

@ Hitachi, Ltd.

Research & Development Group Overview





**SUZUKI Norihiro,
Ph.D.**

Vice President & Executive Officer
CTO
President & CEO,
Research & Development Group

"To contribute to society through the development of superior, original technology and products" - has been Hitachi's corporate credo since its foundation in 1910. Under this credo, Hitachi is committed to its Social Innovation Business as a way to contribute to resolving societal issues which are becoming increasingly global and complex.

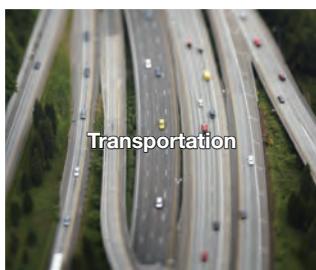
Our vision is to investigate challenges facing society and customers together with the stakeholders, and together identify ways to resolve the issues. By drawing on our vast experience and technology in societal infrastructure and information technology built-up over many years, we will provide the optimal solution.

The Research & Development Group is responsible for leading "collaborative creation" with customers. Specifically, a three prong approach is being taken: "customer-driven innovation" whereby research is conducted close to customers to identify and resolve challenges through such means as Hitachi's unique service design methodologies; "technology-driven innovation" creating innovative products through the optimal combination of technologies, and "vision-driven innovation" to pioneer new areas guided by a creative vision and through open innovation.

An important platform to enable these three types of innovation to dynamically interact and promote Hitachi's Social Innovation Business, is big data. By collecting and analyzing big data from equipment and people on-site, new value can be generated by altering the components in the operation. Hitachi has abundant experience and know-how fostered over the years as a leading company in information and control technologies, as well as technology from experience in building societal infrastructure. This broad range of technologies, knowledge and experience will be leveraged to challenge issues and develop innovative solutions for a better future.

Working together with customers to create innovative solutions

Domains targeted for IT x societal infrastructure solutions



Collaborative creation

Global Center for Social Innovation

Identifying challenges together
with customers, and together
building solutions

Technology innovation

Center for Technology Innovation

Bringing together a wealth of
technology platforms to create
innovative products

Exploratory research

Center for Exploratory Research

Pioneering new areas through
vision-driven exploratory research

Organization chart

Customer-driven research is promoted through an organization supporting the three innovation models. The research centers are located close to customer sites to enhance global Social Innovation Business.



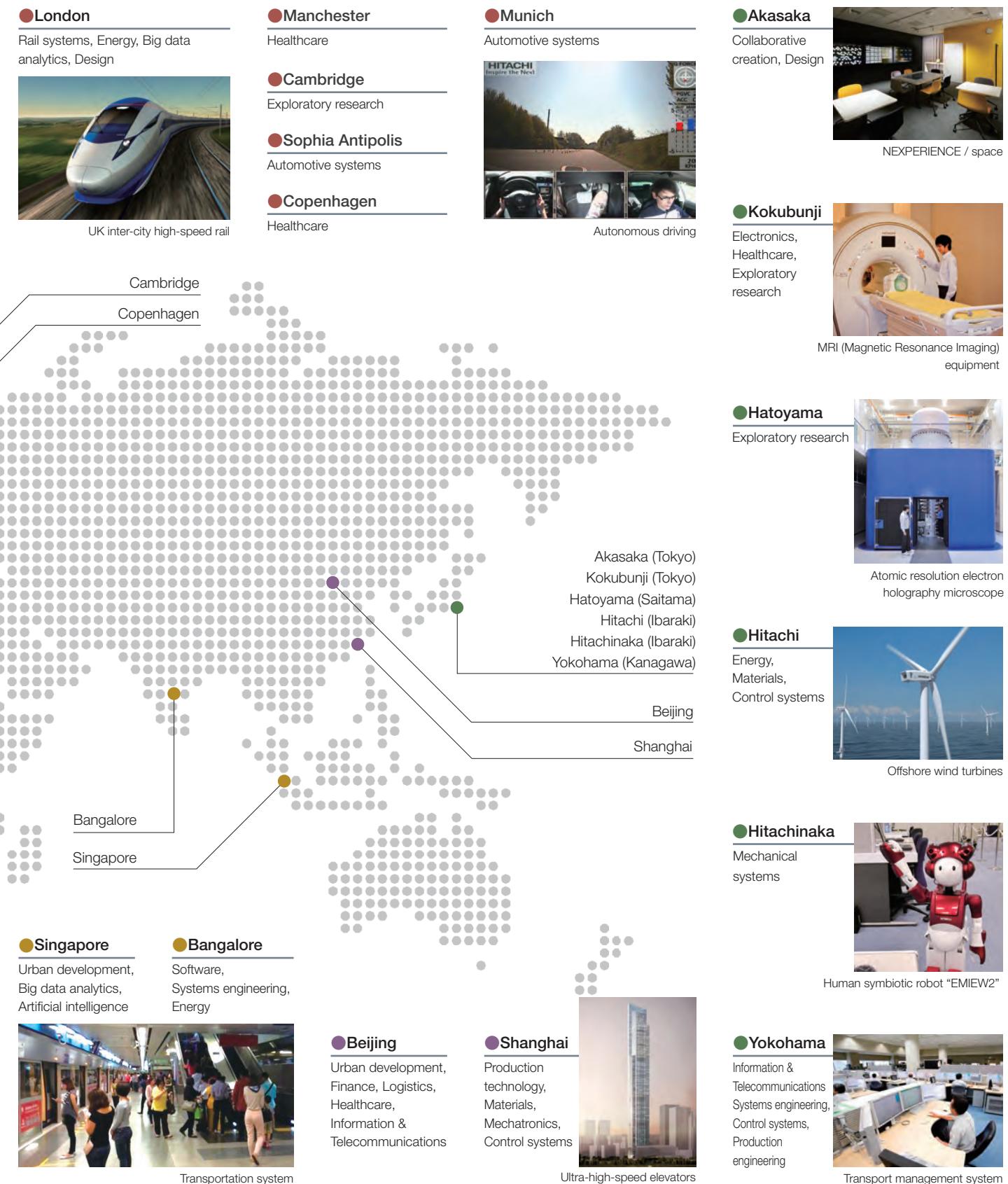
Hitachi global research network

Innovative solutions are being created together with customers through our global organization.

By working near customers, facing the challenges from their perspective and working together to resolve issues, innovative solutions are being delivered by bringing together the optimal combination of products or services.

By facilitating the best mix of leading-edge technologies, we are contributing to solving increasingly complex global issues in society. Further, research on leading-edge technologies forming the technology platforms of the future, is being enhanced through collaboration with various research institutions in the form of a global open laboratory.





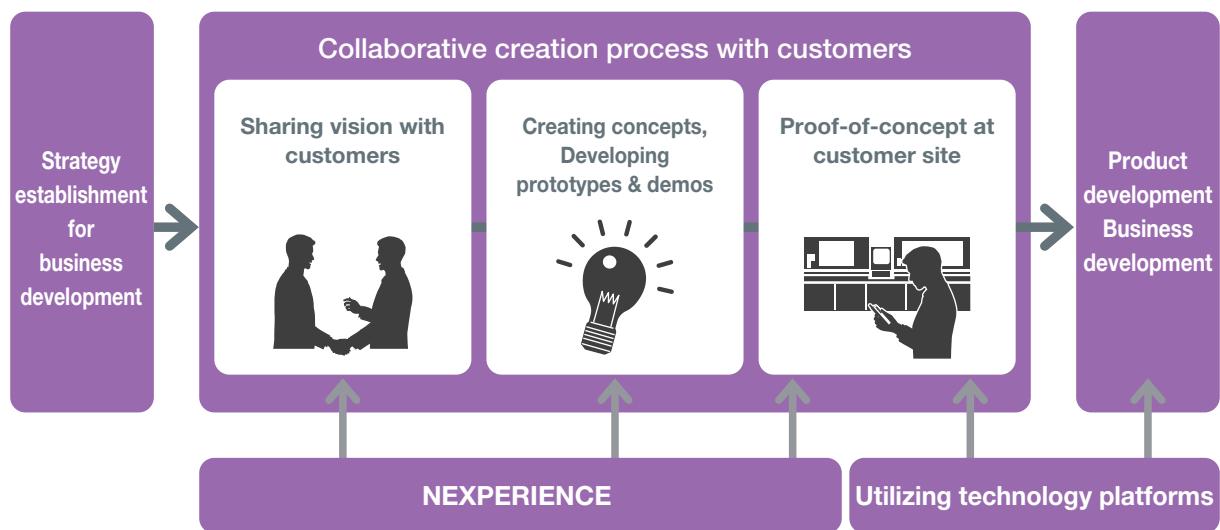
Collaborating creation



As for solving problems that are faced by customers, Hitachi focuses on the four processes of sharing visions with customers by analyzing social challenges and value changes in the future, creating new concepts for providing greater value in solutions by visualizing users' ideal experience, conducting prototypes development and demonstration using IT such as big data, and validating at customer site. This process is to efficiently achieve business development.

The collaborative creation with customers is being accelerated by applying NEXPERIENCE*, a customer collaborative creation methodology developed by Hitachi, and technology platforms developed through years of research experience and knowledge.

Collaborating with customers to identify challenges and deliver solutions



* NEXPERIENCE is a registered trademark of Hitachi, Ltd. in Japan.

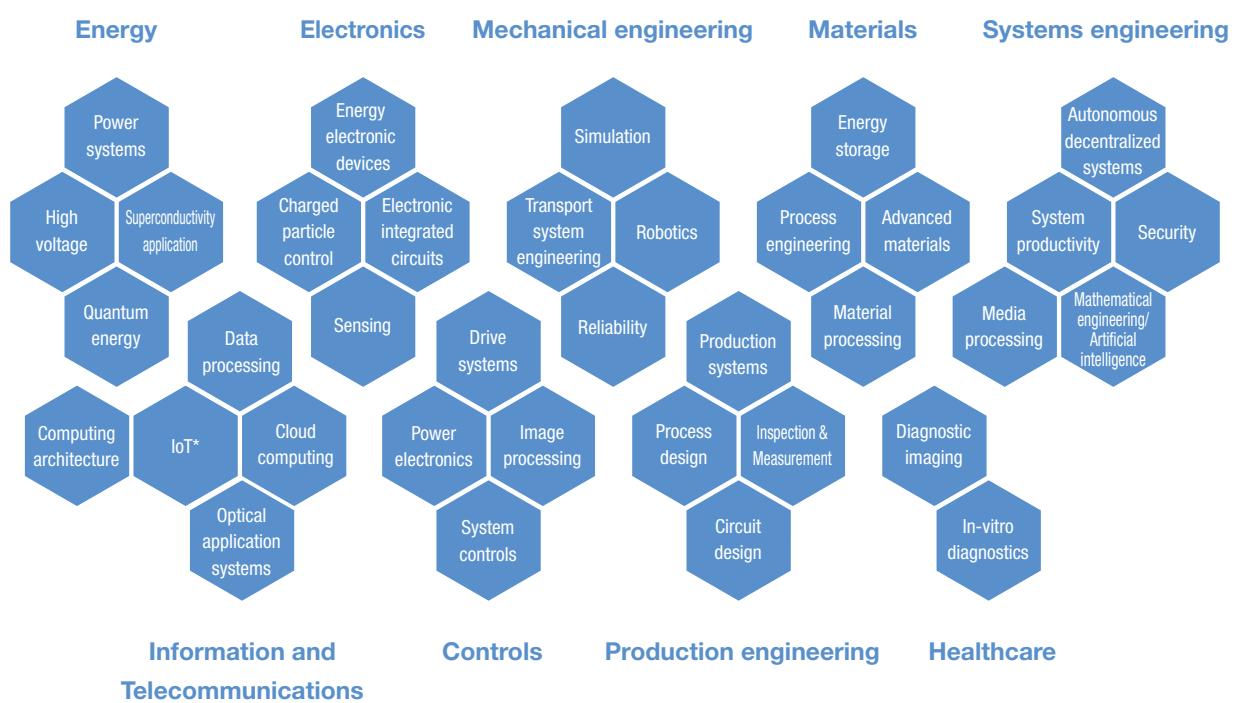
Technology innovation



Over a hundred years, Hitachi has constantly challenged a diverse range of technology areas such as information and telecommunications, power systems, industrial equipment, transportation and urban development, to deliver various products needed by customers, and contribute to society.

Thirty six technology platforms have been built-up in the nine technology areas of Energy, Electronics, Mechanical engineering, Materials, Systems engineering, Information and Telecommunications, Controls, Production engineering and Healthcare, by achieving technology innovation through the pursuit of research and development for products.

36 technology platforms in 9 areas of technology



* IoT: Internet of Things

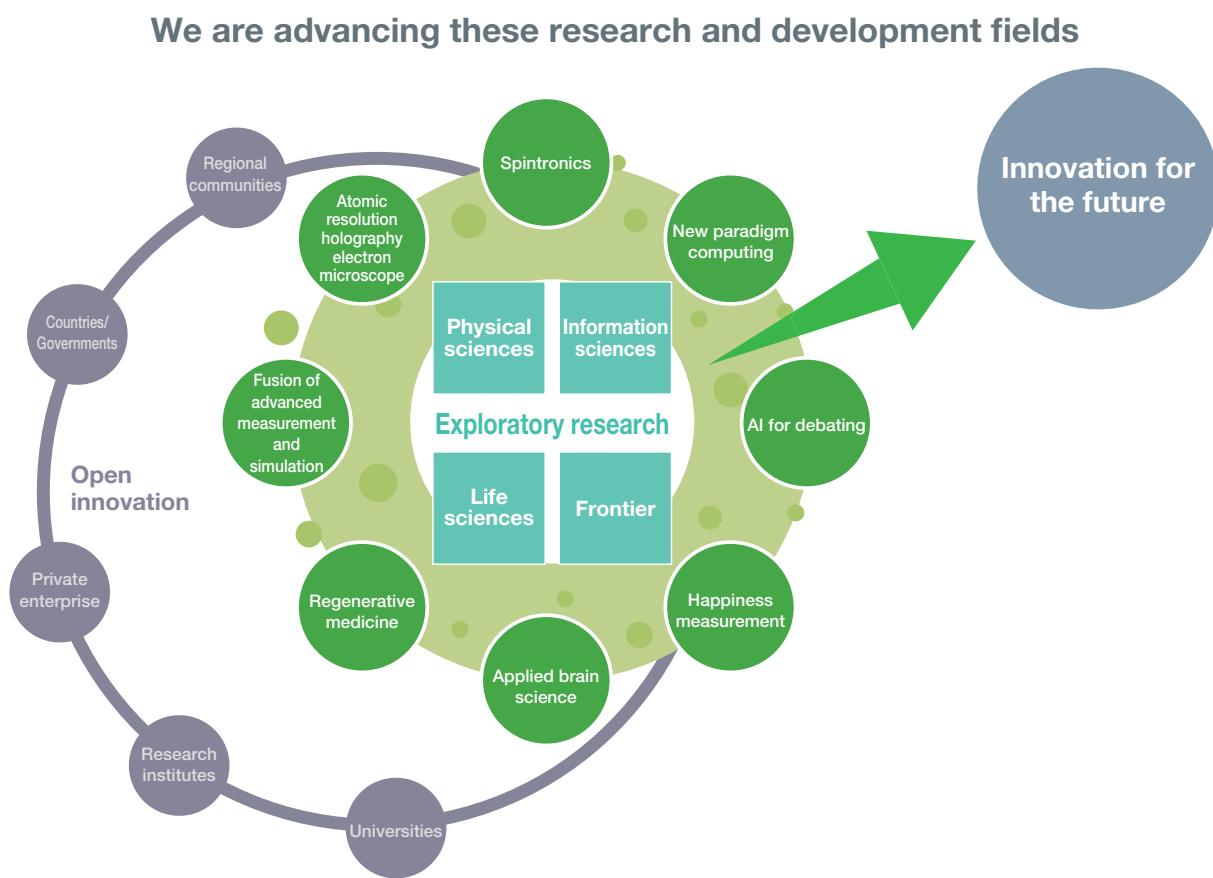
Exploratory research



For customers, and society, to continue to grow, research and development based on innovative visions which address not only societal issues apparent today but also pre-empt unknown societal issues which might emerge in the future, will be necessary. For this reason, we are pursuing “vision-driven exploratory basic research to pioneer new field.”

Four areas of research are being promoted: Physical Sciences, Information Sciences, Life Sciences, and Frontier. Various visions are being pursued: in the area of Physical Sciences, to realize a “green” society through innovative materials and devices; in the area of Information Sciences, to realize maximum prosperity for society through measurement of society and its people; in the area of Life Sciences, to raise QoL (Quality-of-Life) and realize a healthy society, and in the Frontier area, to realize a sustainable society that is kind on people and the environment.

To solve unknown challenges, it is imperative that Hitachi shares the same vision as society and co-creates through research. Open innovation is being pursued to realize this. By making available Hitachi's advanced research facilities and technologies, we connect with research partners worldwide to formulate visions and work together for the future. We are also actively involved in national projects and consortia. The achievements from open innovation applied to challenging new innovation for future society.



Open innovation

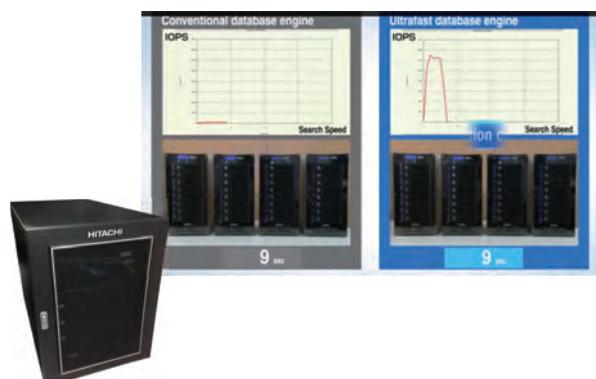
The Research & Development Group has organizational collaboration agreements with 14 major universities in Japan, and is promoting collaborative relationships with over 50 leading universities outside of Japan. The area of research with each partner institution is decided and is reinforced through joint research, as well as through collaboration in education and human resource development.

Recent research achievements from collaborative research in Japan include several projects conducted under the Funding Program for World-Leading Innovative R&D on Science and Technology: ① “Ultra-high-speed database engine” with Professor KITSUREGAWA Masaru of the University of Tokyo, ② “Proton beam therapy system” with Professor SHIRATO Hiroki of Hokkaido University, ③ “Automatic cell culturing systems for regenerative medicine” with Professor OKANO Mitsuo of the Tokyo Women’s Medical University, and [4] “Atomic resolution holography electron microscope” with RIKEN and the Japan Science and Technology Agency. Outside of Japan, collaborative research is leveraging region specific advantages and talent, such as the basic research on quantum physics led by researchers at the Hitachi Cambridge Laboratory; big data analytics in North America and research for rail systems in Europe to support Social Innovation Business, and in emerging nations such as China, India, Asia and in Brazil. Global industry-academia collaboration has been stepped up in China. To enhance materials development in China, the “Hitachi China Materials Technology Innovation Center” was established within Shanghai Jiao Tong University. We will continue to strengthen our industry-academia-government relations in pursuing open innovation.

Information & Telecommunications

University of Tokyo

Ultra-high-speed database engine



Healthcare

Hokkaido University

Proton beam therapy system



Healthcare

Tokyo Women's Medical University

Automatic cell culturing system for regenerative medicine



Exploratory research

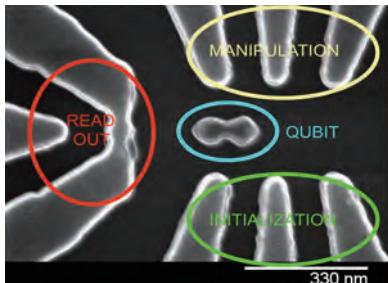
RIKEN, Japan Science and Technology Agency

Atomic resolution holography electron microscope



Exploratory research

Cambridge University (UK)
Quantum property physics, low-power data processing systems



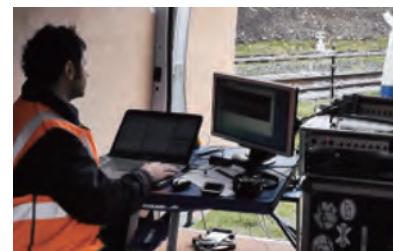
Big data analytics

Energy and Environment Research Center (USA)
Solution building for the oil & gas industry



Rail systems

Birmingham University (UK)
Fault detection using acoustics



Automotive systems

RWTH Aachen University (Germany)
Map data linkage chassis control



Technische Universität München (Germany)
Engine combustion analysis and simulation



Materials

Shanghai Jiao Tong University (China)
Development of manufacturing technologies adapted to Chinese materials, Design support
Hitachi China Materials Technology Innovation Center



Information & Telecommunications

Tsinghua University (China)
Utilizing ICT technologies for harmony with the environment



Natural resources, Energy

Indian Institute of Technology, Hyderabad (India)
Uniqueness analysis of power demand curves



Natural resources, Energy

Universiti Teknologi Petronas (Malaysia)
Energy-saving data centers through gas-type district cooling



Opening up new markets

University of Campinas (Brazil)
Pre-empting future market changes through discussion



Contributing to society

The Research & Development Group is actively engaged in social contribution activities on the themes of “human development” and “environment and community”, working towards building an affluent and sustainable society.

Human development

Universal Design Education Program

Volunteers from the Hitachi Group companies introduce universal design to junior high school students at public schools in Malaysia.



Supporting international academic conferences

The Africa International Biotechnology and Biomedical Conference, held in Kenya, was co-sponsored by the Research & Development Group to contribute to the advancement of the biotechnology in Africa.

Establishment of an international engineering award

The IEEE Technical Field Award for Innovation in Societal Infrastructure was established in cooperation with the IEEE and the IEEE Computer Society, to recognize significant contributions to innovative societal infrastructure. IEEE: Institute of Electrical and Electronics Engineers, Inc.



WakuWaku Kids' Science Seminar

Seminars are held by researchers to stimulate kids' imagination through science projects.



Science Koshien tournament

Hitachi cosponsors the Science Koshien, a national-level high-school tournament organized by the Japan Science and Technology Agency, to stimulate the minds of children interested in math and sciences, in the hope that they will seek careers in science and technology.



Off-site classes on environmental conservation activities

The environmental activities of the Research & Development Group were introduced at the "Higashi Totsuka Elementary School Festival" at Higashi Totsuka Elementary School in Yokohama.



Contributing to the environment and community

Open garden day

The gardens of the Kokubunji site are opened to the public twice a year, in spring and fall. Visitors can stroll the gardens to enjoy the natural landscape and sense co-existence with Nature.



Cleanup volunteers

Employees and their families volunteer in regular clean-up marathons to help preserve the natural environment.

Wild bird survey at the Ibaraki site and its surroundings

In collaboration with the Ibaraki-ken Section of the Wild Bird Society of Japan, the diversity of wild bird species in and around the Ibaraki site is surveyed regularly to monitor changes in the environment and promote environmental conservation activities.



History

November	1910	Founded as an electrical machinery repair shop, Hitachi Seisakusho, at the Hitachi Mine of Kuhara Mining Company	April	1985	Advanced Research Laboratory established
February	1918	Research Team founded in the Testing Section	April	1989	Hitachi America R&D division established
February	1920	Incorporated as Hitachi, Ltd.	October	2000	Hitachi Europe R&D center established
March	1934	Hitachi Research Laboratory established	August	2005	Hitachi (China) R&D center established (Later incorporated as Hitachi (China) Research and Development Corporation)
April	1942	Central Research Laboratory established	October	2008	Hitachi India R&D center established
December	1957	<i>Isho</i> Laboratory established (Later renamed the Design Center)	April	2010	Design Division re-positioned with the Research and Development Group
February	1966	Machinery Research Laboratory established	April	2011	Eight domestic research laboratories reorganized as the Central Research Laboratory, Hitachi Research Laboratory, and Yokohama Research Laboratory
August	1969	Information Systems Research Division established (Later integrated into the Systems Development Research Laboratory)	June	2013	Hitachi Brazil R&D division established
February	1970	Yokohama Research Laboratory established (Merged with the Production Engineering Research Laboratory in 1975)	April	2015	Three domestic research laboratories, Design Division and overseas research centers realigned under the Global Center for Social Innovation, the Center for Technology Innovation, and the Center for Exploratory Research
August	1970	Design Center breaks away from the Consumer Products Research Center (Assigned as a corporate laboratory in 1988; re-named Design Division and positioned under the President in 2001)			
February	1971	Nuclear Power Research Laboratory established (Later renamed the Energy and Environmental Systems Laboratory)			
April	1971	Production Technology Research Laboratory established			
February	1973	Systems Development Research Laboratory established			
August	1983	Microelectronics Device Development Research Laboratory established (Later integrated into the Systems Development Research Laboratory)			



Birthplace of Hitachi, Ltd.
(Electrical machinery repair shop in Daioin, circa 1908)



First product (1910)
5 HP electric motor produced with domestic technology

R&D culture

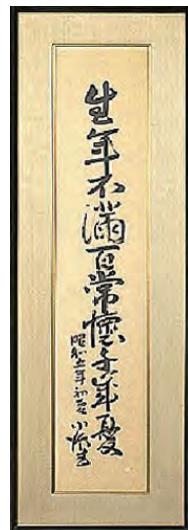
Basic Philosophy

"Although our lifetime may not span a hundred years, we have concerns of a thousand years hence."

A legacy from Mr. ODAIRA, founder of Hitachi, Ltd., the basic philosophy of Hitachi Global Research is embodied in this calligraphy taken from a Hang dynasty poem. It calls on us to consider the impact we have on society and the environment. This philosophy together with the founding principle of contributing to society through technology and products with a spirit of "harmony," "sincerity" and "pioneering spirit", are held strongly and reflected in everyday activities of Hitachi Global Research.



Mr. ODAIRA Namihei
(Founder of Hitachi, Ltd.)



Calligraphy by
ODAIRA Namihei

Henjinkai

An association of doctoral degree holders within the Hitachi Group, both current and retired, that fosters an in-house ethos of aspiring to higher learning. Not resting on the laurels of a doctoral degree, *Henjinkai* members apply their experience to the advancement of research and technology development, and thereby contribute to the prosperity of society through science and technology.

Hitachi Fellows System

A position established to recognize the distinguished service and contributions of an employee to the progress of science and technology on a world-level and to the international acknowledgment of Hitachi's high standard of technology.

Research & Development Group, Hitachi, Ltd.

<http://www.hitachi.com/rd/>

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