Fukuoka Growth

Growth Potential of Fukuoka City

12　R & D as Source of Value Added

（Version1.0）

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A variety of research & development in science and technology fields have not only the academic importance but also the economic importance in business activities. The trend of world economy can be overlooked by the quantity of distribution and the flow of funds as visible indicators, but “value added” is also added up on the value of indicators during the process of generating ingredients, producing and selling products while a variety of countries and regions are relating to its process.

As for corporations, “value added” is the essential factor for differentiating themselves from other competitive corporations and securing high profitability. In order to improve the competitive power, investments to “Research & Development” that generate “value added” are continuously made. Especially, globally developing corporations are starting to enforce the collaborations with external groups such as a specialized research institute as Open Innovation*1 in order to win the worldwide competitive race because it is not easy for a corporation only with its own human resources to speed up producing the result of research & development in the science and technology fields where changes are made every day.

Through collaborations, corporations can turn the research results into the actual products development in return for providing opportunities of study or equipment by consigning or funding to universities or research institutes, while universities and research institutes can not only accumulate the newest equipment, technological development and know how, but also invest the earned fund in next research project. These collaborations between corporations and universities or research institutes can build a win-win relationship for both parties.

Since this virtuous cycle was recognized to bring an impact on local economic growth and cultivation and accumulation of human resources, many nations and regions have been focusing on industry-academia collaborations in research & development. In Japan, initiatives to prompt industry accumulation through collaborations between local corporations and universities have been done, but it is required to have a point of view to positively utilize the newest research result to boost the local economy or academic field by having research institutes strengthen the relationships with the world, especially when global corporations are on the lookout for the most advanced technologies and information throughout the world like today.

Fukuoka City also has the potential to generate larger “value added” by utilizing the results of “research & development” under the environment where many corporations, universities and research institutes are accumulating, and constant communication among them is available. It is important to speedily use the individual resources that Fukuoka City’s corporations and universities have and to develop initiatives promoting industries to generate high value added from a global perspective.

In addition to utilizing the local resources and boosting industries with business-academia collaborations, it is extremely important to develop relationships between Fukuoka City and outside of the city such as to increase the collaborations between local universities or research institutes and outer corporations developing business in and out of Japan, and to develop the most advanced products or service by enforcing the collaborations between local corporations and outer universities or research institutes, especially when globalization is increasing around the world. It is expected that the needs for industry-academia collaboration would grow by individual research project. Fukuoka City needs to make the best use of its strength that accumulates research institutes of new technology field, and increase “value added” that the local community generates by diversified industry-academia collaborations that leads to the economic growth. As a factor for development of collaborations in the world industry-academia collaboration hubs, the importance of face-to-face communication is recognized*2, and the potential of Fukuoka City where a variety of corporations and advanced human resources in research field such as in Kyushu University are accumulating can be considered extremely high.

(Naohisa HATAKEYAMA, Information and Strategy Office, Fukuoka Asian Urban Research Center)

*1 Open Innovation: to create new innovative products or business model by not only the internal technology but also the collaboration with external technology or ideas.
*2 Source: Tokyo Institute of Technology. “欧州大学における産学連携拠点における調査研究報告書(Study Report on Industry-Academia Collaboration in European Universities)” (March 2012).

Major Factories and Research Institutes in Kyushu Region.

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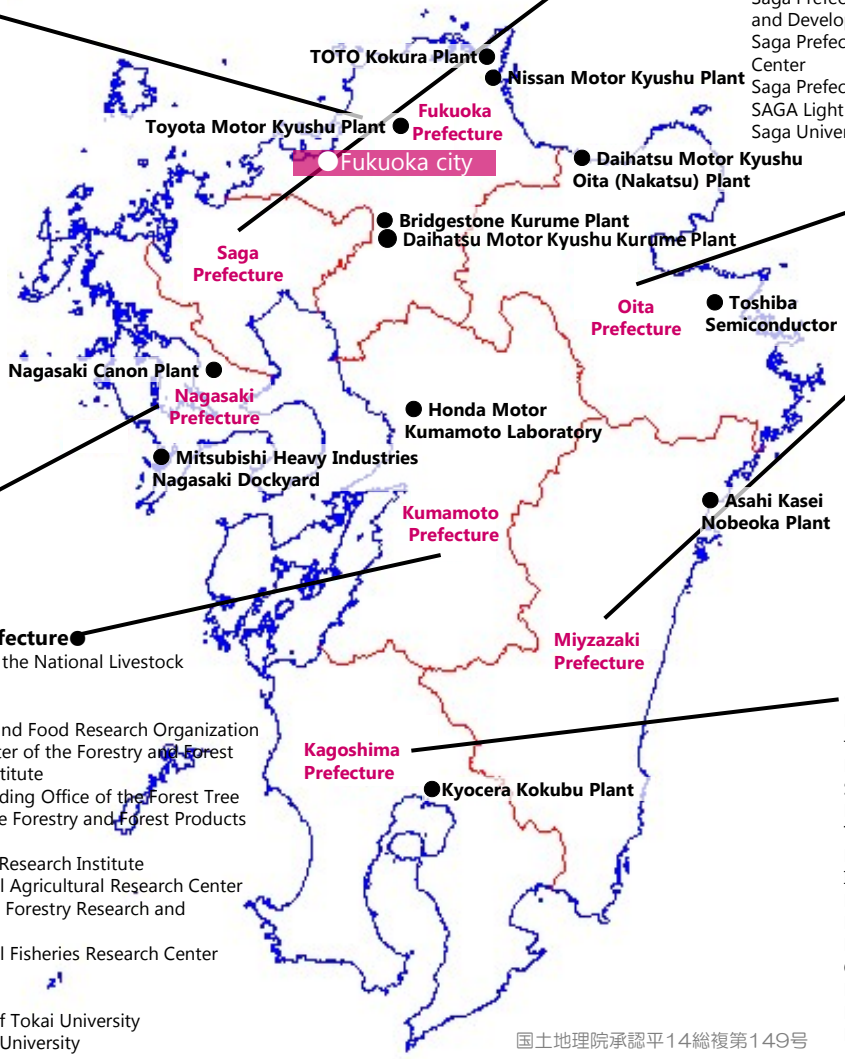


●Fukuoka Prefecture●
Innovation Plaza Fukuoka of the Japan Science and Technology (JST) Agency
Research Center for Hydrogen Industrial Use and Storage, National Institute of Advanced Industrial Science and Technology
Fukuoka Industrial Technology Center
Fukuoka Agricultural Research Center
Fukuoka Forest Research and Extension Center
Fukuoka Fisheries and Marine Technology Research Center
Fukuoka Research Center for Recycling Systems
Kitakyushu Asian Center for Low Carbon Society
Fukuoka Hydrogen Energy Product Testing Research Center
Fukuoka Institute of System LSI Design Industry
Fukuoka Bio Incubation Center
Joint Research Center of the Kitakyushu Science and Research Park
Experimental Center for Social System Technologies
Research Center for Three-Dimensional Semiconductors
Kyushu University
Kyushu Institute of Technology
The University of Kitakyushu
Kyushu Kyoritsu University
Kyushu Sangyo University
Faculty of Humanity-Oriented Science and Engineering of Kinki University
Kurume Institute of Technology
Nishinippon Institute of Technology
Fukuoka University
Fukuoka Institute of Technology
Graduate School of Waseda University

●Saga Prefecture●
National Institute of Advanced Industrial Science and Technology (AIST) AIST Kyushu
Saga Ceramics Research Laboratory
Industrial Technology Center of Saga
Saga Prefectural Fruit Tree Experiment Station
Saga Prefectural Animal Husbandry Experiment Station
Saga Prefectural Genkai Fisheries Research and Development Center
Saga Prefectural Ariake Fisheries Research and Development Center
Saga Prefectural Forestry Experiment Station
SAGA Light Source, Kyushu Synchrotron Light Research Center
Saga University

●Oita Prefecture●
The Oita Prefectural Institute of Public Health and Environmental Science
Oita Industrial Research Center
Oita Prefectural Agriculture , Forestry and Fisheries Research Center
Oita University
Nippon Bunri University

●Miyazaki Prefecture●
Miyazaki Station of the National Livestock Breeding Center
Miyazaki Prefectural Forestry Technology Center
Miyazaki Prefecture Industrial Technology Center
Miyazaki Prefecture Foods Development Center
Miyazaki Agricultural Research Institute
Miyazaki Livestock Research Institute
Miyazaki Prefectural Fisheries Experimental Station
University of Miyazaki
Minami Kyushu University

●Nagasaki Prefecture●
Unzen Station of the National Center for Seeds and Seedlings
SaikaiNational Fisheries Research Institute of the Fisheries Research Agency
Industrial Technology Center of Nagasaki
Ceramic Research Center of Nagasaki
Nagasaki Prefectural Institute of Fisheries
Nagasaki Agricultural and Forestry Technical Development Center
Fruit and Tree Research Division of the Nagasaki Agricultural and Forestry Technical Development Center
Animal Husbandry Research Division of the Nagasaki Agricultural and Forestry Technical Development Center
Nagasaki University
Nagasaki Institute of Applied Science

●Kumamoto Prefecture●
Kumamoto Station of the National Livestock Breeding Center
National Agriculture and Food Research Organization
Kyushu Research Center of the Forestry and Forest Products Research Institute
Kyushu Regional Breeding Office of the Forest Tree Breeding Center of the Forestry and Forest Products Research Institute
Kumamoto Industrial Research Institute
Kumamoto Prefectural Agricultural Research Center
Kumamoto Prefecture Forestry Research and Instruction Station
Kumamoto Prefectural Fisheries Research Center
Kumamoto University
Sojo University
Kumamoto Campus of Tokai University
Aso Campus of Tokai University

●Kagoshima Prefecture●
Research Center for Medicinal Plant Resources, the National Institute of Biomedical Innovation
Kagoshima Station of the National Center for Seeds and Seedlings
Kagoshima Prefectural Institute of Industrial Technology
Kagoshima Prefectural Oshima-Tsumugi Instruction Center
Kagoshima Prefectural Institute for Agricultural Development
Kagoshima Prefectural Forestry Technology Center
Kagoshima Prefectural Fisheries Technology and Development Center
Kagoshima University

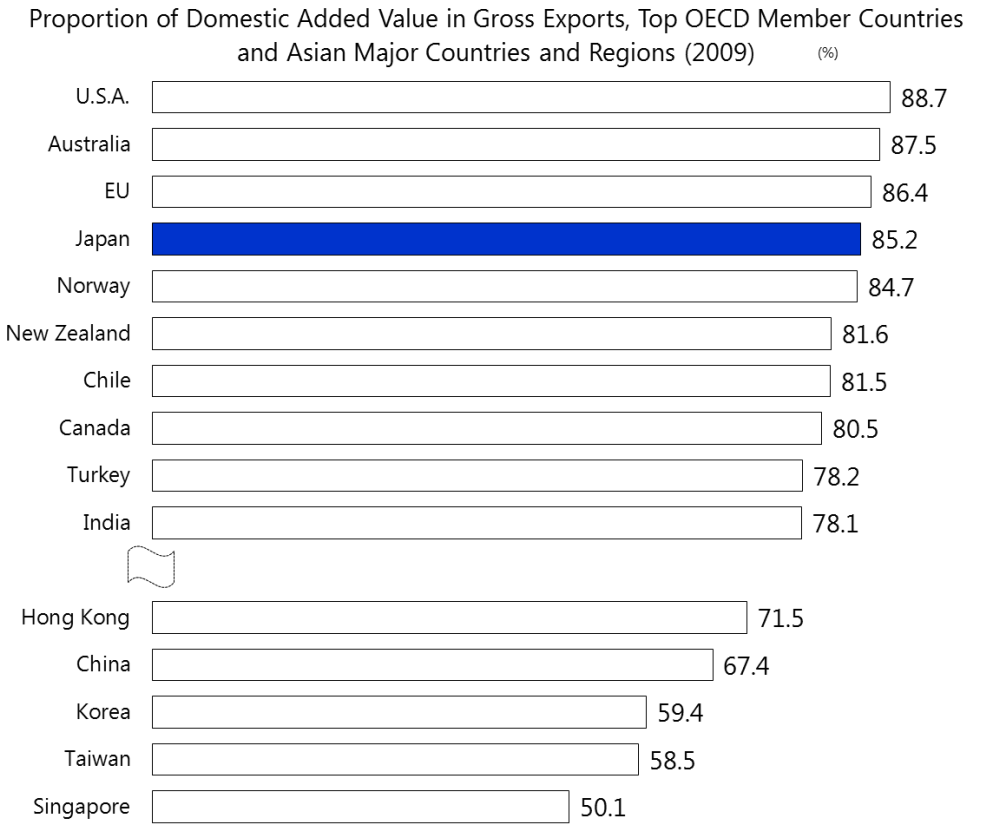
As a hub of Kyushu Economy, Fukuoka City accumulates a number of population and investments, and a variety of economic activities are generating high value added in Kyushu Region. There are many factories and research institutes in Kyushu Region, and they are closely related with the economy of Fukuoka City.

Source: Ministry of Economy, Trade and Industry

Japan's high power of generating value added.

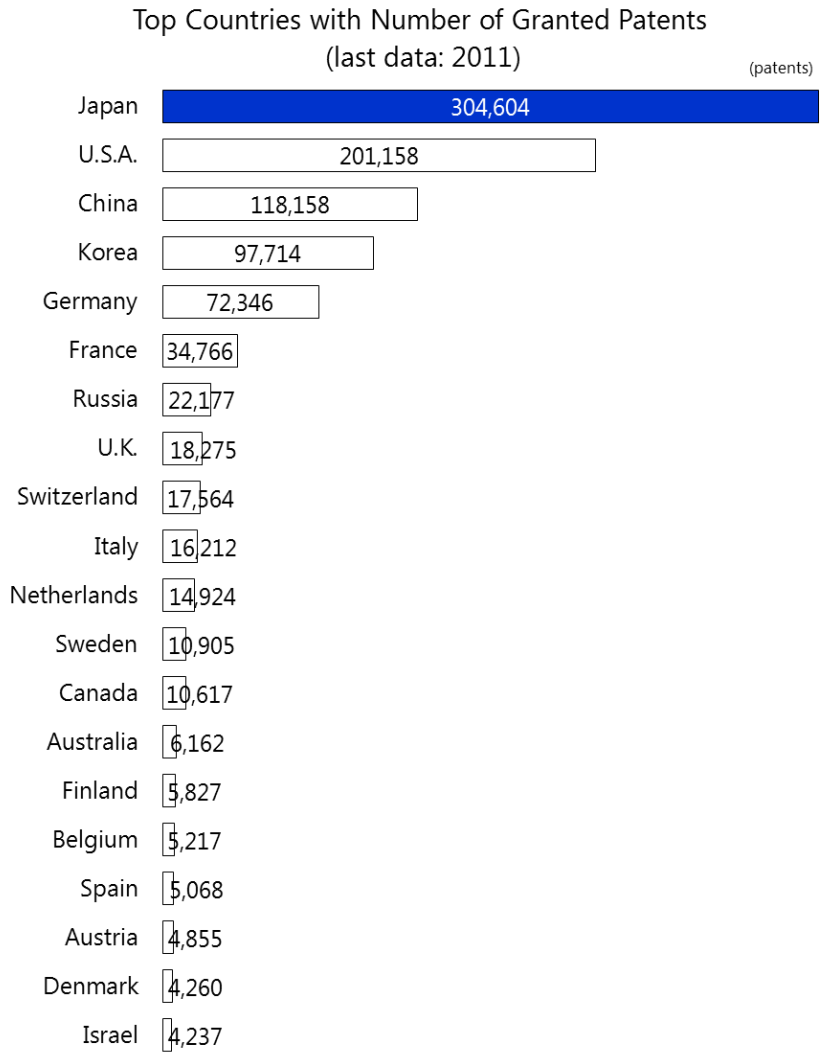
FG12-003

In regards to the share of value added in gross exports, Japan can be considered as a value-creative nation comparable to US and EU.
When products or service are exported to overseas from Japan, most of its value are added domestically, and the weight of its proportion is outstanding compared to other Asian regions such as China and Korea.
It is the result of research & development that domestic corporations have constantly invested not only by assembling materials but also by improving the value of each product or service. It can be said that not only the corporation's own effort but also the collaboration with universities and research institutes also has a main cause for its result.



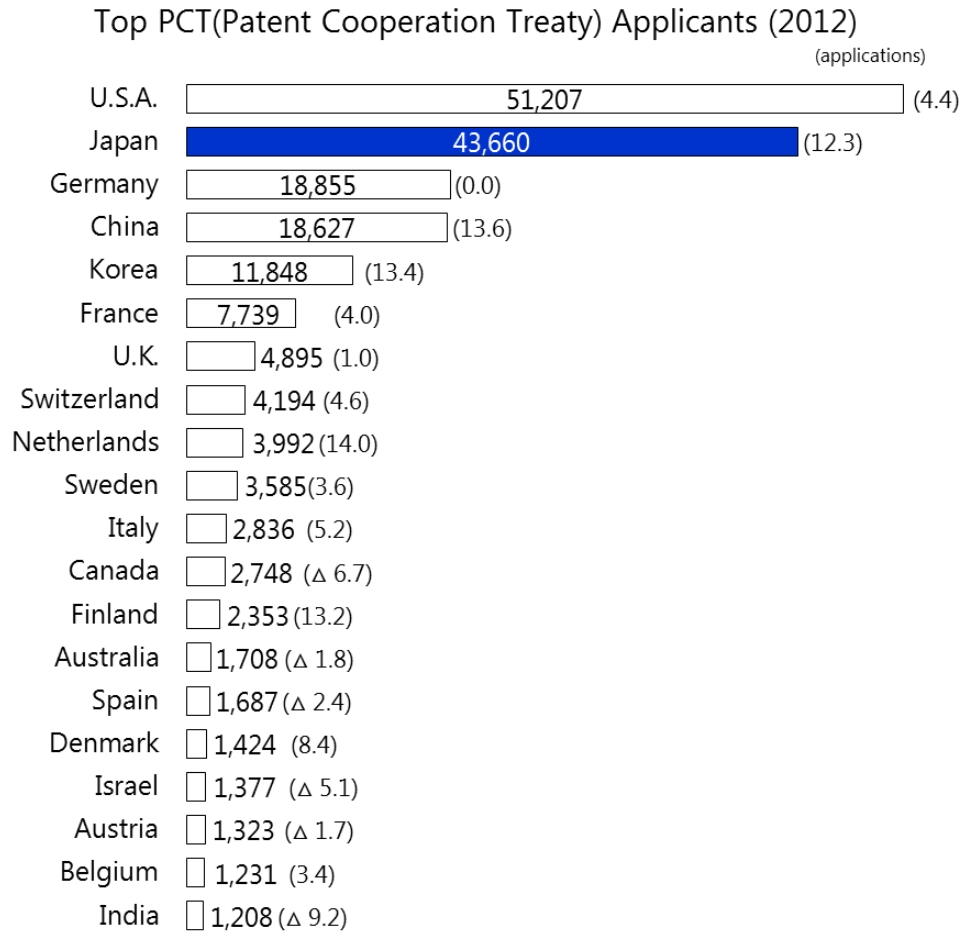
Source: OECD-WTO. "Trade in value-added initiative (TiVA)" (May 2013).

Awareness to patents as high as in US.



In total number of granted patents which is one of performance indicators of research & development, Japan at No.1 followed by U.S.A. , overwhelming other nations. This shows that value only Japan can add has been reflected to the high proportion of domestic value added in international trade.

By contrast, U.S.A has the highest number of patent applications in 2012 followed by Germany, and Asian nations such as China and Korea are experiencing remarkable growth, which has shown signs of a change in the state of value added creation countries.



Source: World Intellectual Property Organization.

In university patents ranking, US dominates the top while Japan's hardly distinguished.

FG12-005

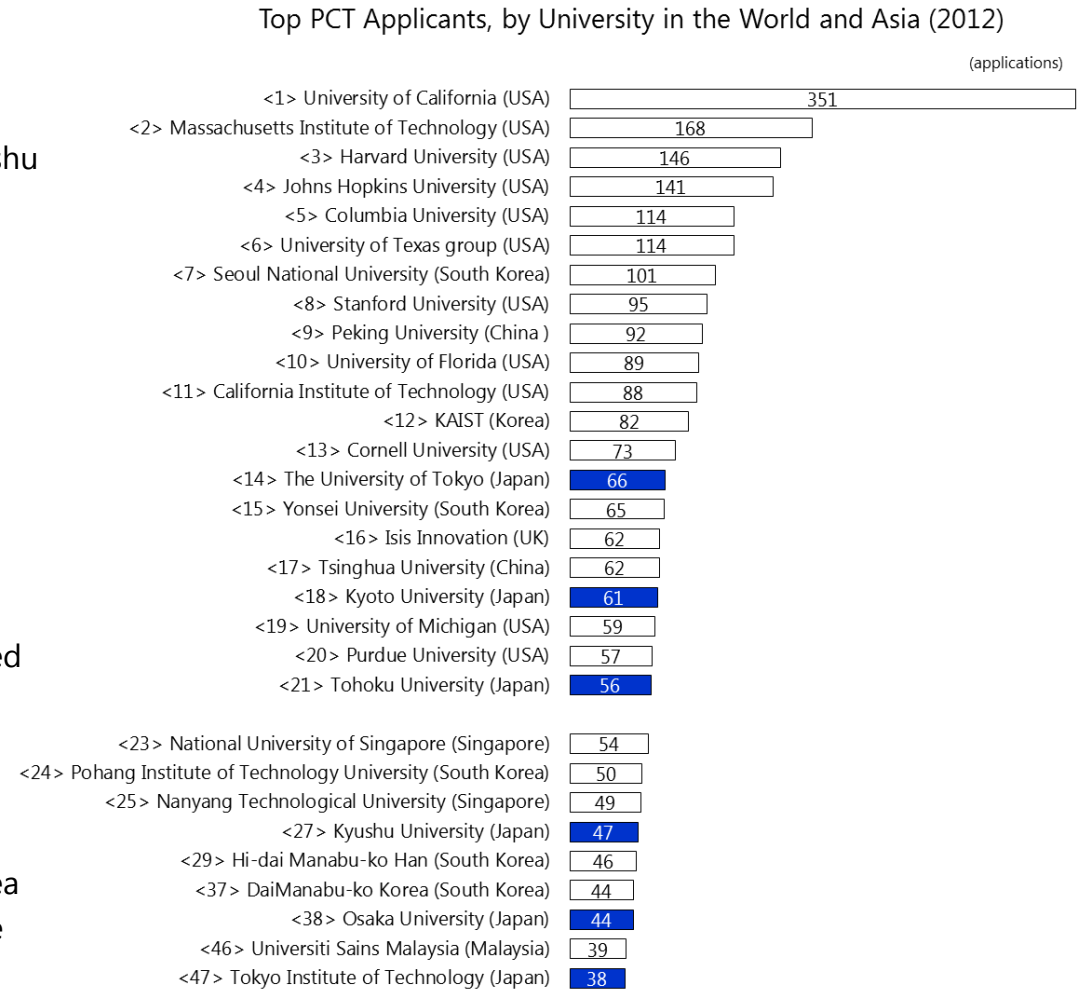
Although Japan ranks at the first place in the world in number of granted patents by country, Japan loses its presence in ranking in number of applied patents by university. Most of top universities are in USA while only Seoul University (Korea) and Peking University (China) in Asian Region rank in higher places. As for Japan, No. 14 of Tokyo University is the highest in Japan and No. 27 of Kyushu University is the highest in Fukuoka Area.

Universities are good mainly at fundamental study field, which means that there are broad ranges of applications. Obtaining patents can bring the source of wide ranges of value added generated from the basic study.

As a character of a patent, there are a "defensive" factor to prevent the invented skill from being used by others and a "strategic" factor to make it be the exclusive origin of a supply of value added created by using the patent.

One of the causes that US universities dominate the top ranking in the number of applied patents can be considered that they are intent not only on gathering excellent talent around the world and owning high research functions and abilities but also on strategically utilizing the intellectual property.

A large number of applied patents in USA, China, and Korea indicates that they are focusing on research activities to be the next generation leader of value added creators. For Japanese universities it is also important to focus on R&D strategically by attracting excellent talent and strengthening collaborations with business.



Note: Number in brackets "<>" is a worldwide ranking.
Source: World Intellectual Property Organization.

Growing number of international patent applications in Japan.

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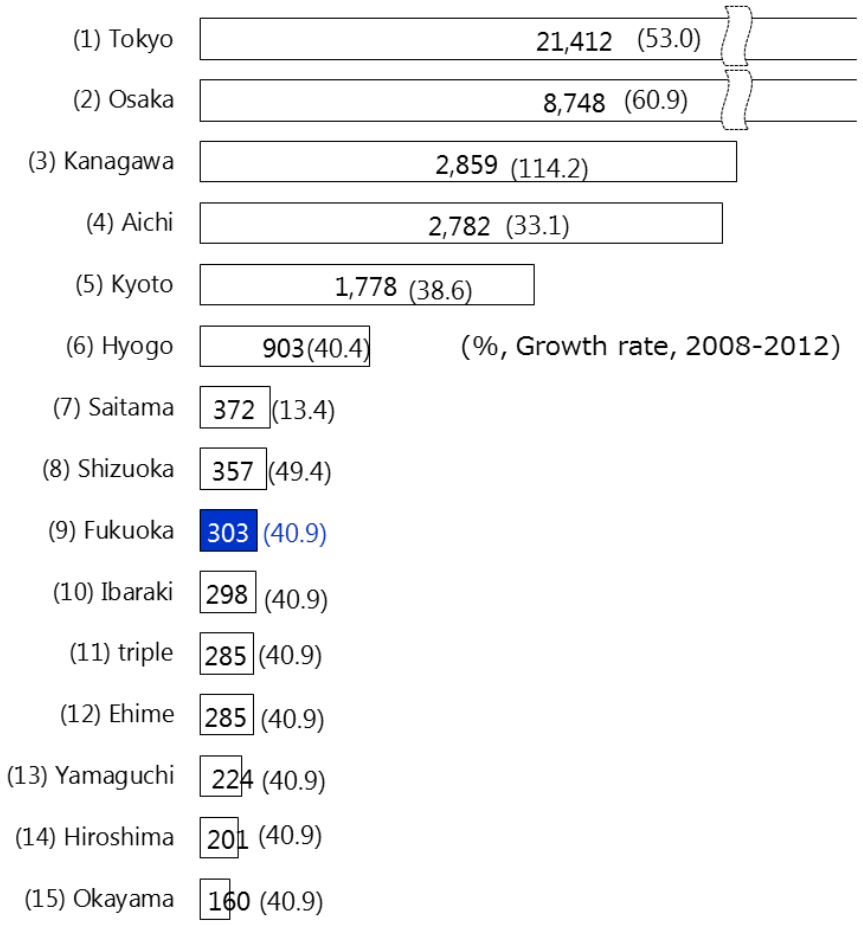
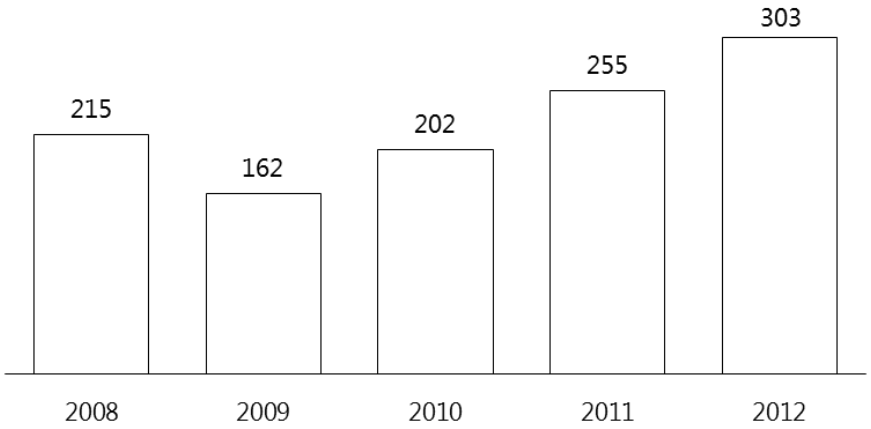
Top Prefectures, Number of International Patent Applications (2012)



Tokyo has the largest number of international patent applications by prefectures in Japan, overwhelming other prefectures, and its growth rate is also high.

Although Fukuoka Prefecture ranks No. 9 in number of applied patents, the number has been increasing since 2009. All of the top ranked prefectures have high growth rate, which indicates that the R&D activities has been actively held and their awareness of preventing leakage of technology and considering patents strategically has been increased.

Trends in Number of International Patent Applications in Fukuoka Prefecture (2008-2012)

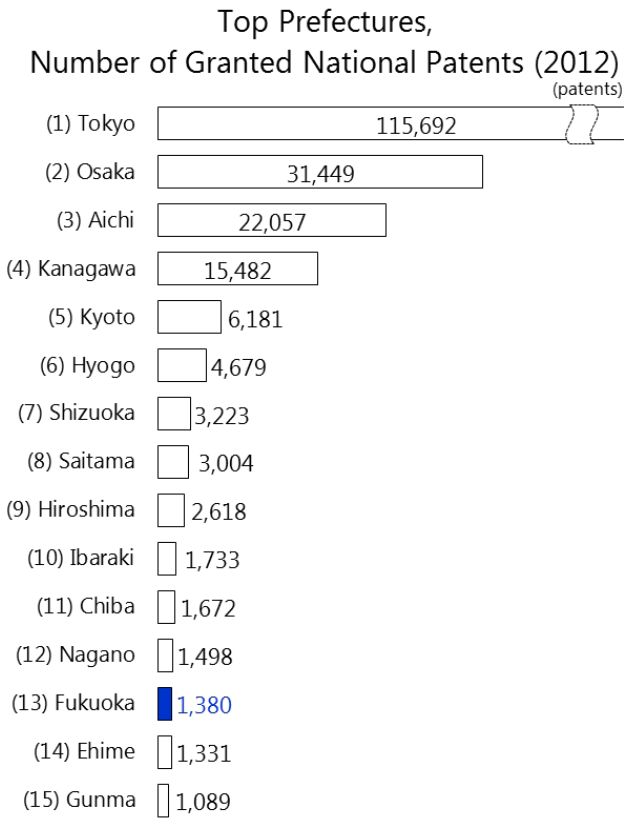


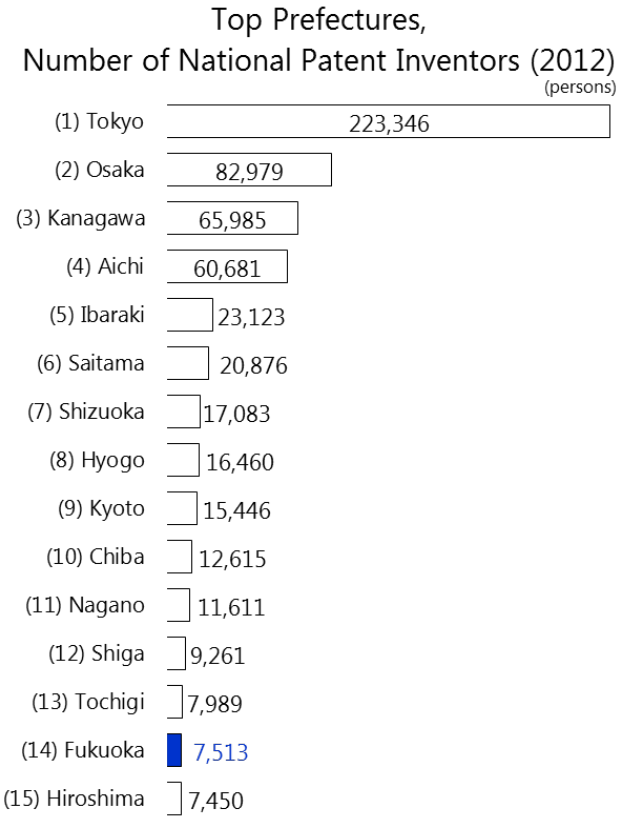
Note: Number in brackets is a domestic ranking. Data is the number of lead applicants of PCT by his/her address submitted in Japan.
Source: Japan Patent Office. “Annual Report 2013”.

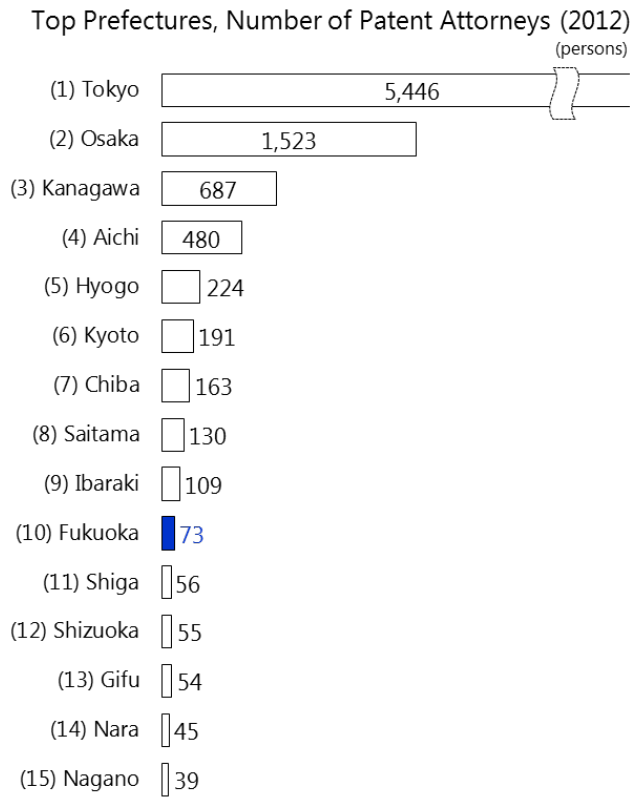
Number of granted national patents depends on the on-site corporation's activities.

FG12-007

In regards to the national patents, Tokyo has both the highest number of granted patents and the highest number of inventors. Number of granted national patents is large in metropolitan areas such as Tokyo and Osaka where many talent and corporations accumulate. Number of patent attorneys who are engaged in application and registration is also high proportionally.
Fukuoka ranks in 13th out of 47 prefectures, which is not very high in ranking. Although there is a large number of universities, research results produced there may not be spread out enough in the community.
Since most patent applicant is a corporation or a university or an individual who belongs to these groups, the difference in number of corporations and universities might affect the number of patent applications; however, a prefecture that doesn't have many universities ranks in the higher rank, it can be considered that the R&D activities by corporations also have an impact.







Note: Number in brackets is a domestic ranking.
Source: Japan Patent Office. "Annual Report 2013".

Kyushu University leading the local community with diversified research activities.

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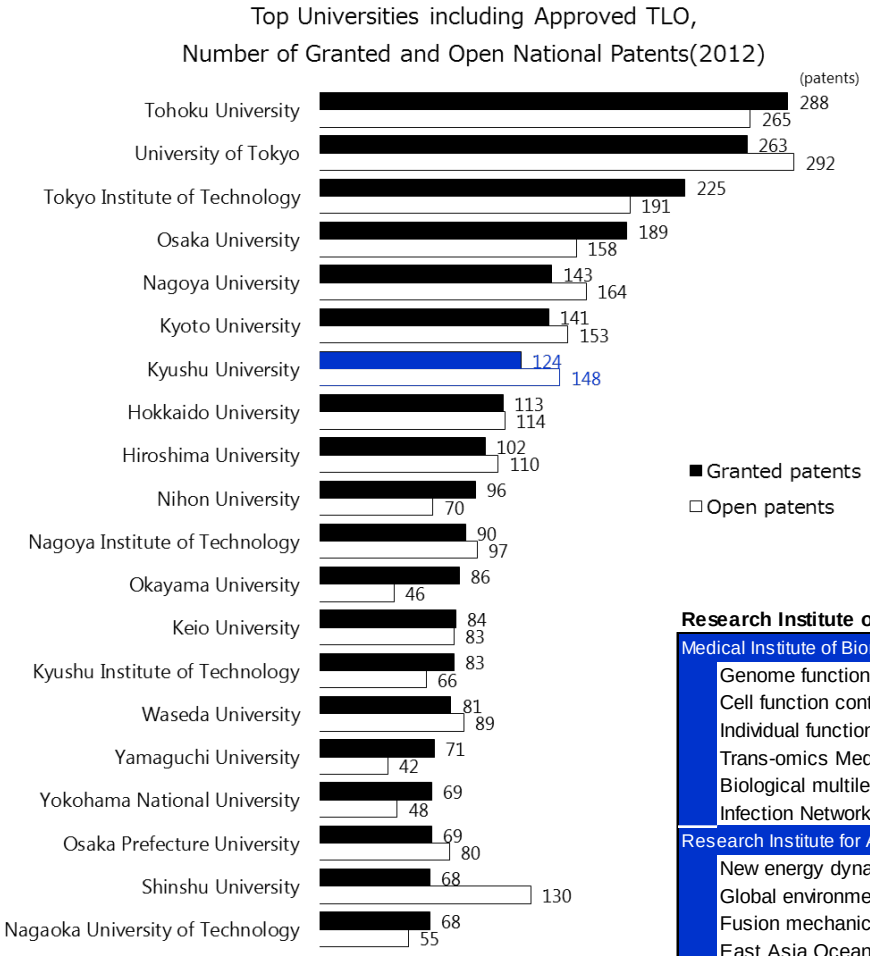


In number of granted national patents, universities called former Imperial Universities representing the local area and Tokyo Institute of Technology rank in higher top universities. Kyushu University rank in the 7th with the number of granted national patents. Kyushu Technical College in Kitakyushu City also has a large number of patents. Kyushu University has been expanding the research & development system at the facilities with the newest equipment, and is expected to bring high performance results in the future.

Research Institute of Kyushu University

Medical Institute of Bioregulation	**Math-for-Industry Research Institute**
Genome function control studies department	Mathematics technology advanced research department
Cell function control studies department	Applied Theory Research
Individual function control studies department	Basic theory research department
Trans-omics Medicine Research Center	**Carbon-Neutral Energy International Institute**
Biological multilevel system Research Center	Hydrogen production research department
Infection Network Research Center	Hydrogen compatible materials research department
Research Institute for Applied Mechanics	Fuel cell research division
New energy dynamics department	Thermo Scientific Research
Global environmental dynamics department	Hydrogen storage research department
Fusion mechanics department	Catalytic Chemical Process Engineering department
East Asia Oceanic and Atmospheric Environment Research Center	CO2 separation and conversion research department
High-temperature plasma dynamics Research Center	CO2 storage research department
Technical office	Energy analysis research department
Materials Chemistry Laboratory	**Research Institute for Information Technology**
Material foundation chemical sector	Academic Research
Molecule integrated chemical sector	Language educational environment research department
Fusion Materials sector	Learning environment design research department
Advanced Devices Materials Division	Tip network research department
Substance functional evaluation center	Interdisciplinary Computational Sciences Division
	Advanced Computing Research department

Sources: Japan Patent Office. “Annual Report 2013”; Kyushu University.

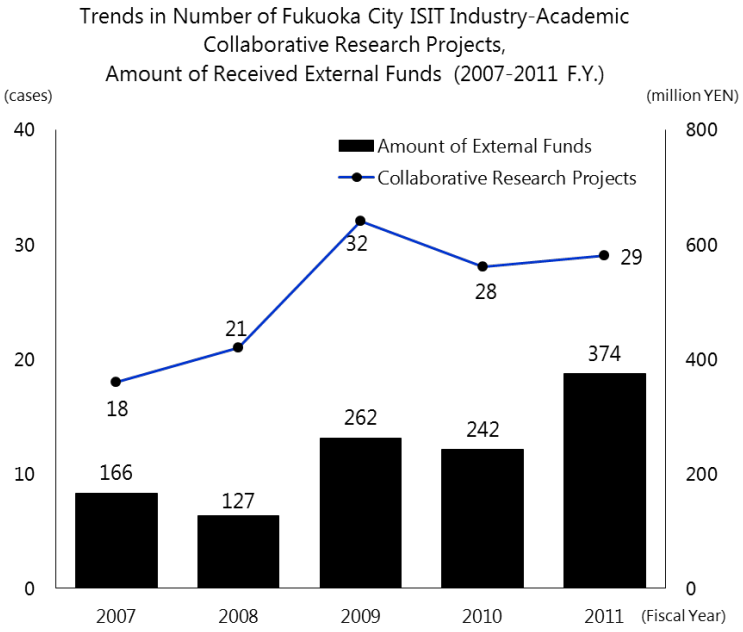
Use of intellectual properties revitalizes economy and emphasizes the meaning of industry-academia collaboration.

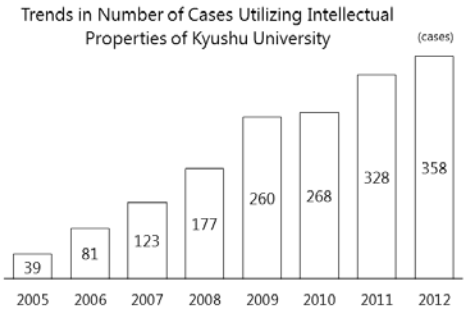
While obtaining and registering of patents has a role of preventing leakage of technology and knowledge, it can also create new value by being used in the industries. The industry-academia collaboration connecting the newest research result of universities and the corporation's needs can bring an impact on boosting the local economy.

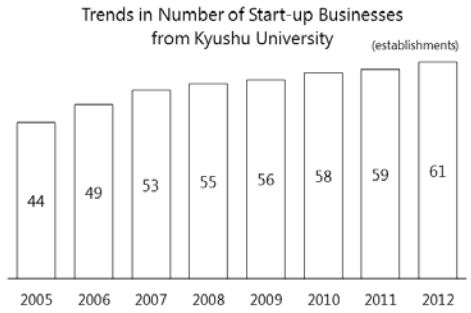
Number of industry-academia collaboration projects organized by ISIT which is an extra-departmental body of Fukuoka City has been increasing recently, and the amount of external funds is also tend to increase. It indicates that the relationships between local research institutes such as Kyushu University and the local corporations are getting stronger.

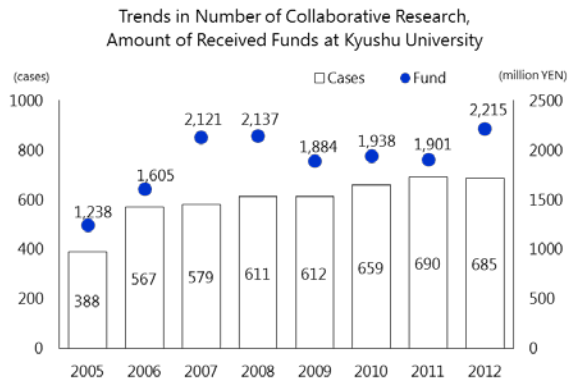
In the global intellectual property market, it has been becoming common to use only necessary intellectual property right without paying monetary royalties by signing the cross-licensing agreement, which is considered the important perspective of utilizing the research result actively.

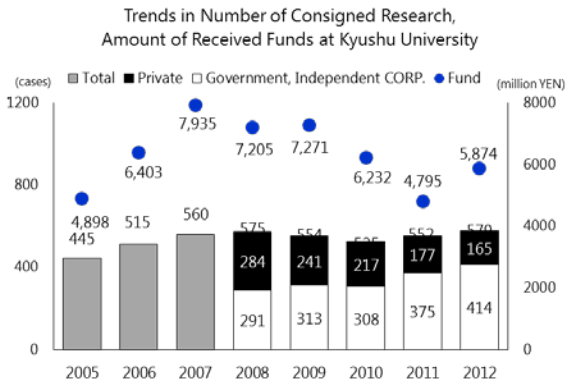
In Kyushu University, case of using intellectual properties is also increasing, and the movement of carrying a role of local economic activities has been expanding with start-ups and collaborative research projects with corporations.











Note: The amount of received external funds is the amount of received business income on the statement of net assets.

Sources: Institute of Systems, Information Technologies and Nanotechnologies; Kyushu University; Industry-University-Government Collaboration Management Center of Kyushu University.

From industry clusters to industry crossovers.

The result of research activities has an important value in economic activities as an "intellectual property", and it can also boost the local economy by actively being used by corporations.

There is an accumulation of corporations as an industry sector in Fukuoka City and its surrounding area, as well as a large number of research institutes such as Kyushu University.

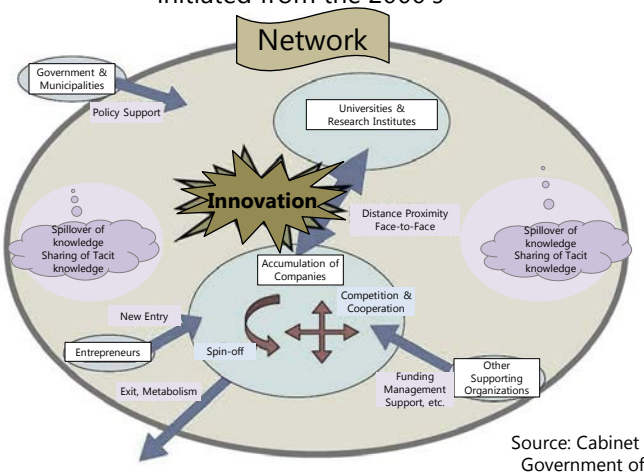
Since 2000's, Japan government has worked on the promotion of industry innovation by the local industry-academia network, under the concept of "Industry Cluster", which created many industry clusters in Fukuoka.

There are diversified type of industry-academia collaborations such as corporation leading collaborations, university leading collaborations, and other collaborations.

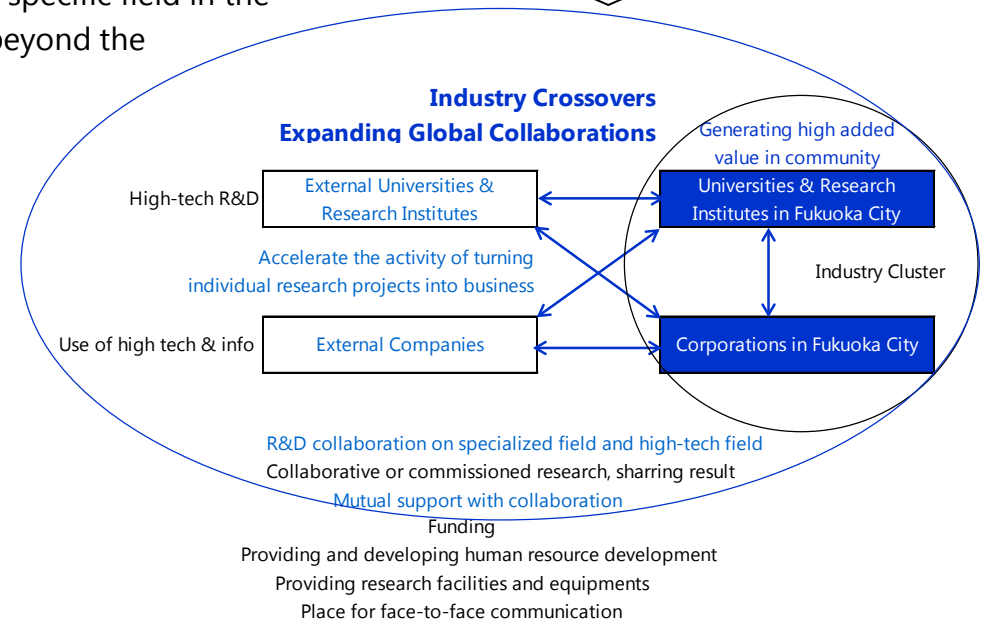
It is expected that expanding these collaborations with foreign corporations or universities would bring larger value to the local community.

There is a corporation which requires a specific technology in a specific field in the world. It is necessary to look for an opportunity of crossovers beyond the boundary of local regions.

Conceptual diagram of industry clusters by inner community business-academia collaborations initiated from the 2000's



Source: Cabinet Office, Government of Japan



Fukuoka Prefecture Industrial Cluster Policy
① Establishment of a hub of system LSI related industries (Silicon Sea Belt Fukuoka Project)
② Establishment of a hub of biotechnology-related industries (Fukuoka Bio Valley Project)
③ Establishment of a hub of new hydrogen energy industry (Fukuoka Hydrogen Strategy Hy-life Project)
④ Establishment of a hub toward low-carbon society (Environmental model city, Coal Gasification Project)
⑤ Establishment of a hub of nanotechnology-related industries (Nano Fukuoka 21 Project)
⑥ Establishment of a hub of training base of the robot related industries
⑦ Establishment of a forefront hub of Asian automobile (Northern Kyushu Promotion Programme of 1.5 Million Units Production Base)
⑧ Establishment of a hub of information and contents industry

Note: Industrial Cluster was introduced and popularized by Michael Porter in *The Competitive Advantage of Nations* (1990), and is a geographic concentration of interconnected businesses, suppliers, and associated institutions in a particular field.

Source: Fukuoka Prefecture. "新成長産業クラスター連携融合拠点構想"(Concept of New Growth Industrial Clusters Collaboration Hub).

Diversified styles of research activities in local community.

Although research & development has been actively held mainly in science and technology field, the field where corporations are using the research result has been expanding, and the way of usage has been diversified.
Research activities have also been held in fields other than science and technology.
In Fukuoka, there are a variety of industry-academia collaborations such as the Grameen Greative Lab by Kyushu University and Prof. Yunus and the cosmetic valley & Karatsu City cooperation agreement.
It is essential to keep a perspective of having a potential to enter into the worldwide spotlight no matter which field the research activities are held, as a new type of growing business model, by having individual research activities directly connect to the world.

The Grameen Creative Lab

THE GRAMEEN CREATIVE LAB
PASSION FOR SOCIAL BUSINESS

Kyushu University concluded the agreement with Grameen Communications represented by Muhammad Yunus, founder of Grameen Bank, who is also awarded the Nobel Peace Prize, and established Grameen Technology Lab, Yunus & Shiiki Social Business Research Centre studying social business to solve social problems by linking poverty and the sustainable economic theory.

Vision 2015: The Grameen Creative Lab

"I believe that we can create a world without poverty because it is not the poor that create poverty." - Prof. Yunus.
The Grameen Creative Lab's mission is to accelerate social business.

Cosmetic Valley & Karatsu City Cooperation Agreement

The city of Karatsu concluded the agreement of the cooperation with Cosmetic Valley, a technopole of French cosmetic industry. The city of Karatsu aims for boosting local economy through business exchange and R&D of ingredients and products while Cosmetic Valley aims for building a strategic cosmetic industry hub for Asian market in Karatsu City.

Collaborative Projects

Business exchange, Negotiation	Business exchange with Cosmetic Valley in Franc.
Business challenge	To support for developing the 6th industrialization, and to prepare the new business environment.
Research & development	Research and cultivation of safe and effective ingredients, and development of high quality products.
Collecting, transmitting & providing information	To promotethe city as the town of cosmetics by transmitting information, and to support developing Asian market.

Sources: The Grameen Creative Lab; Karatsu City.