

IV. Research and Development

1. R&D system

1.1 Hitachi Group R&D structure

Within Hitachi, each business group and Group company has a division directly responsible for product development based on individual business strategy. The Hitachi Group has a total of 30 research laboratories, with some Group companies having their own independent research laboratory and structure. As of April 2006, the Group has a consolidated total of 5,891 people working in research and development.

The consolidated R&D budget for FY 2005 was 405 billion yen, which equals 4.3% of sales. The R&D budget for FY 2006 is 430 billion yen, 6% higher than 2005.

1.2 R&D Group

The corporate R&D Headquarters includes six corporate research laboratories with 2,950 employees (See Fig. 4.1). In 2005, the R&D budget was 66.5 billion yen.

To strengthen collaboration between corporate R&D and Group company R&D, Hitachi is promoting Group integrated management of common technologies.

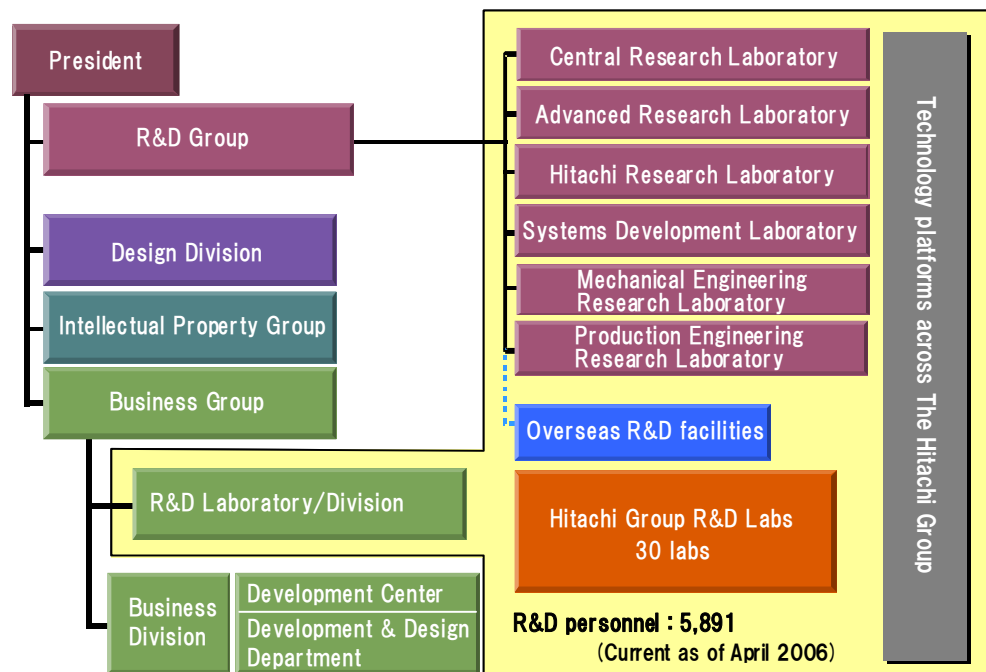


Figure 4.1 Hitachi R&D Structure

2. R&D strategy

Hitachi R&D is based on technology and collaborative innovation. The aim of R&D is to satisfy customers, to contribute to the peace and prosperity of society, and at the same time to stimulate new growth within the Hitachi Group as the world's leader in technology. Through an original approach and a clear grasp of dynamic trends in society, Hitachi R&D is contributing to a paradigm shift in industrial technology. To improve Group competitiveness through R&D, Hitachi is advancing three important measures in close cooperation with each Group company.

The first measure is to strengthen the role of R&D as the central hub of activity for the Hitachi Group. Towards that purpose, Hitachi is building a Technology platform across the Hitachi Group and strengthening rotation between corporate laboratories and business divisions/Group companies.

The second measure is to strengthen manufacturing technology to lower costs. To lower costs, Hitachi must build a supply chain management (SCM) system for a global business environment. At the same time, Hitachi needs to strengthen manufacturing infrastructure technology and promote vertical collaboration within the Group.

The third measure is to bring R&D in line with global markets. Hitachi must promote and strengthen overseas R&D laboratories and deploy dominant technologies worldwide. (See Fig. 4.2)

◆ R&D for increased competitiveness

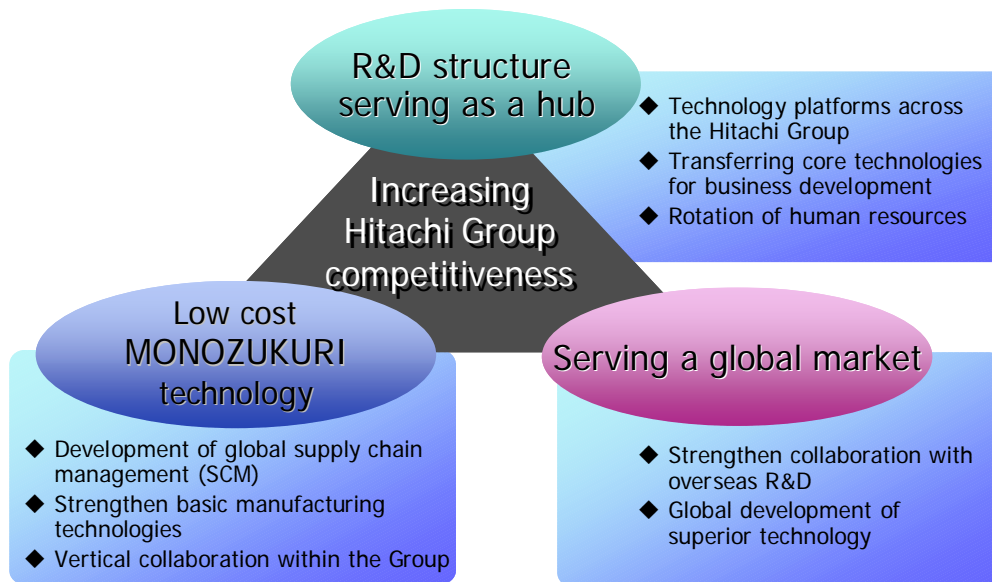


Figure 4.2 R&D Program

2.1 R&D structure serving as a hub

Currently corporate research laboratories employ 2,450 researchers, with nearly half of them working for Group companies.

To strengthen Group R&D further, Hitachi introduced a Group system for Frontier / Platform Research in April 2004. This system strengthens joint Group technology (Group Platform Research) and future Group business development (Group Frontier Research) by splitting the R&D cost evenly among each Group company. Hitachi now has nearly 300 researchers participating in this system. The CTO Meeting was convened to promote Group Frontier and Platform Research operations as well as to refine research themes and evaluate results. Chief technology officers from 30 Group companies participate in the CTO Meeting. To strengthen R&D cooperation among the 30 Group companies, the Hitachi R&D division will act as the hub of activity.

To coordinate researchers and to maximize resources, a “Technology platform across the Hitachi Group” was established in 2004, comprising the Materials Research Laboratory, the Advanced Measurement and Analysis Center, and the Advanced Simulation Center. In 2005, when the Mechanical Engineering Research Laboratory moved to Hitachinaka City in Ibaraki Prefecture, a Mechanical Innovation Center was created. In addition, Hitachi established the Embedded Systems Platform Technology Laboratory, the Motor Innovation Center, the Inverter Innovation Center, and the uVALUE Innovation Center. The infrastructure now in place provides a forum where researchers, staff from relevant business departments, and customers can assemble to

work on R&D and technology development. (See Fig. 4.3)

◆ Allocate platforms for core technologies in three areas

	Mechanical & Electrical		Electronics		Information		
Purpose	Fostering No.1 technology Improve business competitiveness		Improve product competitiveness Improve productivity		Development of service businesses Reform of solution operations		
Details	Materials	Digital Engineering	Embedded Systems		Service Science		
	Electronics Environment & Energy New materials Medical & Biotechnology Nanotechnology	Electron beam-based measurement Non-destructive measurement Product design support Optimal motor development	Solution LSIs Efficient systems developmt. Platforming Project management Optimal inverter development		Outsourcing EA*/SoA**/Initial stage consulting Application of advantage technology and devices New Service Methodologies <small>*EA: Enterprise Architecture **SoA: Service Oriented Architecture</small>		
Technology Platform	Materials Research Laboratory	Advanced Simulation Center	Motor Innovation Center	Inverter Innovation Center	Adv. Measurement & Analysis Center	Embedded Systems Platform Technology Laboratory	
	March 2004	March 2005	April 2004	Oct 2005	April 2006	April 2004	April 2005
						Cooperative Creation with Customers (Lab. Open-Days)	uVALUE Innovation Center
						From 2002	Oct 2005

Figure 4.3 Technology Platform across the Hitachi Group

2.2 MONOZUKURI capability

To strengthen MONOZUKURI capability (“the art of making things”), the corporate division that leads reform activities for the Hitachi Group and research laboratories are cooperating in various ways. Research laboratories are promoting three development strategies to strengthen MONOZUKURI. The first strategy is to develop manufacturing technology superior to other companies and thereby to produce No.1 products on the market. In particular, Hitachi is deploying vertical startup technology for new production lines and yield improvement technology. The second strategy is to strengthen global business infrastructure in a worldwide total supply chain management (WW-TSCM) system, which currently supports the storage business and the flat-panel business. The third strategy is to promote advance development in infrastructure technologies such as processing, packaging, materials, measurement, and simulation, which in turn strengthen the MONOZUKURI platform technology of the Hitachi Group. The aim of these strategies is to give full play to the collective strengths of the Hitachi Group in manufacturing products with high quality at a low cost.

In Group Platform Research, led by the Production Engineering Research Laboratory (PERL), several laboratories (including Hitachi Research Laboratory, Mechanical Engineering Research Laboratory, Systems Development Laboratory, and others) are working to strengthen manufacturing capability. In cooperation with the MONOZUKURI Engineering Division, which is in charge of technology related to “the art of making things” (*monozukuri*), the Hitachi Group is striving to bolster product competitiveness through the achievements of Group Platform Research.

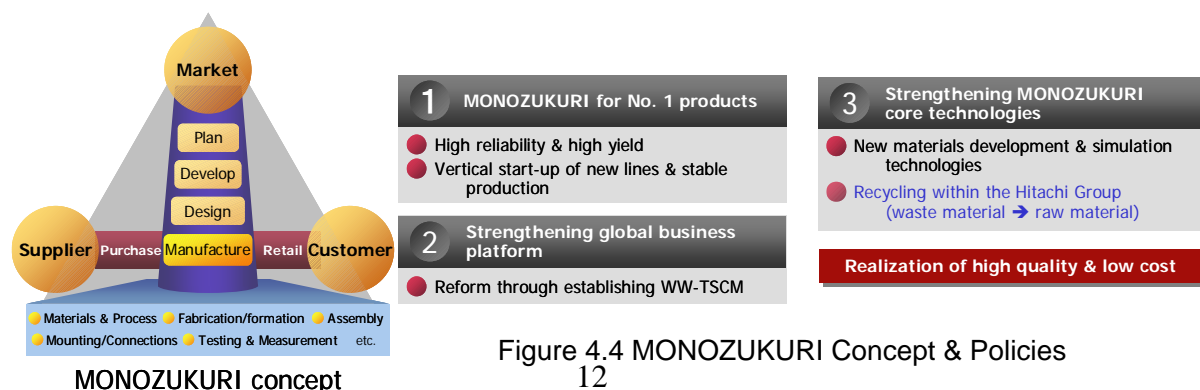


Figure 4.4 MONOZUKURI Concept & Policies

2.3 R&D global development

In 1989 Hitachi established R&D bases in the U.S. and Europe to support global business development and the creation of new business in the global marketplace. In the U.S., research centers were established in San Jose, Santa Clara, and Detroit. In Europe, centers were established in Cambridge in England, Sophia Antipolis in France, Dublin in Ireland, and Milan in Italy. In 2000

an R&D center was established inside Hitachi (China) Investment Ltd. Hitachi R&D activity in China began with the development of air-conditioning equipment for the Chinese market and the technology research related to mobile communications. In October 2002, a laboratory was established on the campus of Tsing Hua University to perform joint research related to ubiquitous information technology. In 2004 Hitachi established a laboratory in Shanghai to perform joint research with Fudan University and other institutions. In April 2005, in anticipation of substantial growth in the Chinese market, Hitachi strengthened the R&D organization by establishing Hitachi (China) Research and Development Corporation. April 2005 saw the opening of a laboratory in Singapore. The laboratory focuses research on the storage sector in collaboration with local research institutions. In Europe in October 2005, Hitachi opened a new automotive laboratory in Germany and France to strengthen research directly related to business. In the U.S., cooperation was strengthened with Hitachi Global Storage Technologies Inc. in San Jose to focus on R&D related to next-generation hard disk drives.

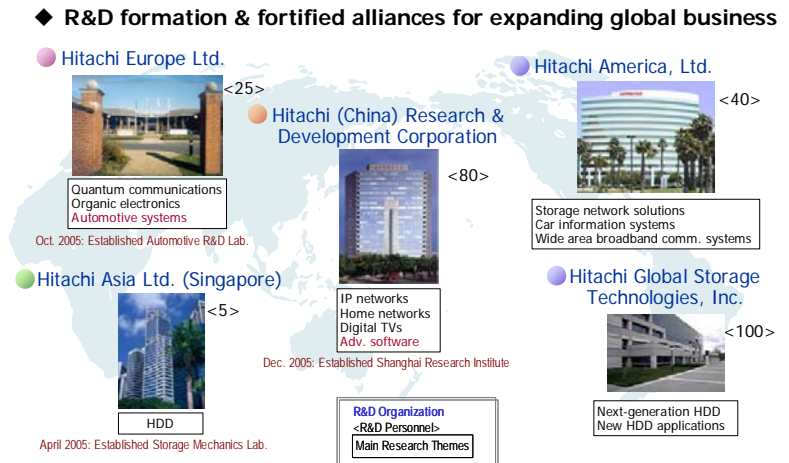


Figure 4.5 Global R&D

3. Collaboration with industry, academia, and government

To accelerate the speed of R&D and new business creation, the Hitachi Group will take the initiative to collaborate with institutions in government and academia. In particular, to improve competitiveness among core businesses, Hitachi is focusing on infrastructure technologies, the creation of new products and services through the merger of technologies from multiple areas, the discovery of disruptive technologies that will cause paradigm shifts, and the conversion of disruptive technologies into business opportunities. In addition, Hitachi is actively grooming talented technologists who can make an immediate contribution to business growth.

To promote efficient collaboration among industry, academia, and government, Hitachi has already made collaboration agreements with 13 universities. The collaboration ranges from planning, promotion, and evaluation to resolving problems. Currently, Hitachi collaborates with Kyoto University, University of Electro-Communications, Hokkaido University, Keio University, Tsukuba University, Tokyo University (three faculties), Ritsumeikan University, Waseda University, Osaka University, Yokohama National University, Kyushu University, Tohoku University, and Tokyo University of Agriculture and Technology. Each partnership sets its own technology focus, human resource training program, and other arrangements, so each partnership can offer its own

strengths.

In 2005 the long partnership with Tohoku University resulted in the development of perpendicular magnetic recording technology, which received the Minister of Economy, Trade, and Industry Award from the Academia-Industry-Government Collaboration Promotion Council. Other results include collaboration with Tsukuba University in the development of the Aichi Expo Robot, collaboration with Kyoto University on comprehensive patent creation from materials to devices in the organic electronics sector, and an academic presentation with Cambridge University in the U.K. The presentation introduced the discovery of specific properties of a catalyst used in metallic nanoclusters. In the future, Hitachi will strive to improve enterprise competitiveness through academia-industry-government collaboration, engage in national initiatives, and help Japan to lead as a nation based on innovation in science and technology.