Global Standardization Activities

Surviving in the Digital Transformation Era; Technical Trends and Issues from the Perspective of The Telecommunication Technology Committee

Mai Kaneko

Abstract

As a standards development organization certified by the Ministry of Internal Affairs and Communications of Japan, The Telecommunication Technology Committee (TTC) has been contributing to standardization activities in the field of information and communication technology by developing and disseminating standards for information and communications networks for more than 30 years. The role of TTC is changing as the environment surrounding information and communications undergoes dramatic changes such as the development of digital transformation. This article describes the current status and challenges of Japanese companies in the global market and explains the latest technological trends and TTC's initiatives to serve as a reference for future business strategies.

Keywords: digital transformation, SDGs, innovation

1. Introduction

An overview of The Telecommunication Technology Committee (TTC) and some examples of the areas of standardization the TTC handles are explained in this section.

1.1 TTC overview

The TTC is certified by the Ministry of Internal Affairs and Communications of Japan to standardize information and communication technology (ICT). The purpose of this organization is to contribute to standardization in the information and telecommunications field and to promote the spread of standardization by creating standards related to information and telecommunications networks.
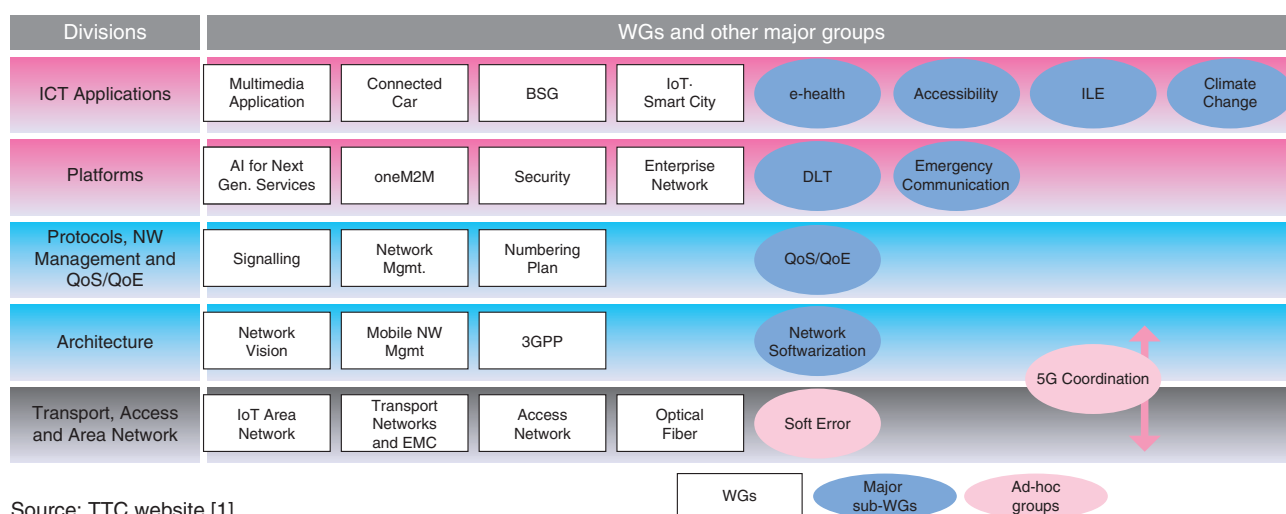
TTC is a members-only organization in which 95 companies, including the NTT Group, information and telecommunications companies, and information technology (IT)-related companies, participate. Members can participate in standardization activities by participating in working groups (WGs) and can also participate in seminars and events for free or for a fee. Members actively interact with each other through activities of the WGs and other events.

1.2 TTC standardization activities through WGs

The TTC has 18 WGs that are organized in 5 technical fields. This organization is based on the layered structure of a telecommunications network. The WGs gather information on related technologies and hold discussions related to standardization. In addition to the WGs, there are sub-WGs, ad hoc groups, and liaison committees (**Fig. 1**).

The Telecommunications System Committee of the Ministry of Internal Affairs and Communications has decided to refer upstream activities concerning all study groups (SGs)[*1] (excluding SG3 and SG9) and

Divisions	WGs and other major groups							
ICT Applications	Multimedia Application	Connected Car	BSG	IoT· Smart City	e-health	Accessibility	ILE	Climate Change
Platforms	AI for Next Gen. Services	oneM2M	Security	Enterprise Network	DLT	Emergency Communication		
Protocols, NW Management and QoS/QoE	Signalling	Network Mgmt.	Numbering Plan		QoS/QoE			
Architecture	Network Vision	Mobile NW Mgmt	3GPP		Network Softwarization		5G Coordination	
Transport, Access and Area Network	IoT Area Network	Transport Networks and EMC	Access Network	Optical Fiber	Soft Error			

Source: TTC website [1]

WGs / Major sub-WGs / Ad-hoc groups

AI: artificial intelligence
BSG: Bridging the Standardization Gap
DLT: distributed ledger technology
EMC: electromagnetic compatibility

5G: fifth-generation mobile communications
ILE: immersive live experience
IoT: Internet of Things
M2M: machine to machine

NW: network
QoE: quality of experience
QoS: quality of service
3GPP: 3rd Generation Partnership Project

Fig. 1. Organization of WGs in TTC (as of June 2019).

the Telecommunication Standardization Advisory Group (TSAG)[*2] of the International Telecommunication Union - Telecommunication Standardization Sector (ITU-T)[*3] to TTC. These activities include deliberating in advance on Japanese contribution letters (proposal documents), drawing up a Japanese response policy, and, if necessary, submitting proposals to the Telecommunications System Committee. In addition, the TTC is recognized as a qualified standardization organization that ITU-T can exchange information with; ITU-T can also use TTC documents as a reference in ITU-T standardization documents, according to ITU-T Recommendations A.5[*4] and A.6[*5]. WGs within the TTC conduct these activities.

1.3 TTC standardization examples

Here, two examples of standardization addressed by TTC in 2018 are introduced. The first example concerns immersive live experience (ILE), which is represented by NTT's Kirari! technology. ILE enables real-time transmission of sports events and entertainment performances to remote locations and provides an ultra-realistic live experience. Service scenarios and frameworks of ILE were standardized based on a proposal from Japan.

The second example is an international standard that defines design, test, and evaluation methods and quality standards for countermeasures against soft errors, which are malfunctions of terrestrial communications equipment caused mainly by cosmic rays. A soft error is not an error that permanently causes the device to fail, but a temporary failure that can be recovered by, for example, restarting the device. It has recently become possible to measure the effects of soft errors on telecommunications equipment by using a compact accelerator-driven neutron source. Consequently, design and evaluation indices of soft errors were required. This is an example of Japan's proactive proposal that embodies the strategy of *the standard is not to follow; it is to make*.

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*1 SG: A group of researchers working on a particular topic.
*2 TSAG: A group providing advice on the management and operation of standardization activities in parallel with SGs.
*3 ITU-T: The ITU is a specialized agency of the United Nations that is responsible for establishing international standards and regulations. ITU-T is the division responsible for the development of standards in the telecommunications field.
*4 Recommendation A.5: Generic procedures for including references to documents of other organizations in ITU-T Recommendations.
*5 Recommendation A.6: Cooperation and exchange of information between the ITU Telecommunication Standardization Sector and national and regional standards development organizations.
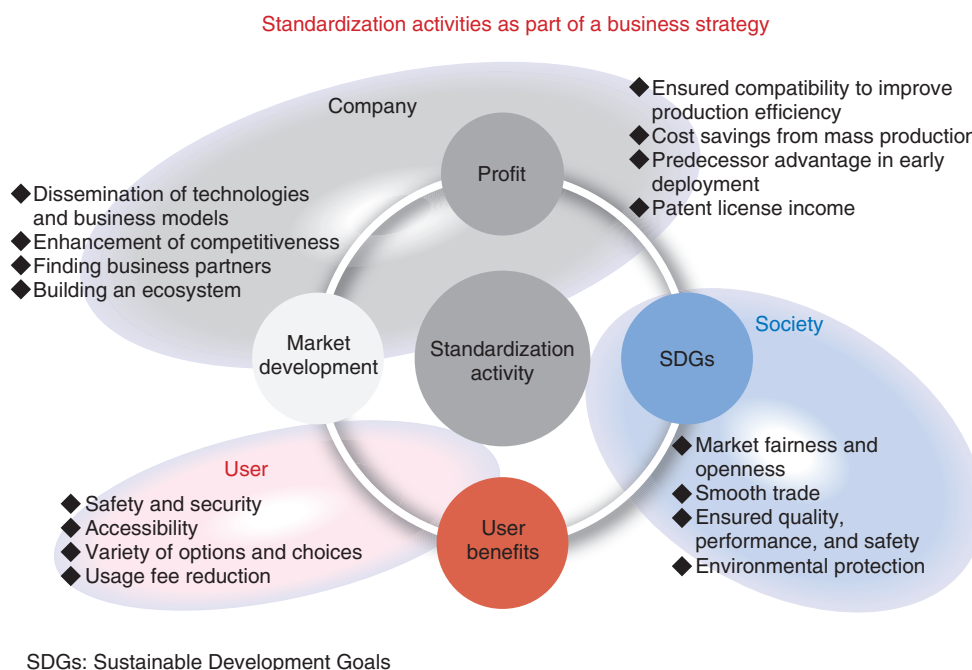
Standardization activities as part of a business strategy

Fig. 2.   Benefits of standardization from a business perspective.

2.   Significance of standardization

Here, the benefits and strategic use of standardization in business are explained.

2.1   Benefits of standardization from a business perspective

Standardization provides many benefits as part of a business strategy. By ensuring compatibility and consistency through standardization, companies can improve production efficiency. Standardization also leads to cost reductions through mass production and simplification. Furthermore, the early adoption of standardization technology will lead to first-mover profits and license income. Finally, it is possible to create an ecosystem in which technologies and business models become more prevalent, competitiveness increases, and ultimately all stakeholders benefit.

In this way, the opening of the market promotes social trade, and the establishment of rules to meet the environment and standards leads to improvements in safety and security.

Not only is safety guaranteed for users, but a variety of companies participate in standardized specifications, and a variety of products are available on the market, which broadens the range of choices. Standardization is therefore a strategy that benefits all

stakeholders (**Fig. 2**).

2.2   Strategic use of standards

Standards are classified into three categories: de jure, forum, and de facto, and they need to be strategically used for different purposes.
(1)   De jure standards

De jure standards are established by formal standards organizations, for example, the ITU. The TTC is also classified as an organization that develops de jure standards. De jure standards have great impact on global markets and developing countries, but because of the involvement of national administrations, deliberation and coordination may take time.
(2)   Forum standards

Forum standards can be formed through the efforts of multiple companies or organizations to speed up the development of standards. Representative examples of such organizations are the Internet Engineering Task Force (IETF)[*6], the Institute of Electrical and Electronics Engineers (IEEE)[*7], and the World Wide Web Consortium (W3C)[*8]. Forum standards

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*6   IETF: A voluntary organization promoting standardization of Internet technology.
*7   IEEE: An organization that standardizes electrical and electronic communications specifications.
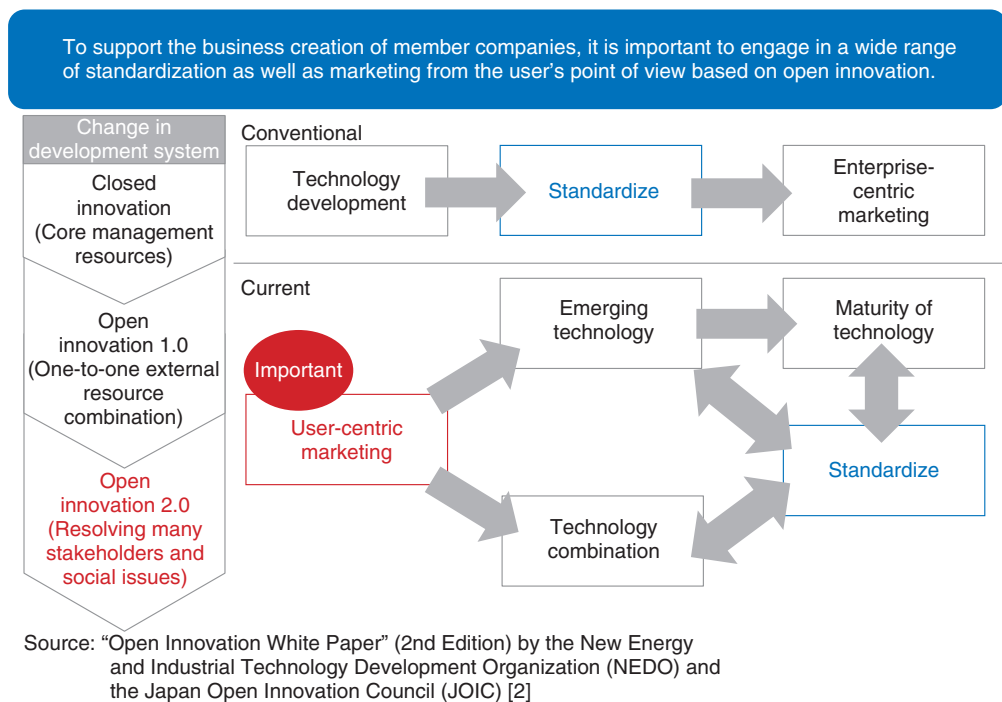*8   W3C: A nonprofit organization that standardizes web technology.

To support the business creation of member companies, it is important to engage in a wide range of standardization as well as marketing from the user's point of view based on open innovation.

Change in development system

Closed innovation (Core management resources)

Open innovation 1.0 (One-to-one external resource combination)

Open innovation 2.0 (Resolving many stakeholders and social issues)

Conventional

Technology development → Standardize → Enterprise-centric marketing

Current

Important

User-centric marketing

Emerging technology → Maturity of technology

Technology combination

Standardize

Source: "Open Innovation White Paper" (2nd Edition) by the New Energy and Industrial Technology Development Organization (NEDO) and the Japan Open Innovation Council (JOIC) [2]

Fig. 3. Expanded role of standardization.

are disadvantageous for small businesses and developing countries because standardization is influenced by power relationships centered on developed companies.

(3) De facto standards

De facto standards, also known as market-driven standards, are standards that are adopted widely by an industry and customers. One example is typified by the Windows operating system.

It is important that standardization is carried out strategically in consideration of the balance between the areas of cooperation that are open to the market through standardization and the areas of competition that are not standardized in terms of improving competitiveness.

2.3 Standardization as the role expands

In this age where the market has matured and customer needs have diversified, it is more difficult to create innovative services, and it is not easy to keep up with the changes that are accelerating with the development of ICT. Until now, the worldwide trend has been to develop technologies that make the best use of existing management resources and then to standardize and commercialize them. However, as many companies feel that creating services on their

own is time consuming and costly, they have shifted to an open innovation system in which they create services beyond the confines of their company and have been moving to a user-oriented development system in which we think about services based on user issues and the way the services should be. As a result, the role of the TTC has been shifting from technology to marketing in corporate support (**Fig. 3**).

3. Environment surrounding information and communications

This section presents information on various trends and issues facing Japanese companies today.

3.1 Digital transformation and Sustainable Development Goals (SDGs) required for enterprises

The evolution of technologies such as the Internet of Things, big data, and artificial intelligence (AI), which affect the way society should be (i.e., a modern, well-functioning society), has accelerated cross-industry collaboration, and the transformation of the industrial structure has been remarkable. The digital transformation (DX) is progressing; this refers not only to the digitization of existing businesses but also
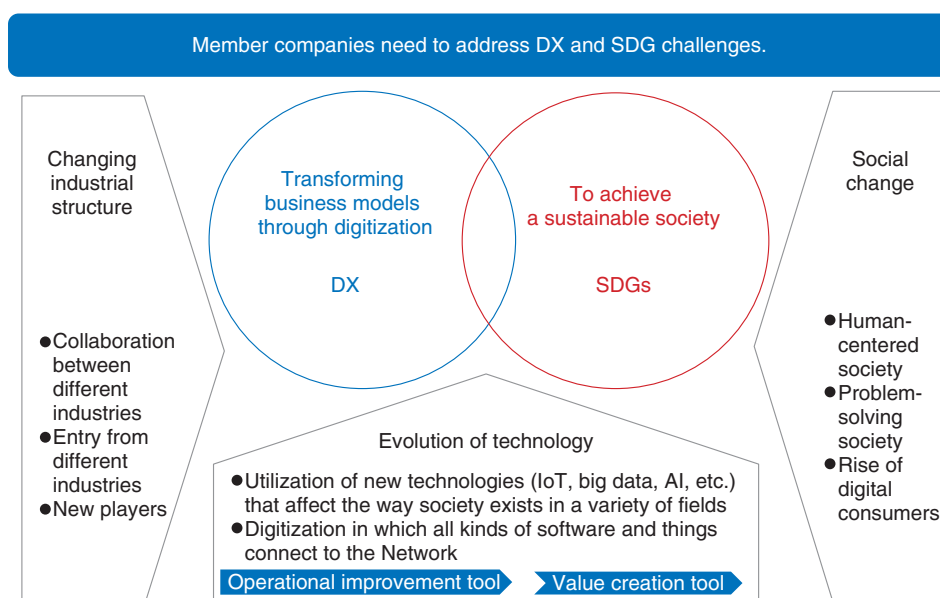
Fig. 4.   DX and SDGs required for enterprises.

the transformation of business models using digital technology. Achieving the United Nations SDGs has become a common practice in global markets, and Japanese companies also face an urgent need to promote activities to achieve them (**Fig. 4**).

3.2   Reality of Japanese companies in the global market

Japanese companies face a difficult situation in the global market. About 30 years ago, there were 32 Japanese companies in the top 50 in the world market capitalization ranking, but in 2018, there was only 1, Toyota. In contrast, the United States had 32 companies in the ranking. IT companies are on top, and the rise of Chinese companies is obvious (**Table 1**).

3.3   Trends at the Consumer Electronics Show (CES) 2019

Samsung from South Korea won numerous Innovation Awards at CES 2019, topping the list of companies with the number of wins. CES is the world's largest consumer electronics trade show and is held annually in Las Vegas, US. Japan had little presence at the event, including exhibition booths. Many of the exhibits from other countries featured combinations of existing technologies such as robots and beauty appliances that were popular in Japan some years ago, but with sensors and other advances. Innovation is not only about developing cutting-edge technology

but also about combining existing technologies and reworking them in innovative ways.

3.4   Trends in ITU-T participating companies

The membership of ITU-T, which is a representative de jure standardization organization, has increased significantly in recent years. More than half of the participating companies are in the traditional IT communication field, involved in areas such as quantum communication, digital currency, MVNO (mobile virtual network operator), and over-the-top (OTT). However, insurance companies and those in the automobile industry are also participating, and the range of fields represented by the participating companies is expanding. Since 2017, 4 companies in Japan (Canon, Murata Manufacturing, Softbank, and Internet Initiative Japan) have joined ITU-T, in addition to 13 companies in China and 15 in the US. China leads the number of ITU-T contributions by country, with 27%, followed by South Korea with 11%, the United States with 10%, and Japan with 4%. In China, companies as well as the government actively participate in standards activities.

3.5   Global responses to SDGs

No Japanese company has been selected as one of the 50 leading companies in the world that support SDGs. The overwhelming majority are in the United States, and half are in Europe. In Asia, companies in

Table 1.   Comparison of world market capitalization rankings.

	1989	Country name	Type of industry	2018	Country name	Type of industry
1	NTT	Japan	Telecommunications	Apple	USA	IT
2	Industrial Bank of Japan	Japan	Banking	Amazon.com	USA	IT
3	Sumitomo Bank	Japan	Banking	Alphabet, Inc.	USA	IT
4	Fuji Bank	Japan	Banking	Microsoft	USA	IT
5	Dai-Ichi Kangyo Bank	Japan	Banking	Facebook	USA	IT
6	IBM	USA	Computers	Berkshire Hathaway	USA	Investing
7	Mitsubishi Bank	Japan	Banking	Alibaba Group Holdings	China	IT
8	Exxon	USA	Oil	Tencent Holding	China	IT
9	Tokyo Electric Power Company	Japan	Energy	J.P. Morgan Chase & Co.	USA	Financial
10	Royal Dutch Shell PLC	UK	Oil	Exxon Mobil	USA	Oil
11	Toyota Motor Corporation	Japan	Automotive	Johnson & Johnson	USA	Healthcare
12	GE	USA	Conglomerate	Visa	USA	Financial

Source: Diamond Weekly, August 25 issue, 2018 [3], prepared by the author

Hong Kong and Singapore are most prominent. By industry, there are many medical, infrastructure, and chemical manufacturers. As Japan is lagging behind other countries in SDG efforts, it can be expected that the formulation of SDG rules will proceed mainly through the efforts of Europe and the United States.

4.   Key technology and TTC initiatives in 2019

The TTC is constantly monitoring ITU-T trends. ITU-T is promoting standardization under the slogan *Smart ABC (AI, banking, cities) – Innovative use of ICT to improve quality of life, service efficiency, and competitiveness*. There are six topics for standardization: 1) new standards for optical fiber, 2) 5G (fifth-generation mobile communications), 3) framework for cooperation between OTT operators and network operators, 4) quality of service (network quality) and quality of experience (user experience quality) such as in video streaming, 5) interoperability for personal health, and 6) key performance indicators for achieving smart cities. TTC is focusing on trends that ITU-T will discuss in the future such as connected cars, quantum communications and cryptography, digital currency and blockchains, AI, and Network 2030 beyond 5G, with various activities being carried out in the TTC WGs (**Table 2**).

5.   Innovation study group for service innovation

To help Japanese companies develop human resources capable of adapting to the changing times, the TTC established a practical study group to create use cases for innovative services using an open innovation approach. The five-part program consists of learning how to generate the ideas needed in the service creation process, listening to innovative examples from key players in advanced companies that develop and provide services from the user's perspective, and experiencing open innovation through collaboration with participants from different organizations. The TTC launched this initiative to address the growing role of standards in 2018.

6.   Conclusion

Japanese companies are falling behind in terms of both competitiveness and SDG compatibility in the global market. It is hoped that the TTC will help to develop innovative services, expand into global markets, and promote cross-industry catch-up and open innovation. The TTC website [4] contains more information on standardization and the latest technical information not covered in this article.

Table 2.　ITU-T trends and TTC activities.

Development of new business and ICT services in the DX era		
MaaS	Connected Car WG	• Specific examination of automobile communications technology, next-generation mobility services, and disaster response using cars
ILE	Multimedia Application WG (ILE-SWG)	• Advanced MMT—elemental technology of NTT's Kirari!—is ultra-realistic media synchronization technology that makes it possible to realize a variety of video services. This WG promotes international standardization of ILE.
e-health	Multimedia Application WG (e-health SWG)	• Promoting standardization of work items for remote medical care and ICT health care using the latest multimedia ICT technology • Downstreaming international standards for safe listening (volume restriction function to prevent hearing disabilities, etc.)
Response to new standardization themes such as quantum communication and AI		
Quantum communication	Security WG	• Inviting experts to study groups and holding collaborative seminars with the Information Processing Society of Japan (IPSJ)
Digital currency		• Establishing SWGs and starting reviews
AI	AI for Next Gen. Services WG	• Collecting and analyzing examples of use cases using AI
Contributing to building infrastructures in the future with the Network 2030		
Network 2030/5G	Network Vision WG	• Discussing future networks such as inter-industry linkage with OTT services and open API
Contribution to SDGs to solve social issues		
SDG	International coordination	• To achieve SDGs, we held TTC seminars for executives and the public, and organized connections between SDG efforts and TTC activities. • At the TSAG meeting, we showed the mappings between the ITU-T SG issues and the 17 SDG goals and proposed clarification of the rationale. Proposal of a mapping guideline from Japan is planned.
Smart City	IoT·Smart City WG OneM2M WG	• Analyzing and understanding IoT and smart city use cases, and implementing cases and disseminating them to domestic companies.

API: application programming interface
MaaS: mobility as a service

References

[1] Website of TTC, Organization, Working groups, https://www.ttc.or.jp/e/org/workin-groups
[2] NEDO and JOIC, "Open Innovation White Paper," 2nd Edition, June 2018 (in Japanese).
[3] Diamond Weekly, August 25 issue, 2018 (in Japanese).
[4] TTC, https://www.ttc.or.jp/e

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Mai Kaneko
Director, Planning and Strategy, The Telecommunication Technology Committee.
She received a B.S. in mathematics from Tokyo Woman's Christian University in 1997 and an MBA from Yokohama National University in 2014. She joined NTT in 1997 and was in charge of designing and building large-scale information systems, including one for the National Museum of Emerging Science and Innovation, as a system engineer in corporate sales. She collaborated with various companies as an alliance strategist from 2002 to 2006. Among her accomplishments, she devised a new tablet service that originated in Japan and initiated a project in the product development division in 2009. She was in charge of training planning and labor management for 100 young technical employees as a manager from 2010 to 2012. She was temporarily transferred to the Center for International Public Policy Studies (CIPPS), where she engaged in policy recommendation work. She returned to NTT EAST in 2015 and worked as a sales manager for the Kanagawa area. She took up her current position in 2018.
Books authored:
Individual Number Card, Pioneering the Future (contributed as a member of Nomura Institute of Capital Markets Research)
Medical Care and Individual Number Card (co-author)
Japan's Growth Strategy Considered in 10 Points (co-author)