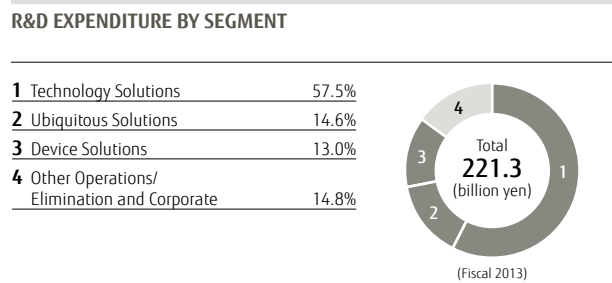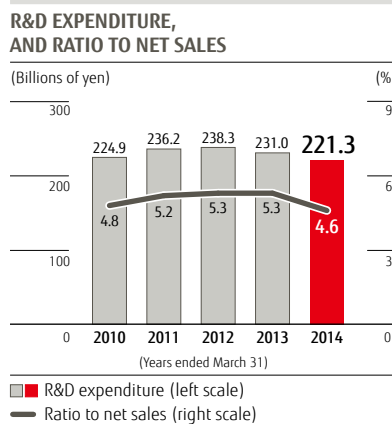# RESEARCH & DEVELOPMENT

Our Mission in R&D

As our fundamental R&D policy, we pursue initiatives to create new value for our customers and to achieve our Corporate Vision of contributing to the creation of a networked society that is fulfilling and secure, bringing about a prosperous and dream-inspiring future. In order to achieve these initiatives, our R&D of advanced technologies includes technologies for next-generation solutions and services to systems, networks, devices, and advanced materials which serve as building blocks for our products and services.

- Create and accumulate advanced technologies
- Extend our value chain globally
- Foster the creation of new businesses
- Fulfill our social responsibilities

**R&D EXPENDITURE,
AND RATIO TO NET SALES**

(Billions of yen)

Year	R&D expenditure	Ratio to net sales
2010	224.9	4.8
2011	236.2	5.2
2012	238.3	5.3
2013	231.0	5.3
2014	221.3	4.6

(Years ended March 31)

■ R&D expenditure (left scale)
— Ratio to net sales (right scale)

R&D EXPENDITURE BY SEGMENT

1	Technology Solutions	57.5%
2	Ubiquitous Solutions	14.6%
3	Device Solutions	13.0%
4	Other Operations/ Elimination and Corporate	14.8%

Total
221.3
(billion yen)

(Fiscal 2013)

Major Advanced R&D Achievements for Fiscal 2013 (April 2013–March 2014)

As steps toward making the Human Centric Intelligent Society a reality, Fujitsu employed three approaches in R&D for advanced technology: support for human decision-making and action through ICT, knowledge creation by leveraging information, and optimized linkage of people, things and social infrastructure.

(1) User Interface Technology Enabling Seamless and Unobtrusive Connections between Operations and Services in Real-World ICT Devices

By leveraging intuitive and simple operation, Fujitsu developed field-support technologies to enable greater efficiencies in on-site tasks and operations outside of office environments, in the form of a glove-style wearable device that enables display of workflow and other data when worn, and is triggered by contact with objects, featured with a world's first, next-generation user interface that enables 3D space-based touch operation by using an ordinary webcam for high-resolution, high-speed detection of fingertip position.

▭ Refer to our related Press Releases for more information:
http://www.fujitsu.com/global/about/resources/news/press-releases/2014/0218-01.html
http://www.fujitsu.com/global/about/resources/news/press-releases/2013/0403-01.html

Fujitsu also developed technology for realizing interfaces that fully engage the human senses, including the industry's first haptic (tactile) sensory touchscreen that uses ultrasonic vibrations to alter friction between the finger and touchscreen surface, enabling the user to feel tactile sensations such as smooth and

rough textures. Also developed was an innovative service featuring a diverse array of voices and tones that can be flexibly leveraged to convey information with ease and clarity, through a rich repertoire of expressive voice options.

▭ Refer to our related Press Releases for more information:
http://www.fujitsu.com/global/about/resources/news/press-releases/2014/0224-01.html
http://www.fujitsu.com/global/about/resources/news/press-releases/2014/0331-01.html
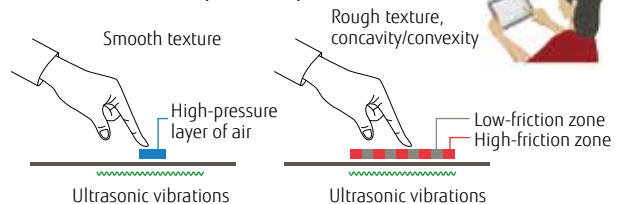
Glove-Style Wearable Device

Data manipulation by touching objects or gesture-based input

Next-Generation User Interface

Haptic Sensory Touchscreen

Smooth texture

Rough texture, concavity/convexity

High-pressure layer of air

Low-friction zone
High-friction zone

Ultrasonic vibrations

Ultrasonic vibrations

📄 Explanations for underlined words can be found in the glossary on pages 160-162.

(2) Technology for Automatic Linkage, Utilization, and Leverage of Massive and Diverse Individual Data Sets Dispersed Worldwide

Linked Open Data (LOD), or data that is linked and merged with other related information, is being more widely released globally. In partnership with the Ireland-based INSIGHT Centre for Data Analytics, which has some of the best technology in the field, as a world's first, Fujitsu co-developed a platform that collects and stores LOD, and allows for high-speed, single-batch search of a multitude of interrelated information that exist as globally-dispersed individual data sets. For example, using data publicly released as LOD, such as basic corporate data (business sector, number of employees, etc.), financial data (net sales, profits, and so on), as well as share price, and other relevant data, the platform enables instantaneous multifaceted analysis of corporate performance. Fujitsu has released a free-of-charge cloud-based search service for this LOD utilization platform. The platform will also become an integrated part of Fujitsu's data utilization business, to realize new data amalgamation services in a variety of fields.

Refer to our related Press Release for more information:
http://www.fujitsu.com/global/about/resources/news/press-releases/2014/0116-01.html
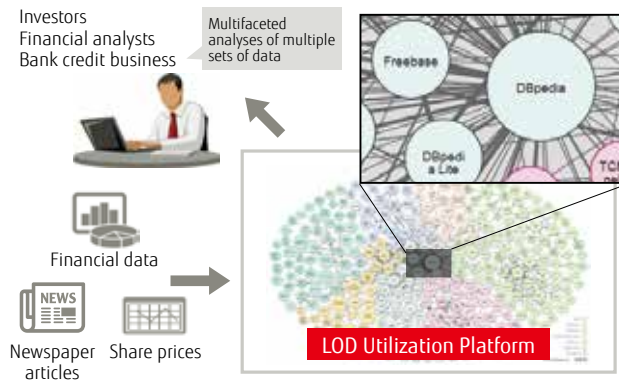
(3) Security Technology Essential for Secure and Safe Data Utilization

Services of all kinds must have mechanisms in place to safeguard privacy to permit the utilization of a variety of diverse data.
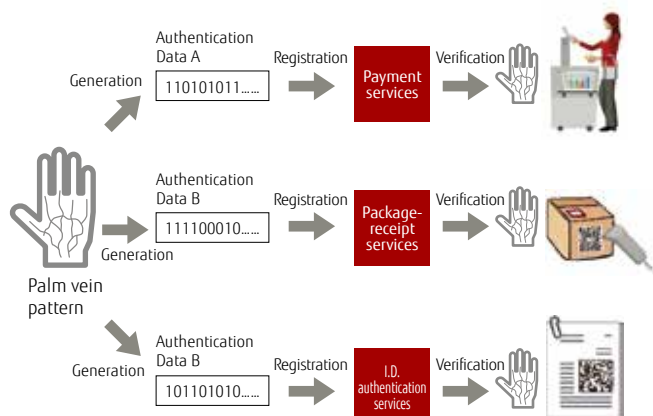
Fujitsu developed technology that enables high-speed statistical processing and searching of such data while encrypted. This breakthrough makes it possible to utilize with a greater sense of security highly private data, such as DNA, and other biological and medical personal data, and educational records. In biometric authentication technology, Fujitsu developed technology that allows for the generation of different types of authentication data based on palm vein images, which can be varied for various separate services. In the unlikely event that registered data is leaked in one service, users can re-register with no impact on other services, enabling uninterrupted use of services with peace of mind.

Refer to our related Press Releases for more information:
http://www.fujitsu.com/global/about/resources/news/press-releases/2014/0115-01.html
http://www.fujitsu.com/global/about/resources/news/press-releases/2013/0828-01.html

(4) Technology for Realizing Continuous Optimization through Dynamic Compositional Change of ICT Infrastructure

The relentless rise in network-connected sensors and mobile devices has triggered explosive growth in transmitted data volume, resulting in an emerging issue as to how to address the sharp increase in communications data traffic and the shift to high-capacity servers. Fujitsu has developed distributed service platform technology that, in response to changes in service parameters, utilizes cloud-based processing and automatic allocation of data chunks to intermediate servers on wide-area networks. This optimal allocation reduces communications data traffic to roughly 1/100th in size, allowing for dramatic improvement in response time.

Additionally, through high-speed interconnection of pooled CPUs, memory, and storage, as a world's first, Fujitsu developed technology that in approximately 10 minutes, can provide clients with a server setup tailored to their needs. These achievements will ultimately make it possible to efficiently utilize ICT resources in response to application load.

Refer to our related Press Releases for more information:
http://www.fujitsu.com/global/about/resources/news/press-releases/2014/0314-01.html
http://www.fujitsu.com/global/about/resources/news/press-releases/2013/0704-01.html

(5) Platform Technology Supporting On-Site Product Prototyping and Development

For higher performance in next-generation servers and super-computers, Fujitsu developed clock distribution technology that cuts power consumption by 20% in high-speed data communication circuits between CPUs. This technology will be applied to interfaces between server boards, the building blocks of servers.

To further expand the range of fields of application for supercomputers, Fujitsu developed the world's first commercial magnetic simulation software technology, that enables large-scale micromagnetic simulations to analyze microstructures of magnetic materials, which had been difficult to achieve in the past. This innovation has made it possible to analyze microstructures of magnetic substances in ways not possible with earlier computational approaches.

Refer to our related Press Releases for more information:
http://www.fujitsu.com/global/about/resources/news/press-releases/2013/0614-02.html
http://www.fujitsu.com/global/about/resources/news/press-releases/2013/1210-01.html

AWARDS AND PRIZES

Commendation for Science and Technology by Japan's Minister of Education, Culture, Sports, Science and Technology with Prizes for Science and Technology, and the 60th Okochi Memorial Technology Award of Japan

Five members of the Fujitsu Group were honored by Japan's Minister of Education, Culture, Sports, Science and Technology, who awarded them with Fiscal 2014 Commendations for Science and Technology with Prizes for Science and Technology (Development Category), for the "Development of Volume Production Technology for High-Density Ferroelectric Random Access Memory (FRAM)." Five members of the Fujitsu Group were also awarded the 60th Okochi Memorial Technology Award of Japan, and were recognized for their development of technology to suppress ferroelectric deterioration during semiconductor manufacturing processes, which resulted in realization of the world's first volume production of Ferroelectric Random Access Memory (FRAM).

Contribution Prize in the 46th Ichimura Industrial Awards of Japan

Three members of the Fujitsu Group were awarded the Contribution Prize for the "Application of a Wraparound-View 3D Monitor Technology for Driver Safety and Peace of Mind" at the 46th Ichimura Industrial Awards of Japan, sponsored by the New Technology Development Foundation, Japan. Using 3D graphics processing technology, this innovative approach leverages video from four vehicle-mounted cameras to give drivers a wide-area, 360-degree omniview both immediately around and beyond their vehicles. Fujitsu was recognized for commercialization of this wraparound-view 3D monitor technology, which integrates video from different angles for an all-inclusive 3D display, flexibly giving drivers a smooth and expansive field of vision.

Advanced R&D Strategic Direction in Fiscal 2014 (April 2014 –March 2015)

With an eye toward the future of the Fujitsu Group, and to enhance resource shifts in response to changes in its business portfolio, Fujitsu has classified its framework for advanced R&D into the following three categories, and will employ a top-down approach to setting research themes and conduct strategic research investment.

1. Research for Near-Term Commercialization Themes: Research directly linked to business with a clearly-defined commercialization plan

2. Advanced Research Themes: Research that will create new business, or expand or enhance the competitiveness of existing business

3. Seeds-Oriented Research Themes: Revolutionary innovative technologies driven by our research laboratories' perceptions

Striving toward the realization of the Fujitsu Group's vision of a "Human Centric Intelligent Society," we have set out three dimensions of the Fujitsu Technology and Service Vision, and four corresponding research domains with which they share a common foundation, to drive cutting-edge Fujitsu technologies to generate innovation.

Four Research Domains

Dimensions to Generate Innovation

Human Empowerment

Creative Intelligence

Connected Infrastructure

Common Foundation

Ubiquitous Innovation
Service platform technologies connecting front-end users and services; media processing and sensing technologies that enhance service value; device platform technologies such as for wearable devices and sensors

Social Innovation
Knowledge platform technologies enabling linkage and leverage of heterogeneous information of companies, public institutions, individuals, and sensors; security and big data-related technologies supporting social solutions

ICT Innovation
Hyper-scale technologies to rapidly and flexibly accommodate projects ranging from small to ultra-large-scale; proactive platform technologies to preemptively support forecasted outcomes; software control technologies enabling external remote control

Manufacturing Innovation
Advanced device technologies, hardware, and software manufacture technologies to support the Fujitsu Group's product manufacturing