

# Introduction

## History of Digitalization in Japan

Information and communication technologies including personal computers, the Internet and mobile phones rapidly spread from the latter half of the 1990s. In this context, after Japan set up the Information Technology Strategic Headquarters, and the IT Basic Act was enacted in 2000, under various national strategies including the e-Japan Strategy, the country has promoted digitalization through infrastructure development and promotion of ICT/data utilization, for example.

This Introduction overviews the history of Japan's digitalization policy, progress of digitalization in society and its evaluation based on international indices since around 2000, when there was a major turning point, while examining causes of the delay of the country's digitalization.

### 1. History of Japan's Digitalization Policy

In this section, we divide the period from 2000 to 2020, when COVID19 infection spread, to four stages based on the targets and priority measures of the past national strategies, etc. : the first stage promoting ICT infrastructure development; second stage promoting ICT utilization; the 3<sup>rd</sup> stage promoting utilization of digital data, and, the 4<sup>th</sup> stage toward formation of a digital society, and summarize the history of each stage.<sup>1</sup>

#### (1) First stage: development of ICT infrastructure

In the first stage, systems and national strategy were developed for Japan's strategic and prioritized actions in response to the global changes in industrial and social structures (IT revolution.) The focus was on the development of ICT infrastructure toward becoming the world's cutting-edge IT nation.

##### a. e-Japan Strategy (2001)

In the latter half of the 1990s when major changes in society and economy were progressing globally as a result of rapid development of computers and communication technologies, Japan's ICT efforts lagged behind. To address this situation, the Information Technology Strategic Headquarters decided basic IT strategies and the Basic Act on the Formation of an Advanced Information and Telecommunications Network Society was enacted (IT Basic Act) in November 2000.

Based on the IT Basic Act, the Strategic Headquarters for the Promotion of an Advanced Information and Telecommunications Network Society (IT Strategic Headquarters) was established in the Cabinet in January 2001 and announced e-Japan strategy as national IT strategy.

#### (2) Second stage: Promotion of ICT utilization

In the 2nd stage, because development of ICT infrastructure of the 1st stage progressed ahead of the original schedule, not only ICT infrastructure development but also many measures for utilization of ICT were im-

plemented.

##### a. e-Japan Strategy II (2003)

Because the goal of e-Japan Strategy, "improvement of usage environment" including "high-speed Internet to 30 million households" was achieved and development of institutional bases related to e-commerce and e-government progressed, IT Strategic Headquarters announced e-Japan Strategy II in July 2003.

##### b. New IT Reform Strategy (2006)

The world's cutting edge was achieved through development of broadband infrastructure in five years under the e-Japan Strategy, etc., but there were still issues in improving people's satisfaction with IT utilization in the fields of administrative service, medical care, education and other fields. To address this situation, in order to continue to be the cutting-edge IT nation with the world's best infrastructure though realizing a society with ubiquitous network that can be used "anytime, anywhere, for any purpose and by anyone," the IT Strategic Headquarters formulated the New IT Reform Strategy in January 2006.

##### c. i-Japan Strategy 2015 (2009)

In the light of the strong demand for remedies to the stalled economy accompanying a financial crisis, in addition to the progress of digital technologies, the IT Strategic Headquarters formulated "New Strategy Toward a New Digital Age – Three-year Emergency Program" in April 2009 and "i-Japan Strategy 2015" as a new medium-to long-term strategy in July of the same year.

##### d. New Strategy in Information and Communications Technology (2010)

In May 2010 the IT Strategic Headquarters announced "A New Strategy in Information and Communications Technology". The strategy was not an extension of the past IT strategies but was positioned as a strategy fo-

<sup>1</sup> The period is divided into four parts based on their respective characteristics, but we need to pay attention to the fact that there were also actions different from respective characteristics. For example, ICT infrastructure was developed not only in the 1st stage but also in the following stages as necessary to respond to high-speed and large capacity communication and wireless communication.

cused on three priority areas to support a discontinuous leap for a shift from a society led by the government to a society led by the people.

### (3) Third stage: utilization of digital data

It is said that the age of massive data flow started in the middle of the 2010s. In the 3<sup>rd</sup> stage, utilization of various digital data was promoted and measures were taken toward creation of a “society that utilizes public and private sector data.”

#### a. Declaration to be the World’s Most Advanced IT Nation (2013)

As a key pillar of the growth strategy to realize sustainable growth and development by revitalizing the economy from the long economic slowdown that is called the “lost 20 years”, to overcome various problems including the progress of declining birthrate and aging population and depopulation, the cabinet decided the “Declaration to be the World’s Most Advanced IT Nation” in June 2013.

#### b. Basic Act on the Advancement of Public and Private Sector Data Utilization, etc.

##### (a) Basic Act on the Advancement of Public and Private Sector Data Utilization (2016)

The Basic Act on the Advancement of Public and Private Sector Data Utilization was promulgated and enforced in December 2016. The act required formulation of the “Basic Plan for the Advancement of Public and Private Sector Data Utilization.” For promotion of the plan, the Strategic Conference for the Advancement of Public and Private Sector Data Utilization chaired by the Prime Minister was set up under the IT Strategic Headquarters.

##### (b) Declaration to be the World’s Most Advanced IT Nation - Basic Plan for the Advancement of Public and Private Sector Data Utilization (2017) “Declaration to be the World’s Most Advanced IT Na-

tion - Basic Plan for the Advancement of Public and Private Sector” was formulated in May 2017. This includes the existing “Declaration to be the World’s Most Advanced IT Nation” and the “basic plan” of the government as provided by the Basic Act.

##### (c) Digital Government Strategy (2017)

In May 2017, based on the Basic Act on the Advancement of Public and Private Sector Data Utilization and the “Declaration to be the World’s Most Advanced IT Nation - Basic Plan for the Advancement of Public and Private Sector Data Utilization”, “Digital Government Strategy” was formulated to show the direction of electronic public administration toward a digital society.

##### (d) Digital Government Action Plan (2018)

Toward digital government through spreading the government’s initiatives to local governments and the private sector, “the Basic Policy for the Establishment of a New IT Strategy” was formulated in December 2017 with the aim of radically reforming social systems taking advantage of IT. In January 2018, the first version of the “Digital Government Action Plan” was formulated to give shape to the Digital Government Strategy.

### (4) The Fourth Stage: Formation of a digital society

Up to the 3<sup>rd</sup> stage, creation of the world’s most advanced “IT nation” was set as a goal, but creation of the world’s most advanced “digital nation” was held up in 2018.

Toward “the world’s most advanced digital nation,” “Declaration to be the World’s Most Advanced Digital Nation - Basic Plan for the Advancement of Public and Private Sector Data Utilization” was formulated in June 2018 with the aim of creating a society in which people can live safely with peace of mind and feel the affluence in their lives.

## 2. Progress of Digitalization of Japanese Society

Diffusion of services and technologies used in digitalization greatly varies depending on the period and field. Below is an overview of the progress of digitalization of Japanese society based on the diffusion of technologies and services related to the digitalization of Japanese society.

### (1) Communication infrastructure

#### a. Fixed communication

Because the communication environment in the latter half of the 1990s when the Internet began to spread was mostly dial connection through a telephone line, there were problems such as insufficient communication speed and pay-per-use billing system.

Owing to the spread of ADSL and other factors, the Internet diffusion rate greatly increased in the first half of the 2000s. In the process of the spread of ADSL, charges were reduced and speed was increased through competition among various providers. Faster FTTH services using optical fibers spread in the latter half of the 2000s. The proportion of the households that could use

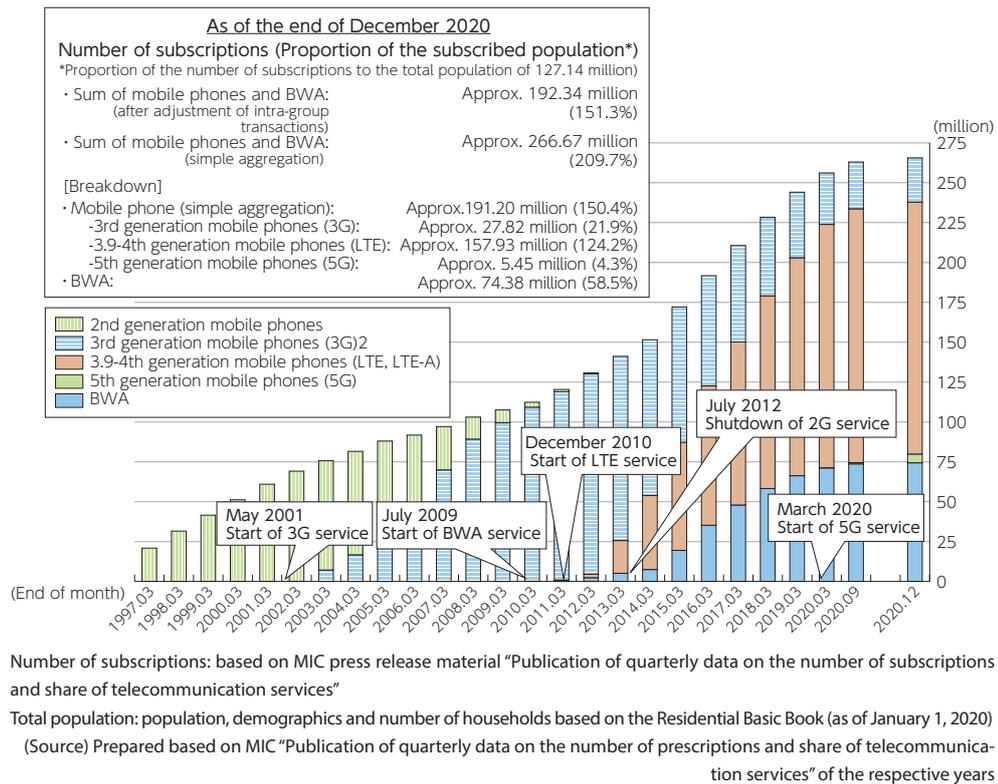
ultra high speed broadband was 90.1% in 2009 and reached 99.98% in 2015. Even today, this FTTH service is still the mainstream of fixed-line broadband service.

#### b. Mobile communication

The number of mobile communication subscriptions exceeded 190 million as of the end of December 2020 (Figure 0-1-2-1).

The number of mobile phone subscriptions exceeded the number of fixed phone subscriptions in 2000. With the increase in the number of users, networks were rapidly upgraded through evolution of communication systems, for example.

In 2001 full-fledged service of the 3<sup>rd</sup> generation mobile communication system (3G) started in Japan ahead of other countries in the world. The spread of the iPhone and other smartphones in the latter half of the 2000s also had a major impact. Against the background of the spread of smartphones, commercial service of the 4<sup>th</sup> generation mobile communication system (4G) started in 2010, which was followed by the 5<sup>th</sup> generation mobile com-

**Figure 0-1-2-1 Changes in the Number of Communication Service Subscriptions**

munication system (5G) in Japan in March 2020.

As described above, communication infrastructure that is the basis of digitalization has spread through evolution in various forms including ultra-high speed and large capacity, and expansion of mobile use by smartphones, etc.

According to the OECD, Japan is at the world's top level in terms of the proportion of optical fibers in fixed-line broadband and diffusion rate of mobile broadband. It is safe to say that digital infrastructure has widely diffused in the country by international levels (Figures 0-1-2-2 and 0-1-2-3).

## (2) ICT Use in People's Lives

Then, how is the progress of ICT use in people's lives? METI publishes a survey on e-commerce that is a prioritized policy field of the e-Japan Strategy. According to the survey, the market size (business-consumer transactions) of e-commerce was 65.0 billion yen in 1998 but projected to increase 50-fold to about 3 trillion yen in 2003. E-Japan strategy aimed to exceed the projection, and the market size in 2003 was 4 trillion 424 billion yen, greatly exceeding the target. Market of the domestic e-commerce continued to expand to 19 trillion 360.9 billion yen in 2019.

## (3) Enterprises

### a. ICT Investment

According to OECD Statistics, ICT investment (nomi-

nal) of Japan in 1989 was 14.3 trillion yen. Later, it was on the decrease from the peak of 20.0 trillion yen in 1997 to 15.8 trillion yen in 2018. In the United States, on the other hand, ICT investment that was 147.6 billion dollars in 1989 continued to increase except in the first half of the 2000s and 2009. The amount was 698.6 billion dollars in 2018, increasing more than 4.7-fold in 30 years.

### b. ICT human resources

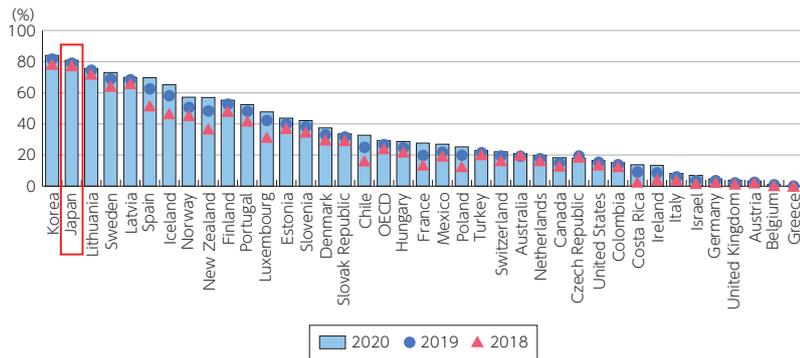
As described in 2019 Information and Communications White Paper, while the environment surrounding ICT human resources is greatly changing, Japan is facing a shortage of ICT human resources. According to a survey by METI<sup>2</sup>, Japan had a shortage of about 220,000 ICT human resources in 2018 and the shortage is expected to expand in the future. The shortage of ICT human resources is expected to worsen in the future.

## (4) Public sector

In the strategies since the e-Japan Strategy, electronic government was always included in priority themes, but it is said that progress is insufficient in improvement of the people's convenience, digitalization in internal government and regulatory and institutional reforms (abolishment in principle of paper documents and interviews) that are the main premise of the former. It is said that utilization in the public sector including medical care and education is insufficient as described in detail in Chapter 2 Section 2.

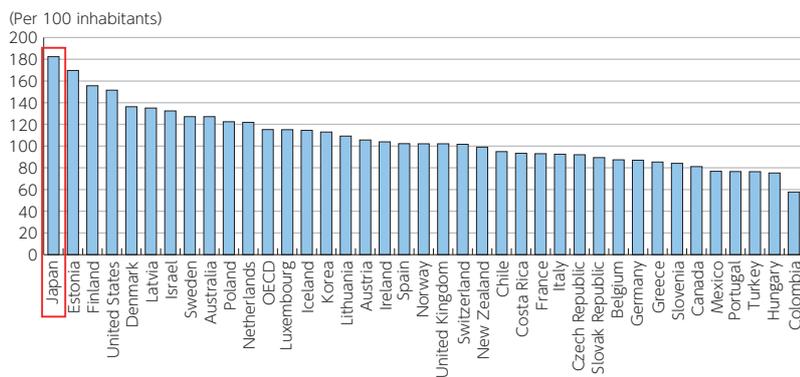
<sup>2</sup> According to the calculation by the METI "Survey on supply and demand of ICT human resources" (April 2019) Japan had a shortage of about 220,000 IT human resources in 2018. The shortage is expected to increase to about 450,000 people in the median scenario and about 790,000 people in the high scenario in 2030.

Figure 0-1-2-2 Percentage of fiber connections in total fixed broadband



(Source) Prepared based on OECD Broadband statistics

Figure 0-1-2-3 Mobile broadband diffusion rates (June 2019)



(Source) Prepared based on OECD Broadband statistics

### 3. Digitalization of Japan Assessed based on International Indices

Position of Japan's digitalization in the world is over-viewed based on international indices.

#### (1) Position in International Indices

As indices of international competitiveness, we take up the digital competitiveness ranking published by the International Institute for Management Development (IMD) and the international competitiveness ranking published by the World Economic Forum (WEF).

As indices regarding e-government, we take up the e-government ranking published by the UN Department of Economic and Social Affairs and the World Digital Government ranking published by the Institute of e-Government, Waseda University.

##### a. World Digital Competitiveness Ranking (IMD)

###### (a) Overview

Digital Competitiveness Ranking is an international index regarding digital competitiveness as formulated and published by IMD. It analyzes, grades and ranks the level of changes in policies, business models and the society as a whole through development and use of digital technologies in each country.

###### (b) Evaluation

In 2020 the United States attained the first place for the third straight year, followed by Singapore and Denmark. Top ranking countries include not only Western countries but also Asian countries and regions: Singa-

pore ranked second, Hong Kong ranked 5th and South Korea ranked 8th. However, Japan's rank has been decreasing in the past few years. In 2020, Japan went down in the ranking by four ranks to 27th among 63 countries and regions.

By factor, Japan's ranking for each factor has been around 20<sup>th</sup> in the past few years, but ranks of "Technology" and "Future readiness," in particular, are on the decline.

##### b. International Competitiveness Ranking (WEF)

###### (a) Overview

International Competitiveness Ranking is an international index regarding international competitiveness as formulated and published by WEF. It analyzes and evaluates 12 factors including technology and ICT introduction, which contribute to the competitiveness of each country.

###### (b) Evaluation in the New International Competitiveness Ranking

Japan maintained high rank in the International Competitiveness Ranking measured since 2018: 5th (among 140 countries/regions) in 2018 and 6th (among 141 countries/regions) in 2019.

##### c. UN Department of Economic and Social Affairs (UNDESA) "e-Government Ranking"

UN e-Government Survey decides ranks based on the E-Government Development Index (EGDI) that is obtained by averaging the results of the Online Service in-

dex, Human Capital Index and Telecommunications Infrastructure Index. In the 2020 e-Government Ranking, Denmark ranked first as it did in the 2019 survey, followed by South Korea, Estonia, Finland and Australia in this order.

Japan ranked 14<sup>th</sup>, falling from 10<sup>th</sup> in the previous survey. In past surveys Japan was roughly between 18<sup>th</sup> and 10<sup>th</sup> (Figure 0-1-3-1).

#### d. World Digital Government ranking by the Institute of e-Government, Waseda University.

The Institute of e-Government, Waseda University has been publishing the “World Digital Government Ranking” every year since 2005. The ranking evaluates progress of e-government promotion of 64 ICT developed countries in the world multilaterally using 10 key indices and 35 sub indices. In this ranking, Japan had been between 8<sup>th</sup> and 4<sup>th</sup> and ranked 7<sup>th</sup> in the latest 2019 survey.

## 4. Causes of Japan’s Delay in Digitalization

While Japan is ahead of many other countries in some aspects of digitalization including development of infrastructure, the country is significantly behind in overall digitalization. What is the cause? It is believed that not a single cause, but rather an intricate web of various causes brought about the delay in digitalization. Here, we list probable causes.

### (1) Sluggish ICT investment

ICT investment in Japan has been on the decline from the peak in 1997. Furthermore, there remain many conventional systems (legacy systems) as exemplified by the fact that 80% of its ICT investments are used for maintenance and operation of the current businesses. It is said that Japan is stuck in the old way of thinking.

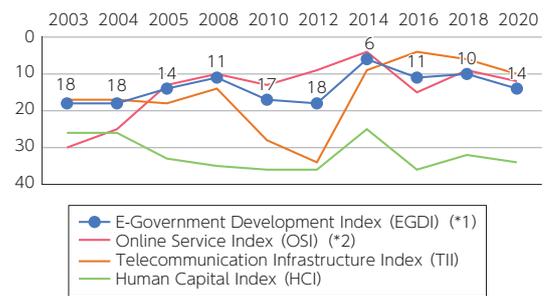
### (2) ICT investment without operational reforms

In Japan, ICT is introduced mostly as means for operational efficiency. In addition to the pressure to reduce costs of information systems, there is a deep-rooted mindset that a company should focus on its main business, and development of an information system is not its core business. As a result, most companies totally depend on external enterprises for information system construction and operation, without accumulating know-how and skills to these ordering companies.

### (3) Absence/uneven distribution of ICT human resources

According to the survey (FY2019) of the Information-technology Promotion Agency (IPA)<sup>3</sup> The sum of the answers that quantity of IT human resources is “considerably insufficient” and “somewhat insufficient” reached 89.0%. In terms of quality, the sum of the answers that the quality of IT human resources is “considerably insufficient” and “somewhat insufficient” was as high as

Figure 0-1-3-1 Changes in Japan’s Rank in UNDESA World e-Government Ranking



(\* 1) “E-Government Index” for 2001 and “E-government Readiness Index” for 2003-2008

(\* 2) “Web Measure Index” in and before 2008

(Source) Prepared by NTT Data Institute of Management Consulting from UN e-Government Surveys

90.5%. In this way, user companies recognize that ICT human resources are insufficient both quantitatively and qualitatively in Japan.

Furthermore, as described in the 2019 Information and Communications White Paper, Japanese companies are highly dependent on external vendors for ICT human resources.

### (4) Past successful experiences

Japan became one of the world’s leading economic powers through the high economic growth period. Production and exports of ICT-related manufacturers had been on the increase up to around 1985 and the country was called the “electronic nation.” In the 2000s, the production amount of ICT-related manufacturers entered a declining trend. Exports were also on the decline in the latter half of the 2000s. However, it is said that companies with past successful experience focused on business improvement based on specific optimization rather than drastic change, and therefore failed to respond to the advent of a digital society.

### (5) Anxiety and resistance to digitalization

Some people have a feeling of anxiety or resistance to digitalization. In addition, it is believed that various factors including inappropriate use of personal data by enterprises, etc. and response to misinformation on the Internet may generate anxiety and resistance to digitalization.

### (6) Insufficient digital literacy

Information security and response to misinformation on the Internet require certain information literacy. According to a survey<sup>4</sup> conducted by MIC, the second most frequently cited cause of delay in digitalization was “lack of users’ literacy.”

<sup>3</sup> “Survey of user companies” of “Trend of IT Human Resources (2020)” by the Information-technology Promotion Agency. Scope of the survey includes member companies of industry groups (JUSA, JEITA,) member companies of local industry groups and companies registered with private data bases (Information systems sector).

<sup>4</sup> MIC (2021) “Research on the actual state of digital technology utilization with COVID19 and changes in user awareness”