Research and Development, and Innovation

DOCOMO's R&D has been leading mobile scenes not only in Japan but across the world and has consistently created new technologies and services. Our R&D focuses every day on achieving sustainable growth in the 2030s by delivering new value for customers and resolving serious social issues.

Promoting R&D and Innovation

Basic Policy

Innovation in industry and technology, known as the fourth industrial revolution, is steadily advancing across the world and generating new economic value, particularly in regard to the Internet of Things (IoT), Big Data, artificial intelligence (AI), and robotics. Meanwhile, while recognizing the need to address social issues, including a declining birth rate, aging population, and adaptation to the new normal, DOCOMO R&D is promoting DX and realizing the IOWN concept by fusing cyberspace and physical space, where humans, things, and experiences in the physical world are digitalized to better predict the future and optimize the real world. Through this approach, we are able to create value such as providing new experiences, higher efficiency, optimization, improved productivity, as well as safety and security. DOCOMO is conducting research and development specifically in the following fields.

1. AI connecting a variety of data, predicting the future, and gaining knowledge
2. 5G and 6G connecting everyone and everything everywhere
3. IoT and devices gathering information and providing an extensive range of feedback

In addition, we are accelerating open innovation with external corporate partners. Through these activities, we will achieve social and industrial development through information and communication technology (ICT) while resolving social issues and providing new value for customers and our partner companies.

R&D System

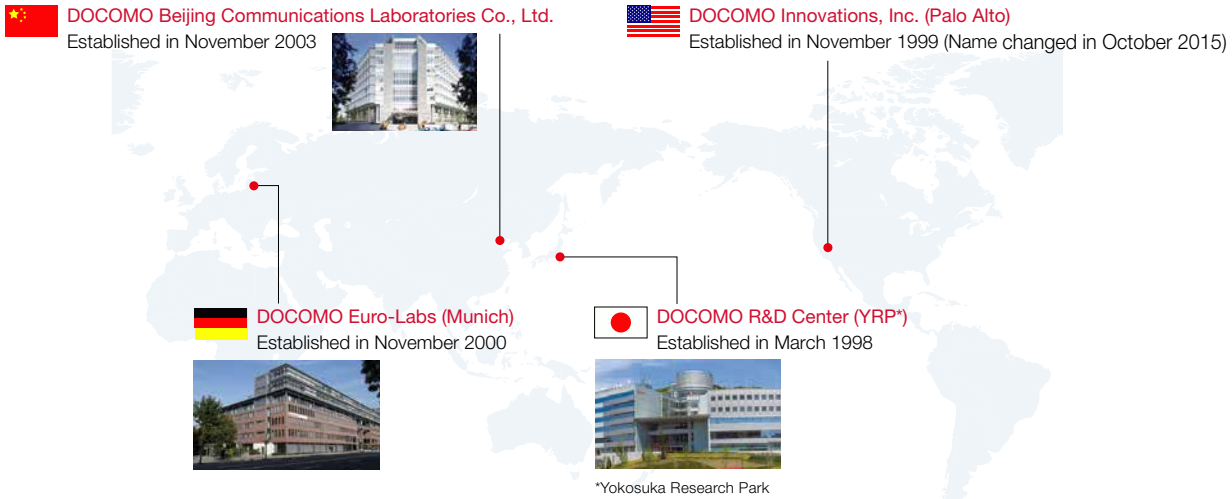
DOCOMO's R&D on mobile communication systems and new products and services is primarily carried out at the Yokosuka Research Park. The R&D Division leads our efforts, while the R&D Strategy Department is responsible for overall supervision. Every R&D division collaborates with other related divisions as part of our ongoing R&D activities and to further enhance the Group's devices, networks, and services. We also jointly develop technologies for devices and networks with major manufacturers. In regard to R&D for services, we focus on realizing new services conceived by business divisions while promoting an open innovation strategy that maximizes our diverse relationships with external entities. We actively and strategically communicate the results of our R&D efforts, such as new technologies, through multiple channels, including press releases.

In response to global technological innovation, we have established R&D bases in the U.S., Germany, and China. These bases particularly contribute to international standardization activities for 5G and virtual network technology in collaboration with the R&D Division at the DOCOMO head office. In addition, DOCOMO, DOCOMO Innovations, Inc., and the Silicon Valley branch of NTT DOCOMO Ventures, Inc. collaborate with and invest in startup ventures in North America in order to invest in startups possessing advanced, innovative technologies that are applicable to mobile communications services.

R&D Innovation Division

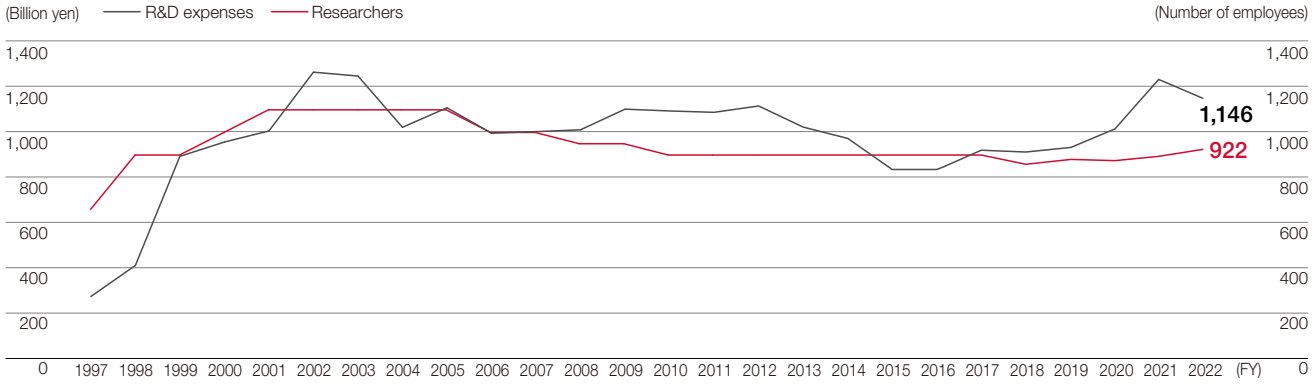
- **R&D Strategy Department**
  - **Global Business Alliance Office*1**
    Common planning and management related to R&D and technological innovation, global technology alliances and technical publications
- **Innovation Management Department**
  Business creation, strategic investment and corporate collaboration related to technological innovation
- **X-Tech Development Department (formerly Research Laboratories)**
  R&D, operation, maintenance, installation support, and technical support related to digital infrastructure and cloud systems
- **6G-IOWN Promotion Department*2 (former 6G Laboratories)**
  Method research, standardization, and co-creation of use cases related to 5G Evolution & 6G powered by IOWN wireless technology and network systems
- **Communication Device Development Department**
  Development, installation support and technical support for terminal devices and applications
- **Service Innovation Department**
  Development, operation, maintenance and technical support for methods and cloud systems related to new services and solutions
- **Core Network Development Department**
  Development, installation support and technical support for core network systems
- **Radio Access Network Development Department**
  Development, installation support and technical support for wireless network systems
- **R&D General Affairs Department**
  General affairs, accounting, technology information management and technical publications for the R&D Division

As of March 31, 2023
*1 Established in July 2021
*2 Reorganized in July 2021

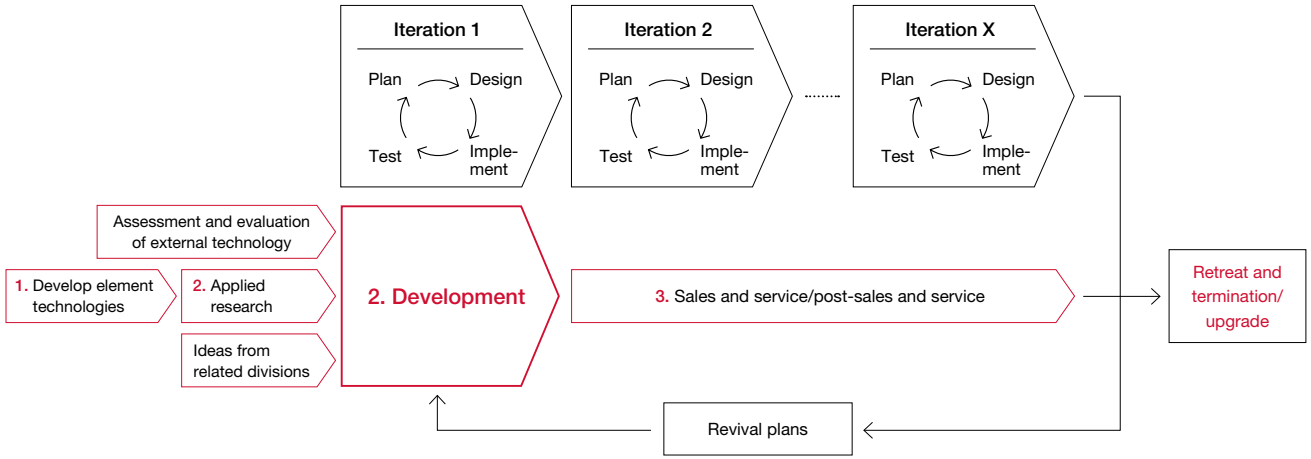


Changes in R&D Expenses and Number of R&D Employees

Since the late 1990s, we have maintained a workforce of between 900 and 1,100 researchers in R&D and spent between 80 billion yen and 100 billion yen annually since the year 2000. We continue to lead in the global mobile communications business and provide innovations that represent the backbone of sustainable development.



Innovation Chain



1. Develop Element Technologies

DOCOMO, as a major operating company of the NTT Group, supports NTT's R&D system for basic technologies. The R&D divisions of NTT and DOCOMO closely cooperate in research to ensure that DOCOMO's business activities benefit from technological achievements made through these efforts. As an example, the laboratories of the holding company conducted basic research on voice recognition and intention interpretation technologies, which were then moved to the applied R&D phase at DOCOMO, leading to the recent creation of new services.

2. Applied Research and Development

In the area of infrastructure, we engage in technological exchanges with major overseas operators, centered on the 6G-IOWN Promotion Department, and formulate strategies in response to external trends. We are consequently contributing to the establishment of global standards and leading the industry in ecosystem-related efforts by conducting proof of concept (PoC) experiments with major manufacturers. Even as we play a role in advancing this industry, we also ensure that we maintain competitive advantages in developing our own businesses. Furthermore, the Core Network Development Department and the Radio Access Network Development Department are heading up our joint development with major manufacturers to provide equipment and systems with internationally competitive functions.

As for services, concepts created by the business divisions are taken up by the Service Design Department to develop system infrastructure, while the Communication Device Development Department develops applications installed on the device. The Innovation Management Department is responsible for creating businesses related to technological innovation, extending strategic investments, and bolstering collaboration with other companies.

The Service Innovation Department develops element technologies and operates cloud systems related to new services and solutions utilizing AI and big data. It also establishes infrastructure and provides technical support to promote Group-wide data utilization. The X-Tech Development Department works closely with the business divisions to develop a technological platform that meets business needs.

As we create services, we accelerate the pace of their introduction to markets and increase their value by incorporating element technologies developed by NTT and the latest technologies developed elsewhere, in addition to DOCOMO's own technologies. We are also striving to further expand into new markets for services based on DOCOMO technologies.

3. Sales and Service and Post-Sales and Service

Related divisions at DOCOMO actively present proposals that reflect social conditions, trends in technological development, and circumstances at shops as well as ideas for improvement from shops and the results of exchanges with external companies and customer marketing activities. We convene screening meetings as part of our deliberations to launch new services. This cross-sectional meeting structure allows for our quick holistic decision-making.

After sales and services are launched, each business promotion division closely monitors their status and formulates revival plans for those that appear unlikely to meet their initial targets.

Promoting the Creation of Innovation

To accelerate the development of services that address social issues, we generate innovation by starting small. As the challenges faced by society and customers become increasingly diverse and complex and business competition intensifies, it has also become more important to identify underlying issues and needs by studying the frontline of our business, quickly develop solutions, and make business profitable. Applying this small start method allows us to reach the commercial trial stage more quickly than by using a standard development process and more rapidly develop businesses that address social issues.

In-House Venture System

The DOCOMO Group's In-House Venture System serves as a means for encouraging the creation of new businesses by supporting employees who aspire to set up and manage an enterprise based on their own business concepts or technology. Business ideas submitted by employees are screened, and DOCOMO invests in those that have passed the screening by establishing a company led by the employee who came up with the idea. During the screening process, the business idea is honed with the support of external mentors by conducting market analysis and verifying potential issues. Once a venture is set up, it continues to receive support from relevant departments of the DOCOMO Group as it seeks to grow. This system is intended to create businesses that stimulate synergies and impact DOCOMO Group businesses.

Topic

Launch of docomo STARTUP

In fiscal 2023, we launched a new business creation program "docomo STARTUP" by integrating all existing business creation programs at docomo Group companies to commercialize new business ideas of DOCOMO Group employees.

We will create new businesses by helping our employees develop their entrepreneurial mindset and skills, holding contests to discover new business ideas with a high potential for profitability, accelerating business verification and growth, and supporting the development of spin-off and spin-out companies.

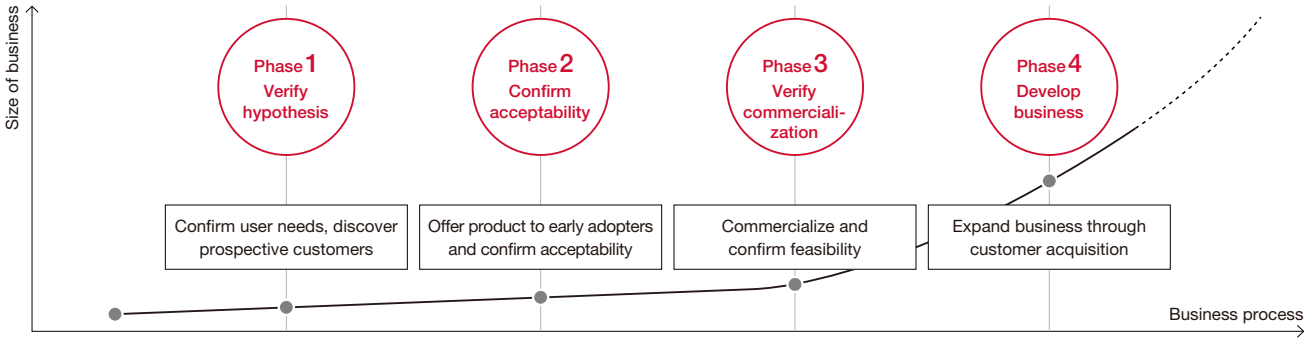
New Business Creation Programs

To promote innovation within the Company, DOCOMO takes on challenges to create new businesses such as launching and providing new services through the implementation of the 39works program, which is centered on R&D employees, and the ZERO ONE DRIVE program, a new business proposal program that welcomes applications from all DOCOMO Group employees. We also offer a human resource development program called the docomo academy to help employees learn the skills and mindsets required for developing their business concepts.

39works

Based on an open innovation strategy that leverages diverse relationships with external entities, the 39works program organizes joint projects with external partners and collaboratively implements the entire process from planning and development to operations and maintenance. The program is intended to support the quick start of small businesses and nurture them through continuously improving service quality in accordance with the market and public response through a high-speed PDCA approach. We launched seven new businesses and started providing eight new services in fiscal 2022.

Steps to Creating a New Business



1. Generate idea	2. Customer Problem Fit (CPF)	3. Problem Solution Fit (PSF)	4. Product Market Fit (PMF)	5. Customer acquisition/ business growth
Human resources development academy for innovation and change	New business contest	Co-creation and collaboration with partners		EXIT
• Fostering an entrepreneurial mindset • Acquiring entrepreneurial skills	• Brushing up ideas • Initial verification	• Providing services to the market • Business verification		• Transferring to business divisions • Establishing a new business division • Establishing an in-house venture • Forming a joint venture • Developing projects for municipalities
docomo academy	ZERO ONE DRIVE 2022			

ZERO ONE DRIVE

The ZERO ONE DRIVE is a contest designed to commercialize employee ideas for new businesses. In fiscal 2022, the DOCOMO Group integrated DOCOMO's LAUNCH CHALLENGE and NTT Communications' Digicom that had been held until 2021 into the ZERO ONE DRIVE, which is open to all employees of the DOCOMO Group. The program helps employees develop their business ideas with advice from a diverse group of mentors, each representing specialized areas of strength, such as entrepreneurs and designers. Each idea is turned into a business by considering which issues could be resolved by the business, verifying the hypothesis of the real need and optimal solution by carefully reviewing customer feedback. Through the program, we will encourage each and every employee to rise to the challenge of creating businesses that will have an impact on society and generate new revenue for DOCOMO. In fiscal 2022, there were 427 applications, and verification is underway toward commercializing some of them.

docomo academy

The docomo academy is an in-house university open to all employees of the DOCOMO Group and is intended to ignite the motivation and passion within each and every employee for cultivating a spirit of challenge in those who will lead in transforming the society for the better. The academy brings together people from all walks of life, regardless of age or professional status, under the motto "Let's do something big," where they can discover their own spark, forge new relationships, and start working together. Our experienced and passionate management staff, mentors, and famous lecturers on innovation are committed to working with all participants through one-on-one consultations to give shape to their ideas and visions. The program offers participants the opportunity to learn the mindsets and skills they need to transform society and become future innovators with outstanding learning experiences. In fiscal 2022, 270 participants were enrolled in this program.

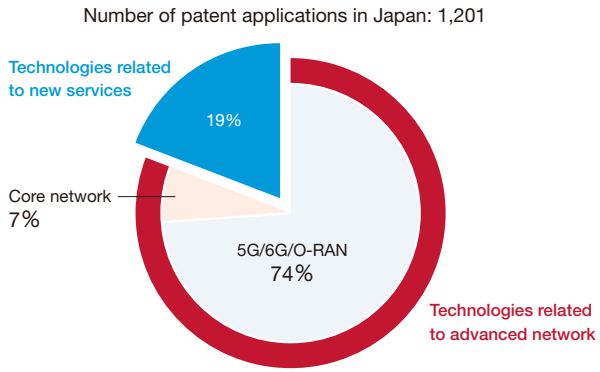
Intellectual Property Initiatives

We are continuing to expand our intellectual property assets to increase the domestic and international competitiveness of our business.

For example, DOCOMO has promoted the research and development of technologies for upgrading its networks such as W-CDMA, LTE, LTE-Advanced, 5G, and 6G, as well as technologies related to new services such as AI and IoT, with the ultimate goal of enhancing mobile experiences for customers.

As a result of encouraging patent applications for these technologies, as of March 31, 2023, DOCOMO holds around 4,400 patents in Japan and 10,100 overseas.

Breakdown of Patents Filed in Japan in FY2022



DOCOMO's intellectual property

Promoting Open Innovation

DOCOMO is seeking to transition from a conventional mobile communications company into a Value Co-Creation Company. It possesses diverse business assets such as its mobile networks and customer base, secure settlement systems, and customer referrals. We believe that we can create new businesses by making these assets available to partners with expertise and knowledge, and this in turn will lead to the cocreation of new social value.

We will particularly focus on 5G, AI, and IoT, promoting co-creative innovation by applying various mechanisms to the technologies of DOCOMO and its partners to create new value for customers while also seeking to address social issues. In the process of creating new businesses, we identify challenges facing customers, including social issues, and conduct trials with customers before commercializing the business and seeking growth. We offer diverse mechanisms for co-creative innovation, such as 39works (P. 53), in which we nurture an idea from the ground up by conducting verification and commercialization with our business partners, and Top Gun (P. 59), in which we proceed with verification and product development with our corporate customers.

As part of this initiative, the DOCOMO 5G Open Partner Program®, launched in February 2018, has been driving the development of new applications with a broad range of partners since the start of the 5G era, so that customers can keep enjoying innovative 5G services.

DOCOMO 5G Open Partner Program®

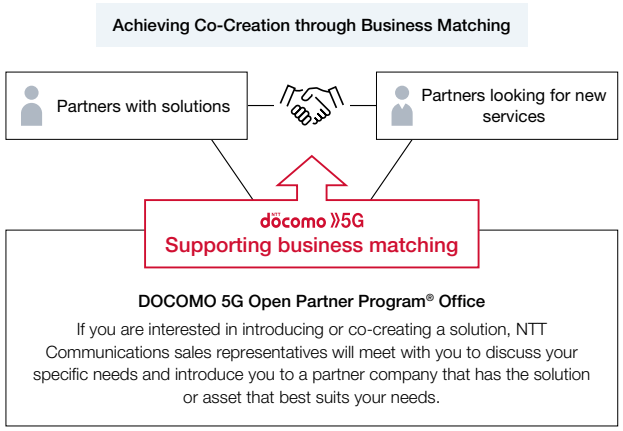
As of March 2023, more than 5,500 partners have joined this program, which provides opportunities for co-creation through 5G. Furthermore, for participating companies and organizations, we established DOCOMO 5G Open Lab®, a permanent testing environment for 5G technology with 10 locations in and outside Japan. We have also been operating

DOCOMO 5G DX Square as a space for experiencing solutions with advanced technologies such as 5G, video AI, XR, and robotics, to drive DX and innovation through co-creation with businesses that support local industries. As of July 2023, there are over 50 locations nationwide, and some are promoting collaboration with partner business sites. Furthermore, we constructed Beyond MEC as a testing environment connected to a cloud infrastructure. We are forging ahead with initiatives for creating new 5G applications in collaboration with a wide range of partners.

Under the DOCOMO 5G Open Partner Program®, we conduct online seminars to introduce the 5G solutions we have launched. The seminars introduce specific examples of business matching and the creation of solutions for participants to grasp the key points for co-creating business.

We also hold the docomo 5G DX AWARDS® to promote the creation of new co-creative 5G solutions.

What you can do with the DOCOMO 5G Open Partner Program®



docomo 5G DX AWARDS®

As part of the DOCOMO 5G Open Partner Program®, we have been holding docomo 5G DX AWARDS® since fiscal 2020. The competition invites companies to apply their technologies, product devices, and services to co-create new business by working together.

In fiscal 2022, we selected the SDGs of eight industries as the theme, and invited applications representing unique assets possessed by each company. Furthermore, we reviewed and awarded applications that offer valuable 5G services. The prize winner, IoTube, was commercialized as a 5G solution. We will continue to uncover assets held by companies and use 5G mobile communication to accelerate creation of solutions for contributing to achieving the SDGs in various industries.

Co-Creation with Ventures

Considering future social environments and industry trends, DOCOMO is assisting with the growth of startups through investments and supporting co-creation via the Group subsidiary DOCOMO Ventures, Inc.

In April 2022, we established DOCOMO Innovation Fund III, L.P. of 15 billion yen to make strategic investments in anticipation of generating synergies with our business. In May 2022, we also held the NTT DOCOMO Ventures Day to promote co-creation between venture companies and the DOCOMO Group. Toward the New DOCOMO Group Medium-term Strategy and beyond, we are building relationships with promising startups inside and outside Japan that have the potential to create a new world.

Co-Creation with External Partners

Lifestyle Co-Creation Lab

In September 2021, we launched the Lifestyle Co-Creation Lab to realize a well-being society where everyone can shine, engage in mutual support, and have ample opportunities to explore their abilities.

The lab utilizes the multiple technologies that DOCOMO has researched and developed, combines them with the technologies and assets held by DOCOMO and its business partners, verifies the value of the technologies, and hones them to create new lifestyles to enrich and add convenience to daily life. Together with our partners, we will specifically leverage the Innovation Co-Creation Platform, which will make the technologies of DOCOMO and NTT Laboratories accessible to various industries, accelerate development, and create new value across industries.

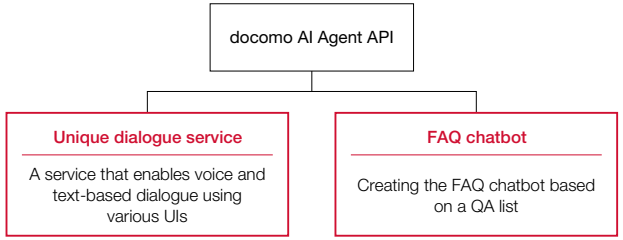
Examples of Initiatives

- New fashion experience using virtual technology for Generation Z
- Improving peoples' lives through the use of regional apps (Kaihin Makuhari area, Chiba City)
- Smart city initiative with Kobe City
- Demonstration test using AI for preventive healthcare services for the elderly in Toyota City
- Open Innovation Office
- Communicating information to residents of the UR Housings to enrich their quality of life
- A new business management model for road operation, Digital Twin Road Management
- Virtual urban space, Virtual Centrair

Commercial Provision of the docomo AI Agent API

DOCOMO has been providing corporate customers with the interactive AI service, docomo AI Agent API®, which is also used for DOCOMO's "my daiz." Creating a scenario for each purpose enables contextual Q&A services and a natural dialogue with users. In addition, the interactive original agent created through this service incorporates voice recognition, natural language processing, and voice synthesis, enabling voice dialogue for users.

How the docomo AI Agent API Works



Through this service, we provide the docomo AI Agent API Partner Program to promote new dialogue-based solutions in collaboration with partner companies, creating dialogue services that provide new experiences for end users, and forge win-win business relationships with partners. In the case of multi-language translation, DOCOMO's service to automatically translate a Japanese scenario into foreign languages is enabled through collaboration with an outside partner that offers this service. We will utilize docomo AI Agent API to familiarize users with the diverse services offered by partners through natural communication supported by AI to deliver benefits, satisfaction, and security for every customer.

Commercial Provision of docomo MEC*1

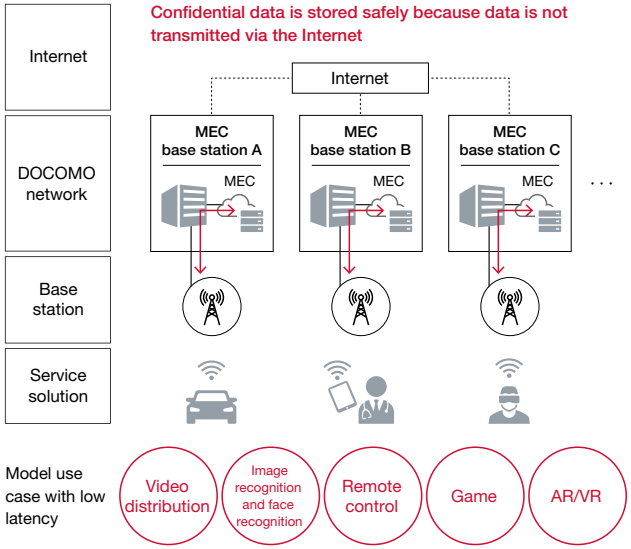
We are providing docomo MEC™ as a service using computing facilities as the MEC platform connected to DOCOMO's low latency network. In addition to compatibility with 5G SA and realizing low latency access using MEC Direct™, it is equipped with technologies such as the image recognition API*2 developed by DOCOMO and also various solutions, including video transmission, VR, and AR, provided by DOCOMO and its partners.

MEC platforms were set up in one additional location by July 2023 for a total of 10 bases that offer low latency DOCOMO network service. This has enabled access to low-latency, high-security networks to places as needed in a way that addresses regional challenges.

Going forward, we will gradually expand the solutions installed in the MEC platform to contribute to the creation of new value and resolution of social issues.

Note: docomo MEC and MEC Direct are registered trademarks of NTT DOCOMO.
*1 The service was offered under the name docomo Open Innovation Cloud® until the end of June 2022.
*2 Part of the image recognition technology constitutes AI corevo® of the NTT Group.

High Security Realized by Low Latency and Closed Network with Cloud Direct



*MEC Direct is available at the following 10 MEC base stations: Tokyo, Kanagawa, Osaka, Oita, Okinawa, Tohoku, Tokai, Hokuriku, Chugoku, and Shikoku.

docomo R&D Open House

We hold docomo Open House every year to showcase the Company and the NTT Group's latest technologies and solutions.

In fiscal 2022, "docomo Open House '23" was held in a hybrid style with about 65,000 page views and 1,272 in-person participants.

The event featured a variety of initiatives from various areas, such as 5G/6G, AI, and XR technologies and solutions, presenting 20 initiatives online and 21 initiatives at the venue. We also indicated the specific SDGs linked to all exhibits, to convey how each contribute to the achievement of the SDGs.

This event represents a key opportunity to strengthen our collaboration with various partners because of its broad appeal to stakeholders associated with our efforts to improve added value for customers and create social value through DOCOMO and the NTT Group's initiatives.

Topic

Digital Twin Road Management Conception

While repairs and other measures for addressing road deterioration across Japan are considered to be very important, it is becoming increasingly difficult for local governments and other road administrators to handle maintenance due to a shortage of engineers and financial resources. DOCOMO is therefore jointly promoting the Digital Twin Road Management concept project with NTT COMWARE and Infroneer Holdings, Inc.

The project supports data-driven, rational management decisions by analyzing, forecasting, and visualizing a wide range of data acquired on-site. Under this concept, AI performs a series of management processes, including daily road inspections, that require considerable labor and cost. The digital twin automatically formulates and simulates repair plans against future deterioration. This will help optimize road operation and maintenance and drastically reduce labor and costs.

Looking ahead, we will implement and expand this concept toward creating towns in which people can enjoy a safe and comfortable lifestyle well into the future and achieving a sustainable society.

Digital Twin Road Management Concept

Topic

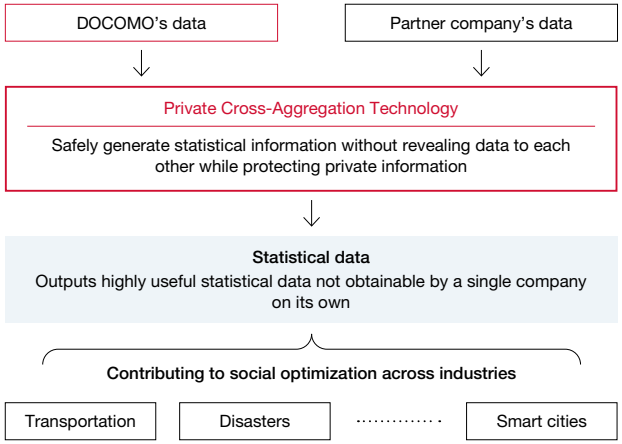
Cross-Company Statistical Data Usage Private Cross-Aggregation Technology*1

Using and cross-correlating data held by multiple companies is expected to facilitate data analysis from multiple, comprehensive perspectives that would be otherwise be difficult for any one company on its own. Sharing data with other companies, however, always involves risks such as data leaks and privacy violations, which often hinder them from actively sharing data. To address this, DOCOMO has developed a private cross-aggregation technology with the cooperation of NTT. The technology makes possible the safe generation of statistical information from data held by separate companies while not revealing*2 the source data to each other.

Practical applications for the technology are already emerging, including a five-month joint verification test with Japan Airlines and JALCARD, starting in November 2022, to improve the value of customer experiences and resolve social issues. In the test, we analyzed the trend in the movement of passengers before boarding based on the demographic information, which was prepared by using data from DOCOMO's cell phone network operations and JAL's domestic flight ticket reservations. The results of the verification will be used in considering and implementing measures to improve on-time departure rates for smoother air travel.

*1 Private Cross-aggregation Technology is a registered trademark of NTT DOCOMO, INC.
*2 "Not revealing" in the sense that the technology ensures that a series of processes is performed without revealing data to human observation.

Operational Image of Private Cross-Aggregation Technology



Topic

Using Smartphones and AI to Maintain and Improve Brain Health

The increasing aging of Japan's population raises the risk of dementia. And interest in brain health has grown along with the awareness that cognitive functions can deteriorate without any subjective symptoms. Anticipating an era of 100-year lifespans, DOCOMO and Tohoku University have jointly developed an AI-powered Brain Health Assessment to visualize brain health status using smartphones and AI along with an AI-powered Brain Health Training application to help maintain and improve brain and oral health.

The AI-powered Brain Health Assessment converts user data, such as smartphone usage trends, step count, and location, into a score that indicates the relative health of the user's brain. With this tool, users can monitor their brain health by simply using their smartphones as usual. They can then determine if they may need brain training or should seek information on specialized tests for dementia, for example, as a guide for acting at an early stage to preventing cognitive decline. The AI-powered Brain Health Training application provides fun, game-like exercises to help users maintain and improve their brain and oral health. Users are asked to record the movements of their cheeks, tongue, and other parts of the mouth using their smartphone or tablet camera for automatic assessment by the AI while simultaneously engaging in four types of brain training exercises, such as calculation tasks. It has been reported that poor oral function is correlated with poor cognitive function, so we are therefore developing this medically supported, effective training app by incorporating the insights of experts in order to market it as early as possible.

Using smartphones and AI to maintain and improve brain health

Topic

MetaMe: Metacommunication for New Communities

In February 2023, we started offering a beta version of MetaMe through Relic, a co-innovation company. MetaMe is a communication service based on a new Metaverse technology we developed, including extreme massive connectivity technology, which enables up to 10,000 people to be connected simultaneously. This service offers a new communication platform in which people with common interests can connect through technologies such as value matching by projecting themselves into a virtual world through avatars. For example, Kotohira Community World is a virtual space created in collaboration with Kotohira Town in Kagawa Prefecture, famous for its association with one of the old gods of the sea known as the Sanuki no Kompira-san. Visitors can experience the town's tourism and culture and interact with local residents. The project is also expected to drive the expansion of tourism, increase the population connected to the local area, and contribute to regional development.

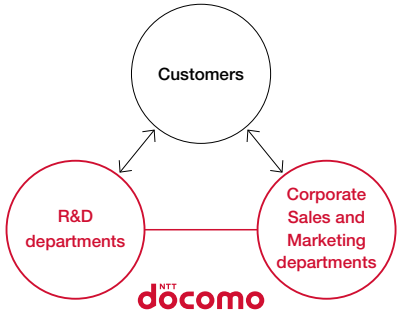
We are also developing an online school service called the J CLASS ACADEMY using the MetaMe virtual space in collaboration with Takarajima Wonder Net Co., Ltd. to contribute to the education field and expand the application of MetaMe. We will continue striving to increase the applications of MetaMe as a next-generation communication tool that offers new experiences and value by integrating the real and digital worlds.


Reproductions of Konpira-gu Shrine and other famous tourist spots in Kotohira

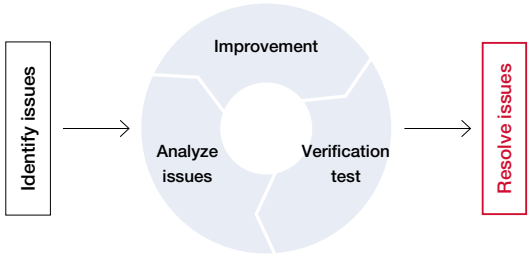
Promoting Process Innovation (Top Gun)

We promote the Top Gun initiative, in which our customers, the R&D, and corporate sales and marketing departments work in concert to address customer challenges by turning DOCOMO's technologies into value for customers. Top Gun collaborations between R&D and corporate sales and marketing are not limited to the departments at the head office. Corporate sales and marketing staff at DOCOMO's regional offices and branches in Japan voluntarily join the initiative to resolve issues faced by local companies and governments. We also set up a system for sharing information about Top Gun nationwide to encourage greater interaction and collaboration between the R&D and corporate sales departments at our regional offices and branches nationwide. We will accelerate the creation of solutions by having R&D members responsible for developing the technology visit customers to make on-the-spot decisions on the relative effectiveness for resolving a particular issue and to present even better solutions. Having R&D staff visit customers together with corporate sales and marketing staff facilitates the connection of needs with potential solutions, with collateral benefits such as promoting process innovation, by quickly and simultaneously verifying and resolving issues, turning technological possibilities into value for customers, and opening the way to solutions for customer challenges by fully applying cutting-edge technologies. We will pursue this initiative to accelerate the pace of co-creation. Although the initiative was discontinued at the end of June2022, we were able to implement a total of 56 collaborations, of which 16 have been commercialized and 3 are ongoing.

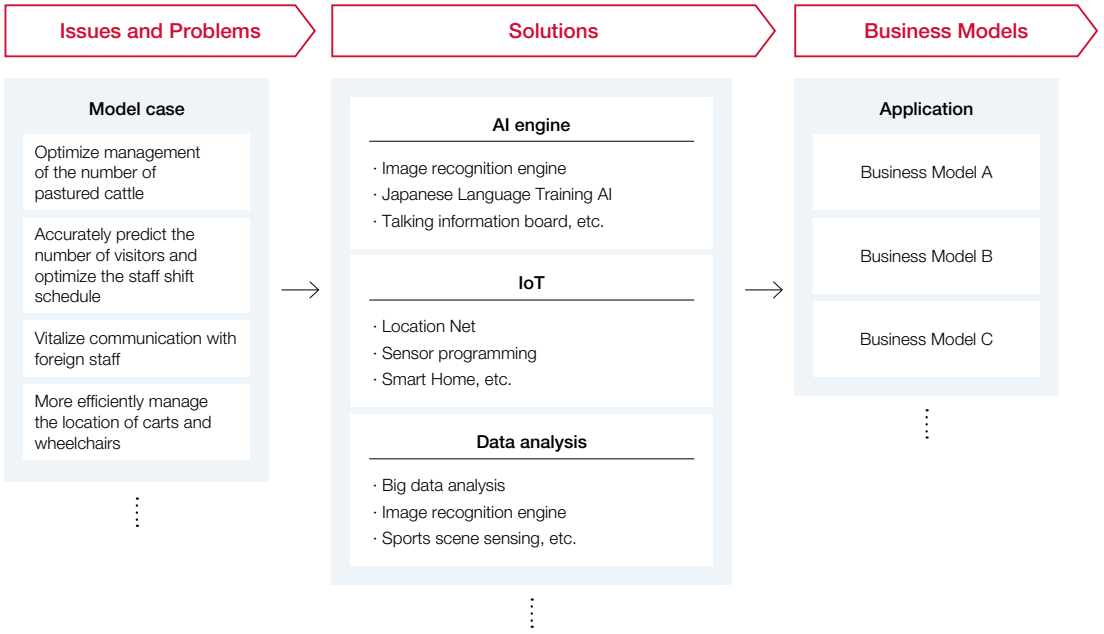
1. Trinity development system to connect issues to technology



2. Simultaneously verifying and resolving issues



3. Turning technological possibilities into value for customers



Social Issues and Innovation

The creation of new innovations that apply and promote digital content, AI, and ICT is essential for contributing to the realization of a sustainable society. We will continue to work together with our co-creation partners and local governments to accelerate efforts to resolve social issues.

Childcare Support Services Using Digital Educational Resources

While programming and financial education have received a lot of attention recently, a lack of adequate learning environments and opportunities has been a challenge. Under the new brand, comotto, we are co-creating and offering digital content with partners from a variety of industries to support children's learning. (P. 68)

Solutions

1. Provide learning opportunities suited to each student
2. Expand future options for children
3. Develop future IT professionals

Solutions 1, 2, and 3

A Game-Based Programming Kit

embot

Developed through DOCOMO's New Business Creation Programs, embot is an education service for learning programming. With embot, children learn the basics of manufacturing and programming by a robot assembled from cardboard and electric parts using a visual programming* app and controlling its movement. This experience nurtures their ability to think freely. We are expanding the use of our service for applications such as training in programming, which has been required in elementary schools since 2020.

*Visual programming provides a programming environment that combines images and shapes.

From Assembly to Programming

Kids Constructing Things

Children can freely color, cut, and paste parts to make their own robot.

Programming

Children can choose the programming level that best suits their skills.

Solutions 2 and 3

Financial and Economic Education for Children in the Digital Age

Money Lessons

In July 2023, we started offering a financial and economic education service on our comotto website in collaboration with Nomura Holdings to help parents and children learn how society works and the role of money. The service focuses on four key points in learning about money, and includes games, quizzes, columns, and other educational content tailored to different skill levels. In August, we organized an in-person, hands-on financial and economic education event for children. We will continue to take advantage of the know-how and technology of both companies to provide opportunities for students to learn how society works through financial and economic education.

Four Key Points in Money Lessons

1. Spending and Saving
Children will learn the basic roles and how to responsibly creatively spend money on what they want to do.

2. Work and Earn
Children will learn about the significance of earning money and different types of jobs and working style, so they can develop a foundation for envisioning their own careers.

3. Circulation and Economic Cycles
Children will learn how money circulates in society and understand how the world works to be able to actively participate.

4. Daily Life and Lifestyles
Children will imagine the person they want to become and learn to plan, set goals, and develop the discipline to realize their dreams.

Money Lessons for Children

Improving Health in the Community with Community-Based Monitoring

With the continuing decline in birthrates and depopulation, there is an increasing need to support the daily lives of senior citizens, which is becoming more difficult due to a shortage of related staff. By providing innovative AI-based support, we intend to help local residents feel safe and comfortable living in their communities.

Solutions

1. Eliminate the shortage of labor to support the local community
2. Make the community a better place to live by improving the health of local residents
3. Establish a community-based support system for the elderly who live alone

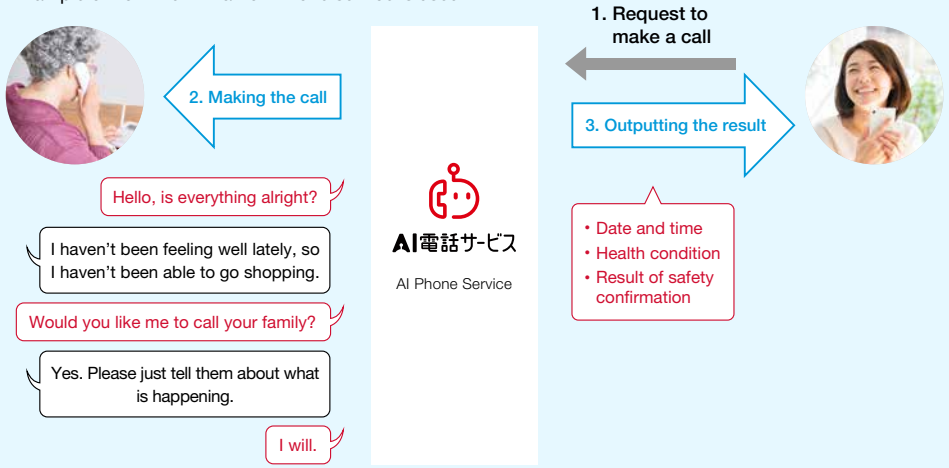
Solutions 1 and 3

Supporting the Senior Citizens with AI

AI Phone Service (Mimamori Phone)

DOCOMO's Mimamori Phone for monitoring senior citizens utilizes its AI Phone Service, which reduces the workload of operators by having AI handle calls on their behalf. The Mimamori Phone service periodically calls an elderly person on their landline phone to check on their safety and health based on their interactions, and then contacts family members or care staff as appropriate. In 2020, we signed a partnership agreement with Nara Prefecture to conduct a demonstration test for an elderly support system using this service, which is being adopted by an increasing number of local governments as a community-based system for looking after senior citizens.

Example of how the Mimamori Phone service is used



Solutions 2 and 3

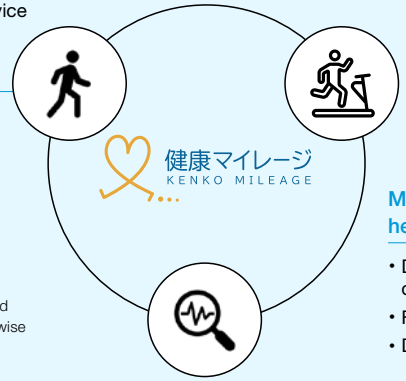
Helping Local Residents Improve Their Health

Kenko Mileage

The Kenko Mileage service is intended to help people improve their health by monitoring their walks using a smartphone app or pedometer and is being adopted by local governments and companies that make it available for local residents and employees. In September 2022, we added a new function to check the physical and cognitive functions of the elderly using frail* estimation AI. Based on the usage history stored in the smartphone of elderly users, location information, and lifestyle data such as step count and sleeping habits, AI predicts the risk of frailty and notifies users of the result on their Kenko Mileage app, which alerts them to their own risk of frailty at an early stage. The service also features other functions to support residents such as monitoring residents during normal times using location-based services and checking the evacuation status of residents in the event of a disaster.

*A stage prior to requiring nursing care in which physical and mental functions become weakened with age.

Kenko Mileage Monitoring Service



Staying healthy

- Walking point project
- Verification of effectiveness
- API linkage with Mynaportal*

*Health checkup information is obtained by using the Individual Number, otherwise known as My Number.

Future health

- Physical health
- Mental health
- Eating healthy

Monitoring of current health status

- Delayed evacuation during a disaster
- Falls and unstable heartbeat
- Detection of unusual conditions

ICT Solutions to Create a New Form of Primary Industry

The Japanese primary industry is facing a serious labor shortage due to the aging workforce and lack of successors. We are taking on the challenge of addressing these issues by leveraging ICT technology, which will lead to the revitalization of local communities.

Solutions

1. Revitalize primary industry with ICT technology
2. Manage and operate work sites more efficiently
3. Secure stable production volume and revenues

Solutions 1 and 2

Reducing Pesticide Use and Enhancing Management Efficiency

Demonstration Experiment for Smart Agriculture

Since April 2022, we have been conducting a demonstration experiment for creating a smart agricultural production area in Sado City, Niigata Prefecture, a site designated as a Globally Important Agricultural Heritage System. The experiment is focused on promoting rice farming in terraces with reduced pesticides (project operator: National Agriculture and Food Research Organization (NARO)). Sado City has been promoting eco-friendly agriculture for some time to expand farming with reduced pesticides. However, a shortage of workers to manage such a large number of terraced rice paddies is presenting an obstacle to making that a reality. The demonstration experiment uses smart agricultural machinery and ICT-based advanced water management systems to verify the feasibility of bringing down costs and labor while increasing profits when reducing the use of pesticides in terraced rice paddies. Using the results of the demonstration, we will further promote the use of reduced pesticides by introducing smart agriculture, reducing the labor of farmers, and increase the added value of rice.

Demonstration Experiment 1 **AI-equipped paddy weeding robot**

The robot detects rice plants by image recognition using AI and removes weeds without stepping on the rice plants.

Demonstration Experiment 2 **Optimal mowing on steep footpaths between rice fields**

Mowing is performed more efficiently by analyzing the 3D data of slopes calculated by aerial photography with a drone and selecting the most efficient method of mowing.

Demonstration Experiment 3 **Water management using automatic hydrants with IoT sensors**

The frequency of monitoring water levels can be reduced by automating the opening and closing of water gates and installing IoT sensors to detect water levels.

Solutions 1, 2, and 3

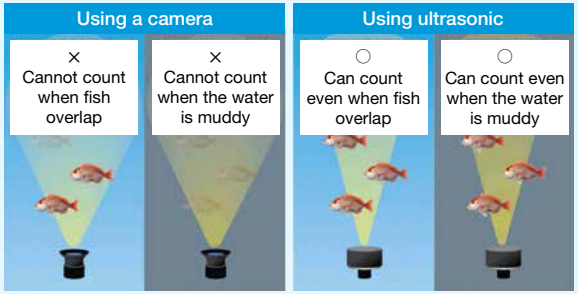
Drastically Reducing the Workload of Farming Fish

Promoting DX in the Fisheries Industry

As part of its support for reconstruction efforts after the Great East Japan Earthquake, the DOCOMO Group began providing a service using an ICT buoy to visualize the sea environment and has since been working to resolve the issues faced by the fisheries industry. In December 2022, NTT Communications, in collaboration with Aqua Fusion, introduced a system that automatically counts and reports the number of fish in a fish tank to a sea bream farm in Ehime Prefecture. As the number of companies and organizations operating aquaculture farms continues to decline, efficient management has been required in the sea bream aquaculture industry. The current system, which uses ultrasonic underwater visualization technology, has an average measurement error of approximately 10% or less. It automatically counts the number of farmed fish in real time using ultrasonic waves, which reduces the labor burden of maintaining the density of fish in a tank at a level suitable for their growth. We will expand the application of this system to other kinds of fish farming to further promote DX in the fisheries industry.

Example of ultrasonic underwater visualization technology

Monitoring and counting fish moving through the passage frame



Provision of Educational Platform for Diversified Learning Environments

The GIGA School Concept*, which aims to provide ICT environments at educational institutions, has raised the issue of making information terminals available in educational settings as well as how they should be used. NTT Communications offers an ICT environment that is easily accessible to anyone via a cloud-based education platform.

*Initiative by the Ministry of Education, Culture, Sports, Science and Technology (MEXT) for providing one computer and a high-speed network to each student nationwide.

Solutions

1. Provide learning opportunities that are not affected by the learning environment
2. Provide individualized support for optimal learning based on the characteristics of each child and student
3. Reduce the burden on teachers and staff by digitizing communication between schools and parents

Solutions 1, 2, and 3

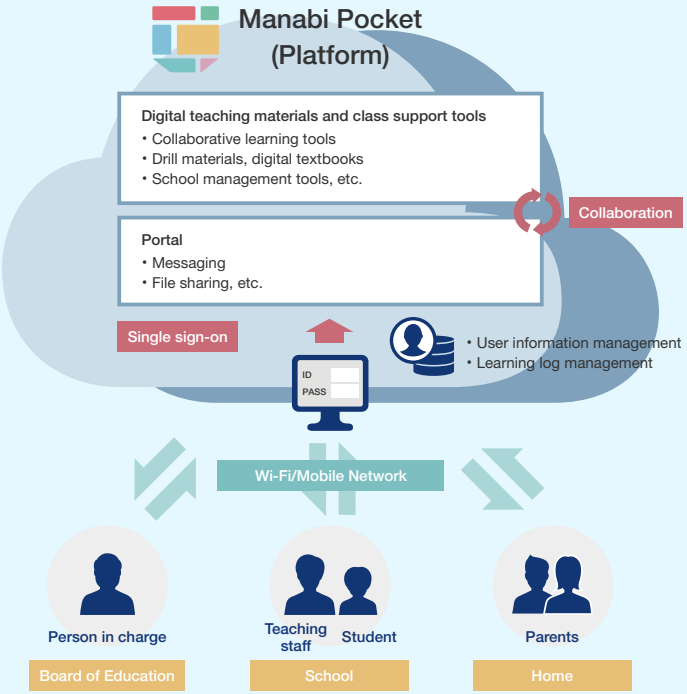
Learning Platform Available Anytime and Anywhere

Manabi Pocket

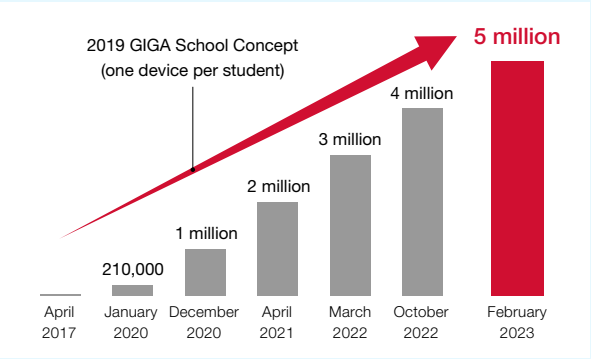
Manabi Pocket is a cloud-based educational platform provided mainly to public elementary and junior high schools. It is accessible both from school and home with a computer and Internet access and has been proved to be helpful for providing online classes during the COVID-19 pandemic. Another convenient feature allows each student, faculty member, and teaching staff a single account and single sign-on to a variety of learning content, such as AI drills and collaborative learning tools. It also features a communication function. Digitizing communication between the school and parents or guardians, such as student absence notifications and newsletters, as well as messaging between teachers and students helps reduce the workload of teachers and other staff with hectic schedules.

Going forward, we will continue to analyze and visualize types of student data, such as learning status, attendance, and health records, to contribute to achieving optimal individualized learning.

Overview of Manabi Pocket



Changes in the Number of Manabi Pocket Subscription IDs



Many local governments have selected the platform as a Learning e-Portal*2 that serves as a gateway to the MEXCBT*1, a CBT system developed by the MEXT. It has been introduced to more than 12,000 schools across the country, with the number of subscription IDs now exceeding 5 million.

*1 MEXCBT is a computer based testing system developed by MEXT that allows students to study and assess their performance online while at school or at home, using questions created by the national government, local governments, and other public institutions. CBT is used in the place of paper-based questionnaires and multiple-choice sheets.

*2 The Learning e-Portal is a digital learning environment concept for primary and secondary education in Japan. It was designed to make better use of educational data as well as to improve user experience by providing software interoperability, taking advantage of the ICT environment of one device per student with a high-speed network established under the GIGA School concept.

Contributing to the Development of Livable Communities for All through the Use of Unique Data

The collection and analysis of population data from diverse perspectives, such as population distribution and behavior, is considered essential for making communities more livable, vibrant places. Various data obtained from mobile phone networks and their usage is useful for addressing issues in community development.

Solutions

1. Provide information that corresponds with the needs from big data
2. Support resilient community development
3. Promote regional development by providing information that meets the preferences and objectives of each visitor

Solutions 1 and 2

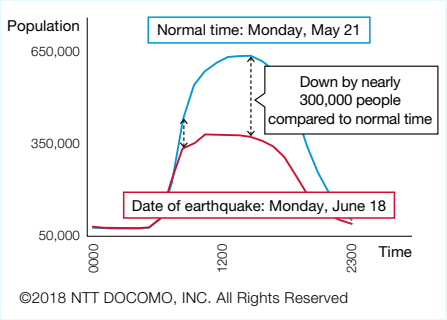
Contributing to Creating Livable Communities with Demographic Data

Mobile Spatial Statistics

Mobile Spatial Statistics uses DOCOMO's mobile phone network to provide hour-by-hour population data throughout Japan 24 hours a day, 365 days a year. The data can be analyzed by gender, age, area of residence, country, region, and other factors and is being used across a wide range of fields in both the public and private sectors. For example, predicting human behavior has been a challenge when formulating natural disaster prevention plans to minimize damage and achieve early recovery in the event of such a disaster. By using data to understand population dynamics, however, we can estimate the number of people who are unable to return home during a disaster or optimize stockpiling decisions based on actual human movements, which allows for more accurate damage forecasting and response planning.

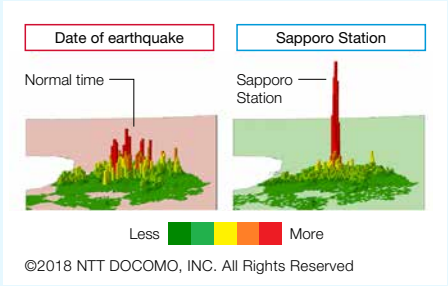
Example of Mobile Spatial Statistics Data in the Event of a Disaster

Northern Osaka Earthquake: Comparison of population during the disaster and normal times



By comparing the population during a disaster and normal times, it is possible to assess how many were affected by the disaster.

Hokkaido Eastern Iburi Earthquake: Population distribution during the disaster and normal times



By comparing the population distribution during a disaster and normal times, it is possible to identify areas likely to become crowded during a disaster and use this information when formulating a supply stockpile plan and examining a disaster-resistant transportation networks.

Solutions 1 and 3

Offering Visitors Personalized Information on Local Attractions

FUN COMPASS

Local governments and private businesses that strive to make their communities more attractive to visitors are facing new challenges in the wake of COVID-19, such as a growing trend of a shift to independent travel and new travel styles, including micro-tourism. The mobile sightseeing navigation system FUN COMPASS provides users with information that matches not only their preferences and attributes but also the time, place, weather, and other conditions. The result is that users are given a complete range of local attractions, both the most famous tourist spots that are usually crowded as well as the hidden gems. FUN COMPASS also helps visitors discover new local attractions each time they visit, encouraging longer stays and more spending, and ultimately leading to the revitalization of the region as a whole.

Examples of FUN COMPASS Applications (Okinawa: Okinawa Compass)

1 Receive the best tourist attraction information on Okinawa before you travel

2 Bookmark your trip to make it more enjoyable

3 Read about spots worth stopping at during your trip