

University-Industry Linkages in Promoting Technical Skills for Human Resource Development, Case Study of Thailand

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Abstract

Labor productivity is an important goal for national sustainable development. Thailand has a potential labor force and attracts significant foreign direct investment, especially from Japan. This research paper presents the current situation of labor productivity in Thailand and discusses how to upgrade the technical know-how for Thai engineering students through technical assistance from Japanese organizations and firms. This paper argues that the labor productivity of Thailand cannot boost the workforce's skill without cooperation with foreign firms and organizations (Japanese ones in this case). This paper also raises the issue of university-industry linkages, which require comprehensive strategic cooperation between theory-based education and technical training, all of which contributes to the quality and adaptability of the labor force. This is a qualitative study based on interviews with Japanese organizations, Japanese firms, and universities in Thailand on how to enhance the technical skills of the labor force in the manufacturing industry. The paper uses a case study of Thai-Nichi Institute of Technology (TNI), which describes the training and "learning by doing" methods to upgrade the technical skills of the Thai workforce.

Keywords: human resources development; university-industry collaboration; Japanese firms; labor productivity; Thai-Nichi Institute of Technology.

Introduction

This paper discusses the cooperation between universities and industries to promote technical skills of students. "Cooperation," the training where Japanese firms deliver engineering workshops for Thai students, and "technical skills," which are used in the manufacturing industry, can lead to industrial growth in Thailand. The paper chooses the manufacturing industry since it is the key to successful economic development, as they create employment, incomes and demand, and accelerate productivity growth (UNCTAD, 2015). By manufacturing

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industry growth, Thailand can develop economic sustainability through said training and this paper helps to highlight what kind of training is effective for the students.

Thailand and Japan have a long partnership in direct investment. Among Southeast Asian countries, Thailand is a major beneficiary of Japanese Foreign Direct Investment (FDI), with many Japanese firms operating in Thailand. In 2021, according to 2021 Japan External Trade Organization (JETRO) Survey on Business Conditions of Japanese Companies Operating Overseas (Asia and Oceania), Thailand ranked second among countries in Southeast Asia where Japanese firms aim to expand business overseas (JETRO, 2021).

The Thai workforce has been important to the productivity of Japanese firms operating in Thailand. Thus, upgrading the technical skills of the Thai labor force is an essential mission for both Thailand and Japanese firms. However, 48% of 314 Japanese manufacturing firms that operate in Thailand are facing difficulty in the quality of employee's work (JETRO, 2021).

In order to upgrade the technical skills of Thai employees, especially in Japanese firms, this paper uses a case study of Thai Nichi Institute of Technology (TNI), which describes the hands-on training and methods used to upgrade the technical skills of the Thai workforce. This paper also highlights the importance of university-industry collaboration, in both the public and private sectors.

This paper aims to explain the current situation of university-industry collaboration in Thailand; therefore, the author uses case studies to better capture and approach the problem rather than discussing it on a theoretical level. The TNI case study is suitable to approach the issue since the institute was established in cooperation with the Thai government and the Embassy of Japan in Thailand to promote domestic Thai engineering at request from Japanese manufacturing firms operating in Thailand.

Literature Review

Labor Productivity for sustainable development

Labor productivity and its roles in the stable development of an economy are studied through many international organizations. According to International Labor Organization labour productivity measures the efficiency of a country, and offers a metrics of economic growth, competitiveness, and living standards within a country (ILO, 2015). The Organization for Economic Co-operation and Development stated that productivity is a key source of economic growth and competitiveness. Labor productivity is a key dimension of economic performance and an essential driver of changes in living standards (OECD, Cross-country comparisons of labour productivity levels, 2000).

The role of industry and university linkages for sustainable education

There are many scholars that stress the importance of the sustainable industry-university linkage, which is technology transferred from the firm to the university. According to Final Report - Study on the cooperation between Higher Education Institutions and public and private organizations in Europe, there are five levels of university-business cooperation (Todd Davey, 2011).

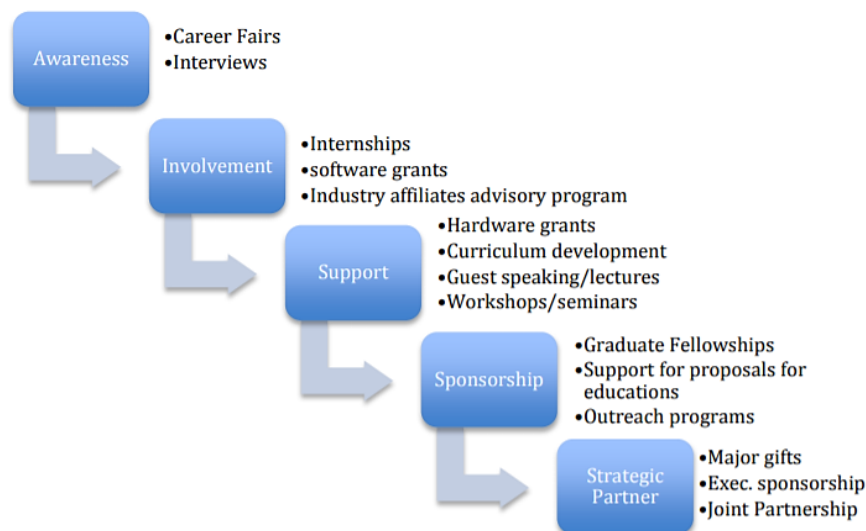


Figure 1. The Levels of University-Business Cooperation

(Source: The State of European University-Business Cooperation Part of the DG Education and Culture Study on the Cooperation between Higher Education Institutions and Public and Private Organizations)

This figure shows the levels of partnership and activities between universities and firms. There are five levels of engagement: awareness, involvement, support, sponsorship, and strategic partners. Each of these levels indicates the roles of the firm in terms of the outcome at the university.

As regards to the partnership between TNI and Japanese firms that are operating in Thailand, it reaches 5 levels from simple to close partner, since the Japanese firms provide courses, partnerships, training, and workshops for Thai students. In this partnership program, Thai students are offered training from Japanese firms, with Japanese engineers as the lecturers. Meanwhile, Japan International Cooperation Agency (JICA) also offers Japanese engineers as lecturers for TNI.

The collaboration between universities and industries can lead to enhanced technological development, beneficial for both the firms and the Thai students. Universities must involve people with networking and managerial skills to attract industry partners (Awasthy, 2020). The industry will therefore add the advantage of practical knowledge to their academic expertise so that the relationship between universities and industry is symbiotic and mutualistic, aimed at advancing technology for the firms and improving the practical knowledge of the graduates. The outcome of this industry-university collaboration can be defined through the quality of development in the graduates, the opening of career opportunities, and the advancement of firms' R&D (Tertuze, 2010). Learning by doing is especially important in Japanese firms, where on-the-job training is an essential part of the process of knowledge transfer. There, seniors or experts will transfer knowledge to juniors through actual job experience. Then the junior, as the student, learns new skills directly from the seniors. So that the skills and know-how can be maintained and transferred within the firm's workers.

The table below specifies the level of cooperation between industry - university. It explains that universities and industry can have many types of collaboration, from high to low intensity. This is in reference to on-the-job training, which was highlighted previously.

There are three levels of university-industry cooperation, from low, medium, to high intensity partnerships.

High (Relationships)	Research partnerships	Inter-organizational arrangements for pursuing collaborative R&D, including research consortia and joint projects.
	Research services	Research-related activities commissioned to universities by industrial clients, including contract research, certification, quality control.
	Shared infrastructure	Use of university labs and equipment by firms, business incubators, and technology parks located within universities.
Medium (Mobility)	Academic entrepreneurship	Development and commercial exploitation of technologies pursued by academic inventor through a company they (partly) own (spin-off companies)
	Human resource training and transfer	Training of industry employees, internship programs, postgraduate training industry, secondments to industry of university faculty and research staff.
Low (Transfer)	Commercialization of intellectual property	Transfer of university-generated IP to firms.
	Scientific publications	Use of codified scientific knowledge within industry.
	Informal interaction	Formation of social relationships (conference, meetings, social networks).

Figure 2. The typology of - industry - university links, from higher to lower intensity
(Source: A typology of University-Industry links, from higher to lower intensity, from paper "Promoting University-Industry Collaboration in Developing Countries," by José Guimón, World Bank, 2013 (Guimón, 2013))

The most intensive relationship between university and firms, "high", covers research partnerships, research services, and shares technology, quality control, and collaborative R&D. The "medium" relationship between universities and industry consists of academic entrepreneurship and human resource training/transfer, which focuses on spin-off companies and training programs for students. The "low" relationship between universities refers to informal interaction. Universities-industry linkage can also be informal interactions, scientific publications, commercialization of intellectual property and activities such as conferences, meetings, and social networks. In Thailand, the relationship between universities and industry is at the medium level. This can be seen in the relationship between the TNI and Japanese firms, which includes technical transfer from firms to students through workshops and training activities in factories.

The role of industrial training in engineering education

The industrial training is seen as essential for the sustainable development of engineering students. The training or internship provides relevant theoretical knowledge and useful

practical experience to deepen the students' understanding of the material in their previous studies. The internship enriches the experience by allowing the student participants access to the real work environment (Stansbie, Nash, & Chang, 2016).

An example from the industrial training program for engineering students from the Department of Electrical, Electronics and Systems Engineering of the Faculty of Engineering and Built Environment, the National University of Malaysia. During this training, the students obtain hands-on experience for their engineering careers before they graduate. After the training, the students have obtained relevant experience to match the objectives and which is only available in this training program (A. Ayob, 2012).

In the Work Experience Questionnaire (WEQ)¹ where 447 engineering students from Portuguese public universities and polytechnic schools participated, the effectiveness of industrial internship for engineering students was demonstrated. As the result of the internship, most students not only gained the technical competence but also non-technical abilities such as teamwork skills and positive attitudes and readiness into the world of work (Teresa Nogueira, 2021).

In November 2018, a survey in Taiwan was carried out, which included a total of 332 completed questionnaires collected from vocational students who participated in a one-year internship with manufacturing firms. The questionnaires focused on (i) academic self-efficacy, (ii) school engagement, Intern engagement, (iii) perceived usefulness of the internship and (iv) intention to continue with the internship. The purpose of the survey was to understand how vocational students engage at school and in firms to learn practical skills. The result of the study illustrated that practicing at firms provides real work experiences, where the need of production is a requirement, while learning at school is involves to theory (Jon-Chao Hong, 2021).

Other benefits of the industrial trainings are that the universities can collect feedback on students' performances and adjust the curriculum and study programs accordingly. The Faculty of Engineering and Built Environment (FKAB) of the National University of Malaysia has decided to include the Industrial training as part of accreditation requirements. The industrial training program is regarded as a compulsory course that students need to take after the sixth semester at university. By doing so, the faculty will continuously be able to monitor the quality of its engineering education (Nordin Jamaluddin, 2013).

Methods

This paper uses qualitative research methods where the author conducted three study trips to Thai Nichi Institute of Technology (TNI) in Bangkok, Thailand. During the trips, the author interviewed three lecturers from TNI: Dr. Watcharin Noothong, the Head of Monozukuri Program; Asst. Prof. Jintawat Chaichanawong, Director of Master Program in Engineering Technology; and Mr. Niita, Japanese expert from Japan International Cooperation Agency (JICA) on interconnectivity for the collaborations between TNI and Japanese manufacturing firms and organizations. Furthermore, the author conducted email interviews with Dr. Mahunnop Fakkao, who is the coordinator of Monozukuri program of TNI.

¹ <https://core.ac.uk/download/516511616.pdf>

Results and Discussion

The current state of the labor force in Thailand

Thailand had an estimated population of 70 million in 2021², ranking it fourth in the ASEAN region, after Indonesia, the Philippines, and Vietnam. According to the 2017 report from the United Nations, Department of Economic and Social Affairs entitled *World Population Prospects: The 2017 Revision*, Thailand is facing a rapidly ageing population. The report showed that the number of people aged 60 and above is expected to double from 2015 through 2050. The fertility rate of Thailand in 2021 was 1.49,³ which is regarded below-replacement fertility, (United Nations, 2006) and a warning that Thailand might perhaps lack labor force in the future. In terms of productivity per hour worked in 2022, Thailand's productivity is lower than Malaysia, Japan and Korea in the region.

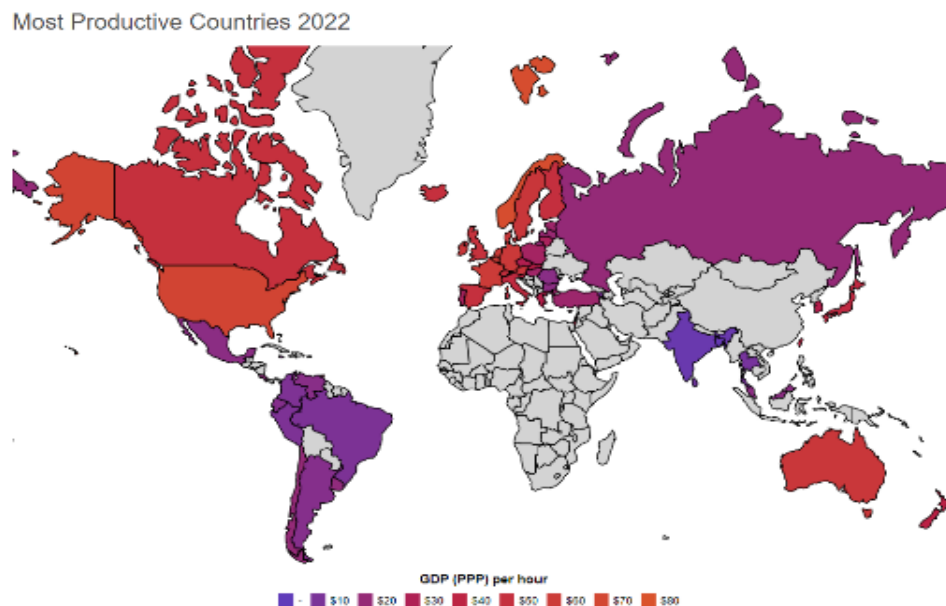


Figure 3. World's productivity per hour works in 2022

(Source: Productivity per hour worked, 2022)

The figure demonstrates the productivity per hour worked in the world in 2022. The indicators are measured in USD. The GDP per hour is a measure of labor productivity, which is considered a key source of economic growth and competitiveness. In the ASEAN region, the most effective labor input in Asia is Japan, with \$50/hour, followed by Singapore and South Korea with some \$40/hour.

The old-age dependency ratio is defined as the number of persons aged 65 or more relative to the 20-64 years old population.

² [https://www.worldometers.info/world-population/thailand-population/#:~:text=Thailand%20Population%20\(LIVE\)&text=The%20current%20population%20of%20Thailand,the%20la test%20United%20Nations%20data.](https://www.worldometers.info/world-population/thailand-population/#:~:text=Thailand%20Population%20(LIVE)&text=The%20current%20population%20of%20Thailand,the%20la test%20United%20Nations%20data.)

³ <https://www.nationthailand.com/in-focus/30402542>

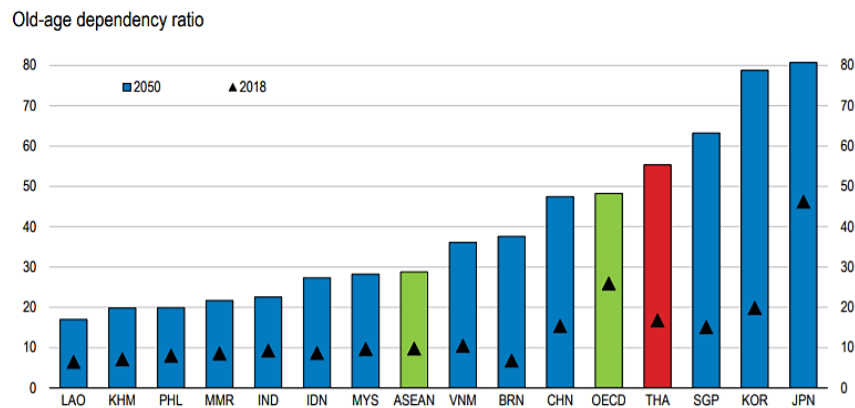


Figure 4. Old -age dependency ratio in Asia region

(Source: United Nations, Department of Economic and Social Affairs, Population Division (2019); World Population Prospects 2019, Online Edition. Rev. 1 (UN, 2019))

The graph above demonstrates that Thailand is the second fastest aging country among ASEAN member states, and which eventually may lead to a shortage of labor. Compared with other emerging economies in the ASEAN region, such as Vietnam and Myanmar, Thailand has become less desirable in terms of labor competitiveness.

In terms of percentage of labor participation in Thailand, the workforce has decreased from 2011 to 2020 as measured in figure 5. Even though the labor force increased between 2017 to 2020, it was still less than in 2011. Since human resources are core in economic contribution, this will become a challenge for economic growth if productivity is not increased accordingly.

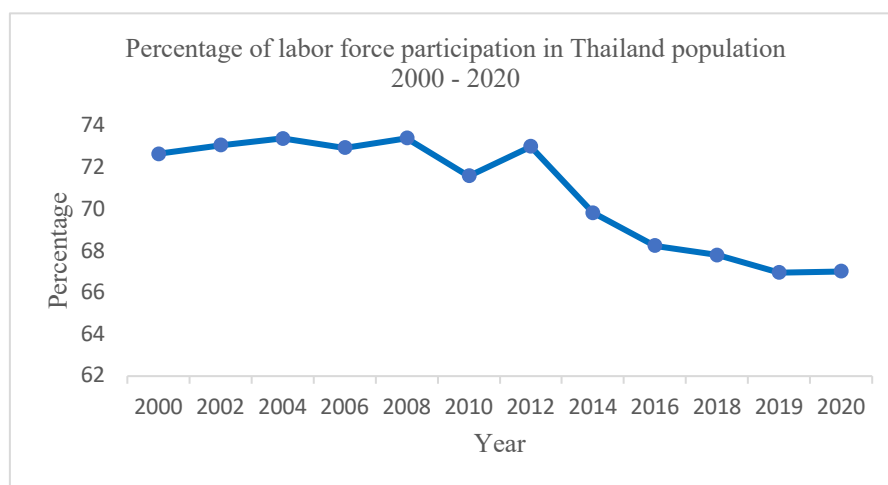


Figure 5. The situation of workforce in Thailand from 2011-2020

(Source: Author’s calculation based on Work Bank Labor Data, March 2022)

According to Japan External Trade Organization (JETRO) “Survey on Business Sentiment of Japanese Corporations in Thailand for the second half of 2019”, 41% of the Japanese

manufacturing firms have been facing a “shortage of engineers” and 56% firms noted that “There is personnel shortage in terms of quality.” This has become a major challenge for Japanese firms in Thailand. The lack of skill set of the engineering workforce will require enhanced training, knowledge gaining, skills upgrading to keep up Thailand’s productivity growth.

Japan – Thailand economic partnership

Japan has been recognized as a strategic economic partner of Thailand. Japan has been the biggest FDI contributor to Thailand for the last 10 years and has been instrumental in the development of the infrastructure and economic structure of Thailand.

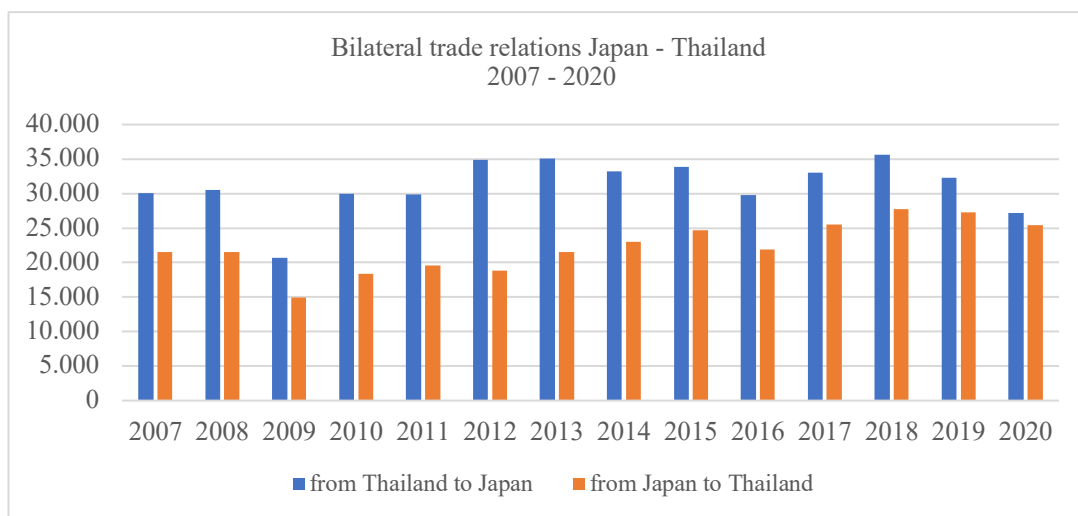


Figure 6. Bilateral trade relations Thailand – Japan from 2011 to 2020
(Source: Ministry of Foreign Affairs Japan)

This figure is addressing the trade relations between Japan and Thailand from 2007 to 2020. As highlighted, the trade balance is asymmetrical, with Japan importing than exporting. But since Japanese firms have established manufacturing facilities in Thailand, with the majority of export products being electronic equipment and machinery, the trade relationship has over time grown increasingly in Japan’s favor.

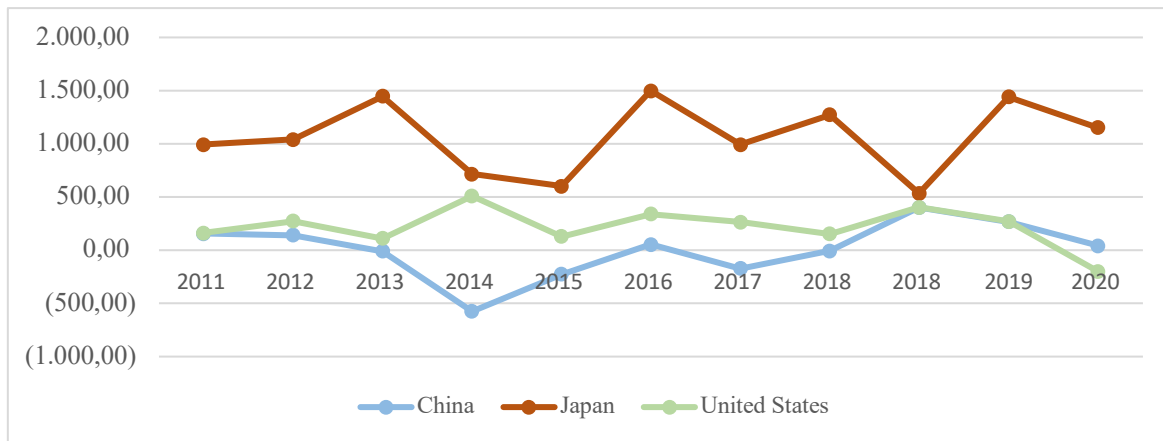


Figure 7. FDI to Thailand from Japan, China and United States from 2011 to 2020
(Source: Bank of Thailand⁴)

The figure shows the Foreign Direct Investment (FDI) from Japan, the US and China to Thailand from 2011 through 2020. The projects and capital from Japan are higher than those from China and the US. However, the indicators describe the instability of FDI from Japan to Thailand with a decrease from 2019 to 2020.

With the benefits of FDI, which bring technology transfer and knowledge from spill-over effects, and which creates the need for a higher-skilled labor force, Thailand should maintain the focus on FDI promotion (OECD Investment Policy Reviews: Southeast Asia, 2019).

Japan – Thailand education partnership

Japan and Thailand have been maintaining a long cordial relationship. The Japanese companies have been investing in Thailand since 1980s. Regarding trade partnership, Japan was Thailand’s third largest exporter and second largest importer in 2019.⁵

There are many joint projects, partnership agreements to enhance the economic-social and education partnership between Thailand and Japan.

Japan International Cooperation Agency (JICA) sent the first volunteer to Thailand in 1981. Since then, JICA have been cooperating with Thai government, organizations and universities to promote Industrial Human Resource Development, Sustainable Industrial Development of Rural Regions, Assistance for the Socially vulnerable.⁶ By 2021, there were 1,077 volunteers, who had been sent to 68 provinces in Thailand for knowledge sharing between Japan and Thailand to ensure sustainable growth and cultural exchanges.⁷

In 2007, the Japan – Thailand Economic Partnership Agreement (JTEPA) was signed which enhance trade, investment cooperation between two countries.⁸

Technology Promotion Association Thailand – Japan (TPA), was established in 1973 to transfer knowledge and technology to Thai personal support the Thai economy and industry

⁴ https://www.bot.or.th/App/BTWS_STAT/statistics/ReportPage.aspx?reportID=654&language=eng

⁵ <https://www.mofa.go.jp/region/asia-paci/thailand/data.html>

⁶ https://www.jica.go.jp/thailand/english/office/others/40th_volunteer_03.html

⁷ https://www.jica.go.jp/thailand/english/office/others/40th_volunteer_03.html

⁸ <https://www.mofa.go.jp/region/asia-paci/thailand/data.html>

growth.⁹ TPA has been providing services such as seminars, training in the Japanese language and culture, business and technology development, and expertise.

Case study of Thai Nichi Institute of Technology

The Overview of Thai-Nichi Institute of Technology

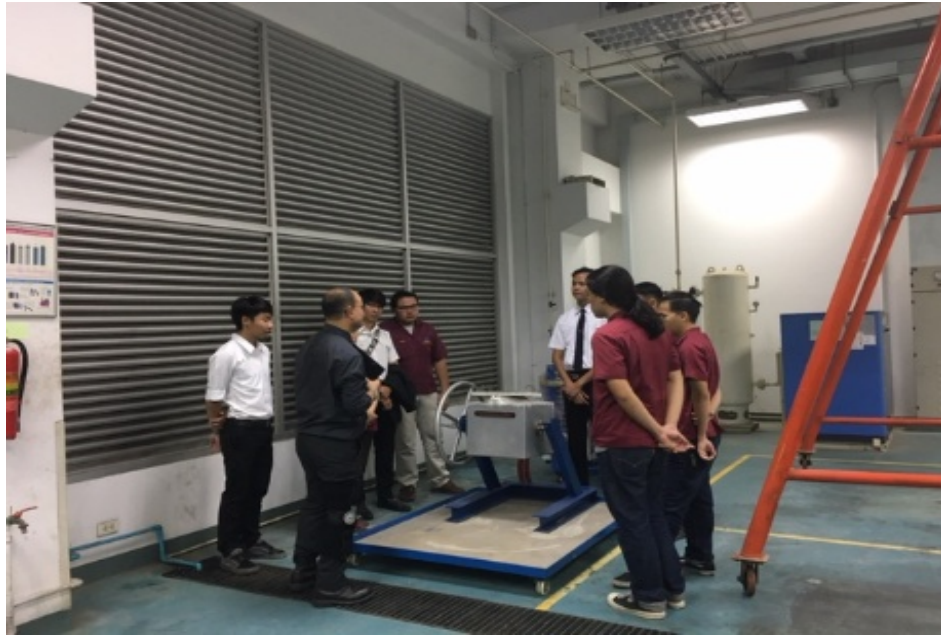
The TNI was established by the Technology Promotion Association Thailand-Japan (TPA) in August 2007. According to Dr. Watcharin, the mission of TNI is to make it possible to meet the personnel demands of Japanese companies in Thailand, those predominantly being more skilled technicians and engineers. TNI's founding was established by Japanese alumni and those who were trained in Japan with Asia Bunka Kaikan (ABK) and the Association for Overseas Technical Scholarship (AOTS). This cooperation will help to improve the quality of graduated engineers from TNI who will work for Japanese firms. TNI will be in charge of recruiting the students and the Japanese firms will contribute with the technical trainings and workshops.

With the objective of supplying skilled engineers to Japanese firms in Thailand, TNI's establishment came from a meeting between several big Japanese companies, the Embassy of Japan in Thailand, the TPA, and the Government of Thailand. In this meeting, the Japanese companies expressed their demand for high technical skills among their Thai employees. These Japanese enterprises needed Thai personnel, but they first had to learn the Japanese language and work culture before they could be employed as technicians in the factories. After the meeting, it was decided that TNI would be the institution to provide a workforce that has acquired technological skills and Japanese language ability. In this respect technological and culture skills, are mandatory in the TNI's curriculum

Monozukuri program - collaboration between Japanese manufacturing firms and TNI

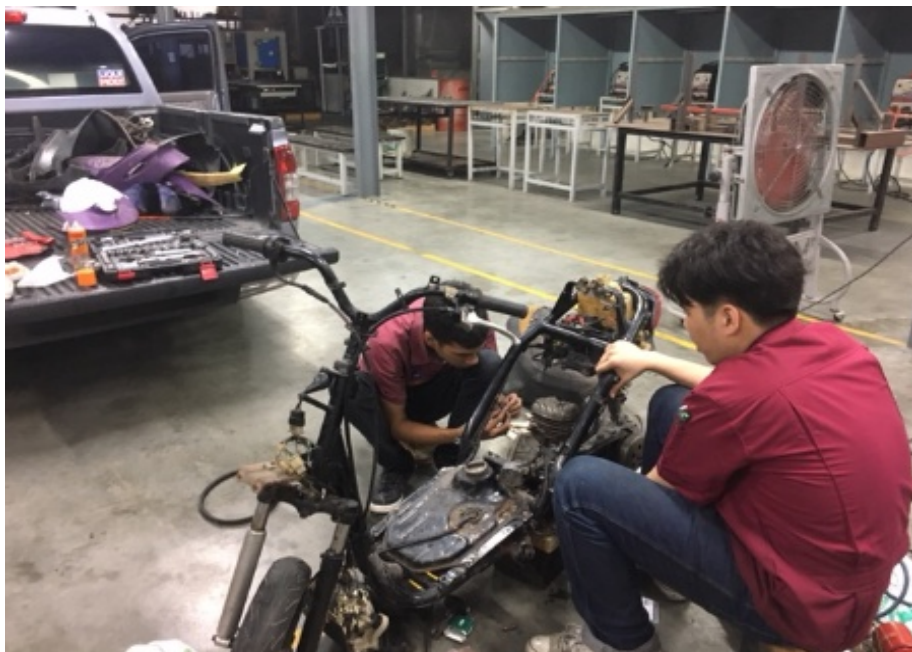
The Monozukuri program began in January 2017 and has been supported by Japanese organizations and companies. This program is sponsored by the ASEAN Economic Ministers and the Minister of Economy, Trade and Industry of Japan (AMEICC) for ASEAN countries and is expected to contribute to a high-quality workforce for Japanese firms operating in Thailand. In addition, the program has been supported by Japan through collaborations between TNI and Japanese firms. TNI and Japanese firms have organized factory field trips, workshops and trainings, where the students are able to learn on the spot with the Japanese engineers and experts. In addition, this program partners with JICA. According to a JICA expert, JICA sends one technical expert every two years to TNI for lectures and trainings in the Monozukuri program. The Monozukuri concept is a competency-based education for the students to acquire job skills based on the demands from the firms and industries, including technical competency, managerial competency, language skill (English and Japanese), and human relations knowledge (TNI, 2018).

⁹ https://www.tpa.or.th/tpanew/default_en.php



Picture 1. TNI lecturer and students during a lecture
(Source: The author took the photo during the research trip to TNI)

In addition, through the workshops, the collaboration with the industry sectors has enlightened best practices of knowledge integration in engineering. Thus, these workshops are not designed only for educational purposes, but also for recruiting. As a result, many students who participated in these workshops have become company staff after the graduation.



Picture 2. TNI students are working at the laboratory
(Source: The author took the photo during the research trip to TNI)

Result of Monozukuri program

The main initiatives between TNI and Japanese firm are on-the-spot training, internships and on-site study programs at the factory and which provides practical and updated knowledge to the students. Dr. Mahunnop Fakkao mentioned that through the program, in the period 2016-2019, more than half of the engineering students were currently working in Japanese companies.

Table 1. Number of graduates from TNI working for Japanese and Thai companies

	Engineering	Information Technology	Business Management
Japanese Company	271	36	191
Japanese Trading Company	46	20	75
Thai Company	240	333	529

(Source: Thai – Nichi Institute of Technology report¹⁰)

From the first batch of the Monozukuri programs 2016-2018, about 96% of TNI graduates went on to work at Japanese and Thai companies. The table 1 is addressing the number of TNI graduates entering employment. TNI provides employees to Japanese companies and Thai companies, covering Engineering, Information Technology, and Business Management, the main majors of TNI. In the engineering major, the percentage of graduates working for Japanese and Thai firms is about the same.

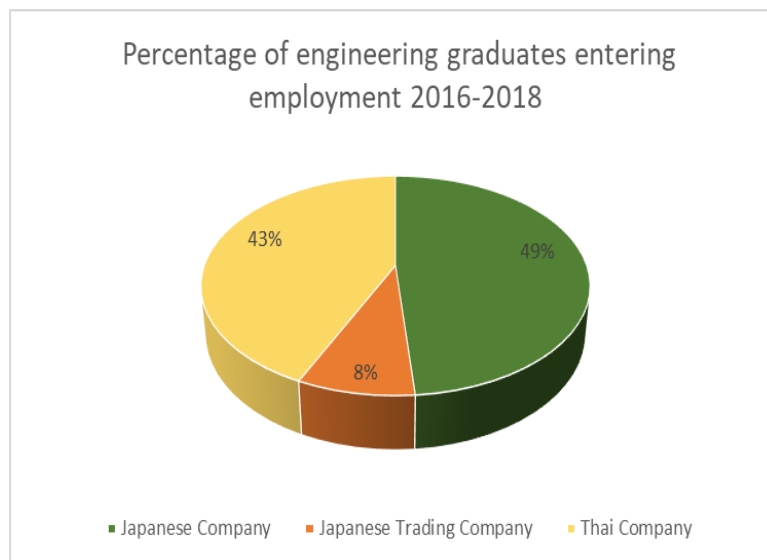


Figure 8. Percentage of engineering graduates, entering employment 2016-2018

(Source: Thai – Nichi Institute of Technology report ¹¹)

¹⁰ https://issuu.com/thainichipublishing/docs/ebroc_tni-guide2020

¹¹ https://issuu.com/thainichipublishing/docs/ebroc_tni-guide2020

The figure 8 shows that the graduates primarily work for Japanese companies and that the mission of TNI, which focuses on offering high quality engineers to Japanese manufacturing and Thai firms, is fulfilled. The Thai firms in this case are the sub-suppliers for Japanese manufacturing firms or cooperate with Japanese firms.

The positive result of the trainings and internships of TNI's students with Japanese firms has been proved from the graduate's comments on their experiences. One of the alumni of TNI, Mr. Charanpat Boonyung mentioned the opportunities to learn academically and to grow as a first-hand experience through the training with university's institute global partner. According to the alumni, the internship from TNI to study and work in Japan provided the best practices for his career path (TNI, 2018).

Adisa Praphanworakhun and Chayanon Chaengsuk, who are alumni from Faculty of Engineering, are currently working at Partners of Filterfine Thailand. Adisa and Chayanon established a branch to supply industrial corporations and components to the Thai market. Both Adisa and Chayanon said that the 'Monozukuri' and 'Kanban' programs made them understand the essential cultural principles in the workplace in Japan and the global stage (TNI, 2018).

Conclusion

For the development goals of a country, governments should become the bridge between the private sector and universities. The relationship between universities and industries influences the human resource development of a country. In this case, universities educate prospective Thai employees for the Japanese firms, which contributes to the economies of both countries. If universities can adopt the standards of Japanese firms in their educational programs, the workforce will be able to meet the required skills of the firms.

In the case of Thailand, the Government of Thailand has given priority to the development of its education system. The Government of Thailand also has good cooperation with the private sector, including Japanese companies operating in Thailand. The case study of TNI is a good model as to why establishing a strong network with foreign firms (in this case, Japanese organizations and companies) is vital for human resource development. Many academic organizations, government organizations, and private companies have supported TNI. These networks have helped TNI to provide practical technical training programs for students; for example, lectures done by technical experts from Japanese firms, on-site tours of industrial plants, and internships.

This paper establishes the need for the university-industry linkage as a channel for upgrading human resources skills and bridging the gap between local employees and foreign manufacturing firms. Highlighted by the case study of TNI in Thailand, the government should promote the university-industry linkage for human resources development in its manufacturing industry.

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