

Outline of the 2018 White Paper on Information and Communications in Japan

(Unofficial Translation)

—Sustainable Growth Through ICT in an Era
of Population Decline—

July 2018

Ministry of Internal Affairs and Communications, Japan

Special Theme: Sustainable Growth Through ICT in an Era of Population Decline

- Information and communication technology (ICT) can create new values by *connecting* between all kinds of entities, such as people, things, organizations, and communities. By stimulating demand, improving productivity, and promoting people's social and labor force participation through utilization of ICT, sustainable growth can be achieved in an era of population decline.

Chapter 1 ICT in Japan and the World

- Current state of the world's ICT market where dissemination of artificial intelligence (AI) and the internet of things (IoT) is making progress
- Comparison of the state of ICT investment, contribution of ICT capital stock to GDP growth, and innovation acceptance in Japan and the United States

Chapter 2 Formation of New Economies Through ICT (Markets): Market Creation Through the Spread of X-Tech

- Creation of new products and services
This section takes up formation of new markets through progress of X-Tech, which creates new values and systems through ICT transcending industrial barriers, and changes in the modes of business to business (B to B), business to consumer (B to C), and consumer to consumer (C to C) transactions through use of ICT platforms.
- Capturing of global demand
This section deals with the current state of overseas expansion of the ICT industry and utilization of ICT for capturing the demand of inbound visitors, both of which supplement the shrinking domestic demand resulting from the population decline.

Chapter 3 Productivity Improvement and Organizational Reform Through ICT (Organizations): Productivity Improvement Through *Aggressive ICT Investment*

- Productivity improvement
ICT contributes to labor productivity in both aspects of increasing the efficiency of the labor input and increasing the value added. This section takes up measures to resolve challenges and improve productivity through ICT and ICT that connects organizations such as cloud computing.
- Organizational reform
This section discusses organizational reform that brings out the potential of ICT, focusing on chief information officers (CIO) and chief digital officers (CDO) who lead ICT utilization in organizations.

Chapter 4 Promotion of Inclusion Through ICT (People): Realization of *Multiple-Group Membership* Using ICT for Enabling Diverse Lifestyles

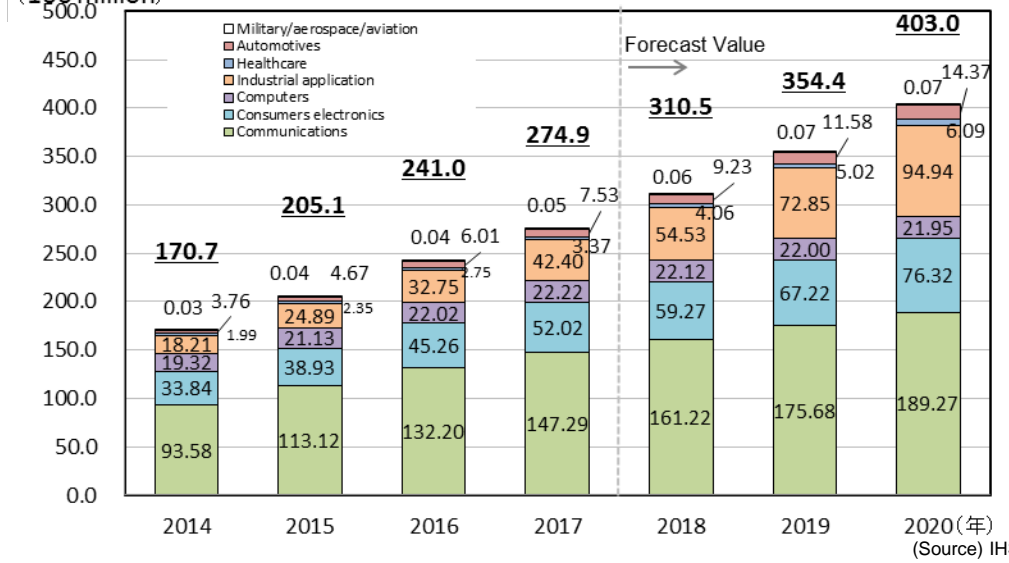
- Social participation
This section takes up topics including the state of dissemination of ICT, such as social media, and the current state of communications, the state of participation in communities through social media, and *networking ability* (the ability to connect with others).
- Labor force participation
This section discusses the state of use of telework and crowdsourcing as means of labor force participation for diverse people, and the possibility that dissemination of AI would cause changes in work and redirect education to deal with such changes.

Chapter 5 Basic Data on the ICT Field (Latest Data on ICT in Japan)

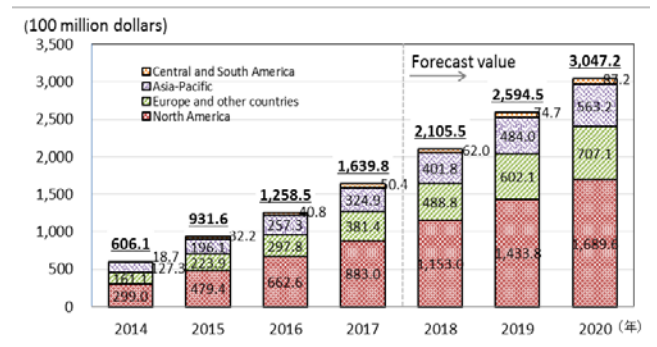
Chapter 6 ICT Policy Trend (Latest Trend of ICT Policies of the Ministry of Internal Affairs and Communications [MIC])

- The number of IoT devices is about 27 billion in the world in 2017. It is expected to reach 40 billion in 2020.
- The market size of cloud services, which support AI・IoT services, is predicted to continue expanding to reach about 1.9 times the 2017 level by 2020.
- On the other hand, there are markets such as the smartphone market which have shifted to stable growth as a result of achieving widespread dissemination.

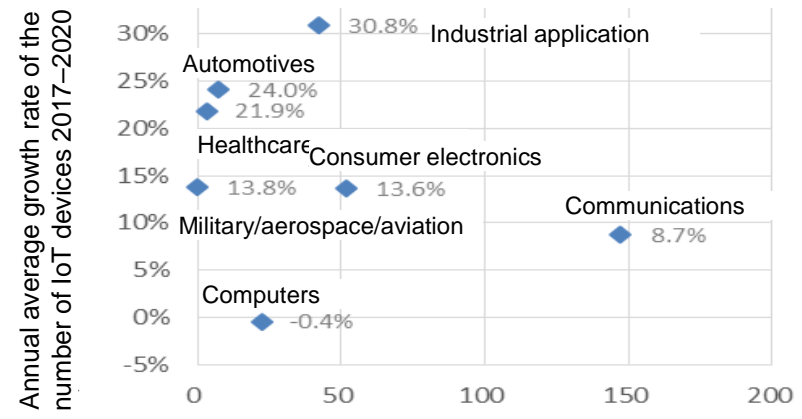
Transition and forecast of the number of IoT devices in the world



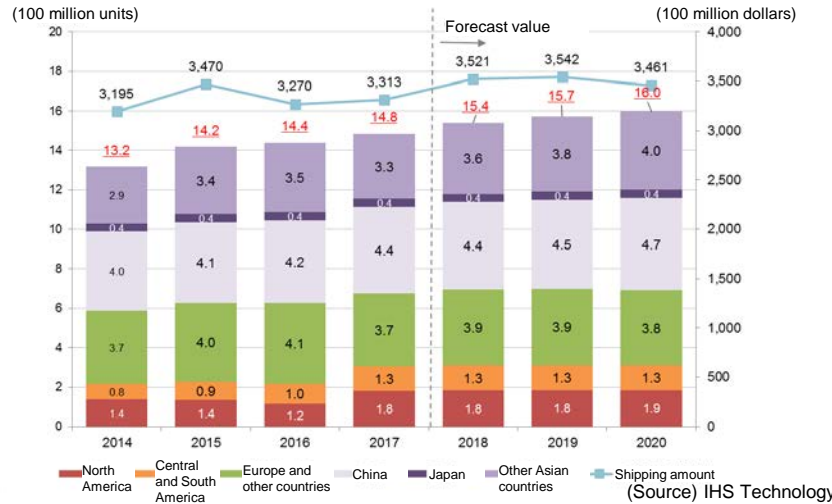
Transition and forecast of cloud service market sizes in the world



Number and growth rate forecast by field/industry of IoT devices in the world

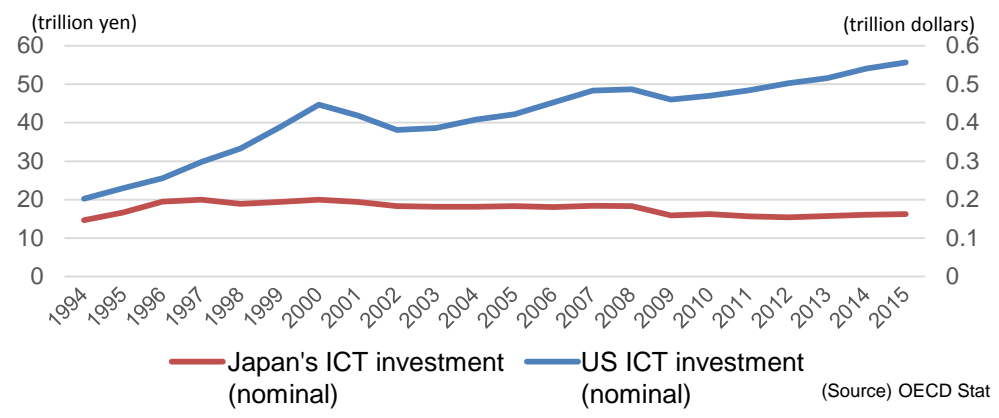


Transition and forecast of smartphone market sizes and shipments in the world

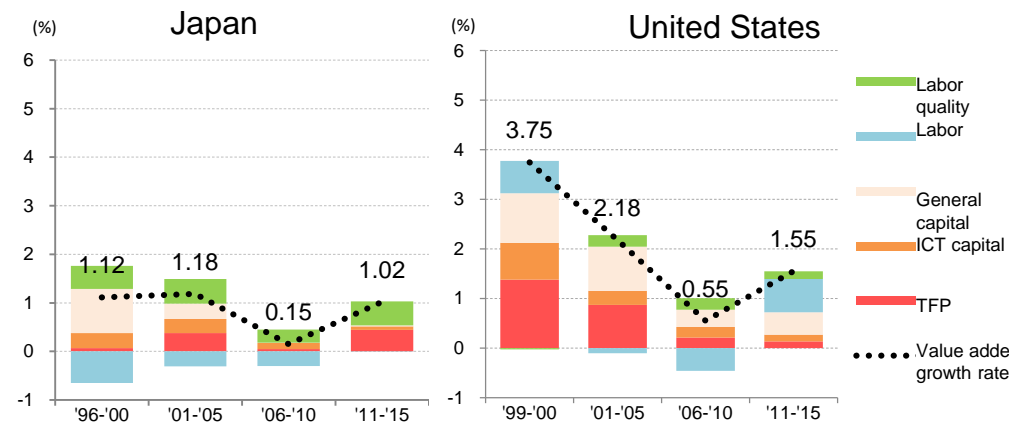


- Compared to the United States, the amount of ICT investment in Japan is small, so the ICT capital stock also remains on the same level.
- The total factor productivity* which could be affected by ICT and the ICT capital stock have contributed to Japan's GDP growth (an increase in value added) to a certain extent, but the level of contribution had been low compared to the United States until 2010.
 - * Total factor productivity (TFP): Factors other than capital and labor which contribute to production growth. Specifically, factors such as technological progress and efficiency improvement which could be affected by ICT.
- When comparing the rates of contribution of the ICT industry and other industries to Japan's growth rate, industries other than the ICT industry are found to be contributing little to pushing up the TFP.

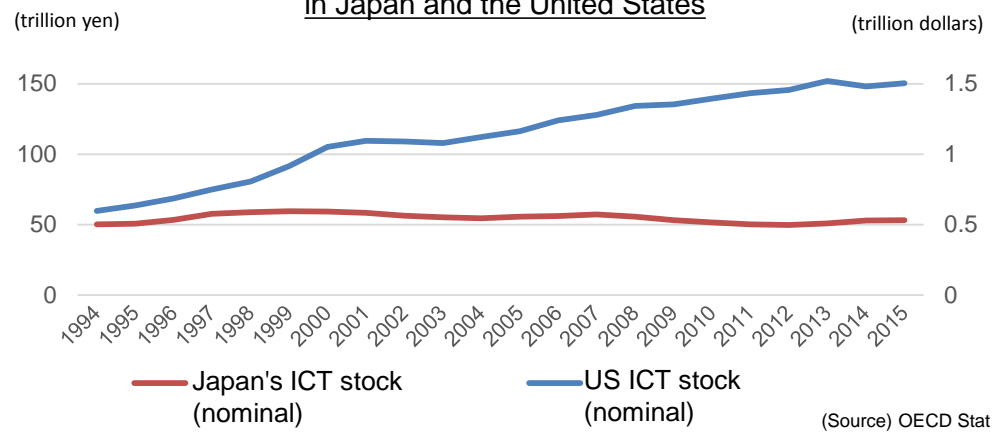
Transition in ICT investment amounts (nominal) in Japan and the United States



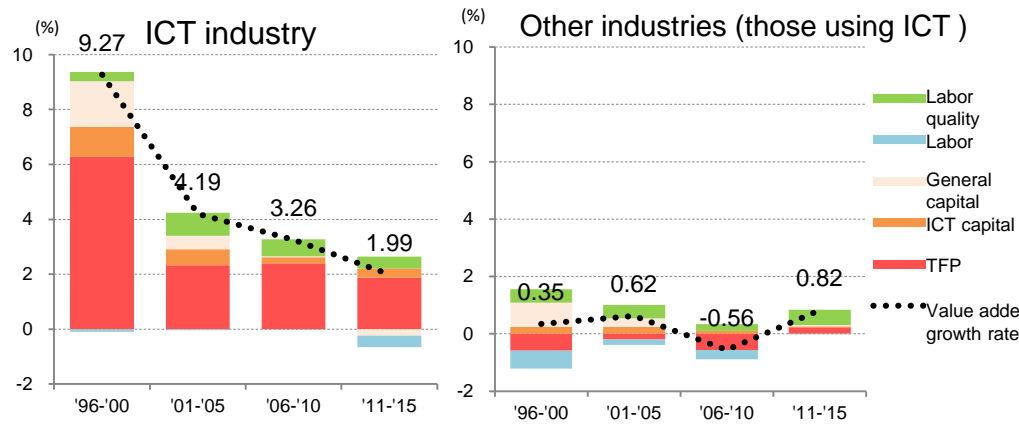
Breakdown of contribution to the GDP growth rate in Japan and the United States



Transition in ICT capital stocks (nominal) in Japan and the United States



Breakdown of contribution to the growth rate by industry in Japan



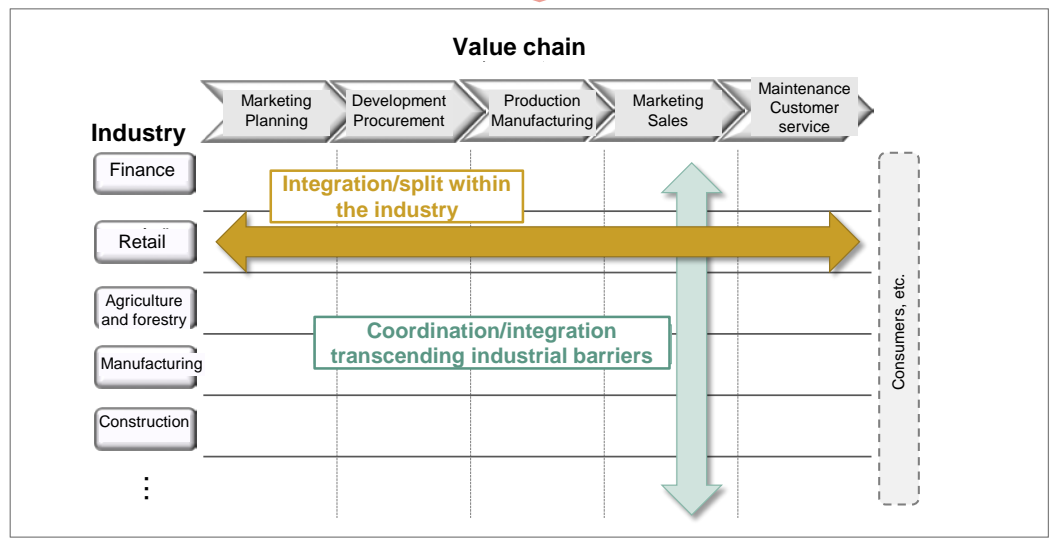
- Due to the transformation brought about by AI and IoT, changes are occurring in the mutual relationship between companies and industries also in the market.
- "X-Tech," which creates new values and systems by providing solutions using ICT, has made progress. It is spreading to various fields including financial services that are becoming increasingly digitized (FinTech).
- The progress in X-Tech has promoted coordination and integration beyond industries and value chains (processes that create the value added). As a result, industrial structures have changed and mutual entry between different industries increased, and new markets have started to be formed transcending industries.
- Cross-sectoral services beyond the conventional industrial frameworks have advanced, such as FinTech companies that provide asset management or automatic saving services by accessing customer information held by financial institutions.

Major FinTech services

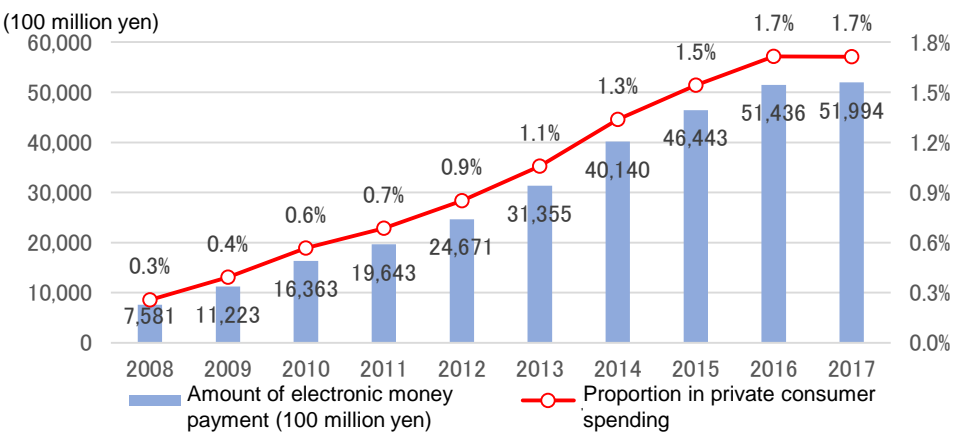
Category	Business type	Field/function provided	Typical example of a FinTech service
Operations	Banking	Deposit/asset management	• PFM (Personal Financial Management), virtual banks
		Loan	• P2P lending, social lending, crowdfunding
	Card	Payment	• Mobile payment, online payment, mobile POS, automatic payment
		Money transfer	• Online money transfer, P2P transfer
	Securities	Investment/asset management	• Robo-advisor, online securities, FP (financial planner)
Infrastructure	Business support		• Big data analysis, security, crowd-type accounting/labor consulting services
	Currency/payment networks		• Virtual currency payment/exchange, decentralized exchange (blockchain)

Impact of X-Tech on market structure changes

Progress in generation, collection, and analysis of digital data through new ICT such as AI and IoT



Transition in the Amount of Electronic Money Payment



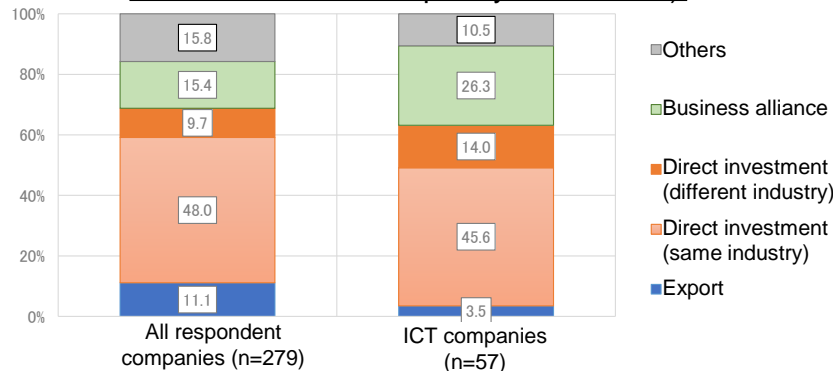
(Source) Created based on "Coefficient of Electronic Money," Bank of Japan.

Changes in industrial structures, including shifts in the roles and initiatives of the players, new entries, and creation of new industrial/business models brought about by expanded use of digital data

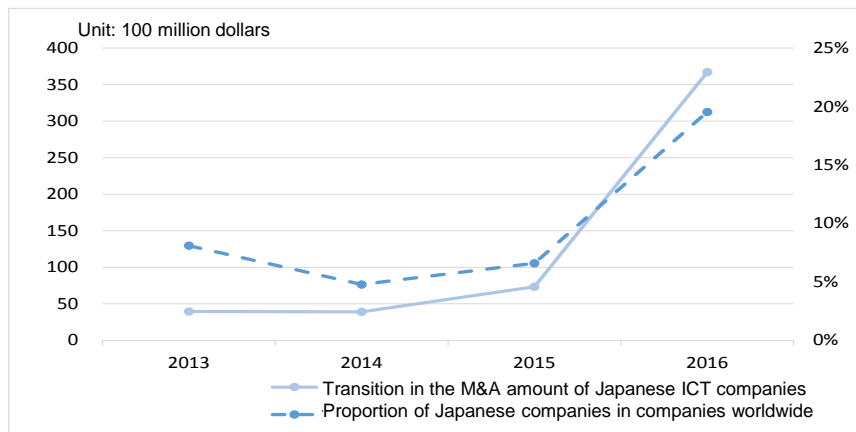
- In order to supplement the shrinking domestic demand resulting from the population decline, it is important to capture global demand, mainly demand in emerging countries that continue to grow.
- As a result of a questionnaire survey of ICT companies, they desire to use direct investment frequently as the means of overseas expansion in the future (same industry).
- Another approach to capture capital is M&As (corporate mergers/acquisitions). ICT companies' M&As overseas in 2016 amounted to 36.7 billion dollars.*
- To boost the number of inbound visitors that have increased in recent years, ICT can contribute in such areas as enhancing the soft power (providing Japanese content overseas) and improving the receptive environment (providing Wi-Fi access, providing multilingual signage/communication, etc.).

* About 4 trillion yen at the FY2016 exchange rate under the Operational Rules for Disbursing Officers (1 dollar = 120 yen)

Companies' means of overseas expansion (questionnaire survey result; the means desired to be used frequently in the future)

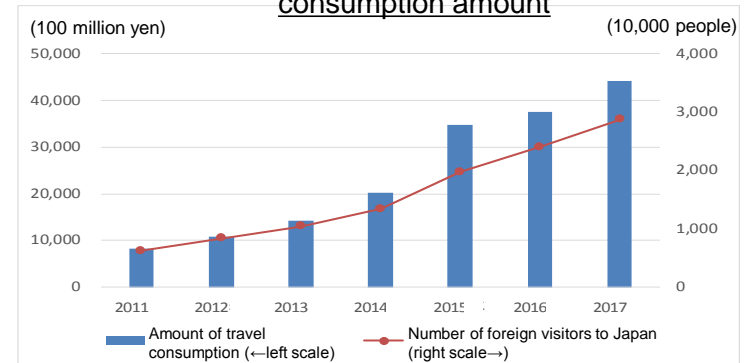


Transition in the M&A amount of ICT companies (the amount for Japanese companies and its proportion in the world's ICT sector)



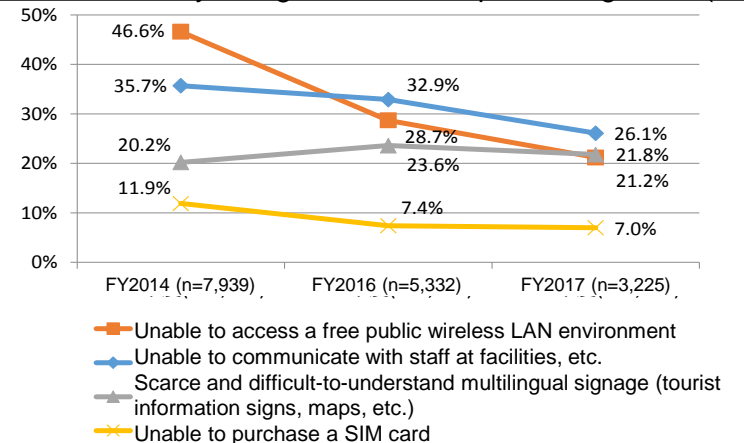
Data collected from 1500 ICT companies in 10 countries
(Source) Create based on "International IoT Competitiveness Index," MIC.

Transition in the number of foreign visitors to Japan and their consumption amount



(Source) "Consumption Trend Survey for Foreigners Visiting Japan," Japan Tourism Agency and "Trends in Visitor Arrivals to Japan," Japan National Tourism Organization (JNTO).

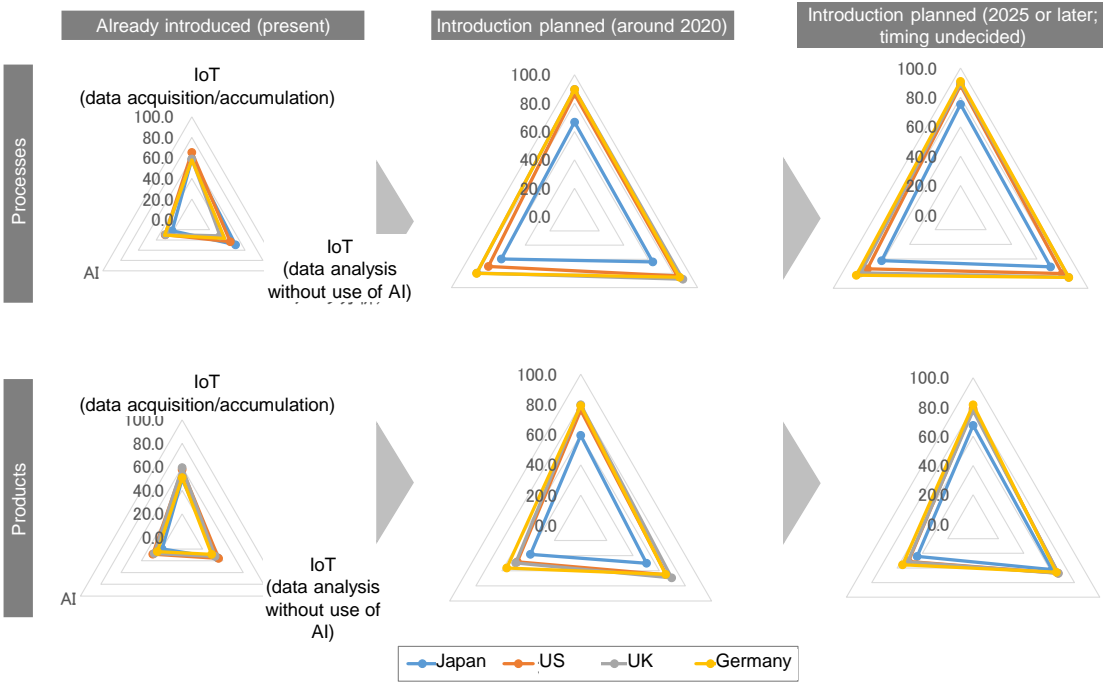
Difficulties faced by foreign visitors to Japan during travel (extract)



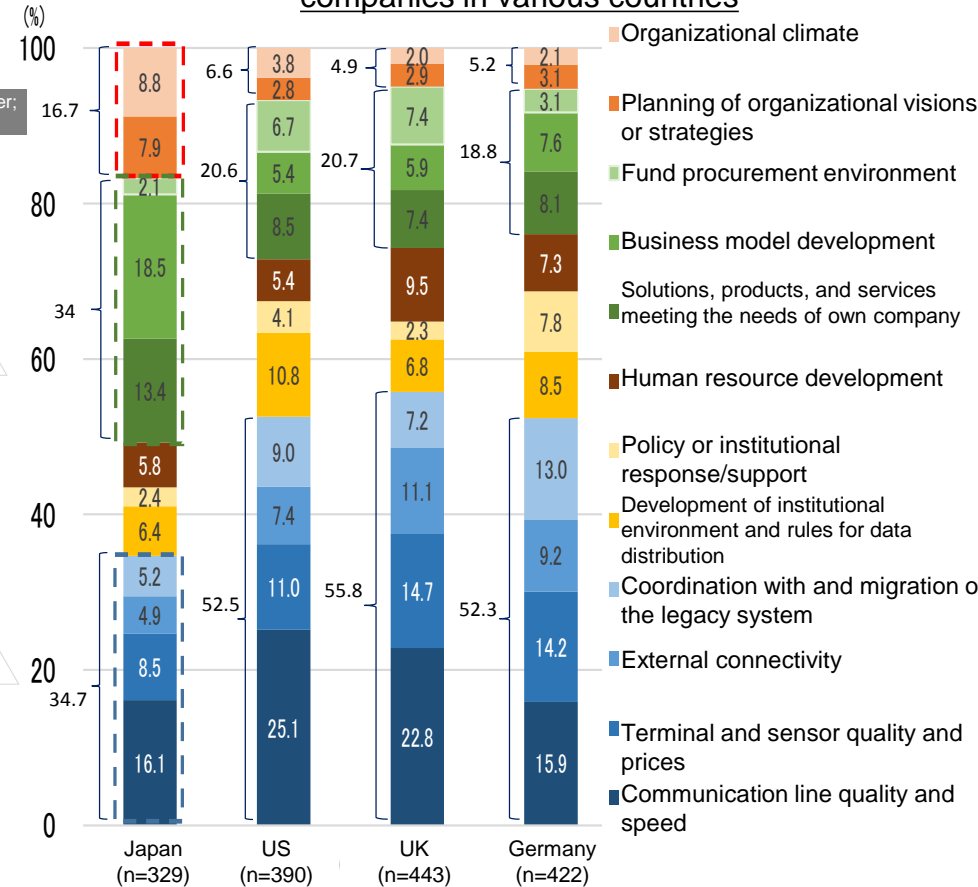
(Source) "Questionnaire survey conducted on foreign visitors to Japan with regard to the receptive environment of multilingual signage/communication," Japan Tourism Agency, etc.

- Looking at the state of introduction of AI and IoT in companies in various countries from the viewpoints of *processes* (production processes, delivery methods, etc.) and *products* (introduction of products and services into the market), the introduction rate of AI and IoT in Japanese companies is not much different from that in European and US companies, but there is a risk that Japanese companies would lag behind companies in other countries in and after 2020.
- As challenges facing utilization of AI and IoT, Japanese companies mentioned challenges concerning information and communications systems (the right figure below: the part enclosed in blue broken lines) less frequently than European and US companies, but mentioned challenges concerning business (the right figure below: the part enclosed in green lines) and organization (the right figure below: the part enclosed in red lines) more frequently than European and US companies.
- The above suggests a possibility that Japanese companies have been unable to gain a concrete view on the effects that can be brought about through utilization of AI and IoT and measures for maximizing those effects.

State of and plans for introduction of AI and IoT in companies in various countries

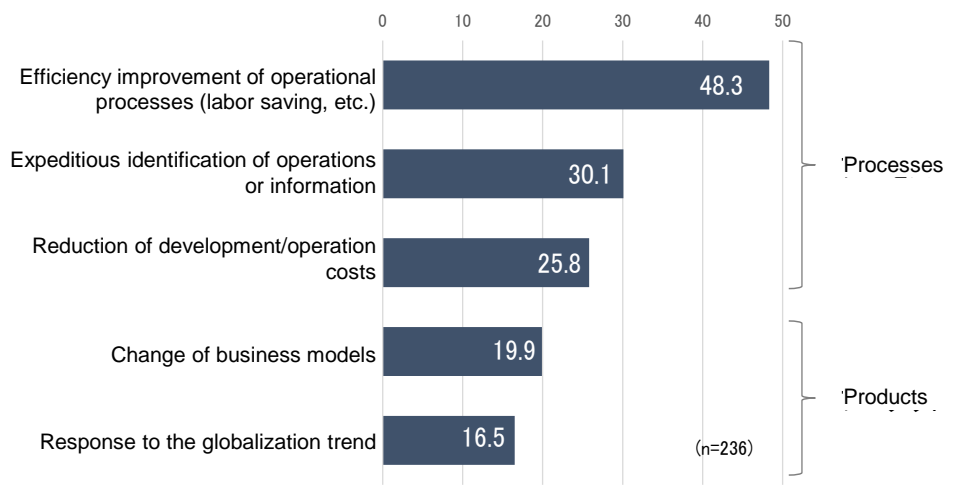


Challenges facing in utilizing AI and IoT in companies in various countries

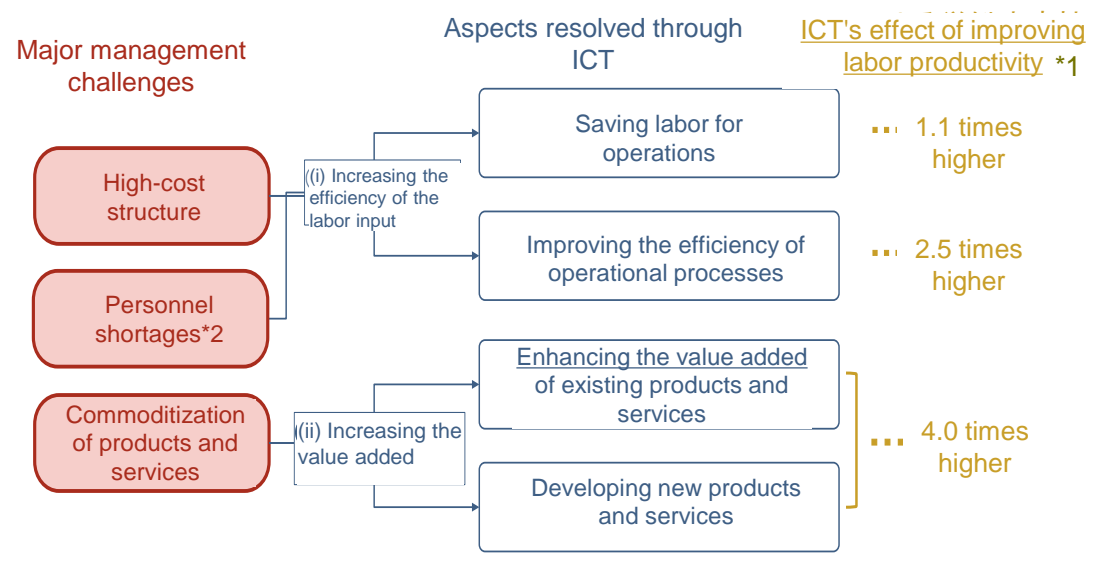


- In terms of labor productivity per hour of OECD member countries (2016), Japan ranked lower than the average at around the medium level (21st among 35 countries).
- Labor productivity can be improved by (i) increasing the efficiency of the labor input (processes) and (ii) increasing the value added (products), and ICT can be utilized in both of these approaches.
- At present, many of the management challenges which companies have resolved through ICT are related to (i) (processes).
- The effect of improving labor productivity is particularly large for *aggressive ICT investment* centering on enhancement of the value added of existing products and services.

Major management challenges which companies resolved through ICT



Categories of measures for resolving challenges and improving productivity through ICT

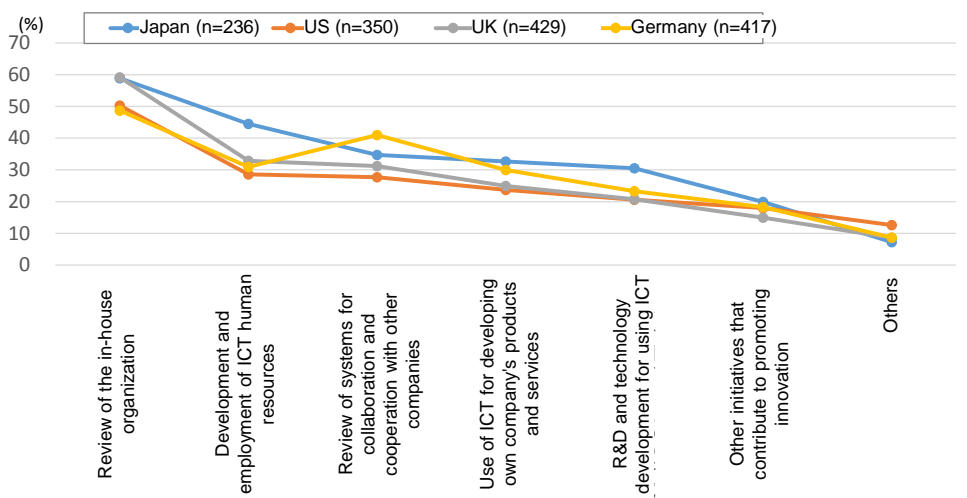


*1 According to a questionnaire survey, each group's labor productivity growth rate over a span of three years was as follows.
 "Saving labor for operations": applicable (3.32%), not applicable (3.10%)
 "Improving efficiency of operational processes": applicable (6.71%), not applicable (2.71%)
 "Enhancing the value added of existing products and services," "developing new products and services": applicable (7.78%), not applicable (1.96%)

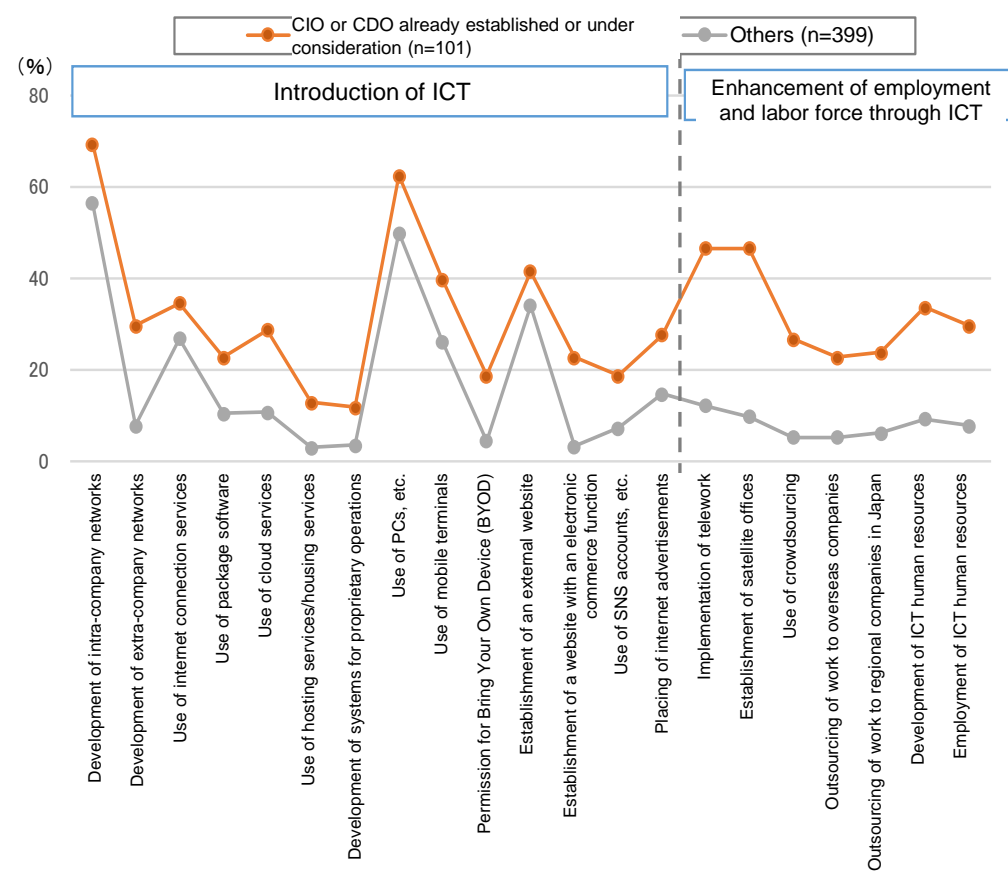
*2 The issue of promotion of labor force participation through ICT for resolving personnel shortages is discussed in Chapter 4 as an issue related to *people*.

- In order to achieve *aggressive ICT investment*, organizational reform for bringing out the potential of ICT is also indispensable.
- To that end, organizational reform needs to be carried out centering on establishment of a CIO or CDO who will lead the introduction and utilization of ICT in business activities.
- However, the rate of establishment of a CIO or CDO is lower in Japan compared to the United States, the United Kingdom, and Germany.
- Companies that have established or are considering establishing a CIO or CDO tend to have a higher ICT introduction rate and be actively engaging in efforts to increase employment or labor force through use of ICT.

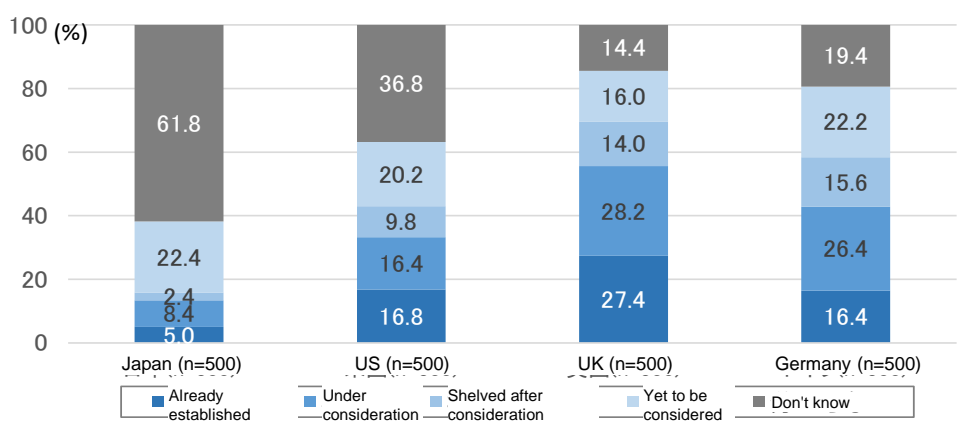
Efforts to utilize on ICT investment



State of efforts of domestic companies to increase employment or labor productivity through use of ICT

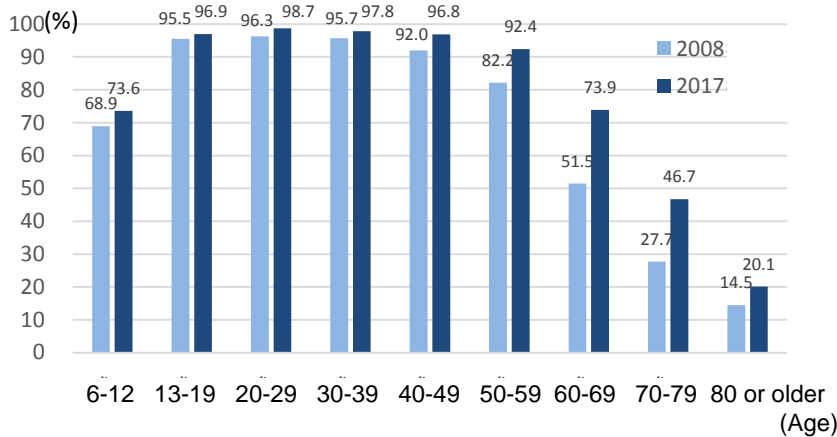


State of establishment of a CDO

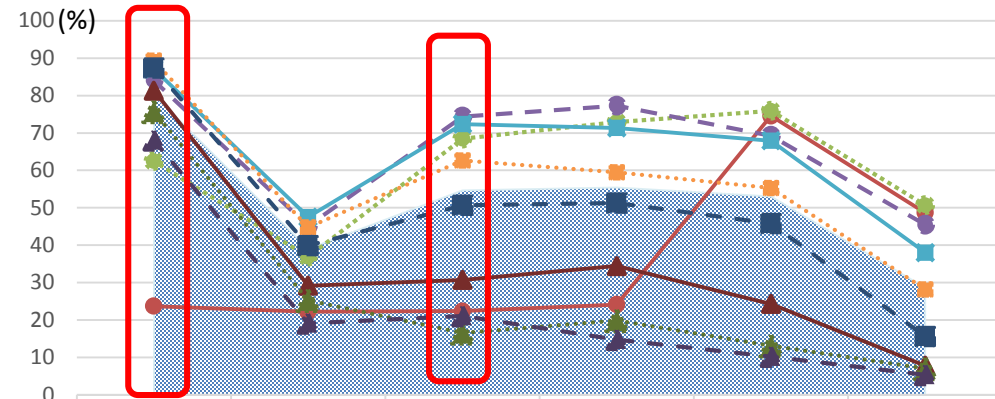


- The internet usage rate for those in their late teens to those in their 40s in Japan exceeded 90% both in the 2008 and 2017 surveys. In the 2017 survey, the usage rate for those in their 60s or older also increased.
- The terminals used for internet connection were mainly smartphones for those in their 40s or younger. Those in their 60s or older showed a different tendency than younger age groups of mainly using personal computers for internet connection and more frequently using cellular phones as mobile terminals.
- Unlike the usage rate of emails, the usage rate of social media differs greatly by age group, such as 74% for those in their 20s and 31% for those in their 60s.

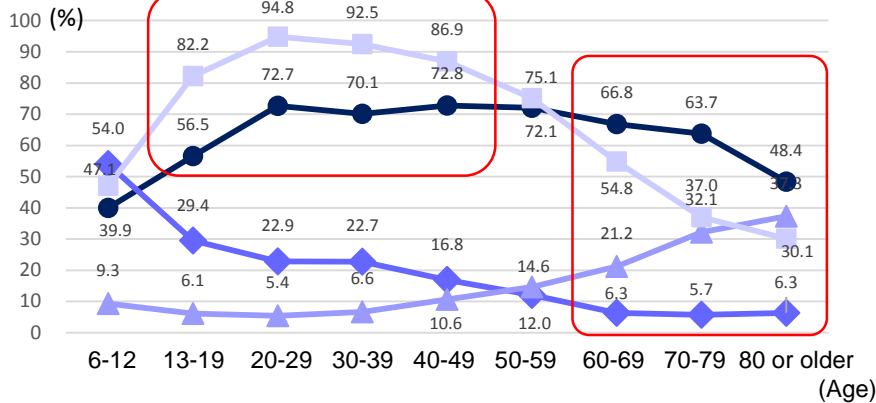
Internet users (2008 and 2017)



Functions and services used on the internet (2017)



Terminals for using the internet (2017)

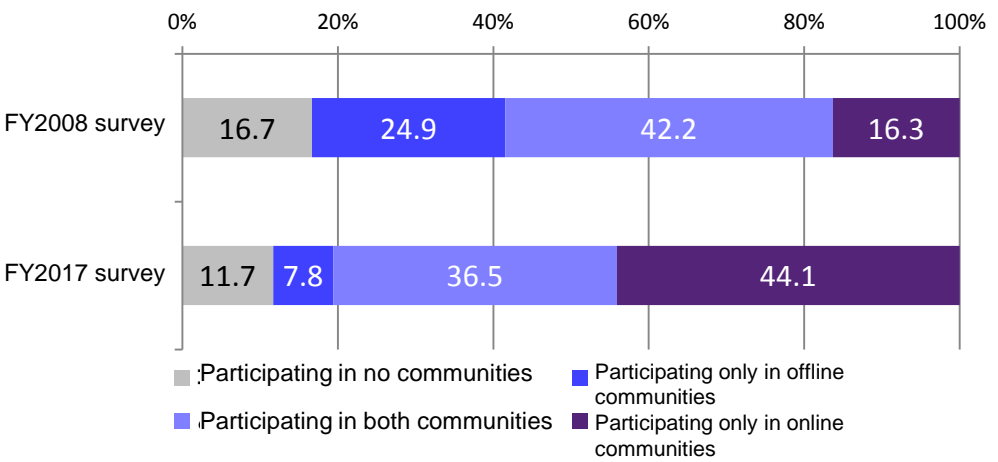


	Sending and receiving emails	Browsing and posting comments on websites or blogs	Using social networking services	Using free calling apps or voice chats	Using video posting/sharing sites	Using online games
All age	80.2	39.0	54.7	55.4	53.1	28.7
6~12	23.7	22.2	22.4	24.1	74.6	48.7
13~19	62.5	36.9	68.4	72.9	75.9	50.7
20~29	84.1	45.1	74.4	77.3	69.2	45.5
30~39	87.1	47.5	72.4	71.3	67.9	38.0
40~49	89.4	44.7	62.6	59.4	55.3	28.2
50~59	87.4	39.9	50.7	51.2	45.8	15.6
60~69	81.3	29.2	30.7	34.4	24.3	7.8
70~79	75.8	25.3	16.5	19.9	13.1	7.1
80 or older	68.0	19.2	21.1	14.7	10.2	5.4

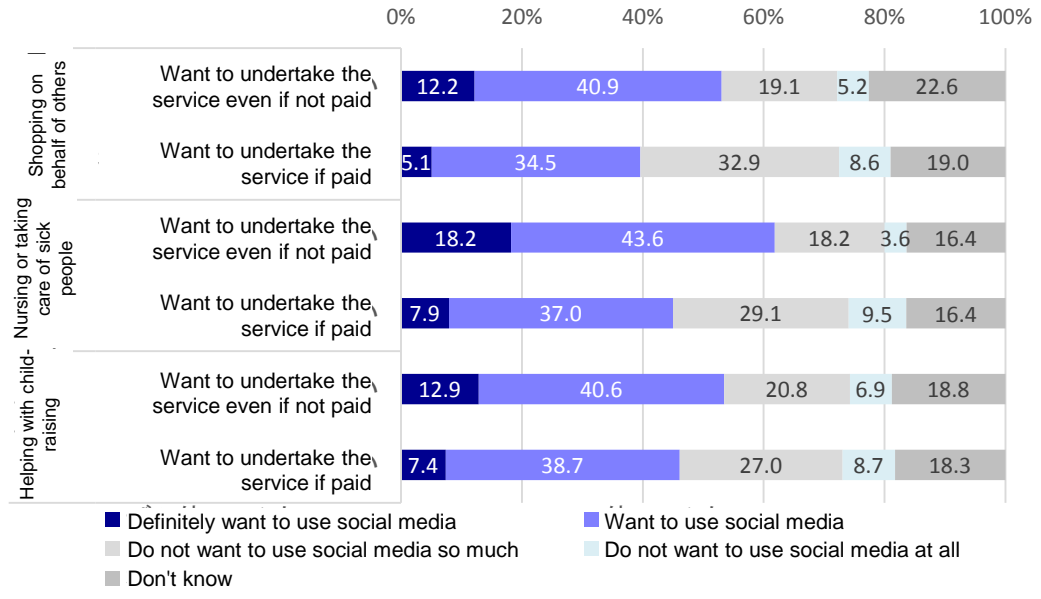
(Source) "Communications Usage Trend Survey," MIC (both figures).

- In a survey on participation in communities, people who do not participate in communities decreased while those who participate only in online communities increased compared to the results of the FY2008 survey.
- However, the tendency that people who participate in both offline and online communities have a strong ability to connect with others has not changed.
- Among people who want to help others in the community, more than 40% had an intention to participate in mutual assistance systems that use social media. There are case examples of initiatives to support mutual assistance by making challenges facing residents and their intention to provide assistance visible through utilization of ICT such as social media.

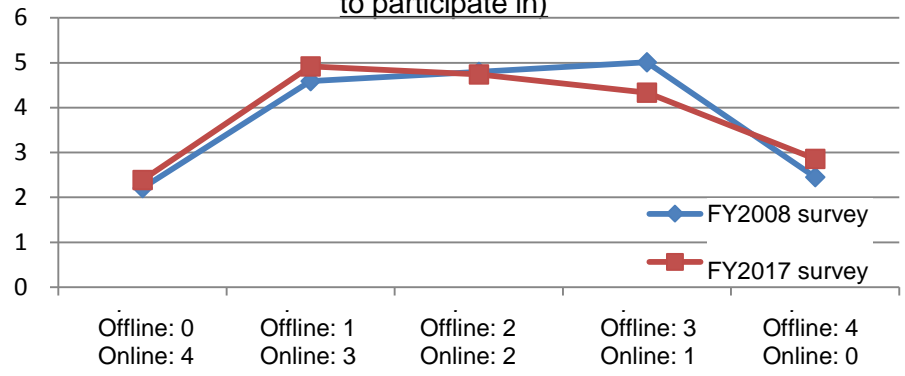
State of participation in online and offline communities



Intention to use social media (breakdown of people who want to help others)



Networking ability index (if there are up to four communities to participate in)



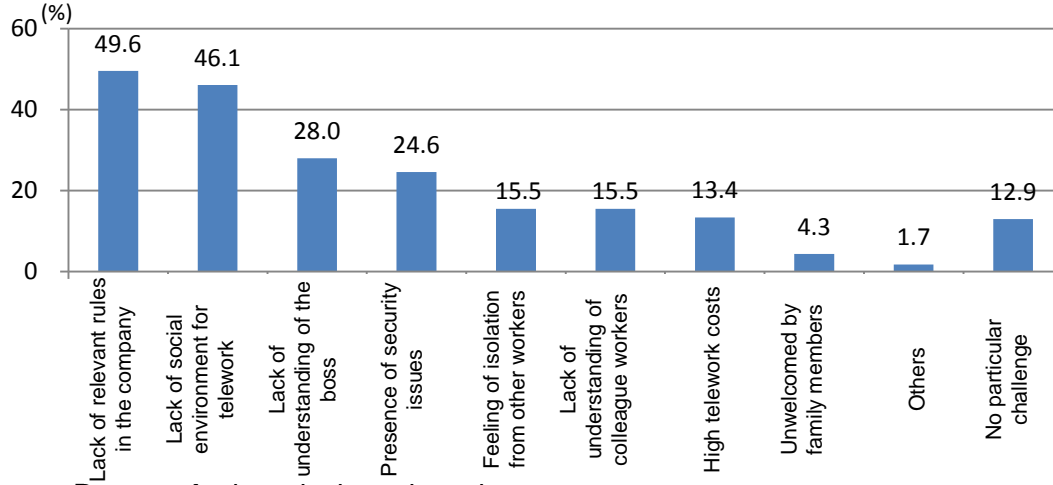
* Networking ability: An index that quantitatively indicates a person's state of participation in both online and offline communities and the person's awareness of communities. People who participate in many communities that have strong ties have a higher networking ability.

Case examples of ICT utilization for supporting mutual assistance in communities

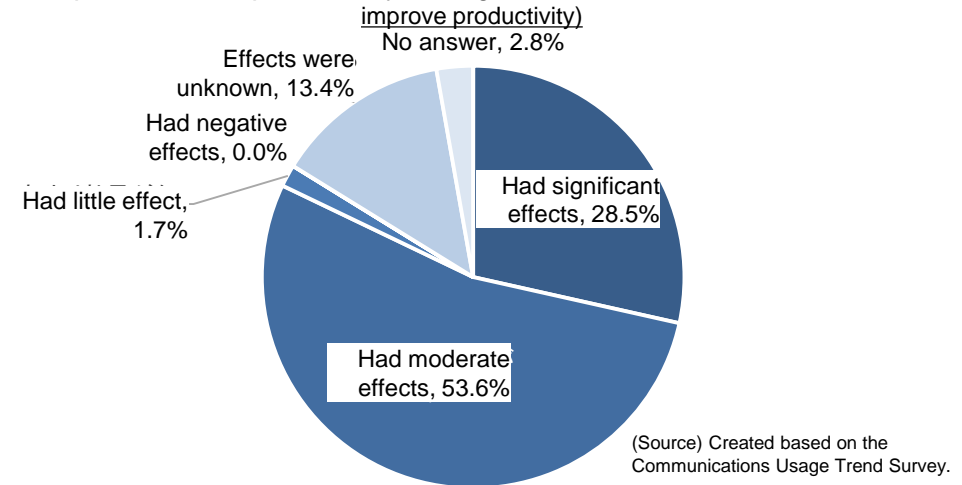
Case example	Provision of information by the municipality, etc.	Matching between difficulties and the intention to provide help	Paid service
Yamae Village, Kumamoto Prefecture: Yamae Village Community Development Research Institute	○	○	×
Koto City, Metropolitan Tokyo: Community SNS (Piazza)	○	○	×
Ikoma City, Nara Prefecture: Sharing Economy (AsMama)	○	○	○

- The telework dissemination rate for companies was 13.9% in 2017. While there may be challenges such as a lack of relevant rules in companies, telework has an advantage of improving the work-life balance for workers and improving labor productivity for companies (companies that experienced an improvement effect: 82.1%).
- Crowdsourcing is a system where individuals or groups undertake orders made by companies or other such entities. Through use of ICT, crowdsourcing also contributes to promoting labor force participation of diverse people including women and creating jobs in rural areas. The number of people registered for crowdsourcing services has been on an increase.

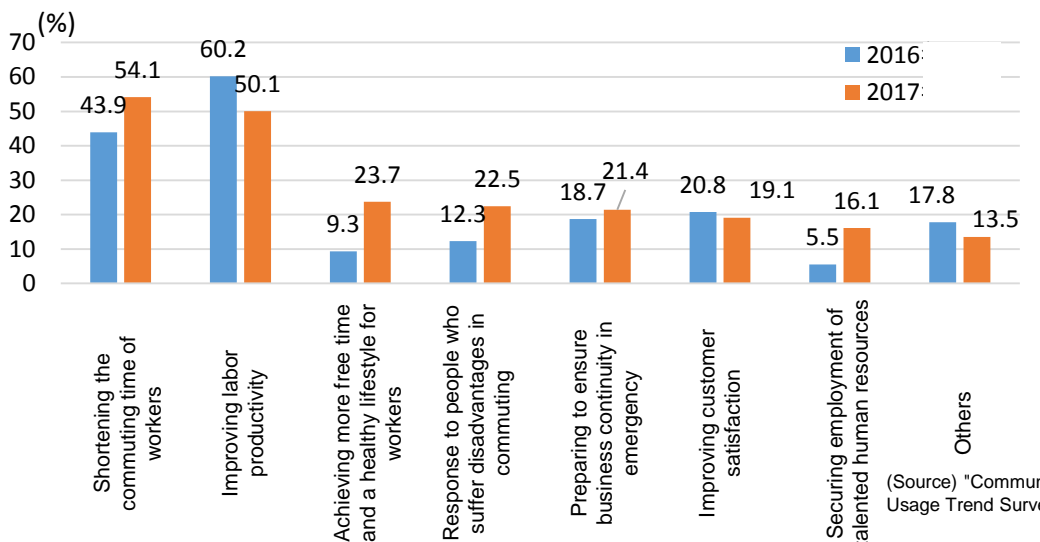
Challenges facing implementation of telework (workers wishing to telework)



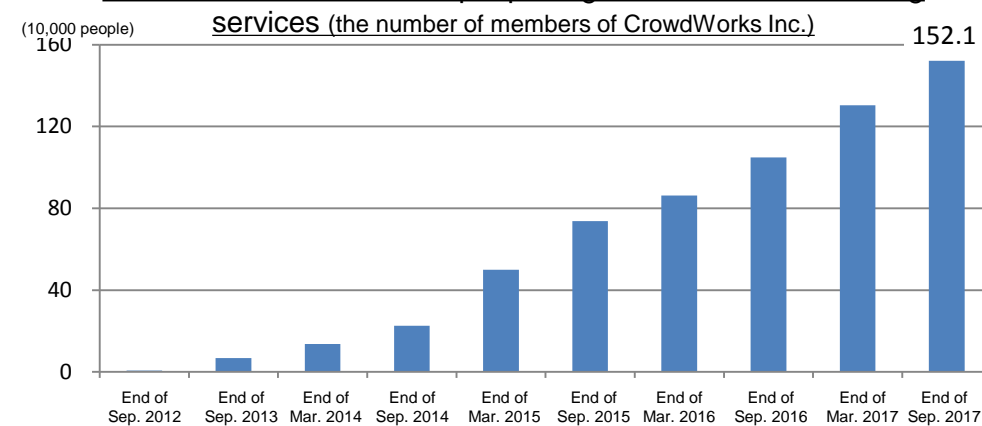
Improvement of productivity through telework (companies that aimed to improve productivity)



Purpose for introducing telework (companies that already have introduced telework)



Transition in the number of people registered for crowdsourcing services (the number of members of CrowdWorks Inc.)



(Source) "Explanatory Material on the Financial Results of the Business Term Ended September 2017," CrowdWorks.