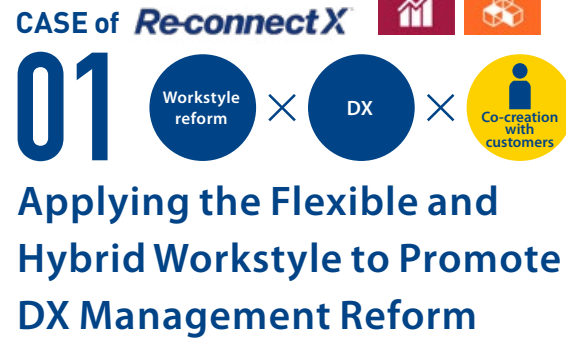
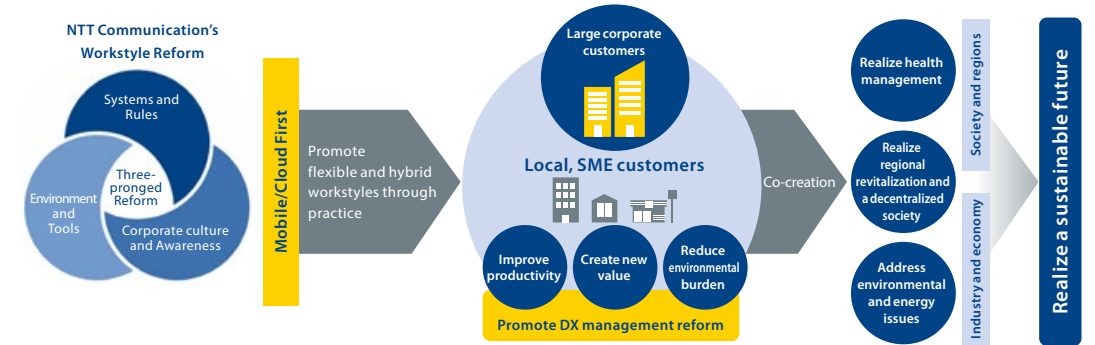


Overcoming Social Challenges through Our Business



Resolving Social Issues by Promoting Flexible and Hybrid Workstyles



Social Issue

Disparities in the Remote Work Environment

Solution

Contributing to Society by Providing a DX Solution that Addresses Management Concerns

Our Vision of Society

Making an Additional Contribution to Building a Decarbonized, Recycling-oriented Society

In response to the COVID-19 pandemic, remote work has become established broadly, resulting in the rapid spread of DX in areas such as workstyle reform and enhancing operational efficiency, which in turn has led to a heightened awareness of DX as an indispensable element of corporate management reform. NTT Communications has been promoting its “Three-Pronged” workstyle reform, consisting of corporate culture and awareness, systems and rules, and the environment and tools, since around 2002, thereby facilitating its transition to full-scale remote work during the pandemic. However, successful examples such as this are often limited to a handful of companies and business units, and there is a need to establish working environments that match the realities of each company.

Roughly 80% of the NTT Communications workforce has been working remotely since February 2020. Riding the momentum of ongoing trends to adapt to living with COVID-19, we are striving to enable each employee to work with enthusiasm as a “remote work native” as the next stage of our workstyle reform. To that end, we have been advancing initiatives focused on the four core areas of: practicing open communication, creating flexible systems and rules, reconstructing the office as a place for new creation and collaboration, and utilizing DX and data to improve operational processes. Consequently, we were able to show results such as a tenfold increase in online conferences and higher employee satisfaction due to the introduction of a super-flextime system with no core work times. By combining the experience, know-how, and solutions we have gained along the way, we created the Flexible and Hybrid Workstyle model, which offers the freedom of choosing work hours and location as well as working on-site or remotely according to the business type and format of each customer. We have begun to contribute to society through this model. For example, our efforts include contact centers operated from homes and digitizing contact points for customers, support for remote work and safety management including the prevention of heatstroke for essential workers at construction sites, and a Remote Work Handbook provided free of charge on our website.

The Flexible and Hybrid Workstyle we are striving to establish throughout society has the potential to impact business practices even in industries, companies, and units that were considered to be incompatible with remote work and ultimately transform society and industry. By making use of the diverse data that constitutes an unavoidable aspect of reforming and expanding workstyles, we will not only facilitate DX management reform that enhances productivity and operational efficiency, as well as the creation of new businesses that utilize data, but will also alleviate the environmental burden through paperless offices and lower energy consumption for transportation and help realize a decarbonized and recycling-oriented society.



Mitsuhiro Kihara
Vice President of Business Strategy, Business Planning, Business Solution Division

We were essentially forced to expand remote work during the COVID-19 pandemic, eventually accelerating the pace of digitization and revising workstyles premised on face-to-face interaction, use of printed materials, and personal seals. We are recommending the Flexible and Hybrid Workstyle as a further evolution of remote work that can give concrete form to data-driven management by designing new workstyles that transcend the limitations of time and place, as well as “digital first” operations and processes. NTT Communications will help overcome social and industrial issues by co-creating and practicing flexible and hybrid workstyles with our customers.

Overcoming Social Challenges through Our Business

CASE of *Reconnect X*



Deep Learning with Secure Computation that Ensures Safety and Security by Managing, Analyzing, and Utilizing Encrypted Medical Data

Social Issue
Growing Need to Utilize Medical Data

Solution
Joint Research with Chiba University Hospital Aimed at Using Concealed Medical Data in AI Analysis

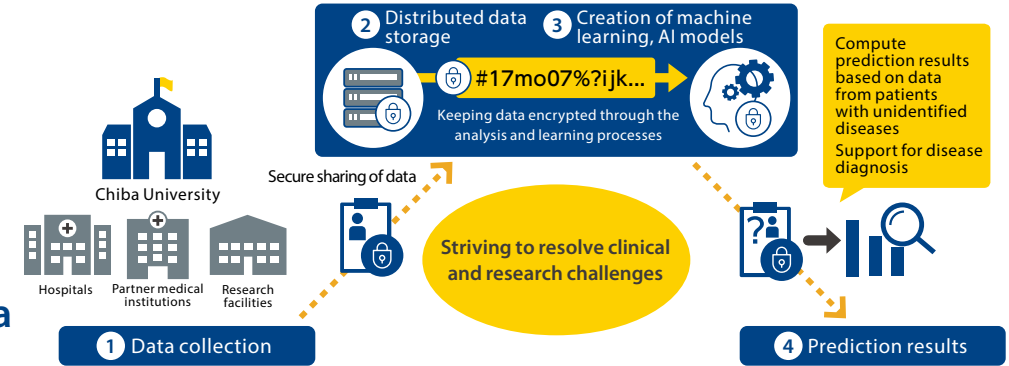
Our Vision of Society
Constructing a Platform for Safely Using Medical Data

While the level of Japanese medical technology is high by global standards, it is expected to advance even further through the power of DX. Until now, Japan has made little progress in its initiatives for sharing data on medical treatment and diseases in the form of big data and utilizing data on-site for research and diagnosis due to privacy concerns. Recently, however, the country has been confronting social issues closely connected to the future of its medical services, such as the declining birthrate and aging population, a shortage of labor, and regional disparities. Under these circumstances, the Japanese government has proposed a national policy for data-based health management initiatives, while the additional impact of the COVID-19 pandemic has heightened the need for the active use of medical big data as never before.

In October 2020, NTT Communications and Chiba University Hospital began joint research on clinical data analysis using NTT's unique technology of deep learning with secure computation. The technology can be used to store clinical data, including highly sensitive medical treatment information in encrypted form, and conduct deep learning to create AI models without decrypting the data. This opens up various possibilities for using data while ensuring confidentiality, as researchers are only able to access the results of analysis. We are currently analyzing data collected from various clinical departments including neurology, gastroenterology, and infectious diseases at multiple facilities and creating AI models to verify that our system is able to resolve issues in clinical settings.

For example, we can effectively create AI models and analyze data to develop tools that support the use of AI in diagnosing rare diseases, which is difficult for a single medical facility with a limited number of cases, and analyzing clinical data, as well as for joint research by multiple facilities, such as long-term observations involving patients. We will continue to pursue joint research with appropriate clinical departments to address diverse clinical and research challenges by encouraging the use of data while ensuring security.

Deep Learning with Secure Computation



NTT Communications is striving to provide new healthcare services by collecting and accumulating data at every stage, from prevention to treatment and patient care, and constructing a platform for safely analyzing and using that data. Furthermore, we will actively pursue collaborations with medical institutions and related companies, not only to provide innovative, advanced medical care using patient data but also to reduce the burden on medical staff and realize an enriching Smart Life for each person.



Yoichi Sakurai
Senior Manager, Smart Healthcare, Smart World Business

The promotion of DX in clinical sites using deep learning with secure computation has the potential to overcome diverse challenges. While we must always obtain prior agreement from patients to use their data, I have been told there are many patients who readily provide their data for the advancement of medical science. I am also aware of the high expectations of clinicians. I hope to develop a genuinely useful mechanism that lives up to the expectations of my many team members.

Overcoming Social Challenges through Our Business

CASE of *Re-connect X*

03



Halving Electricity Consumed by Air-conditioner with the World's First Cooling System Using a New Refrigerant

Social Issue

Urgent Need to Reduce Power Consumption at Data Centers

Solution

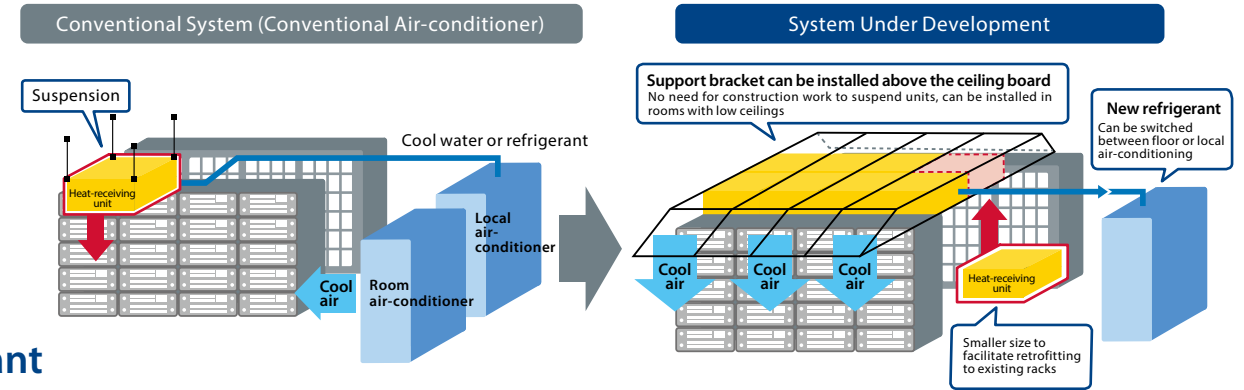
Development of a Breakthrough Cooling System that Uses a Non-CFC Refrigerant

Our Vision of Society

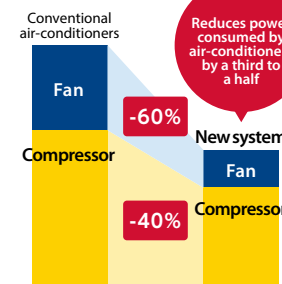
Providing Benefits to the Global Environment as the New Mainstream in Air-conditioning Systems

The increasingly ubiquitous presence of ICT throughout society has led to higher power consumption at data centers that house numerous servers and network equipment. There are high hopes for significantly reducing electricity use through initiatives targeting air-conditioning, which accounts for around 30% of the power consumed by data centers. Current systems for thermal energy management based on hydrofluorocarbons (HFCs) approved for use as air-conditioning refrigerants have reached their limits. As a high-pressure gas, HFCs are associated with issues such as the cost of hiring qualified staff to manage the gas and government directives for reducing the volume of production.

NTT Communications and NEC Corporation have developed the world's first cooling system based on a new low-pressure, non-chlorofluorocarbon (CFC) refrigerant to meet the air-conditioning needs of telecommunications facilities inside data centers. The new refrigerant will not deplete the ozone layer, features fire resistance and low toxicity, and is not subject to safety regulations governing high-pressure gases. Joint trials conducted at our data centers from November 2019 to July 2020 verified that our system reduces power consumption by 50% compared to conventional cooling systems. The new system adopts local air-conditioning for each rack, as opposed to systems that cool entire floors. The racks are arranged to direct and gather exhaust heat from equipment in a single row and releases the heat outdoors using phase change technology. This is the novel concept behind our system and represents our combined expertise on thermal management systems accumulated over the years. We also ensured versatility in system construction by adopting a structure that facilitates retrofitting to existing floors and server rooms.

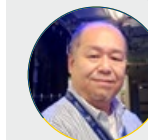


Expected Reductions in Electricity Use Depending on Installation Criteria*



*Results depend on installation criteria including the average annual outdoor temperature and amount of heat generation and heat removal.

We are planning to commercialize the cooling system using the new refrigerant through NEC in 2023, and considerations are being made for the secondary use of waste heat for hot water, power generation, and agriculture. We also plan to install the system in hospitals and commercial complexes that require large-scale cooling systems. Switching from a conventional air-conditioner to our system is expected to reduce annual electricity use by 55 GWh per 1,000 units, which is equivalent to about 30,000 tonnes of CO₂. Widespread use of our system is expected to significantly reduce power consumption and help alleviate the global environmental load.

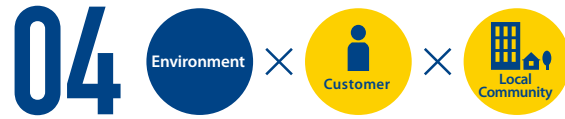


Akio Tsuzuki
Manager, Infrastructure, Infrastructure Design

We have been jointly working on this project with NEC for roughly five years toward striking a balance between addressing global warming and developing a sustainable business. The impact of this new air-conditioning system on reducing environmental load is by no means small. We will help achieve carbon neutrality through our thermal solution business, which is also relevant to our goal of accelerating the pace of DX across society.

Overcoming Social Challenges through Our Business

CASE of *Reconnect X*



Circular Renewables Platform that Promotes the Development of a Circular Economy by Utilizing ICT

Social Issue

Urgent Need to Break Away from the Cycle of Consuming Resources Beyond Their Limits

Solution

Constructing a Platform for Sharing Information on Recyclable Resources

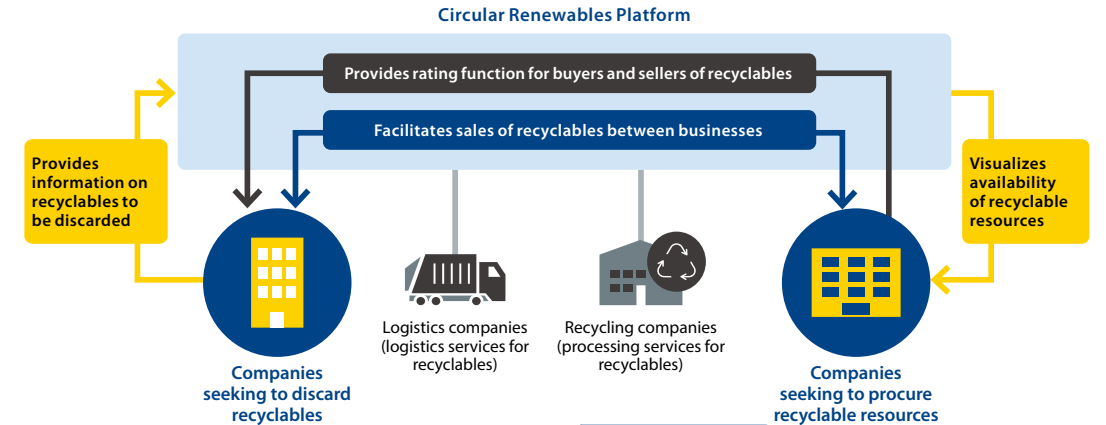
Our Vision of Society

Leading to the Transition to a Circular Economy

In the face of worsening environmental issues such as the depletion of natural resources, climate change, and marine plastic pollution, it has been pointed out that we have reached the limits of a linear economy, in which we have been taking, making, using, and disposing of resources. The realization of a circular economy, in which we limit the input and consumption of resources and utilize finite resources through recycling, is a globally recognized initiative also linked to achieving the SDGs. However, the use of renewables—and plastics in particular—has remained at low levels in Japan due to the difficulties of assuring quality and stable procurement. There is an urgent need to resolve this so as to comply with regulations promoting the recycling of plastic resources that will come into effect in 2022.

In April 2021, NTT Communications began conducting a trial for a Circular Renewables Platform aimed at realizing a circular economy, along with Sojitz Corporation, Recotech, Co., Ltd., and Nissho Electronics Corporation. The project is based on Recotech's Material Pool System, which has been combined with our Smart Data Platform to create a mechanism enabling users to view real-time information on the volume, type, quality, and location of recyclable resources such as plastic that are being discarded by participating companies, with the goal of facilitating transactions between suppliers and buyers. The trials are taking place in various locations by enlisting partners primarily consisting of businesses seeking to discard recyclables, such as commercial facilities and their tenants, and businesses seeking to procure recyclable resources. The participants will trade recyclables and assess their quality to verify the effectiveness of the platform and to ascertain corporate needs. NTT Communications will take responsibility for developing the flow of collecting, accumulating, analyzing, and using data related to recyclables. We plan to commercialize the platform after fiscal 2022.

	Role of Each Company
Sojitz	<ul style="list-style-type: none"> ● Attract potential partners ● Take the lead in implementing a circular business model
Recotech	<ul style="list-style-type: none"> ● Provide the Material Pool System for plotting information on recyclables onto a map ● Propose and plan verification projects using its network of waste-handling industries
Nissho Electronics	<ul style="list-style-type: none"> ● Propose and plan platform and app-based system development
NTT Com	<ul style="list-style-type: none"> ● Collect and accumulate data related to recyclable resources and provide the platform for analysis, and analyze collected data



The real-world implementation of the Circular Renewables Platform and its wide acceptance as a business tool will lead to reducing waste and improving collection and recycling ratios, signifying major progress in the transition to a circular economy. Specifically, the platform will enable matching the needs of companies that had been discarding recyclables due to the lack of buyers with those that have not had a channel for procuring recyclables. This is expected to lead to a social system that can effectively and economically circulate massive volumes of recyclable resources with guaranteed traceability (information on origin, distribution route, materials and ingredients, and quality level).



Yoichi Suzuki
Senior Manager, Smart Factory, Smart World Business Department

The use of ICT and co-creation with partners are the key elements for realizing a circular economy. We seek to construct a circular platform that encompasses the entire product life cycle, from manufacturing and sales to collection, recycling and reuse, and disposal. In doing so, we face many challenges, such as establishing the regulatory framework, optimizing logistics, raising the efficiency of sorting waste, and reducing the cost of the process. We need an initiative that brings together the skills and knowledge of industry, government, and academia. We would like to see as many companies as possible participate in this effort to construct a digital infrastructure for the circular economy.

Overcoming Social Challenges through Our Business

CASE of *Reconnect X*



Total Solution for Accounting and Invoicing that Supports the Shift to Teleworking for the Accounting Department

Social Issue

Growing Need for Digitizing Invoices

While widespread adoption of teleworking during the pandemic has increasingly led to flexible workstyles, the hurdles against introducing teleworking have remained high for the accounting department, where many operations are not suitable for processing at home or outside the office. Handling invoices is particularly affected by the distinct business practices and procedures of a company as well as business partners, making it difficult to revise the operation without mutual cooperation. The daily operations of the accounting department, however, are expected to undergo major change following the revision of the law on preserving national tax records in electronic form, scheduled to come into effect in January 2022, and the introduction of a registration-based consumption tax invoicing system in October 2023. Along with advances in promoting paperless operations, there is a heightened need to digitize invoices, which has led to growing interest in solutions for supporting teleworking at accounting departments.

Solution

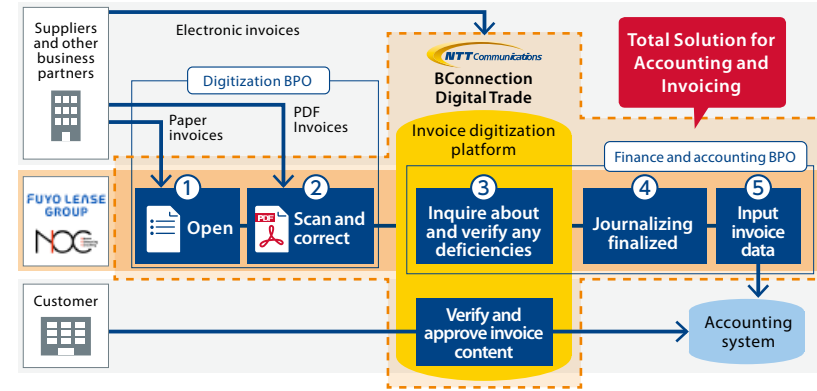
Offering Support to Raise Operational Efficiency in Accounting Departments by Involving Business Partners

NTT Communications and NOC Outsourcing & Consulting Inc. (NOC), a member of the FUYO LEASE GROUP, have jointly launched the Total Solution for Accounting and Invoicing to support accounting departments seeking to shift to full-scale teleworking, including enhanced productivity, digitizing operations, and reducing paper-based operations. The solution offers a single package that combines BConnection Digital Trade, a cloud-based invoice digitization service provided by NTT Communications, and the BPO^{*1} service for accounting operations that leverages the know-how accumulated by NOC over a number of years. We support a complete transition to teleworking by handling the series of operations for the accounting department, which includes receiving, opening, and scanning paper; PDF and electronic invoices; inquiring about deficiencies in the scanned data; journalizing accounting data by accounting professionals; and inputting data to accounting systems.

The PDF delivery solution model, which is the current mainstream, allows for only one-way communication from the invoice issuer to the recipient. In contrast, BConnection Digital Trade provides a platform^{*2} that can be used by both the issuer and recipient and is characterized by the exchange of metadata. With invoices exchanged via the platform, users can register journalized information as well as apply for and approve requests for payment. The data can be linked to the company's own accounting system, which is expected to accelerate the pace of business process reform.

^{*1} Outsourcing a part of the business process of corporate activity to a specialized firm outside the company.
^{*2} A standard environment that serves as the shared foundation (infrastructure) required for providing, customizing, and operating services, systems, and software.

Seamless Accounting Operations Made Possible by NOC and NTT Com



Reducing Process Costs

Annual reduction effect
20 million yen per year^{*1,2}

^{*1} Assuming that 12 full-time staff processed 50,000 invoices per year.
^{*2} Assuming that 90% of the 50,000 invoices received per year are digitized.

Promoting Paperless Operations

CO₂ reduction effect of reducing paper use

4.5 t-CO₂ per year^{*1,2}

^{*1} Assuming a 90% reduction in the 50,000 paper invoices received per year per company.
^{*2} Assuming that a total of 30 companies reduced their use of paper invoices.

Our Vision of Society

Developing a Standard Service for Invoice Digitization Comparable to Global Business Practices

Introducing the Total Solution for Accounting and Invoicing will not only reduce paper invoices but also provide major benefits in terms of reducing process costs and work hours associated with the operation. While the global use of electronic invoices is more advanced than in Japan, future transmissions based on metadata are expected to replace PDF invoices to become the mainstream. NTT Communications will continue to improve this solution and enhance our support to realize workstyles that meet the needs of remote workers.



Ryutaro Hirota
Manager, Application Services

There is currently a momentum for change in the area of electronic invoicing between businesses, which has been slow to spread in Japan due in part to its longstanding paper-based culture. The Total Solution for Accounting and Invoicing is a service that will promote a customer's shift to remote work. We provide a platform solution that fundamentally changes the business process. I am convinced that the introduction of this solution represents an extremely significant service for accelerating DX at our customers as well as for developing a sustainable society.