Part 1

Chapter 1

ICT-based Innovation and Economic Growth

There are concerns in Japan that the rapidly progressing population aging and birthrate decreases, and the resultant population decline, is leading to waning labor inputs and shrinking domestic demand and will hinder economic growth over the mid-to-long term. In this chapter, we systematically organize, from both the supply side and the demand side, the paths by which the Internet of Things (IoT), big data, artificial intelligence (AI), and other new forms ICT could contribute to our nation's economic growth. Working from this organization basis, we then examine quantitatively the potential effects of each of these paths on economic growth, interspersed with examples and the current state of initiatives by enterprises in each area.

Section 1 ICT Potential for Solving Issues Facing Japan, Such as the Declining Birth Rate and Aging Population

1. Japan's economic growth issues

(1) Advent of population decline

As the country's population has aged and birthrate decreased, the working age population has been dwindling from its peak in 1995 and the total population has been in decline since its peak in 2008 (Figure 1-1-1-1). Over the long term, the number of non-employees (such as self-employed workers and family-business workers) among all employed people has been on a downward trajectory, while the number of employees has been moving upward since 2011. The total working hours per employee is tending down.

Studies and analyses by the Japan Productivity Center have shown a growing number of workers in the medical care sector, ICT sector, and others. These findings have also revealed acute labor shortages in such sectors as food service, retail, and transportation and highlighted that the inability to source sufficient labor is a constraining factor on the economy.

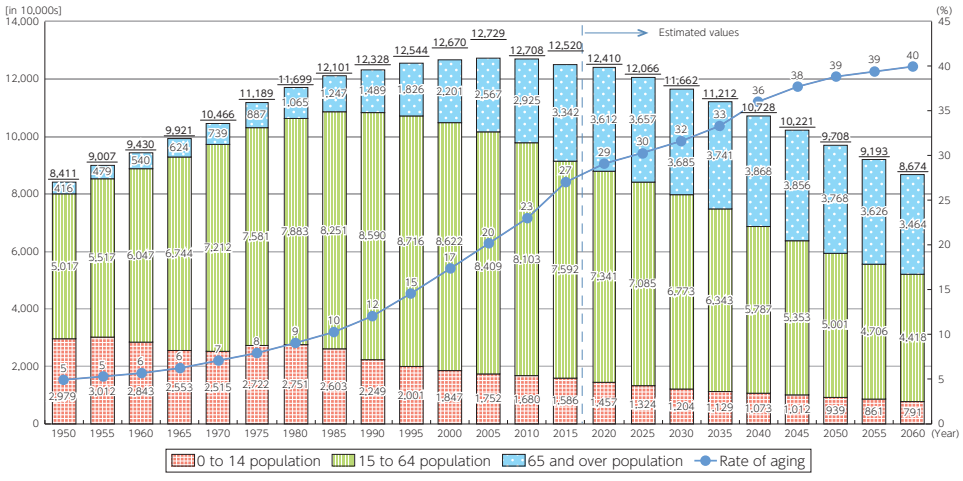
2. Social and economic contributions from new forms of ICT

Attention has been focusing in recent years on new forms of ICT such as the Internet of Things (IoT), big data, and artificial intelligence (AI). In this paragraph, we give a general outline of ICT's evolution and sort out qualitatively its social and economic impacts.

(1) Evolution of ICT

The consensus in economics circles is that *technological progress* — propelled chiefly by general-purpose technologies suitable for many applications — is vital as a prime driver of sustained economic growth. The positive feedback of evolution should maintain ICT progress

Figure 1-1-1-1 Transitions in Japan's population



(Sources) Figures to 2015 taken from the "National Census," MIC (excluding the age-indeterminate population); figures for 2020 and beyond taken from "Population Projections for Japan (estimated in January 2012)," (medium fertility and medium mortality assumption) National Institute of Population and Social Security Research

into the future, and an effective economic strategy is to concentrate resources in domains that will accelerate technological progress. Specific technological domains include software, communications, the cloud, and robotics, and the fields gaining attention for their rapid evolution spurred on by these technologies are the Internet of Things (IoT), big data, and artificial intelligence (AI).

a. Internet of Things

Linking, via networks, things, people, services, and information on a massive scale will generate new value. In this context, *Internet of Things* (IoT) is the term given mainly to the interconnection of things. Gartner, in the U.S., defines IoT as "the network of physical objects that contain embedded technology to communicate and sense or interact with their internal states or the external environment.

b. Big data

Big data, as a keyword, first gained prominence in 2011 when it was used in a McKinsey ad in the United States. Data usage is distinctive in its non-competitiveness and its near-zero marginal costs of reproduction. The near future will see the real-time accumulation of many kinds of unstructured big data lacking any format, in addition to structured data. Coupled with advancements in IoT, big data will profoundly change social systems through the analysis of data, which is benefiting from the exponential growth in computing power.

c. Artificial intelligence

The history of artificial intelligence (AI) research can be divided into 3 major stages (Figure 1-1-2-1).

Deep learning technology is gaining attention as a tremendous leap forward in the capability of machines to analyze abstract information, using representations inspired by brain anatomy. If software reaches the point where it can understand language, then it could obtain the ability to predict and analyze humans through autonomous computer learning. This development could advance AI into the realm of imagination and creativity.

(2) Social and economic impact of new forms of ICT

A relationship is being formed between IoT, big data, and AI. IoT is used to collect all kinds of data to visualize the current situation. Then, various types of data are accumulated on multiple levels over time (creating big data) and AI is applied to process and analyze these big data sets to forecast the future. In this chapter, we will refer to this integrated concept as *IoT in the broad sense* (Figure 1-1-2-2). Using the concept of IoT in the broad sense, it becomes possible to create new values.

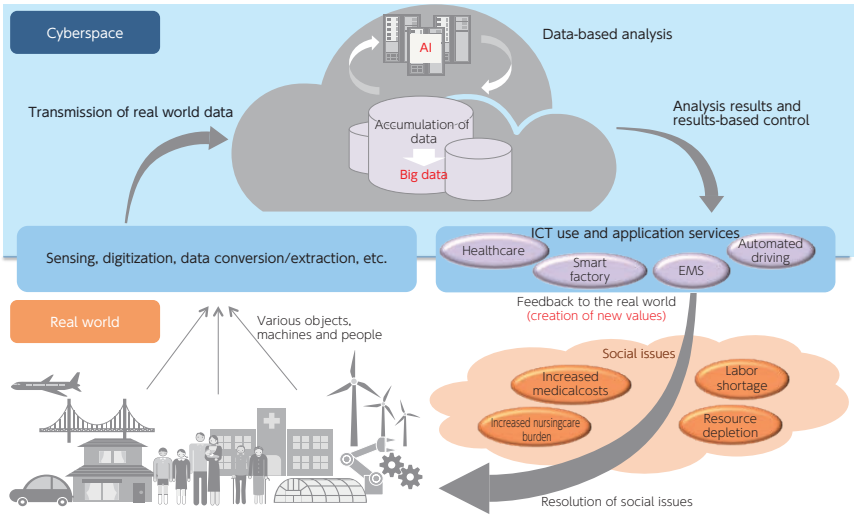
More specifically, IoT in the broad sense enables the realization of innovation in many different configurations: *process innovation* for the optimization of business processes at enterprises, *product innovation* for the development and provision of new goods and services that tap latent demand, *marketing innovation* connected to the design and marketing of goods and services, *organization innovation* for business practices and organiza-

Figure 1-1-2-1 AI categories and comparisons

	Description	Extraction of elements (features) to be detected	Discovery of connections between features
Second AI explosion (Knowledge representation) 1980s to around 1995	Information necessary for the computer to perform some inference or deduction must be notated as "knowledge" in a format the computer can recognize. Since humans couldn't possibly notate all the vast amount of information in the world for computers, AI applications were limited and the AI boom cooled off for a time.	Done by humans	Done by humans
Machine learning (in the narrow sense) Around 2000 to present	Machine learning, in a narrow sense, is technology in which humans teach the computer what elements are to be detected and then give the computer a large amount of data (numbers, text, images, voices, etc.). The computer then learns rules and knowledge on its own (i.e., the computer notates connections between elements and improves the accuracy of its deductions and decisions). Analyzing big data is 1 well-known application of machine learning.	Done by humans	Done by computers
Deep learning Around the mid-2010s to present	Deep learning is 1 technique of machine learning in the broad sense of the term. By extracting information 1 layer at a time across multiple layers, the computer is able to represent high levels of abstraction and discover on its own elements to be detected. Practical applications for deep learning are being pursued in speech recognition, image recognition, and natural language processing.	Done by computers	Done by computers

(Source) Table created based on "Study Report on ICT Evolution's Impact on Employment and Work Patterns," MIC (2016)

Figure 1-1-2-2 New values created by IoT, big data, and AI



(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

tional composition, and even *social innovation* that addresses social issues. In this way, too, IoT in the broad sense should contribute to the sustained social and economic growth of the nation.

Section 2 ICT Contribution to Economic Growth: Specific Contribution Paths and Case Example Analysis

In this section, we systematically organize, from both the supply side and the demand side of the economy, the paths by which ICT can possibly contribute to our nation's economic growth, taking the period to around 2020 as our timeframe. We include specific case studies as well as analyses of surveys on the current situations and future intentions of enterprises.

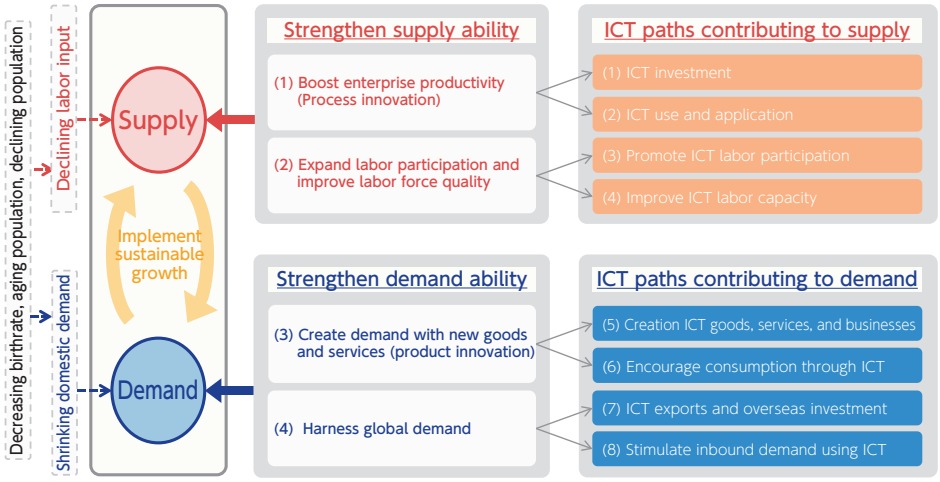
1. Systematic organization of ICT's potential contribution paths to economic growth

In this section, we provide a systematic description of ICT's economic contribution paths, based on the relationship between Japan's issues and addressing those issues established in the previous section (Figure 1-2-1-1).

2. Supply-side enhancements: (1) ICT's boost to enterprise productivity

Many observers have indicated how critical improving productivity is in a declining population. In the following paragraphs, we first verify the significance of ICT's boost to enterprise productivity, while referring to prior research and debate in this area, and then describe *ICT-related investment* and *application of ICT* as 2 specific economic contribution paths.

Figure 1-2-1-1 ICT paths contributing to the economy



(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

(1) Significance of ICT's boost to enterprise productivity

a. History of ICT investment by Japanese industry

The long period of growth by the U.S. economy in the 1990s has been attributed to the enlargement of capital investment, particularly ICT investment. The transformations during this period that rivaled the Industrial Revolution in scale were dubbed the ICT Revolution by some. In other words, the influence of ICT investment went beyond its direct impact on business conditions in terms of demand. It affected supply structures and contributed to increases in capital stock and total factor productivity (TFP).[1] As such, ICT investment has been pointed to as key in boosting labor productivity across the entire economy as well as raising the labor productivity, through the application of ICT, in ICT "user" industries.

Japan, on the other hand, remained sluggish throughout the lost decade of the 1990s after the collapse of the economic bubble. Capital investment did not accelerate or generate sufficient opportunities for future growth. A closer sector-by-sector examination by Fukao et al. (2015) found the Japanese ICT "maker" sectors experienced productivity growth widely surpassing that in the U.S. and other developed countries. Indeed, ICT turned into one of the most important industries driving the growth of the Japan economy since the 1990s. However, in ICT "user" industries (such as the distribution industry and service industry), ICT investment has not accelerated and productivity has languished.

Also of interest is that Japanese enterprises have largely used ICT investment as a means of boosting operational efficiencies and cutting costs. It has been pointed out Japanese enterprises have much lower expectations than their U.S. counterparts regarding ICT investment assisting with enhancing product and service development, transforming business models, applying new technologies, products, and services, and similar benefits. These differences in how ICT investments are approached may be why ICT investment in Japan has failed to increase added value the way it has in the United States.

b. ICT-driven productivity increases in the IoT era

Japan's Declaration to be the World's Most Advanced IT Nation states in its Basic Principles that "IT strategies are the pillars of growth strategies" and that "the society Japan should seek to become" is "a society that encourages the creation of new and innovative industries and services and the growth of all industries." In the IoT era, big data, and AI, which are expected to be used and applied in many fields, Japan must make use of past lessons and raise productivity by, namely, considering ICT-related investment and application of ICT as 2 sides of the same coin.

(2) ICT-related investment

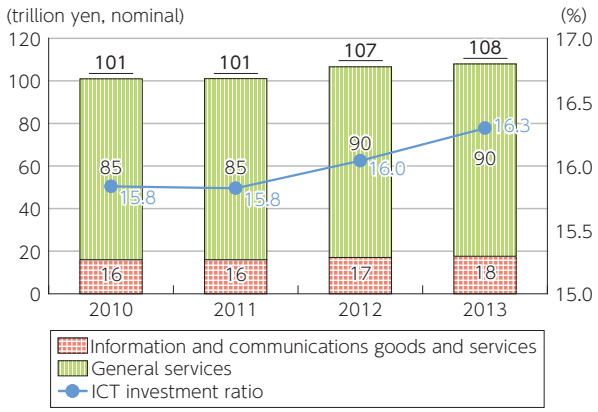
a. Overview of economic contributions

There is no general accepted definition of ICT investment's scope. In recent years, intangible investments have been singled out as a key factor in raising productivity. ICT investment certainly encompasses a wider range of things than just hardware.

For this chapter, we take ICT investment to comprise hardware, software, ICT services, and other aspects, which includes the assumptions used in the survey of enterprises. Looking at recent transitions in ICT investment finds a slight upward trend in overall (nominal) investment amounts, according to an analysis based on the ICT industry's input-output table. A breakdown of the figures shows a gradually increasing portion of this investment going to information and communications goods and services, reaching approximately 18 trillion yen in 2013 (Figure 1-2-2-1).

One change in ICT investment since 2000 has been a shift first from hardware to software and then to services. Results from questionnaires underscore this trend (Figure 1-2-2-2). In particular, the barrier to ICT investment has been lowered for many industries and SMEs in recent years, with further ICT commoditization — for example, falling unit costs for server storage — and the proliferation of cloud computing. In addition, virtualization and other technologies are pushing ahead processing power and quality and even contributing to produc-

Figure 1-2-2-1 Transitions in ICT investment amounts

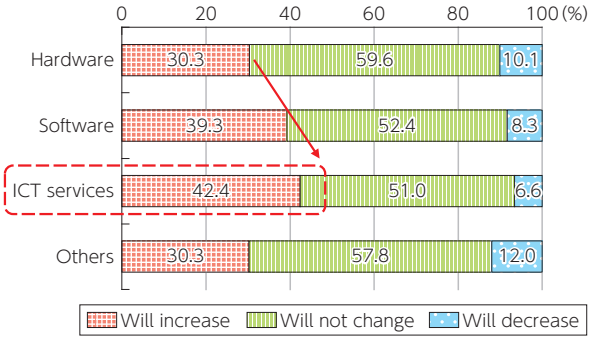


(Source) "ICT Industry's Input-Output Table Report for 2013," MIC

[1] Factors other than production factors (labor, capital) that contribute to increasing added value. Specifically, it includes technology progress, improvement of workers' skills, and improvement in business management efficiency or organizational management efficiency. See Section 3 for a detailed analysis.

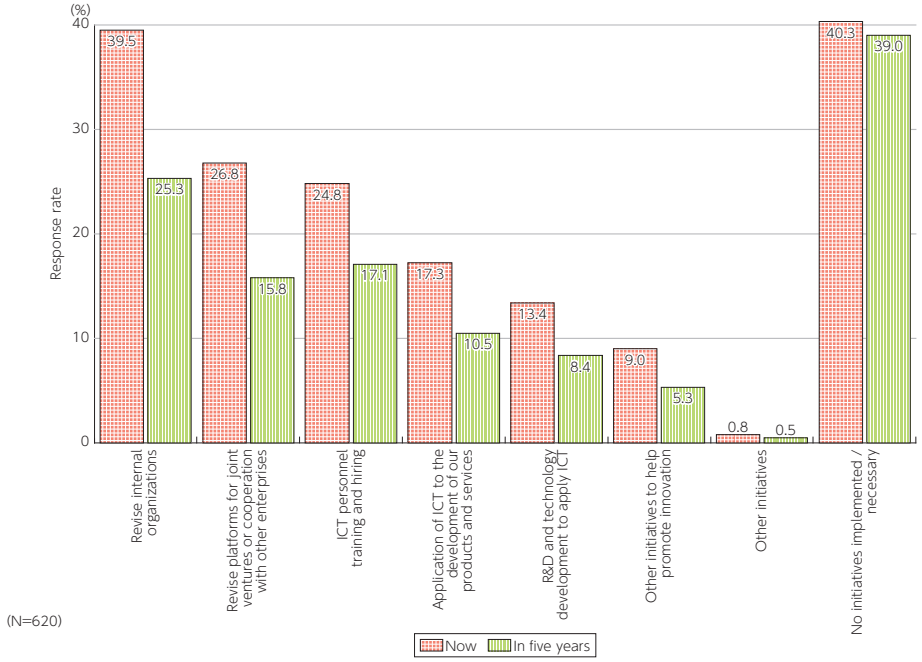
tivity gains. In a questionnaire query about initiatives to utilize ICT investments to make productivity gains, the top answer, from about 40 percent of the respondents, was "revise internal organizations," followed by "revise platforms for joint ventures or cooperation with other enterprises" and "train ICT personnel" (Figure 1-2-2-3).

Figure 1-2-2-2 Prospects for future ICT investment (by category of investment)



(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

Figure 1-2-2-3 State of initiatives to utilize ICT investments



(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

3. Supply-side enhancements: (2) ICT's role in expanding labor participation and improving labor force quality

ICT is giving people more diverse and flexible work options, such as telework, which has led to higher labor participation rates. ICT advances are also an important part of supplying the higher skills and labor quality employers demand. This paragraph's discussion of ICT's economic contributions in the labor sector are split into ICT's role in encouraging labor participation and ICT's role in improving labor force quality.

(1) ICT's role in encouraging labor participation

a. Overview of economic contributions

Labor shortages are one factor limiting our nation's economic growth. There are ongoing initiatives that rely on ICT to help promote labor participation. In the Declaration to be the World's Most Advanced IT Nation (Revised on June 30, 2015), the government indicates its intention to realize a society in which location-independent job opportunities are created, by making use of ICT services including cloud computing, thus providing a diverse and flexible choice of working styles according to the circumstances of individuals including young people and women, senior citizens, caregivers, and people with disabilities, and the content of their work, while continuous efforts are made to spread the concept of

telework through society, thereby ensuring a good work-life balance for workers and revitalizing local economies. As part of these efforts, the government also indicates its intention to promote "*furusato* telework" which allows people to work in local area where they live.

b. State of initiatives by enterprises and other organizations

We developed a general view of the state of ICT-based initiatives by enterprises to promote labor participation from the results of a survey given to domestic enterprises that participate as monitors. The most common initiative taken was "training ICT personnel," followed by "satellite offices." When asked about their intentions to launch new initiatives in the next 5 years, enterprises indicated they had high expectations for telework and several other initiatives. However, sector-specific results revealed that 1 challenge is to further promote telework among enterprises outside of the ICT industry (Figure 1-2-3-1).

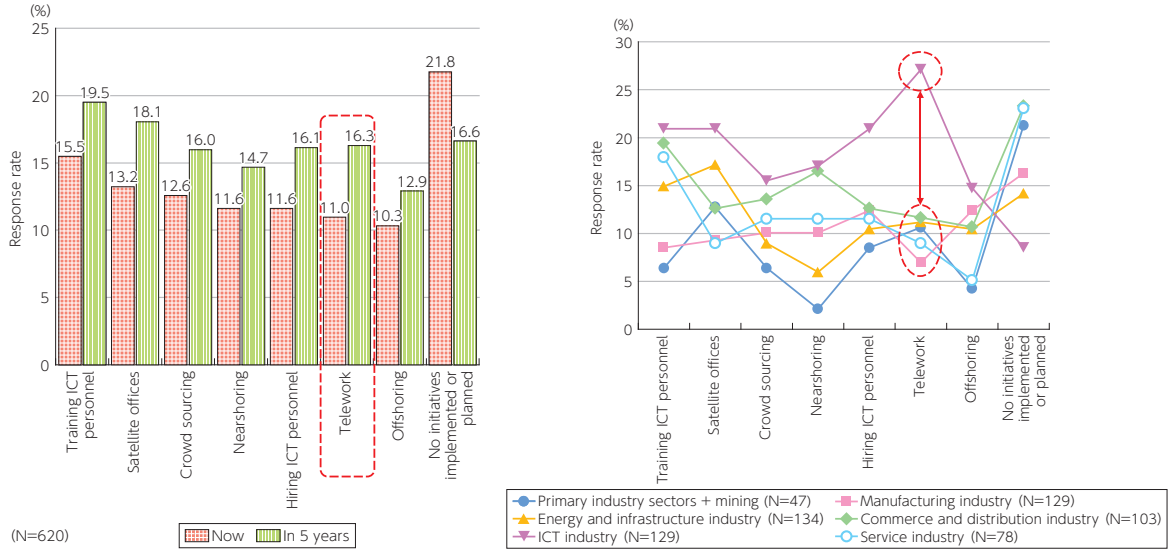
When asked about specific outcomes of these initiatives, more than 50 percent of the enterprises implementing initiatives (37 percent of all respondents) answered "diversification of working arrangements and workstyles." This result suggests ICT does contribute to working environment improvements and transformations. In addition, around 30 percent of the enterprises implementing initiatives said the initiatives helped "hire new employees," which suggests ICT does contribute to the expansion of job opportunities. How ICT can be used, in detailed and specific ways, to foster labor participation and counter the shrinking labor pool, which is a bottleneck to the long term growth of our economy, will be an increasingly important issue in the coming years.

c. Overview of economic contributions

Enterprises can reduce the amount of labor needed to generate the same levels of production and added value, and simultaneously boost productivity, by adopting and using robots, AI, and other forms of ICT. ICT adoption and application is expected to also help speed up work operations and improve accuracy. For example, in operations that require pattern recognition that computers excel at, substituting ICT and pairing skilled human capital with ICT will raise enterprise productivity and create employment for skilled ICT workers.

While ICT-driven labor force improvements are recognized to raise enterprise productivity, there are many theories on how ICT take-up will affect the status of employment. Nevertheless, the opinion that ICT is a main factor in the bifurcation of employment and will replace routine work operations has been verified repeatedly and is widely shared.

Figure 1-2-3-1 Enterprise initiatives to promote labor participation using ICT, and the promotion outcomes



(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

4. Demand-side enhancements: (3) Creating demand with new goods and services

Supply enhancements without shoring up demand will not foster economic growth. Weak demand is a serious problem for Japan's economy. Accordingly, the following paragraphs consider the creation of goods, services, and businesses, along with ICT-driven consumption, from the perspective of ICT creating and revitalizing new demand.

(1) ICT-derived goods, services, and businesses

a. Overview of economic contributions

ICT is the source of new market creation, as innovative goods and services are developed and marketed one after another. What sets ICT goods and services apart is, as each goods or service spreads extensively through the market for a time, new derivative goods and services are created that use the original product or service as a

platform. Repeating this process forms new markets at multiple tiers (Figure 1-2-4-1).

This cycle has been accelerated by the prevalence of smartphones, social media, and the cloud. On the down side, ICT-related goods and services are subject to sudden fluctuations. Finding ways to continually stimulate demand, including collaborations across industries and fields, will be required in the future.

b. Examples of ICT-derived goods, services, and businesses

Transformative mechanisms such as IoT, big data, and AI, which can be termed background technologies, are expected to have profound implications for industry as they reach markets. Here, we focus on examples of new ICT-derived goods, services, and businesses in the automotive, housing, and entertainment fields that are expected to have social impacts as well as make significant contributions to economic growth from the demand side.

Insurance telematics

Insurance telematics is integrated with communications systems on cars and other vehicles and collects and analyzes driving distances, behavior, and other data on individual drivers. These data are used to calculate the driver's auto insurance rates. Since insurance rates will be set to reflect precisely the relative riskiness of the driver's behavior, insurance telematics is expected to encourage safer driving and reduce accidents. Automakers and insurance companies are already working on insurance telematics services in Japan.

Connected cars

Connected cars have the functions of ICT devices, such as Internet connectivity. Road-to-car and car-to-car wireless communications facilitate advanced driving assistance functions, such as automated driving, and provide many kinds of data, such as the car's operational status and the surrounding road conditions. Aggregating and analyzing these data is expected to create new services and value. Development of connected cars in Japan is proceeding under a Strategic Innovation Promotion (SIP) program, which assists cutting-edge research. Automakers and others are moving ahead with developing technologies and testing connected cars.

Smart homes

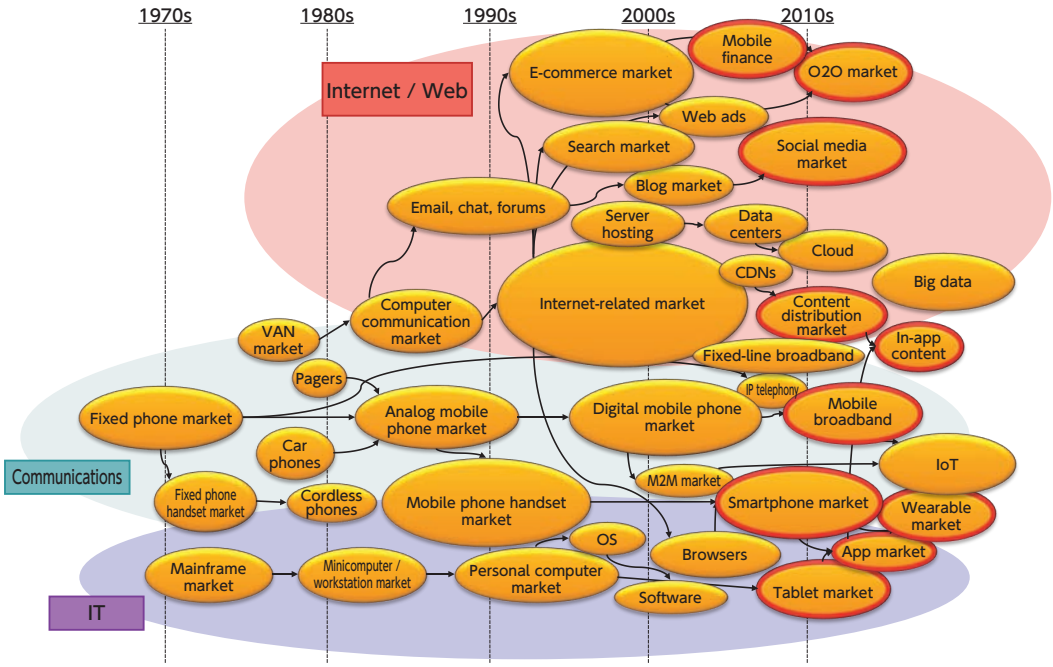
Smart homes, which integrate ICT with houses, can provide more comfortable living conditions for people. Smart homes boost energy efficiency and conserve electricity by adjusting the supply and demand of energy as well as monitor the home and prevent crime with sensor arrays and enable remote control of household appliances. Communications carriers and homebuilders in Japan are collaborating on various smart home projects.

c. Benefits from ICT's economic contributions

What levels of demand generation benefits can be expected from ICT advancement? Focusing on new services and applications anticipated to appear by around 2020 in all ICT areas, not just the examples given above, we measured and estimated the intention of consumers to use paid services and applications and how much they are willing to pay based on the results of a survey given to consumers. From this survey, we estimated the demand generation effects to total approximately 1.8 trillion yen in direct annual contributions across all markets (Figure 1-2-4-2).

Further analysis based on the ICT industry's input-output table found the induced production value to be approximately 4.1 trillion yen and the added value total to be approximately 2.0 trillion yen, when secondary spillover effects, including income effects, are accounted for.

Figure 1-2-4-1 Development of ICT services



(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

(2) ICT-driven consumption

a. Overview of economic contributions

Personal consumption accounts for roughly 60 percent of Japan's GDP. However, business conditions and economic growth is susceptible to personal consumption. In this context, to what degree can ICT promote consumption? The following paragraphs look at the paths of ICT's contributions, along with an outline of recent trends.

b. Growth of Internet shopping and electronic money

Internet shopping is often cited as *the* ICT service that drives consumption. The online shopping market has expanded rapidly with improved convenience, thanks to the provision of broadband connectivity and more and easier payment methods. The Survey of Household Economy indicates the percentage of households purchasing goods online has risen over time, as has the amount spent per household (Figure 1-2-4-3). Furthermore, mobile devices are increasingly being used for Internet shopping, supplanting computers, which used to be the primary online shopping device.

c. Examples of initiatives using ICT to promote consumption

The O2O (Online to Offline and Offline to Online) concept has become established in recent years. O2O focuses on correlating Internet spaces with stores and other real world spaces (Figure 1-2-4-4). Interest is strong in O2O marketing, coupled with trends in IoT and big data, which makes use of analyses of customer information and POS data. Effective sales promotions can be realized by mining buried information beyond what products are the best sellers (for example, information on products with high repeat purchase rates and information on products that correlates highly with other data).

As O2O services utilizing big data, location information, and smartphone apps are developed and released for various consumers, the services are expected to encourage consumption and facilitate matching of supply and demand.

d. Effect of ICT's economic contributions

We used a consumer survey to examine changes in the overall expenditures by consumers on shopping and other routine purchases before and after taking up Internet shopping. Just under half of the respondents (43 percent) said their expenditures increased. The weighted average of the expenditure changes among all respondents worked out to a 12 percent increase (Figure 1-2-4-5).

We calculated the annual economic effect of Internet shopping by multiplying the average amount spent on household consumption items available online with the increase in household spending calculated above. The direct benefits were estimated to be about 7.4 trillion yen, the induced production value to be approximately 14.2 trillion yen (accounting for secondary spillover effects, including income effects, based on the ICT industry's input-output table), and the added value total to be about 8.7 trillion yen. These figures indicate ICT-driven consumption provides significant economic effect from the perspective of demand stimulation.

Figure 1-2-4-2 Economic effect estimates

	Potential users*1		Percentage intending to use paid services*2		Amount willing to pay (monthly, in yen)*3		Economic effect (direct impact, billions of yen)
Connected cars (with insurance telematics)	51.84 million households	×	13.4%～13.7%	×	661 - 692	=	56.3 - 57.7
Connected cars (with automated driving functions)	51.84 million households	×	18.3%～19.1%	×	918 - 1,030	=	104.5 - 119.8
Smart homes (with energy features)	51.84 million households	×	12.2%～13.0%	×	1,732 - 1,913	=	131.4 - 154.7
Smart homes (with monitoring features)	51.84 million households	×	17.1%～18.1%	×	1,685 - 1,734	=	183.4 - 189.9
Wearable services	47.18 million (smartphone users)	×	13.4%～13.5%	×	613 - 617	=	46.5 - 47.1
Wearable devices					15,000		100.7 - 101.4
Service robots	33.28 million households (households owning smartphones)	×	10.9%～15.5%	×	16,693 - 16,995	=	377.1 - 564.9
Personal or household ICT education services	33.28 million households (households owning smartphones)	×	15.7%～15.6%	×	448 - 468	=	28.1 - 30.4
Personal or household ICT medical services	33.28 million households (households owning smartphones)	×	15.7%～16.5%	×	1,085 - 1,159	=	71.5 - 72.7
Personal ICT financial services	47.18 million (smartphone users)	×	9.9%～13.3%	×	645 - 797	=	42.6 - 48.6
Ultra HD video streaming services	51.84 million households	×	17.3%～18.5%	×	337 - 359	=	38.5 - 38.8
Sharing services	47.18 million (smartphone users)	×	8.8%～12.8%	×	300	=	14.9 - 21.7

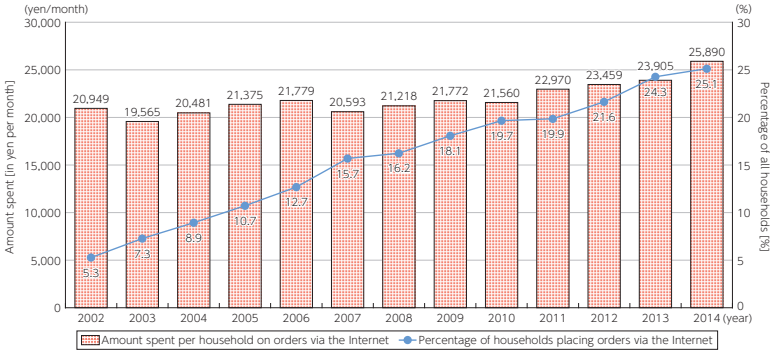
*1. This column is the potential user base (households / individuals) according to the nature of the service or application. When services and applications are expected to work with smartphones or other devices, the potential user base is limited to those users.

*2. These figures are based on a survey given to consumers. (The upper and lower figures are the result of multiple functions presented to the respondents.)

*3. These figures are based on a survey given to consumers. For connected cars, ICT education, ICT medical, and ultra HD video streaming services, respondents were asked by what percentage their expenditures would increase from their current household expenditures on the same service or application. The figures here were calculated by multiplying expenditures by this percentage.

(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

Figure 1-2-4-3 State of online expenditures



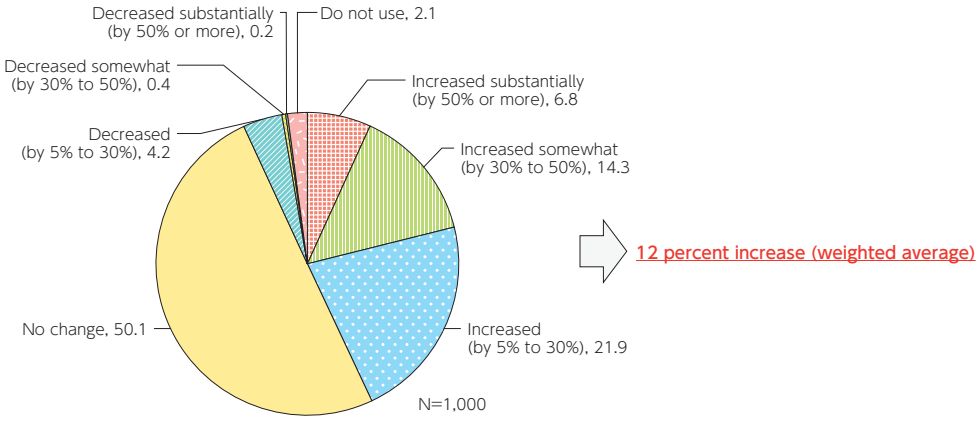
(Source) "Results of the Survey of Household Economy," MIC

Figure 1-2-4-4 020 categories and examples

O2O categories	Description	Examples
Online coupons	- Encourage store visits by providing discount coupons via apps or websites - Technological advances allow coupons to work even more effectively as promotional tools, such as pushing nearby shop information to users based on their location	- Muji Passport by Mujirushi Ryohin - Premium Outlet Shopping Navi by Ami Premium Outlets - Tamachi Granpark App by Granpark plaza
Store visit points / check-ins	- Apps and services that automatically give points or other incentives to customers who visit stores - Store visits are detected using location information from beacons, Wi-Fi, or GPS	- tamecco by Yoshinoya - Shoplat by Atre
Games and gamification	- Uses the location information of users enjoying a game as a means to promote store visits - Game design techniques and structures are re-purposed for sales promotions	- Ingress by Lawson - Nyanko Presidente! by Tsutaya - Keitai Kunitori Kassen by Toyota Rental Cars
Omnichannels	- A concept that approaches consumers in any location, both online and offline, that removes barriers and interconnects online sales channels and bricks-and-mortar sales channels, which conventionally sell independently	- omni 7 by Seven - & i Holdings - Isetan Navi by Isetan's Shinjuku store
Social gifts	- Encourage store visits with a social media gift service that allows social media users to give each other coupons and other perks - Social media is also used to spread word-of-mouth	- Starbucks eGift by Starbucks Coffee

(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

Figure 1-2-4-5 Changes in everyday household expenditures before and after starting online shopping



(Source) "Study Report Analyzing User Attitudes on New Forms of ICT in Different Countries in the IoT Era," MIC (2016)

5. Demand-side enhancements: (4) Capturing global demand

Actively harnessing overseas demand will be essential to our economic growth over the mid-to-long term. Aggressive global expansion by the ICT industry will be a key component in capturing overseas demand for the entire economy, including the knock-on effect for other industries. Expectations are also mounting for inbound

demand generated by attracting overseas visitors, which includes such measures as hosting the 2020 Tokyo Olympic and Paralympic Games. In the following paragraphs, we detail 2 paths along which ICT makes economic contributions: ICT product and service exports and overseas investments and ICT-driven growth in inbound demand.

(1) ICT-related exports and overseas investments

a. Overview of economic contributions

Overseas expansion by enterprises generally refers to exports (trade), investments, business partnerships, and other forms of transactions (Figure 1-2-5-1).

Enterprises usually select the best form of overseas expansions for them, in view of the nature of their business and types of transactions as well as their productivity and other factors. Certain types of overseas expansion tend to be used for certain product and service areas. For example, exports (trade) are the mainstay of manufacturing industries, whereas commerce and service industries more often utilize investments.

Given the inevitable waning of domestic demand, Japanese enterprises, regardless of their industry or size, are viewing overseas markets as survival routes. This is true of enterprises outside of industries, such as manufacturing industries, with a history of overseas expansion, and even extends to such domestic-demand-centric fields as distribution, services, and construction.

Among ICT enterprises, direct investment is the most common form of overseas expansion in all layers, but exports are also used relatively frequently, at 57.1 percent, in the device layer (Figure 1-2-5-2). The ICT industry, in particular, because of its inherent economies of scale, leans toward the formation of oligopolies. Therefore, given rapid globalization, whether or not a company expands globally has a profound influence not only on business enlargement but also on competitiveness. For this reason, many global ICT enterprises aggressively expand overseas using a variety of means, particularly direct investment.

But does this kind of overseas expansion really have positive benefits for the domestic economy? Kimura and Kiyota (2003) and Fukao and Amano (2004), for example, have made clear, from analyses of individual Japanese enterprises' financial data, that foreign-owned enterprises have higher TFPs than domestic enterprises. According to a RIETI study (2009) that analyzed the impact of globalization at Japan's largest enterprises on the domestic economy, overseas expansion strengthened the enterprises' businesses as well as lifted domestic production. These effects occurred regardless of whether the expansion was directed into developed countries or developing countries. The study also demonstrated that overseas expansion stimulated production activities, especially in terms of expanding employment and production value. And according to the results of another analysis by RIETI (2012), overseas expansion by manufacturing industries, the wholesale sector, and the service industry boosted employment in every case. The analysis calculated that manufacturing industries' overseas expansion pushed up the employment growth rate by about 12 percent, whereas a 9 percent hike was seen in the wholesale sector and the service industry.

b. Overseas expansion trends and examples

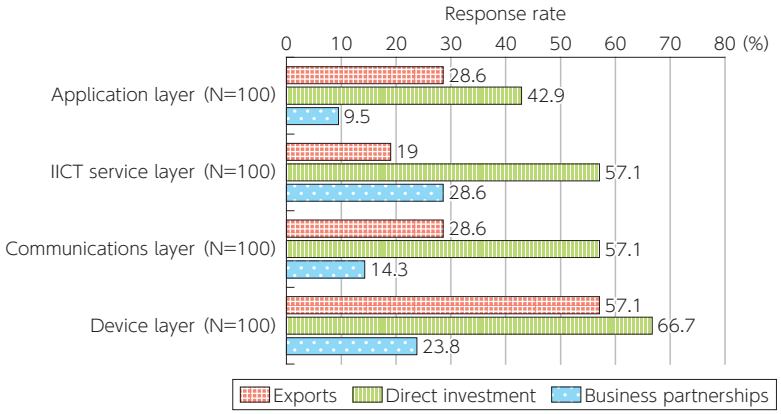
The following paragraphs give examples for each of the main forms of overseas expansion related to ICT: namely, exports, direct investments, and business part-

Figure 1-2-5-1 Categories of overseas expansion

Category		Description	Remarks
Exports (trade)	Direct exports	Trading arrangement where goods are exported directly to overseas customers	Though this refers to transactions of tangible goods, there are also transactions of intangibles such as trade in services and technology trades
	Indirect exports	Trading arrangement where exports are made via a trading company or other third party (including countries difficult to export to)	
Investments	Direct investments	The purpose is to control, or participate in, the management of the company receiving the investment. Methods include investing 100 percent of funds to set up a new company in the country receiving the investment (greenfield investments) or acquiring an existing company (M&A)	Investments can be broken down into full ownership (100% financing) or joint financing with an overseas company, from the view of the financing ratio, and into investment in the same industry or investment in a different industry, from the view of the investment target
	Indirect investments	The purpose is to secure income through interest, dividends, or sales proceeds without intervening in management	
Business partnerships		The completion of a business operations cooperation agreement with an overseas company for a specific field or business domain	Examples include technology development / involvement, production, resource procurement, logistics, personnel exchanges, and sales promotion

(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

Figure 1-2-5-2 Primary forms of overseas expansion in each ICT layer



(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

nerships.

(i) Exports

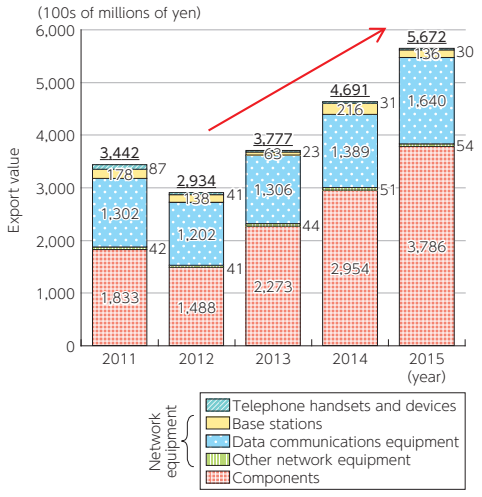
ICT-related exports in general are the export of ICT equipment and related products. In the four years since 2012, exports of ICT equipment have expanded at a solid pace, according to transitions in exports put together by the Communications and Information network Association of Japan (CIAJ) based on foreign trade statistics. The main factors responsible for this growth have been components, followed by data communications equipment (Figure 1-2-5-3). By region, it is clear exports to Asia have soared since 2012 (Figure 1-2-5-3). From these findings, we surmise the ongoing proliferation of ICT equipment (mobile phones, for example) in Asian markets is driving the growth of Japanese ICT components.

(ii) Direct investments

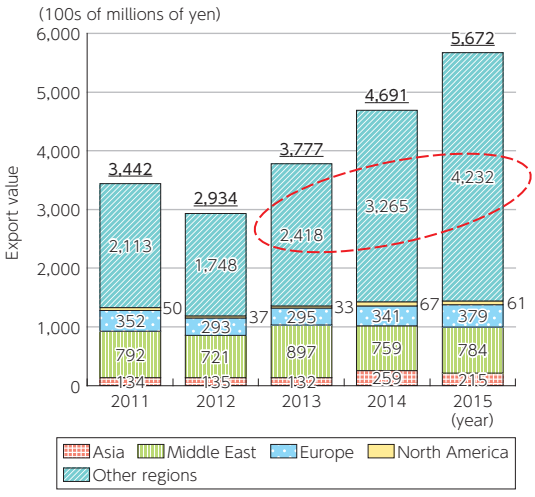
Corporate acquisitions (M&As) are the primary means of direct outward investment. From the purchaser's side, M&As are used for a variety of purposes and goals, such as expanding a business or gaining a larger market share, diversifying or fortifying a business, entering new business domains, markets, or regions, extending into upstream or downstream layers, and moving into adjacent industries. M&As are increasingly prized by the ICT industry because of dramatic market transformations and deep-seated connections with other industries, especially industries that make use of ICT.

Let's look at some M&As by Japanese ICT firms. The NTT Group has been moving into a number of countries in the world while aggressively pursuing corporate takeovers in the ICT services and solutions field. The Group's recent acquisition of an ICT services provider from Dell in the United States is being watched as the Group expands into the U.S. market. The KDDI Group is entering the mobile phone business in Myanmar through a joint business with the Sumitomo Corporation and Myanmar Posts and Telecommunications (MPT). The SoftBank Group purchased Sprint Nextel, the No. 3 mobile carrier in the United States, in July 2013. As these examples highlight, large ICT enterprises are moving into overseas markets, including ICT service markets, with high growth rates, either by setting up local subsidiaries or through M&As.

Figure 1-2-5-3 Transitions in ICT equipment exports (by product category and by destination)



(Source) Communications and Information network Association of Japan (CIAJ)



(Source) Communications and Information network Association of Japan (CIAJ)

(iii) Business partnerships

Business partnerships involve entering into a production or sales outsourcing contract and having the contractor either manufacture or sell your products. The advantage of such arrangements is the low risks when expanding business operations or when considering withdrawing from the business.

Business partnerships are often selected when an enterprise lacks knowledge about the overseas business, is unable to raise sufficient capital for direct investment, or lacks proof the business is sustainable over the mid-to-long term. Collaborations between enterprises are increasing in the ICT field, partly because standardized technologies and systems often transcend national borders and barriers between enterprises (Figure 1-2-5-4).

(2) Applying ICT to stimulate inbound demand

a. Growth of ICT-driven inbound demand

With a declining population and limited growth markets, consumption by overseas tourists (inbound demand) has important significance in mid-term economic growth scenarios. The numbers of overseas visitors has skyrocketed in recent years due to relaxation of tourist visa requirements and the trend toward a cheaper yen (Figure 1-2-5-5). Spillover effects from inbound demand are expected to show up in other industries, such as manufacturing and the wholesale sector. The application of ICT is a necessary part of promoting inbound tourism and widening inbound demand.

When gathering information before coming to Japan, overseas tourists find personal blogs, travel portal sites, and accommodation websites useful. In the interest of having in-country travelers access these information sources and providing compelling information about local regions, secure and convenient free public Wi-Fi services play an important role and are strongly in demand by overseas tourists.

Information provision in general is an effective means of stimulating demand, because it appeals to potential travelers to Japan as well as aiding in-country travelers. It is possible today for many entities to provide information from Japan's many regions via the Internet, broadcasting, and other forms of media. Broadly disseminating information about the attractions of Japan's regions to the world is expected to increase inbound tourism, in addition to providing substantial stimulus to regional economies.

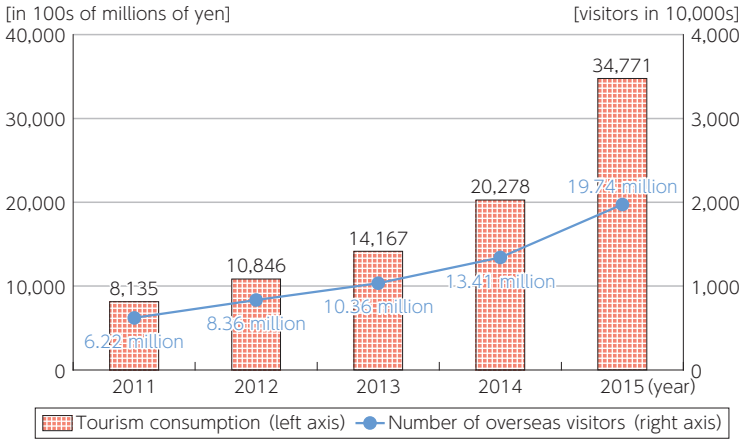
We anticipate other state-of-the-art initiatives exploiting Japan's advanced ICT to appear. One area is the provision of multiple payment methods such as electronic money, credit card terminals, and payment apps. Another is applying big data on consumption patterns to study and analyze tourism trends and to plan tourism. And a beneficial means to eliminate language barriers is making available multilingual tourism apps with tourism information and maps as well as multilingual interpretation and translation apps.

Figure 1-2-5-4 Examples of business partnerships with overseas enterprises by ICT enterprises

Japanese enterprise	Partner enterprise	Country	Summary
Information Services International-Dentsu	Indocyber Global Technology	Indonesia	Information Services International-Dentsu entered a business partnership with PT. Indocyber Global Technology, which has developed an IT business in Indonesia, via its subsidiary, PT. ISID Indonesia, and has started providing Lamp, a core business system for leasing and financial businesses, to local enterprises in Indonesia.
International Technology Center	Titan Technology Corporation	Vietnam	The companies aim to develop markets in Japan and the Southeast Asia region by establishing innovation centers in both countries and jointly constructing new cutting-edge and competitive business models. International Technology Center is also moving ahead with offshore development in Vietnam.
Human Holdings	Ace Plus Solutions Ltd.	Myanmar	The business partnership has started offshore IT operations for website and app development. The companies are constructing a business platform extending from personnel supply and support to website and app development.
NTT	e-shelter	Germany	NTT has partnered with Germany's largest data center operator. NTT's aim is to strengthen its competitiveness in Europe.
SoftBank	PT Tokopedia	Indonesia	SoftBank invested 100 million dollars in PT Tokopedia, the largest EC site in Indonesia, to enter the fledgling Indonesian EC market.
SoftBank	Snapdeal and Ola	India	SoftBank invested about 67.7 billion yen in Snapdeal, a large Indian online retailer, becoming Snapdeal's largest shareholder. SoftBank also invested in Ola, an operator of a taxi-dispatching platform. SoftBank is looking to strengthen its business in India, where the EC market is forecast to expand.

(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

Figure 1-2-5-5 Transitions in inbound demand



(Source) Consumption Patterns of Overseas Visitors, Japan Tourism Agency, and Transitions in Inbound Tourists, JNTO

b. Examples of initiatives by enterprises

The following paragraphs give examples of enterprises using ICT to stimulate inbound demand.

(i) Initiatives by ICT enterprises

Toshiba, in partnership with Toshiba Tec, launched an end-to-end inbound service in November 2015. An ICT-based promotion and customer service tool for businesses that deal with overseas tourists, the service runs on Toshiba ICT and Toshiba Tec's POS systems and duty-free processing and multiple-payment services. By integrating these systems with data on overseas tourists' consumption patterns and purchases, Toshiba's service handles out-of-country promotions to tourists before they come to Japan, sightseeing excursions while traveling in Japan, and duty-free sales procedures and payment services when travelers make purchases. The benefits of the service for businesses are simplified operations (lower costs) and enhanced promotional capability, while providing useful information and convenience to travelers.

(ii) Initiatives by ICT user enterprises

Enterprises that use ICT but are not ICT enterprises themselves are looking at how to use ICT to provide ICT-based services and applications and to promote efficient collaborations between different industries (Figure 1-2-5-6).

Figure 1-2-5-6 Examples of ICT-based inbound strategies taken by enterprises that apply ICT

Field	Examples
Manufacturing	A trend seen among manufacturers is making capital investments to retool domestic factories in order to provide more made-in-Japan products. For example, Kosé is spending some 6 billion yen to build a new production wing at its Gunma plant in Isesaki that will be completed by 2017. The added production facility will enable Kosé to ramp up production of its mid-price and luxury makeup cosmetics to meet future sales growth.
Travel	The inbound tourism travel company HAnavi was established in November 2014 by H.I.S. and ANA to take advantage of their complementary strengths: H.I.S.'s network of overseas branches and its domestic hotel reservation system and ANA's ability to deliver customers to H.I.S. The company started operations in April 2015. HAnavi addresses many overseas travelers' needs by enabling them to mix and match ANA's 115 domestic routes to 51 cities with hotels around the country via H.I.S.'s Sumayado hotel reservation site.
Transportation	Tokyo Metro is planning to install free Wi-Fi services for overseas guests in all stations and on all trains. (Wi-Fi had been installed at 108 stations as of March 2016.)
Retailing	In response to the expanded scope of products exempt from consumption taxes on October 1, 2014, department stores, supermarkets, mass electronics retailers, and other large retailers made enhancements to their stores to better serve overseas travelers, such as free public Wi-Fi installations and upgraded POS systems that simplify duty-free sales transactions. For example, Aeon, a large retail chain, added selections for English, Chinese, and Korean, as well as Japanese, to its in-store touch panels and posted multilingual in-store signage and directions and currency exchange information (Aeon Bank). The retailer also ran store-visit promotions, such as distributing coupons at 200 Aeon stores throughout Asia.

(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

Section 3 ICT Contribution to Economic Growth: Quantitative and Comprehensive Verification

1. ICT contributions to economic growth

(1) Economic growth based on an ICT growth scenario

Using macro production functions, we attempted to answer the question: how much will aggressive investment by ICT enterprises accelerate the latent economic growth rate by around 2020? We verified our estimate by comparing 2 scenarios: a baseline scenario that assumes the future economy will transition at the current latent economic growth rate, and an ICT growth scenario that focuses on developments in IoT, big data, AI and other new forms of ICT that will stimulate ICT investment and productivity improvements by enterprises (Figure 1-3-1-1).

The estimates found the ICT growth scenario will add 0.7 percent to real capital investment and 0.5 percent to the employed population by 2020. Furthermore, total factor productivity (TFP) rose to 1.8 percent from 1.1 percent under the baseline scenario. These additions are predicted to expand the real GDP by 2020 by 33.1 trillion yen (+5.9 percent) (Figure 1-3-1-2).

Figure 1-3-1-1 Scenario assumptions and calculation methods

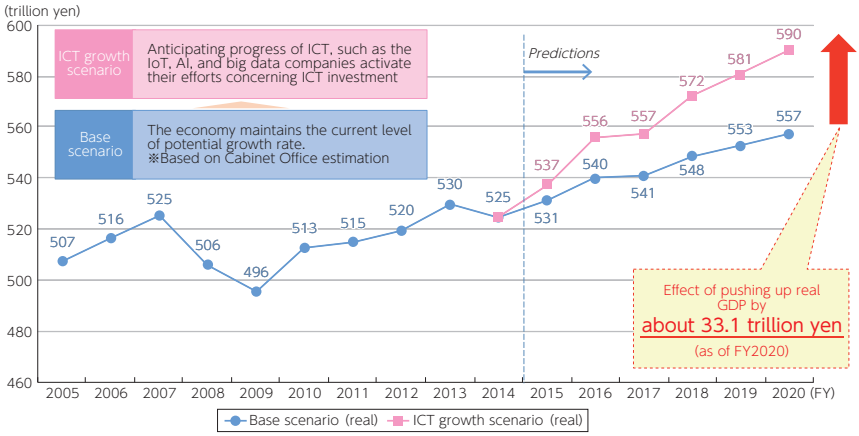
Indicator	Baseline scenario	ICT growth scenario
Approach and references	The baseline scenario assumed the real GDP growth rate from the Cabinet Office's estimated baseline case.[2] In this estimate, the future economy is assumed to transition at the current latent economic growth rate. Using this rate, the real economic growth rate over the mid-to-long term will be just under 1 percent and the nominal growth rate will be around 1.5 percent. The baseline scenario takes into consideration the planned consumption tax rate hike (from 8 percent to 10 percent) in FY 2017.[3] The real GDP growth rate from FY 2015 on was broken down into labor contributions, capital contributions, and TFP contributions for each industry using the calculation methods described below.	The ICT growth scenario was estimated using findings from a survey given to enterprises (covering all industries except public services). After finding specific economic contributions from ICT, the survey looked at how much ICT investment, worker numbers, and labor productivity will change at each enterprise by FY 2020. This scenario also takes into consideration the planned FY 2017 consumption tax rate hike.
(1) Labor contributions	The employed population growth rate from FY 2015 on was set in accordance with 2020 forecasts in labor supply and demand estimates (Progressive Labor Participation Cases: Realistic Scenarios) by the Japan Institute for Labour Policy and Training (JILPT). Note that the labor allocation rate was calculated after dividing, as added value, "operating surpluses and mixed income + employee compensation" from the SNA input-output table (FY 2013).	The scenario assumed that the FY 2020 employed population will increase from the baseline by the rate of increase in the employed population as calculated in the survey of enterprises above.
(2) Capital contributions	Capital contributions were calculated in reference to the "real net capital stock by sector" from the JIP database. The calculation assumed the real capital investment growth rates and capital stock removal rates for each industry would continue at their average values since FY 2010.	Capital contributions were calculated by applying the increase in ICT investments to the real capital investments in FY 2020 (the product of the ICT investment increase rate and the proportion of ICT investment).
(3) TFP contributions	TFP contributions were calculated as the residual value of labor contributions and capital contributions.	Assumed that the FY 2020 TFP will increase from the baseline by the rate of increase in labor productivity as calculated in the survey of enterprises above (with adjustments for the effect of capital stock).

(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

[2] "Economic and Fiscal Projections for Medium to Long Term Analysis" (submitted by the Council on Economic and Fiscal Policy on January 21, 2016).

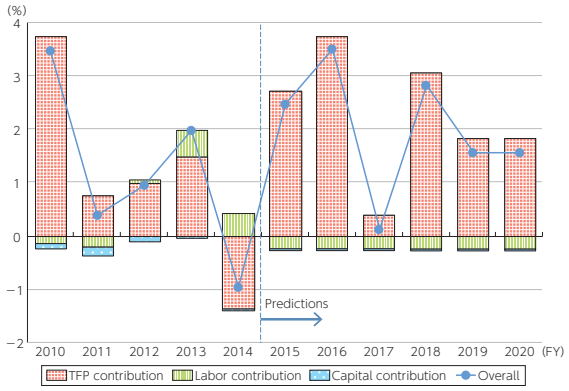
[3] Prime Minister Abe announced at a June 1, 2016 press conference that the increase in the consumption tax from 8 percent to 10 percent would be postponed by 30 months to October 2019.

Figure 1-3-1-2 Real GDP boost under the ICT growth scenario



(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

Figure 1-3-1-3 Breakdown of growth factors (ICT growth scenario)



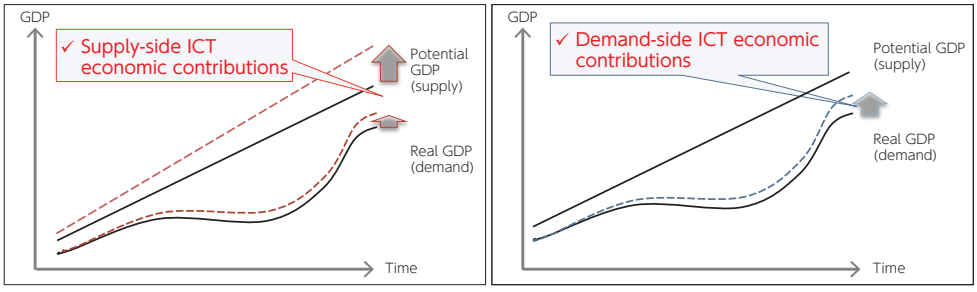
(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multilevel Contributions to Economic Growth," MIC (2016)

2. Suggestions taken from the verification results

The primary effect of the economic contributions from future ICT advancements will be a rise in productivity in all industries, according to an analysis of enterprise expectations for ICT. The effects from ICT-related capital investment and labor uptake will be small in comparison. However, with growing recognition of the benefits of IoT, big data, AI, and other new forms of ICT, the consciousness of enterprises will change, leading to more active investment in these areas. This, coupled with policy initiatives promoting the further application of these forms of ICT, is anticipated to prompt more capital investment and provision of related services and, thus, magnify the aforementioned effects.

On the other hand, ICT development spurs supply-side enhancements that do not require large amounts of labor. There is concern of supply-only growth with little corresponding growth in demand. If the application of ICT, however, generates the kinds of demand outlined in the previous section (EC, inbound demand, etc.), then well-balanced growth is possible — i.e., supply-side enhancements that do not exacerbate the negative gap between potential GDP and real GDP (Figure 1-3-2-1).

Figure 1-3-2-1 Image of ICT economic contributions (stronger potential supply with corresponding demand)



(Source) "Study Report on a Structural Analysis of the ICT Industry in the IoT Era and Verification of ICT's Multifaceted Contributions to Economic Growth," MIC (2016)

Section 4 Multifaceted ICT Contribution to the Economy and Society

This section reconsiders ICT from the perspective of non-monetary values. ICT is distinguished by having introduced digital platforms, exponential increases in performance, and cloud platforms. Thanks to ICT advances, people can today exchange huge amounts of information for little cost, and the influence on people of ICT advances, and its value, is still growing.

If enterprises and consumers are considered separately, we can say that existing statistics measuring enterprise activities reflect the eventual value of ICT to enterprises. On the other hand, ICT's value to consumers has aspects that existing statistical measures cannot capture. For instance, the value to consumers of Internet content, search services, and review sites that are provided for free or almost for free is not fully expressed in terms of monetary value alone. In this section, we focus primarily on consumers and investigate the non-monetary value brought by ICT in 3 areas: *consumer surplus*, *economy of time*, and *information assets*. We also look at what kind of implications this non-monetary value will have for society and our lives in the future.

1. Diversity of ICT social and economic contributions

(1) Efforts to devise indicators of well-being in place of GDP

In November 2007 the European Commission, European Parliament, Club of Rome, OECD, and WWF held an international conference called Beyond GDP. Beyond GDP has since become an initiative to build indicators that properly assess progress and measure well-being. Specific "beyond GDP" efforts are the OECD's Better Life Index and Measuring National Well-being in the United Kingdom. These efforts list indicators thought to contribute to social well-being.

2. Non-monetary social and economic changes brought by ICT

In the following paragraphs, we provide examples and survey analyses for the 3 types of non-monetary value — consumer surplus, economy of time, and information assets (reviews) — ICT gives to consumers.

(1) Consumer surplus

a. Analysis of survey results

As an example of ascertaining consumer surplus quantitatively, we estimated how large a surplus consumers enjoy by using music and video streaming services (Figure 1-4-2-1). The survey asked users how much they would be willing to pay and how much they actually pay for the services. The difference between the two was found as the consumer surplus. The average amount users in their 20s paid per month was about 146 yen. Based on this figure, the consumer surplus per person was estimated to be 204 yen per month.

Users enjoyed a surplus between about 150 and 200 yen per month depending on the age bracket (Figure 1-4-2-2). Users in their 20s benefited from the largest surplus; those in their 30s and 40s, the smallest. For users over 50, the higher the age, the larger the surplus tended to be. Using the monthly per-person consumer surplus, we estimated the annual consumer surplus for the country (Figure 1-4-2-2). The specific calculation was the Internet user population x the usage rate of music and video streaming services x the monthly per-person consumer surplus x 12. Using this formula, the annual consumer surplus was estimated to be around 110 billion yen.

(2) Information assets (reviews)

a. Examples

(i) Review sites

Review sites compile and provide information on prices, reputations, specifications, and other aspects of many goods and services. Typically, users of the sites compare prices at different stores and post reviews, and users can look at comments from other users and ask and answer questions. As more reviews are posted on the sites, the amount of ratings on stores and services increases, consumers can compare goods and services more readily and accurately, and competition between goods and services in the same categories increases.

(ii) Online auctions

Online auctions let consumers conveniently buy and sell things with other consumers anytime anywhere. Auction sites provide incentives for honest and fair transactions by allowing sellers and buyers to rate each other after a transaction. Users can also see other users' past ratings before starting a transaction, helping them to decide whether to proceed with a transaction. There are also mechanisms for buyers to ask sellers questions. Together, these functions allow consumer-to-consumer (C2C) transactions to take place with an assurance of trust.

(iii) 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 select and use services that meet their preferences from a wide range of services without having to own the assets. For the sharing economy to function, there has to be an assurance of trust between the parties. Services have been making efforts, such as letting lenders and renters rate each other and view past ratings and combining ratings with other information, to ensure trust and to improve matching between lenders and renters.

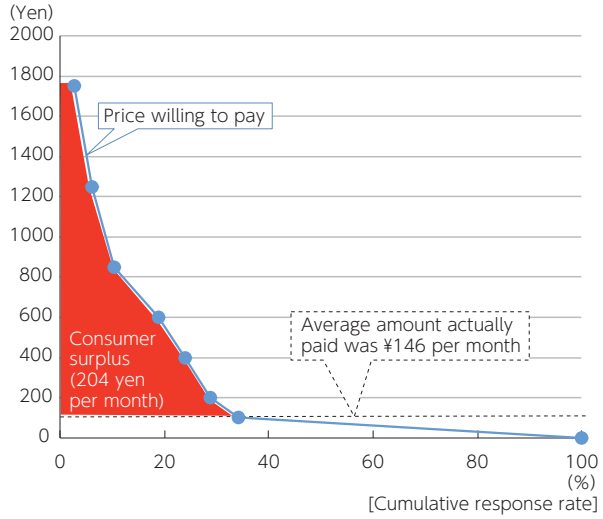
Review-based services continue to get more sophisti-

cated, as seen in the order of emergence of review sites, online auctions, and the sharing economy. Review mechanisms are being innovated, while also being affected by advances in ICT applications, so they can be applied to a more diverse range of transactions and to add more value to transactions through matching and other means.

b. Analysis of survey results

A survey was used to ask users of Internet shopping sites, as an example of word-of-mouth and review services, how much they valued reviews when shopping (Figure 1-4-2-3). More than half of the respondents in every age bracket said they valued the reviews to some

Figure 1-4-2-1 Estimate of the monthly consumer surplus per person from music and video streaming services



(Source) "Study Report on ICT Contributions to Social Well-Being Not Seen in GDP"

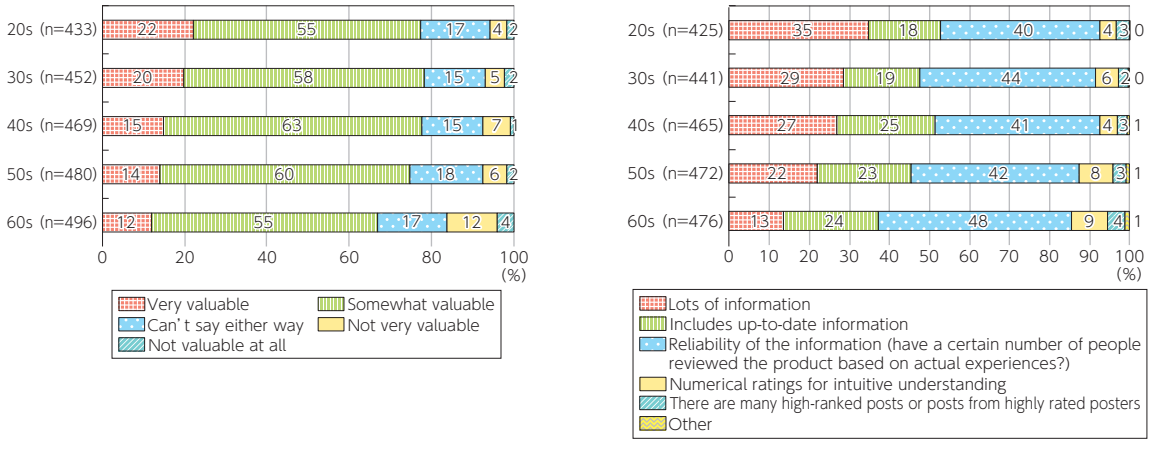
Figure 1-4-2-2 Total annual consumer surplus from music and video streaming services

	Internet user population	Usage rate of music and video streaming services (percentage)	Consumer surplus per person (per month in yen)	Consumer surplus (per year in billions of yen)
20s	12,583,190	86.1	204.2	26.54
30s	15,165,910	77.6	158.4	22.38
40s	17,986,280	71.2	156.9	24.12
50s	14,196,520	70.0	168.1	20.05
60s	13,773,720	58.2	172.6	16.62
Total				109.71

The Internet user population for each age bracket was calculated using the estimated populations by age (in five-year increments) and populations by gender on March 1, 2016 taken from "Population Census" (Statistics Bureau, MIC) and the state of Internet usage by age and by gender taken from the FY 2014 Communications Usage Trend Survey.

(Source) "Study Report on ICT Contributions to Social Well-Being Not Seen in GDP"

Figure 1-4-2-3 Value of reviews and the main focus points when reading reviews



(Source) "Study Report on ICT Contributions to Social Well-Being Not Seen in GDP"

extent. The lower the age, the more likely the user felt reviews are "very valuable." The survey next asked what they primarily focused on when reading reviews. The most common response in all age brackets was "reliability of the information (have a certain number of people reviewed the goods based on actual experiences?)."

3. Future social and economic prospects brought on by ICT progress

The table below summarizes some prospects on the kind of future ICT progress will bring to our society and economy, based on the significance and implications of ICT's non-monetary value we have seen so far (Figure 1-4-3-1).

Figure 1-4-3-1 ICT's non-monetary values and future social and economic prospects

Considerations based on current examples

Area	Examples	Significance and implications
Consumer surplus	- Music and video streaming services - E-books	- Consumer surpluses, along with user bases, will grow as ICT progress drives down prices of goods and services - Consumers tend to have relatively strong needs for content recommendations matching one's preferences (from survey results)
Time savings	- Information search services - e-commerce services - Navigation services	- ICT helps save time when searching for information or shopping (from survey results) - Since less time is spent per search, an increasing amount of information can be searched
Information assets	- Reviews (word of mouth), etc.	- ICT progress makes it easier for individuals to communicate and share information
	- Review sites, online shopping (B2C)	- Less risk of purchasing goods or services with poor cost-versus-quality tradeoffs because word-of-mouth and reviews drive competition among similar goods and services - Consumers tend to put considerable importance on reviews by a certain number of people based on actual experiences (from survey results)
	- Online auctions (conventional forms of C2C)	- Auction sites have established mechanisms to ensure trustworthiness of transactions, such as allowing sellers and buyers to rate each other and enabling users view past reviews on other users
	- New forms of C2C	- New forms of C2C are improving matching accuracy and boosting the assurance of trust, by combining the ability to rate other users and view past reviews on other users with other information — such as credit card information, passports, driver's licenses, and reputations on social media

Future prospects

Future prospects based on generational usage trends

- Additional ICT progress and new ideas from the digital native generation will expand ICT user bases further and potentially lead to the emergence of new ICT services (and their surpluses)
- Reviews will carry even more social influence as today's youth, who rely on reviews, move into middle and old age

Changes brought on by greater amounts of information

- As more options for goods and services appear, more information about these options will be generated; however, deciding how to select from all the options and information will become a problem
- When purchasing goods or services, consumers will put importance on the reputations of highly trusted individuals, much like reviews, amid a sea of information
- Functions are emerging that recommend suitable goods and services to individual consumers from their past purchases and browsing histories
- Continued advances in artificial intelligence are expected to bring about functions that are more trustworthy and reputable and functions that more accurately reflect individual preferences and that feel more comfortable for individuals

Potential for new economic activities that use non-monetary information as signals

- The non-monetary information of reputations and trust are indispensable in forming marketplaces for consumer-to-consumer transactions in goods and services. Such information will also contribute to the formation and expansion of new economic activities.
- Combining reviews with other types of information will likely increase the assurance of trust as well as raise C2C matching accuracies, improve satisfaction, and expand the quantity of transactions

(Source) "Study Report on ICT Contributions to Social Well-Being Not Seen in GDP"