Innovation Management

Throughout its history of over 100 years, Hitachi has pursued its Mission “to contribute to society through the development of superior, original technology and products” aiming at creating innovation leading into the future. We view the approach of leveraging data and technology even further to produce strong, robust products, solutions, and business models as essential in realizing a sustainable society and business amid the increasingly diverse and complex social issues we face. Accordingly, we are backcasting from 2050 to bolster research and development aimed at creating radical innovation and working to protect and effectively utilize intellectual property (IP).

Innovation Management

- Executive Summary
- Innovation Strategy
- Research and Development
- Intellectual Property
- Human Capital
- Human Rights
- Value Chain Management
- Community
- Social Data

Social

Innovation Management

- Why it matters —
- What we are doing —
- Policy and promotion structure
- How we are doing it —

- What
  - Expanding Investments in Innovation
  - Generating digital service businesses with the Lumada growth model
  - Backcasting from 2050 to create radical innovation
  - Accelerating outside-in innovation through startup investments

- How
  - Policy and promotion structure
  - The newly established innovation Growth Strategy Division will formulate innovation investment strategies that will inspire the next growth for customers, and under this strategy, promote the creation of digital service businesses and radical innovation. We are also working to build an innovation promotion structure fully leveraging Hitachi Group’s technology platforms, human capital, and customer network to achieve growth worldwide.

Achievements in FY 2021

- Backcasting from 2050 to create radical innovation
- Accelerating outside-in innovation through startup investments

Policy and promotion structure

- Why
  - Hitachi Group R&D expenditure: 317.3 billion yen (R&D expenditure as a percentage of revenue: 3.1%)

- How
  - Accelerating value co-creation
  - Creating growth drivers
  - Evolving Lumada further
  - Creating the next pillars of growth
  - Bolstering recruitment and development of digital talent
  - Observing AI ethics

Achievements in FY 2021

- R&D investment
- Promoted activities, including holding forums and roundtables with universities and customers, formulate visions and design business scenarios.

- Bolstering recruitment and development of digital talent
- Digital talent: Approx. 67,000 people

- AI ethics observance
- Published a special issue of Hitachi Review, “AI Governance and Ethics in Social Innovation Business”
Social

Innovation Management

- Executive Summary
- Innovation Strategy
- Research and Development
- Intellectual Property

Human Capital
Human Rights
Value Chain Management
Community
Social Data

---

**Intellectual Property**

**What**

- Deploying IP activities globally based on our IP strategy
- Engaging in IP activities aimed at creating environmental value
- Enhancing our reward system for employee inventions
- Promoting design and brand protection activities

**How**

Policy and promotion structure

In fiscal 2022, the name of the Intellectual Property Division was changed to the Global Intellectual Property Group with the intention of strengthening collaboration with companies outside of Japan and promoting further global deployment of our IP activities. We also created the position of Chief Intellectual Property Officer (CIPO) to strengthen our global intellectual property management framework.

Achievements in FY 2021

Global deployment of IP activities based on our IP strategy

Globally implemented an intellectual property strategy comprising three pillars: Competition, Collaboration, and IP for society.

IP activities aimed at creating environmental value

Established the new Environmental IP Enhancement Center and began considering measures to contribute to the improvement of environmental value from the perspective of intellectual property.

Awards for IP

Selected for inclusion in Clarivate Plc’s Derwent Top 100 Global Innovators (2021) list for the 11th consecutive year.
Innovation Strategy

Approach to Generation of Innovation

Over a history of more than a 100 years, Hitachi has pursued the company Mission "to contribute to society through the development of superior, original technology, and products," and generating innovation for the future by pursuing cutting-edge technologies.

During the Mid-term Management Plan 2021, we opened Kyōsō-no-Mori and expanded co-creation with customers, while reorganizing technology platforms and acquiring business models through startup investment and collaborations. To further accelerate these initiatives, the newly established Innovation Growth Strategy Division in April 2022 will formulate innovation investment strategies that will inspire the next growth for customers, and under this strategy, promote the creation of digital service businesses and radical innovation.

Generating Digital Service Businesses with the Lumada Growth Model

Under the Mid-term Management Plan 2024, we will further develop the Lumada growth model to co-create innovation together with customers, and promote digital services that address our customers’ next management challenges. To ramp up the Lumada growth cycle, we will deepen our understanding of captured signs and changes in society and customers, draft together with our customers visions for new growth, and provide innovations to realize that growth. In the Lumada growth model, we will promote the categorization of business segment characteristics and operations as well as work with the global front teams to strengthen marketing activities, to materialize and scale up through co-creation.

Backcasting from 2050 to Generate Radical Innovation

In formulating the 2024 Mid-term management plan, we explored future social issues through repeated discussions with international organizations, universities, customers, and startups. Based on these discussions, we understood that the societal challenges that need to be addressed as we approach 2050 are: “an environmentally-neutral society,” “a society which supports an active 100-year lifespan of its citizens,” and “the co-evolution of digital technologies, people and society,” and set them as areas of focus. We are addressing these concerns through such initiatives as “energy storage and supply” and “direct air capture” to realize a carbon negative society; “minimally invasive cancer treatment” and “designed cells” to overcome cancer and intractable and infectious diseases; and “Ultra Big Data Management” and “silicon quantum computers” to facilitate a data economy and computing innovation. Hitachi will be taking on the challenge of creating radical innovation to resolve future issues by backcasting from 2050.

Accelerating Outside-in Innovation through Startup Investments

Through investments and collaborations with startup companies, Hitachi will achieve radical innovation and acquire groundbreaking business models contributing to the expansion of the Lumada business. In 2019, we established Hitachi Ventures GmbH (HVG) and launched the first fund. We have now launched a second fund and invested in 17 companies.

Under the Mid-term Management Plan 2024, we will expand innovation ecosystems with customers, startup companies, academia and others. Specifically, we will focus on three areas identified in backcasting from 2050: “achieving a decarbonized and carbon-negative society,” “overcoming cancer and intractable and infectious diseases,” and “promoting the co-evolution of digital technologies, people and society.”

In May 2022, HVG CEO Stefan Gabriel was ranked 19th on the Top 50 Powerlist by Global Corporate Venturing.
Innovation Promotion Structure for DX/GX Global Growth

Structure

Fully leveraging the Hitachi Group’s technology platforms, human capital and the customer network, we will create DX/GX innovations under a global structure. The Research & Development Group with a highly diversified workforce of 2,300 people, will be leading the creation of innovation through digitalization and other technologies. Together with Hitachi Ventures GmbH (HVG), we will work to create innovation that will solve issues faced by customers and society through collaborations with leading startups in a wide-range of fields. The Global Intellectual Property Group is promoting the establishment of a new intellectual property platform to provide value to global customers under experienced global leadership. We will accelerate global business growth together with Hitachi Energy, GlobalLogic, and business units in each region.
Research and Development

Approach to R&D

Hitachi’s R&D strength is that it has established a value creation cycle based on owning platform technologies for OT × IT × Products, and know-how, and pursuing technology development through co-creation with customers and partners, adding to greater know-how.

Under the Mid-term Management Plan 2024, Research & Development will work closely with Hitachi Digital, the Global Environment Division and the Innovation Growth Strategy Division that are leading the growth strategy across the Hitachi Group. We will accelerate initiative for the co-creation of value to further advance the Social Innovation Business, focusing on “Digital,” “Green” and “Innovation” as the growth drivers. By generating innovation which will drive the Lumada growth model, we will contribute to the growth of our global business as well as create the next pillars of growth through radical innovation backcasted from 2050.

In fiscal 2022, R&D will be conducted under the following policy:

**R&D Policy for Fiscal 2022**

- **Basic Policy:** “Generate innovation through ‘Digital’ and ‘Green’ solutions for global business growth”
- Accelerate co-creation of value: Create OT × IT × Products value through digital technology
- Create growth drivers: Contribute to global business growth through innovative products × Digital
- Establish the next pillars of growth: Generate radical innovations by backcasting from 2050

Structure to Promote R&D

To execute on the R&D policy, the Research & Development Group was reorganized on April 1, 2022. The Global Center for Social Innovation, which was responsible for generating value-driven innovation, together with front line Business Units (BU), and the Center for Technology Innovation, which was responsible for development of world-leading technology to support value creation, were integrated and reorganized as the Center for Digital Services and the Center for Sustainability, to enhance value creation through DX/GX. Together with the Center for Exploratory Research, responsible for laying key stones for the future, and research laboratories in North America, Europe, China, India, and Asia-Pacific (APAC), we will work as one global organization to drive innovation.

**Global R&D Structure (As of April 2022)**

**R&D Investment**

Hitachi is actively investing in R&D. We are strengthening our Digital systems & Services, Green energy & Mobility, and Connective industries businesses, and working to reinforce mid-to-long-term initiatives for future growth. With regard to the Research & Development Group, a corporate division, it is expanding digital technology platforms and enhancing research resources outside of Japan to expand the Lumada business, Hitachi’s growth engine and global deployment, as well as investing in co-creation to resolve issues faced by customers and society and the creation of world-leading technology and radical technology. In fiscal 2021, the R&D expenditure of the Hitachi Group was 317.3 billion yen, and R&D expenditure as a percentage of revenue was 3.1%.
Creating Growth Drivers

Hitachi is developing data-driven solutions under the Lumada growth model. By implementing the Lumada four-quadrant value co-creation cycle, our goal is to create growth drivers that support customer businesses. In Research & Development, we are furthering our understanding of customers’ next business challenges while promoting the co-creation of innovations and digital services to resolve these issues. The Lumada growth model will be deployed worldwide together with GlobalLogic and others.

Accomplishments in Fiscal 2021

Hitachi participated in the Transition to Zero Pollution panel discussion hosted by Imperial College London in the United Kingdom to promote consensus-building on expectations and issues regarding a decarbonized, recycling-oriented society. Transition to Zero Pollution aims to achieve net zero emissions by 2050 (the state where the amount of CO2 produced is equivalent to that removed from the atmosphere). Additionally, forums and roundtables were held at the H-UTokyo Lab. and Tsinghua University in China to discuss the realization of a carbon neutral society in each region.

Achievements in Fiscal 2021

Hitachi considers its most important issue to be realizing a sustainable society, while respecting planetary boundaries and human wellbeing. Aiming to realize societal and economic development that protects the Earth, Hitachi will deliver “Green,” “Digital,” and “Innovation” as the solutions for future growth to society and customers to realize a society and economy that protects the Earth, and to achieve happiness in everyday life and workstyles. We will develop Hitachi’s unique co-creation approach, NEXPERIENCE, into a methodology to resolve societal issues and deploy the Lumada growth model. Through activities such as those in our university joint laboratories, we are capturing the kizashi (sign) of change in society and customers, to develop visions and business scenarios.

About NEXPERIENCE

https://www.hitachi.com/rd/research/design/nexperience/

Examples of Value Co-creation in Finance and Public Services

- **Current issue: Operational excellence**
  - **PLAN**
    - Optimize work processes with design thinking
  - **BUILD**
    - Increase work process system efficiency using AI (RPA, dialogues, automated responses), awarded first place in an international competition (SemEval2020)
  - **OPERATE**
    - Hitachi’s “Explainable AI” analyzes and evaluates operational data, and supports the implementation of AI in work systems, continuous operations and improvements
  - **MAINTAIN**
    - Hitachi’s sensitivity analysis service automatically analyzes risk countermeasures, and so on.

- **Next challenge: Create new demand**
  - **PLAN**
    - Design cross-industry financial and public service products based on OT know-how
  - **BUILD**
    - Launch of Sustainable Finance Platform as inter-industry coordinated services using IoT and blockchain technology, implement an inter-industry coordinated IoT informational distribution system
  - **OPERATE**
    - Data analysis with assured security in DFFT and Blockchain/NFT discussed at first UTGS hosted by the World Economic Forum
  - **MAINTAIN**
    - Offer value distribution services leveraging metaverse and Web 3.0

### Key Terms
- **AI (RPA, dialogues, automated responses)**: Artificial Intelligence, Robotics Process Automation
- **DFFT**: Data Free Flow with Trust
- **NFT**: Non-Fungible Token
- **GTGS**: Global Technology Governance Summit
- **TFTT**: Token Function: Tokenized Service
- **OT**: Operational Technology
Examples of the Value Creation Cycle in the Fields of Energy, Railway and Transport

<table>
<thead>
<tr>
<th>PLAN</th>
<th>Optimize facility costs with design thinking</th>
</tr>
</thead>
<tbody>
<tr>
<td>BUILD</td>
<td>Deploy Hitachi's digital maintenance platform and digital twin equipment diagnoses and management systems to maintain and improve analysis accuracy in line with changes in equipment status</td>
</tr>
<tr>
<td>OPERATE</td>
<td>Implement remote and automated equipment inspections using &quot;image diagnostics AI technology&quot; that has achieved the highest level in an international competition (TRECVID2020)</td>
</tr>
<tr>
<td>MAINTAIN</td>
<td>Provide condition-based services with Hitachi's APM which was selected as a Leader in the IDC MarketScape 2020–2021 Vendor Assessment</td>
</tr>
</tbody>
</table>

**Hitachi Product Strengths**

Hitachi is promoting the provision of value to customers through OT x IT x Products. In terms of products, during the Mid-term Management Plan 2021, we were able to establish the top global technologies, winning prominent awards for high-speed railways, in-vehicle inverters, particle beam cancer treatment systems, and biochemical immune-assay systems.

In the Automotive System business, we are working on gearless, high-efficiency drive systems and multi-port EVs realizing the industry’s most substantial size and weight reductions. Regarding the drive system (in-wheel motor), we aim to reduce energy loss by 30% compared to previous motors, and have been selected for support by the Japanese government’s Green Innovation (GI) Fund, aiming for even higher efficiency.

In the measurement and analysis systems business (Hitachi High-Technologies), we will enhance the competitiveness of our semiconductor inspection and manufacturing equipment while integrating and analyzing data generated from equipment in processing, inspection, measurement and analysis to provide feedback on manufacturing processes and products to realize customer process innovations. Through co-creation with customers, we will use the data generated from products for predictive diagnostics, analytics visualization and optimizing operating conditions to contribute to reduced development time, improved yields in manufacturing, and increased productivity for customers.

Further Evolution of Lumada

In conducting R&D to further evolve Lumada, Hitachi is engaged in the creation of Lumada cyber-physical systems (CPS) that link the digital and physical spaces in real time. We are also focusing on the key technologies of AI, 5G, beyond 5G, security, electrification, metaverse/Web 3.0.
Social

Innovation Management

Executive Summary

Innovation Strategy

Research and Development

Intellectual Property

Human Capital

Human Rights

Value Chain Management

Community

Social Data

Toward the realization of the co-evolution of digital technologies, people and society

We will further enhance ultrahigh-speed database engines to realize data extraction performance speeds more than 100-times faster than conventional systems.

We are also accelerating developments for bio transformation (BX) and quantum transformation (QX), which will follow DX and GX.

Digital Human Resource Development

Activities

To respond to the recent progress of digitalization, Hitachi is strengthening our digital human resources, including top-class AI experts. In the Research & Development Group, we are placing particular emphasis on developing top-class AI researchers*1 and established the Lumada Data Science Lab. to bring together digital human resources to foster and develop them. This helped us to realize our target (350 top-class AI researchers by fiscal 2021) ahead of schedule, with currently 399 at the end of fiscal 2021.

*1 Top-class researchers who use AI/analytics, and data scientists who received internal certification.

Achievements in Fiscal 2021

In fiscal 2021, we published a special issue of Hitachi Review, AI Governance and Ethics in Social Innovation Business. It provides an in-depth explanation of Hitachi’s approach to AI ethics and governance for AI implementation in research, PoC, and product development.

AI Ethics

Activities

In February 2021, Hitachi released Principles guiding the ethical use of AI in Social Innovation Business and a white paper on Hitachi’s activities in the area of AI ethics. Its goal is to ensure human-centric AI development and societal implementation.

Since then, we have striven toward the development, societal implementation, and proper utilization of human-centric AI that is safe and secure. And in the AI development stage, we are working to curb the various risks that arise when using AI.

In fiscal 2021, we checked approximately 800 AI projects in the planning phase, identified risks and took measures against them.

Hereafter, we will continue to promote the establishment of AI governance, and help to stimulate discussions throughout society. We are continually working to improve the substance and operation of this effort, while incorporating the opinions of stakeholders and changes in the external environment.

Major External Recognitions in Fiscal 2021

In the environmental sector, we received the 68th Okochi Memorial Prize and the 2021 Commendation for Science and Technology by the Minister of Education, Culture, Sports, Science and Technology Awards for Science and Technology (Development Category) for the development of a compact and high power density inverter for EVs and PHVs, together with Hitachi Astemo. In the digital sector, together with the National Research Institute for Earth Science and Disaster Resilience, we were awarded the R&D World Magazine’s R&D100 Award for the SIP4D: Shared Information Platform for Disaster Management, together with the National Research Institute for Earth Science and Disaster Resilience, Japan.

With regard to products, Hitachi’s Urban Ace HF standard elevator was recognized in Nikkan Kogyo Shimbun’s 64th (2021) Best Ten Greatest New Products Award, and the EMU3000 rolling stock built for Taiwan Railways Administration, MOTC, was awarded the Good Design Award 2021, Best 100. Recognition was also given by the Japan Association of Technology Executives to Dr. Shizu Takeda, Corporate Chief Scientist, for outstanding achievement in training female engineers and researchers with the 7th Distinguished Service Award for fostering female technologists.
Intellectual Property

Approach to Intellectual Property

Hitachi has positioned intellectual property (IP) activities as one of its key business strategies, and has established a basic policy for the protection of IP and brand in the Hitachi Group Codes of Conduct. Under the Mid-term Management Plan 2021, in line with the stated vision of becoming a global leader driving enhanced value through the use of intellectual property and the goal of realizing IP-driven social innovations, we engaged in value-based (Environment, Safety & Security, Resilience) intellectual property activities. In the Mid-term Management Plan 2024, we established a new vision to become a global leader that resolves societal issues and grows our DX and GX businesses using intellectual property. We will achieve further advances and growth in the our Social Innovation Business through the protection and use of intellectual property centered on Green, Digital and Innovative initiatives.

https://www.hitachi.com/corporate/about/conduct/index.html#ank8071860

Intellectual Property Strategy

Hitachi has formulated and implemented an IP strategy that consists of three pillars: Competition, Collaboration, and IP for society.

IP Strategy for Competition

The IP strategy for Competition is centered on acquiring and utilizing patents and other IP rights. "IP Master Plans" customized for the nature of each business are formulated and implemented to enforce competitiveness.

IP Strategy for Collaboration

As opportunities for co-creation with our customers and partners increase through the use of our IoT platform, Lumada, we are expanding the scope of our IP activities to include not only copyrights, patents, and trade secrets as well as information assets such as data and information, and are using IP to promote partnerships and build ecosystems.

IP for society

Hitachi is strategically engaged in IP activities that contribute to solving social issues. In fiscal 2019, we introduced the IP for society concept, in which we promote the use of IP in certain highly public domains to maintain and evolve social norms. We will work in cooperation with external organizations (national governments, municipalities, universities, organizations in the United Nations, international standards organizations, etc.) through the use of IP to make contributions to businesses aimed at achieving SDGs.
**Global Deployment of Intellectual Property**

**Approach**

We are contributing to the globalization of Hitachi's business by strengthening international patent applications (PCT applications) that cover inventions that were developed through open innovation with our customers and partners in addition to inventions from our own R&D activities. We will work to promote further globalization of our IP by working in cooperation with new members of the Hitachi Group, including Hitachi Energy and GlobalLogic.

**Framework to Promote Global Deployment**

In fiscal 2022, we changed the name of the Intellectual Property Division to the Global Intellectual Property Group. Our intent was to strengthen collaboration with companies outside of Japan and promote further global deployment of our IP activities.

Moreover, we have created the new role of Chief Intellectual Property Officer (CIPO) to serve as the Hitachi Group's metaphorical control tower with regards to IP. We have also established a new CIPO Office within the Global Intellectual Property Group that will work to support the formulation and execution of CIPO strategy. The highly experienced Stephen Manetta, who comes from outside the company, has been appointed CIPO to hasten the enhancement of our system for global IP management (which promotes the protection and utilization of global IP, including at group companies outside of Japan).

Specifically, we cover our globalized business in collaboration with our IP offices in the United States (Santa Clara and Farmington Hills), China (Beijing), United Kingdom (London), Singapore, Switzerland, and India.

**Structure**

New Initiatives Linked to Innovation

Hitachi is promoting activities that contribute to innovation by analyzing IP information. In the Environment field, for example, we analyze the degree of market maturity for each theme. This involves estimating the market's scale and growth potential based on the compound annual growth rate of the most recent inventions worldwide. We also use IP information and other data to estimate and analyze the degree of technological superiority Hitachi has for each theme. We contribute to innovation through these processes by identifying markets with high growth potential, areas where we have the greatest technological advantages, and providing our findings to business divisions.

**Intellectual Property Activities Aimed at Creating Environmental Value**

**Activities**

We are working to create solutions that utilize IP to enhance environmental value.

In fiscal 2021, we newly established an Environmental IP Enhancement Center within the Intellectual Property Division. With it, we have begun considering policies (solution creation contributing to environmental value realization, construction of IP libraries, etc.) aimed at improving environmental value from the perspective of IP. In order to maximize Hitachi's business—especially environmental value—by accumulating and utilizing knowledge of the results of IP activities that contribute to improving environmental value, Hitachi established guidelines and deployed them internally. With regard to IP libraries in particular, our hope is to link the IP we possess internally with the environmental value that the utilization of such IP may bring about, to visualize them and promote their use both within the company and externally.

**Achievements in Fiscal 2021**

Hitachi has registered our wind-generation technology that contributes to solving issues of climate change with WIPO GREEN a platform for environmental technology operated by the World Intellectual Property Organization (WIPO). We also share our ambition to inspire innovation by accelerating the application of environmental IP through collaboration with WIPO GREEN, and have shared this message in a video.

[Contribution to Environment through Intellectual Property - Hitachi](https://www.youtube.com/watch?v=sk18jbfqqSk)
Hitachi’s Environmental Vision
Hitachi Environmental Innovation 2050
High-speed battery deterioration diagnosis (Hitachi High-Tech)*¹
Visualization of green energy*²
WIPO GREEN (Environmental technology transfer platform)
Constructing IP libraries (ex.)

Solutions Environmental value IP
Visualization of green energy CO₂ reduction IP (A)
High-speed battery deterioration diagnosis CO₂ reduction IP (B)
Optimization of production management Energy savings IP (C)
Optimization of building management CO₂ reduction IP (D)

Home appliance recycling
High-efficiency seawater desalination system

Home appliance recycling

Appropriate registration in IP marketplaces

*¹ PCT application JP2020/028961
*² Patent application 2019-073173

**Achieving Visualization and Scaling Beyond the Company with IP Libraries that Link IP with Environmental Value**

**Reward System for Employee Inventions**

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 that was paid to employees, as well as opinions on the reward system.

We have established a special department 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.

**Innovation Management**

Executive Summary
Innovation Strategy
Research and Development
- Intellectual Property

Human Capital
Human Rights
Value Chain Management
Community
Social Data

**Social**

**Protection of Our Designs and Brand**

To protect Hitachi’s designs and brand, we take resolute measures against such infringements as making and selling counterfeit goods, copying our designs or carrying the Hitachi brand, and illegally applying for or registering trademarks of such goods.

In recent years, we are intensifying our efforts to identify counterfeiting networks, whose manufacturing methods and sales channels have become more sophisticated and diverse. We are also working with e-commerce site operators on countermeasures against online counterfeit sales.