

# Chapter 1

## Present and Future of Smartphone Economy

This year's White Paper on Information and Communications in Japan pays attention to new values created by networks and data, featuring the special theme of "Data-driven Economy and Social Change." The reason for paying first attention to smartphones is that smartphones as familiar Internet access devices can generate enormous data.

### Section 1 Advent of Smartphone Society

Chapter 1 checks quantitative data of smartphone dissemination and utilization regarding the advent of

smartphone society.

#### 1. Smartphone Utilization Situation Indicated by Numerical Data

##### (1) Explosive Dissemination of Smartphones Indicated by Numerical Data (Quantitative Expansion in 5 Years)

The year 2017 marks the 10th anniversary of the 2007 iPhone launch in the United States. Smartphones have rapidly disseminated in Japan. Comparison of dissemination trends for smartphones and other ICT terminals makes the rapid smartphone dissemination clearer<sup>1</sup> (Figure 1-1-1-1). Smartphones represent an ICT terminal owned by each person. The Communications Usage Trend Survey indicates that the smartphone ownership rate<sup>2</sup> quadrupled in five years from 14.6% in 2011 to 56.8% in 2016 (Figure 1-1-1-2).

Smartphones are explosively disseminating not only in Japan and other developed countries but also in the whole of the world.

When considering smartphones and relevant services, we can assume that goods and services taking advantage of smartphones could disseminate in emerging

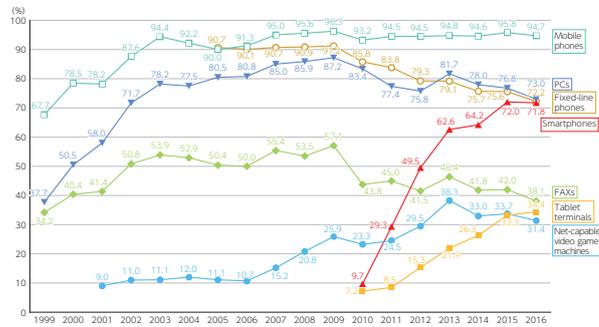
countries more rapidly than in developed countries as existing goods and services in emerging countries are relatively less developed than in developed countries.

##### (2) Smartphones Becoming Central to Life (Qualitative Change in 4 Years)

Duration and other details of smartphone utilization are taken up here to indicate that the impact of the smartphone dissemination includes not only the number of smartphones in use but also how they are utilized.

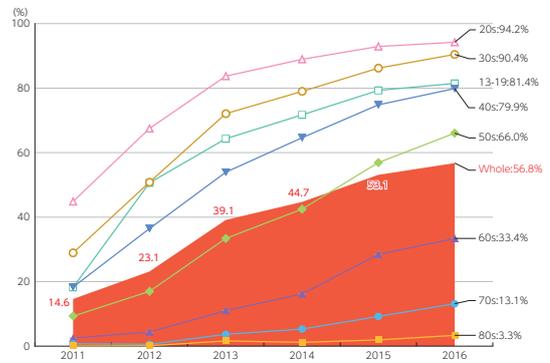
The duration of mobile phone<sup>3</sup>-based Internet use on a weekday average basis increased 1.6-fold from 38 minutes in 2012 to 61 minutes in 2016. The increase in the duration of mobile phone-based Internet use is attributable not only to a rise in the duration of Internet use per smartphone user but also to an increase in smartphone users' share of mobile phone users. The duration of smartphone-based Internet use on a weekday average

Figure 1-1-1-1 Trend in household ownership of ICT terminals in Japan



(Source) Communications Usage Trend Survey, MIC

Figure 1-1-1-2 Trend in individual smartphone ownership rate



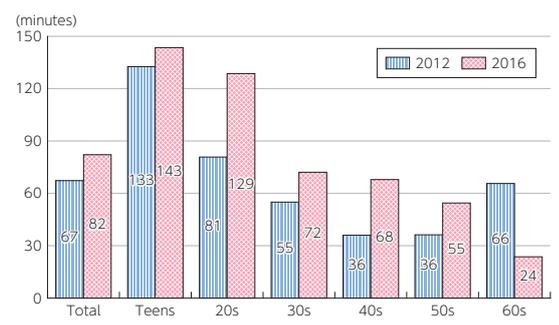
(Source) Communications Usage Trend Survey, MIC

<sup>1</sup> As a smartphone is a device owned personally, it may be appropriate to focus on ownership on a personal basis rather than on a household basis. For comparison with other types of ICT terminals, however, household ownership is adopted here. See Figure 1-1-1-2 for the individual smartphone ownership rate.

<sup>2</sup> Data for 2011 and 2012 are estimated based on the Internet utilization rate and the Internet-using equipment utilization rate in the survey.

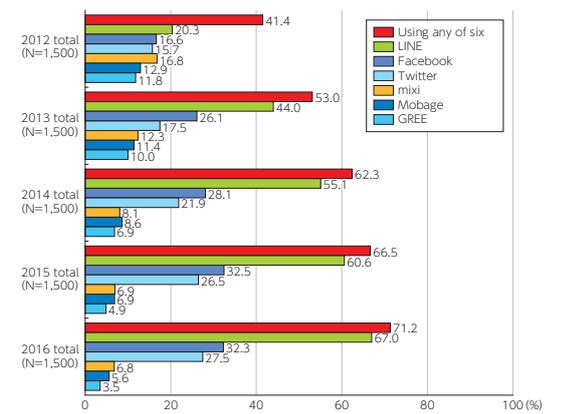
<sup>3</sup> Mobile phones here cover both feature phones and smartphones.

**Figure 1-1-1-3 Duration of Internet use of smartphone users (weekday average for 2012 and 2016)**



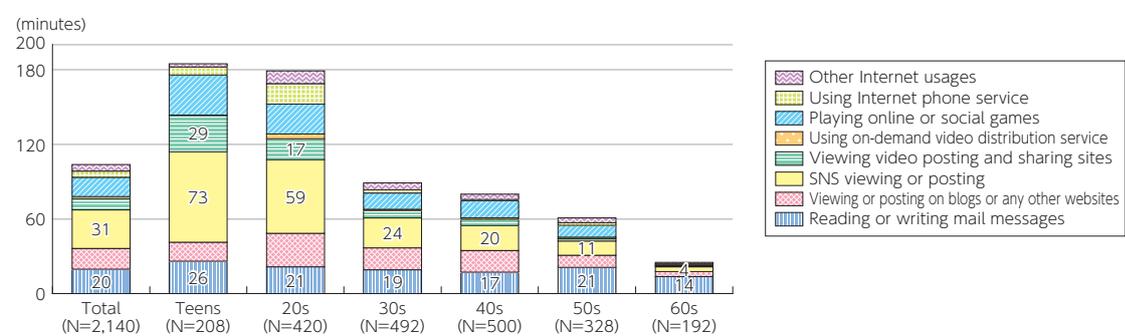
(Source) "Survey on Time Spent for Information and Communication Media and Information Behaviors," MIC

**1-1-1-5 Trend of use rates for representative SNS services (total)**



(Source) "Survey on Time Spent for Information and Communication Media and Information Behaviors," MIC

**Figure 1-1-1-4 Duration of smartphone-based Internet use by purpose category (2016)<sup>4</sup>**



(Source) "Survey on Time Spent for Information and Communication Media and Information Behaviors," MIC

basis in 2012 and 2016 by age group indicates that the overall average increased to 82 minutes in 2016, with the average being as much as 143 minutes for the teens group and 129 minutes for the 20s group. (Figure 1-1-1-3)

For what purposes are smartphones used?

Purposes for using smartphones are divided into categories including "reading or writing mail messages," "viewing or posting on blogs or any other websites," "SNS viewing or posting" and "viewing video posting and sharing sites" (Figure 1-1-1-4). A key point is that time spent on "SNS viewing or posting" is long particularly for the teens and 20s. The teens and 20s spend more time than other age groups on "viewing video posting and sharing sites," indicating their characteristic of utilization of smartphones.

**(3) SNS Becoming Central to Smartphone Use**

SNS use has increased in line with smartphone dissemination.

In 2016, 71.2% of respondents in a survey were us-

ing any of six SNS services, including LINE, Facebook and Twitter, which have been representative in Japan and available for inter-annual comparison, indicating a steep increase from 41.4% in 2012 (Figure 1-1-1-5). Among age groups, the teens and 20s featured relatively higher SNS use rates in 2012. In 2016, 97.7% of the 20s were using any of the six SNS services. The SNS use rate rose from 37.1% in 2012 to some 80% in 2016 for the 40s and from 20.6% to some 60% for the 50s, logging sharp growth in 2014 and 2015.

Smartphones and SNS show similar dissemination tracks. Their combination might have led to the expansion of smartphones and relevant services.

SNS not only serves as a communication tool but also is used for and cooperates with other services.

For example, SNS is used for marketing, as described later in this chapter. SNS utilization situation is also used for FinTech and sharing services to secure the reliability of personal deals. Given that smartphones and social media are positioned as information media in a disaster

<sup>4</sup> As some users conduct multiple information behaviors simultaneously on weekdays, durations for information behaviors may not add up to the total duration of smartphone-based Internet use in Figure 1-1-1-3.

as described in Chapter 5 later, SNS as well as smart-

phones is becoming a social infrastructure tool.

## Section 2 New Services Facilitating Expansion of Smartphone Economy

### 1. Dissemination of Smartphone-related Services

Under the acknowledgement that smartphones and relevant services have great potential, this chapter analyzes the impact of new smartphone services from the following two viewpoints:

- (i) Use of new smartphone-related services will further expand in the future built on smartphones as terminals and existing relevant services.
- (ii) Smartphones, relevant services and data distribution match supply and demand individually or on a real-time basis, contributing to improving productivity, creating new services and resolving problems.

In this section, after Paragraph 1 briefly describes the two viewpoints Paragraph 2 categorizes FinTech, sharing economy and various C2C services as new smartphone-related services and analyzes their use in emerging countries.

#### (1) Transition of Smartphone-related Services and Applications

Smartphones are characterized as a terminal owned by each person, as available for Internet access at any time and any place, as able to provide various services through platforms and as a data input-output hub.

When smartphones began to disseminate, smartphone-related services centered on SNS, movie and music services that were also available through personal computers. Since the mid-2010s, new services taking advantage of smartphones' abovementioned characteristics have disseminated or emerged, including FinTech, sharing economy, AR/VR (augmented reality and virtu-

al reality), flea market applications and personal data store services. Their conceptual diagram is given by Figure 1-2-1-1.

These services include those that cooperate with each other. For example, SNS is utilized to secure the reliability of consumer-to-consumer transactions and FinTech settlement services are used for other services.

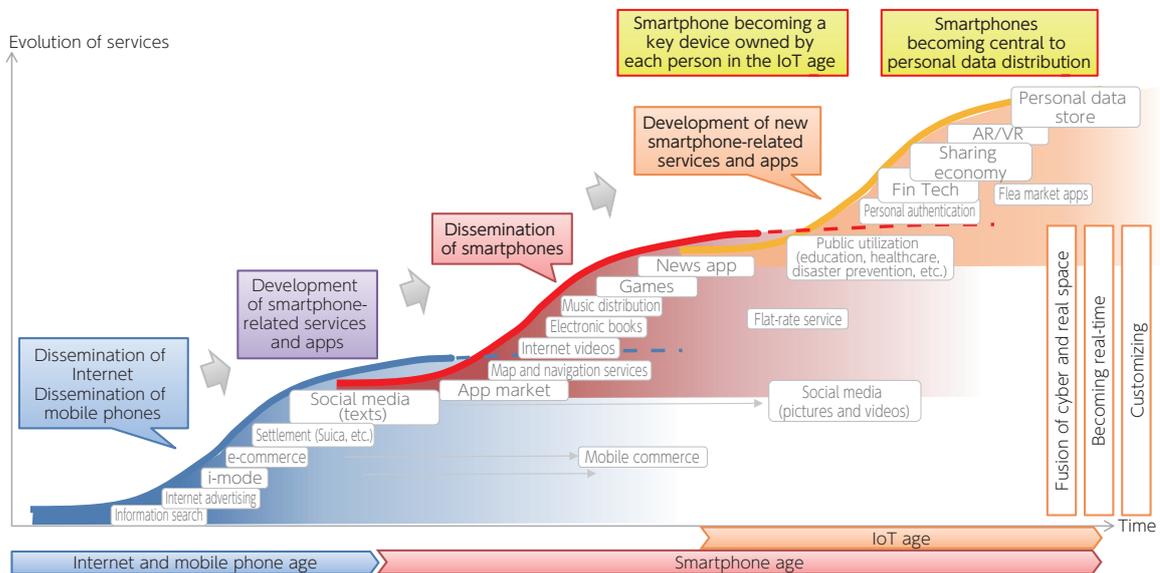
#### (2) Promoting Matching between Supply and Demand

Given smartphones' abovementioned characteristics and digital data's features including zero cost for copying and zero time for transmission, smartphones and relevant services are expected to bridge between suppliers and users of goods and services, promoting their matching.

Transactions via smartphones are classified by whether transaction participants are suppliers or users of goods and services, or businesses or consumers, and by flow of goods and services, money and information into four categories: business to business (B to B), business to business to consumer (B to B to C), business to consumer (B to C), and consumer to consumer (C to C) transactions (Figure 1-2-1-2).

Matching between supply and demand individually or on a real-time basis could improve productivity and generate new services, contributing to economic growth. Given that the services industry's, widely defined in a broad sense, economic shares are growing in developed countries and that the tertiary industry accounts for about 70% of GDP in Japan, the service industry's pro-

Figure 1-2-1-1 Conceptual diagram of transition of smartphone-related services and applications



(Source) "Research on Present and Future of Smartphone Economy," MIC (2017)

**Figure 1-2-1-2 Four categories of transactions**

	Business to business (B to B)	Business to business to consumer (B to B to C) (two-sided market)	Business to consumer (B to C)	Consumer to consumer (C to C)
Conceptual diagram				
Specific services	<ul style="list-style-type: none"> <li>Fin Tech (for corporations) see 2 (1)</li> <li>AR/VR (for corporations) see Section 3' s.3 (1) c</li> </ul>	<ul style="list-style-type: none"> <li>Information search</li> <li>SNS (social media) see 3(3)b</li> <li>Internet videos (free of charge)</li> </ul>	<ul style="list-style-type: none"> <li>Fin Tech (for individuals) see 2 (1)</li> <li>AR/VR (for individuals)</li> <li>Internet shopping see 3</li> <li>E-books</li> <li>Music</li> <li>Internet videos (chargeable)</li> </ul>	<ul style="list-style-type: none"> <li>Sharing economy see 2(2)</li> <li>Auction</li> <li>Flea market app see 2(2)</li> </ul>

(Source) "Research on Present and Future of Smartphone Economy," MIC (2017)

ductivity must be enhanced for economic growth. Productivity-enhancing measures include improving capacity utilization rates and leveling demand, to which smartphones are expected to contribute.

A point to note is that as users and relevant services increase, available data grow to help improve the accuracy of matching. Another point is that smartphones will not only improve the efficiency of existing business operations or replace these operations but also take advantage of the improved matching accuracy to restore transaction opportunities that were once lost due to

insufficient matching and to generate new services.

These changes, instead of being limited to temporary, small ones, could contribute to the fourth industrial revolution and bring about changes equivalent to the past industrial revolutions. Equipment, human resources, business flows, organizations and other various social systems will have to be reformed to allow society to truly benefit from smartphones, relevant services and data distribution. In this sense, a medium to long-term viewpoint covering the next several years may be required along with a short-term viewpoint.

## 2. Impact of New Smartphone Services

Smartphones are characterized as (1) a terminal owned by each person, as (2) a data input-output hub available for Internet access almost at any time and any place, and as (3) having platforms (including those for personal authentication and settlement). These characteristics enable (1) personal customization, (2) real-time matching, (3) various services and (4) growth in information available for analysis through data interchange between services. Therefore, smartphones apparently have potential to contribute to economic growth and society reform through the enhancement of productivity and the promotion of innovation.

This paragraph takes up new smartphone-related services.

### (1) FinTech

#### A. What is FinTech?

FinTech represents a combination of finance and technology. Blockchain, big data, AI and other new technologies are utilized through smartphones and tablet computers that have rapidly disseminated. The utilization of ICT for personal asset management and financial institutions' business operations has generated very convenient services one after another. Particularly, FinTech<sup>5</sup> services expanding in Japan include (1) "personal asset management" for automatically keeping household accounts on smartphones, (2) smartphone-based "money transfer and remittance" via the Internet, and many others designed to use smartphones. A point to note is that most of FinTech service companies are ventures affiliated with domestic financial institutions.

<sup>5</sup> As moves to promote FinTech services have accelerated in Japan, the Japanese FinTech market is expanding. According to a survey by Yano Research Institute Ltd., the Japanese market size for FinTech ventures is predicted to expand from about 4.8 billion yen in FY2015 to 80.8 billion yen by 2021.

## B. Categories of FinTech Services

(a) Lending Under the lending service, lenders and borrowers are gathered via the Internet and rated before lending is conducted. The service is called P2P (person to person) lending or social lending. Borrowers cover individuals and corporations.	(b) Settlement The service uses smartphones for credit card settlement. Many FinTech companies traditionally have launched the service, including those that have grown into large enterprises. Some companies have recently begun to use Bitcoin technology.
(c) Remittance The service provides mobile remittance including international and P2P remittance at low prices. Remittance can be made even in the absence of bank accounts for remittance beneficiaries. The service has attracted attention as a means for expatriates' remittance to their home countries.	(d) Personal financing The service serves as an interface between mobile terminals and banks, providing mobile terminal-based banking. It can provide individuals with advice for preventing excessive spending.
(d) Capital fundraising The service matches money-seeking venture companies with individual investors, allowing these companies to raise capital funds. Investors can invest in initial public offering companies.	(e) Personal asset management The service manages customers' assets in an easy-to-understand manner through account aggregation to integrate bank account information as accepted by customers.
(f) SME services The service supports the management of accounts receivable and payable, and of fixed assets, the preparation of bills, wage and tax payments and other accounting and tax procedures for small and medium enterprises and micro companies.	(h) Personal investment support The service uses software to provide advice on personal investment at low prices. In a manner to answer questions, the service allows customers to develop portfolios, select themes for investment and use big data analysis for asset management.

## (2) Sharing Economy (C2C services)

Transactions between individual consumers have expanded via smartphone. In this respect, sharing economy and C2C services are taken up here.

### A. What Is Sharing Economy?

Sharing economy represents economic vitalization activities to allow assets owned by consumers to become available for others through Internet matching platforms. These assets include skills, time and other intangibles. As sharing economy services are expected to contribute to the vitalization of the Japanese economy, to the improvement of national life convenience, to the effective utilization of idled assets and to the resolution of social problems by providing new values to people and society, the Japanese sharing economy market is expanding.

According to a survey by Yano Economic Institute, Japan's sharing economy market size is predicted to expand from about 28.5 billion yen in FY2015 to 60 billion yen by 2020.

Sharing economy services match individuals willing to provide assets or skills with those willing to be provided with them through the Internet. The dissemination of smartphones has allowed such matching to be conducted at any time and place on a real-time basis. Backing up sharing is SNS.

According to the "Interim Report by the Sharing Economy Review Conference – Sharing Economy Promotion Program"<sup>6</sup> (hereinafter referred to as the program), the creditworthiness of individuals that had been difficult to infer in the absence of their faces through the

Internet has become visible to some extent thanks to the dissemination of social media using real names, allowing citizens to select and use services provided by individuals. This indicates that SNS and smartphones synergistically promote sharing services.

### B. Categories of Sharing Economy Services

The program classifies targets for sharing into five categories – goods, space, skill, transportation and money.

#### (a) Sharing involving goods (goods and sharing)

This category of services allows unused goods to be shared between individuals, including flea market apps and rental services.

#### (b) Services for sharing personally owned spaces (space and sharing)

This category of services includes accommodation using vacant housing rooms, allowing housing spaces, parking areas and conference rooms to be shared.

#### (c) Services for asking individuals to undertake housekeeping or any other jobs (skills and sharing)

This category of services includes housekeeping, nursing care, childcare, knowledge and cooking services.

#### (d) Sharing involving transportation (transportation and sharing)

This category of services include ride sharing as well as car sharing in which individuals use their own cars to transport others.

#### (e) Sharing involving money (money and sharing)

This category of services includes crowd funding.

<sup>6</sup> Cabinet Secretariat Sharing Economy Review Conference ([http://www.kantei.go.jp/jp/singi/it2/senmon\\_bunka/kaikaku.html#shiea](http://www.kantei.go.jp/jp/singi/it2/senmon_bunka/kaikaku.html#shiea))

**C. Specific Sharing Economy Services**

**(a) Goods and sharing**

Among the five categories, goods sharing has made the greatest progress. Most goods sharing services are provided through a flea market smartphone app that allows buyers and sellers of goods to trade with each other in a virtual Internet market. Such apps are called “flea market apps” as their dealing is similar to that in a flea market.

In a flea market, various new and used goods are bought and sold, including clothing, sundry goods, furniture and electrical home appliances. A flea market app is used mainly from smartphones and has disseminated particularly among young people featuring high smart-

phone diffusion rates.

**(b) Skills and sharing**

Skills sharing services have diffused in recent years in Japan. The most popular among them is crowdsourcing<sup>7</sup>. However, ordering parties are mainly ordinary companies, with crowdsourcing limited to B2C.

In the meantime, services have emerged to match individuals willing to provide skills with those willing to use them. Services by AnyTimes Inc., introduced later, have attracted attention as those that provide consumer-to-consumer deals and could lead to solutions to social problems such as women’s and aged people’s labor participation, working style reform and regional revitalization.

**3. Smartphone Use and Its Consumption Promotion Effects**

This paragraph takes up smartphone use and its consumption promotion effects.

**(1) Direct and Indirect Effects**

Smartphones, Internet advertising and Internet shopping may be effectively utilized to match supply and demand well to improve the satisfaction of consumer needs and the degree of consumers’ satisfaction while enhancing producers’ sales and productivity.

Smartphones’ private consumption promotion effects have been quantitatively estimated to find sizes and trends of Internet shopping and mobile commerce by product and consumer attribute.

Here, the amount of consumption using smartphones is estimated as a direct effect and the amount of consumption induced by information collection through smartphones as an indirect effect, based on questionnaire survey and other data.

**A. Amount of Consumption Using Smartphones**

Based on questionnaire survey data, the percentage shares of consumption using smartphones and Internet shopping have been estimated (Figure 1-2-3-1).

The estimation results show that consumption using

smartphones accounts for 8% of monthly private consumption and Internet shopping for 28%.

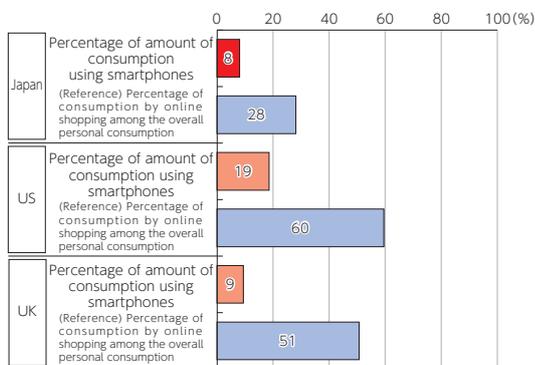
Internet shopping’s share of overall private consumption stands at 60% in the United States and at 51% in the United Kingdom. Smartphones using Consumption may have room to grow further for products now with small shares of smartphone-using consumption as smartphones’ characteristics are utilized to increase convenience. As the smartphone using market size has increased, smartphones might have been increasingly used for Internet shopping. (Figure 1-2-3-2)

**B. Impact of Information Collection Using Smartphones**

Based on questionnaire survey data, the share of the amount of consumption induced by smartphone-using information collection has been estimated (Figure 1-2-3-3). In Japan, consumption induced by smartphone-using information collection accounts for 19% of total private consumption and consumption induced by tablet-using information collection for 3%.

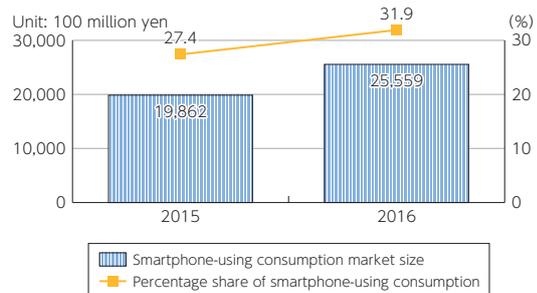
The share of consumption induced by smartphone-using information collection stands at 34% in the United States and at 23% in the United Kingdom. The share of consumption induced by tablet-using information collection stands at 15% in the United States and at 13% in the United Kingdom. In the United States, consumption in-

**Figure 1-2-3-1 Amount of consumption using smartphones**



(Source) “Research on Present and Future of Smartphone Economy,” MIC (2017)

**Figure 1-2-3-2 Smartphone-using consumption market size and share**



(Source) “Market Research on Electronic Commerce,” METI

<sup>7</sup> Crowdsourcing represents a combination of “crowd” and “sourcing.” The service uses ICT to procure human resources as necessary. The Japanese crowdsourcing market has grown greatly in recent years, estimated by Yano Economic Institute to reach about 295 billion yen in FY2020.

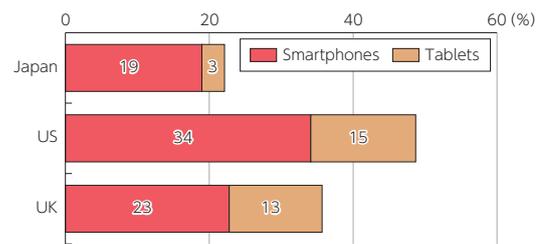
duced by information collection using smartphones and tablets commands a half of total private consumption.

#### C. Examples of Internet Advertising for Consumption Promotion

Time spent on SNS and similar services through smartphones and tablets is longer than that through personal computers in teens. SNS and similar services are a charge-free communication tool for consumers while being established SNS and similar service as a business model for operators is based on data including users' action history and on advertising using such data.

SNS and similar service operators have gotten aware of users' respective ideas through their action trends. On the other hand, service providers willing to approach specific users can make advertisements focusing on users interested in their services through SNS and similar service operators. SNS and similar services enable one-

**Figure 1-2-3-3 Amounts of consumption induced by information collection (by country, per month)**



(Source) "Research on Present and Future of Smartphone Economy," MIC (2017)

to-one advertisements. By repeating customization to improve the accuracy, SNS and similar service operators can match supply and demand on a more real-time basis.

## Section 3 Online Platform and Data Utilization

Section 3 deals with online platforms and data utilization. Online platforms allow contents and applications service providers to have sites for reasonable Internet services to consumers, promoting innovation. Meanwhile, online platform operators have collected massive user data, leading ordinary consumers to become con-

cerned over how such data would be used. If some companies prevent their rivals from using some online platforms, fairness may be called into question. If online platform servers are installed in foreign countries, cross-border data handling may become controversial.

### 1. Two Sides of Online Platform

#### (1) Significances of Online Platforms

Sections 1 and 2 explained that various services including SNS, FinTech and sharing economy have emerged and been increasingly used on smartphones. Factors behind the phenomenon includes the presence of platforms. Here, the two significances of online platforms are considered. The first significance is that online platforms make it easier for various applications and services to be generated<sup>8,9</sup>. If a business operator were to provide from applications to communication networks and terminals, it would have to make massive investment and consume much time for their development. If platforms exist and are available for connection, what any business operator must do can be limited to the provision of applications. Hurdles to business entry in this case may be lower than in the case for vertically integrated services, with more users being expected.

The second significance is that smartphones and their relevant services bridge between providers and users of goods and services and promote their matching. Their transactions are divided into four categories – business to business (B to B), business to business to consumer (B to B to C), business to consumer (B to C) and consumer to consumer (C to C) (Figure 1-3-1-1).

Among the four categories, particular attention may have to be paid to the B to B to C category including

what is called "two-sided market" because of its expected great influence on the future.

In the two-sided market, two groups of economic entities interact with each other through mediators and platforms. Specific examples include free-of-charge broadcasting backed by advertisement, information search services through the Internet and SNS. The reason for these services to have attracted attention regarding competition policy in recent years is that a party standing in a slight advantageous position over others in the initial stage can gain a dominant market size or share in later stages due to strong network effects (Figure 1-3-1-2). These services also match supply and demand through advertisement. Given that digitalization and data distribution growth can improve the accuracy of matching between supply and demand, data distribution growth apparently has further enhanced network effects in the two-sided market.

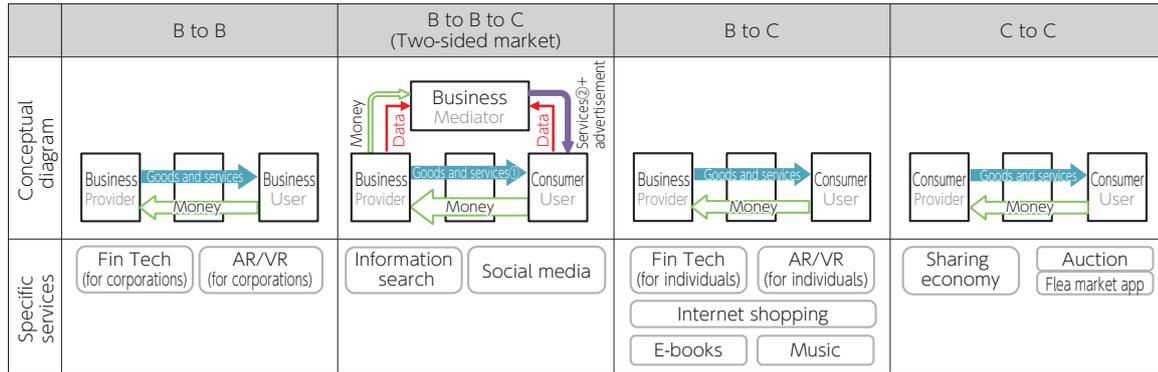
#### (2) Challenges for Platforms

As described in (1), the unification of standards, though having some positive effects, can restrict competition by limiting the number of business operators, giving the disadvantage of consumers. Monopoly or oligopoly is apparently accompanied by the following adverse effects:

<sup>8</sup> Here, goods and services related to information and communications are divided into terminals, communication networks, platforms and applications, with platforms interpreted as common standards for connecting communication networks and applications.

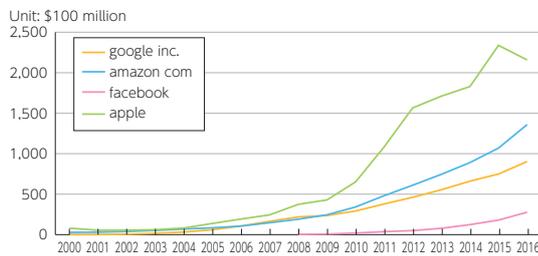
<sup>9</sup> A document published by the European Commission on May 10, 2017 ([ec.europa.eu/newsroom/document.cfm?doc\\_id=44527](http://ec.europa.eu/newsroom/document.cfm?doc_id=44527)), points out that platforms promote innovation and growth in the digital economy, creating business opportunities particularly for small and medium enterprises.

Figure 1-3-1-1 4 Categories of transactions



(Source) "Research on Present and Future of Smartphone Economy," MIC (2017)

Figure 1-3-1-2 Sales trend for representative business operators with online platforms



(Source) "Research on Present and Future of Smartphone Economy," MIC (2017)

- Prices of goods and services under monopoly or oligopoly are higher than under perfect competition (with volume of goods and services being less), affecting consumer interests.
- New innovation could be impeded.

## 2. Hopes on New Innovation and Safe/Secure Data Distribution

Platforms can increase efficiency while impeding competition. Whether platforms are good or wrong, could it be decided through comparison between the advantages and disadvantages for individual cases and conditions? Key viewpoints for making the decision include innovation and consumer interests.

### (1) Innovation

Innovation was originally defined by economist Joseph Schumpeter as combining unprecedented methods of existing technology, resources and labor. Recently, the Organization for Economic Cooperation and Development has widely defined innovation as including (1) product innovation (new goods and services), (2) process innovation (innovation or substantial improvement of production and distribution methods for goods and services), (3) operational and organizational innovation and (4) marketing innovation.

Suggestive for considering innovation regarding smartphone-related platforms are the past case called "Over the Top", voice input and data trade markets.

The past history indicates that as influential business players in the ICT area have changed, horizontally compatible standards have repeatedly emerged over traditional standards (Figure 1-3-2-1).

As of 2017, services by Amazon as Alexa to combine voice recognition with real space, data trade markets and decentralized data processing are attracting atten-

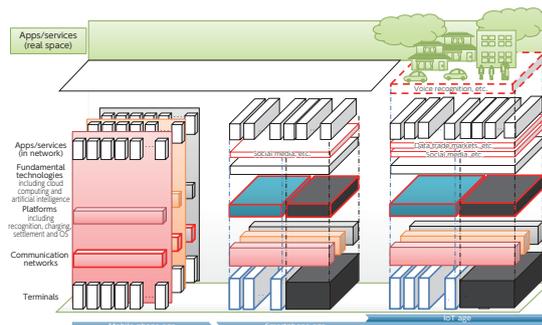
tion.

A competition environment may have to be developed to prevent data hoarding from impeding innovation.

### (2) Consumer Interests

While consumer interests include consumer satisfaction, security and safety, prices and other short-term elements, medium to long-term viewpoints are discussed here. To allow society to benefit from innovation achievements, consumers are required to have abilities to determine the merits and demerits of new services using innovation and positively use services with greater merits without sticking to traditional values and ideas. As men-

Figure 1-3-2-1 smartphone-related Structural change in layers



(Source) "Research on Present and Future of Smartphone Economy," MIC (2017)

tioned in 1. of Section 2, various social systems must be reformed to fully benefit from the merits of new technologies and realize substantial productive improvement and economic growth.

U.S. economist Robert Solow said, "Productivity is not everything, but in the long run, it is almost everything." It must be noted that productivity defines the medium to long-term affluence of a country. History indicates that while railways, automobiles, ICT in the ICT revolution in the 1990s and other general-purpose technologies were not necessarily accepted in a universal manner, regions'

or countries' economic growth depended on whether they could utilize them to improve productivity.

The dissemination of smartphones and relevant services, and data distributed through the dissemination have potential to match supply and demand on an individual, real-time basis to contribute to productivity improvement and economic growth and change society. It is hoped that businesses and consumers will utilize smartphones and relevant services, and data distribution to realize economic growth and social change.

### 3. Considering Post-Smartphone Society

#### (1) Evolving Information Terminals and Scenes for Their Use

##### A. Replacement of the Leading Actor in the Mobile World Congress

As explained in the previous paragraph, the smartphone economy including upper-layer applications and services is expected to evolve further as consumption using fully disseminated smartphones increases qualitatively and quantitatively. Meanwhile, growth in shipments of smartphones as information terminals has rapidly slowed down. Annual growth in smartphone shipments decelerated from 58.5% in the 2010-2011 period to 1.7% in the 2015-2016 period.

##### B. Spreading AI Speakers Recognizing Voice Data

The replacement of the leading actor of information terminals has been indicated by the Mobile World Congress, one of the world's largest events for the communications industry. Remarkable in the MWC2017 were AI speakers that numerous companies are developing as terminals replacing smartphones. Some AI speakers have already been put into the market (Figure 1-3-3-1).

##### C. Graphics Data Utilization and AR/VR

As computer processing speed has improved with smartphones and tablets disseminating, AR technologies to display supplementary information on photo images have increasingly been used along with VR technologies to utilize computer graphics for creating virtual spaces on-screen.

As of 2017, AR technologies are most frequently used for consumer entertainment at game and amusement facilities. However, they are expected to connect cyber and real spaces for deepening data distribution and contribute to creating values in business areas including

construction work and public transportation systems.

#### (2) Communications Infrastructure Used Increasingly as General-Purpose Technology

##### A. Transition of Communication Systems and Business Models

The mobile phone industry's communication system has so far been replaced every five to 10 years. As the fourth-generation (4G) mobile communication system has been disseminating steadily in developed countries, the fifth-generation (5G) system planned to be introduced in the 2020s has become a topic being frequently talked about in Japan and other countries. The 5G system features not only ultrafast speed but also connection of numerous devices and low latency.

While 4G and earlier systems have been used mainly for "humans," the 5G system is assumed to connect "things" via the Internet. In the 5G world, communication business operators may partner with various companies regardless of business area to generalize the B2B2X pattern and generate an infinite number of business models.

##### B. Communications Industry to Promote Growth in Other Industries

The MWC2017 sponsor set the event's main theme as "The Next Element," noting that mobile communications will become "the next element" for growth and innovation in all other industries. The telecommunications industry in the world is looking at other industries for new growth.

IoT contents have evolved through technology development and discussions in the past three years. IoT is now interpreted not only as a means for collecting information with small sensors but also as a solution for han-

Figure 1-3-3-1 Voice data-recognizing AI speakers

Launching	Overseas service cases	Japanese service cases
By 2016	ECHO (Amazon (U.S.)) Google Home (Google (U.S.)) NUGU (SK Telecom (South Korea))	
2017	Harman Kardon Invoke (Microsoft (U.S.)) HomePod (Apple (U.S.))	WAVE (LINE) petoco (NTTDocomo) au Home (KDDI) Xperia Agent (Sony Mobile Communications)

(Source) "Fact-finding Survey on Digital Innovation and ICT Industry Trends," MIC (2017)

dling big data through such measures as installing cameras for utilizing image recognition technologies. The LPWA (low power wide area) and 5G are positioned as new communications technologies to meet such usage scenes.

### **(3) Toward IoT Age**

#### **A. Data to Connect New Added Values**

In the IoT age, “data utilization” is an initiative common to all industries. In an MWC2017 talk session, a representative of a company said in a very natural man-

ner that data would represent a new currency. Distributing data under certain conditions beyond a company’s inhouse data utilization may be understood as connecting added values.

Smartphones consist of sensors and generate data, making human life convenient. The future global trend of the telecommunications industry is that data collected through not only smartphones but also other various means including cars will be utilized to increase business operation efficiency, create new added values and resolve social problems.