Japanese Technology Transfer (JTT) to Malaysia: Re-assessment in Globalization Induced Changing Environment

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ABSTRACT

There have been mixed opinions and skepticisms on the contribution of Japanese technology transfer to Malaysian indigenous technology development. This paper seeks to review the issue and explore reasons for the differences and disagreements towards refining findings on the issue. Analysis is carried out within the perspective of changing context of technology transfers as a result of globalization process. Such changes suggest necessary revision of framework and approach in technology transfer analysis. Japanese technology transfer to Malaysia provides an excellent case study of how these changes took place and how the issues of approaches and measurements in technology transfer are proven to be very critical in assessing any technology transfer process.

It is undeniable that Japanese technology transfer did take place in Malaysia. The doubts and critics are due to the issue of appropriate measurement and diverse understanding of Japanese style of technology transfer. This paper concludes that analysis of JTT requires a more comprehensive measurements incorporating substantial and deep understanding of Japanese style of TT with

ISSN 0128-5599

strong consideration to be given to the changing context of technology transfer. Analyzing such process, it is found that while certain characters of new technologies appear to fit well into this style, some post challenge for changes and adaptation.

Introduction

The world economy is undergoing a change that it is even referred to as the third industrial revolution characterized by rapid advancement in knowledge and rapid changes in competitive conditions. This development lead to a new economic and business environment especially in technology related areas. Technology competitiveness is becoming more important element especially in developing countries like Malaysia to attract foreign investment and to maintain its comparative advantage.

This technology competitiveness can be developed domestically through investment in Research & Development (R&D) or it can be imported in various ways from abroad, or generated from combination of the two. But for a developing country like Malaysia, given expensive nature of R&D and abundance of multinational corporations (MNC), international technology transfer is considered as an imported mode for technology acquisition. However the extent of benefit to be gained from such process is highly dependent on three interrelated factors; first, the strategies of transferor (among others include mode of entry, level of technology transferred, transfer mechanism); second, the absorption capacity of the transferee and the host country (e.g. human resource capacity and local innovation system); third, the business environment and technology development governing the technology market. These factors are now gaining more important role and further re-emphasized by the globalization impact.

Japan-Malaysia economic relations provide an interesting case study manifesting the above complexity of technological collaboration in a changing technology and business environment. Japan, either through its Overseas Development Assistance (ODA) or Foreign Direct Investment (FDI) through multinationals and their supporting companies have long been part and parcel of Malaysian industrialization process. In term of investment, Japan has been the main source for FDI to Malaysia, second to the United States for the past 5 years (MITI, 2002). Between 1997 and May 2002 alone, 643 projects with Japanese equity were approved. (Utusan Malaysia, 17th July 2002). As for

technological collaboration, technology import from Japan, based on Technology Transfer Agreement (TTA), account for 32% between 1957-1987 (Anuwar, 1993). While from 1989 to 2001, the TTA with Japanese companies sums up to 932, the highest, in comparison to the United State with only 240 (MITI, 2002). There are now 1368 companies with Japanese equity; 786 in manufacturing sector and 582 in non-manufacturing (JETRO, 2002).

Given these facts, one would assume that Japanese firms should serve as the main source of technology learning and acquisition for Malaysia. But surprisingly, the literature reviews found skeptical opinions and criticisms on JTT process and contribution to local technology development. JTT is argued to be 'slow and less intensive' than other country in transferring technology, especially the United State (Anuwar, 1992, 94; Lynne 1996; Lai, 2001). Although these studies admit that technology transfers did take place but still discontentment were raised because much more is expected (Nazari, 1999; Capanelli, 1999; Lai, 2001). The absence of substantial level of TT is even agreed by Japanese manufacturers who admitted that the technology being transferred is restricted to simple operational capabilities required for production and maintenance only.[1] There is technological advancement that took place in the process but it is only in term of automation of the machineries whereby local worker remain to be doing the simple task of operating the machines, double check the machine tests and package the product (Yamashita, 1998, p.68)

Do Japanese firms really slow and ineffective in transferring technology? Or the observations were concluded based on inappropriate measurement argued based on weak understanding of Japanese technology transfer style?

Furthermore, now that the business environment has changed, certainly the technological collaborations relations between Japan and Malaysia have progressed which obviously implies changes in the nature and extent of TT process. Thus, there is a need to re-assess the issues and explore changes in the context of technology transfer given the latest development in technology and economic environment.

This paper is based on secondary data analysis and the present author's preliminary observation during his fieldwork. The industries and firms covered are various to enable broader understanding of trends in technology transfer.

Malaysian-Japan relation is used a case study for several reasons. First, Malaysia is chosen not only because of the interest of the author,

but it features the characteristics that represent the other developing countries as well, especially ASEAN (Thailand, Indonesia, Singapore and the Philippine), which share common feature of high dependence on foreign investment and technology for technological learning process. Furthermore, Malaysia is now intensively focusing on building its own indigenous technology capability, which implies that greater attention will be given to the issue of technology transfer.

Japan is selected because it has been part and parcel of Malaysian industrialization process. Japan is also significant for its unique management and production system, which is said to be undergoing changes in adjusting to the new business environment. With these factors in the background, this paper hopes to contribute to the body of knowledge in seeking for new perception and opinion on the more general topic of technology transfer to developing countries.

In the next section some terms and conceptual aspects will be outlined to establish a conceptual framework for the paper.

Analytical Framework

Technology transfer is a broad area and its elusive nature of multiple characters has been illustrated in diverse way. Technology can be classified into production and management technology or engineering documentation and manufacturing techniques (Hayashi, 2001, p.117). The term technology transfer has been defined in various ways but the substances remain as movement of knowledge skills, organization values and capital from the point of generation to the site of adoption and application (Mittelman and Pasha, 1997). Technology consists of technology embodied in machinery as well as disembodied technology. The disembodied form is in the transfer of designs and drawings and the skills of technologically qualified people. Technology transfer can be done in various modes; licensing, foreign direct investment and joint ventures. It can take place among various agencies. But this paper, given its interest in Japanese multinational companies, focuses on intra-firms and inters firm forms of TT.

The most difficult part and controversial in assessing TT is the measurement to be employed. This paper, notwithstanding this hard task, argues that the measurement for JTT requires unique tools, which should be different from firms of other countries. It should be able to measure whether the transferred technology stimulates further innovation within

the recipient country. This is because the main concern of this paper is the utmost benefit of TT, which depends on how much of upgrading of local capabilities, take place over time, how far local linkage deepened and how closely affiliates integrate themselves in local learning system.

While studies on TT have adopted several focus and angle admitting that the nature of technology and environment so much affect the process, hardly few studies tried to analyze the issue by incorporating the changing aspect of technology under the globalization as framework. This paper attempt to fill this gap by adopting a framework based on study made on analysis of changes in international technology transfer environment (for detail refer Radosevic, 1999. pp.43-95)

The study suggests there are at least 3 factors that lead to changes in technology transfer context; the changing relationship between finance, trade and production; changes in the industrial and technological capabilities of firm and host country; and the changing character of new technologies. These factors are not new to analysis of technology transfer process but with the impact of globalization and rapid development of technology, the context has changed or evolved ensuing changes in the process itself.

Though these 3 factors are strongly interdependent and interrelated, the present author believes that the third factor of changing character of new technologies is the most important. Based on the analysis, the factor can be further categorized into three (Radosevic, 1999, pp.65-79).

Firstly, changes in technology transfer context are caused by the increasing knowledge intensity of new technology and production system. An increasing feature of IT-based content in the new technology implies an increase in knowledge-based character of the product. This means that the intangibility nature of the technology also increased. As such the method of transferring the technology will be more complicated and so does the measurements task of it.

Secondly, the appropriatability and transferability of new technologies, which all these while have been dependent on their technical characteristics, are being more dependent on the structural characteristics of the host nation innovation system and the effective and efficient management of the relevant policy, support and incentive by the hosting institutions.

Thirdly, changes in the production networks due to the rising complexity of technical changes. Due to specialization and rapid advancement of technology, firms become more interdependent and consequently technology transfer processes involve in an increasingly complex process of international production networks.

With these brief outlines, next section will elaborate application of the framework into the experiences of Japanese technology transfer to Malaysia.

The Experience of Japanese Technology Transfer (JTT) to Malaysia

Technology is a running target of a very dynamic nature. With widespread application of information technology and rapid progress of technology itself the transfer process has become more complicated. Even more difficult is to measure the success of such process.

The literatures on the extent of JTT to Malaysia have used various measurements. Those measurement can be summarized as follows: comparison of level of technology transfer targeted at the start and after accomplishment (Yamashita, 1991); presence of imported machineries (Anuwar, 1992; Abibullah et al.95); technological transfer agreement (Suresh, 1994); presence of local research and development (R&D) centers (Lynne, 1996); proportion of technical and management position held by locals (Urata, 96); extent of local sourcing (Capanelli, 1999;Axele, 2000); and measurement based on division of technology into stages of adoption, rooting and diffusion process (Lai, 2001). The application of these different measurements has led to different observations, which to certain extent has led to contradictory findings. For example, one study (Suresh, 1994) suggests that there is a substantial level of JTT took place in Malaysia, but in contrast, another study (Lai, 2001) argues that even though they did take place, but it is not as significant as suggested by the former. The former conducted his study based on the TTA, which this paper argues that such measurement does not guarantee that actual technology transfers did take place. While the later used questionnaire asking managers' assessment on different level of technology transfer in different stages of technology. In this case, it is very likely that the later will provide more authoritative explanation than the former. It is not the intention of this paper to question the validity of both findings but to highlight the critical role of an appropriate measurement to arrive at correct judgment of JTT. This is because the complexities of technology and the ensuing difficulties in approximating different types of technology flows are so pervasive. Some argue that TT is firm and industry specific. As such, this paper suggests that measurement of technology transfer should be

eclectic in order to cope with the multidimensionality, increasing complexities and strongly knowledge-based character of the technology.

Another measurement of the extent of TT is through the presence of R&D center. Establishment of R&D can be regarded as one of the most reliable evidence to measure the seriousness of certain firm in transferring technology and also treated as the cornerstone of TT.

Literature on development of R&D center by Japanese MNC in Malaysia show mixed opinions. Some argue that there has been a progress but at a slow rate. Others report that much more significant center should be established locally. In one of the literature, it is argued that Japanese firms were slow in transferring formal R&D expertise (Yamashita, 1991). This is supported by a study of forty electronics firms, which corroborates general absence of R&D activities in their firms (Abibullah et.al, 1995). Another study found that 77.5% of the interviewed firms were reluctant to allocate R&D in Malaysia since most are conducted solely by head office (Lynne, 1996). To what extent can these observations justify the presence of JTT? While admitting that there is general inadequacy of R&D center, this paper contends that the small number was not purely because of Japanese reluctance to transfer technology, but in those periods, the number of highly skilled and trained local human resource is still insufficient. This has been the reason why technological transfer to Malaysia is not advancing. It was only from the mid 1990s that Malaysian government, realizing this deficiency, has intensified effort to upgrade the technological skills of local workers through various programs. Some changes have taken place since then. As a result, now, in contrast to previous findings, Japanese firms have set up many more R&D centers. Matsushita is one of the most intensive firms in taking the opportunity from the changes by setting up Matsushita Air conditioning R&D Center, Matsushita Compressor and Motor R&D Center and Home Appliance R&D Center that are staffed by 130 employees with only 20 Japanese. Many other Japanese firms are following the steps like Minolta, Nitto Denko and JVC. This positive development is not only in responding to Malaysian government encouragement, but it is inevitable strategies to cope with the changing character of new technology which require close and continuous method of transfer due to its intangibility. However, despite these positive developments, there is still wide room for improvement since it has been recognized that R & D efforts especially in science and technology were partly constrained by the lack of a critical mass of scientists and engineers (Malaysia 2001, p.125).

Technology being more complicated and more knowledge-based i.e. more intangible making transfer through mere license or equipment import which only provides manual or blueprints alone is insufficient. Technology cannot be fully transmitted through blueprints, manuals, or external R&D. New technology must be integrated with the firm's own production and organizational structures. This requires a lot of in house efforts to understand and absorb the technology. Obviously, a transfer method that provides stronger and closer commitment is more appropriate. The existing literature gives mixed opinion on the effect Japanese method of transferring technology. Some studies argue that Japanese style management, which directly influences the transfer method of technology, is one of the factors that affect the process negatively (Urata, 1996; Nazari, 1999).

Some scholars argue that the style JTT contributes to the complex nature of technology and knowledge. It is often quoted that Japanese production models draw its strength more from human related dimensions of engineering technique, workplace practices and corporate culture than through technology import of capital goods or other disembodied technology imports. This can be observed from the emphasis given by the Japanese firms on human embodied technology transfer through learning by doing. This paper agrees that indeed these features of JTT are effective imparting increasing knowledge-based and intangible production know how, but they need to be supported with written documents. This is because when technology become more developed, R & D for example, the technology documentation is very critical. Multiple channel of transferring knowledge is necessary. Here is where JTT style is lacking in as it has been observed in one study whereby Japanese firms is increasingly facing problem when dealing with the realm of product development in R&D (Hayashi, 2001, p.133).

The second factor of change is the fact that transferability and appropriatability of technology transferred is not only determined by technological characteristic but increasingly dependent on the host innovation system and implementation and management of the relevant policy support and incentive for technology development.

The case of Japanese technology transfer to Malaysia is especially true in this respect, whereby the wide technological gap has complicated the transfer process. Malaysian industry has developed and the gap is gradually narrowed. The more critical issue is how conducive and supportive is the local infrastructure in fostering effective technology

transfer. Does Malaysian innovation system address the issue of technology transfers efficiently through its technology transfers policy by providing efficient monitoring system in selection, adaptation, absorbing, combining and development of the technology? The literature found to be highlighting the conflicts between the seriousness of Japanese MNC to transfer technology and the readiness of Malaysian industry including its institutional support to provide positive environment for higher level of technology to be transferred.

On one hand, Japanese is argued to be reluctant in transferring their technology whereby they only transfer the standardized technology (Kojima, 1978). Malaysian is presently aspiring for high level of technology. Report by JETRO and Japanese Embassy show that 75% of company studied had fully transferred knowledge relating to operating equipment; 58% on quality control practice; 54% on maintenance skill but none of them responded positively on product development (Yamashita, 1991). Rasiah (1995) finds that there is substantial transfer of product and process technology but such transfer was only beneficial for technologically advanced suppliers While another author found that Japanese FDI in the Malaysian consumer electronic industry appears to discourage meaningful technology transfer and development of domestic innovative capacity (Lynne, 1996). She reported that from the 40 firms interviewed, over half did not view TT as a priority in choosing to locate their manufacturing facilities in Malaysia, since their main rationale for establishing such facilities is to export to third countries and to avoid higher cost in Japan. The study further argues that if there is any TT, it is internalized among the *keiretsu* and small Japanese based firms.

On the other hand, some studies point to the fact that the low maturity of Malaysian innovation system and absence of effective industrial governance procedure contributed to less intensiveness of JTT (Kagami, 1998; Rasiah and Anuwar, 1998). Apart from that, Malaysia, like other ASEAN countries, inherit the same characteristics of industrial structure a) appearance of extreme high-tech orientation but does not really the true fundamental technological capabilities; b) dependence on external sources of innovation which caused home-grown technological capability generally weak; c) insufficient pool of knowledge workers and talents to localize the innovation function, thus may thwart growth in local economy; d) lack of local base supporting industries; e) weaknesses of domestic sector due to unbalanced treatment of the export and domestic (Masuyama, 2001, pp.8-21). These

characteristics point to the weakness of domestic industry to receive high technology from Japanese firms.

Another group of studies found that the weak technology management system, especially implementation and monitoring process of technology-transfer-related policy and incentives are another factors that further discourage higher level of JTT. Rasiah (Rasiah, 1995; 1998) for example, reports that one of the constraints of effective TT to Malaysia is the fact that the administration of TTA was not professionally done. For example, the screening of agreements in practice is not stringent. He further argues that MIDA lack the capacity to monitor the implementation of agreement *ex post* to ensure that the contract has conferred technological mastery to the technological purchaser (Rasiah, 1995). Another study found that the TTA were not handled by those who know about technology content (Lynne, 1996). The person entrusted to do the job is expected to acquire the skills throughout the working process without necessarily posses a technical background.[2]

The inefficiency in the technology management can also be attributed to fact that the responsibility for monitoring technology transfer is distributed among too many agencies. The task seems to be floating around among various agencies like Ministry of International Trade and Industry, Ministry of Science, Technology and Environment and Malaysian Industrial Development Authority. The closest agency identified based on job description is Secretariat Unit of Malaysian Industrial Development Authority (MIDA). But this section appears to mainly responsible on evaluating the agreement for approval. There is no specific enforcement agent to ensure that the agreement is strictly observed.[3] As one of the consequences from this problem, one study found that the tax incentives for R&D was not widely used and very low claim, showing the unpopularity of the incentives (Kondo, 1999). The study found that companies were not using it because of the bureaucratic procedure and strict requirements.

The passive enforcement of Intellectual Property Rights (IPR) is also found to be another reason why Japanese MNCs fear to transfer high-level technology to Malaysia (Kagami, 1998). This is because the effectiveness of technology transfer is dependent on adequate framework for legal protection apart from other non-economic factors (Higuchi, 1999). The absence of legal protection in regulating technology transfer to Malaysia has long been recognized as major problem in Malaysian industry (Lim, 1983).

Another point of weaknesses is the variance of coordination between government and business in fostering technology transfer. One study found that there is clear difference of supporting local structure between Penang and Klang Valley which resulting in difference performance of foreign firms (Rasiah, 2002) Though this study is not a study of Japanese MNC per se but it is strongly belief, as suggested in the study, once the local structure is not coordinated the firms technological activities which include TT will be affected. The coordination includes putting the TT strategy into wider framework of industrial development strategy for upgrading capabilities.

These problems confirm the argument that technology transfer is no longer an issue of technology per se, but rapidly becoming more of management of the technology change and the dynamism of transfer process itself. Without having these problems overcome, it is doubted that the increasingly dynamic process of technology transfer will take place at a faster rate and contribute more significantly to local technology development.

The third factor of change evolves from the changing characteristics of production network. The systemic character of technical change and new technologies requires network type relationship to exploit their full potentials (Stopford, 1998, p.2). Firms are having simultaneous access to technology and technology market. As such, selection of suppliers should be purely on competitive basis.

However, the literatures reveals that Japanese MNC is not very keen involving local firms in their production network. Many studies reported weak production linkages between MNC and local firms (Rasiah 1996, 1999; 2002, Suresh, 1997). Japanese production networks is based on a closed network system with headquarters-centered governance structure.. They are not very enthusiastic in promoting backward linkage with the domestic suppliers since it has been their traditional practice to rely on long-term relationship based on trust and loyalty. Trade and Development Report (2002) report that Japanese production network in comparison to US still less independent in getting local supply. Therefore the spillover effect on the local economy is small and backward linkage is not that developed or very minimal. One study found that Japanese MNC source most of technologically sophisticated components from other Japanese subsidiaries, while mainly procuring low technology from Malaysian joint ventures (Capanelli, 1999, Axéle, 2000). Another study reports that the Japanese firms interviewed admitted that they source core components from Japanese

suppliers including from own subsidiaries (Rasiah, 2002). The study also argues that local suppliers are limited to low value-added non-core activities. Key technologies are still from Japan and development work in head quarters. This kind of production network should be revised and the negative perception and attitude of Japanese firms toward local suppliers need to be changed. As argued above, given the simultaneous access to technology and technology market all firms, regardless of nationality, should be allowed to compete fairly.

Realizing this fact, some trends of changes can be traced recently. Some Japanese firms are now moving toward systemic rationalization (Ernst, 2000,pp. 94-95) whereby the changing production and product cycle times has led them to subcontract out dissimilar activities to effective and best suppliers not only concentrating on affiliates (Best 2001). Based on the report of Rasiah (Rasiah, 2002) it can also be observed that JVC, Toshiba, SONY, NEC, Fujitsu and Hitachi have attempted to increase local sourcing following promotional effort and the changing business environment however failed because they found that they do not have division of labor vertically below them (Rasiah, 2002). They are interested in increasing local sourcing but lack of network synergies to ensure cohesiveness (Rasiah, 2002). This again raises the issue of local business environment system.

Conclusion

Based on the above discussion, several points can be concluded. Firstly, JTT does take place in Malaysia but the assessment on its performance need to be comprehensive and differently applied from firms from another countries. Given the distinct character of Japanese management and production system, it may not be appropriate to apply the same standard and measurement on both Japanese and non-Japanese firms. The selection of an appropriate measurement for technology transfer is essentially critical in evaluating Japanese technology transfer. The importance of these criteria is obviously further imposed given the increased complexity of knowledge and production process itself, as described above. One possible method, as argued above, is an eclectic approach combining the previous measurement done in the literature.

Secondly, some of the reason that lead to judgment on ineffectiveness or slow transfers of technology by Japanese firms are actually partly attributed to he transferee institutional weaknesses. As it has been raised

above, the technology transfer process is becoming more dependent on local innovation system and the management of technology transfer process itself.

Lastly, the globalization induced changing environment has changed the technology transfer context, which subsequently suggest necessary change in framework and approaches in analyzing the issue of technology transfer process.

Notes

[1] Based on Annual Survey of Japanese Chamber of Commerce in Malaysia (JACTIM)

[2] Based on author's interview

[3] Based on author's interview with MITI and MIDA

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