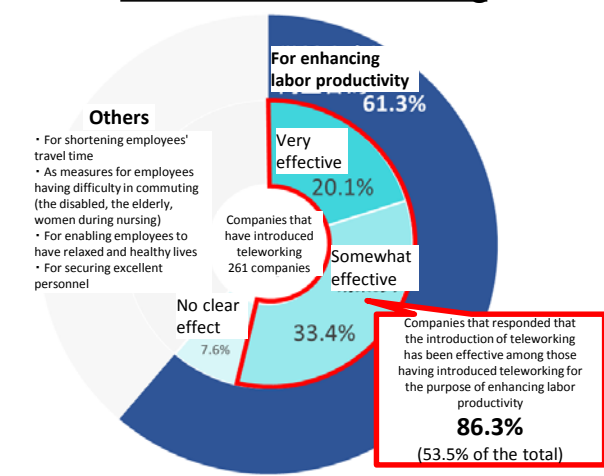
\* DI (Diffusion Index): The difference subtracting the percentage of companies responding that the number of employees has decreased from the percentage of companies responding that the number of employees has increased

### Objectives of introducing teleworking (companies with 300 or fewer employees)



\* Companies that can introduce teleworking: Companies whose levels of internal systems for working style reform and introduction of ICT systems exceed the average of companies that have introduced teleworking, but have not yet introduced teleworking

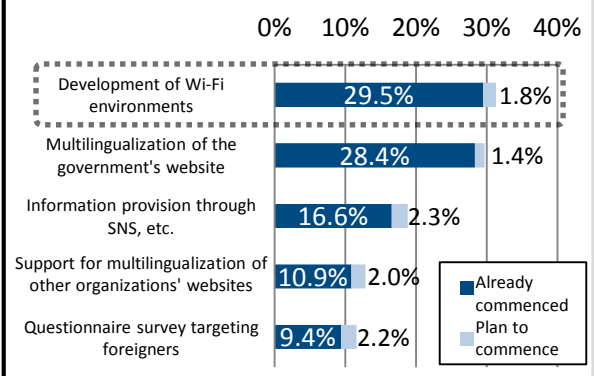
### Objectives and effect of companies' introduction of teleworking



\* Enhancement of labor productivity: Enhancement of efficiency of routine tasks and enhancement of added value of and creativity in duties

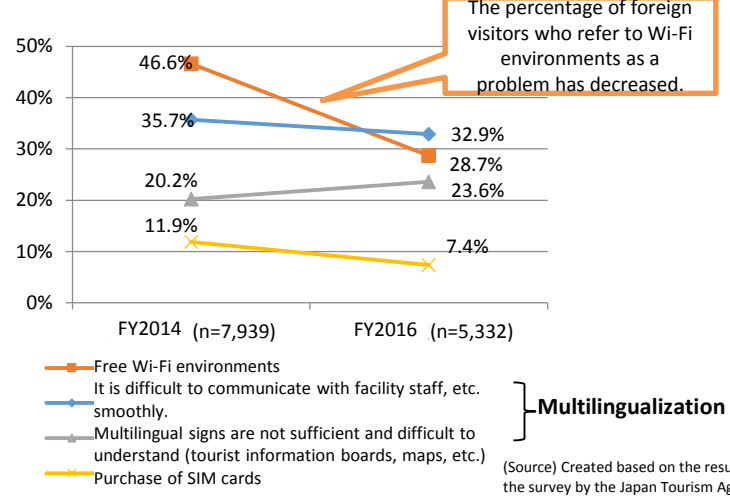
**Tourism promotion**

### Local governments' ICT-related measures for tourism promotion



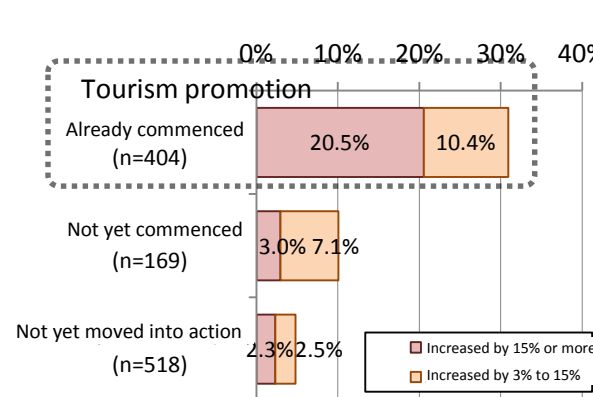
\* Questionnaire survey targeting local governments: All local governments are covered. Responses were received from 1,104 organizations (response rate: 61.7%).

### Inconvenience suffered by foreign visitors during their stay in Japan



(Source) Created based on the results of the survey by the Japan Tourism Agency

### Local governments having increased tourists



- 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, "00000JAPAN," 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 "00000JAPAN" 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.