

CURRENT PROGRESS OF GLOBAL NETWORK STRATEGY THROUGH INDUSTRY-ACADEMIA COLLABORATION IN GIGAKU TECHNOPARK NETWORK OF NAGAOKA UNIVERSITY OF TECHNOLOGY AND OVERSEA BASES

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Abstract

Nagaoka University of Technology (NUT) is building a global network of educational systems through global collaboration with GIGAKU TECHNOPARK (GTP) in Vietnam, Thailand, Malaysia, Mexico, India, Mongolia, Spain, and Romania to promote higher engineering education with advanced technology. In particular, the GTP offices in ASEAN and Mexico are of quite importance as strategic area hubs for Japanese companies that are expanding their business activities overseas. Therefore, efficient collaboration with overseas academia and subsidiaries through the GTP network has strongly supported their business, especially for SMEs through industry-academia-government collaboration. This aims to promote the globalization of academia and companies in strategic countries, to support engineering education programs based on the GIGAKU philosophy and to the development of innovative technologies in each country and ultimately produce global engineers with advanced technologies.

Keywords: *Academia-company cooperation, Global research, practical engineer education, human resources, Internationalization of the University and company*

JEL Classification: F01; F22; F35; I2; I21; J8; O14; O15

1. Introduction

Many universities are actively training students who can play an active role in the international community. In line with this trend, global human resource development is being carried out through class lectures and overseas experiences in each university. The significance of the globalization of universities is also directly related to the way of global human resources and the development. Thus, each university is taking distinctive measures. In this process, following is urgent to produce the human resources; people who have a sense of identity in a globalized society, who can communicate with people around the world, and who can take leadership. In addition, the globalization of universities needs to be promoted through the shared advancement of education and research. One strategy is to promote the development of educational activities with overseas, including the use of overseas bases, and to actively promote the use of overseas campus systems.

In 2014, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) adopted 37 universities as Top Global Universities in order to provide priority support for

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university reforms (Ministry of Education, Culture, Sports, Science and Technology-Japan, 2014), and Nagaoka University of Technology (NUT) was recognized as a university that leads Japanese society as a global leader. Since its inception, NUT has been producing creative and practical human resources through joint industry-university education and research with industry and academia. The project is an opportunity to promote internationalization of the university and the development of global human resources through industry-academia-government collaboration (Niihara, 2015). As a measure to achieve this goal, NUT aims to improve its educational achievements and internationalization by focusing on its overseas network strategy. The "GIGAKU Technopark (GTP)" network is one of them. The main purpose of this network is to expand the model of industry-academia-government collaboration in overseas to foster practical global engineers who can meet the needs of society, and to support and drive the globalization of Japanese companies through global industry-academia-government research. There are four main areas of development in the GTP:

- 1) the development of practical education in technology and the production of global human resources through an industry-academia fusion campus,
- 2) the industrialization of technology through international joint research projects,
- 3) the production of practical global engineers,
- 4) the globalization of Japanese small and medium-sized companies (SME) through the support and promotion of GTP. This paper provides an overview of the current progress of the GTP network in terms of educational programs and industry-university collaborative research as current topics.

2. In NUT, how do we educate engineering students with practical skills and global sense?

It is difficult to teach practical skills that match those of companies actually developing products in technical education at university campuses. But there is the fact that these skills are essential in the enterprise, although it is still difficult for universities to teach skills that match those of companies. Education is not achieved by only teaching, so we need to produce people who can think quickly (Kawakami, 1979). To achieve this important goal, we need to develop a new generation of engineers with practical expertise and a creative approach. NUT established in 1976, has been implementing engineering education under the new concept with an emphasis on graduate education and research focusing on the development of practical technology. In particular, in order to teach practical skills to NUT students, we have been promoting industry-academia collaboration and developing joint research with companies since the opening of the university. Since 1986, we have been one of the first universities in Japan to require all undergraduates to offer long-term internships to undergraduate students instead of graduation research. The corporate internships, called Jitumu-Kunren (practical training), are very beneficial for practical research and development in master's research. In addition, the experience of graduate students participating in joint research with companies and developing technology together with company engineers is an effective way to create practical skills. So, those two points have been carried out for practical ability education under GIGAKU (技学) philosophy, representing scientific approach to technology for aiming for industry innovation (Transaction on GIGAKU, 2012).

In addition to this, in recent years, there has been an urgent need to train engineers who can be active on a global scale. Recognized as a Top Global University, NUT has been developing its engineer education in cooperation with overseas universities. The aim of this trial is to establish a NUT office at an overseas base in collaboration with the cooperation universities, to promote joint education and research, and to accelerate staff exchange.

3. Performance of GTP global network

Establishing a global network of overseas offices

In order to realize this strategy, NUT has been building a global network, and by 2021, has established 12 GTP offices in Mexico, Vietnam, Thailand, Malaysia, India, Spain, Romania, and Mongolia, where NUT and the overseas base are cooperatively conducting joint research and education with local universities. Overseas-based networking is very important for multiple growth and efficient operation especially for the globalization of university. From this perspective, the NUT has selected the following overseas-based partners in countries and partner schools (Date of establishment in parentheses), where Japanese companies have established operations and where there are positive prospects for the future, to develop and operate the GTP network (Figure 1).

Mongolia: Mongolian University of Science and Technology (2015, March).

Mexico: University of Guanajuato at Salamanca and Guanajuato (2015, March).

Vietnam: Hanoi University of Science and Technology (2015, March).

Thailand: Chulalongkorn University (2015, October).

Spain: Basque Centre for Climate Change (2017, April).

Malaysia: University of Science Malaysia (2016, March).

India: Indian Institute of Technology Madras (2018, September).

Chile: Santiago city (2018, November).

Romania: Romanian-American University (2019, October) and Babes-Bolyai University (2019, October)

The reason for choosing a particularly strategic country is that industry-academia collaboration can facilitate the overseas expansion of Japanese companies and also enable them to develop their own technology on a foreign company basis. In these regions, the GTP network can effectively engage and support global industry-academia collaboration without difficulty. Especially, the GTP offices in ASEAN at Vietnam, Thailand and Malaysia and Mexico are of quite importance as strategic area hubs for Japanese companies that are expanding their business activities overseas in these countries.

New Overseas Expansion Strategy via GTP

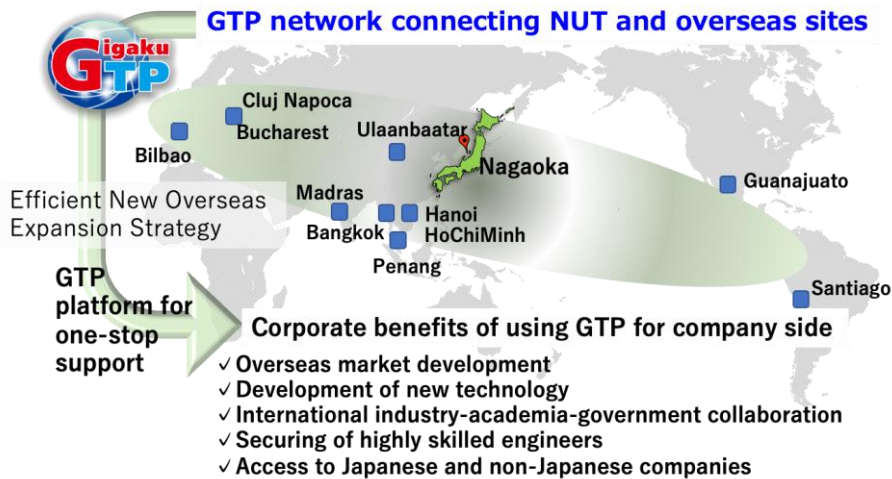


Figure 1: GTP global networking and benefits for company side who participates in the GTP global program

Promotion of global industry-academia collaboration

In particular, global industry-academia collaboration research is very important not only for universities but also for companies. Namely, on the university side, the base office can contribute to the revitalization of globalization of education and research. In addition, corporate research funding can stimulate university research and human exchange. On the corporate side this can support Japanese SMEs' innovation in industrialization like technology development and product manufacturing efficiency in oversea. Other than this, GTP supports the overseas expansion of Japanese SMEs, their conversion into venture companies, and the sustainable innovation of Japanese and local companies in oversea. In addition, GTP supports business matching of companies located in Japan and other counties. This one-step support through GTP enables efficient corporate overseas expansion and brings the advantages to companies, as shown in Figure 1.

For these reasons, NUT has been trying to promote joint industry-university research, especially in Mexico and ASEAN countries, which are strategic regions. Therefore, NUT aims to realize industrial innovation through global joint research with Japanese companies and supports the overseas expansion of Japanese companies by promoting research and human resource into the needs of domestic and overseas companies. Especially, this system becomes an efficient way for globalizing SMEs, which do not have efficient systems of globalization. One of this for SMEs is a less global network and others are weak in terms of foreign language communication and less in such global engineer.

Global researches in strategic countries

The NUT and its overseas partner schools have made good use of the GTP in this process by utilizing the university bases and network to develop joint industry-university research in each strategic country. In the conventional approach in R&D at the country

concrete bases, problem solving and innovation have been highly dependent on the direction of home country headquarters. This results in slow problem solving and closes off the possibility of foreign- based technological innovation. The global research system via GTP has the advantage of introducing equipment, technology, and human resources from overseas based universities to the Japanese overseas base, which can compensate for the above shortcomings. Of course, the NUT and the headquarters in Japan can collaborate to support the overseas based universities and local companies. This style of research has supported 30 global collaboration research projects, 46 research supports like approach suggestion and technical consultant and also 49 overseas advancements in the year range of 2015 and 2020. Among their countries, the numbers of collaboration research projects with companies were 14 and 8 in Mexico and Vietnam, respectively. These results reflected the population numbers of advanced companies in Mexico and Vietnam. The high demand for joint research in Mexico is due to the fact that many Japanese automobile companies have advanced into the country as a base for exporting automobiles to North America. On the other hand, in Vietnam, the number of Japanese companies relying on GTP support is increasing every year due to the high overseas expansion trend of Japanese companies. This trend is due to Vietnam's attractive labor costs and the fact that the Vietnamese retain the production capacity to cope with advanced technology. In addition, Japanese companies and factories in the region are eager to develop their own local technologies. Thus, as research support, there are many requests for consulting services from the university side (Fig. 2 right pictures).

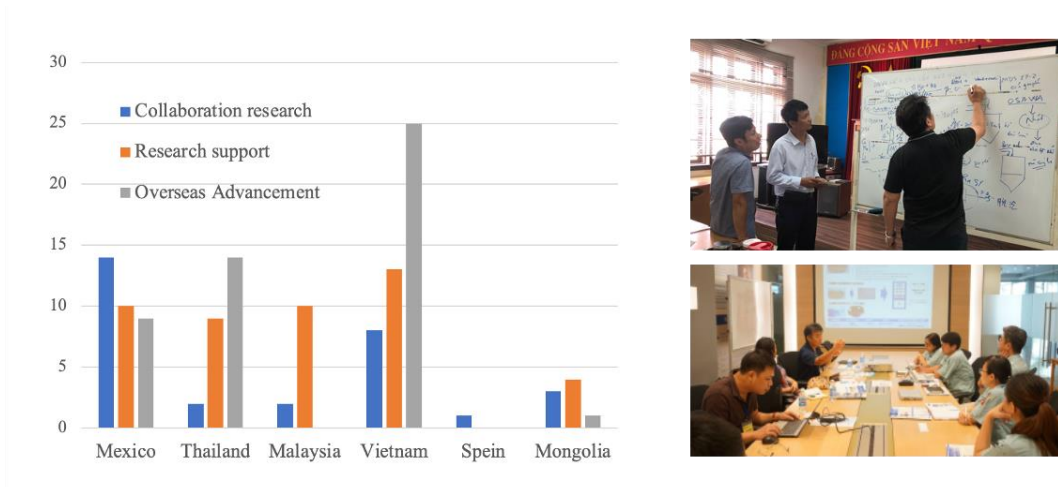


Figure 2: Project numbers of collaboration research, research support and overseas advancement in each country in the range of 2015-2020 (left) and pictures of technical consulting in Hanoi at Vietnam local company (above) and Japanese subsidiary (down).

Collaboration between students and corporate engineers

Global collaboration has the advantage of encouraging joint research between universities in Japan and strategic regions through the GTP. In this process, students and corporate engineers can participate in practical global applied research at overseas

factories, providing a place where they can learn about manufacturing in a practical way, which is useful for building and operating a new system for human resource development.



Figure 3: Pictures of collaboration of student and corporate engineers. a) Air conditioning research in Hanoi (2015-2020), b) Material shaping research in Guanajuato (2016-2019) , c) Product automation evaluation and interfacing development in Bangkok (2016-2018), d) Biomass waste material recycling in Penang (2019-2021).

Human resource exchange

Another advantage of the global collaboration is that of securing excellent human resources for company side. The reason is that companies always want to recruit and secure the best engineers. Because of this, GTP promotes mutual human resource exchange between overseas and Japan. From the company's point of view, it is a great opportunity for recruiting to see the quality and ability of the students who participated in the joint research, and from the student's point of view, they can add the company to their recruitment choices. For this reason, GTP also supports the supply of human resources from the local universities to Japanese companies, reflecting the intentions of students and companies.

Such a system can provide a convenient place for universities and companies to match human resources, and there are successful examples in Mexico and Vietnam, as shown in Figure 4 (a-c). In Japan, this trend of hiring overseas highly skilled human resources is on the increase, reflecting the global business. However, there is no clear approach yet, and the GTP case study provides a useful policy for future trends. However, in the recruitment system of advanced engineers using GTP, it is possible to proceed smoothly through interviews (Fig. 4 a in Hanoi) and site visits (Fig. 4 b in Mexico and Fig. 4 c in Japan, respectively) at GTP bases.



Figure 4: Pictures of student interviews for recruit students of a) HUST in 2017, b) Ho Chi Minh University of Science on 2019 and c) University of Guanajuato in 2015. Global internship of foreign students of (d) Thailand, (e) Malaysia and (f) Vietnam. There are pictures of domestic internships in (g) Mexico and (h) Malaysian bases of Japanese company.

As a measure to obtain external funding, global industry-university collaborative research is useful for the university side. Here, the GTP network can use it to support the overseas expansion of companies, which can be used as operational funds for the project. One way to use the fund is to accept foreign students for global internships in companies. The research funds are used to pay for the students' travel to Japan. This will reduce the financial burden on the students and train the companies in globalization by accepting foreign student interns.

Internships are an opportunity for companies to observe student talent, and the GTP network has been working to improve the efficiency of these internships through domestic and international internships. There is an example of an industry-academia joint research project in which the research funds were used to pay for internships at Japanese companies to improve both the research results and human resource development. Figure 4 d, e and f are pictures of global internships in Japan for foreign students from Thailand, Malaysia and Vietnam, respectively. As a result, for example, one company in Mexico has been hiring engineers from the University of Guanajuato every year since the start of the plant in 2016 (Figure 4g), and a similar case is happening at a Japanese local plant in Malaysia (Figure 4h).

As a result, these internships are effective in helping students find jobs, and companies recognize that they are effective in securing human resources and globalization.

In addition with the human resource exchange, there is exchange for cooperation in developing local sales channels, training company engineers and providing oversea information, etc., the company will be provided with funds. In this way, a new approach that emphasizes sustainability is being adopted by GTP for contributing to energy conservation for corporate globalization.

4. Conclusion

The current progress of international industry-academia collaboration using the GTP network was explained in this review. In 2015-2021, NUT and the oversea bases have been able to support the overseas corporate base in the fields of technology development and human resource development, and have contributed to the revitalization of collaboration between universities and companies. As a result, the effect of the GTP project is as follows;

- 1) Development of practical, global human resources and engineers to meet the demands of global society and lead such activities through industry–government–academia joint research projects.
- 2) Globalization and industrial development in the host countries will be promoted by putting GTP project research to practical use.
- 3) Development of GTP strategies by global accomplishments of university and companies especially as cultivated by having networking SME participates in both Japan and other countries.
- 4) Mobility up to students & faculty staff on between industry and academia is a good way to support the advancement of technology in companies, resulting in matching between companies and students, and helping to secure human resources in companies. This can give companies the ability to make globalization possible in terms of technology and human resources. In particular, this approach is extremely beneficial in helping SMEs.

As an author, I hope that each review at the oversea bases in GTP global network gives you an idea of the range of new educational and technical ways for globalization in universities and companies, being a useful and good example for the development of global engineers.

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