New frameworks in corporate R&D and commercialization of results

3rd December 2009

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Vice President and Executive Officer,
General Manager of Research & Development Group,
Hitachi, Ltd.
1. Corporate Management Policy
2. Environmental Strategy
3. Corporate R&D Management
4. R&D Culture
1-1. Origin of Hitachi

1910
Established as Hitachi Seisakusho

Ibaraki Prefecture

Launched business as an electrical machinery repair shop of Kuhara Kogyo K.K.

Founder
Namihei ODAIRA

The repair shop
A replica of the original repair shop was built within Hitachi Works, the oldest factory of Hitachi by Namihei Odaira (1910)
5 HP induction motor designed and manufactured by the original technology of Hitachi (1910)

In 1910, the first domestic 5 horse power induction motor was achieved.

"Motors rotate but this one wouldn’t. And, when at last it did, all those around joined hands, circled and shed tears of joy."

・・・ from this moment, began a new “future”

Height 46cm, Width 28cm, Depth 43.5cm
## 1-4. History of Hitachi products & services

<table>
<thead>
<tr>
<th>Year</th>
<th>Power and Industrial Systems</th>
<th>Digital Media and Consumer Products</th>
<th>Information and Telecommunication Systems</th>
<th>Electronic Devices</th>
<th>High Functional Materials and Components, Logistics, Services &amp; Others, and Financial Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960</td>
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<td>1969:</td>
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<td>1970</td>
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<td>1990</td>
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<td>2000</td>
<td>1996: ITS</td>
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<td>2010</td>
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</table>
1-5. Growing business volume of Hitachi

(as at the end of each financial year)

- FY1970: 1,029 [B JPY]
  - Home Appliances: 39%
  - Information and Electronics: 24%
  - Metal & Cables: 24%
  - Information and Electronics: 13%

- FY1985: 5,013 [B JPY]
  - Home Appliances: 30%
  - Information and Electronics: 18%
  - Power Systems: 14%

- FY1995: 7,592 [B JPY]
  - Home Appliances: 28%
  - Power and Industrial Systems: 25%
  - Materials: 14%

- FY2008: 10,000 [B JPY]
  - Home Appliances: 14%
  - Information and Electronics: 23%
  - Power and Industrial Systems: 29%

Sales (Consolidated)

- 1970: 0.2 trillion JPY
- 2005: 10 trillion JPY

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1-6. Business areas & Major Group companies

- **Financial Services**
  - Revenue: JPY 412,040 M
  - Operating Income: JPY 10,210 M

- **Logistics, Services & Others**
  - Revenue: JPY 1,089,971 M
  - Operating Income: JPY 23,063 M

- **High Functional Materials & Components**
  - Revenue: JPY 1,556,886 M
  - Operating Income: JPY 27,777 M

- **Digital Media & Consumer Products**
  - Revenue: JPY 1,261,501 M
  - Operating Income: JPY (105,563) M

- **Electronic Devices**
  - Revenues: JPY 1,151,066 M
  - Operating Income: JPY 27,322 M

- **Power & Industrial Systems**
  - Revenue: JPY 3,310,544 M
  - Operating Income: JPY 24,245 M

- **Information & Telecommunication Systems**
  - Revenue: JPY 2,594,450 M
  - Operating Income: JPY 176,629 M
1-7. Measures to restore a growth trajectory

Basic policy

Greater focus on social innovation business

Initiatives

1. Fusing the Information & Telecommunication Systems and the Power & Industrial Systems

2. Transforming into a truly global company

3. Expanding environmental business
Create new social innovation business through technology fusion

1-8. Fusion of ICT and Power & Industrial Systems

Information infrastructure
- Software
- Storage
- Network

Life infrastructure
- Medical care
- Digital home appliances
- Urban systems

Energy infrastructure
- Batteries
- Power stations
- Environment

Industrial infrastructure
- Devices, Components, Advanced materials, Inspection apparatus

Platform technology

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1. Corporate Management Policy
2. Environmental Strategy
3. Corporate R&D Management
4. R&D Culture
2-1. Hitachi’s environmental vision

Reduce CO₂ emissions in energy production
Enhance energy efficiency of our products

Towards a Sustainable Society
2-2. Hitachi environmental vision

Framework Convention on Climate Change

Hitachi Environmental Management Vision

Environmental Vision 2010

1st Target
- reduce CO₂ emission by 3% of 1990 business activity level

Environmental Vision 2025 - achieve "Emission Neutral"

2nd Target
- reduce CO₂ emission by 7% of 1990 business activity level

Environmental Vision 2025

3rd Target
- contribute reducing CO₂ emission by 100 million tons through Hitachi products

Post-Kyoto Protocol

- Kyoto protocol GHG 6% reduction (compared with 1990)

Participate in Combat Climate Change (3C) initiative

GHG: Greenhouse Gas

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2-3. Helping reduce annual CO₂ emissions by 100M tons by 2025 through Hitachi products & services

Worldwide annual CO₂ emissions

- Scenario assuming policies implemented to date
- Scenario with CO₂ emissions halved back to 2005 level

1990: 20.7 billion tons/year
2005: 27.0 billion tons/year
2025: 14.0 billion tons/year
2050: 62.0 billion tons/year

2025: includes 100 Mton CO₂ emission reduction through our products
2-4. Plan to curb CO₂ emissions by 100M tons/yr

Transportation, commercial & residential goods

Industry 20%

2025 CO₂ reduction

Power generation 70%

100Mt/ yr

Plan for reduction in CO₂ emission

[base year: 2005]
2-5. Expanding Hitachi Eco-Products

Make all our products & services Hitachi Eco-Products by 2025

Increase in Eco-Product sales

<table>
<thead>
<tr>
<th>Year</th>
<th>% of product sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>32%</td>
</tr>
<tr>
<td>2007</td>
<td>38%</td>
</tr>
<tr>
<td>2008</td>
<td>47%</td>
</tr>
<tr>
<td>2010</td>
<td>(50%)</td>
</tr>
<tr>
<td>2025</td>
<td>(100%)</td>
</tr>
</tbody>
</table>

Note: Before offsetting accounts between business groups (total turnover of all business groups)

Strategies to expand business

- Increase in Eco-Products
  - Pursuit of environmental efficiency of products through technology
- Active investment in environmental business
  - Power generation
  - Green mobility
  - Green ICT
  - Urban infrastructure, etc.
1. Corporate Management Policy
2. Environmental Strategy
3. Corporate R&D Management
4. R&D Culture
3-1. R&D directions

1. R&D management organization
2. R&D schemes & funding
3. Global R&D activity
2009/10: Shift to company system to enhance social innovation businesses

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1. Management support function:
   Business structure of the Group as a whole, resource allocation, etc.

2. Promoting optimal use of common resources across the Group: R&D, marketing, funding, personnel, production technology, procurement, IT, etc.

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Major Hitachi Group companies

Continue structural reform of business to enhance social innovation business in the Hitachi Group

Approximately
40 business groups
3-4. Corporate laboratories

**ARL**
<100>
Hatoyama-machi, Saitama

Human & Information, Health & Measurement, Environment & Energy, Nanotechnology

**CRL**
<950>
Kokubunji-shi, Tokyo

Info. & Communications, Solution LSI, Devices, Life Science, Storage, Embedded Systems

**SDL**
<500>
Kawasaki-shi, Kanagawa

Info. Systems, Security, Ubiquitous, Storage, Service Solutions

**HRL**
<680>
Hitachi-shi, Ibaraki

Public Systems, Devices, Components & Materials

**MERL**
<380>
Hitachinaka-shi, Ibaraki

Mechatronics Application Systems

**PERL**
<340>
Yokohama-shi, Kanagawa

Management Systems, Production Engineering

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3-5. Hitachi Group R&D expenditure

R&D expenditure as % of Revenue

Consolidated Subsidiaries

Hitachi, Ltd.

Hitachi Gr.

Financial Year

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3-6. R&D schemes

Budget structure

- Commissioned & Advanced commissioned research (70%)
  - Expansion of priority business
  - Monthly follow-up of priority themes
- Frontier research (10%)
  - Strategic advanced research for growth
- Platform research (20%)

Initiatives

1. Exercise Group synergy
   - Use of *Tokken* (Special R&D scheme)
2. Alignment of business & technology roadmaps
   - Group CTO meeting
3-7. Hitachi Group Frontier/Platform research

**Frontier Research**
- Develop future core businesses
- Develop new technologies and business models which cause "Paradigm Shifts" in industry

**Platform Research**
- Improve productivity, efficiency, and reliability of technology and product development
- Upgrade basic manufacturing technology

- Material research
- Advanced measurement and Analysis
- Numerical simulation
- Embedded software platform technology

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3-8. Corporate research

Within Research Laboratory

- Department Manager
- Group Leader
- Senior Researcher
- Researcher

Propose

- Review
- Discussion
- Approval

- General Manager
- Planning Office (Sr. Researchers)

Start Corporate Research

- Frontier research
- Platform research

6-monthly Research Progress Review

(Board Members, President of in-house companies and Hitachi Group companies)

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3-9. Commissioned research

**Business division**
- General Manager
- Department Head
- Senior Engineer
- Engineer

**Research Laboratory**
- General Manager
- Department Head
- Senior Researcher
- Researcher

- Propose
- Discussion
- Consensus

**Start research project**

**6-monthly Research Review Meeting**
(Laboratory & Business divisions General Managers & Department Heads)

- Target
- No. of research staff
- Research Expenditure
- Schedule
- Capital Investment

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3-10. *Tokken* (Special research project)

- Corporate level, large-scale projects for urgent or strategically important R&D
  
  - Co-operation between multiple divisions/works/laboratories
  - Core technologies for future products
  - Fixed term dedicated project: 1-2 years max. (6 monthly review)
  - Project leader: Laboratory Department Head
  - Flexibility in recruitment of staff with specialized skills & expertise

**Overall responsibility: Research Laboratory**
3-11. Strategic business project

- Development of strategically important business by means of concurrent management

**Business Model Planning**
- Business strategy
- Marketing
- Investment-return

**Product Development**
- Purchasing
- Research & Development
- Production facilities

**Marketing, Sales & After-service**
- Marketing / Sales channels
- After service

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**Planning Team**
Leader: Business division
Marketing, Sales, Finance, Advertising departments

**Product Development Team**
Leader: Engineering divn. or Research lab.
Business divisions & Works (Engineering & Production)

**Sales Team**
Leader: Sales & Marketing division
Business division, Marketing department

Overall responsibility: Director of Business Division

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3-13. Hitachi Group CTO meetings

- Engine for expanding existing businesses and incubating new businesses through **collaborative Group R&D**

**Goals**
- Strengthen R&D by utilizing existing Group technologies
- Improve product competitiveness by vertical integration of Gr. technologies

**Schemes**
- Hitachi Group Frontier / Platform Research
- Common Technology Platforms Across the Hitachi Group
- progress review, funding, technology roadmaps

**Organization**
- Hitachi Group CTO Meeting
- Group Headquarters
- R&D Group
- Hitachi Company CTOs
- IP Group
- Group Company CTOs

**Seven Companies**
- Information & Telecommunication Systems Company
- Power Systems Company
- Industrial & Systems Company
- Information & Control Systems Company
- Urban Planning and Development Systems Company
- Battery Systems Company
- Defense Systems Company

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3-14. Global R&D network

Mission of overseas R&D centers

1. Contribute to regional business operations
2. Cooperate with world leading research centers
3. Deployment of global staff (% local staff: 75%)

Hitachi Europe Ltd. - European R&D Centre

- Fundamental device physics
- Organic electronics
- Mobile communications
- Security
- Automotive systems

- Fundamental physics research at the Univ. of Cambridge
  - Hitachi Cambridge Lab.
- Technology support for European automobile manufacturers
  - Automotive Research & Development Lab.

Hitachi America, Ltd. - R&D Division

- Automotive components
- Advanced wireless systems
- Storage area network solutions

- R&D for the next-generation U.S. storage business
  - Storage Area Network Laboratory

Hitachi (China) R&D Corporation

- IP network
- Digital TV
- Innovative software
- Materials, etc.

- Info. & Communications, Software, Environmental tech.
- Industry-academia cooperation with Tsinghai Univ., Fudan Univ., etc.

Hitachi Asia Ltd. (Singapore) - R&D Center

- Storage mechanics
- Network storage
- Water treatment

- R&D in line with national strategy to fortify storage technology
- Regional R&D hub in ASEAN region and south Asia

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3-15. Global R&D network: North America

Hitachi America, Ltd.
R&D Division

Automotive Products Research Laboratory
★ Farmington Hills, Michigan
  • Engine management and Electric powertrain systems
  • Car navigation systems
  • Production process technologies

Wireless Systems Research Lab.
★ Santa Clara, California
  • Advanced broadband wireless systems

SAN Solutions Laboratory
★ Santa Clara, California
  • Next generation storage network solutions
  • Next generation storage system architectures

R&D Division Headquarters
Santa Clara, California
(in the Hitachi Data Systems bldg.)

Venture & Academic Relations Dept.,
Santa Clara, California

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1. Corporate Management Policy
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4-1. Foundation Principles of Hitachi

Harmony

Basic philosophy of corporate code of conduct since 1910

To contribute to society through the development of superior and original technology & products

The basic principle of Hitachi is to further enhance its founding concepts of Harmony, Sincerity and the Pioneering Spirit, with a steadfast pride in being a member of Hitachi, and thus contribute to society through the development of superior and original technology and products.

Further, based on a deep understanding that business is itself a member of a society, Hitachi will conduct its corporate activities in a fair and open manner, promote harmony with the natural environment and actively engage in social welfare activities, so that as a good corporate citizen it can strive to contribute to a prosperous society.

Sincerity

Pioneer Spirit
4-2. Corporate Philosophy

~ Messages left to us by Namihei Odaira, founder of Hitachi ~

Mr. Odaira’s words on the establishment of CRL in 1942 (translation)

“… we should not only handle today’s problems; but from now on, it will be necessary to conduct basic research with a target quite far in the future. Therefore, the main target should be 10 to 20 years ahead, but research should be conducted with today’s issues in mind.”

Calligraphy of a verse from a Hang Dynasty poem (translation)

“Although our lifetime may not span a hundred years, we have concerns of a thousand years”
4-3. R&D culture for learning & growth

Establishment
1952 (initiated by Dr. Kumeo Baba, 1st General Manager of CRL)

Purpose
- Association within the Hitachi Group & Hitachi Zosen Corporation, of doctoral degree holders
- Foster an in-house ethos of aspiring to higher-learning; encourage the pursuit of doctoral degree
- Promote wide technological cooperation through close exchange between members
- Contribute to society and its development through science & technology

Origin of Name
- Taken from the teachings of the Chinese philosopher, Meng-tzi (Mencius)

Kujin Best Paper Award
- Silver medal with the image of Dr. Baba, the 1st Henjin-kai President on the front, and the name of the recipient on the back

Membership
- Total membership 2,256
  (as at 2009/4/1)

Henjin Bridge
- (Central Research Laboratory, Kokubunji-shi, Tokyo)
4-4. Hitachi Fellows

- **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 acknowledgement of Hitachi's high standard of technology.**

- **Hitachi Fellow is equivalent to that of a Board Director, and a Fellow is assured freedom of choice in research theme, research funding and support for external professional activities.**

- **June 1999**

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<table>
<thead>
<tr>
<th>Fellow</th>
<th>Name</th>
<th>Field</th>
<th>Appointment Date</th>
<th>Title</th>
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<td></td>
<td>ITOH Kiyoo</td>
<td>(Semiconductive Memory)</td>
<td>June 1999</td>
<td></td>
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<tr>
<td></td>
<td>TONOMURA Akira</td>
<td>(Holography Electron Microscope)</td>
<td>June 1999</td>
<td></td>
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<tr>
<td></td>
<td>ODAKA Toshihiko</td>
<td>(Large-scale general purpose computer, supercomputer)</td>
<td>June 2002</td>
<td></td>
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<tr>
<td></td>
<td>KAMBARA Hideki</td>
<td>(DNA Sequencer)</td>
<td>June 2003</td>
<td></td>
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<tr>
<td></td>
<td>KOI ZUMI Hideaki</td>
<td>(Optical Topography)</td>
<td>April 2004</td>
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</table>
In order to advance Japanese industry, we should not rely on imported technology to do so, but rather manufacture it ourselves. The Japanese people have the skill to do so.” (translation)

- Nov. 1910 • Founded as an electrical machinery repair shop of the Hitachi Mine, Kuhara Mining Co.
- Feb. 1918 • Research team founded in the testing section
- Feb. 1920 • Incorporated as Hitachi, Ltd.
- Mar. 1934 • Hitachi Research Laboratory (HRL) established.
- May 1937 • Metallurgical Research Laboratory established.
  (Later transferred to Hitachi Metals, Ltd.)
- 1939 • HRL becomes an independent lab. directly under the President of Hitachi, Ltd.
- Apr. 1942 • Central Research Laboratory (CRL) established.
- July 1958 • Transistor Research Laboratory breaks away from CRL.
  (Later renamed Musashi Works; currently Renesas Technology Corp.)
- Feb. 1966 • Mechanical Engineering Research Laboratory (MERL) established.
- Aug. 1969 • Information Systems Research Division established.
  (Later becomes part of the SDL)
- Aug. 1970 • Yokohama Research Laboratory established
In order to advance Japanese industry, we should not rely on imported technology to do so, but rather manufacture it ourselves. The Japanese people have the skill to do so.” (translation)

- Aug. 1970 • Design Center breaks away from Consumer Products Research Center (CPRC) (In 1989, the Design Center is assigned as a corporate laboratory.; in 1991 CPRC is renamed Image Media System Laboratory)

- Feb. 1971 • Nuclear Power Research Laboratory established. (Later renamed Energy Research Laboratory; Power & Industrial Systems R&D Lab.; currently Energy and Environmental Systems Laboratory)

- June 1971 • Production Engineering Research Laboratory (PERL) established.

- Feb. 1973 • Systems Development Laboratory (SDL) established.

- Aug. 1983 • Microelectronics Products Development Laboratory established.

- April 1985 • Advanced Research Laboratory (ARL) established.

- Aug. 2001 • Design Center becomes the Design Group, placed directly under the President

- April 2004 • Material Research Laboratory established within HRL

- April 2005 • Embedded Systems Platform Technology Laboratory established within CRL