

**The Transition of the Japanese Technology Transfer:
The Role of Thailand as a Training Hub in ASEAN**

Yuri Sadoi¹
Professor
Faculty of Economics
Meijo University
sadoi@meijo-u.ac.jp

Paper presented at the Third Copenhagen Conference on “‘Emerging Multinationals’: Outward Investment from Emerging Economies”, Copenhagen, Denmark, 25-26 October 2012

¹ Corresponding author

1. Introduction

Technology transfer is an important issue for developing countries in terms of economic development, and has been studied from various perspectives. Technology and knowledge have moved across enterprises and countries. Since the 1980s, Japan's foreign direct investment has been accelerated because of the appreciation of Yen. Since then, Japan has been a major contributor of technology transfer to Asian countries. Especially, in Thailand, Japanese technology transfer to the automobile industry has been intensive and playing an important role for the development of manufacturing industry and its human resource development.

The Japanese production system, represented by Toyota production system, has contributed for achieving high skill based Japanese industries and is associated with the Japanese human resource development system. Japan is known for its extensive, firm-based training system which strongly associated with complementary personnel policies such as seniority wages and internal career ladders.

However, in recent years, the process and strategies of the Japanese technology transfer, especially in terms of human resource development, has been changing with the development and diversity of international division of labour. MNCs in Thailand have started to play important roles for technology transfer to ASEAN countries. The role of Thailand has been changing from the recipient of training to intermediary offering training to ASEAN countries.

The objective of the study is to examine the transition of the Japanese technology and knowledge transfer from Japan to Asian countries, especially in the core skills and technology in manufacturing industries. This paper focus on transfer of skills and knowledge which are largely used for core parts in automobile industries and analyses how the local firms in recipient countries have responded to such stimuli from Japan. This paper seeks to examine the changing strategies of technology transfer concerning the position of firms in international technological division of labour.

The research questions of the paper is, the first, how the technological capability in die and tool making is transferred from Japan to ASEAN countries. The second question is that what kinds of strategies were used for the high-precision technological capability.

This paper first shows the theoretical framework of this study. The past two decades have witnessed an enormous outpouring of literature on globalization, and industrial development in Asian countries. Among them, the role of multinational companies (MNCs) and technology transfer, and the international division of labour are introduced. Then, the technology transfer from the Japanese industries and firms have been focused on the issue. The second, as empirical study, this paper shows the author's survey of die & mould making firms in Thailand (2009-2011), Malaysia (2010), and Vietnam (2008-2011 Ho Chi Minh C. and Hanoi). The empirical study shows some findings of the strategies of MNCs in Thailand and transition of the Japanese technology transfer practices.

2. Theoretical Framework

The concept of technology transfer was studied from early years. In its current usage, technology transfer largely refers to the movement of commercial technologies across, and to a lesser degree within, countries (Lall 2001). Technology (and knowledge more generally) has moved across enterprises and countries from the earliest days of productive activity. In earlier days, much of the technology has been transferred informally by migration, imitation, reverse engineering and buying capital goods. But in recent years, the transfer has become more formalized.

The concept of technology was clarified by Manesfield (1975) by distinguishing between various types of technology, between general technology (information common to an industry or trade), system-specific technology (information concerning the manufacture of a certain item of product that any manufacturer of the item or product would obtain), and firm-specific technology (information that is specific to a particular firm's experience and activities, but that cannot be attributed to any specific item the firm produces). Later, Kim (1997) refers the term technology to both collections of physical processes that transforms inputs into outputs and knowledge and skills that structure the activities involved in carrying out these transformations. Technology is the practical application of knowledge and skills to the establishment, operation, improvement, and expansion of facilities for such transformation and to the designing and improving of outputs therefrom.

Multinationals enterprises play an important role for technology transfer across countries. Technology has moved across firms and countries through the flows from persons to persons and firms to firms. Many literatures studied the role of multinationals from various perspectives. Teece

(1977) studied it by looking at multinational firms on the resource cost of transferring technological know-how. Cantwell (1995) re-examines the hypotheses associated with earlier version of the product cycle model (Vernon 1967). The hypothesis is that innovation is always kept in home country of the parent companies.

While multinationals are a powerful and growing force in technology transfer the relationship between foreign direct investment and local technological development in host countries is not always straight forward or linear. FDI transfer technology to local firms in four ways: backward linkage, labour turnover, horizontal linkages and international technology spillovers (Lall & Narula 2006).

The ability of host economic to benefit from multinational enterprise linkages depend crucially on the relative technological capabilities of recipient and transmitter, the greater the distance between them, the lower the intensity of linkages (Lall & Narula 2006). Wider technical gap between local and foreign owned activities tend to lead to fewer backward linkage and to fewer technological content in the inputs sourced locally (Narula & Portelli 2004).

Heileiner (1975) shows the role of multinationals in the less developed countries showing that MNCs may increasingly be prepared to sell more labour-intensive technologies and more essential-incentive products. Teece (1977) analyses the resource cost of transferring technological know-how by multinational enterprises. Dunning (1981) showed the concern of developed countries about the possible adverse effects of exporting technology to developing countries through their own MNCs.

Then, Chesnais (1988) analyses the international diffusion of technology by multinational enterprises. Cantwell (1995) pointed out the process of globalizing innovation and the international spread of patenting by multinationals. Cantwell debunks the common notion that innovative activity by MNCs remains based in their home countries.

The international division of labour in production involves the geographical separation of different production stages across world different economy in order to exploit differences in factor costs and capabilities (Hymer, 1972; Rasiah, 1988, 1995). Hymer (1972) argued that the drive to retain oligopolistic control of markets, and the advantages of host sites resources over the home sites resources essentially drive the geographical dispersal of production by multinational firms. Dunning (1981) analysed the consequences of international transfer of technology by international

division of labour and Dunning (1988, 1997) used his eclectic theory to argue that ownership, location, and internalization (OLI) are instrumental in driving the internationalisation of production. Reduction of trade cost make firms more likely to choose vertical foreign direct investment (FDI), which allows a relocation of a part of the production process to cheap-labour countries, and engages in vertical production process division between host and home countries. Substantial reduction in trade costs among countries has led to an increase of vertical FDI from developed countries to developing ones. Li and Sadoi (2008) showed the empirical research of the automobile parts production among China, Japan, and Taiwan from the international division of labour perspective. There are a significant works that demonstrate positive spillovers from foreign firms to the local economy (Rasiah, 2004; Huhn et al, 2010).

Hypnosis arise here is that as the international division of labour become active and mature in production, the form and direction of human resource development will be transformed as shown in Figure 1. As the production system transferred from A country to B country, A's human resource development system and training activities are intensively transferred from A to B. Then, after some years, the similar production system is transferred from A country to C country with the similar process. However, the HRD system and training might be done from A to C directly and indirectly by using B country.

International Division of Labour in
Human Resource Development (HRD)

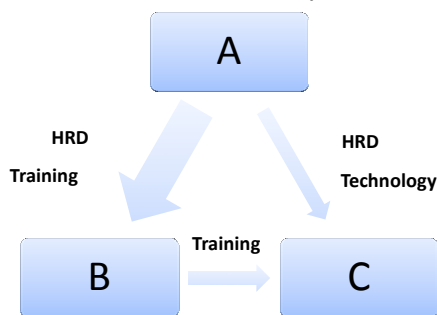


Figure 1 Transformation of Human Resource Development

Source: Author

As shown Figure 1, the need of human resource development for MNCs is getting higher due to the rise of competition. The international division of labour in human resource development has been varied regarding to cost and absorbed capacity of recipients. The process of transfer to human resource is very important and can be difficult than it may seem. Just as in the original technology, it is very important that a proper matching occurs between the technological considerations on the one hand, and the more purely economic considerations on the other.

Absorbed capacity and technological capability play an important role in transformation of human resource development. Recent years there has been increased interest in the issue of technology accumulation in many countries. Technology accumulation plays a central role in economic development. Empirical research has drawn attention to two aspects of technology accumulation; technical change and the acquisition of technological capabilities (Lall, 1993). Rasiah (1994, 1995) argued using empirical evidence of the importance of technical external economies in the flow of technology from foreign sources to local firms, which has implications for analysing the economic performance of firms in developing countries. Recent theories have demonstrated that incremental technology accumulation can have a positive impact on firm-level efficiency and productivity (Rasiah, 1996; Kim, 1997).

Lall (2001: xii) describes four levels of technological capabilities; the simplest operational level needed for running a technology efficiently, these involve basic manufacturing skills as well as some more demanding troubleshooting, quality control, maintenance and procurement skills. At the intermediate level, duplicative skills are also critical, which include the investment capabilities needed to expand capacity and to purchase and integrate foreign technologies. Next come adaptive skills where imported technologies are adapted and improved, and design skills for more complex engineering are learned. Innovative skills are also important to creatively absorb technologies (Kim, 1997).

Kim (1997) refers the term technological capability to the ability to make effective use of technological knowledge in efforts to assimilate, use, adapt, and change existing technologies. Finally, as firms get close to the technology frontier, formal R&D will be needed for firms to participate in the creation of new technologies. Technological capacity is used interchangeably with the term absorptive capacity, a capacity to absorb existing knowledge and in turn generate new knowledge.

The acquisition of skills and investment in human capital are seen by many economists as an engine of growth (Acemoglu and Pischke 1998, Sadoi 2008, 2009). Several studies point to a strong link between skills and productivity (Acemoglu 1996) and a country's knowledge base is an important resource for innovation and which has linked cross-national differences in education to persistent disparities in per capita income across national economies (Romer 1990).

One form of skill acquisition is the movement of people. To transfer know-how, much of which is not written down in any event, there is frequently no substitute for person-to-person training and assistance, some of which may have to go on for extensive periods of time.

3. Japanese Technology Transfer to Thailand

Japanese technology transfer has been actively discussed especially after 1985 plaza accord. The application of yen and the industrialization policies of Asian countries accelerated the Japanese transplant to Asian countries. The industrialization of Asian countries (Taniura, 1988) were largely accumulated by the Japanese transplants and the Japanese technology transfer through them (Taniura, 1990). The growth of the Japanese automobile industry in the 1980s was conspicuous for more than the speed of the increase in production volumes. The rapid expansion of overseas production and the integration of overseas operation into a global production network and the accompanying expansion of integrated global supply networks also attracted attention (Busser and Sadoi 2004).

With the regards to the product architecture and organizational capabilities, automotive industry has characteristics of integral architecture and its technical innovation is relatively moderate but requires wide experience and coordination with other members and processes (Fujimoto 2003). Therefore, the expansion of the Japanese global production networks in Asian countries, especially NIEs and ASEAN, especially Thailand, Malaysia, Indonesia, Philippines, and Vietnam, were studied and evaluated the cases of technology transfer (Taniura 1990) (Itagaki 1997) (Koike & Inoki 1990) (Busser and Sadoi 2004). The technology transfer of Japanese enterprises, automobile, electric, electronics and other various industries were studied as cases (Okamoto, 1998). The host governments applied industrial strategies to create a cluster policy in their automotive sectors which draw on multinational enterprises (MNE) to enhance the automotive industries (Taniura, 1990) (Sadoi, 2003). Studies show that the governments see cluster policies as a

means to improve competencies within the automotive sectors. Case studies conducted to automotive industries in ASEAN countries to examine if international transfer of technology was successfully transplanted in those countries.

Technology transfer of the Japanese production system was studied various ways. Itagaki (1997) showed their surveys of technology transfer of the Japanese production system in NIEs and suggested the importance of human resource management in those cases. Especially the Japanese skill formation system is a key to the successful technology transfer (Koike & Inoki 1990). Japan developed skill formation system from early years of development. In other Asian countries, as Japanese technology transferred, the importance of human resource development in industries was started to evaluated and introduced, started from Asian NIEs.

Japan has been successful achieving high skill based industries. Japan is best known for its extensive, firm-based system of training strongly associated with complementary personnel policies such as seniority wages and internal career ladders (Thelen 2004, Sadoi 2009). However, Japan as well as other Asian NIEs experienced falling competitiveness in export markets due to a rise in labour costs since the 1980s and the rapid development of China. Rising labour costs have driven the relocation of a significant share of production from Japan to China and Southeast Asia. Japan, which has developed high skill and technology based industries, have expanded production in ASEAN and transferred their skills and technology in the process, with important ramifications for the international division of labour of firms in both countries. This raises an important question about how have the firms local responded to such stimuli from Japan.

Thailand, as well as other developing countries, foreign direct investment (FDI) of multinational enterprises has become a major source of technology. Thailand's economic growth rate in the 1980s and 1990s have paralleled that of its more technologically sophisticated neighbours, such as Malaysia, Singapore, South Korea and Taiwan, yet its technology development lags behind quite significantly (Wang & Chien, 2007).

By 2000, the division of labour in the automobile industry saw car makers in Thailand specializing on assembly and their Japanese side specializing on engineering and research and development (R&D) processes (Yamauchi, et al. 2009, Poon et.al, 2009). However, Thai firms' specialization in this division of labour has since 2000 shows signs of shifting towards upstream activities. The three major factors of the shift are government's commitment to liberalization

policies in the early 1990s, the aftermath of the Asian financial crisis, and the expansion of Japanese investment and technology transfer to Thailand (Poapongsakorn and Techakanont 2008). The shift was impossible without the technology transfer from Japanese firms necessary to upgrade the technological capability of local employees, as well as their suppliers. Global competition has led car makers to consolidate their dispersed operations as a network (Ernst and Kim 2002). The shift has been accelerated by production and export base for pickup trucks by major Japanese car makers. In addition, the International Multipurpose Vehicle (IMV) project by Toyota Motors, which involves producing Asian cars in Thailand (Ito 2008, Tanaka 2008) The expansion of production volume targeted by this programme has increased the demand for technological capability in Thailand.

Sadoi (2010) focuses on development of technological capability and aims to investigate how organization capability and human resource has been developed. Technological capability was judged focusing on engineering related job in R&D and engineering divisions in Thai automobile industry. According to the Frascati Manual (OECD 2008), R&D comprise creative work undertaken on a systematic basis in order to increase the stock of knowledge and the use of this stock of knowledge to devise new applications. R&D covers basic research, applied research and experimental development. Sadoi (2010) pointed out the increase demand for die and mould designing and production engineers in Thailand and many Thai engineers in R&D are in die and mould related area.

Domestic market oriented affiliates generally purchase more locally than export-oriented firms because of lower quality requirement and technical specification (Reuber 1973). As Thai automobile assemblers shifted from domestic-oriented to export after 2000, higher quality and technical specification are required for local suppliers. Technological capability is used interchangeably with 'absorptive capacity', a capacity to absorb existing knowledge and in turn generate new knowledge (Kim 1997). Firms with high absorptive capacity are likely to benefit from FDI spillover (Narura and Marin, 2005). Judging from the Kim's (1997) three elements of technological capability, production capability, investment capability, and innovation capability, Thailand has achieved high production capability and is under establishing investment capability.

In order to successfully introduce technological upgrading, both car assemblers and suppliers are expected to transfer the appropriate advanced level of technology to Thailand. As Japan is playing an important role as the biggest foreign investor in Thailand, Japanese firms have

been at the forefront forming a major automobile cluster targeted primarily at supplying the Southeast Asian market. The recent bilateral economic partnership agreement (EPA) between Thailand and Japan has increased further the impetus for attracting investment inflows. The governments of the two countries have gone beyond tariff reductions and eliminations to focus on technology transfer and human resource development with the objective of turning automobile manufacturing in Thailand globally competitive.

Thai suppliers are now increasingly required to upgrade their quality and precision levels to meet international standards (Techanont 2011) (Sadoi 2010). To achieve this, the Japanese assemblers have begun to train engineers and technicians in supplier firms so that they can specialize horizontally on the basis of core competence (Yamauchi & Poapongsakorn 2009).

Poon and Sajarattanochoe (2009) examine the role of Asian manufacturing subsidiaries in technology transfer in Thailand, focusing on the manufacturing activities of firms from Japan and NIEs. The effect of human resource development on the productivities are surveyed by Poapongsakorn (1992, 2004), and Yamauchi, et.al (2009).

Thus, the Japanese technology transfer in human resource development has been intensive in Thailand. The research question of this paper is if the upgrading experience of automotive industries in Thailand because of their outstanding export performance can shed some light on the strategies of technology transfer. In particular, can Thailand become hub of Japanese human resource development in ASEAN in international division of labour?

4. Empirical Study

For empirical study, the author surveyed die & mould making firms in Thailand (2009-2011), Malaysia (2010), and Vietnam (2008-2011 Ho Chi Minh C. and Hanoi). In this section, first part shows the overview of die & mould training strategies in Thailand and Malaysia. Then, from the cases of Vietnam die & mould firms, the role of international division of labour as the third country is examined.

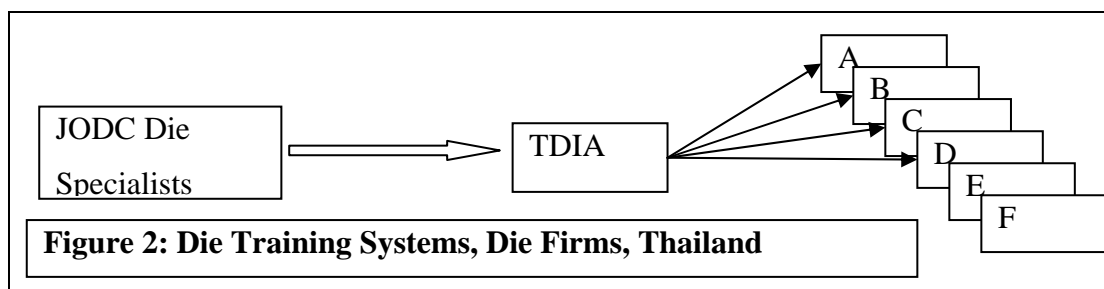
Die and mould production technology requires high skills and knowledge and is largely used for core parts in the automobile and electronics industries. Die and mould technology is indispensable for most of all manufacturing process which uses dies. It varies for plastic and metal parts for variety of electronic parts such as mobile phones, computers, electric appliances, and

automobile parts. For making dies and tools, high-precision production requires high skills and knowledge. The development of machine tools has replaced skilled workers of the intermediate precision level, but micron-level precision parts still depends of human skills. In addition, prototype making process requires human skills.

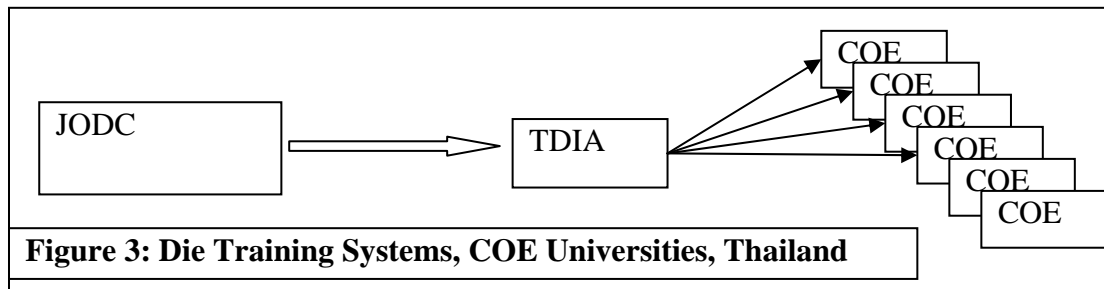
In Thailand, die & mould designing and production is a core technology that is applied in a wide range of supporting industries for automobiles. The skills development process in die and tool engineers are researched by author in August 2008. Interviews with officials of the Industry Ministry of Thailand since 2004 show that the government encouraged die technology training to broaden and deepen the industrial base in the country. The ministry targeted 7,700 die engineers in 5 years with a budget of 1,690 million Thai baht.

As part of Japan-Thai EPA, the Japanese government encouraged Japanese organizations such as Japan Overseas Development Corporation (JODC) to support the Thai government's initiative. The JODC has since begun sending die specialists to assist the Thai Tool and Die Industry Association (TDIA). The die specialists give lectures and train Thai local die & mould companies (see Figure 2). One specialist was selected from Denso Corporation Japan from 2007 to 2008 and gave intensive programs to Thai local die & tool companies regularly. The size of Thai companies varies from 10 to 200 employees.

Also, the JODC sends die specialists to support the R&D development activities of the Centre of Excellence universities (COE) (see Figure 3). Each COE University has its own special field of specialization, such as dies for forging, die plastic, dies for rubber, dies for stamping, die material, and dies for casting. The die specialist gave lecture and workshop to classes and gave practical advices to university students as well as lecturers.



Source: Author



Source: Author

In Malaysia, Malaysia Japan Automotive Industries Cooperation or MAJAICO was initiated under the Malaysia Japan Economic Partnership Agreement in July 2006 in order to develop and improving Malaysian Automotive Industries to become more competitive as global players. Signed in 2006, MAJAICO is a five years project that helps Malaysian Automotive Industries in various fields from the technical base to the business negotiations (JETRO 2010). There were 10 sub projects and three of them were surveyed by author in 2010, which JETRO is responsible. They are; Automotive Skill Training Center in Malaysia (MAJAICO PROJECT B), Business Development Program (MAJAICO PROJECT E), and Cooperation in Exhibition (MAJAICO PROJECT F3).

Automotive Skill Training Center in Malaysia (MAJAICO PROJECT B) is a project with a cooperation of Ministry of Human Resources (MOHR), Malaysia in conjunction to bringing up the technical skill of Malaysian technician and human resources. The execution of the project is done by NISSAN and JTM. ADTEC (Advance Technology Training Center) Shah Alam has being selected as a base for a pilot project execution because of the strategic location, which is within the area of Malaysian Automotive Industries.

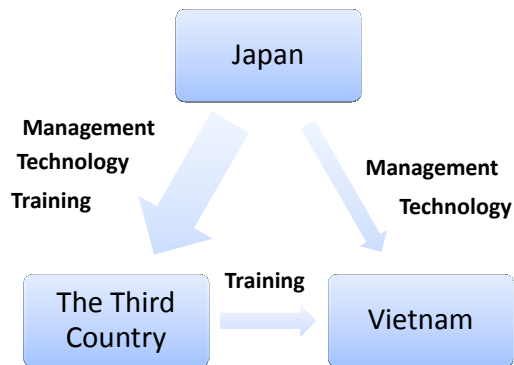
To ADTEC Japanese experts from NISSAN are dispatched to train the master trainer from JTM as well as developing the syllabus of the Training Center. These master trainers are expected to train trainers as well as industries' workers using the syllabus and curriculum developed. The Skill Training Center will become a model institute for the existing public vocational schools in helping private companies to improve or develop their technical training systems and environments so that their workers will be able to acquire additional knowledge and skill.

In the case of Vietnam, die and tool making technologies were trained by private firms. Fifteen firms of die and mould firms in Vietnam were surveyed by author, 7 firms near Ho chi min city in March 2008 and 8 firms near Hanoi in January 2011. All of them are Japanese owned or joint ventures. Those are; N Tooling, Muto Technology Hanoi (Quang Minh Industrial park, Hanoi, Citizen Machinery (Nomura HaiPhong Industrial Park), Taisei Electronics (Phuc Dien Industrial Zone), Mizuho Precision (Phuc Dien Industrial Zone), Kyoei die Tech (Thang Long Industrial Park), Denso Manufacturing (Thang Long Industrial Park), Toho (Thang Long Industrial Park, and Nippo Mechatronics (Noi Bai Industrial Zone).

Here in this paper, the summary of findings of the surveyed firms are introduced as follows. Overall, there are three major findings. The first finding is that human resource development activities are very active in most of the firms surveyed. Most firms provide formal Off JT and OJT to all the employees. For the key workers for core technology were often sent to Japan or other major location of firms for intensive training.

The second finding is that the human resource development practices are done by both direct and in-direct process from the Japanese firm. As shown in Figure 4, the third country is used for training, such as receiving trainers from the third country or sending trainees from Vietnam to the group firms in the third country for training. For example, initial training for the new Vietnamese key employees was done in China or Thailand, at their China or Thailand plant of the same firm. In addition, selected key workers were sent to the site of China or Thailand for months of training. In the meantime, some Chinese or Thai staffs were sent to their Vietnam plant as OJT and off-the Job training instructors. The cases of China as the third country is higher than that of Thailand in die & mould among the cases of this survey. However, when we look at the firms with wider range of production processes, the involvement of Thai trainers and training centre in Thai are getting higher.

International Division of Labour



11

Figure 4 Human Resource Development of Vietnam firms in International Division of Labour

Source: Author

The third finding is that there are two opposite types of strategies. One is human skill oriented strategy and the other is high-tech machine oriented strategy as shown in Figure 5. The former case shows that there were a quite a few highly skilled workers performing the finishing and profiling processes, which required a minimum of a year of specific skill training. These workers use multiple-purpose machines to shape a variety of parts. The latter case shows that firms install state of arts mother machines to eliminate human skill or quality instability. Those mother machines are the same or even higher specification and prices than those of in Japan.

Two Strategies

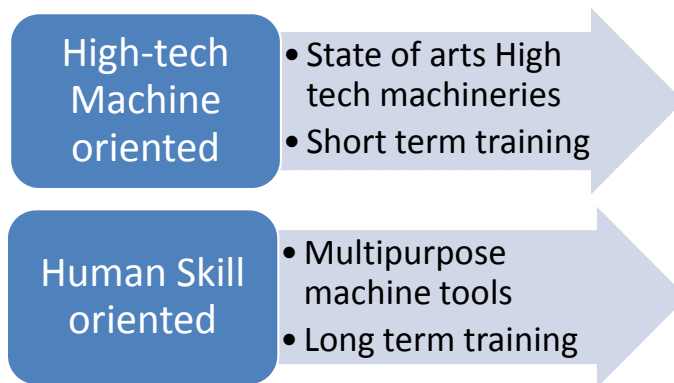
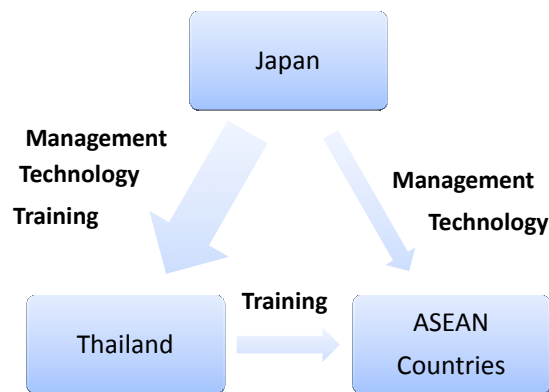


Figure 5 Two Strategies of Technology Upgrading in Vietnam

Source: Author

The strategies differ by the management policies of each firm. In either way, the proximity is an important factor for selecting the training source for human skills and maintenance for advanced machinery in terms of saving time and cost. As shown Figure 6, there will be a high potential for Thai to be a hub of training for ASEAN countries using its two strong points, intensive Japanese FDI in training environment and proximity to ASEAN countries, such as Vietnam, Indonesia, Lao, Cambodia, and Myanmar.

Processes of Human Resource Development



12

Figure 6 Thailand as Training Hub

Source: Author

5. Conclusion

This paper examined technology transfer from the view point of human resource development from Japan to ASEAN countries in core skills and technology in manufacturing industry. Especially it tried to show the transition of Japanese human resource development practices and strategies in overseas plants under the diversity of international division of labour.

The second section examined theoretical studies on technology transfer from the role of MNCs, international division of labour, and technological capacity. The literature review lead a hypnoses that the international division of labour become active and mature in production, the form and direction of human resource development winn transformed indirect way using the third country.

The third section analysed theoretical studies of the Japanese technology transfer in Thailand, focusing on the automobile industry and its human resource development. This section tried to see the above mentioned hypnoses more specific way and raised the research question that; as the Japanese human resource development is intensive in Thai automobile industry, can Thailand become a hub of Japanese human resource development and training in ASEAN countries as a role of international HRD division of labour?

The empirical study section showed author's survey in Thailand, Malaysia, and Vietnam and summarised into three finding. They are (1) relatively active HRD activities in firms, (2) in Vietnam, the third countries are used for HRD and training, such as receiving trainers from the third county and sending trainees to the third country, (3) two opposite HRD strategies are used, high-skill oriented and high-tech-machine oriented.

The survey result in Vietnam showed some evidences of high potential for Thailand to be hub for the Japanese production system training for ASEAN countries, especially for automobile related manufacturing industries. Thailand has strong points for proximity to ASEAN countries and intensive Japanese HRD sources.

References

- Acemoglu, Daron (1996) Credit Constraints, Investment Externalities and Growth. *Acquiring Skills*, Edited by A.L. Booth and J.J. Snower, Centre for Economic Policy Research, London.
- Acemoglu, Daron, and Pischke, J-S. (1998) Why Do Firms Train? Theory and Evidence , *Quarterly Journal of Economics*, 113(1): 79-119.
- Busser R. (2008) ‘‘Detroit of the East’’? Industrial upgrading, Japanese car producers and the development of the automotive industry in Thailand’. in Rajah, R. Sadoi, Y. and Busser, R. (eds.) *Multinationals, Technology and Localization in Automotive Firms in Asia*. New York: Routledge.
- Busser, R., and Sadoi, Y. (2004) *Production Networks in Asia and Europe*. London: Routledge.
- Cantwell, J. (1995) The Globalisation of Technology: What Remains of the Product Cycle Model?, *Cambridge Journal of Economics*, 19: 155-74
- Censnais (1988) Multinational Enterprises and the International Diffusion of Technology, in Giovanni Dosi, Christopher Freeman, Richard Nelson, Gerald Silverberg and Luc Soete (eds.) *Technical Change and Economic Theory*, Chapter 23 London: Printer Publishers, 496-527.
- Chen, C. (2003) *The Role of Government in Taiwan's Economic Development* (In Japanese), Sensyu University Press: Tokyo.

- Dunning, J. (1981) The Consequences of International Transfer of Technology by MNEs: Some Home Country Implications, in *International Production and the Multinational Enterprise*, Chapter 12 London: George Allen & Unwin, 321-53
- Dunning, J. (1988) Trade Location of Economic Activity and the Multinational Enterprises: A Search for an Eclectic Approach, Ch.1 pp.13-40. In Dunning J. *Explaining International Production*. Unwin Hyman: London.
- Dunning, J. (1997) *Alliance Capitalism and Global Business*, Routledge: London.
- Ernst, D., and Kim, L., (2002) Global production network, knowledge diffusion, and local capability formation. *Research Policy* 31, pp. 1417-1429.
- Fujimoto, T., (2003) Sosiki noryoku to seihin akitekucha (in Japanese, Organizational capabilities and product architecture). *Sosiki Kagaku*. 36(4): 11-22.
- Helleiner, G.K. (1975) The Role of Multinational Corporations in the Less Developed Countries' Trade in Technology, *World Development* 3(4): 161-189.
- Hobday, M. (1995) East Asian Latecomer Firms: Learning the Technology of Electronics, *World Development*, 23(7): 71-93.
- Huhn, C. H., and Narjoko, D. Eds. (2010) Causes and Consequences of Globalization in East Asia: What do the Micro data Analyses Show?, *Summary of ERIA Research Projects in 2009-2010*, Economic Research Institute for ASEAN and East Asia: Jakarta.
- Hymer, S. (1972) The Internationalization of Capital, *The Journal of Economic Issues*, 6(1): 91-111.
- IRC (2006) *Tai Jidousya Sangyo no Jittai 2006* [Thai Automobile Industry Report 2006] Nagoya. IRC
- Itagaki, H. (1997) Nihonteki Keiei Seisan Shisutemu to Higashiajia, (Japanese management and production system in East Asia) Mineruba Syobo, Tokyo.
- Kim, L. (1997) Imitation to Innovation: The dynamics of Korea's Technological Learning, Harvard Business School Press, Boston, MA.

- Kohpaiboon, A. (2006), *Multinational Enterprises and Industrial Transformation: Evidence from Thailand*, Edward Elgar, Cheltenham
- Kohpaiboon, A. (2009), Global Integration and Thai Automotive Industry, Discussion Paper No. 16, Faculty of Economics, Thammasat University, Bangkok (available for downloading at www.econ.tu.ac.th/Research/Discussionpaper)
- Kohpaiboon, A. and Nipon, P. (2010). Industrial Upgrading and Global Recession: Evidence of Hard Disk Drive and Automotive Industries in Thailand. Discussion Paper No. 22, Faculty of Economics, Thammasat University, Bangkok (available for downloading at www.econ.tu.ac.th/Research/Discussionpaper)
- Koike, K. and Inoki, T. eds.(1990) *Skill Formation in Japan and Southeast Asia*, University of Tokyo Press. Tokyo.
- Lall, S. (1993) Promoting Technology Development: The Role of Technology Transfer and Indigenous Effort, *Third World Quarterly*, 14(1): 95-108.
- Lall, S. ed. (2001) *The Economics of Technology Transfer*, Edward Elger: Cheltenham.
- Lall, S., and Narula, R.,(2006) Foreign direct investment and its role in economic development. *Understanding FDI assisted economic development*. New York: Routledge
- Lall, S., and Urata, S., eds. (2003) *Competitiveness, FDI and Technological Activity in East Asia*. Gloss: Edward Elger
- Lall, S. (2001) *Competitiveness, Technology and Skills*. Cheltenham: Edward Elger.
- Lall, S. (2004) Reinventing Industrial strategy: The Role of Government Policy in Building Industrial Competitiveness. G-24 Discussion Paper Series. No.28 April 2004.
- Lauridssen, L (2004) 'Foreign direct investment, linkage formation and supplier development in Thailand during the 1990s: The role of state governance'. *European Journal of Development Research* 16 (3):561-586.
- Li, Lih-ren, Sadoi, Y. (2008) Taiwanese Automobile Parts Suppliers in China, *Asia Pacific Business Review*, 14(1): 119-146.

- Mansfield, E. (1975) International Technology Transfer: Forms, Resource Requirements and Policies, *American economic Review*, 65(2), 372-6
- Motohashi, K. (2008) 'Growing R&D collaboration of Japanese firms and policy implications for reforming the national innovation system'. *Asia Pacific Business Review*. 14(3): 339-361.
- Narula, R., and Marin, A., (2005). Exploring the relationship between direct and indirect spillovers from FDI in Argentina. Research Memoranda. 024, Maastricht : MERIT, Maastricht Economic Research Institute on Innovation and Technology.
- Narula,R., and Portelli, B., (2004). Foreign direct investment and economic development: Opportunities and limitation from a developing country perspective. Research Memoranda. 009, Maastricht: MERIT, Maastricht Economic Research Institute on Innovation and Technology
- Okamoto, Y. (1998) *Nihon Kigyo no Gijyutsuiten (Technology Transfer by Japanese Enterprises)*, Nihon Keizai Hyoronsha Tokyo
- OECD (2008) *Main science and technology indicators*, OECD: Paris
- Phinaitrup, B. (2000) 'Human resource development in Thai higher education', *Human Resource Development International* 3(2): 147-151.
- Poapongsakorn, N. and Techakanont, K. (2008) 'The development of automotive industry clusters and production networks in Thailand', in Kuroiwa, I, and Toh Mun Heng eds, *Production Networks and Industrial Clusters*. Singapore: ISEAS, pp.196-256
- Poon, J.P. H. and Sajarattanochoe, S. (2009) Asian Transnational Enterprises and Technology Transfer in Thailand, *European Planning Studies* 18(5): 691-707.
- Rahmah, I. and Ishak Y. (2003) 'Labour market competitiveness and foreign direct investment: The case of Malaysia, Thailand, and the Philippines', *Regional Science* 82: 389-402.
- Rasiah R. (2007) 'Export-orientation and technological intensities in auto parts firms in East and Southeast Asia: Does ownership matter?', *Asian Economic Papers* 6(2): 55-76.
- Rasiah, R (2001) 'Liberalization and the car industry in SEA-4', *International Journal of Business and Society*, 2(1): 1-19.

- Rasiah, R. (1988) The Semiconductor Industry in Penang: Implications for the New International Division of Labour Theories, *Journal of Contemporary Asia*, 18(1): 44-67.
- Rasiah, R. (1994) Flexible Production Systems and Local Machine Tool Subcontracting: Electronics Component Transnationals, *Cambridge Journal of Economics*, 18(3): 279-298.
- Rasiah, R. (1995) *Foreign Capital and Industrialization in Malaysia*, Basingstoke: Macmillan.
- Rasiah, R. (1996) Industrial Relations and the Workplace in Malaysia: Electronics, Textiles and Garments, Lee J. and Verma R. eds, Taipei: Chung Hua Institution of Economic Research
- Rasiah, R. (2004) 'Exports and technological capabilities: A study of foreign and local firms in the electronics industry in Malaysia, the Philippines and Thailand', *The European Journal of Development Research* 16(3): 587-623.
- Rasiah, R. (2004) *Foreign Firms, Technological Capabilities and Economic Performance: Evidence from Africa, Asia and Latin America* (Cheltenham: Edward Elgar).
- Reuber, G., (1973) *Private Foreign Investment in Development*. Oxford: Oxford University Press.
- Robinson, R.D.(1988) *The international transfer of technology: Theory issues and practice*, Bellinger, Cambridge, MA.
- Romer, Paul M. (1990) Endogenous Technological Change. *Journal of Political Economy*, 98(5): 71-102.
- Sadoi, Y. (2003). *Skill Formation in Malaysian Auto Parts Industry*, Selangor Malaysia: Universiti Kabangsaan Malaysia (UKM) Press.pp. 1-177.
- Sadoi, Y. (2008) "Technology Transfer in Automotive Parts Firms in China", *Asia Pacific Business Review*, 14(1): 147-163.
- Sadoi, Y. (2009) "Japanese Skill and Knowledge Transfer: The Case of Exporting High-precision Production Technology to China and Vietnam", *Meijo Ronso* 19(4): 39-50.
- Sadoi, Y. (2010) Technology capability of Automobile Parts Suppliers in Thailand, *Journal of Asia Pacific Economy*, 15(3), pp. 320-334.

- Suehiro, A. and Higashi, S. (eds.) (2001) *Tai no Keizai Seisaku – Seido Soshiki Akuter-* [Economic Policy in Thailand- Institution, Organization, and Actor-]. Tokyo: IDE
- Taniura, T. (1990) *Asia no kougyouka to gijyutsu iten* (Industrialization and Technology Transfer in Asia). Asia Keizai Kenkyusho. Tokyo.
- Tagi Sagafi-Nejad (1991), International Technology Transfer Literature: Advances in Theory, empirical Research, and Policy in Righard D. Robinson (eds) *The International communication of Technology: A Book of Reading*, Chapter 11, New York: Taylor & Francis, 199-223.
- Tanabe, K. and Watanabe, C. (2005) ‘Sources of small and medium enterprises excellent business performance in a service oriented economy’. *Journal of Service Research* :5 (1): 5-20
- Techaknout, K. (2011) Thailand Automotive Parts Industry, in Intermediate Goods trade in East Asia: Economic Deepening Through FTAs/EPAs, edited by Mitsuhiro Kagami, BRC Research Report No. 5. Bangkok Research Center IDE-JETRO Bangkok Thailand
- Teece, D.J. (1977) Technology Transfer by Multinational Firms: The Resource Cost of Transferring Technological Know-how, *Economic Journal*, 87(346):242-61
- Thelen, K. (2004) How Institutions Evolve – The Political Economy of Skills in Germany, Britain, the United States, and Japan. Cambridge University Press, Cambridge.
- Vernon, R. (1967) International Investment and International Trade in the Product Cycle. *The Quarterly Journal of Economics*, 80(2), pp. 190-207
- Vernon, R., (1979) The product cycle hypothesis in a new international environment. *Oxford Bulletin of Economics and Statistics* Vol. 41, No. 4 pp 255-267.
- Wang, T.Y. & Chien, S. C. (2007) The Influence of technology development on economic performance: The example of ASEAN countries, *Technovation*, 27(8): 471-488.
- Watanabe, T. (2006) Tai ni okeru jidosya oyobi buhin meka no gennchicyotatsu no genjo [Local Parts Procurement of Automobile Makers and Suppliers in Thailand] Research Report of Toyota and Toyota Group Firms in ASEAN. Nagoya: Meijo University Industrial District Research Centre.