Part 1

Chapter 3

New Products and Services in the IoT Era

Chapter 3 looks into ICT devices and services that will emerge in the IoT era from the standpoint of consumers as users and ordinary citizens.

Section 1 New Services in the IoT Era

Two significant global trends in services are *FinTech* — innovative financial services that rely on ICT — and the *sharing economy* — services where individuals lend or rent their idle assets to others over the Internet. While each of these services and devices have their own circumstances and factors, there are commonalities as well. One is the digital revolution, in which technological innovation has boosted computing power exponentially and dramatically lowered communications costs and information processing costs. Another commonality is the inherent nature of digital that makes it easy to divide up tasks or combine tasks through the use of APIs that ensure interoperability or interconnectivity. There are four discrete events behind these: (1) the evolution of ICT, such as the prevalence of smartphones, social media, and cloud services — specifically, the ability for anyone at anytime from anyplace to connect to the Internet; (2) the growth in ICT use in non-ICT industries; (3) the massive growth in data available for analytic tasks; and (4) advances in data analysis technologies.

1. FinTech

(1) Background to the current focus on FinTech

FinTech is a portmanteau coined from finance and technology. Investments in the FinTech field have shot up in recent years. The background to this, in addition to ongoing innovation and growth of ICT technologies, was the displacement in human resources in the United States after the 2008 global financial crisis. After this time, enterprises from other fields were seen entering payment services business and loan businesses. More importantly, particularly in the West, was the trend for existing financial institutions to partner or collaborate with Internet enterprises in order to harness innovation from the information and communications sector.

The trend toward partnerships and collaborations in this area has the potential to create new values, and it is probably 1 factor elevating hopes and investments in FinTech. In Japan, a bill to Partially Amend the Banking Act and Related Laws to Address ICT Progress and Other Banking Environment Changes was passed in May 2016 to address the landscape changes in the financial sector, particularly the deployment of ICT. One of the resulting amendments to the Banking Act is the possibility for banks to invest in business firms beyond the previous 5 percent cap, with the approval of the banking regulator, in cases where the use of ICT or other technologies will enhance the functionality of banking or improve user convenience. Amendments to the Payment Services Act include the creation of a registration system for operators of exchange businesses between virtual currencies and legal currencies and of regulations to protect users of such exchanges. And the Act on Prevention of Transfer of Criminal Proceeds was amended to oblige banks to confirm the identity of customers.

(2) Examples of FinTech

a. Payments and remittances

Businesses providing payment and remittance services can be divided into 3 camps: companies like PayPal that primarily provide payment services; companies like Apple and Google that provide payment services connected to mobile businesses; and companies like Coiney and Square that use ICT efficiencies to lower the service fees for credit card payments that have been a barrier to entry for SMEs and owner-operated businesses. New payment methods are being introduced in emerging countries, such as non-cash payment services provided by Alipay and the Vietnam Post.

b. Asset management

Asset management services are another example of FinTech. For example, Money Forward is an app for individuals to create household account books, and freee is a cloud-based accounting software package for SMEs. Both are distinctive because they use cloud services and greatly automate the work of creating account books and accounting by connecting their own services with other companies' services, with the consent of the user. And both services are kept inexpensive: Money Forward's premium membership is 500 yen a month, and freee costs 980 yen a month.

In particular, the use of freee by SMEs or owner-operator businesses can make accounting processing more efficient, leaving more time for core operations and creative work. Such services are expected to promote busi-

ness start-ups and help realize more diverse work arrangements.

c. Financing and procurement

In the area of financing and procurement services, Kabbage is a prime example. Through an API, Kabbage collects data on a loan applicant, such as their payment service usage history, their purchase histories on Internet shopping sites, and data from their social media accounts. These data are analyzed using AI to determine whether to accept or reject the loan application. The loan decision is done completely online, taking an average of six minutes. Services like this can potentially address loan demands that conventional financial institutions cannot cover. Kabbage is a typical FinTech service, symbolic of the IoT era, in that it collects and analyzes data to create new values.

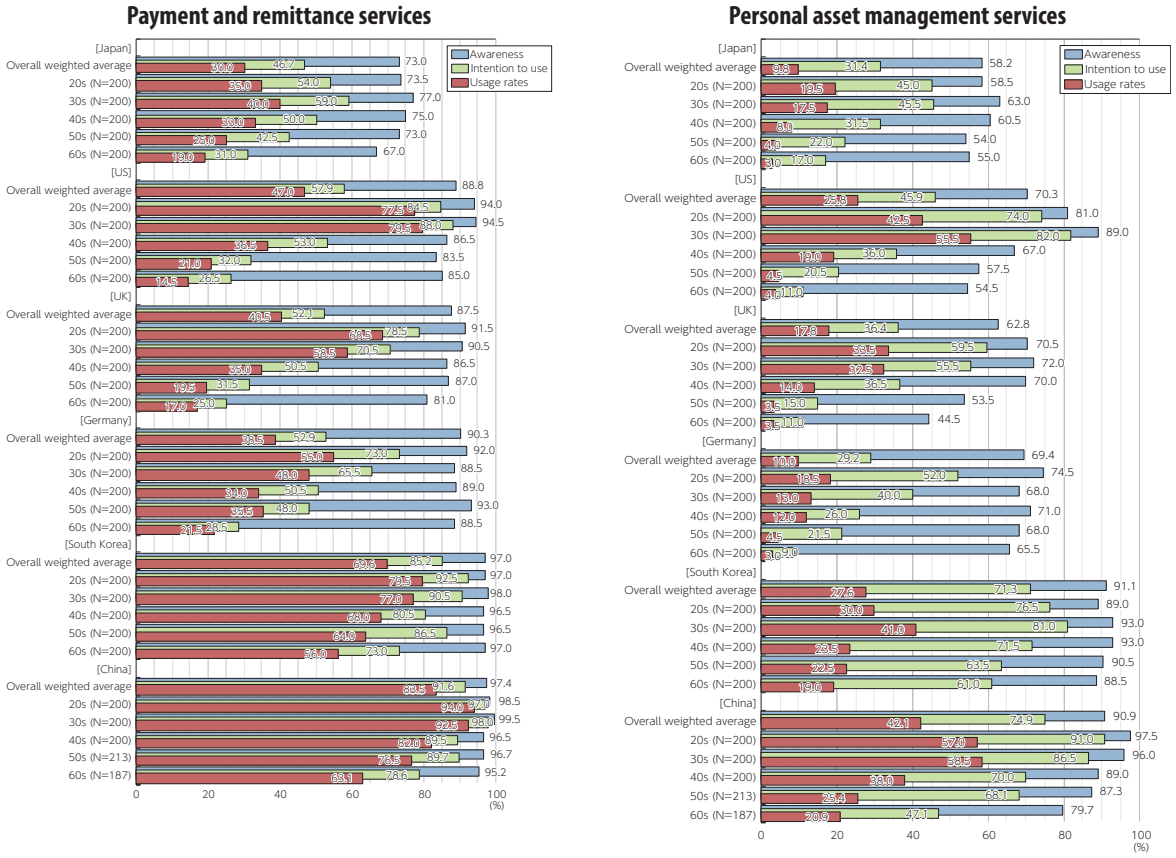
d. Use of blockchain and other distributed processing technologies

Distributed processing technologies, led by blockchain technology, are a hot trend from a technological perspective. A blockchain is a type of distributed database that directly connects devices over communications networks and processes and stores transaction records using encryption technologies. It is the base technology behind bitcoin and other virtual currencies. When combined with encryption technologies, blockchain can achieve distributed processing and management that is extremely difficult to tamper. Compared to conventional centralized processing models of financial infrastructure, distributed processing technologies cut management costs and ensure greater security.

(3) FinTech awareness, usage, and intention to use

For this report, we surveyed 1,000 monitors[4] each in Japan, the United States, the United Kingdom, Germany, South Korea, and China about their awareness of FinTech and their intention to use FinTech (Figure 3-1-1-1). Intention to use FinTech and current usage rates were highest, by country, in the United States and, by age bracket, in the younger age brackets.

Figure 3-1-1-1 Awareness, usage, and intention to use payment and remittance services and personal asset management services



(Source) "Study Report on an International Analysis of User Perceptions of New Forms of ICT in the IoT Era," MIC (2016)

[4] Caution must be exercised when interpreting these survey results, as it was an online survey given to monitors registered with a survey company. Internet growth is still ongoing in some countries and in some age brackets, resulting in few registered monitors in some cases. Because of this factor and others, the results may be biased by individual respondents' characteristics or answers. (This caution holds for all survey results in Chapter 3.)

2. Sharing economy

(1) Background to the current focus on the sharing economy

The sharing economy refers to online services where individuals let others use their idle assets. The benefit to lenders is earning money from idle assets, and the benefit to renters is being able to use assets without having to own them. From the macro perspective, the sharing economy is expected to address the varied demands of individuals and resolve social issues. On the flipside, there are issues with ensuring security and protecting users.

What allows the sharing economy to function are the lowered transaction costs between individuals due to the proliferation of the Internet and the easing of time and location restrictions on using sharing economy services because of the prevalence of smartphones. Besides these reasons, the ability to interconnect sharing economy platforms with social media has made it possible to better match needs between people and heighten the trustworthiness of the services.

One key policy trend in Japan on the sharing economy is vacation rentals. Various vacation rentals have appeared overseas and the market is growing quickly. Vacation rentals are needed in Japan too, both to address the needs of overseas visitors, whose numbers are skyrocketing, and the accommodation demand in large cities and to help stimulate regional economies. At the same time, drawing up rules governing such services must take into consideration adjustments with the Hotel Business Act and other laws and regulations, appropriate management to prevent terrorism and the spread of infectious diseases, and the prevention of trouble with neighboring residents.

The Council for Regulatory Reform issued its Third Report in June 2015. In response, the Cabinet decided the Implementation Plan for Regulatory Reform, which calls for studying vacation rentals from all viewpoints and reaching a conclusion in 2016. The Council for Regulatory Reform and its working groups began holding interviews with related ministries and agencies, experts in the field, business operators, and related industries in October 2015. In March 2016, they also held a public discussion on vacation rentals.

Furthermore, the Act on National Strategic Special Zones, enacted in 2013, made it possible to continue vacation rentals for payment — in other words, run them as a business — without the Hotel Business Act applying, in zones stipulated in zoning plans for designated businesses providing accommodations to overseas visitors in National Strategic Special Zones. The Council on National Strategic Special Zones established a zoning plan for Tokyo in October 2015 and for Kansai in April 2016. After the enactment of related ordinances, vacation rentals started operating based on the provisions of the Act on National Strategic Special Zones in 2016 in Tokyo's Otaku Ward and in Osaka Prefecture.

Following the cabinet decision of the plan mentioned above, the Ministry of Health, Labour and Welfare and the Japan Tourism Agency launched the Committee on "Minpaku service" (vacation rentals) in November 2015. The Study Group put together a report in June 2016. The report provides examples of rules established in other countries permitting individuals to operate vacation rentals after setting caps on the number of accommodation days per year and setting other conditions, such as limiting services to rooms inside dwellings. Rules are expected to be established, accounting for circumstances in Japan, with reference to these examples in other countries.

(2) Examples of the sharing economy

a. Vacation rentals and home sharing

The table below summarizes a few examples of the sharing economy related to vacation rentals and home sharing (Figure 3-1-2-1).

Figure 3-1-2-1 Examples of vacation rentals and home sharing

Service name	Provider and start date	Description
Stay Japan / Tomarina	Tomareru / Hyakusenrenma (Japan) 2014	Stay Japan is a service that matches people seeking accommodations with owners of condominiums or detached homes with empty rooms. Stay Japan has received special approval for vacation rentals properties in Tokyo's Otaku Ward and Osaka Prefecture, which, as National Strategic Special Zones, have established ordinances allowing vacation rentals. Tomarina is a service that matches travelers with various experiences, such as lodging at a farm.
Airbnb	Airbnb (U.S.) 2008	Airbnb is a community and marketplace where members can post, discover, and reserve unique rooms around the world on the Internet, mobile devices, and tablets. The company connects people with people and provides unique travel experiences in over 34,000 cities in 190 countries with accommodations at various price points. Airbnb was selected as an official supplier to the 2016 Rio de Janeiro Olympics and it planned to provide 20,000 accommodations during the Olympic Games.
Zizaike	Jian Yun Network Information Technology (Shanghai) Co., Ltd. (China) 2011	Zizaike is a service that introduces vacation rentals to Chinese travelers. According to the company, it has approximately 50,000 listings as of April 2016 in all countries.

(Source) "Study Report on an International Analysis of User Perceptions of New Forms of ICT in the IoT Era," MIC (2016)

b. Other examples of the sharing economy

The table below summarizes other examples of the sharing economy other than vacation rentals (Figure 3-1-2-2).

As stated at the outset of this paragraph, the sharing economy offers benefits to both lenders and renters, and from the macro perspective, the sharing economy is expected to address the varied demands of individuals and resolve social issues. On the flipside, there are issues with ensuring security and protecting users. For example, consider services like Uber and Lyft where ordinary drivers take riders to their destination in private automobiles. A major problem with these services is the presupposition that the private automobile driver alone is responsible for driving and that no entity bears responsibility for operation and management or for servicing cars.

(3) Awareness and intention to use sharing economy services

a. Vacation rentals

The table below summarizes the awareness and intention to use vacation rentals by country and by age bracket (Figure 3-1-2-3). Awareness levels by country ranged between 70 and 90 percent, with Japan scoring lowest, at 72.0 percent. This illustrates vacation rentals are widely known in all the countries. More variation was seen in the intention to use vacation rentals between the countries due to differing circumstances in each country.

b. Other sharing economy services

The table below compares awareness levels of services that provide transportation to a destination in the driver's personal car (Figure 3-1-2-4). Awareness levels by country ranged between 70 and 90 percent, except for Japan, where the awareness level for such services appears to be comparatively low, at 48.3 percent.

The intention to use such services was over half in China (86.4 percent), South Korea (71.5 percent), and the United States (53.5 percent). The intention to use was just 31.2 percent in Japan, the lowest of the six countries.

When asked about the disadvantages or reasons for not using sharing economy services, the response "concern about support in the case of an accident or other problems" was particularly common among Japanese respondents (Figure 3-1-2-5).

Comparisons in each country between respondents with and without an intention to use suggest the possibility that the disadvantages or reasons for not using sharing economy services change with the popularity of the service and with the user's level of awareness and understanding. With greater awareness and understanding, and after seeing specific successful examples, users' misgivings may gradually be alleviated and they may start to use the services. For example, in all countries, respondents without any intention to use services selected "none of the above" more often than respondents with an intention to use, indicating respondents without any intention to use services had only vague worries. Japanese respondents without any intention to use services selected "concern about support in the case of an accident or other problems" at a fairly high rate. In other countries — particularly in the United States, where the services are well used and well established, respondents

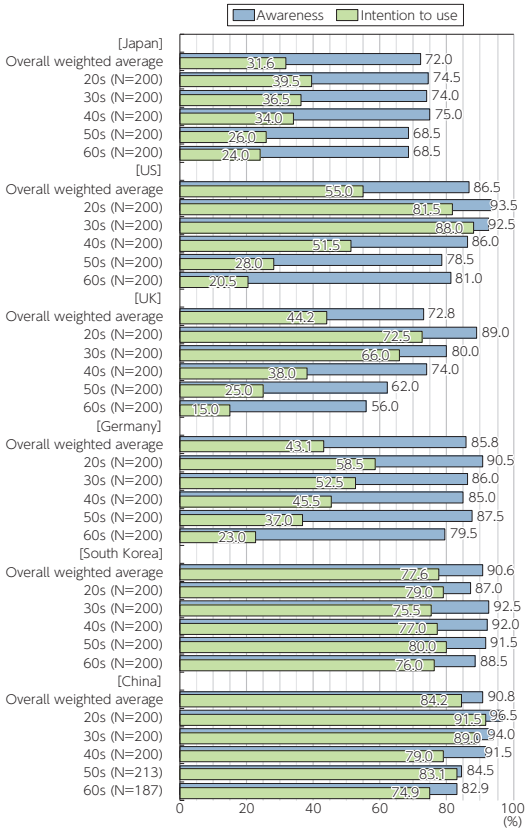
Figure 3-1-2-2 Examples of other sharing economy services

Name	Provider and start date	Description	
Uber	Uber (U.S.) 2009	Uber is a service that matches ordinary drivers with people who want to move from place to place. According to the company, the service is used in 382 cities around the world, as of April 2016, including matching riders with taxis. In Japan, Uber provides a service for dispatching taxis. The company is also launching new services, such as UberRUSH, which delivers packages, and UberEATS, which delivers meals.	
Lyft	Lyft (U.S.) 2012	Lyft is a service that matches ordinary drivers with people who want to move from place to place. According to the company, the service is used in more than 190 cities in the United States, as of March 2016. Lyft signed a partnership with GM in January 2016, with the aim of providing ride sharing with self-driving vehicles.	
Minaport	Archi M's (Japan) 2015	Minaport is a bike share service in the city of Kyoto. In addition to four rental and return locations, Minaport will deliver bicycles at a place and time prearranged with a smartphone app. It also has a service that delivers a bicycle to the user's current position. Minaport delivers bicycles in 10 to 30 minutes within its service area.	
Space Market	Space Market (Japan) 2014	Space Market is a platform service that lets users rent out spaces such as older private homes, movie theaters, baseball stadiums, temples, and municipal public facilities. Space Market supports such unique plans as a general meeting held in a movie theater or a kick-off meeting in a temple. According to the company, it had more than 6,000 spaces to rent out, as of April 2016.	

(Source) "Study Report on an International Analysis of User Perceptions of New Forms of ICT in the IoT Era," MIC (2016)

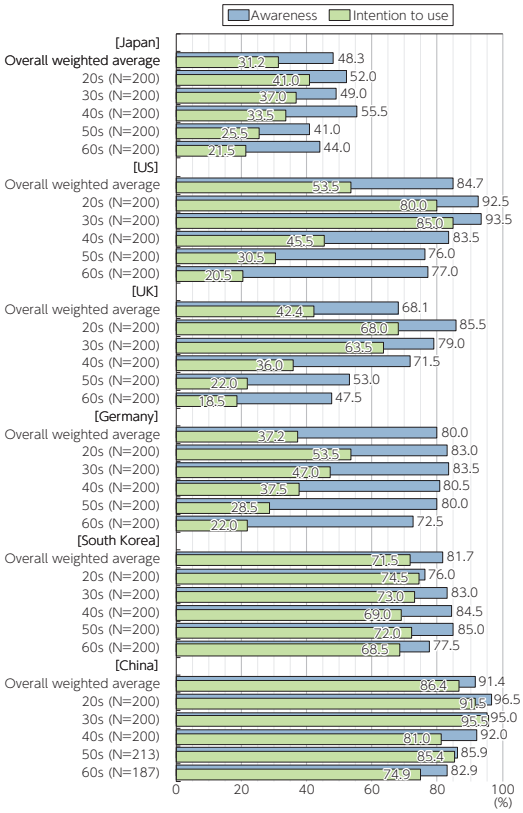
with an intention to use services generally selected "services cannot be ranked sufficiently by user comments alone" and "services are more trustworthy when provided by a company that can be held responsible" more often than respondents without any intention to use.

Figure 3-1-2-3 Awareness and intention to use vacation rentals



(Source) "Study Report on an International Analysis of User Perceptions of New Forms of ICT in the IoT Era," MIC (2016)

Figure 3-1-2-4 Awareness and intention to use services that provide transportation to a destination in the driver's personal car



(Source) "Study Report on an International Analysis of User Perceptions of New Forms of ICT in the IoT Era," MIC (2016)

Figure 3-1-2-5 Disadvantages or reasons for not using sharing economy services (vacation rentals)

(Unit: %)

		Services responsibly provided by companies are more trustworthy.	There would be limits to service evaluation through user reviews.	There are concerns about support in the case of an accident or other problems.	Service details and how to use the services seem to be difficult to understand.	Procedures such as registering personal information in advance are bothersome.	Others	n
Japan 2015	Do not have intention to use	23.2	9.2	61.1	20.2	30.7	–	1473
Japan 2016	Do not have intention to use	31.5	6.1	53.6	11.6	19.0	22.7	680
	Have intention to use	25.7	15.4	44.1	11.1	18.3	16.2	320
US 2016	Do not have intention to use	33.8	9.6	32.5	7.0	5.4	45.1	461
	Have intention to use	54.0	21.5	28.7	10.2	7.5	10.6	539
UK 2016	Do not have intention to use	31.2	12.3	33.6	5.7	8.2	40.3	567
	Have intention to use	38.7	31.1	28.6	8.4	5.1	10.7	433
Germany 2016	Do not have intention to use	21.0	5.8	31.7	4.7	9.0	40.7	567
	Have intention to use	21.3	19.2	30.0	7.2	7.0	26.2	433
South Korea 2016	Do not have intention to use	27.9	22.8	55.9	15.2	21.6	12.4	225
	Have intention to use	36.7	30.7	36.2	16.5	12.8	7.0	775
China 2016	Do not have intention to use	12.2	24.2	45.0	12.7	20.7	22.9	164
	Have intention to use	41.8	20.1	26.2	14.0	14.7	10.8	836

(Source) "Study Report on an International Analysis of User Perceptions of New Forms of ICT in the IoT Era," MIC (2016)

Section 2 Smartphone Penetration and ICT Use and Application

In Section 1, we provided examples of new ICT services along with their current usage and future projections. What makes these services feasible is the prevalence of smartphones and other ICT devices as well as social media and other ICT services, which act as the bedrock for newer services. In this section, we look at the usage of ICT devices and services, and the conditions of their use, primarily based on a user survey conducted in Japan, the United States, the United Kingdom, Germany, South Korea, and China.

1. Usage rates of major ICT devices and services

(1) Usage rates of major ICT devices (smartphones, tablets, etc.)

To find out the state of ICT device usage in the six countries, we asked, in a survey, about the devices people normally use for personal use. The overall smartphone usage rate (weighted average by age bracket) was just over 60 percent in Japan, whereas it was in the 80 percent range in the United States, the United Kingdom, and Germany and well over 90 percent in South Korea and China. The 40 percent usage rate for feature phones was unique to Japan. By age bracket, 87.0 percent of people in their 20s use smartphones, whereas 62.0 percent of people in their 60s use feature phones. This underscores that middle-aged people and older people have high feature-phone usage rates. Since most middle-aged and older users use mobile phones mainly for voice calls and email, there remain needs for feature phones (Figure 3-2-1-1).

2. Distinctive media use in the age of widespread smartphone adoption

(1) Spread of social media

In the previous paragraph, we noted the rising use of social media and gave examples in the previous section on FinTech of how information on social media is being utilized, such as analyzing social media information with AI to decide whether to approve a loan. As applications like this show, social media has already started to become a mainstay of our social lives.

Here we present survey results on the usage rates of individual social media platforms. Respondents were shown the names of leading social media platforms and asked whether they use the platforms. The results are tabulated in the table below (Figure 3-2-2-1).

U.S. social media platforms Facebook and Twitter, followed by Instagram and WhatsApp, had relatively high usage rates in all countries. Facebook had the highest usage rate of all platforms in the United States, the United Kingdom, Germany, Australia, and India. At the same

Figure 3-2-1-1 Devices normally used for personal use

(Unit: %)

	Smartphones	Feature phones	Tablets
[Japan]			
Overall weighted average	60.2	41.9	19.5
20s (N=200)	87.0	20.0	19.5
30s (N=200)	73.0	31.0	25.0
40s (N=200)	60.0	42.5	21.0
50s (N=200)	54.0	47.5	18.5
60s (N=200)	35.0	62.0	14.0
[US]			
Overall weighted average	78.6	18.4	57.2
20s (N=200)	92.5	8.5	67.0
30s (N=200)	94.5	11.5	76.5
40s (N=200)	83.0	17.0	57.0
50s (N=200)	61.5	23.0	45.5
60s (N=200)	58.5	35.0	37.0
[UK]			
Overall weighted average	82.3	13.9	55.6
20s (N=200)	95.5	4.5	61.5
30s (N=200)	92.5	7.5	66.0
40s (N=200)	85.0	12.0	52.5
50s (N=200)	71.0	21.5	46.0
60s (N=200)	64.5	26.0	51.5
[Germany]			
Overall weighted average	82.3	20.2	45.8
20s (N=200)	97.5	9.5	52.0
30s (N=200)	94.0	9.0	56.5
40s (N=200)	85.5	15.5	46.0
50s (N=200)	74.0	30.0	44.5
60s (N=200)	62.0	35.5	29.5
[South Korea]			
Overall weighted average	96.6	7.8	34.1
20s (N=200)	100.0	3.5	31.0
30s (N=200)	97.0	7.5	43.5
40s (N=200)	96.0	9.5	37.5
50s (N=200)	97.0	7.0	30.0
60s (N=200)	91.5	12.5	24.5
[China]			
Overall weighted average	98.3	5.0	47.3
20s (N=200)	98.5	3.0	49.5
30s (N=200)	100.0	2.5	57.5
40s (N=200)	98.0	6.0	46.0
50s (N=213)	97.7	5.6	44.1
60s (N=187)	96.8	9.6	34.8

(Source) "Study Report on an International Analysis of User Perceptions of New Forms of ICT in the IoT Era," MIC (2016)

time, certain countries had popular social media platforms of their own, such as Line, which has a large user base in Japan.

Figure 3-2-2-1 Usage rates of social media

(Unit: %)

	Facebook	Google+	Twitter	LinkedIn	YouTube	Instagram	Pinterest	LINE
[Japan]								
Overall weighted average	35.3	9.4	28.7	2.1	39.5	10.2	1.5	44.9
20s (N=200)	51.0	15.0	53.5	4.0	61.5	24.5	4.5	73.0
30s (N=200)	42.0	11.0	35.5	4.0	50.5	16.0	2.5	58.5
40s (N=200)	34.0	10.0	29.0	0.5	41.0	8.0	0.5	43.0
50s (N=200)	27.5	7.0	21.0	1.0	26.5	4.5	1.0	39.0
60s (N=200)	26.0	5.5	11.0	1.5	23.5	2.0	0.0	19.5
[US]								
Overall weighted average	77.7	29.1	39.1	26.3	53.7	34.3	24.4	8.7
20s (N=200)	91.0	43.5	62.5	28.5	80.5	68.5	36.5	18.0
30s (N=200)	85.5	51.0	60.5	30.0	73.0	59.5	29.0	20.5
40s (N=200)	77.5	23.0	31.5	26.5	52.5	23.0	23.5	3.5
50s (N=200)	70.0	16.5	22.0	27.5	34.5	9.5	16.5	0.0
60s (N=200)	61.5	8.0	14.5	17.5	22.0	5.5	14.5	0.0
[UK]								
Overall weighted average	69.8	19.8	33.6	17.0	48.5	19.4	13.8	2.4
20s (N=200)	84.0	33.0	50.5	24.0	74.5	45.5	22.0	6.5
30s (N=200)	81.0	28.5	41.0	24.0	65.5	26.0	20.5	4.0
40s (N=200)	75.5	17.0	34.5	14.0	46.0	14.5	11.0	1.0
50s (N=200)	56.5	11.5	23.0	12.5	32.5	5.5	8.5	0.0
60s (N=200)	48.0	7.0	15.5	9.5	19.0	2.5	6.0	0.0
[Germany]								
Overall weighted average	64.4	18.6	12.5	5.1	47.9	10.4	5.6	1.1
20s (N=200)	81.0	20.5	16.0	4.5	73.0	26.0	13.5	1.0
30s (N=200)	70.0	24.0	16.5	4.5	54.0	15.5	4.5	2.5
40s (N=200)	66.0	20.0	15.0	6.5	42.0	8.0	4.5	0.5
50s (N=200)	55.5	16.5	10.0	5.5	42.0	4.0	4.5	1.0
60s (N=200)	52.0	12.0	5.0	4.0	31.5	1.0	1.5	0.5
[South Korea]								
Overall weighted average	69.3	27.6	33.0	5.6	58.8	29.1	2.9	20.2
20s (N=200)	79.0	26.0	29.0	3.0	63.0	47.5	2.0	24.0
30s (N=200)	70.0	30.0	34.5	7.5	60.0	39.0	7.5	28.0
40s (N=200)	64.5	26.0	35.0	7.0	58.0	21.0	2.5	21.0
50s (N=200)	71.0	29.5	36.5	5.5	60.5	21.5	1.0	13.5
60s (N=200)	60.5	26.0	27.0	4.0	50.0	14.5	1.0	12.0
[China]								
Overall weighted average	16.1	14.7	9.4	6.9	12.2	4.1	2.6	4.0
20s (N=200)	24.5	17.5	14.0	9.5	17.5	8.5	2.5	5.0
30s (N=200)	23.0	22.0	13.5	10.5	18.0	7.5	5.5	7.0
40s (N=200)	13.5	14.5	9.0	6.0	10.0	1.5	1.5	3.0
50s (N=213)	9.4	9.9	5.2	4.2	5.6	0.5	2.3	2.3
60s (N=187)	4.8	5.3	1.1	2.1	7.0	0.5	1.1	2.1
[India]								
Overall weighted average	92.9	62.3	50.5	46.5	78.3	25.9	17.2	11.4
20s (N=200)	90.5	61.0	49.5	43.0	79.5	38.0	20.0	20.5
30s (N=200)	95.0	66.0	52.0	48.0	80.0	24.0	18.5	11.5
40s (N=200)	95.5	61.0	54.0	49.0	80.0	25.0	17.0	7.0
50s (N=232)	91.8	62.5	49.6	41.8	74.1	16.4	12.5	5.2
60s (N=168)	91.7	58.9	43.5	55.4	72.6	8.9	13.1	1.2
[Australia]								
Overall weighted average	75.3	25.0	20.4	18.9	50.6	22.4	16.2	3.3
20s (N=200)	83.5	30.5	32.5	21.0	71.0	44.5	17.5	7.5
30s (N=200)	83.0	28.0	25.0	24.0	63.0	31.0	22.0	5.0
40s (N=200)	76.0	29.0	20.0	20.5	49.0	15.0	15.0	1.0
50s (N=200)	70.0	20.0	12.0	13.5	37.0	11.0	16.5	2.0
60s (N=200)	59.0	14.0	8.0	14.0	24.0	4.0	8.0	0.0

(Source) "Study Report on an International Analysis of User Perceptions of New Forms of ICT in the IoT Era," MIC (2016)

Section 3 ICT Use and Application in the Public Sector

1. Medical and healthcare sector

The Japanese government, in the 2015 revision of the Japan Revitalization Strategy, advanced a policy to encourage the application of ICT to the medical field in the interest of bettering the convenience of citizens. As part of this policy, the government is aiming to advance initiatives to coordinate regional medical care that will improve patient convenience by sharing information on the medical and healthcare frontlines. The government also aims to develop health management services that rely on the analysis of medical information. To deal simultaneously with the issues of utilizing medical information and protecting patient privacy, the government is examining mechanisms by which patients manage their own personal information and provide it only when necessary to doctors or healthcare providers. The next 2 paragraphs introduce 2 leading examples of ICT applications in this sector.

(1) MySOS, Join, and Team

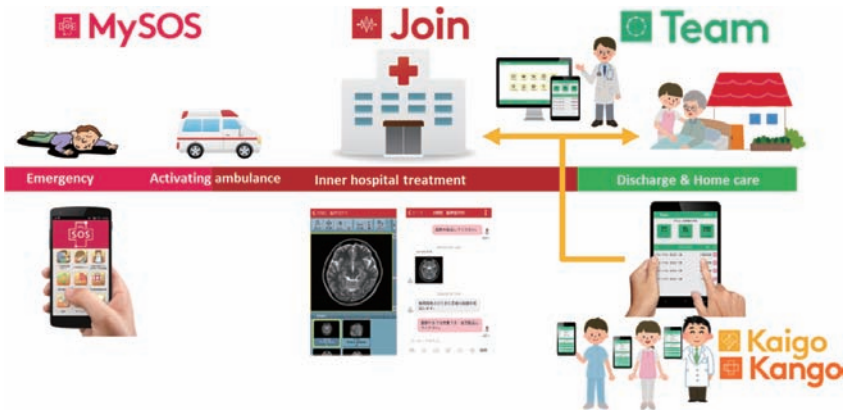
a. Overview of MySOS, Join, and Team

MySOS, Join, and Team are 3 mobile apps. MySOS is for personal health management, Join for the medical field, and Team for homecare. The aim is to connect the 3 services and construct an information-sharing platform for medical practitioners (doctors, dentists, registered nurses, etc.), patients, and care providers (Figure 3-3-1-1). Professor Hiroyuki Takao of the Jikei University School of Medicine has pointed out the necessity of treating patients through coordination between medical institutions and nursing homes, particularly in regional areas with doctor shortages. The University's affiliated hospital deployed more than 3,500 smartphones in 2015 in a trial using these apps to address the coordination problem.

b. Characteristics and advantages of using smartphones and the cloud

Sharing information with smartphones as the media has made it possible to reference medical information containing large amounts of images and videos that were difficult to handle with PHS handsets, which were used in the past. In particular, smartphone use makes it possible to access treatment advice at night or on holi-

Figure 3-3-1-1 Image of coordination between MySOS, Join, and Team



(Source) Materials provided from the Jikei University School of Medicine

Figure 3-3-1-2 Image of coordination between MySOS, Join, and Team

	MySOS	Join	Team
Users / Summary	App that patients and ordinary people install and use on their smartphones	App that allows medical practitioners (doctors, dentists, registered nurses, etc.) communicate with each other	Consists of the Kaigo / Kango apps, which make operations more efficient for home care and home healthcare providers, and a cloud system that backs regional comprehensive care systems, by means of coordinating information between multiple occupations
Information handled	Health and chronic disease information, medication history, family doctor, medical examination results, blood collection data, etc.	Text messages, CT scans, MRI images, hospital room and operating room video, etc.	Medical treatment information, daily caregiving records, medication history, etc.
Typical applications	• Sends rescue requests to nearby app users and to family members set as emergency contacts • When an emergency occurs to the app user, the app displays an assessment of the situation to third parties as well as emergency treatment methods and the user's family doctor	• Able to see video of operating rooms or hospital rooms from remote locations at any time • When the doctor on duty or a doctor at a general hospital in a local region examines a patient outside of their specialty, the doctor can request advice from a specialist in another location	• Home care and home healthcare providers can use a mobile device to enter and upload records from the patient's home • Share daily caregiving records, medication history, and other information with multiple occupations, including doctors and pharmacists
Charges	Free	900 yen per month per ID	No fixed retail price

(Source) "Study Report on an International Analysis of User Perceptions of New Forms of ICT in the IoT Era," MIC (2016)

days from specialists who are out on calls or at home. It also makes it possible to arrange conditions so that doctors on duty or inexperienced doctors can easily consult with specialists, even when no specialists are present at the hospital, about complex diagnoses. In fact, around 4,000 messages were exchanged in the first six months of introducing the system at the Jikei University School of Medicine.

Applications of systems like these to emergency medicine are expected to reduce cases of emergency patients passing away while being sent from hospital to hospital. Mechanisms are being examined where paramedics are given MySOS apps to coordinate with doctors using Join. The Jikei University School of Medicine and University of Tokushima are cooperating to run demonstration trials of these mechanisms. When paramedics share detailed information about the patient's condition right away with doctors, the hospital can make preparations for surgery with a good idea of what treatment is necessary before the patient arrives and reduce the time the patient waits for surgery. Furthermore, by taking advantage of the system's ability to reference medical information from remote locations, local clinics can coordinate with university hospitals that have specialists and even small hospitals can provide advanced treatments (Figure 3-3-1-3).

c. Quantitative benefits of MySOS, Join, and Team

When general hospitals, central hospitals, and university hospitals can all share information, it will be possible to reduce the number of duplicate CT scans, MRIs, and blood tests caused by hospital transfers, which, in turn, will speed up medical examinations and reduce medical costs. The Jikei University School of Medicine's affiliated hospital, since deploying Join, has reduced the total medical expenses per stroke patient by 60,000 yen a year.

(2) Distributed management of personal data

a. Overview of distributed management of personal data (personal life repositories)

Sharing patient information between medical institutions and care providers is necessary to implement community medicine collaborations that assist patients (care receivers) by having medical institutions and care providers work in tandem. Professor Koichi Hashida of the University of Tokyo points out 3 problems with sharing patient information: (1) the high costs associated with obtaining patient consent when exchanging the patient's personal data; (2) since personal information collected from many providers is centrally managed, the damages from security breaches would be enormous, as would the costs for security measures; and (3) it is problematic for competing providers to exchange data with each other. Professor Hashida advocates for personal life repositories (PLRs), in which care receivers manage their own personal data from their smartphone or other device, to solve these problems. PLR is a scheme that distributes the management of information to individuals. Care receivers' personal data is encrypted and stored on devices and the cloud. Personal data can then be shared when necessary to specific parties under the care and control of the care receiver (Figure 3-3-1-4). For example, the care receiver records with a PLR app his or her daily activities and medication status and can share that information with doctors when being examined at a medical institution for appropriate and safe diagnoses and treatments (Figure 3-3-1-5).

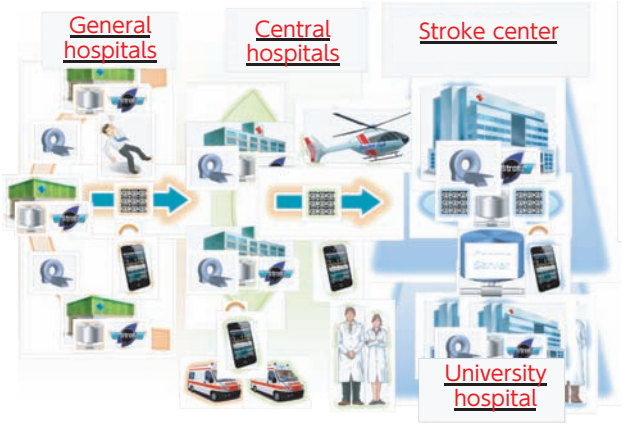
Distributed management schemes like PLR are attracting attention because they meet various requirements on data application scalability, security, and costs.

b. Characteristics and advantages of using smartphones and the cloud

The first characteristic of managing information with smartphone apps is keeping operational costs low, because existing cloud services can be used for free to store data. The second characteristic is the potential to lower the risk of information leaks.

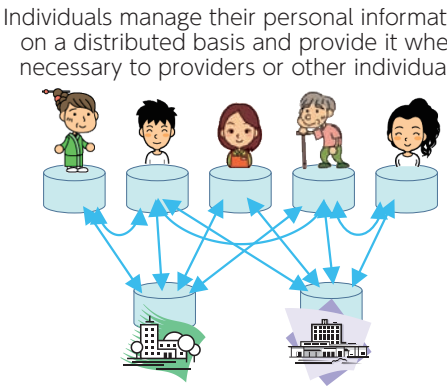
Another advantage Professor Hashida cites is the ability to cut providers' management costs, since direct exchanges of personal information between providers will no longer be necessary if there is broad acceptance of schemes where patients perform the sharing of personal

Figure 3-3-1-3 Image of information coordination between hospitals (example of a stroke)



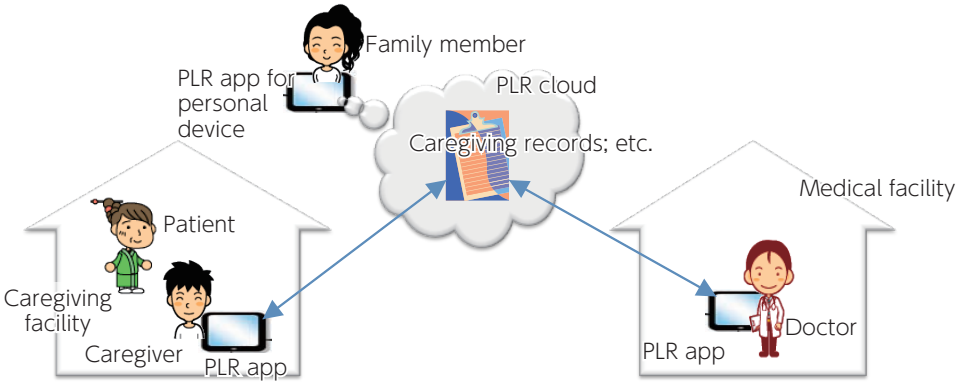
(Source) Materials provided from the Jikei University School of Medicine

Figure 3-3-1-4 Image of distributed management of patient information



(Source) Materials provided by Professor Hashida, University of Tokyo

Figure 3-3-1-5 Image of using a PLR app to coordinate between medical institutions and caregiving facilities



(Source) Materials provided by Professor Hashida, University of Tokyo

information themselves. Another advantage is satisfying various laws and regulations, including Japan's Personal Information Protection Act and the EU's Data Protection Regulations, because the individuals have control over who they share their information with in these schemes.

2. Education sector

(1) Study Suppli

a. Overview of the Study Suppli service

Recruit Marketing Partners Co., Ltd. offers Study Suppli, a service for taking online courses for 980 yen per month, mainly to high school students. The company began in October 2011 with the release of Juken Suppli, an online study service for high school students. In February 2016, the company unified all its study services under the Study Suppli brand name to indicate it offers comprehensive learning support for elementary, junior-high, and high school students. There were around 250,000 Study Suppli members to date, as of March 2016.

b. Characteristics of using smartphones

The first characteristic of Study Suppli, particularly because it is a service that targets smartphone use, is that users can take classes given by top-notch instructors anytime, anywhere, and as many times as they like, for the price of 980 yen per month. For example, the Study Suppli high-school and university entrance exam program (previous called Juken Suppli) offers more than 3,000 lessons in 5 courses and 13 subjects, broken down into 3 levels of difficulty.

High schools also use Study Suppli, and there are examples of high schools using Study Suppli to provide individualized support for students in classes with students at various learning levels. On a macro level, Study Suppli is thought to help close divides in education environments arising from differences in income and regions.

The second characteristic is making use of functions only possible with a video lesson format to continually incorporate user feedback and improve the service. For example, each video is mapped on a grid with the playback time on the horizontal axis and the percentage of viewers that continued to watch on the vertical axis. This allows administrators to analyze the factors in lessons that many people stopped watching partway through. Another function lets users give comments on each lesson chapter. This function is used to retake the lesson, if deemed necessary, and improve the lesson through feedback to the instructor.

c. Data applications create values

For the Study Suppli high-school and university entrance exam program, each chapter in the 3,000 hours of lesson videos has been mapped to each question on practice problems and achievement tests. With this mapping, when a student makes a mistake on a certain question on an achievement test, the service automatically displays practice problems and the video lesson corresponding to the question's unit, making it easier for the student to overcome his or her stumbling block. And to see whether the student can still do the question where the mistake was made several days later, the instructor can check on a digital dashboard where the student is having problems overall. Recruit also offers Study Suppli for Teachers, a learning management system, without any additional charges to the instructor when Study Suppli is used in a high-school as a whole. With this learning management system, the instructor can monitor how each student is progressing with his or her particular difficulties.

d. Expanding Study Suppli overseas

Recruit Marketing Partners made Quipper into a subsidiary in 2015 and started expanding its business overseas. Quipper was established in 2010 and began providing Quipper School in 2014. Quipper School is a tool for elementary, junior-high, and high school teachers to put all processes related to homework and in-class problems online. As of December 2015, Quipper School was used by 200,000 teachers and 3 million students in 9 countries. Quipper School content is localized for each country.

Before introducing the tool, teachers created problem sets, printed forms, distributed forms to students, collected forms, marked each individual form, and managed grades all on paper. By putting these processes online, teachers were able to distribute and collect homework and problem sets in an instant. Teachers were also able to encourage students to submit their work online, incorporate student answers in classes, and even involve parents. Many emerging countries face teacher shortages as the numbers of students soar with population growth. Recruit Marketing Partners is analyzing how Quipper School's use is expanding organically between teachers via Facebook and other social media, as a tool that solves issues and generates new value.

One precondition that has allowed Quipper School to flourish in emerging countries is the rapid proliferation of smartphones in emerging countries. Economic growth is relatively higher in emerging countries than in developed countries, and to the degree that existing services are scarce, the potential is high for inexpensive and innovative services to grow quickly. Quipper School may be an illustrative precedent, as we watch how EdTech's growth impacts society.

3. Crime prevention sector

(1) ICT applications and volunteer coordination in the security field

a. Service overview and background

Sohgo Security Services Co., Ltd. (ALSOK) has been testing and verifying a service called ALSOK Zone Security Management® that equips security personnel with wearable cameras, smartphones, and other devices, as well as the Volunteer Coordinated Security platform, in which security personnel with wearable cameras provide security in coordination with volunteer staff. The impetus for these services is the declining population and labor shortages, anti-terrorism measures, and the hosting of the 2020 Tokyo Olympic and Paralympic Games. According to the Tokyo Organizing Committee of the Olympic and Paralympic Games , some 14,000 security personnel will be needed to provide security for multiple venues spread out over a vast area. The problem is the security industry lacks sufficient manpower. It is hoped services like those ALSOK is testing will be able to construct platforms for providing a high level of security with fewer security personnel.

b. Examples and characteristics of ICT usage

Video from wearable cameras, together with video and signals from surveillance cameras, security robots, security drones, and other sources, is collected at a control center. Information is analyzed at the control center and the analysis results are used to give directions to security personnel and control security devices.

The application of deep learning technology, a type of artificial intelligence, to video analysis is expected to power programs that detect situations where a suspicious article has been left unattended or where a person is crouching due to a sudden illness and then send in nearby security personnel. Such applications will detect behavioral patterns of suspicious people or people with the intent to commit a criminal act and prevent crime (such as shoplifting or thefts of bags or suitcases). This is akin to reproducing the "sixth sense" of veteran security personnel with a program. Further advances in deep learning technology will lead to the provision of more advanced services with higher levels of image recognition accuracy.

c. Future development — Potential for creating values through connections with data applications

ALSOK is also looking at initiatives to apply platforms similar to security platforms to emergency medical care. For example, doctors stationed at an information control center would check the external wounds and complexion of people struck by illness or injured in accidents, working from video from security personnel's wearable cameras and images reported by volunteer staff, and provide treatment instructions. It is well known that every minute's delay in treatment following a cardiac arrest reduces a person's chance of survival by 7 to 10 percent. Therefore, prompt treatment will probably help increase survival rates.

4. Disaster and accident mitigation sector

(1) 2016 Kumamoto earthquakes

A 6.5 magnitude earthquake centered on Kumamoto Prefecture struck on April 14, 2016, which registered 7 on the Japanese seismic-intensity scale in Mashiki, Kumamoto. Two days later, Kumamoto Prefecture was struck again by a 7.3 magnitude earthquake, which registered 7 on the Japanese seismic-intensity scale in Mashiki and other surrounding towns.

In the following paragraphs, we provide a summary of the impact on disaster and accident mitigation the advancement of ICT and the ability to collect and accumulate data has had. We will also compare how ICT was used during this disaster with the Great East Japan Earthquake 5 years earlier.

a. Comparison of ICT usage between the Kumamoto earthquakes and the Great East Japan Earthquake

Below we will give some examples of safety confirmation services, information aggregation on the Internet, and applications of new technologies from the Kumamoto earthquakes. In the wake of the Great East Japan Earthquake, mobile phone carriers worked to enhance coordination between disaster message boards and improve their functionality. An example of more expansive coordination between enterprises and organizations is the J-anpi safety information search site, which lets peo-

ple search safety information pulled together from multiple enterprises and organizations (Figure 3-3-4-1). J-anpi was launched in September 2012, led by NTT, NHK, and NTT Resonant. Following the initial launch, cooperation agreements were signed with local municipalities, and in March 2014, J-anpi was linked to Google's Person Finder service.

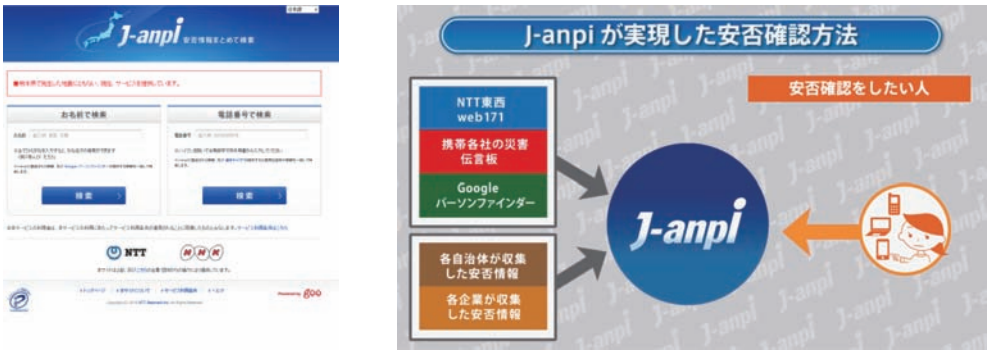
Aside from safety information, there were examples of aggregating disaster-related information on the Internet. Students and young volunteers worked separately over social media to collect and map information on evacuation sites, emergency food distribution points, and relief supply collection points. They also gathered information on where individual cars were traveling and mapped which roads were passable. Still others collected and analyzed information on social media (Figure 3-3-4-2). Similar examples were seen during the Great East Japan Earthquake, but an evolution in their usage, such as the deployment speeds, was noticeable during the Kumamoto earthquakes.

Social media's role as a means for confirming safety and collecting information was highlighted during the Great East Japan Earthquake. The downside is the problem of how to deal with information on social media that is not always correct.

DISAANA is a system that analyzes tweets that the National Institute of Information and Communications Technology (NICT) began to develop with the opportunity presented by the Great East Japan Earthquake (Figure 3-3-4-3). Users can specify an area and search for problems or incidents in that area. It has a function that matches with needed supplies and displays results of tweets that contradict the matches. To deal with false rumors, DISAANA can add a caution tag to tweets flagged as very likely to be inconsistent with the truth. A service that performed analyses using tweet data from the Great East Japan Earthquake launched in November 2014, and a service that analyzed real-time tweets launched in April 2015. Although the services are still at the testing stage, the future development of such services, through the accumulation of more data and advances in data analysis technology for more precise analyses, along with the increasing use of social media, is expected to resolve some of the issues.

Other examples of new technologies and services, which are quickly becoming feasible, being put to use in the disaster and accident mitigation sector include the Geospatial Information Authority of Japan using drones to observe areas struck by disasters (Figure 3-3-4-4) and private organizations using crowdfunding for relief efforts.

Figure 3-3-4-1 J-anpi



(Source) Materials provided by NTT Resonant

Figure 3-3-4-2 Resource maps (left: evacuation sites, right: emergency food distribution points and relief supply collection points)

(Source) Materials provided by Youth Action for Kumamoto

Figure 3-3-4-3 Example of DISAANA screenshots

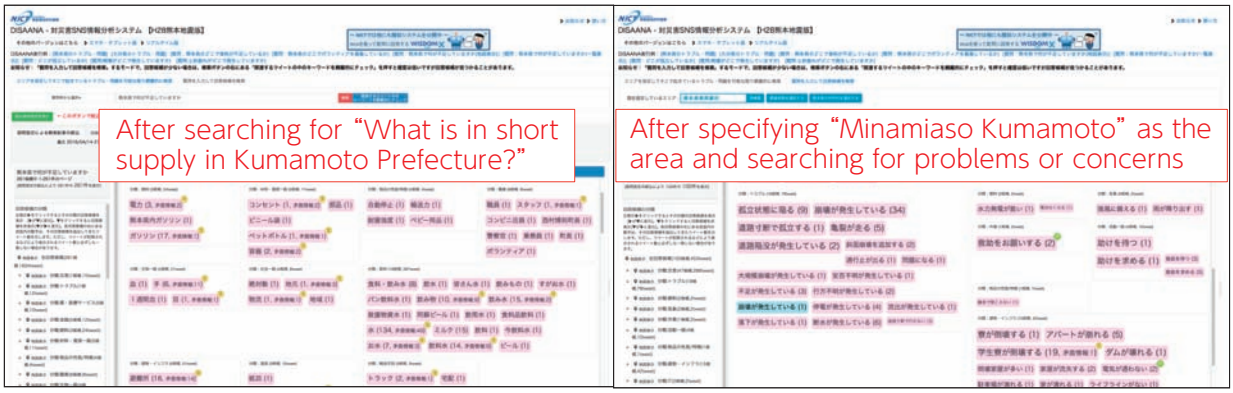


Figure 3-3-4-4 Disaster zone observations by drones

(Source) Geospatial Information Authority of Japan

Section 4 Japanese Culture and ICT in the Eyes of Foreign Nationals

In the past, Japan tended to have fewer interactions with people from other countries compared with continental countries. But in the last few years, with the relaxation of tourist visa requirements and a weaker yen, the numbers of overseas visitors to Japan have soared. In this section, we investigate what roles ICT can play in the future to help stimulate the Japanese economy through inbound tourism demand and promote mutual understanding between non-Japanese people and Japanese people.

1. Japan’s ICT and culture as seen by non-Japanese

(1) Overseas visitor trends by country and region

The number of overseas visitors to Japan has been climbing year by year, setting a new all-time high record in 2015 of 19.74 million visitors. Recognizing that the initial target of 20 million overseas visitors per year had been met, the government’s Council for the Development of a Tourism Vision to Support the Future of Japan announced new targets in March 2016 of 40 million visitors in 2020, twice that of 2015, and 8 trillion yen in consumption, more than double that of 2015.

In statistics on overseas visitors by country and region, China leads the way with 4.99 million visitors, followed by South Korea with 4.00 million, Taiwan with 3.68 million, Hong Kong with 1.52 million, and the United States with 1.03 million. In 2015, 84.3 percent of overseas visitors came from Asian countries, while just 12.9 percent came from Western countries. The Tourism Vision to Support the Future of Japan , mentioned above, and the 2016 White Paper on Tourism both pointed out the necessity of promoting Japan more as a travel destination in North America, Europe, and Australia.

(2) Japanese culture and content of interest

Questionnaire results provide a number of suggestions for improving tourism promotions. The percentage of people who have travelled to Japan is currently lower in North America, Europe, and Australia than in South Korea and China. More generally, a high percentage of people in these regions have never seen Japanese culture or content before, indicating interest in Japan is not high. Surveys, however, have shown that, in comparison to other forms of media, domestic broadcasting in these countries ranks relatively high in terms of influence. Therefore, broadcasting is a valuable tool to create opportunities for people to learn about, and want to learn more about, Japan and to deliver information to large audiences. Furthermore, an effective policy is using broadcasting in conjunction with online media, as is now occurring in Asian countries.

Among Asian countries, numerous visitors are from

nearby South Korea and China, as described above. Surveys have also shown that people in these countries are quite interested in Japan and that broadcasting ranks highly as a media for watching and gathering information. At the same time, online media is well ranked in this area too. Because of the relatively large number of visitors to Japan, and because of the strong interest in Japan, Japan is frequently covered in broadcasts and online. People who have travelled to Japan post related information on social media, which is shared widely. These are thought to be factors in fueling interest and travel to Japan in Asian countries.

Providing information through the Internet media non-Japanese regularly use and employing designs that resonate with people in each country are 2 ways of improving convenience and friendliness when providing information over the Internet to potential visitors. Furthermore, some private enterprises are accumulating histories of visitor behavior and using these data to develop goods and improve services. Looking ahead, collecting and storing data on the consumption and actions of visitors while in Japan, and analyzing these data, will enable more sophisticated information provision and help businesses develop goods and services, which in turn is expected to improve the satisfaction of overseas visitors and encourage more repeat visitors.