Your Value Partner
Message from the CEO

In November 2018, after my appointment as president and CEO, we announced our medium-term management strategy. In 2019, we have reinforced our foundations and started new initiatives. Specifically, we launched the urban solutions business (NTT Urban Solutions) and the medical science business (NTT Life Science) in July and the smart energy business (NTT Anode Energy) in September, with the goal of driving future growth.

In addition, we reorganized the global businesses of NTT Communications, Dimension Data and NTT Security into NTT Ltd. operations began in July, and we are rebranding all business units as NTT. Looking ahead, we will continue to strengthen and invest in the global business.

Furthermore, in June of 2019, we announced the “Innovative Optical and Wireless Network” (IOWN) concept for an optical-based innovative network and information processing platform. With NTT Group’s technology research and development capabilities, we will collaborate with various global experts and partners in order to achieve highly innovative breakthroughs in technological fields to advance from electronics to photonics.

As the NTT Group accelerates our transformation, we will always act as your valued and trusted partner so that we can help solve social challenges for people, clients and communities.

I sincerely appreciate your continued support and long term relationship with us.

Jun Sawada
President and Chief Executive Officer, Member of the Board
Main Businesses
For NTT Group as a whole, formulation of management strategies and promotion of basic research

Mobile Communications Business
Business Activities: Mobile communications business, smart life business, etc.
Main Company: NTT DOCOMO, INC.

Regional Communications Business
Business Activities: Regional telecommunications operations in Japan and related businesses, etc.
Main Companies: Nippon Telegraph and Telephone East Corporation, Nippon Telegraph and Telephone West Corporation

Long Distance and International Communications Business
Business Activities: Long-distance telecommunications operations in Japan, international telecommunications business, solutions business, and related businesses
Main Companies: NTT Ltd. (Global Operating Company), NTT Communications Corporation (Japan Operating Company)

Data Communications Business
Business Activities: Network system services, system integration, etc., in Japan and overseas
Main Company: NTT DATA CORPORATION

Other Businesses
Business Activities: Real estate, finance, construction / electric power, system development, advanced technology development, etc.
Main Companies: NTT Urban Solutions, Inc., NTT Anode Energy Corporation

Composition by Segment (As of March 2019)
- Operating Revenues: ¥11,879.8 billion
  - Mobile Communications Business: 15.8% (¥1,843.8 billion)
  - Regional Communications Business: 35.4% (¥4,045.5 billion)
  - Long Distance and International Communications Business: 16.7% (¥1,970.7 billion)
  - Data Communications Business: 23.1% (¥2,652.1 billion)
  - Other Businesses: 5.0% (¥628.4 billion)
- Operating Profit: ¥1,693.8 billion
  - Mobile Communications Business: 8.6% (¥147.3 billion)
  - Regional Communications Business: 5.9% (¥106.1 billion)
  - Long Distance and International Communications Business: 21.1% (¥346.7 billion)
  - Data Communications Business: 21.1% (¥346.7 billion)
  - Other Businesses: 23.1% (¥398.4 billion)
- Capital Investment: ¥1,697.0 billion
  - Mobile Communications Business: 10.6% (¥173.5 billion)
  - Regional Communications Business: 14.4% (¥234.3 billion)
  - Long Distance and International Communications Business: 8.2% (¥134.7 billion)
  - Data Communications Business: 31.9% (¥511.7 billion)
  - Other Businesses: 8.3% (¥133.5 billion)
- Number of Employees: 303,351
  - Mobile Communications Business: 35.0% (107,054)
  - Regional Communications Business: 26.2% (79,324)
  - Long Distance and International Communications Business: 15.8% (48,020)
  - Data Communications Business: 8.8% (26,629)
  - Other Businesses: 9.1% (31,584)
Value Creation Process—Cycle to Realize Ongoing Improvements of Corporate Value—

The Company’s attributes include a solid customer base in Japan and overseas, global brand power, human resource capabilities, and world-class research and development capabilities. We will leverage these to sustainably increase our corporate value in a manner unique to NTT through digital transformation together with our partners.
Your Value Partner 2025

We are advancing the measures below based on the "Your Value Partner 2025" medium-term management strategy, released November 2018.

The following sections explain the main measures that we are taking.

The measures of the fiscal year ending March 31, 2020, include the main measures implemented in the period through to September.

Pillars of Medium-Term Management Strategy

- **Support our customers’ digital transformations**
  1. Promote B2B2X model
  2. Roll out 5th-Generation Wireless System
  3. Provide personal services

- **Accelerate our own digital transformation**
  4. Enhance competitiveness in global business
  5. Drive self-digital transformation in domestic business
  6. Migrate PSTN to IP Networks

- **Leverage talent, technologies, and assets**
  7. Enhance and globalization R&D
  8. Create new lines of business (IoT, etc.)
  9. Contribute to revitalization of regional societies and economies
  10. Disaster Countermeasures

- **Promote ESG management, and enhance the returns of shareholders to improve corporate value**

Support Our Customers’ Digital Transformations

**NTT Group : Contributing to the Realization of a Smart World**

**Promote the B2B2X Model**

While leveraging information digitization, IoT, AI, and other social and technological trends, NTT Group will support the digital transformation of "center B," which refers to service providers in a variety of fields. In this way, we will accelerate the B2B2X model and provide added value to end users (X).

The B2B2X Strategy Committee was established at NTT in January 2019 to advance B2B2X models even further.

The committee will increase the number of projects by conducting the preparation of strategies, the management of targets, and the advancement of projects for the Group and by encouraging even greater collaboration within the Group.

**Main B2B2X Projects in the Fiscal Year Ending March 31, 2020**

- Entered into an industry-government-academia cooperation agreement with Hokkaido University and the city of Iwamizawa with the goal of creating a smart agri-city (June 2019)
- Entered into a comprehensive cooperation agreement with Chiba City for future community development (July 2019)
- Entered into a "Community Development Partnership Agreement" with 12 municipalities in the Sapporo Metropolitan Area (July 2019)
- Launched a collaboration with Tokyo Metro Co., Ltd., in order to achieve reduced congestion and smooth transportation (July 2019)
- For details on the agreement concluded with Hokkaido University and the city of Iwamizawa, please see page 10
Roll Out 5th-Generation Wireless Systems

We will steadily build out 5G networks in the locations where they are needed. While supporting the advancement of digital transformation through 5G, we will create new value and help address social issues.

### Immersive and Interactive 5G Services and Solutions
- Delivery of new sports-viewing styles
- Circumvent labor shortage through remote operation of construction equipment
- Eliminate inequality in access to healthcare through remote medicine
- Disaster prevention and mitigation using AI analytics of city video/image feeds

### Activities with Partners
- In May 2017, we began creating 5G trial sites that allow general customers to experience the characteristics of 5G.
- In February 2018, we launched the DOCOMO 5G Open Partner Program with the aim of working with a wider range of partners on the use of 5G for the creation of new ways of using mobile communications.

### Pre-commercial service
- From Sep. 2019

### Commercial service
- From spring 2020

Main 5G initiatives in the Fiscal Year Ending March 31, 2020

- Concluded an agreement with JTOWER Inc. on a capital and business partnership with the aim of realizing efficient early expansion of 5G service areas and reducing the number of communications (radio) quiet areas (July 2019)
- At the Rugby World Cup Japan 2019™ and in four NTT DOCOMO stores in Hiroshima Prefecture, for the first time in Japan provided general customers with pre-commercial-service 5G network environment equivalent to SG commercial services (September 2019)
  - Realization of new styles of viewing sports matches, including multiple viewing and highly immersive live viewing—
  - Increased the number of bases with permanently installed DOCOMO Open Lab™ environments for the verification of 5G technologies from four to 11 bases (September 2019)
  - Began offering DOCOMO Open Innovation Cloud™ to partner companies and organizations participating in the DOCOMO 5G Open Partner Program to advance the on-site verification of services for 5G solutions (September 2019)
  - Concluded an agreement with JTOWER Inc. on a capital and business partnership with the aim of realizing efficient early expansion of 5G service areas and reducing the number of communications (radio) quiet areas (July 2019)

Basis for the Provision of 5G Services from September 20, 2019

- Roll-out in 47 prefectures in FY2020 Q1
- Enhanced a platform of 10,000 base stations one year after FY2020 Q1
- Four models
  - Three smartphone models and one communications terminal model
- Personnel involved in provision of 5G services
  - More than 15,000 personnel
  - More than 5,000 personnel for network construction and more than 5,000 operations managers and technical managers for collaborations with partners

Provide Personal Services

NTT DOCOMO will further expand its client base and create earnings opportunities by leading the provision of highly personalized solutions that help change each customer's everyday life.

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**Case Study**

**Smart Agriculture**

Helping address issues in Japan’s agricultural industry, where the farming population is decreasing and aging, and mitigate worldwide food shortages

**Overall Summary and Initiative Themes**

**Themes**
- A. Infrastructure for high-precision positioning and information transmission
- B. Field management/remote networks
- C. Advanced information processing technologies and AI infrastructure

**Analysis**

- Analyzing and verifying optimal positioning and information transmission systems for fully autonomous operation
- Analyzing and verifying optimal networks for fully autonomous operation
- Analyzing and verifying data transmission and compression technologies and AI analysis platforms

**Hokkaido University, the city of Iwamizawa, NTT, NTT East, and NTT DOCOMO aim to establish world-class smart agriculture that realizes leading-edge self-driving technology for agricultural machinery through the utilization of high-precision position information, fifth-generation wireless systems (5G), and such data analysis technologies as AI.

The above parties concluded an industry-government-academia cooperation agreement on developing models for sustainable regional revitalization and smart cities with the aim of introducing these models to society and smart agriculture. In addition, the parties agreed to begin joint analysis for creating applications for 5G/5N™ smart agriculture.

*1 This refers to the CNS (Global Navigation Satellite System) Position Correction Information Distribution Platform, which NTT DOCOMO plans to offer and that enables high-precision position measurement with a margin of error of only several centimeters.

*2 For details on 5G, please see NTT DOCOMO’s website.

Enhance Competitiveness in Global Business

We will strengthen the competitiveness of the global business by heightening synergistic benefits through the combination of integrated solutions that support the evolution of clients’ businesses with initiatives for innovative creation that utilize leading-edge technologies. Further, the Group will unite its brand and pursue initiatives based on the “One NTT” global growth strategy.

NTT, Inc., was established as a global holding company and a wholly owned subsidiary of NTT. Further, the Group integrated Dimension Data Holdings plc, NTT Security Corporation, and the overseas businesses of NTT Communications Corporation to establish an NTT-branded global operating company (NTT Ltd.) under the control of the global holding company. This new operating company conducts businesses in 70 countries and areas worldwide (as of the end of July 2019). Further, the operating company has six directors, of whom the president and three other directors are non-Japanese. NTT Ltd. will continue reorganizing systems and operations in stages and transition to an operating company centered on managed IT services in approximately two years.

Drive Self-Digital Transformation in Domestic Business

Aiming to achieve further growth itself, NTT Group will forge ahead with its own digital transformation. In August 2018, major Group companies appointed chief digital officers, who will spearhead the digitalization measures of a working group that spans Group companies laterally. NTT Group will increase the efficiency of its work processes by using such technologies as AI. Moreover, the Group will build connected value chains that link a series of processes, including those of partner companies outside the Group. In this way, we will realize labor-saving, smart operations for a range of processes.

In the period through to June 2019, NTT DOCOMO, NTT East, NTT West, and NTT Communications, in principle, introduced automation to increase the efficiency of the operations of help desks that receive telephone inquiries about service issues in Japan. For example, we guide customers to websites that enable customers to diagnose issues themselves, and we use chat bots to provide consultations on issues. Plans call for extending these initiatives to include NTT West.

Digitalize Own Operating Processes

(Realize Connected Value Chains by Leveraging AI)

Achieve Efficiency through Smart Operations Not Requiring Labor

- Apply NTT Group’s RPA® (WinActor®) to operating processes
- Further expand scope of work
- Optimize enterprise service processes from service order / delivery with IT
- Optimize construction / maintenance-related processes with IT (in collaboration with partner companies)4/5

Diversification / Optimization of Web Service Order Procedures to Enhance Customer Convenience

- Reduce wait / attendance time at docomo Shops

Cut by half

- 15 thousand robots
- 850 operating processes

Productivity 2 times

1.5 times

We are steadily introducing robotic process automation (RPA). Since November 2018, when we announced our medium-term management strategy, we have increased the number of robots by 3,000, to 15,000, and the number of work processes for which RPA is used by 350, to 850.

Further, digitalizing our own operations will enable us to realize new services. For corporate clients, we will offer such services as Cognitive Foundation®, which integrates and optimizes the management of ICT resources. As for individuals, we will provide personal solutions based on digital marketing.

Migrate PSTN to IP Networks

The Group plans to complete the migration from public switched telephone networks—which are operated by NTT East and NTT West—to Internet Protocol (IP) networks by January 2025. Accordingly, IP interconnection will begin among carriers from January 2021. Further, in January 2024 nationwide call rates to fixed-line telephones will be uniformly revised to ¥6.5 (excluding tax) for every three minutes.

<table>
<thead>
<tr>
<th>Year</th>
<th>Jan 2021</th>
<th>Jan 2024</th>
<th>Jan 2025</th>
</tr>
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<tbody>
<tr>
<td>2017</td>
<td>Start migration of NTT’s fixed-line telephone services</td>
<td>Start IP interconnection</td>
<td>Complete migration</td>
</tr>
<tr>
<td>2021</td>
<td>Specification examination, standardization</td>
<td>Point of interconnection preparation</td>
<td>Development test</td>
</tr>
<tr>
<td>2022</td>
<td>IP interconnection with other carriers</td>
<td>Connect local switches to IP networks</td>
<td>Switch incoming calls from other carriers over to IP networks</td>
</tr>
<tr>
<td>2023</td>
<td>Switch outgoing calls from NTT’s fixed-line telephone services over to IP networks</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2024</td>
<td></td>
<td></td>
<td>Take over all of the contracts</td>
</tr>
</tbody>
</table>
Enhance and Globalize R&D

To advance innovative research and development that drives changes worldwide and to step up basic research, plans call for the establishment of research centers overseas, the global rollout of the results of R&D, and the globalization of research targets. Also, the Group will strengthen joint research with a varied range of research bodies, actively utilize the latest external technologies, and increase investment in research on new growth fields.

Over the five years beginning from the fiscal year ending March 31, 2020, the Group will invest ¥1 trillion in the building of 5G infrastructure to accelerate business growth.

For details on specific R&D initiatives, please see “Special Feature: Research and Development” on pages 15 to 20.

Create New Lines of Business (Real Estate, etc.)

The NTT Group will take maximum advantage of its real estate, ICT, and technologies related to energy and the environment to advance new urban development and digitalization projects that go beyond conventional real estate development.

Further, we will create new businesses, such as the smart energy business and the medical science business, and invigorate regional communities and economies.

Urban Solutions Business

Advancing NTT Group’s Differentiated Urban Development

Taking maximum advantage of the Group’s real estate, ICT, and technologies related to energy and the environment

Real estate

Design, construction, and maintenance enabled by ICT (AI, robotics, IoT)

Advancement of new urban development that goes beyond conventional real estate development (urban digitalization)

NTT Urban Solutions, Inc., began business operations in July 2019. The company will utilize NTT Group’s telephone exchanges and other real estate while laterally drawing on the Group’s real estate- and energy-related personnel and technologies. The Group will make maximum use of its assets in a concerted effort to advance collaborative urban development projects with companies and municipal authorities. Through these initiatives, we aim to grow the sales of the urban solutions business to ¥600 billion by the fiscal year ending March 31, 2026.

NTT Group will advance differentiated urban development and contribute to the realization of Society 5.0, which will be centered on local communities full of individuality.

Smart Energy Business

The maintenance of telecommunications equipment and facilities and the operation of such facilities as data centers by NTT Group account for close to 1% of Japan’s commercial electricity consumption. With this in mind, we are proactively addressing environment- and energy-related social issues by taking measures to reduce our environmental burden. Moreover, we aim to utilize the know-how that this gives us to create new businesses.

To this end, in June 2019 we established NTT Anode Energy Corporation, which began operations in September 2019. The company will develop a smart energy business that fully capitalizes on NTT Group’s assets, including ICT, such power source technologies as direct current (DC) power transmission technologies, and storage batteries. This business will concentrate on three power-related fields: generation, transmission, distribution, and storage; and retail and wholesale. The business will provide new value, such as improved energy efficiency and enhanced disaster resiliency in relation to coping with such eventualities as power blackouts during disasters.

NTT Group will advance the smart energy business with the aim of doubling the sales of energy-related businesses to ¥1 trillion by the fiscal year ending March 31, 2026.

Medical Science Business

As well as accumulating various information related to health and medicine, NTT Group will analyze health and medical big data to create new value. In July 2019, we established NTT Life Science Corporation. The company will leverage the Group’s technologies—such as big data analysis, AI, and security technologies—to analyze healthcare data that includes genome data and health data. This analysis will enable the company to develop a medical science business that recommends lifestyle changes and other health improvement methods suited to the constitution of each individual.
Special Feature: Research and Development

Under our medium-term management strategy, "Your Value Partner 2025," we are pursuing innovative research and development aimed at transforming the world. In this special feature, we introduce initiatives that we are undertaking together with players in various fields and industries. Our aim is to generate new sources of value creation in diverse areas by enhancing industrial competitiveness and solving social issues.

Researchers: Approx. 2,500
(Number of personnel engaged in basic research at NTT Laboratories)

<table>
<thead>
<tr>
<th>Patents held: Approx. 17,900</th>
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<tbody>
<tr>
<td>(Number of personnel worldwide)</td>
</tr>
<tr>
<td>Approx. 11,600</td>
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<td>Approx. 15,600</td>
</tr>
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Clarivate Analytics
Derwent Top 100 Global Innovators 2018-2019 Award
(8th consecutive year)

Research and Development to Promote the B2B2X Model

Conducting Commercial Performances of New Kabuki Using ICT
Shochiku Co., Ltd., and NTT concluded a business alliance for the three-year period from 2019 to 2021 for jointly conducting commercial performances of a new form of kabuki that incorporates state-of-the-art ICT such as Kirari®. The first of these collaborations, hosted jointly by NTT-Shochiku Partners, a voluntary partnership established by both companies, was held in August 2019 as the “Minamiza Reopening Commemorative Event August Minamiza Chokabuki” at the Kyoto Minamiza Theatre.

Through the performance, the two companies have accumulated knowledge in the entertainment field to enable them to respond to various business opportunities in new markets such as inbound visitors to Japan and the younger generation. We will continue to study the business potential of this venture through joint performances during the period up to 2021, and aim to expand the business by combining ICT with kabuki and other forms of entertainment.

For details about Kirari®, please refer to page 17.

Contributing to Manufacturing through Optical Fiber Technology
—Successful Long-Distance Transmission of High-Quality Laser-Processing Light
We have been working together with Mitsubishi Heavy Industries, Ltd., to promote the transformation of manufacturing technology in the social infrastructure industry. By applying communication-grade optical fiber technology with laser processing, we have succeeded in transmitting high-power single-mode laser light suitable for high-precision processing over distances of up to several hundreds of meters without loss of quality. Conventionally, such transmissions have been possible only up to several meters.

This research success opens the door to higher efficiency and precision in laser processing, while expanding the fields for its application. The technology is expected to spark innovation in manufacturing.

Cybersecurity Technology "InteRSePT®"
Commercialized
We have developed cybersecurity technology with Mitsubishi Heavy Industries, Ltd., for control systems such as critical infrastructure. The technology can detect anomalies caused by unknown cyberattacks and respond in real time. Mitsubishi Heavy Industries has commercialized the technology as "InteRSePT®" and is now available for sale. It features the ability to control communication in accordance with operation status and to isolate only the abnormal locations to remove harm, realizing a cybersecurity system that allows the system to continue operating.

The features of photonic crystal optical fiber

Features of InteRSePT®
Cybersecurity Technology for Continuous System Operation

Analysis section
Detection results, etc.
Integrated security management
Security control
Integrated security management
Status determination section
Sensor information, etc.
Real-time detection and response
Control network
Control devices (PLC, DCS, etc.)

Cybersecurity Technology for Continuous System Operation
Research and Development Aimed at Achieving Immersive and Natural Worlds

**Further Evolving of Ultrahigh-Immersive Telepresence Kirari**

NTT has further evolved its "Kirari®" processing technology, which aims to create worlds that provide "just like being there," ultrahigh-immersion experiences in real-time that can be accessed anywhere. The newly developed techniques not only enable the acquisition and transmission of the images of subjects from video broadcasts, along with 3D positioning information, but also allow them to be reproduced at the destination in a pseudo-3D display that generates the sensation that the subjects also move toward and away from the viewer. This results in the achievement of an audience experience in which the subjects appear to move in three dimensions at the destination.

For example, in a sports match, the technology can project a pseudo-3D display of an athlete onto a stage and give a real sense of the projected athlete moving nearer or further away through synchronization with the movements of the athlete in the actual event being broadcast. Further, collecting and synthesizing sounds from the event venue and using rows of speakers for sound output create auditory localization, whereby sound seems to "jump out" in front of the speakers. This effect, together with a multangle image display that surrounds both sides of the stage, instantly creates a real sensation of "being there" as the match progresses.

**Launching New "Point of Atmosphere" Research Program**

NTT has also started a new "Point of Atmosphere" program of research that allows not only electronic terminals but also various everyday objects to be used as devices to convey information more naturally. This research will promote digital transformation (DX) without interfering with original human activities through natural interactions that harmonize with people and their environment. For example, several ICT devices in a room work together and provide an illusion that a raincoat hung on the wall appears to be trembling and the floor looks wet, thereby letting the resident know in this natural manner that it is going to rain today.

**Natural Living Spaces**

Envisaging natural living spaces where all surrounding devices and environments coordinate autonomously, naturally providing cues that enable efficient, creative activity in the various scenes of daily life

ICT is incorporated into everyday products, enabling anyone to receive support in a natural way.

Human emotions and intentions are interpreted by portable AI, and spaces are robotized.

In addition to voice communication, light and images are used to provide support.

We are working to create technologies that make life a little smarter and more interesting by conveying human emotions and intentions naturally to the surroundings in a device-free world.

**Optical Transistor Capable of High-Speed Operation with Ultralow Power Consumption**

As Moore’s law approaches its limit in electronic circuits, there are expectations for a new, high-speed, energy-saving computing platform that incorporates optical technology. Achieving this requires technologies that have hitherto been considered difficult to achieve with low energy consumption, such as opto-electronic signal conversion and high-speed signal processing in the optical area. NTT has been developing a semiconductor nanostructure called photonic crystals with which to realize various tiny optical devices. In this work, we used our nanotechnology to realize a nano electro-optic modulator (E-O converter) and a nano photodetector (O-E converter) with extremely small capacitance and low energy consumption. Moreover, through their integration, we also realized an O-E-O converter. These nano-optical technologies have opened the way to realizing high-speed, low-energy integrated opto-electronic information processing.

For details about Kirari®, please refer to the following website: https://www.ntt.co.jp/activity/en/innovation/kirari/

For details about OAM multiplex transmission technology, please refer to the following website: https://www.youtube.com/watch?v=jKLBzmHmX1Y

**Increasing the Capacity of Networks**

With the full-scale uptake of IoT and 5G services, increasing the capacity of mission-critical optical fiber communication networks has become an economic necessity. We have developed new proprietary technology for digital signal processing and ultrawide area optical devices, increasing the channel capacity per wavelength to the point that transmission speeds achieve a level more than 10 times that of current commercial systems, and achieving a global first of 1 terabit/sec of capacity in long-distance wavelength-division multiplexed transmission trials. Furthermore, we also succeeded in developing an ultrahigh-speed compact optical front-end module with integrated compact, wide-band IP optical modulator.

As another accomplishment, we realized high-capacity wireless transmissions at approximately 10 times the speed of LTE and Wi-Fi, and five times that of 5G, by using two technologies.

First, we succeeded in wireless transmissions at rates of 100 Gb/sec by using a method devised by NTT combining a principle called "OAM multiplexing" with MIMO technology. This generates multiple radio waves of different frequencies so that they can transmit simultaneously without interfering with each other. The result is a dramatic increase in the volume of data that can be transmitted simultaneously, enabling large-capacity communications.

The second is the joint development with the National University Corporation Tokyo Institute of Technology of a technology that enables wireless transmissions of 100 Gb/sec in the 300 GHz band. It is easier to expand the transmission bandwidth or terahertz waves, including the 300 GHz band, although they require high-performance devices. We developed an ultrahigh-speed integrated chip (IC) for wireless front-end devices, leading to the world’s first 100 Gb/sec wireless transmission in the 300 GHz band.

For details about OAM multiplex transmission technology, please refer to the following website:

https://www.ntt.co.jp/activity/en/innovation/kirari/

Ultrahigh-speed compact optical front-end module

Optical transistor capable of high-speed operation with ultralow power consumption (featured in Nature Photonics)
IOWN

NTT R&D is envisaging the arrival of new smart societies that are not yet possible with today's Internet, with features such as mobility as a service (Maas) for extreme fast-safe systems and entertainment services offering deep immersion. To realize such smart societies, we will require innovation that cannot be achieved merely by extending the trajectory of current technologies; we will need to realize ultralow power consumption, high-speed signal processing, and the vision of virtual worlds that can equal or surpass reality with sophisticated prediction technologies. NTT Group has proposed the "Innovative Optical and Wireless Network" (IOWN) concept to realize new smart societies, and we are making a committed effort to realize this concept.

What's IOWN?
IOWN is a concept for realizing new smart societies that are not yet possible with today's Internet. IOWN comprises three main technology components: "all-photonics network" that uses optical processing on not only networks but also devices; "digital twin computing" that enables high-speed, real-time interaction between things and people in cyberspace; and Cognitive Foundation®, in which these and various other ICT resources are efficiently managed.

Digital twin computing is a significant advance in existing digital twin technology. By performing calculations such as conversions, combinations, and applications for various digital twins representing things and people in the real world, and having those digital twins interact, this new paradigm allows free interactions between people and things to be recreated and tested. This can be used to build virtual societies at a level of precision that has never been achieved before, enabling us to run prediction and testing on large-scale, highly accurate futures, and to provide high-level communications offering new value. The technology is expected to solve various social problems around the world and lead to the creation of innovative new services.

IOWN is set to change our world in new and exciting ways.

Establishment of Overseas Basic Research Centers
In July 2019, we opened the overseas basic research center NTT Research, Inc., in Silicon Valley in the United States. NTT Research operates three research laboratories and works to reinforce basic research as the source of innovation, coordinating with research laboratories in Japan.

Each research laboratory has a team and manager made up of globally active researchers. The laboratories are engaged in not only closed research for NTT research laboratories but also proactive joint research with universities and research institutes worldwide, as well as with the laboratories of other companies. We aim to achieve the peak of basic research and produce unrivaled world-class results that contribute to innovation. We will continue to globalize our research and development even further, by opening research centers in areas around the world, starting with Silicon Valley.
Operations in Review

Mobile Communications Business

In the Mobile Communications Business Segment, NTT Group worked to promote sales of mobile phone services and “docomo Hikari” and also collaborated with various business partners in an effort to provide new value-added services in the smart life area.

Competitive Advantages

- A stable communication network that can be used comfortably anytime, anywhere
- Top-notch research and development capabilities
- Large market share and stable customer base

Composition by Segment for the Fiscal Year Ended March 31, 2019

- Operating Revenues: 35.4% (¥4,840.8 billion)
- Operating Profit: 59.4% (¥1,013.6 billion)
- Capital Investment: 35.0% (¥593.7 billion)
- Number of Employees: 8.8% (26,629)

Market Trends and Risks

Business Environment

Market Trends

- Appearance of new services using advanced technologies such as 5G, virtualization, and AI
- Growth in markets for point services and the finance and payments business

Business (Competition) Risks

- Intensifying competition from new entrants
- Tightening of regulations on business operations by the government
- Contraction in demand due to population decline

Major Initiatives

- Further strengthening customer base through new rate plans
- Growth in non-telecommunications businesses such as the finance and payments business through strengthening of payment platform
- Strengthening initiatives to commercialize 5G

Topics

- We worked to expand the number of retail outlets using the new d Pay smartphone payment service, which uses bar codes and QR codes, and to increase the number of retail outlets utilizing d POINT’s both in Japan and overseas. As a result, the number of d POINT CLUB subscribers reached 70.15 million, while the number of registered d POINT CARD subscribers came to 33.72 million.
- By increasing the number of booked appointments to stores, revising explanation methods, and strengthening our web presence, we made efforts to reduce customer waiting times and support times at docomo Shops.
- By establishing systems whereby the information obtained from smartphones is used by AI to show recommended insurance plans, we aim to drive an evolution from “insurance for mobile phones” to “insurance entrusted to mobile phones,” and to this end, we have come to an agreement with Tokio Marine & Nichido Fire Insurance Co., Ltd. to start studies on the “use of AI for insurance recommendation” and the “full digitalization of insurance processes.”
- For customers who are hard of hearing, we have begun offering the Mieru Denwa (literally “visible telephone”), in which the content of the other party’s speech is shown as characters on a screen. In collaboration with AGC Inc., we became the first in the world to develop a glass antenna that can be fixed onto the inner surface of existing window glass to transmit and receive radio waves without disrupting screen visibility.

Focus

Simple, Value-Priced New Rate Plans “Gigahō” and “Gigaliht”

In June 2019, NTT DOCOMO launched its new rate plans, “Gigahō” and “Gigaliht,” which feature simple structures and great value. NTT DOCOMO has also strived to improve the returns to customers, introducing the “Zutto DOCOMO Tokuten” program that offers special privileges to long-term heavy use customers. The total number of “Gigahō” and “Gigaliht” applications* as of June 30, 2019, was 2.75 million, of which 1.46 million were subscriptions.

* The number of applications is the total number of subscriptions and reservations (including the number of cancellations) of “Gigahō,” “Gigaliht,” “Kids Ketai Plan,” “Kids Ketai Plan,” and “Data Plus.”
Regional Communications Business

In the Regional Communications Business Segment, NTT Group worked on the Hikari Collaboration Model, which provides wholesale fiber-optic access services, among other things, to various service providers, as well as strengthening its solutions business with the aim of revitalizing local communities and regional economies.

Competitive Advantages
▶ Secure, highly reliable, stable communication network
▶ Provision and support of ICT solutions with strong local ties
▶ Large market share and stable customer base

Composition by Segment for the Fiscal Year Ended March 31, 2019

Operating Revenues:
- 23.1% (¥3,152.3 billion)
- Fixed-Line Broadband Services
- Operating Profit:
- 21.1% (¥360.7 billion)
- Capital Investment:
- 31.9% (¥541.0 billion)
- Number of Employees:
- 26.2% (79,534)

Fixed-Line Broadband Services Subscriptions:
- (Million subscriptions)

Number and Share of Subscriptions for Fixed-Line Broadband Services:
- Total for NTT East and NTT West:
- 53.9%
- NTT East:
- 12.14 million subscriptions
- NTT West:
- 9.54 million subscriptions

Business Environment

Market Trends and Risks

Market Trends:
- Advance of population aging and decline in the working population
- Government led regional revitalization and workstyle reforms, etc.
- Expansion of use of AI, big data, IoT, etc.

Business (Competition) Risks:
- Change in market structure, including diversification of services by over the top (OTT) service providers
- Contract in demand due to population decline
- Tightening of regulations on business operations by the government

Major Initiatives:
- Supporting customers' digital transformations with close relationships to local communities
- Contributing to revitalization of local communities through ICT solutions

Topics

- In the Hikari Collaboration Model, we have developed a business model whereby we provide social infrastructure operators with an integrated service for end users that includes electricity, gas, and fiber-optic services, to be used when opportunities arise, such as when end users are relocating, thus increasing our collaborations with other industries. Through such initiatives, the number of service providers providing wholesale services was approximately 750 companies at the end of the fiscal year ended March 31, 2019, while under the same model, the number of subscriptions to fiber-optic access services came to 12.69 million.
- We have begun offering IoT packages for factories that enable the visualization of production sites. The adoption of such packages enables the accumulation of operating data from production machinery, the use of alerts to allow the early discovery of abnormal stoppages, and the use of network cameras to record images from the time at which abnormal stoppages occurred. By combining these packages with such efforts as revising operating processes and ensuring the generational hand-down of employee skills, we have achieved improved productivity at production sites, reductions in labor used, and development of human resources.
- As a first step toward the realization of the "Regional Revitalization Clouds" concept, we have begun a collaboration with Microsoft Japan Co., Ltd., to develop and deploy cloud service platforms for local governments, with the aim of supporting local government-led industrial revitalization, generating employment and dealing with population aging, as well as delivering the improvements in work efficiency demanded by regional companies, which tend to struggle with labor shortages.

Establishment of NTT Group's First "Agriculture × ICT" Specialist Company Aimed at Promoting Regional Revitalization and Urban Development through Agriculture

In July 2019, NTT East established NTT AgriTechnology, aiming to promote regional revitalization and urban development through the fusion of agriculture and ICT.

Today, agriculture in Japan is facing a declining workforce due to the aging of agricultural producers and other factors, while the number of corporations in this sector is on the rise due to advances in development of agricultural corporations and the entry of general companies into the field. At the same time, there are calls to implement efficient management through concentration of cultivated areas and increases in scale. The Ministry of Agriculture, Forestry and Fisheries is also promoting the expansion of next-generation facility horticulture to achieve high productivity and large-scale management using ICT.

Against the backdrop, NTT AgriTechnology plans to begin operating its own farm in Yamashita Prefecture from fiscal 2020, in order to conduct field trials aimed at establishing next-generation facility horticulture solutions by concentrating advanced technologies in agriculture. NTT AgriTechnology's farm will use advanced environmental control using IoT and AI; yield prediction through analysis of environmental and crop-raising data; and systems that integrate and mutually link data from each business process, such as production, sales, labor management, and accounting.

Moreover, we will strive to maximize synergies through use of NTT Group's AI technology, energy management, and urban development expertise, collaborating with local governments and other members of the community to develop new towns centered on agriculture × ICT.
Long Distance and International Communications Business

In the Long Distance and International Communications Business Segment, in addition to enhancing its ability to provide ICT solutions, which combine network, security, and other services, NTT Group worked to enhance its service provision in growth areas such as cloud services and IT outsourcing.

Competitive Advantages

- Full-stack solutions from application to IT infrastructure
- Global coverage
- Strong customer engagement

Business Environment

Market Trends and Risks

- Global growth in Telco-related markets associated with advances in use of AI and IoT, etc.
- Increasing sophistication of market needs globally (increase in demand for advanced IT services)

Business (Competition) Risks

- Economic impacts of U.S. trade policies and European political situation, etc.
- Curb on IT investments by customers due to changes in the economy and business environment

Major Initiatives

- Strengthening sales in managed IT services market
- Reviewing service portfolio in line with the market environment

Data Communications Business

In the Data Communications Business Segment, NTT Group responded to the acceleration of its customers' digital transformations at a global level and to their increasingly diversified and sophisticated needs, by working to expand its business in the global market and to extend and consistently provide a range of IT services, such as digitalization and system integration, that are responsive to the changes in the market.

Competitive Advantages

- High-level technology development and project management capabilities
- Large market share and stable customer base in Japan
- Powerful service delivery capabilities using development bases in EMEA and in Central and South America

Composition by Segment for the Fiscal Year Ended March 31, 2019

<table>
<thead>
<tr>
<th>Operating Revenues</th>
<th>Operating Profit</th>
<th>Capital Investment</th>
<th>Number of Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>15.8% (¥2,278.7 billion)</td>
<td>10.6% (¥100.1 billion)</td>
<td>8.6% (¥147.7 billion)</td>
<td>40.8% (123,884)</td>
</tr>
<tr>
<td>16.7% (¥2,163.6 billion)</td>
<td>15.8% (¥108.3 billion)</td>
<td>14.4% (¥179.2 billion)</td>
<td>15.8% (48,020)</td>
</tr>
</tbody>
</table>

Topics

- By combining chat AI, including the COTCHA® Virtual Assistant chat-based natural language analysis AI engine, with RPA such as WinActor®, we provided a Contact Center DX Solution, which enables the automation of all processes from contact center responses to business processing, for significant increases in productivity. As a result, instead of the previous “person-centric” contact center response, we realized an environment in which “AI+RPA” provide the primary response and are able to complete all operations.

- To provide a comprehensive response to our customers’ security needs, we signed an agreement to acquire U.S.-based WhiteHat Security, Inc., a leading application security operator, as our wholly owned subsidiary.

- To respond to demand for cloud services and data centers in various regions worldwide, we advanced the expansion of our service provision systems in various countries that have continuous market expansion. In addition, we established an investment subsidiary company, with the objective of centralizing the construction, ownership, and the provision of wholesale equipment for data centers of NTT Group.

- In collaboration with local governments and local municipalities, we used WinActor® to research and verify improvements in process efficiencies and workstyle reforms. As a result, we confirmed efficiency improvements in routine work related to individual and corporate taxes as well as high accuracy for AI OCR when reading a variety of forms, and announced the practicality of the solutions.

- We decided to begin offering a service whereby retail operators can handle various code payment methods, such as QR codes and one-dimensional bar codes, from both Japan and overseas, by using just one payment terminal or a single interface for CAFIS, the largest payment platform in Japan. Also, for local governments, we began offering the Mobile Register Public Fund Credit Collection Service, which enables credit payments via smartphone. Moreover, in preparation for expanding our electronic payments business in the APAC region, we took steps such as signing an agreement to acquire India-based Atom Technologies Limited as a subsidiary, thus promoting initiatives to provide highly convenient and sophisticated pay-related services both in Japan and overseas.

- In order to further strengthen our service provision capabilities, primarily in the digital area, we acquired U.K.-based MagenTys Holdings Limited, Germany-based Sybit GmbH, and Canada-based Sierra Systems Group, Inc., as subsidiaries.
Other Businesses

In the Other Businesses Segment, NTT Group mainly provided services related to the real estate business, finance business, construction and electric power business, and system development business.

Operating Revenues

9.1%  
(¥1,240.3 billion)

Capital Investment

8.2%  
(¥138.7 billion)

Number of Employees

8.3%  
(25,284)

Operating Profit

5.0%  
(¥85.6 billion)

Details of Major Initiatives

Real Estate Business

NTT Urban Development Corporation is engaged in the development of a hotel in Kiyomizu, Higashiyama-ku, Kyoto, and plans to start operations in March 2020 under the name “The Hotel Seiryu Kyoto Kiyomizu.”

The hotel is being created by converting Kiyomizu Elementary School, which has been a treasured part of the community for many years, into a hotel with 48 guest rooms, restaurants, private baths, a fitness gym, and other facilities.

The name of the hotel combines two elements, “Kiyomizu,” which is a world-class sightseeing area steeped in history, and “Seiryu,” which is the name of a mythical dragon said to have been the guardian of the Higashiyama area since ancient times.

It conveys to the world the unique qualities of this hotel, which utilizes the character of a local elementary school house with historic value.

NTT Urban Development and the hotel operator, Prince Hotels, Inc., aim to respect the character and history of the building and create a one-of-a-kind hotel that offers a luxurious accommodation to guests from around the world.

Construction and Electric Power Business

By combining and utilizing our technologies in ICT, energy, and construction to the fullest extent, we have implemented initiatives for the utilization of natural energy, such as by completing solar power plants, including the Minamisoma Kawabusa Power Generation Mega Solar Power Plant, as well as for the efficient, waste-free use of limited energy, working toward safe and secure urban development that is resilient against the risk of natural disasters.

Finance Business

We have developed financial services such as leasing and financing to facilitate the popularization of ICT devices and resolve social issues revolving around the environmental, educational, and medical fields. Furthermore, we provided billing and collection services for telecommunication service bills as well as credit card transaction settlement services.

System Development Business

We worked to develop network operation systems and application services to provide optimized, high-quality ICT services. Additionally, we worked to develop solutions utilizing cutting-edge technologies such as IoT, big data, and AI.

Composition by Segment for the Fiscal Year Ended March 31, 2019

Focus

Converting a Historically Significant Elementary School into a Hotel

NTT Urban Development Corporation is engaged in the development of a hotel in Kiyomizu, Higashiyama-ku, Kyoto, and plans to start operations in March 2020 under the name “The Hotel Seiryu Kyoto Kiyomizu.”

The hotel is being created by converting Kiyomizu Elementary School, which has been a treasured part of the community for many years, into a hotel with 48 guest rooms, restaurants, private baths, a fitness gym, and other facilities.

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**Corporate Data**

**Name**
NIPPON TELEGRAPH AND TELEPHONE CORPORATION

**Head Office**
NIPPON TELEGRAPH AND TELEPHONE CORPORATION Head Office, East Tower, 5-1, Otemachi 1-Chome, Chiyoda-ku, Tokyo 100-8116, Japan

**Date of Establishment**
April 1, 1985

In accordance with the Nippon Telegraph and Telephone Corporation Law (Bill No. 85, December 25, 1984)

**Paid-In Capital**
¥938 billion (As of March 31, 2019)

**Total Number of Shares issued**
1,950,394,470 (As of March 31, 2019)

**Number of Employees**
2,550 (As of March 31, 2019)

*303,350 employees (As of March 31, 2019, on a consolidated basis)

**Members of the Board**

Chairman of the Board
- Hiromichi Shinohara

President & CEO
- Jun Sawada

Senior Executive Vice Presidents
- Akira Shimada
- Motoyuki Ii

Executive Vice Presidents
- Tsunehisa Okuno
- Hiroki Kuriyama

Senior Vice Presidents
- Takashi Hori
- Eiichi Sakamoto
- Katsuhiro Kawae
- Ryota Kitamura
- Atsuko Oka
- Katsuhiro Shirai
- Sadayuki Sakakibara
- Ken Sakamura
- Keiko Takegawa

**Audit & Supervisory Board Members**

- Akiko Ide
- Takao Maizawa
- Takeshi Iida
- Hidetsu Kanda
- Kaoru Kashima

**Organization Chart**

(As of September 1, 2018)

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**Access**

Otemachi First Square

Tokyo Metro: Chiyoda Line / Tozai Line / Hanzomon Line / Marunouchi Line

Toei Subway: Mita Line

Otemachi Station, direct connection from exits C8, C11, and C12

JR lines

Tokyo Station, Marunouchi North Exit, 5 minute walk from exit
Your Value Partner