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New Year Messages

**From the Minister for Internal Affairs and Communications,
Secretary-General of ITU, President of ITU-AJ**

Special Feature

Development of High-quality ICT Infrastructure

Keynote Address: High-quality ICT Infrastructure Development: Toward the Realization of a Digitally Connected World

Current State and Development Potential of the ICT Sector in Africa

Provision of High-quality ICT Infrastructures: An Introduction of NEC's Global Initiatives

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C O N T E N T S

New Year Messages

- 2018 New Year's Greetings from the Minister for Internal Affairs and Communications
- New Year Message from ITU
- New Year Greeting

Special Feature — Development of High-quality ICT Infrastructure

- Keynote Address: High-quality ICT Infrastructure Development: Toward the Realization of a Digitally Connected World
- Current State and Development Potential of the ICT Sector in Africa
- Provision of High-quality ICT Infrastructures: An Introduction of NEC's Global Initiatives

Report

- Overview of the 2017 White Paper on Information and Communications in Japan

Column

- = A Serial Introduction Part 2= Winners of ITU-AJ Encouragement Awards 2017

About ITU-AJ

The ITU Association of Japan (ITU-AJ) was founded on September 1, 1971, to coordinate Japanese activities in the telecommunication and broadcasting sectors with international activities. Today, the principle activities of the ITU-AJ are to cooperate in various activities of international organizations such as the ITU and to disseminate information about them. The Association also aims to help developing countries by supporting technical assistance, as well as by taking part in general international cooperation, mainly through the Asia-Pacific Telecommunity (APT), so as to contribute to the advance of the telecommunications and broadcasting throughout the world.

2018 New Year's Greetings from the Minister for Internal Affairs and Communications



Seiko Noda

Minister for Internal Affairs and Communications

To begin with, I would like to wish everyone a very happy New Year.

Since assuming office of Minister for Internal Affairs and Communications five months ago, I have visited local communities and inquired about their conditions. While attaching great importance to the viewpoints of residents and consumers, I have devoted myself to the administrative field of the Ministry of Internal Affairs and Communications (MIC), which is closely and broadly involved with the lives of citizens.

Japan has entered a mature period with a population that is predicted to decrease even further in the years to come. Under these circumstances, establishing a sustainable society that enables everyone regardless of gender or age to provide mutual support is an extremely important issue.

A great deal of wisdom and experience accumulates in a mature nation. The Ministry of Internal Affairs and Communications has likewise accumulated a wide variety of data, technologies, and knowledge over the process of administering policies in the diverse areas under its supervision. This year, as well, I plan to put these resources to work and devote all of my energy toward the creation of a “peaceful, kind, and sustainable society” in which everyone can work together and live a happy life.

I believe the key to regional revitalization is diversity, inclusion, and sustainability. I would like to emphasize this viewpoint in MIC policies.

Establishing the world's highest-standard ICT environment

Information and communications technology (ICT) is the “trump card” that creates new added value by interconnecting all kinds of resources including people, things, and data. ICT penetrates every corner of people's lives as an indispensable platform for all sorts of social and economic activities. To maximize the benefits of ICT, we will promote the “use of ICT throughout society” by ensuring cybersecurity, further enhancing the ICT platform, and promoting widespread use of ICT. Additionally, as a compass to guide us in this endeavor, we will formulate new information and communications policies for creating Japan's future with an eye to the 2030s and beyond when the drop in population and the aging society likely intensify.

With the Olympic and Paralympic Games Tokyo 2020 in view, we are working to establish an ICT environment of the world's highest standard by introducing a fifth-generation mobile communications system, promoting an advanced platform for video delivery as in new 4K/8K satellite broadcasting (scheduled for launch in December of this year), furthering the research and development of a multi-lingual speech translation system, and achieving a society in

which all vehicles are connected to the network.

It is important that diverse services are provided with reasonable rates so that users can enjoy the convenience of communication services by smartphones. To this end, I will work toward creating an environment that ensures fair competition in a market that includes mobile virtual network operators (MVNOs).

I will also enhance our efforts at achieving a smooth migration of the fixed telephone network—Japan's core communications infrastructure—to an IP network while ensuring a fair and competitive environment and user convenience.

At the same time, I will push for more effective utilization of the radio spectrum, which we can expect to affect a wide range of fields as the core element of the ICT platform.

Enhancing cyber security and ensuring safe and secure ICT

As we enter into a full-scale Internet of Things (IoT) era, cyber attacks on IoT devices are suddenly increasing and the strengthening of cybersecurity is becoming an urgent matter. At MIC, we are enhancing the system for formulating cybersecurity policies, steadily advancing “IoT security comprehensive measures,” enhancing countermeasures to Internet incidents, and upgrading training for security professionals. In addition, we continue to deal with the dissemination of illegal and harmful information and to work on creating a safe-and-secure radio environment.

Promoting the use of IoT, big data, AI, and the sharing economy for greater productivity

New applications of ICT such as IoT, big data, artificial intelligence (AI), and the sharing economy can lead to new business models and greater productivity. It is the key to solving regional issues and achieving sustainable economic growth. We will support the comprehensive creation of new IoT services and their regional implementation to steadily realize the “Road Map to Promote Regional IoT Implementation.”

In the area of AI, our efforts are centered on social implementation and research and development. We will promote the implementation of fundamental AI technologies in a wide variety of fields and accelerate the research and development of next-generation AI technologies. We will also proactively contribute to discussions at G7, G20, OECD and other international meetings to achieve a sound development of AI networking.

In addition, we will actively promote the introduction of new technologies and mechanisms such as blockchain technology and information trusting functions to promote the expanded use of data.

In closing, I wish everyone great health and good fortune to come.

January 1, 2018

New Year Message from ITU



Houlin Zhao
Secretary-General

International Telecommunication Union

It is an honour for me to greet ITU's Japanese community via the ITU Association of Japan (ITU-AJ), which continues to be a key partner in enhancing and promoting ITU's work in technical standardization, radiocommunications management, and information and communication technology (ICT) penetration in developing countries.

Looking back at the events of 2017, we find that ITU and the world have made great strides towards improving the lives of millions of people through the use of innovative ICTs to achieve the United Nations Sustainable Development Goals (SDGs).

In February, ITU members agreed on key performance requirements for IMT-2020 that will position 5G mobile systems to provide lightning speed ultra-reliable communications. ITU brought together the world's top minds in Artificial Intelligence (AI) at the *AI for Good Global Summit* in June, to identify opportunities for AI solutions to address global challenges such as poverty, hunger, health and education.

The ITU Focus Group on Digital Financial Services published 85 policy recommendations to drive greater financial inclusion for the estimated two billion unbanked people around the world. In July, the *ITU Global Symposium for Regulators* focused on the security of digital financial services, while the *Financial Inclusion Global Initiative* was launched targeting developing countries.

Gender equality in tech was advanced in 2017 through hundreds of events around the globe on Girls in ICT Day, while ITU and UN Women joined hands to launch the EQUALS digital gender equality network together with more than 50 partners.

In June, more than 2,000 ICT stakeholders met at the *World Summit on the Information Society Forum 2017*, where they announced new ICTs for SDGs tools and initiatives. *ITU Telecom World 2017*, in Busan, brought together over 9,000 stakeholders to foster innovation and business partnerships. At the *World Telecommunication Development Conference 2017* in Buenos Aires, a forward-looking four-year Telecommunication Development Sector agenda was agreed upon, designed to leverage ICTs for the SDGs.

Innovative partnerships within our UN family were

realized this year. ITU and ILO launched a campaign to train five million young people with job-ready digital skills by 2030. ITU and FAO agreed to work together to advance e-agriculture. ITU and WMO advanced the use of radio-based systems for life-saving weather prediction. ITU and WHO partnered to strengthen the delivery of public healthcare services in Africa with digital technology.

ITU released the first-ever report tracking ICT regulatory trends and their economic implications, *Global ICT Regulatory Outlook 2017*; and ITU's annual *Global Cybersecurity Index* provided countries with the information needed to make strategic decisions in developing and strengthening their cybersecurity capacities.

This year marked several historic milestones for ITU, including the 25th anniversary of the ITU Telecommunication Development Sector and the 90th anniversary of the CCIR/ITU-R Study Groups.

I am also excited to share with you the launch of the new *ITU Journal: ICT Discoveries* – and the win by ITU and its partners of a Primetime Emmy Award for outstanding achievement in engineering for 'High Efficiency Video Coding' (ITU-T H.265 | ISO/IEC 23008-2), which has emerged as the primary coding format for Ultra-High Definition TV.

It was also a great personal pleasure for me this year to have met with His Holiness Pope Francis, who expressed his support for ICTs and the role they play in providing the World's poorest with access to socio-economic resources, as well as the valuable role of ITU in bringing these to the world.

In all these activities, ITU recognizes the active participation of Japan, including its government, industry, academia and ITU-AJ. I am confident that Japan will continue to contribute actively to all of ITU's activities, and I would like to thank Japan for its continuous support of ITU since joining the Union in 1879.

Lastly, I take this opportunity to wish all Japanese friends and partners, as well as your families, a peaceful and prosperous 2018.

New Year Greeting



Michiaki Ogasawara

President of The ITU Association of Japan

Happy New Year!

As you may already know, ITU-D (ITU Telecommunication Development Sector) celebrated its 25th anniversary last year, and its general assembly was held at the World Telecommunication Development Conference (WTDC-17) in Buenos Aires, Argentina. As the strategic plan for the next period of ITU-D (2018–2021), it was declared that efforts should be made to expand and increase the use of telecommunication/ICT infrastructure, applications and services in order to attain the sustainable development goals (SDGs) set forth by the United Nations and ITU.

The Plenipotentiary Conference is the most important event in the ITU calendar, and will be held in Dubai, United Arab Emirates this year. At this event, Japan will stand for re-election to the council, and will propose the appointment of Dr. Akira Hashimoto as a member of the Radio Regulations Board (RRB). As in previous years, ITU-AJ intends to work hard at gathering information for the Plenipotentiary Conference and other important gatherings, supporting Japanese delegates, and promoting their selection as supporting members.

The Asia-Pacific Telecommunity (APT) held its general assembly last autumn. At this event, Ms. Areewan Haorangsi (Thailand) was re-elected as Secretary General, and Mr. Masanori Kondo of Japan

was re-elected as Deputy Secretary General. I hardly need to point out that the development of the Asia-Pacific region will lead the world economy as a whole, and the role of APT will become even greater in the future.

In December last year, a training program called “Development of Practical Problem-solving Skills: Network Construction or E-application in Regional Community to Bridge the Digital Divide” proposed to the APT by ITU-AJ was adopted as part of the APT-sponsored capacity building program for training in member countries. Through activities such as these, the ITU-AJ is continuing to support the efforts of the APT together with the Japanese government and supporting members.

We have also introduced new technologies in the *ITU Journal* and the English-language *New Breeze* magazine, including various examples of ICT utilization and 5G mobile communications.

This year we intend to continue providing information on interesting fields including the use of ICT in artificial intelligence (AI), environmental and medical applications. We would be delighted to hear your suggestions for new projects.

I hope 2018 will be your most successful and fruitful year yet.

■ At the WTDC-17 conference



Keynote Address: High-quality ICT Infrastructure Development: Toward the Realization of a Digitally Connected World



Ryoji Yamazaki

Director, International Policy Division, Global ICT Strategy Bureau
Ministry of Internal Affairs and Communications

1. International Symposium on Quality ICT Infrastructure Development: Overview and Objectives

Following up on the joint declaration of the G7 ICT Ministers' Meeting in Takamatsu, Kagawa in 2016 to implement measures to "improve access to ICT," the symposium was convened by the Ministry of Internal Affairs and Communications (MIC) in Tokyo on March 15, 2017 to exchange views and promote international discussion among G7 member nations, international organizations, emerging markets, and developing economies expected to see the greatest demand for ICT infrastructure regarding initiatives and policies to help bridge the digital divide through "quality ICT infrastructure development."

The keynote address "High-Quality ICT Infrastructure Development: Toward the Realization of a Digitally Connected World" provides a broad overview of the following three sessions: session one "ICT infrastructure news in developing countries," session two "improvement in policy and investment environment for quality ICT infrastructure development," and session three "quality ICT infrastructure required in the IoT era." In addition, the speech also highlights the concept, elements, and significance

of "quality ICT infrastructure," the theme of the symposium, and introduces "quality ICT infrastructure" investment efforts promoted by the MIC.

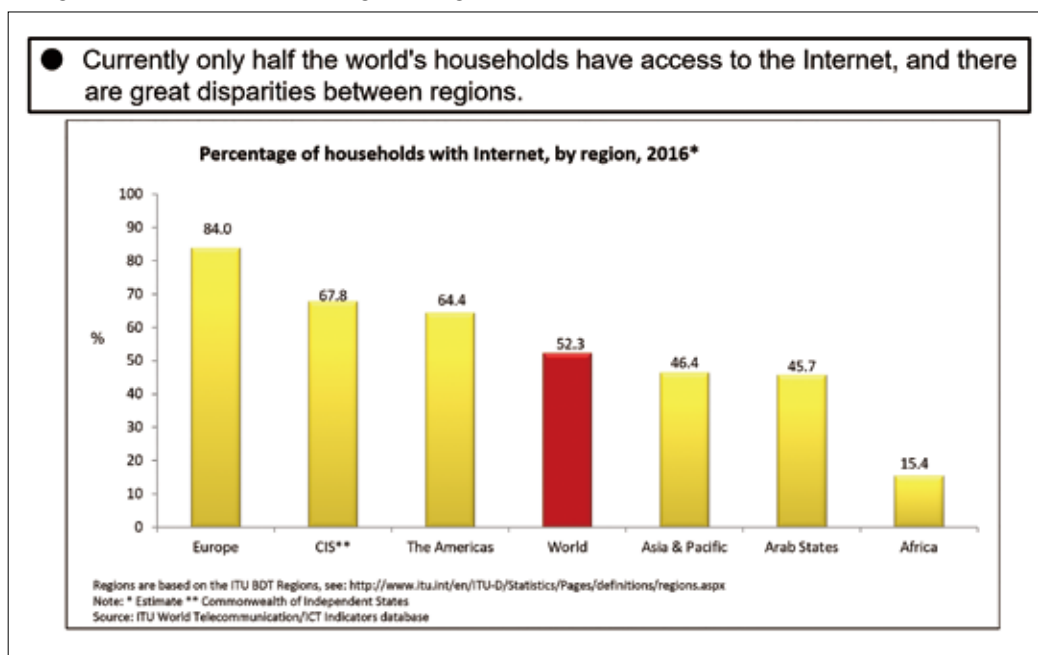
2. Realization of a Digital Connected World Through Quality ICT Infrastructure Investment

2.1 State of the Global Digital Divide and the G7 ICT Ministers' Meeting in Takamatsu, Kagawa

ICT is key infrastructure for promoting economic growth and an indispensable tool in every aspect of socio-economic activity, yet there are vast disparities in access to information technology among regions throughout the world—the so-called digital divide—and approximately only 52.3% of households have access to the Internet.

Given this situation, the MIC hosted the G7 ICT Ministers' Meeting in Takamatsu, Kagawa in April 2016 to discuss policy guidelines and challenges to achieving a digitally connected world. This would be a world in which all people and things are connected to a global-scale seamless network that opens the way to economic prosperity and transformative social change. The joint declaration coming out of the meeting highlighted

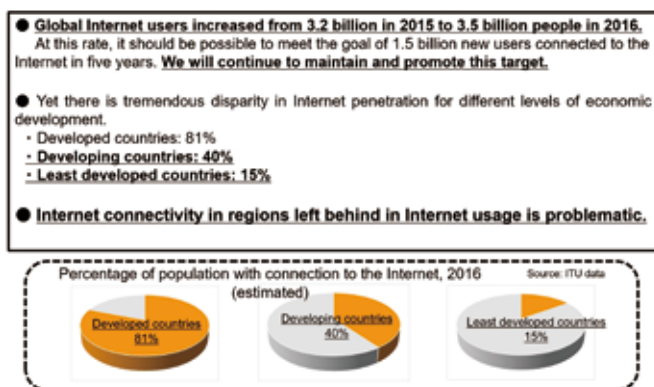
■ Figure 1: Current state of the global digital divide



four key objectives: “enhanced access to ICT,” “protection and promotion of unfettered distribution of information” “promotion of innovation” and “leverage ICT to address global-scale challenges and opportunities.” To achieve the first goal, “enhanced access to ICT,” the meeting proposed concrete initiatives by multi-stakeholders that would bring an additional 1.5 billion new Internet users online worldwide over the next five years, an objective that was agreed to at the G20 Hangzhou summit held in September 2016.

When we look at the number of Internet users after the G7 Ministers’ Meeting, we see that Internet adoption increased by 300 million during 2015 and reached 3.5 billion in 2016, so the initiative is on track to achieve its target of “1.5 billion in five years.” Japan is committed to sustain and promote this movement. Yet it is apparent from the correlation between Internet penetration and economic development—81% for advanced economies, 40% for developing economies, and 15% for least developed economies—that without removing barriers to Internet adoption, many regions may be left behind. And even if we do reach our goal of 1.5 billion new Internet users in 5 years, much more effort is needed to improve connectivity and close the digital divide.

■ **Figure 2: Global ICT access progress following the 2016 G7 ICT Ministers’ Meeting**



2.2 Policies and Initiatives to Close the Digital Divide Broken out by Country / Institution

Let us consider some of the policies and initiatives that have been proposed and implemented by countries and private-sector institutions in an effort to bridge the digital divide. The U.S. unveiled the *Global Connect Initiative* (GCI) in 2015, a multi-stakeholder approach with the goal of bringing 1.5 billion additional people online by 2020. Meanwhile, the government of Italy has inaugurated a *National Ultra-Broadband Plan* to build out a smart-city backbone access network throughout the country that should also open up investment opportunities.

The World Economic Forum (WEF) has teamed up with the U.S. GCI initiative to develop an *Internet for All*, while the World Bank has thrown its support behind the *Digital Development*

Partnership (DDP), which is engaged in a wide range of multi-stakeholders initiatives.

Japan has put out a global call for quality ICT infrastructure, which I discuss in some detail below. The idea is to promote investment in quality ICT infrastructure while contributing to enhanced ICT access around the world.

Emerging and developing countries are also taking aggressive steps to enhance ICT access. For example, Indonesia is working on the *Palapa Ring project*, an ambitious broadband backbone network that will effectively close the gap between rural and urban areas by providing access to high-speed Internet throughout the country. And as part of Colombia’s *Plan Vive Digital* ecosystem, a second phase called *Plan Vive Digital 2* is now under development that focuses on broad-based exploitation of ICT.

Meanwhile, the African Union has promulgated *Agenda 2063*, a strategic framework designed to boost broadband usage 10% by 2018, and deploy the necessary infrastructure to achieve socio-economic transformation of the continent by 2063.

Amid all these infrastructure plans and projects in emerging and developing countries across the globe, a recent study reported that the telecom sector of developing economies in Asia alone will require an investment of US\$2.3 trillion over the next 15 years from 2016 to 2030 just to sustain its economic growth, so it is clear that ICT infrastructure development will continue to be a global-scale challenge for the foreseeable future.

2.3 What do we Mean by “Quality ICT Infrastructure?”

Here we would emphasize that development of ICT infrastructure alone is not the whole story. While certainly economic growth through development of ICT infrastructure is important, development should be conducted in a way that enhances the quality of peoples’ lives—including the lives of the more vulnerable—and in a way that harmonizes with the local environment and culture. This insight led us to the concept of “quality ICT infrastructure.” In light of the current ICT infrastructure boom, it occurred to us that this emphasis on quality might be something Japan could share with the rest of the world.

By “quality ICT infrastructure,” we mean ICT infrastructure that doesn’t leave anyone behind; that is, infrastructure that promotes inclusivity, sustainability, and robust quality growth. For ICT infrastructure to be characterized as qualitative, the ICT infrastructure itself must exhibit quality.

For example, typical attributes enhancing the quality of ICT infrastructure include, “cost-effective economical lifecycle costs,” “social inclusivity,” “safety and robustness,” “sustainability,” and “convenience and comfort.” Note that just because the infrastructure is high quality does not necessarily mean it will support socio-economic growth or the lives of the local people. Other factors must also be taken into account such as “dealing with socio-economic development strategies and needs,” “serving the interests of local communities and economies,” “effective

funding through public-private partnerships,” and “compliance with high-level international standards formulated to reduce adverse impacts on the environment and society.”

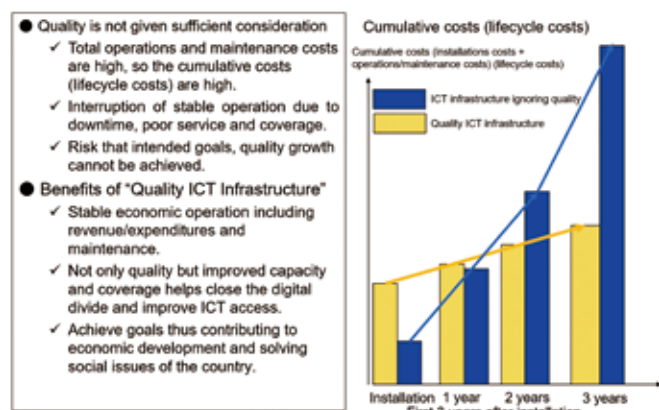
2.4 Japan’s Efforts Regarding “Quality Infrastructure Investment”

Let us next turn to Japan’s initiatives regarding “quality infrastructure investment,” including ICT infrastructure. Back in May 2015, Prime Minister Abe announced a “quality infrastructure partnership” bringing together a number of countries and international organizations to promote Asian quality infrastructure investment ensuring the “quality” of infrastructure while also seeking to “expand the quantity” of infrastructure. A year later in May 2016, just before the G7 Ise-Shima Summit, the government of Japan announced the “quality infrastructure export expansion initiative” expanding the scope of the initiative from Asia to the world at large. The G7 Ise-Shima Summit also incorporated the initiative when members agreed and shared the “G7 Ise Shima principle promoting quality infrastructure investment.”

Now if we compare the cumulative costs (*i.e.*, the lifecycle costs) including installation costs and operations/maintenance costs for “quality ICT infrastructure” versus “ICT infrastructure without quality,” we find that operations and maintenance costs are considerably higher for infrastructures when quality considerations are ignored. This is problematic because it drives up the lifecycle costs. Operation of networks and systems also become less stable due to problems and equipment failures, and this means relatively poorer provisioning of services and coverage. Consequently, neither intended results nor quality growth can be achieved.

On the other hand, installation of “quality ICT infrastructure” ensures stable economic operation including revenue /expenditures and maintenance aspects. This not only provides better quality but improves capacity and coverage to achieve the intended effects of closing the digital divide and improving ICT access. This contributes to economic development and social problem-solving

■ Figure 3: Significance of “Quality ICT Infrastructure”

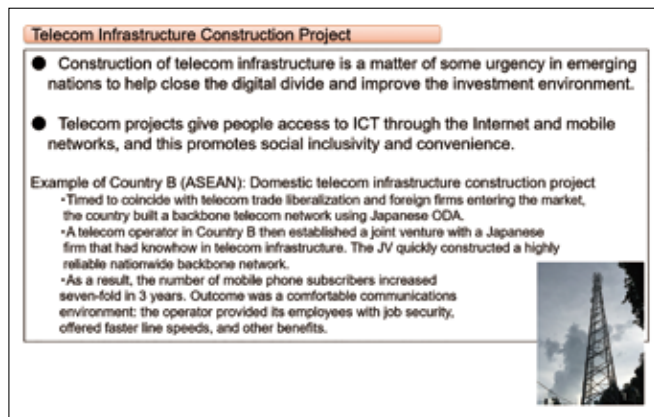


in countries that are now deploying quality ICT infrastructure.

Let us next consider a telecom infrastructure construction project as an example of quality ICT infrastructure. I noted earlier that constructing telecom infrastructure projects is a matter of some urgency in emerging nations to help close the digital divide and improve the investment environment. But telecom projects also give more people access to ICT through the Internet and mobile telecom networks, which enhances social inclusivity and convenience.

Recently for example, perfectly timed to telecom trade liberalization and entry of foreign firms, an ASEAN nation constructed a backbone telecom network using Japanese ODA. Subsequently, a telecom operator in the same country launched a joint venture in partnership with a Japanese company with considerable expertise in telecom infrastructure. The joint venture was able to quickly deploy a highly reliable backbone network extending from one end of the country to the other, and the number of mobile phone subscribers increased seven-fold within three years. And there were other benefits to the local economy as well. They ended up with a very comfortable communications environment where the operator provided its employees with job security, offered markedly faster line speeds, and other benefits.

■ Figure 4: Example of Quality ICT Infrastructure (2)



3. Conclusions

To share our insights regarding “quality ICT infrastructure” investment and advanced economy case studies with emerging markets and developing economies where the greatest demand for quality ICT infrastructure development is likely to occur, we are now in the process of drafting a “Playbook for Investment in Quality ICT Infrastructure.”

We are confident that these guidelines will provide a valuable resource in helping people understand quality ICT infrastructure, will help boost investment in quality ICT infrastructure, and contribute to the realization of high-quality growth.

* MIC published its “Playbook for Investment in Quality ICT Infrastructure” (English and Japanese) in July 2017.
http://www.soumu.go.jp/english/gisb/index.html#gisb_06

Current State and Development Potential of the ICT Sector in Africa

Tomoyuki Naito

Senior Advisor
ICT and Development
Japan International Cooperation Agency



1. Introduction

There is surprisingly little reliable statistics and other information regarding Africa compared with Asia. It is even more difficult to obtain information in Japanese, particularly information organized to give an overview of the ICT sector.

In the context of development, high-quality ICT infrastructure is an unavoidable requirement for maintaining on-going development, as much in Africa as in Asia. However, there is a shortage of basic infrastructure in Africa, so beyond simply maintaining quality, compensating for shortages in absolute quantities is an urgent issue.

Under the current conditions Japan has come to a crossroads at the Sixth Tokyo International Conference on African Development (TICAD 6), and must reexamine our mid-to-long term perspectives for support in the ICT sector, particularly considering the high priority given to promoting human resource development, to bolster ICT industries and infrastructure that will be able to use the human resources once they are trained.

With this article, I hope to provide food for thought for considering future directions on support and investment in African ICT sector. I describe the state of the ICT sector in Africa, including development potential, based on reliable survey data from international organizations mainly in Europe that have been dealing with African ICT sector issues for many years, as well as local conditions and empirical data as obtained by the Japan International Cooperation Agency (JICA), an agency undertaking official development aid (ODA) of Japan.

2. Economic Impact of ICT in Africa: Overview

Recent technical innovation in telecommunications, centered in certain developed regions in Europe, America, and East Asia, has brought drastic reductions in the cost of mobile telephones through commoditization, and made it possible to connect to the Internet from anywhere in the world through mobile telephones. Africa has also benefited from this innovation. The “Mobile economy,” which is composed of both the economic effect created by mobile communications and its related services industries, is continuously contributing to overall economic growth in the whole African region. The mobile phone has now grown into an indispensable engine of growth for economic activity throughout Africa.

The GSM Association (GSMA) is an organization of mobile communications operators and associated industries that have adopted GSM, the current most widely used mobile telecommunications system in the world. The report issued by

GSMA in July 2016 titled, “The Mobile Economy Africa 2016,” contains very important data for forecasting the scope of effect that the mobile economy will have on economic growth of Africa in the future. According to this report, the overall adoption rate for mobile phones in Africa relative to the population had already reached 46% by 2015, and was expected to continue to grow by approximately 6% yearly. In that same year, the added value created by the mobile economy accounted for 6.7% of the overall GDP of Africa, equivalent to 153 billion US dollars of economic value. The GSMA expects these figures to rise to 7.6% and 214 billion US dollars by 2020. Note that the GSMA has confirmed that as of June 2016, 4G level telecommunications networks were already operating in 32 countries and 74 regions throughout Africa.

Incidentally, Rwanda advocated ICT nation building in its “Vision 2020,” long term development plan, winning high recognition from around the world through this strategy and strong governance. The ICT sector’s economic contribution to Rwanda’s GDP reached 3% in 2014, which exceeded the total value of all agricultural exports from the country. On the other hand, ICT related business activity and especially manufacturing has not fully taken off as a secondary industry for many countries in Africa. In those cases, the ICT sector is supported by revenue from telecommunications operators and related services based on the spread of mobile telephones, so it is not an exaggeration to say that “ICT sector” and “mobile economy” mean almost the same thing.

There are four fields that can be defined to compose the mobile economy, namely (1) Sales by mobile telephone operators, (2) Sales from directly related industries, (3) Sales from indirectly related industries, and (4) Added value created by improved productivity due to mobile communications technology. Recently, the most remarkable growth is being seen in the field of services that build on the spread of mobile phones, which corresponds to items (2) and (3). M-Pesa, developed in Kenya as the mobile phone money transfer service, is the one of the largest such services that generates sales. It is also an example of so-called “fintech” in Africa. According to the Wall Street Journal, the total of mobile money transfers in all of Africa had reached 30 billion US dollars, and the GSMA report mentioned earlier stated that gross mobile money settlements would continue to grow at a yearly rate of over 30%. On street corners in every country in Africa, you will see kiosks offering easy mobile money transfers, using mobile telephone technology to provide an excellent solution to a demand that is particular to the Africa region.

3. Opportunity: Internet Infrastructure in Africa

In the previous section I discussed how high-demand services such as mobile money transfers are showing remarkable growth in the rapidly expanding mobile phone market in Africa, but we also want to know the state of the actual ICT infrastructure supporting these information technologies.

Currently, there are many international undersea network cables in place along the eastern and western coasts of the African continent (Figure 1).

The main cables on the eastern side cross the Indian Ocean, connecting East Africa with South Africa and the Middle-East region, while on the west side they connect the west side of Europe (U.K., France, Spain, etc.) with countries on that side. Crossing the southern Atlantic Ocean, they also connect with Brazil as a gateway to South America. There are also many international undersea cables, mainly from Asia, connecting with various European countries on the Mediterranean coast via the Red Sea and landing at locations along the north coast of Africa. Projects including DARE (east coast, scheduled for 2018), Africa-1 (east coast, 2018), Liquid Sea (east coast, 2018), and SACS (west coast, 2018) are also in the construction

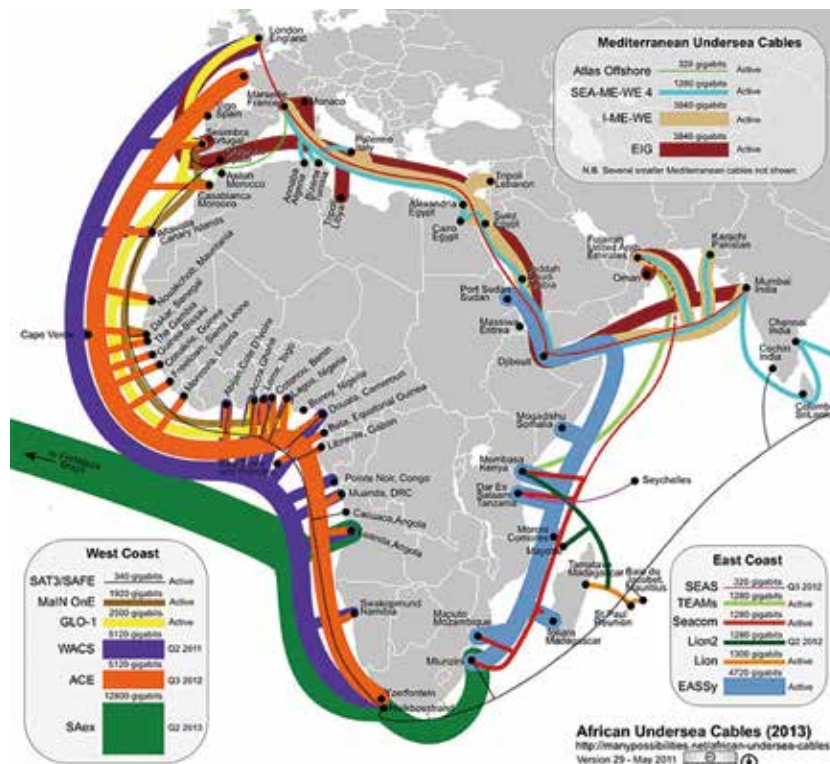
stages. Through those projects, Africa has been connecting with international undersea networks at a rapid pace in the past ten years, and it is clear that it will also connect with Asia and North and South America by high capacity communication networks in the future.

This consolidation of international telecommunications networks includes several investment projects from international cooperation. Recently, the World Bank invested 500 million US dollars into the Regional Communication Infrastructure Program (RCIP), to improve communication lines in Africa, which rapidly expanded capacity in the sub-Saharan region from just 80 Gbps (Gigabits per second) in 2008, to 15.7 Tbps (Terabits per second) in 2012. This clearly demonstrates the effects of support from public funding.

On the other hand, what are conditions like for end users, who are actually using this telecommunications network? According to the GSMA report, the global rate of smartphone adoption was 51%, and the rate in Africa was 30% in 2016, but this difference is expected to decrease significantly in the future (Figure 2).

In this way, wired network infrastructure enabling high-speed has reached the continental coast and sub-US\$100 inexpensive smartphones coming from China and India are spreading rapidly,

■ Figure 1: Undersea cable high-capacity international telecommunications networks surrounding the African continent



Source: SAex

■ Figure 2: Smartphone adoption rates in Africa

Percentage of connections



Source: GSMA

but there are still several bottlenecks for this to be a driver of real, continuous growth in the mobile economy of Africa as a whole. These include (1) inadequate domestic communications networks able to provide services at competitive prices, (2) inadequate domestic core networks able to provide access to international lines arriving at the coasts, (3) concentration of most of the available bandwidth in cities and major urban areas, and (4) while connection to the Internet through mobile phones is a powerful breakthrough, it is not a panacea.

It is clear that it will be difficult for all countries in Africa to overcome these bottlenecks through self-help efforts alone. Mutual cooperation between neighboring countries and collaboration with supporting countries and international organizations outside the region, setting and implementing policy for general and strategic measures and investment planning is essential. Concrete policies and allocation of roles for this is being discussed seriously at many related international meetings and initiatives.

4. Opportunity: Digital Economy related Initiatives in Africa

Africa consists of 54 countries, large and small, with almost 20% of the world's population. Among the countries there are great differences in the per-capita gross domestic product, which expresses levels of income in basic terms, ranging by a factor of over 60 from highest ranked Seychelles (14,938 US\$) to lowest ranked South Sudan (233 US\$).

Considering that there are also great differences in the populations of countries, ranging by a factor of 2,000 from the largest (Nigeria, approx. 180 million) to the smallest (Seychelles, approx. 90,000), disparity in GDP is not necessarily directly proportional to the level of ICT infrastructure development or

penetration of ICT into societal activity. It is clear that explaining the situation for all regions in such broad terms is not necessarily the right approach.

Thus, even in numerical and physical terms, it is not an exaggeration to call Africa one of the world's most dynamic regions, overflowing with diversity. Neutral organizations and mechanisms are needed in the whole continent, as well as within regions, which can span borders and pursue the common good, and distribute it effectively and efficiently. There have already been many projects in the past, mainly established from UN proposals and leadership (e.g. UN Economic Commission for Africa, African Development Bank, etc.). On the other hand, particularly since the failure of structural adjustment lending by multilateral development banks in the 1990s, "African regional organizations and cooperative infrastructure facilities by Africa and for Africa" are being established, and there is an increasing tendency to respect discussion and activity that pursues economic growth that is capable of sustainable development, while maintaining African identity and ownership, according to local conditions and emphasizing sharing of development knowledge.

Given this background together with the trend since 2000 toward active introduction and use of ICT in global development, initiatives by function and spanning regions are being established one-after-another, using ICT as the driving force and promoting digital economy according to conditions in each country, to realize and promote a "leap frog" effect in Africa.

At the first Transform Africa Summit (TAS) held in Kigali, Rwanda in October 2013, heads-of-state from seven countries shared leadership in establishing Smart Africa (SA), as a regional initiative to accelerate social and economic development in Africa through ICT. The heads-of-state in the region agreed on and signed a manifesto at the 22nd meeting of the African Union

(AU) in 2014, with public support provided by the International Telecommunications Union (ITU), the World Bank, the African Development Bank and other organizations. A headquarters was established in Kigali starting in 2016, with Hamadoun Toure of Mali (former Secretary General of the ITU) as the Founding Executive Director; a position which he still holds. Given this background and events leading to its establishment, and having a rare international leader like Dr. Toure as its full time ED, it is very promising for the role and function of ICT in Africa to have the SA as a permanent gateway for collaboration with agencies outside the region.

The third biannual meeting of TAS was held in Kigali in May 2017. TAS continues to increase in number of participants, number of countries represented, and in diversity, and has become the largest international conference related to ICT in the region. As mentioned earlier regarding Smart Africa, TAS brings together many heads of state in the region and ministers in charge of ICT from most of the countries, so it is used as a venue to discuss important common ICT related initiatives. It also attracts many ICT related participants from outside the region, both government and private, with reports of 3,800 participants from 81 countries at the third meeting. It also has a role as a trade fair, enabling ICT related enterprises expanding their international business to present their latest technologies and solutions for Africa, and at each meeting, sessions are held for venture entrepreneurs and investors to meet, so it is an excellent opportunity to get an overall view of the dynamic ICT activity in each African region.

In the East African region, the Northern Corridor Integration Project (NCIP) has governments and private enterprises in each of the countries along the corridor (the northern corridor is an international telecommunications corridor connecting Mombasa Bay in Kenya with Rwanda) collaborating in the ICT sector, and the Northern Corridor Technology Alliance (NCTA), which has been officially operating since 2015, is an initiative attempting to create common benefits for the whole region through technical cooperation. The NCTA has already succeeded in stimulating demand for communications, by reducing communication roaming fees among the countries along the northern corridor all at once. It also has initiatives such as unifying electronic customs clearing procedures and making distribution of agricultural products more efficient through ICT.

The Sustainable Development Goals Centre for Africa (SDGC/A) is an independent non-profit agency established in Kigali, Rwanda, to promote initiatives for achieving sustainable development goals (SDGs). As a regional agency promoting SDGs in the Africa region, the SDGC/A has led other regions by starting in January 2016, and held a ceremony celebrating the start of activities in January 2017. The main roles of the SDGC/A are (1) policy proposals and research, (2) training and capabilities development, (3) promoting technical reform and innovation, and

(4) coordinating investment and projects among the countries.

5. Issue: “Four billion not reaping the benefits” in Africa

In Africa, where there are still overwhelming shortages of basic infrastructure such as water and electricity, there are many areas where the ICT sector still lags behind expectations, so we will touch on a few of them.

According to analysis in the 2016 World Development Report, “Digital Dividends,” the size of the population without access to a high-speed internet connection in that year was more than half of the total population of the earth, at approximately four billion. Without actively working to improve this number, it would be extremely difficult to resolve various development problems identified as SDGs. One of the major differences between the SDGs and their predecessor, the Millennium Development Goals (MDGs), is their evolutionary approach in that ICT is seen as an essential means for achieving many of the development goals. In this case, ICT is exemplified by the Internet, which has already become established as new social infrastructure in countries around the world. For example, one of the SDGs set was called “Goal 5: Gender equality and empowerment of women,” and ICT was expected to play a crucial role in achieving this goal.

On the other hand, as mentioned above, there are already many international undersea communications cables installed and landing along the coasts of the African continent, but most of the countries are still developing their inland data communications infrastructure to use this capacity effectively, backbone networks, particularly fiber optic, are not yet complete, and investment is gravely inadequate to meet the need for completing these networks.

To achieve Goal 5 and other SDGs, it will be critical to stimulate and attract investment for these inland backbone communications networks. Accordingly, since the SDGs were agreed upon by UN member countries in September 2015 and recognizing that the investment shortfall problem must be dealt with, various initiatives have been started in international society and efforts seeking alignment in international society are accelerating.

Typical initiatives include the Global Connect Initiative (GCI) by the US State Department, and Internet for All (IfA) by the World Economic Forum (WEF). GCI and IfA are closely connected and linked to the US Agency for International Development (USAID), a bilateral support agency under the umbrella for the US State Department. In the fall of 2016, USAID published a report called, “Connecting the Next Four Billion,” which focused on the situation of the “four billion not reaping the benefits” identified by WDR 2016, identified measures to address it, and encouraged unification and cooperation among support agencies at a practical level.

The WEF, which is promoting organic cooperation through

dialogue between public and private organizations for work on global scale development issues, also officially started IfA in 2016 as a multi-year project. It has gained participation from approximately 50 public and private organizations around the world, has selected three pilot regions as of March 2017 which are: Africa (Northern Corridor), Southern Asia (India), South America (Argentina); and is actively continuing to work with the intention of enabling those that are not “reaping the benefits” to receive income or to participate in society at a higher level.

Japan has been participating in IfA since May 2016, actively contributing input with JICA as a member of the global steering committee. Beyond just investment in infrastructure to increase the number of Internet users and promote sustained development in developing countries, the IfA acts as a common platform for various approaches and initiatives by industry, government and academia, in areas such as human resource development, content, device pricing, and ecosystems, and makes valuable contributions to accelerating further mediation of ICT inequality on a global scale.

6. JICA and ICT in Africa: Projects on Strengthening ICT Innovation Ecosystems in Rwanda

In the light and dark areas of ICT in Africa, there are aspects that are developing beyond expectations and others that remain undeveloped, as ever, so an objective perspective on both of these aspects must be maintained while studying practical ways to solve issues according to conditions in each country and region.

Throughout Africa, with its 1.1 billion people in 54 countries, even with countries and agencies supporting individual cases where support can be given, it is clear from the facts of international development over the past half century, that highly effective results in terms of efficiency cannot be expected without a specific strategy.

So what initiatives should be taken to increase development effectiveness? It goes without saying that as foreigners, we cannot envision the solution, and it will only become clear when the people of Africa take ownership and study it, considering possibilities of lessons from the past and conceivable futures, and international society must provide support from the side through dialogue. Existing initiatives, including SA, TAS, NCTA, and support from SDGC/A and others are naturally essential for this. The fact that Rwanda exists is not an accident, and we should consider it due mainly to these important initiatives.

Rwanda is a landlocked country with scarce natural resources, but since 2000, when it initiated its “Vision 2020,” 20-year long-term development plan to build an ICT nation, it has instituted various reforms and schemes required to receive foreign investment, performed diligently through strong leadership from the president himself and Rwanda’s cabinet and bureaucracy, and as a result, in recent years it has consistently ranked second only

to Mauritius among African countries in the annual World Bank Group publication, “Doing Business.” This is related to the fact that it has become a hub for important ICT initiatives across the region.

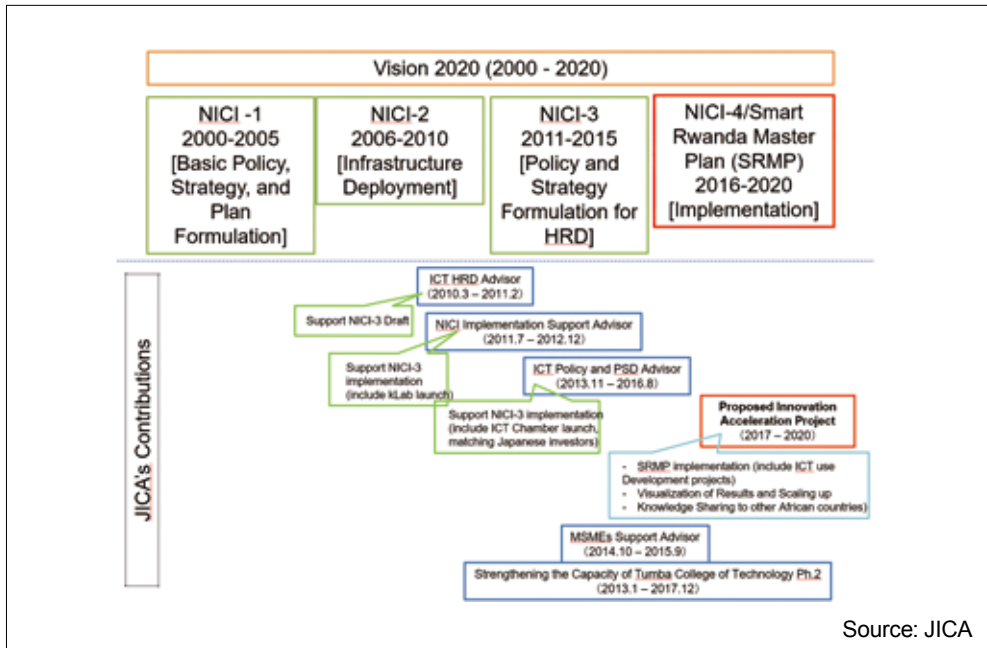
Since 2010, JICA has provided continuous support for Rwanda, which has become an ICT hub in Africa. In the Rwanda government’s “Vision 2020”, the National ICT Strategy and Plan (NICI) is divided into five-year phases. In the past three phases, the basic policies, strategies and plans were created, data communications infrastructure was completed, and policies and strategies for human resource development were created. In the final, fourth phase (NICI-4: 2016-2020), The “Smart Rwanda Master Plan (SRMP)” created in the previous phases will be comprehensively put into practice.

JICA began its support in the final stages of NICI-2, and in NICI-3, it has conducted joint projects working closely with government agencies to create a human resource development plan based on the policy. This will enable large numbers of human resources to be produced, who will contribute to increasing overall productivity, building the ICT sector as an industry that can contribute to the nation’s economic growth and also promoting its use in other sectors.

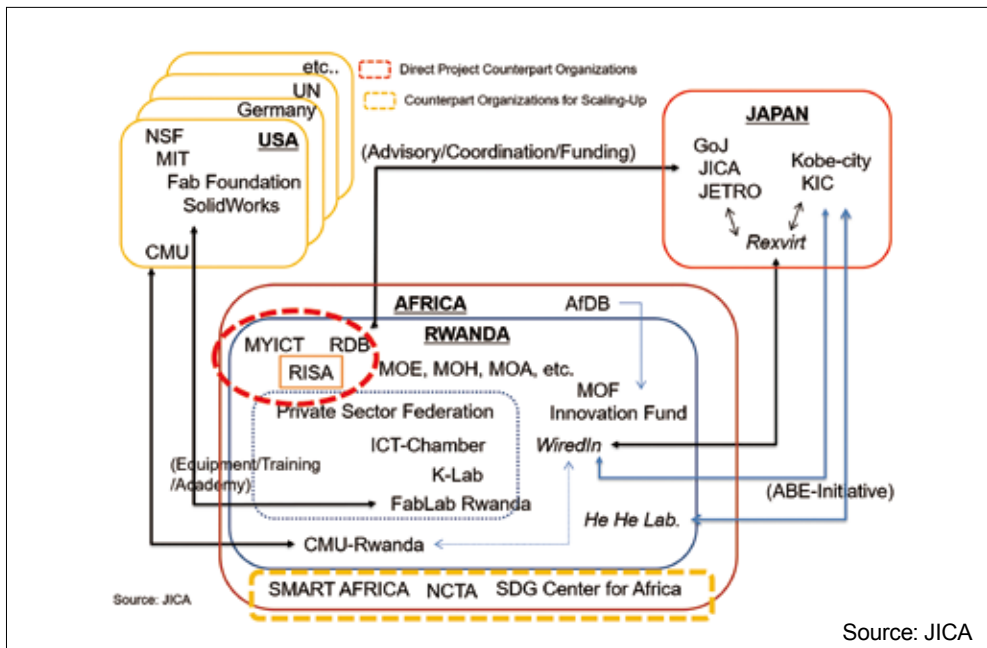
Through the effective activities of specialists from the UN and other agencies, who provide rich support, advice and experience in the ICT sector, functions and organizations have been established over the past six years, including the Knowledge Laboratory (K-Lab), which is an incubation facility supporting the young generation of “Digital Natives” from concept through to starting a business; the Fabrication Laboratory (FabLab), which is a digital workshop where product prototyping can be done easily and at low cost; and the ICT Commerce/Industry Association, which provides various regulatory functions for nurturing the ICT industry. These have acted as a showcase to other countries when advocating for Rwanda as an ICT Nation (Figure 3). The strong leadership and ownership by the Rwanda government, effectively integrating support from JICA and other industry, academic, and government sources, continuously gathering people, goods and money in Rwanda from around the world, and organically generating an ecosystem of innovation there, is a notable and rare development result in the world.

The Rwanda government, needing to further scale up the results of these past six years based on this success, has asked for technical cooperation from the Japanese Government to further strengthen this innovation ecosystem and is starting a new collaborative project between JICA and the Rwanda Government in November 2017 (Figure 4). As part of performing SRMPs based on NICI-4, this project aims ultimately to strengthen the innovation ecosystem, which will resolve various social issues in Rwanda through use of ICT, through pilot projects performed jointly with various other sectors, while strengthening growth of industry, promoting investment, and promoting creation of jobs.

■ Figure 3: Rwanda “Vision 2020” and related support from JICA



■ Figure 4: Rwanda “Innovation ecosystem” and related support from JICA



7. Conclusion

I have described the ICT sector in Africa in terms of the current state of telecommunications networks, digital economy initiatives, and the example of the innovation ecosystem in Rwanda. However, I have not mentioned many aspects such as the micro-conditions in each country, characteristics within each region, the current state of human resources and organizations, or the state of private investment, but these are all important factors when considering investment or expansion into support, whether from a public or a private organization.

Nevertheless, as mentioned at the beginning, there is

surprisingly little reliable statistics and other information regarding Africa, particularly information organized to give an overview of the ICT sector, so I would be pleased if this article is helpful in providing an initial understanding of the current state and future potential of the ICT sector in Africa.

In closing, I had the opportunity to present the main points in this report at the symposium in March 2017, and I would like to express my sincere thanks for that opportunity to everyone involved at the ICT Global Strategy Bureau, Ministry of Internal Affairs and Communications.

Provision of High-quality ICT Infrastructures: An Introduction of NEC's Global Initiatives

Shin Sakamoto
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1. Introduction

NEC has defined the values that the NEC Group must offer as “safety,” “security,” “efficiency,” and “equality”—social values that are essential in realizing “for all people, an abundant society.”

In particular, this article introduces a few global market use cases on utilizing ICT to “close the social divide and eliminate inequality,” as well as to “provide equally high quality of life” to all people.

First are examples of submarine cable and terrestrial digital broadcasting solutions, which are critical infrastructures in the broadband communications era, serving as core infrastructure solutions that close the social divide in broadband accessibility and information delivery between urban and rural areas. Next are examples of solutions that offer an equally high quality of life to all people.

2. Introduction of use cases

2.1 Submarine cable solution

Optical submarine cables are a core infrastructure solution necessary in providing communication services between continents and islands. They enable equal opportunities for access to broadband communications by underpinning the information exchange and communication systems for not only large-scale data transmission, such as in online transactions and in transmission of videos, music, games, and other entertainment media content, but also for education, healthcare, and economic transactions between and within local communities for people living in rural areas.

NEC is one of the few solution providers throughout the

world that have the capability to provide turnkey solutions needed in completing a submarine cable project, including the terminal equipment for submarine communications installed at the landing points and the optical submarine cables and repeaters for laying on the seafloor, as well as the submarine construction knowhow for laying down the optical submarine cables.

A recent example is the Hong Kong Guam Cable System, a 3,900-km large-capacity optical submarine cable system connecting Hong Kong and Guam.

The cable system, which is scheduled to begin operation in January 2020, supports the optical wavelength multiplex transmission system with a capacity of 100 gigabit per second (100 Gbps) per wavelength. The cable system consists of four fiber pairs that can accommodate 120 wavelengths each pair, enabling a total capacity of 48 terabits per second (48 Tbps). NEC takes pride in the project, which is partially funded by the Fund Corporation for the Overseas Development of Japan's ICT and Postal Services (Japan ICT Fund), as a successful case of a public-private partnership that is consistent with the strategy of exporting infrastructure from Japan.

2.2 Terrestrial digital TV infrastructure solution

Many countries around the world have either already introduced or are planning the introduction of terrestrial digital TV broadcast, an advanced solution that offers high-quality broadcast services, such as HDTV programs, multi-programs, and datacasting and interactive services, which are not available through analog broadcasts.

■ **Figure 1: Hong Kong Guam Cable System Project Route Map**



Figure 2: Dissemination of disaster prevention information using terrestrial digital broadcast



NEC is one of only a few providers that are able to provide end-to-end solutions for terrestrial digital TV broadcast, including studio systems for creating TV programs and transmitters for distributing program contents.

The terrestrial digital platform and datacasting functions can also be used for widely and efficiently disseminating disaster information to residents, thereby contributing to disaster prevention and mitigation.

2.3 Agricultural solution

NEC is working with Kagome Co., Ltd., a global tomato processing company, to maximize tomato cultivation yields.

Tomato is an agricultural crop that is difficult to grow, requiring long years of cultivation experience. To address this issue, we tried to increase productivity by applying digital technologies.

Use of NEC's advanced AI technologies enabled highly accurate production forecasts in the first year of introduction, an achievement that normally takes a few years, without the need for accumulating massive amounts of past data.

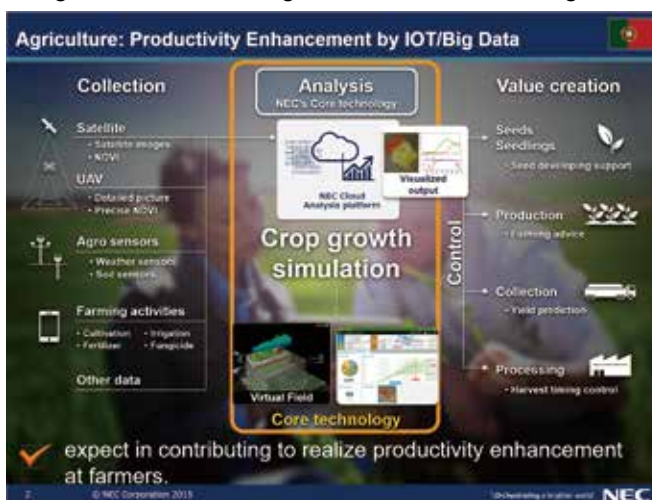
Although climatic conditions are highly uncertain in open-field cultivation, simulations to forecast crop growth and development can be carried out for any number of times to take into account ever-changing climatic and cultivation conditions. NEC's solution performs simulations for more than 20,000 patterns of farmers' daily agricultural practices.

NEC's IoT and AI technologies enable simulating the real world in a virtual farm in such a way that even previously unrecognized changes are visualized. Going forward, NEC plans to expand this solution for maximizing harvest using AI beyond agricultural production, to cover the entire process that includes post-harvest processing and distribution, and conduct simulations of the entire value chain.

2.4 City Video Surveillance Solution

NEC deployed the solution in the city of Tigre, Argentina, contributing to the building of safe and secure cities and to crime prevention using the world's most accurate image recognition

Figure 3: Overview of agricultural solution utilizing ICT



technologies.

The high prevalence of crime had been a serious problem in Tigre City. After NEC introduced an image recognition solution at the city's surveillance center, remarkable improvements in safety were achieved, such as reduction of car theft by 80% from 2008 to 2013.

Besides urban safety and security, the introduction of the solution resulted in economic benefits as well, wherein income from tourism has tripled in the last 10 years.

These safety and economic benefits are the very fruits of the digital transformation, via "visualization, analysis, and prescription," made possible by NEC's AI and other cutting-edge technologies.

Moreover, NEC's video face recognition technology has garnered the first place with a matching accuracy of 99.2%, an overwhelming lead over other companies, in benchmark tests conducted by the U.S. National Institute of Standards and Technology (NIST), the world's leading authority in measurements.

This is the fourth consecutive time that NEC's face recognition technology took first place in NIST benchmark tests, following the previous still image face recognition tests. The latest technology can be used to prevent untoward incidents and accidents through detection of suspicious individuals via rapid analysis of surveillance camera feeds, and enables recognition as subjects walk naturally without stopping or acknowledging cameras installed at gates of critical facilities, greatly improving convenience and utility.

2.5 Solution for educational centers in Colombia

NEC has constructed 648 ICT Rooms that allow the use of ICT environment, such as Internet connection via satellite communications, wireless LAN, computers, and printers, in schools and community centers throughout seven of Colombia's regional departments. In addition, NEC also provides maintenance and operation services as well as training for users of the ICT rooms.

The ICT Ministry of the government of Columbia, under its

Figure 4: Surveillance solution deployed at Tigre City

Safety and Security: Video Surveillance

Design, build & operate video surveillance/command control in Argentina

- Tigre city introduced video surveillance solution to reduce crimes, traffic and other incidences. More than 1,000 cameras, command and control system, IP & Fiber network, 22 operation seats and a high availability video recording system are operating for 24hours/365days.
- to contribute in decreasing crimes and incidences. (ex. 80% reduction of car theft)
- positive impact for regional economy. (ex.300% increase of tourist income)

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“Kiosco Vive Digital” plan for promoting the nationwide spread of broadband Internet and for narrowing the country’s digital divide, aims to build more 4,200 ICT rooms throughout the country and connect them via high-speed Internet. This project is part of the national plan and involves the construction of the ICT environment by NEC and other partners.

NEC is involved in building ICT environments geared at the nationwide uptake of broadband Internet and at closing the digital divide in Colombia. Further, NEC will promote the construction of ICT infrastructures in the country and contribute to their efficient use and advancement, as well as continue to globally expand the construction of ICT environments going forward.

2.6 Biometric identification solution to support the school feeding program in Chile

Guaranteeing that all school children are given equal access

to nutritionally healthy meals is part of the health and nutrition policies of the government of Chile.

JUNAEB* is a public institution that was created in 1964 to administer the public school feeding programs of the government in order to address the nutritional deficiency among children. The activities of the institution have led to significant alleviation of the nutritional deficiency in school children, as well as to the increase in school attendance, leading to Chile’s having the lowest illiteracy and malnutrition rates in Latin America.

Presently, however, Chile is faced with an increasing rate of childhood obesity. As a measure to address this issue, JUNAEB is planning to introduce a scheme to monitor individual student records in the distribution of meals and optimize the management and improvement of nutrition and health.

NEC’s biometric authentication system has been chosen in validating the practicability of the scheme, and NEC conducted

Figure 5: Overview of initiatives in building educational ICT environments

Education Service : ICT Center

Build ICT centers for schools and community in Colombia

- ICT Ministry of Colombia has been promoting its “Kiosco Vive Digital” plan, which seeks to promote the nationwide spread of BB Internet and to narrow the country’s digital divide through the creation of more than 4,200 ICT rooms.
- to contribute in narrowing and eliminating digital divide between cities and rural area.
- to provide accessibility to BB internet at poor segment.
- to contribute in reducing crime involvement at young people.

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Figure 6: Project to support the school feeding program using fingerprint identification

Health & Education: Biometric Identification & Recognition

Project Name: Biometrics Identification and Recognition (PoC)

Customer: JUNAEB (Santiago, Chile)

Solution: USB Fingerprint Reader (JareU 4500)
Panel Check and Thermal Printer
Telefonica’s Mobile Broadband
Support services

Project Scale: 30,000 Students in 30 Schools

© NEC Corporation 2015

* JUNAEB : Junta Nacional de Auxilio Escolar y Becas

the trial throughout 30 schools in three cities in Chile. Results of the trial have demonstrated the effectiveness of the solution.

The system is slated for implementation across all public schools through the country.

2.7 Financial inclusion solution in Mozambique

Hunger and poverty are serious issues in Mozambique, where agriculture is the main industry. NEC is working with the UN Food and Agriculture Organization (FAO) to improve agricultural productivity in the country. FAO had been handing out paper vouchers that could be used to purchase agriculture supplies as part of a project aimed at supporting farmers. The system, however, had been encumbered by a number of practical issues, such as safety, convenience, and traceability.

Under the FAO's agricultural support voucher project, farmers are provided with vouchers that could be used particularly for agriculture-related purchases, wherein they pay 1,000 yen for a voucher that could buy 2,000 yen worth of agricultural supplies. There were risks, however, in paying for the vouchers in cash and in keeping the paper vouchers at home.

Also, although they were able to monitor the recipients of the vouchers, they had no way of tracking how the vouchers were actually used. Further, since the farmers needed to spend the voucher in a single purchase, it was not very convenient to use.

NEC, therefore, introduced an e-voucher system using mobile technologies—a project that could not have been possible without the cooperation of various partners, including a mobile telecom carrier, the Japan International Cooperation Agency (JICA), Nippon Biodiesel Fuel Co., Ltd., as well as the FAO.

The introduction of NEC's e-voucher IC card system resulted in the following benefits:

- Ability to trace when and where the e-vouchers are used
- Ability to use the e-vouchers only for the required amount
- Ability to use the cash payments for harvest to charge the IC cards, providing an alternative to banks

The system encouraged the wide use of agricultural vouchers

Figure 7: Cooperation towards FAO's agricultural support voucher project



and enabled farmers to obtain farming implements for enhancing their productivity, leading to increase in their income. We believe that the introduction of similar financial platforms will contribute to the economic progress of developing countries.

3. Conclusion

Other than the use cases introduced today, NEC is providing global ICT infrastructures and solutions in all aspects of human life, literally from the seafloor to outer space.

The NEC Group has consolidated its management resources to Solutions for Society that bring about new and advanced ICT-based social infrastructures, and is continually endeavoring to transform itself into a Social Value Innovator—a company that continues to grow as it contributes to the realization of an abundant society by providing “safety,” “security,” “efficiency,” and “equality.”

Cover Art



Ichimura Hazaemon (Picture of kabuki actor Ichimura Hazaemon (1841). It is said that he is playing the role of a legendary Japanese poet Ariwara no Narihira (825-880).)

Utagawa Kunisada (1786–1865)

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Overview of the 2017 White Paper on Information and Communications in Japan

Economic Research Office
ICT Strategy Policy Division
Information and Communications Bureau
Ministry of Internal Affairs and Communications

1. Introduction

On July 28, 2017, the Ministry of Internal Affairs and Communications published the 2017 White Paper on Information and Communications in Japan.

This white paper* touches on the theme of this special issue (“Data-Driven Economy and Social Change”), and discusses the prospects for social activity redesign and the solution of social issues through the generation, collection, distribution, analysis and utilization of diverse data in a data-driven economy.

This article introduces the first three chapters of the white paper, which are closely related to this issue’s special theme.

2. Present and future of the smartphone economy (White Paper Chapter 1)

2.1 Advent of a smartphone society

Ten years have passed since the first iPhone was unveiled in the US in 2007. Smartphones have grown rapidly in popularity since 2010. By 2016 over 72% of households owned at least one, making them as popular as PCs. This rise in popularity has been much faster than that of other data communication devices.

Due to the growing popularity of smartphones, the amount of time people spend using them is also increasing. The average amount of time smartphone users spent on-line per day on weekdays in 2016 was 82 minutes. The 10-19 and 20-29 age groups spent even longer on-line (143 and 129 minutes on average, respectively).

2.2 Information behavior of millennials

The millennial generation (people who have reached adulthood since 2000) spend more time using smartphones, and less time using PCs.

According to the results of a questionnaire survey, people aged 10-29 spend considerably more time using social networks and video sharing sites on smartphones compared with other generations. This trend is more noticeable at weekends, when people aged 10-19 spend an average of 122 minutes using social networks, and 55 minutes using video sharing sites.

People in their twenties are also more tolerant of sharing in real space, and a high proportion of respondents said that they were not averse to sharing their belongings with others or borrowing things from other people, and can be said to exhibit

greater generosity in sharing with others.

Group interviews have also shown that the younger generation are less reluctant to share information on social networks, use flea market smartphone apps, and share their belongings in the real world. There have also been seen to multi-task on multiple devices, and to make active use of video media.

3. Data utilization (white paper, chapter 2)

3.1 Increased distribution and use of data

With further advances in digital technology, network performance, and the development of smaller and more affordable smartphones and IoT (Internet of Things) equipment such as sensors, an environment is being created where huge quantities of digital data (“big data”) can be collected and shared efficiently.

The amount of data circulating on networks is growing at an explosive rate, and as a result, improvements are being made to environments where data is used. These include the introduction of a basic act for promotion of public and private data utilization between the end of 2016 and the start of 2017, and the full implementation of the revised personal data protection law. As a result, by promoting the bulk utilization of data while balancing the need for data protection, one could say that 2017 is the first year of the big data era.

3.2 Data distribution and utilization issues

In a survey of Japanese businesses, 77% responded that they used or were considering using industrial data, and 78% responded that they used or were considering using personal data.

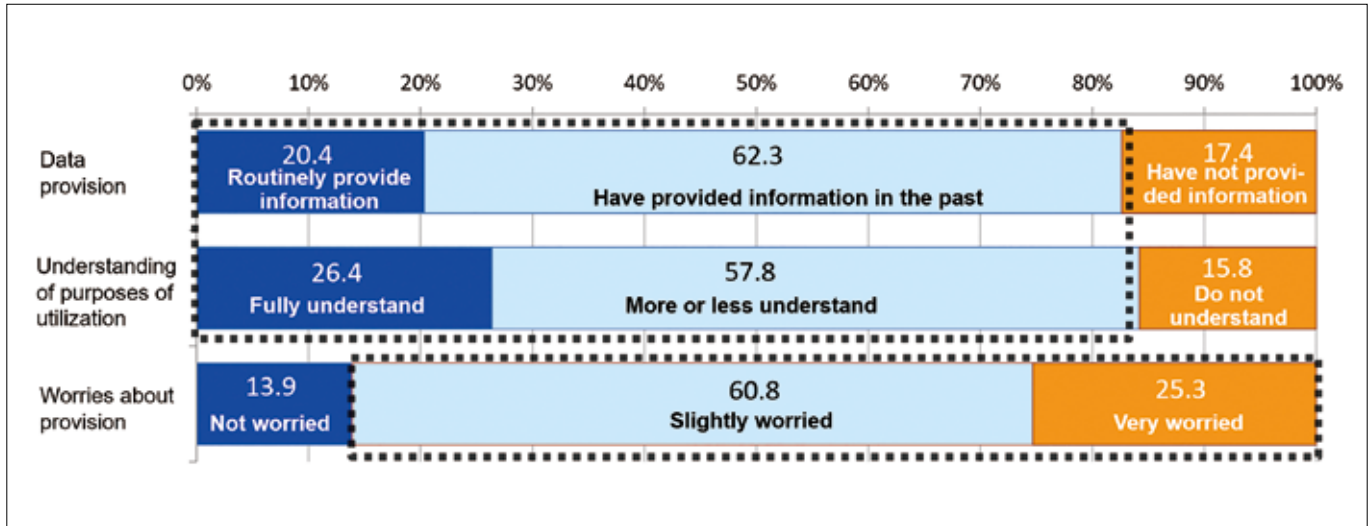
In a survey of individuals who share personal data, although 80% responded that they understood the purpose of providing personal data, over 85% responded that they felt uneasy about providing this data, indicating feelings of anxiety and resistance about the user of their personal information (Figure 1).

In the provision and collection of personal data, the purpose for which both business and personal data will be used features prominently in the information that businesses should provide to individuals, but individuals are particularly concerned about security measures, and there is a gap in the provision of information that businesses concentrate on, such as whether the information will be offered to third parties.

Although there are high expectations and motivations for the

* Available online at <http://www.soumu.go.jp/johotsusintokei/whitepaper/eng/WP2017/2017-index.html>

■ Figure1: Understanding and anxieties regarding personal data provision (Japan)



use of data by businesses, it is feared that the use of personal data will not advance while individuals still have deep-seated concerns about the provision of personal data. To promote the future distribution and use of data leading to economic growth and social change, it will be necessary to eliminate such gaps between the enthusiasm of businesses to use this data, and public fears about providing this data.

4. Changes brought about by the fourth industrial revolution (white paper, chapter 3)

On June 9, 2017, the Cabinet set forth its 2017 growth strategy and 2017 basic policy on economic and fiscal management and reform. To achieve medium- to long-term growth, these policies aimed to incorporate the technical innovations of the fourth industrial revolution into industry and society to solve various social issues and bring about “Society 5.0” ahead of the rest of the world.

Huge quantities of data (big data) are collected by diverse tools including smartphones, and stored for processing and analysis using technologies such as artificial intelligence (AI) as a way of understanding the present and predicting the future as a way of creating value and solving problems.

4.1 Progress towards and issues of the fourth industrial revolution

An international comparison with the United States, United Kingdom and Germany regarding which industry sectors are particularly likely to be revolutionized in the fourth industrial revolution appears to show that the answers given by Japanese businesses are centered on the information and telecommunications sector, and demonstrate lower awareness that the fourth industrial revolution will have an impact on other industries.

In 2017, when businesses were asked to classify the stage of their response to the fourth industrial revolution as “under examination”, “in progress/infrastructure development” or “in effect/reforms being implemented”, most responses were “under examination”. Meanwhile, many other countries have reached the

“in progress/infrastructure development” stage, and are one step ahead of Japan.

From 2020 onwards, the fourth industrial revolution is expected to bring about drastic changes in the structure of industry, but Japanese companies seem less willing to invest in new businesses and markets than businesses in other countries.

Of the challenges involved in implementing the fourth industrial revolution, the awareness of factors that are outside the control of businesses (e.g., rules, regulations and networks) is perceived as highly important in the US, UK and Germany, where businesses are keenly aware of issues relating to networks, standardization, terminals and the like. Meanwhile, Japanese businesses have a strong awareness of issues relating to standardization, the regulation of data distribution and collaboration (Figure 2). Regarding the awareness of issues concerning internal factors, overseas companies and Japanese companies were found to differ in terms of their awareness of issues concerning human resources and external resources (Figure 3).

4.2 Development of IoT in the information and telecommunications industry

As of 2016, the number of objects (IoT devices) connected to the Internet is 17.3 billion, which represents a substantial increase of 12.84% on the 15.4 billion IoT devices recorded in 2015 (Source: IHS Technology). It is expected that the annual average growth rate will accelerate to 15.0% until 2021, reaching about 30 billion in 2020, which is double the current quantity.

In addition, the Ministry of Internal Affairs and Communications devised an IoT International Competitiveness Indicator in March 2017. This indicator divides the ICT industry into an “IoT market” that provides components and systems related to smart cities and connected cars, and a “conventional ICT market” that provides other technologies. When scores were calculated for the business competitiveness of ten major countries and regions, Japan achieved third place in the IoT market, and third place overall.

Figure2: Issues relating to the provision of environments for the fourth industrial revolution (external factors)

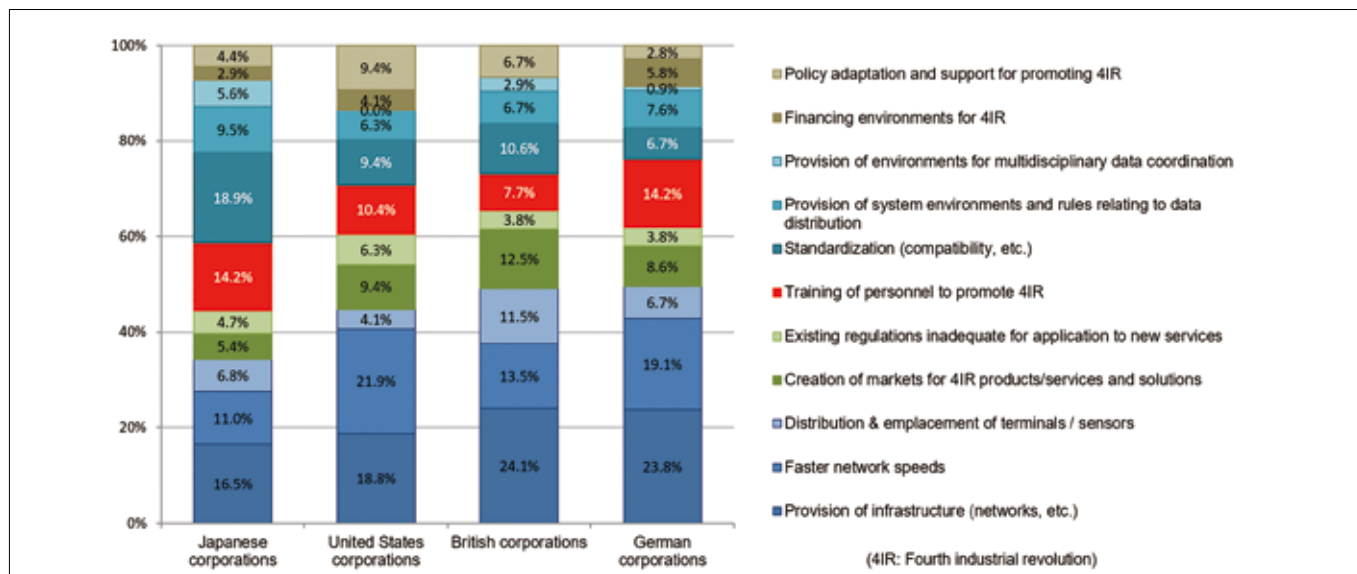
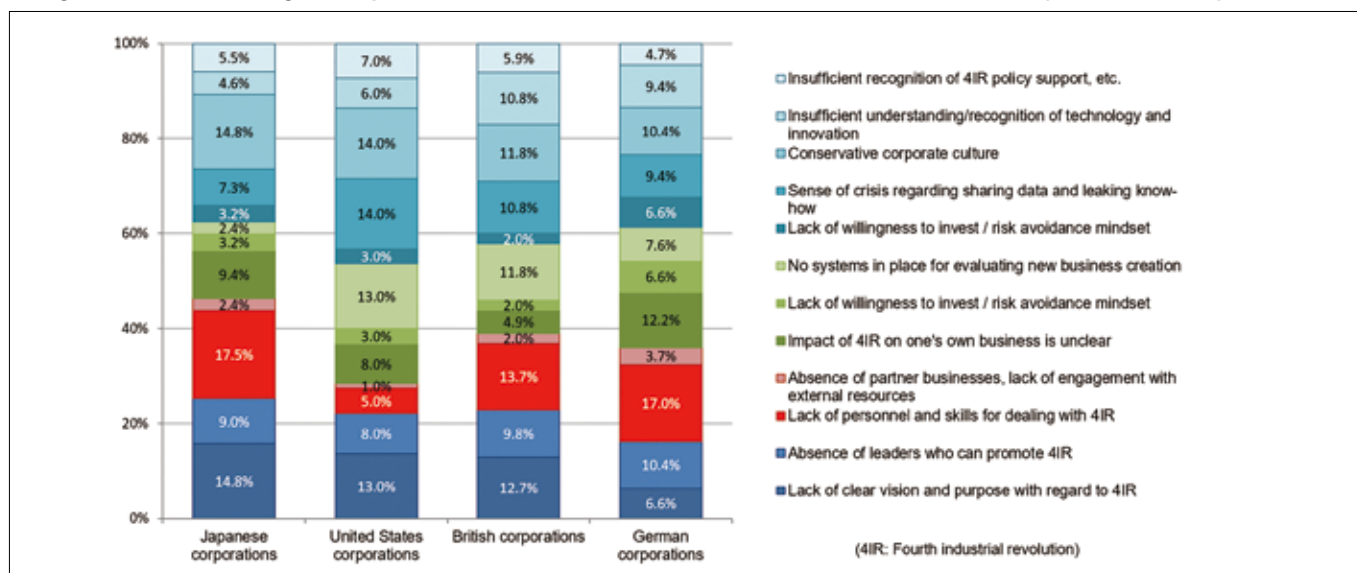


Figure3: Issues relating to the provision of environments for the fourth industrial revolution (internal factors)



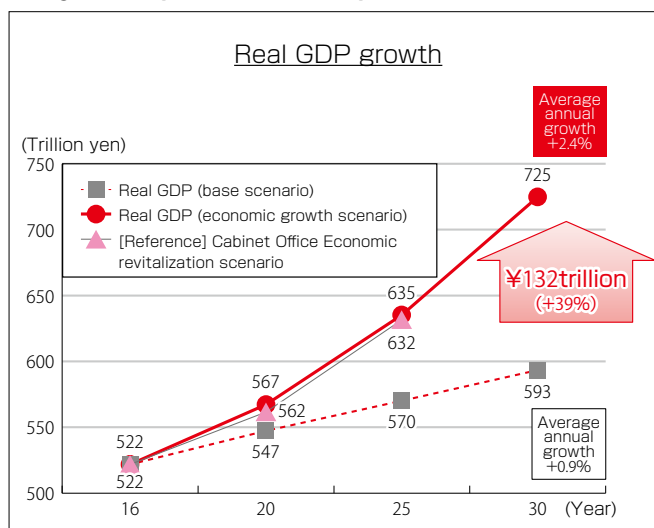
4.3 Comprehensive analysis of the fourth industrial revolution

To gain an overview of the economic impact of business reforms and the introduction of IoT and AI (IoT introduction), a comparison was made of one economic growth scenario in which these changes made steady progress, and another scenario based on the Cabinet's medium- to long-term forecast.

In the economic growth scenario, it is assumed that IoT introduction and business reforms will be implemented at different timings for each category such as process innovation, product innovation, and so on.

The values of various indicators such as market scale (induced production value), real GDP and employment figures (labor inducement figures) were estimated based on these frameworks up to the year 2030. As a result, it was estimated that the economic growth scenario will achieve a real GDP of ¥725 trillion by 2030, ¥132 trillion higher than the base scenario (Figure 4).

Figure4: Impact of the development of IoT



= A Serial Introduction Part 2= Winners of ITU-AJ Encouragement Awards 2017

In May every year, The ITU Association of Japan (ITU-AJ) proudly presents ITU-AJ Encouragement Awards to people who have made outstanding contributions in the field of international standardization and have helped in the ongoing development of ICT.

These Awards are also an embodiment of our sincere desire to encourage further contributions from these individuals in the future.

If you happen to run into these winners at another meeting in the future, please say hello to them.

But first, as part of the introductory series of Award Winners, allow us to introduce some of those remarkable winners.

Yoichi Suzuki

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Fields of activity: ITU-R WP4B



Standardization of ISDB-S3

It is a great honor to receive the ITU-AJ Encouragement Award, and I would like to express my appreciation for the award and to all those who supported me.

In 2014, Japan completed standardization of the national UHDTV satellite broadcasting standard, which is supported by the ISDB-S3 (Integrated Services Digital Broadcasting for satellite, 3rd generation) next-generation standard for 4K and 8K digital satellite broadcasting. I was closely involved in international standardization of ISDB-S3 at ITU-R SG4 WP4B meetings from July 2014 to September 2016, and played a role in drafting two key ITU-R documents: Recommendation ITU-R BO.2098 and Report ITU-R BO.2397.

Recommendation ITU-R BO.2098 outlines the scope of transmission systems for UHDTV satellite broadcasting, and includes

a detailed summary of ISDB-S3 in ANNEX1, and a table comparing ISDB-S3 and DVB-S2X in ANNEX2.

Report ITU-R BO.2397 outlines the scope of satellite transmissions for UHDTV satellite broadcasting. This document includes a summary of ISDB-S3, outlines Japan's satellite transmission experiments in the 12 GHz BSS band, and provides an overview of the UHDTV satellite broadcasting trial that was initiated in Japan on August 1, 2016.

This was a wonderful opportunity for me to be so closely involved in drafting two highly important ITU documents relating to UHDTV satellite broadcasting in Japan. I look forward to further work with the ITU-R and continued development of satellite broadcasting in Japan.

Kazuaki Takeda

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Fields of activity: 3GPP



LTE-Advanced and 5G standardization activities in 3GPP

I am delighted to receive the ITU-AJ Encouragement Award, and express my appreciation to the ITU Association of Japan and to all those who supported me.

Since joining NTT DOCOMO, my research has largely focused on LTE, LTE-Advanced, and 5G wireless access. In 2009, I got involved in developing LTE-Advanced standards in the 3GPP family by working on specifications for the physical layer in Radio Access Network Working Group1 (RAN WG1). For the first few years, I studied basic technologies and ways of moving the deliberations forward, and became fairly proficient at drafting proposals that were reflected in final specifications, and negotiating with delegates from other countries to build consensus.

3GPP began carrying out standardization of 5G in March 2015, and I was assigned as rapporteur of Study Items (SIs) and Work Items (WIs) relating to *new radio* (NR), a wireless access method that is not backward compatible with LTE-Advanced. In my role as rapporteur,

I became keenly aware of how important it was to understand the requirements and unique backgrounds of the different countries and regions involved in order to make progress and move discussion in the standardization ahead. I found it was practically impossible to make any headway so long as the participants continued to stubbornly advocate their own positions without any thought to the backgrounds and views of others. What we have been trying to do recently is move forward with deliberations based on better mutual understanding of the background factors and views of all members, and draft standard specifications that reflect new value for more nations, regions, and individual users.

Through the 5G standardization process, the goal is to create a wireless network that continues to provide value to consumers for the coming decade and beyond. I remain committed to ongoing growth and development of the mobile industry through involvement in the standardization process.

Kazuhiro Takaya

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Fields of activity: Environment, climate change and circular economy (ITU-T SG5)



Standardization activities in ITU-T SG5 toward realization of recycling-oriented economic society

I am really honored to receive the ITU-AJ Encouragement Award. I would like to thank the ITU Association of Japan, and all those who supported me.

Since 2007, I have been closely involved in standardization activities as a member of ITU-T SG5. When I first joined SG5, the primary role of the study group was to investigate electromagnetic compatibility and lightning protection. Since then, however, we've seen rapid evolution of DSL systems, FTTH systems, wireless LANs, mobile communication systems, and other ICT systems as the entire telecom equipment environment has been dramatically transformed. This has made it critically important that we accurately identify the requirements corresponding to these evolutionary changes. Here we helped implement effective ITU-T Recommendations by providing NTT field data required to define these requirements.

Meanwhile, we also began to investigate electromagnetic security in order to counter deliberate (malicious) electromagnetic interference using SCOPE (Strategic Information and Communications R&D Promotion Programme) developed by the Ministry of Internal Affairs and Communications. Since then, Japan has been in the forefront

of efforts to develop Recommendations relevant to electromagnetic security, and has pushed through a whole series of Recommendations: ITU-T Rec. K.78, K.81, K.84, K.87, and K.115.

During the last study period, environment and climate change were also added to SG5's workload with the goal of leveraging ICT to achieve a more sustainable society. The rapid dissemination of mobile communications in developing countries has raised concern about potential health effects of exposure to electromagnetic fields, and this has led to an influx of new participants from non-Western countries. In my role as Associate Rapporteur for Question 8/5 dealing with EMC issues in home networks, I became keenly aware of how closely interconnected ICT is with the "environment" and "safety."

In the current study period, 5th generation mobile networks (5G) and other new communications systems will become available. Given our mission to mitigate environmental impacts, our study group will pursue standardization activities supporting the recycling-oriented society, that is, a society that leverages ICT to make the most effective use of resources and energy while producing zero waste by exploiting ICT. I am fully committed to doing everything I can to promote the sustainable society as Vice Chairman of SG5.

Kengo Tsuda

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Fields of activity: ITU-R WP6A, WP5C



Moving toward deployment of 8K broadcasting

I feel honored to have received the prestigious ITU-AJ Encouragement Award, and express my sincere appreciation to the ITU Association of Japan and to all those who supported me. Let me also take this opportunity to thank colleagues for their cooperation helping me pursue my activity at the ITU-R.

After moving to my current position, I have been involved in ITU-R activities since the ITU-R SG6 block meeting in the fall of 2014. Up until then, my work had mainly focused on the DSO (Digital terrestrial television broadcasting Switch Over) in Japan, so this work at the ITU-R was my first involvement in an international project. Not only was this my first foray into international work, I didn't know proper ITU-R procedure or etiquette, so I found myself running round in circles. But eventually I began to get good advice first from seasoned Japanese technicians then from some of the onsite overseas experts, and I learned to deal with each challenge that came up.

Among various broadcasting-related topics over the past four years, I have contributed a number of Japan developed broadcasting initiatives in the area of *service ancillary to broadcasting* (SAB)—

including ENG (electronic news gathering) of sporting events, outdoor concerts, etc. as well as TVOB (television outside broadcast)—to the ITU-R. Some of these contributions are now reflected to ITU-R texts. For example, in Working Party 6A (WP6A) which is in charge of terrestrial broadcasting delivery, Report BT.2069 describes the status of efforts to deal with frequency reassignment in Japan, and Report BT.2344 details the status of work in Japan to achieve 8K SAB. And in Working Party 5C (WP5C) which has jurisdiction over fixed wireless systems, the technical attributes of Japan's service ancillary to broadcasting technology using millimetric-wave is mentioned in Recommendation F.1777 and Report F.2323.

Roll out of 8K satellite broadcasting in Japan is scheduled in December 2018, and will be followed less than two years later by the Tokyo Olympics opening ceremony in 2020. We can safely anticipate increased production of 8K content, and this suggests that 8K-enabled service ancillary to broadcasting (SAB) will not be far behind. Through ongoing involvement in ITU-R activities, I would like to make further contributions to broadcasting technology.



The ITU Association of Japan