

Innovation Management

Hitachi's Approach

Hitachi will strengthen its Social Innovation Business, which has been the key focus under Hitachi's Corporate Credo "to contribute to society through the development of superior, original technology and products," and will contribute to the sustainable development of society by utilizing its internet of things (IoT) and artificial intelligence (AI) capabilities, thus helping to achieve the Sustainable Development Goals (SDGs) through the realization of Society 5.0. To this end, we will help resolve customer issues by further enhancing Lumada and NEXPERIENCE, a methodology for collaborative creation with customers. "Kyōsō-no-Mori," a new research initiative for open collaborative creation, will also support our customers in resolving their challenges, and we will promote open innovation through vigorous activity in the field of intellectual property (IP).

Our Impact on Society

R&D Personnel

2,650

Our Performance

R&D Expenditure (consolidated)

323.1 billion yen

Research and Development (R&D)

Hitachi's R&D Initiatives and R&D Policy for Fiscal 2019

Policy Frameworks and Systems

Hitachi has established an R&D policy for fiscal 2019 of becoming a global innovation leader in the fields of SDGs and Society 5.0. With Lumada as a base, we will fully utilize our expertise in operational technology (OT), IT, and products, along with the technological foundation established by our R&D department, to create solutions through collaborative creation with customers in the five sectors of mobility, smart life, industry, energy, and IT. We will create social, environmental, and economic value for our customers, as well as improving people's quality of life.

In order to accelerate collaborative creation with customers, in fiscal 2015 we realigned our R&D structure under a customer driven model, developed NEXPERIENCE, and strengthened our digital solutions development.

NEXPERIENCE is a systematized methodology for collaborative creation that allows us to precisely identify social challenges in business areas, design business models based on incubated ideas, and assess profitability. It helps expand solution core templates based on Lumada customer cases and selected OT- and IT-based customer cases. In fiscal 2018 we released a tool that uses AI to identify the most appropriate stored customer cases for resolving a given customer's issues, and we will continue to evolve NEXPERIENCE to create new value.

In April 2019 we opened "Kyōsō-no-Mori," a facility for global collaborative creation in harmony with the surrounding environment, within our Central Research Laboratory. Kyōsō-no-Mori aims to develop open innovation ecosystems through open collaborative creation, connecting our researchers and designers to stakeholders including customers and academic research institutions around the world. We also concluded a comprehensive partnership agreement with Kokubunji City, where Kyōsō-no-Mori is located, to explore future societal systems supporting the sustainable development of regional communities.

In pursuing our R&D policy to become a global innovation leader in the fields of SDGs and Society 5.0, we will focus on three areas: the Global Center for Social Innovation (CSI) will take the lead in enhancing co-creation of global solutions, the Center for Technology Innovation (CTI)

will be primarily responsible for creating the world's No. 1 technologies for solutions and products, and the Center for Exploratory Research (CER) will promote basic exploratory research to resolve issues in society.

R&D Policy for Fiscal 2019

Become a global innovation leader in the fields of SDGs and Society 5.0



Enhancing Co-Creation of Global Solutions

Frameworks and Systems | Objectives, Activities, and Achievements

As part of its efforts to promote initiatives in growth areas and social challenges in its regions of focus, Hitachi has expanded open collaborative creation spaces to a global level and accelerated the pace of innovation. Outside Japan, R&D centers are located in Silicon Valley and Detroit in the United States; in London, Cambridge, Copenhagen, Sophia Antipolis, and Munich in Europe; in Beijing, Shanghai, and Guangzhou in China; and in other cities across India, Singapore, and Australia. These regional centers aim to contribute to global society by collaboratively resolving regional and customer issues.

Also, in May 2019, the Hitachi America R&D division was relocated to Hitachi Vantara's new office in Santa Clara, California, to strengthen collaboration and provide a development center for digital solutions to improve people's quality of life through open collaborative creation.

In addition to the current approach of industry-academia-government cooperation to create vision and develop rules, initiatives such as open forums and ideathons are being used to create new services and ideas, as well as hackathons to develop solutions and real-world verification, in our efforts to promote collaborative creation through open innovation.

Events held in fiscal 2018 included an event in Singapore to generate ideas based on advanced FinTech initiatives and trends in related businesses, and a hackathon with Chinese startups and academia to identify blockchain application ideas. We will further promote such activities globally to evolve collaborative creation through open innovation with stakeholders.

Creating the World's No. 1 Technologies for Solutions and Products

Objectives, Activities, and Achievements

In order to achieve our R&D policy goals, we believe it is indispensable to create the world's No. 1 technologies for solutions and products. We have been bringing new value to society by developing globally top-level products and systems such as high-speed, low-noise trains; the world's fastest elevators; particle beam therapy equipment that helps to improve patients' quality of life; semiconductor testing and biochemical/immunological analysis devices with top global market share; industrial machinery such as air compressors and motors; and energy and storage systems. In fiscal 2019, our high-speed train for the UK market was recognized with the Imperial Invention Prize in the National Commendation for Invention, and the Medal with Purple Ribbon was bestowed on Kazuo Hiramoto of our Research & Development Group for inventing innovative particle beam therapy equipment.

We are also advancing our technological developments in each of the five sectors specified in the 2021 Mid-term Management Plan. In the industry sector, we launched the "Hitachi Digital Solution for Retail," an integrated service for the retail distribution industry that collects and stores data from customers, analyzes it with AI, and proposes measures to optimize the value chain. For the manufacturing industry, we launched the "IoT Compass," a solution developed through

collaborative creation with a car manufacturer. This solution facilitates seamless and timely AI analysis and simulation by combining operational and environmental OT data from production equipment with IT data such as production plans and inventory management, thus optimizing the entire production process.

In the IT sector, we developed and deployed solutions for digital administration and cashless settlement in India and North America. India saw the launch of Hitachi MGRM Net, which will help digitalize a broad range of administration services, from education and healthcare to agriculture and insurance, under the Digital India project led by the Indian government. Hitachi America's Financial Innovation Laboratory is participating in the Hyperledger project to jointly develop and standardizes OSS blockchain technologies and develop control and management systems for financial institutions.

Moving forward, we will invest intensively in technologies including these, as well as others combining the five sectors of mobility, smart life, industry, energy, and IT with Lumada. Also, by drawing on our combined expertise in OT, IT, and products, we will strive to develop the world's No. 1 technology and provide high value to our customers.

Promoting Basic Exploratory Research to Resolve Social Issues

Objectives, Activities, and Achievements

In order to create economic, environmental, and social value for our customers as specified in the 2021 Mid-term Management Plan, and for the continued growth as a company, we believe we must create new value in harmony with a human-centric society and environment. To meet this challenge, the mission of the Center for Exploratory Research (CER) is to generate human-centric value through basic exploratory research to resolve social issues and promote such concepts to the world, and they are accelerating the development of disruptive technologies to lead Society 5.0 through vision-creating open innovation. To this end, we will continue our cooperation with academic research institutions at our collaborative research bases, such as the Hitachi-UTokyo Laboratory, the Hitachi Hokkaido University Laboratory, the Hitachi Kyoto University Laboratory, and the Hitachi Kobe Laboratory.

In the matter of creating human-centric value with the aim of realizing a society in which all

people can fully participate in, the Hitachi Kobe Laboratory succeeded for the first time in the world in automatically culturing human iPS cells into sheets of retinal pigment epithelial cells. Additionally, the Hitachi Cambridge Laboratory developed the world's first technique for selectively controlling silicon quantum bits using hybrid circuits, as part of their efforts toward creating a data processing environment that can support future societies.

The Hitachi-UTokyo Laboratory promotes "Habitat Innovation," aiming to design cities that strike a balance between efficient urban infrastructure and improved quality of life, alongside energy system projects supporting data-driven society. The laboratory is working with other academic research institutions to prepare policy recommendations and build social consensus toward achieving the SDGs and Society 5.0. At Hitachi Kyoto University Laboratory, in response to Crisis 5.0, a work released in 2017 depicting future challenges in 2050, we have been working with Kyoto University on global public policy recommendations using AI to improve social sustainability.

We will continue to promote these initiatives, grow our open innovation ecosystems, and explore new business opportunities and disruptive technologies through basic exploratory research to resolve social issues.

R&D Investment and Digital Human Capital

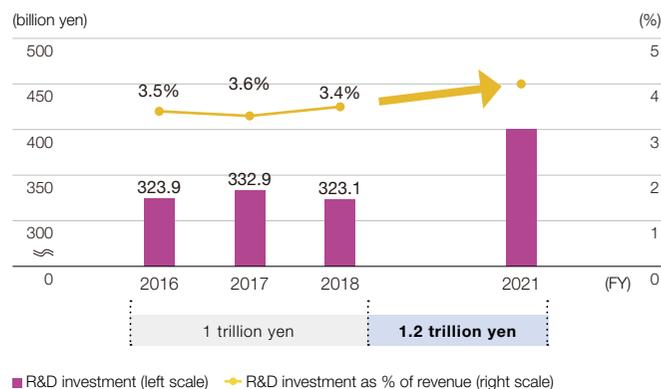
Objectives, Activities, and Achievements

Hitachi allocates about 4% of revenue to R&D aimed to strengthen our capabilities in the five core sectors of our Social Innovation Business. We invested approximately one trillion yen under the 2018 Mid-term Management Plan, but will strengthen our R&D by increasing that amount to 1.2 trillion yen under the 2021 Mid-term Management Plan. Regarding corporate-led R&D, we will invest in collaborative creation with customers, developing world-leading technologies, and basic exploratory research. We will also expand our digital common platform and enhance R&D resources outside Japan to ensure the N-fold expansion of our growth engine, the Lumada business, and to expand our global footprint.

At the same time, we are working to develop digital human capital, including top-class digital talent in AI-related areas, to respond to society's needs accompanying recent advancement in

digitalization. The R&D group is focusing on developing digital talent in the field of AI, and plans to increase its headcount from 226 in fiscal 2018 to 350 by fiscal 2021.

• R&D Investment (Hitachi Group)



developing an IP management framework for establishing win-win relationships with our customers while respecting their IP rights.

Globally, however, the situation around IP has been changing and the change is accelerating. Attention has been drawn to liabilities and ethical issues arising from the application of AI, robots, autonomous driving, and other advanced technologies. The issuance of AI Ethics Guidelines in Japan, the United States, and Europe is just one example of the growing demand for a response to these new technologies. There is also a growing trend toward data localization, as seen in the European General Data Protection Regulation (GDPR). And, of course, handling IP has become one of the issues in the trade war between the United States and China. Under the circumstances, we must consider the geopolitical risks when we engage in IP activities. In addition, we are prompted to develop IP strategies based on a balance between competition and collaboration, responding to the rise of IT platform giants, increasing global M&As, and the advance of open innovation.

With all this in the background, we will accelerate our IP activities for a new era by accumulating findings and knowledge about new technologies and national and regional rules and regulations, aiming to create solutions that will deliver value to customers and resolve social issues in line with initiatives like the SDGs and Society 5.0. Regarding IP highly public in nature, for example, we will actively work on making it more publicly accessible, contributing to designing a future society in order to establish “IP for Society,” a new IP strategy for a new era.

Intellectual Property

Hitachi's IP Strategy and Vision

Policy

Intellectual property (IP) is a key element of Hitachi's business strategy. From fiscal 2019, Hitachi will promote IP activities to create solutions that enhance value for customers in line with the 2021 Mid-term Management Plan and resolve social issues in line with initiatives like the SDGs and Society 5.0.

We have made a shift in recent years from IP strategy designed to enhance our competitiveness in the product business to IP strategy designed to promote partnerships centered on our digital solution business. This has advanced our collaborative creation strategy focused on IP in the broader sense, including data, putting us ahead of other companies. Based on this collaborative creation strategy, we have engaged in more than 300 business cases of collaborative creation with our customers annually. Through these cases we have recognized the importance of

Hitachi's IP Activities for a New Era

Policy

In the Social Innovation Business, Hitachi plans and implements IP strategies appropriate to each area of its product and digital solution businesses.

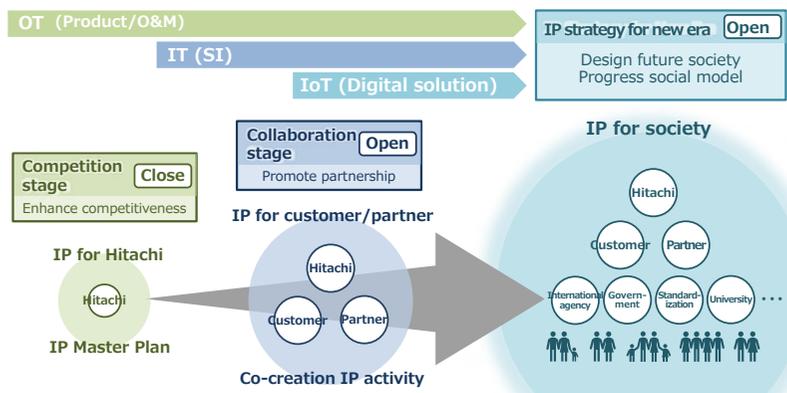
In the product business, where IP strategies are crucial for competitiveness, we are actively working toward obtaining and using patent and other intellectual property rights (IPRs), and enhancing our competitive edge by planning and implementing an “IP Master Plan” customized to the nature of our business.

In the digital solution business, on the other hand, we have promoted collaborative IP strategies. As opportunities to co-create with our customers and partners using the Lumada IoT platform

increase, we believe it is important to use IP to promote partnerships and to build ecosystems. In order to leverage our IP activities and create solutions, we take a broader view of “intellectual property,” which goes beyond patents, copyrights, and trade secrets to include data and information assets as well.

Moving forward, we will make continued efforts to create solutions through IP activities. Our Intellectual Property Division will participate in developing ways to promote new methods of collaborative creation, turning patent information into new technologies and cultivating data scientists capable of utilizing data for IP activities.

Additionally, in order to advance our open innovation activities designed to create solutions, such as the Ideathon and Hackathon, we have formulated the “Kyōsō-no-Mori” IP Guidelines, and will further evolve our IP Master Plan with the aim of combining our product and digital solution businesses.



Hitachi Group Codes of Conduct: 6. Protection of Intellectual Property and Brand

Protecting Our Designs and Brand

Policy

Protecting Hitachi's designs and brand is crucial for promoting our Social Innovation Business and supporting our global operations. We operate a rigorous regime against such infringements as making and selling counterfeit goods copying our designs or carrying the Hitachi brand and illegally applying for or registering trademarks similar to the Hitachi brand.

Until recently, most counterfeit goods were manufactured in China, but over the past several years manufacturing methods and sales routes have become more sophisticated and diverse, which has spurred us to take further action.

Framework for IP Activities

Frameworks and Systems

As of fiscal 2018, we had IP offices in New York and Santa Clara, California, in the United States, Beijing and Shanghai in China, and London in the United Kingdom to cover our globalized business. As a “control tower” for reviewing and implementing new IP activities based on the focus sectors and regions for investment under the 2021 Mid-term Management Plan, in fiscal 2019 we established the IP Strategy Department within the Intellectual Property Division. Going forward, we will make efforts to seek cooperation with major sites around the world, forming global human capital networks in which the new department plays a central role, and building close ties with our newly established Corporate Venturing Office in addition to our strategy planning division and the government and external relations division in Hitachi, Ltd.

To develop globally minded IP human capital, since fiscal 1964 the Intellectual Property Division of Hitachi, Ltd. has operated an international job training system, sending trainees to IP law firms and Group companies in Europe and the United States to study abroad. In fiscal 2018, one employee went to the United Kingdom and one to Singapore for business training, while one employee was sent to Hong Kong in China to study.

Hitachi protects innovations generated from R&D activities under this framework. Specifically, we increased our patent application ratio outside Japan from 47% in fiscal 2009 to 58% in fiscal 2018. We will make further efforts to increase the number of solution patent applications in the United States and China during the 2021 Mid-term Management Plan, aiming to become one of the top patent holders in terms of quality and quantity in the field of social innovation. Going forward, we will continue to efficiently build and maintain our global patent portfolio.

Reward System for Employee Inventions

Frameworks and Systems

We motivate employees in the R&D field with an ample reward system for new inventions. To make this reward system as fair and transparent as possible, we set standards to evaluate inventions and disclose these standards to employees. We also have a mechanism for receiving inquiries about the rewards, as well as opinions on the reward system.

We have established a special division within the Intellectual Property Division to plan and operate this system, while an internal Invention Management Committee made up of R&D, legal affairs, personnel management, and IP experts ensures that the system operates effectively across the whole Group. The system includes an invention information channel to promote communication between inventors and the business divisions implementing the resulting patents. Inventors can ask the business divisions for information about patent implementation and check the evaluation standards used to calculate the rewards for their inventions. To ensure transparency and inventor satisfaction, we also set up an Arbitration Committee for Invention Rewards, composed similarly to the Invention Management Committee. Inventors can appeal to this committee if they disagree with the amount they have been awarded.

From fiscal 2005, we have given President's Awards to the top 100 inventors. Since fiscal 2006, we have also given awards to the top 50 young inventors (under 35 years old) based on patent application rewards received within five years of their joining Hitachi.

Achievements Through IP Activities

Objectives, Activities, and Achievements

Our active promotion of IP activities, including efforts to formulate an IP Master Plan and plan IP activities for collaborative creation with customers, have been highly acclaimed by external organizations. In recognition of these efforts, Clarivate Analytics included Hitachi in its Top 100 Global Innovators for the eighth consecutive year, and the Japan Institute of Invention and Innovation presented Hitachi with the 2019 Imperial Invention Prize for our design of the Class 800 high-speed train for the UK. This is the third consecutive year that we have received high honors from the National Commendation for Invention, a prestigious Japanese award for invention established in 1919, and the first time that the Imperial Invention Prize, the highest prize offered by the National Commendation for Invention, has been awarded in recognition of outstanding design. Hitachi, Ltd. has been honored by the organization eight times in total, more than any other recipient.