

Soft Technology Transfer for Japanese MNCs in Malaysia a Conceptual Model

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Abstract

This article examines the soft technology transfer for Japanese MNCs in Malaysia, based on knowledge-view model. The objective of this study is to verify the factors causing of soft technology transfer, technologists' absorptive capacity and social capital. The interrelationships between absorptive capacity, social capital and soft technology transfer are formulated as conceptual models.

Keywords: *Technology transfer (TT), Hard technology (HT), Soft technology (ST), Multinational Corporation (MNC), Foreign direct investment (FDI), Gross domestic product (GDP), Newly industrialized country (NIC), R&D expenditure as a percentage of GDP (R&D Intensity), Research Scientists and Engineers per 1 million workforce (S&T Density)*

Introduction

Malaysia has established the Vision 2020 goal to achieve economic development to be placed among the world's most competitive industrialized economies by the Year 2020 (Jomo & Felker, 1999). Given the importance of technology-based industries in the global economy, the development of technically trained human resources and investment in R&D capabilities are necessary major dimensions of this effort. Through the 'Look East' Policy (LEP) since 1981 (Raduan, 2002), Malaysia government has taken Japan as models and partners in economic and industrial development process, in order to learn the good aspects of Japanese soft technology (ST) or work organisation and management styles. As of

2010, there are 730 Japanese-owned or related manufacturing companies from Japan (referring to Figure 1). This makes Japan MNCs the biggest Foreign Direct Investors in Malaysia (JETRO, 2010, pp. 38-41).

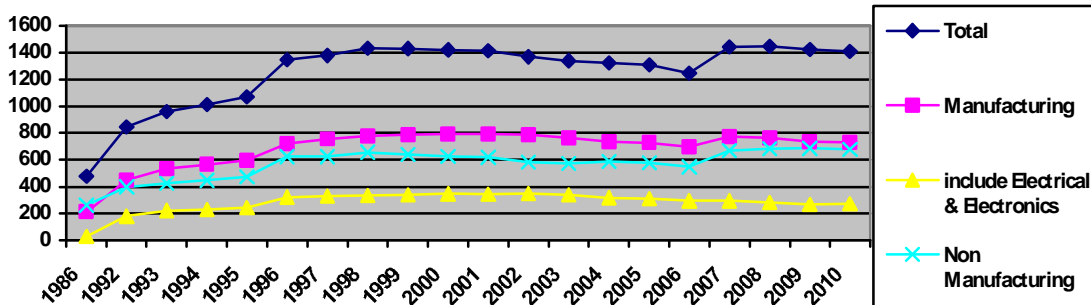


Figure 1: Number of Japanese MNCs in Malaysia

For Malaysia to forge ahead towards high value added activities, it is essential to develop capability to innovate, produce new technology and design new products, through soft technology transfer, or knowledge transfer.

Soft Technology Transfer: Knowledge Management Model

Soft Technology transfer is a vast topic that has been studied in the disciplines of science, economics, sociology, anthropology, management. There have been several attempts to give a systematic view of the different studies of soft technology transfer. This paper focus soft technology transfer on the knowledge view.

(a) **The Knowledge Management**

On soft technology transfer within companies, a frequently mentioned instrument is computer-based knowledge management. The basic idea is to set up a computer database with a directory and search functions and then design a system of incentives to make knowledgeable employees use it.

Information technology can probably be helpful as a support in soft technology transfer efforts (Albino, et al., 2004). Its advantage is being appealing to many technology-oriented companies. Its main shortcoming is that databases capture only explicit knowledge, while tacit knowledge has to be transferred through mechanisms that are not included in the model.

(b) **The Knowledge View**

The previous models have been enriched by the distinction between knowledge and information, which presents knowledge as a richer concept than what can be written down. Polanyi (1967) formalized this approach by introducing the concept of the "tacit dimension" of knowledge. This approach is complemented by the further distinction between know-what and know-how (Orlikowski, 2002). On the other hand, the knowledge perspective leaves unclear whether it is more appropriate to speak of knowledge as an object or of knowing as an activity. In the approaches mentioned above, transfer is not explicitly dealt with.

(c) **The Knowledge Flows**

Based on this perspective, knowledge has been likened to a liquid which flows from one point to another. The most evident advantage on the knowledge flow approach is its focus on transfer. Many researchers have used Von Hippel's (1994) concept of "stickiness", a measure of the difficulty of knowledge transfer, in their empirical studies (example: Riusala & Smale, 2007). However unclear definition of "stickiness" has led to a confusion between knowledge characteristics, human and organizational factors.

(d) **Knowing As an Activity**

Orlikowski (2002) has developed an approach that conceives of knowing as an activity rather than knowledge as an object. The obvious advantage of this approach for the study of technology transfer is that is directly based on human activities and human relations. However, it seems difficult to come up with a convincing operationalization of these concepts for quantitative studies of knowledge transfer.

(e) **Conceptual Model**

A conceptual model of knowledge transfer within Japanese multinational companies and their overseas affiliates has been proposed base on the studies by Sýtrach & Everett (2006). This general model, as shown in Figure 3, incorporates two principal dimensions: facilitating factors and knowledge. This model was not operationalized nor proven in the research.

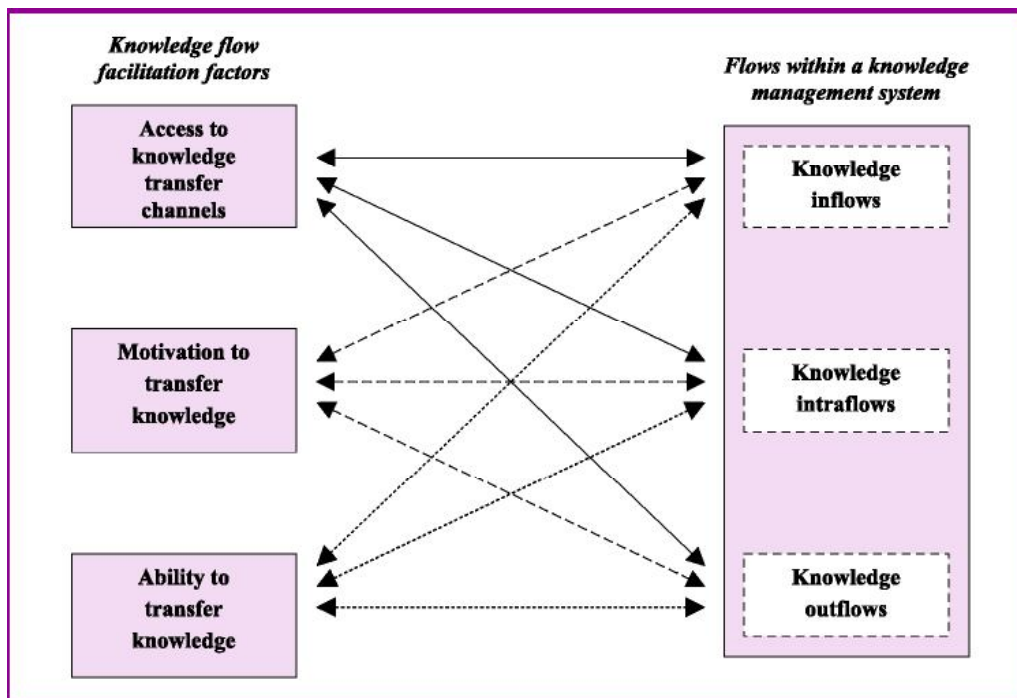


Figure 2: Model of knowledge transfer

Technology Transfer: The Factors

One of the classical lines of research about soft technology transfer looks at whether the knowledge is transferred within the MNC, to a joint venture, or to an external partner (example: Almeida, Song, & Grant, 2002), which constitutes an application of transaction cost theory. On a lower level of aggregation, Foss and Pedersen (2002) have linked the amount of knowledge transferred to the position of MNC units within their network.

A number of studies (example: Bjorkman et al. 2004; Dhanaraj et al., 2002) have looked at whether soft technology transfer between MNC units takes place at all.

Alternatively, these transfer processes have been labeled as subsidiary inflows or outflows (example: Gupta & Govindarajan, 2000). Referring to the same concept, Tsai (2002) defined his dependent variable as "intra-unit knowledge sharing".

The quantitative study of soft technology transfer began with a focus on costs. According to Teece (1998), the transfer costs are negatively correlated with the existence of firms with similar technology and to the transferee's manufacturing experience, while the results are less clear for the relationship between costs and the transferor's transfer experience as well as between transfer costs and the age of technology. The importance of transfer costs has been confirmed in the literature (example: Teigland et al., 2000).

The other objective measure for transfer success is the time required to complete a process. In fact Teece (1998) has proposed that cost and time in soft technology transfer could be traded off against each other. However, transfer studies that use time as the dependent are also rare. This lack of "hard" or "objective" measures for the success of soft technology transfer projects could be one of the causes for the disparity of findings in the field.

A series of papers have presented measures for the effectiveness of soft technology transfer. Most of these measures have the form of new constructs, such as "degree of knowledge transfer" (Minbaeva, 2007), "effectiveness of transfer projects" (Lin & Berg, 2001), "inward knowledge transfer" (Li, 2005), "scope and diversity of intra-network knowledge sharing" (Cho & Lee, 2004). These constructs are operationalized either as combinations of individual items or based on the subjective appreciations of managers involved in the transfer processes. On the other hand, there are also objective measures for transfer effectiveness. Szulanski et al. (2004) have used "accuracy of reproduction" as their dependent variable. Ambos and Schlegelmilch (2008) have measured R&D performance directly at each international unit in obtaining number of patents per annum.

While the measures mentioned above focus on the results of soft technology transfer, others have looked at the process. For the lack of the better name, "tacitness" and "knowledge ambiguity" as been dubbed as difficulty of transfer. The most widely used term (example: Jensen & Szulanski, 2004; Riusala & Smale, 2007), is Von Hippel's (1994) metaphor of "stickiness". On the individual level of the expatriate manager, Minbaeva (2007) has used "ability and willingness to transfer" as their dependent variable.

These multiple research lenses have produced mixed results. Therefore, any attempt to move forward in the field of soft technology transfer should strive for making the underlying assumptions as clear as possible in order to construct a coherent framework.

Soft Technology Transfer in Practice : MNCs in Asia

Motivation to Transfer

Soft technology transfer can be seen as an effective mechanism to advance the flow of technological development in a developing country's economy (Kumar, U. et al., 2007). Although small-scale soft technology transfer projects are initiated and managed by private organizations, the large-scale technology transfer projects in a developing country need support of the state, given the complexity level of and resource requirements for such projects. Kumar et. research have emphasized aspects of negotiation and adoption/assimilation capability development in examining critical elements of a large-scale soft technology transfer process frame-work in a developing country context include (i) understanding and selecting soft technology components; (ii) selecting a technology transfer mode; (iii) negotiating effective process; and (iv) developing capability.

Why should the MNCs transfer technology? Hobday (1996) in analysing the motives for technological upgrading most MNCs pointed out that parent companies were commercially motivated to transfer technology and that plant expansions and export growth depended on the upgrading of local plants. Specific MNC motives for capability building included the need to: reduce plant start-up times; control and reduce operating costs of plant, once set up; shorten production lead-times; minimize equipment down-times; bring about continuous improvements; and raise productivity.

Another contribution by Mu et al. (2007) is foreign subsidiaries' innovation through learning from local environments, which in turn influences their knowledge contribution back to the MNCs headquarters, as shown in Figure 4.

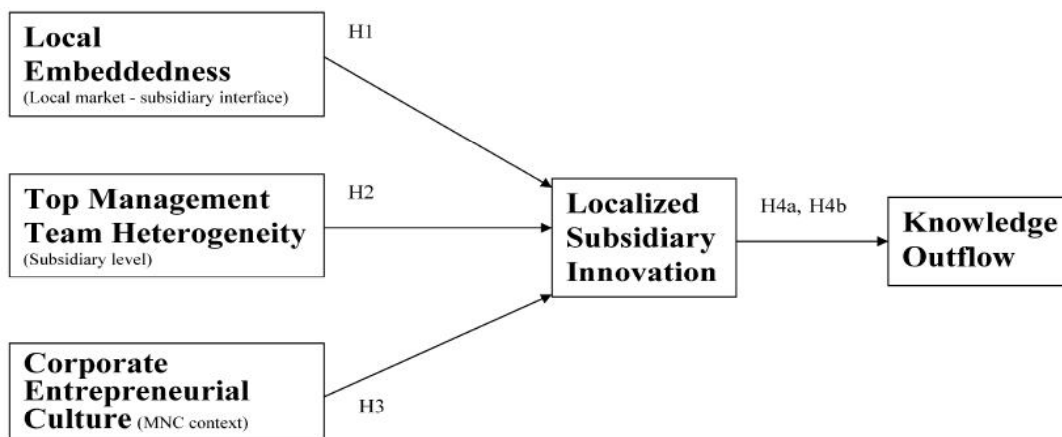


Figure 3: An Integrated Model of Subsidiary Learning and Knowledge Outflow

Their findings support that the learning and innovation of subsidiaries are significantly influenced by their local embeddedness, their top management team heterogeneity, and the corporate entrepreneurial culture of their parent company, along with the control variables including subsidiary size and the internationalization of parent company.

Parent Firm's Policies

A study by Giroud and Mirza (2006) on Japanese manufacturing firms' policies towards intra-firm soft technology transfer to subsidiaries in Asia have lead to three distinct categories of soft technology ("production/supply chain knowledge"; "human resources systems" and "technology for innovation") being recognised by firms and policies exist for each category, including whether it will be transferred, the extent of the transfer, and when.

Giroud and Mirzas' (2006) findings suggest that manufacturing/production systems are easier to codify than Human Resource Management, adaptive knowledge or R&D processes. Therefore Japanese companies are more willing and able to design policies and engage in transferring manufacturing system and process type of technology and knowledge.

Parent companies' policies are strongly influenced by centralised coordination as a means of controlling Japanese subsidiaries' networks, a finding supported by the preference for frequent, regular reports and the primacy of expatriate managers, engineers and technicians in subsidiary management and technology transfer. Such an organizing principle tends to intensify the strategic importance of subsidiary export-orientation and, hence, policies towards manufacturing "control systems".

Lower reliance on expatriates may result in local managers seeking greater autonomy, pushing for a change in subsidiary orientation or persuading "head office" to transfer other technologies. Having said this, Japanese companies do transfer other types of knowledge and technology, perhaps after a lag, when Information Technology is better established or, more importantly, when local conditions are better understood.

Collaboration on Firm Performance

Bastos (2001) has investigated the effect of intra-firm R&D expenditure and inter-firm collaboration (considered as non-routine, weak link) on firm performance, base on proposal that R&D expenditures enable a company to improve knowledge and assimilate the exchange of information within activities. The findings have conclusively indicated that intra-firm R&D expenditure increases performance, but no clear conclusions could be made the effects of inter-firm collaborations (non-routine).

Wang et al. (2005) has applied a process-oriented resource-based view and MNC network theory to concur that host country experience, industry experience, subsidiary experience, and group affiliation influence Japanese MNC subsidiary performance during an economic crisis in Thailand, Indonesia, Malaysia, and Korea.

Among different knowledge resources that the MNC accumulated in its internationalization process, it was found that subsidiary experiential knowledge was most significant in picking the winners from the losers during the crisis. Keiretsu affiliation and the parent firm's industry experience were also significant, positive factors for firms remaining profitable or even better after the crisis. However, firm size and industry effects are found not related to performance in the research by Wang, Huang and Bansal (2005).

Technology Transfer in Malaysia

In Malaysia, innovation among MNCs in general are focused on incremental design changes and new models of existing product lines (Hobday, 1996), with some large MNCs such as Matsushita (Craig, 1997) carried out significant product design work, R&D departments are small by the international standards of leading firms. Most technological activities were carried out by technicians and engineers, rather than researchers or scientists. Most firms had larger budgets for training and skills upgrade than they did for R&D. There was no cases found among MNCs subsidiaries conducting long-term or basic research (example: into new materials, novel designs or artificial intelligence) under-taken (i.e. the “R” of R&D).

As Hobday pointed out, the MNCs in Malaysia cannot be described as merely assemblers (or “screwdriver” plants). A great deal of innovative activity is carried out, centred on improvements to products and processes and the introduction and development of organizational methods (example: total quality management and statistical process control). Substantial design-for-manufacture was conducted in order to ensure the efficient mass production of electronic goods. This involved learning about core product design, software engineering, automation technologies, manufacturing materials planning and so on. Another point worth noting is that production-led innovations occurred not only in MNCs but in all groups of firms at varying degree. Extensive improvements and modifications to capital equipment are carried out by almost all firms, in a few cases leading to patents and own-brand sales abroad. In the increasingly complex area of semiconductor assembly and testing. Malaysia is one of world technology centre, with a cluster of leading firms in Penang and Klang Valley (example: Intel, Motorola, Sony). Substantial technical support is carried out for production and other near-term technological needs in most firms. For example at Sony there were around 500 technically trained people amounting to about 10% of the workforce (Hobday, 1996).

Innovation in Malaysia involved not only technological activities but also managerial and organizational improvements (some-times called “soft” innovations). Soft innovations have resulted in impressive records of continuous improvement and productivity gains at Siemens, MEMC and SHE (Japanese manufacturer). MEMC (German wafer manufacturer) had develop its own version of a modular manufacturing system involving worker empowerment, leading to substantial productivity gains. Siemens Penang also had applied and modified a total quality management system to suit its own needs. This plant received regular visits from German headquarters, from managers keen to learn about the techniques used. Siemens Penang was also a designated design centre for optoelectronics.

The internationaliation of Industrial R&D is different among Japanese, US and European-based MNCs. (Reger, 2006).

Overall, the efforts to innovate had improved the efficiency of the MNC subsidiaries through time, enabling the export expansion in Malaysia since 1990s. Equally, success in capability building allowed Malaysian managers to require for more MNC investment, adding a strategic motive for the subsidiary to demonstrate innovative capacity.

It is noted that there has not been as many recent research on technology transfer on MNC in Malaysia among international management literatures. Possible reasons could be the growing emergence of China and India as significant players in international trade, suggesting the gradual decline of Malaysia as a major foreign manufacturing companies’ investment hub.

The development of Conceptual Model on Soft Technology Transfer base on Knowledge Perspective

Models that integrate the theoretical underpinnings of soft technology and knowledge transfer models explored in previous sections related to this studies has been summarized follows :

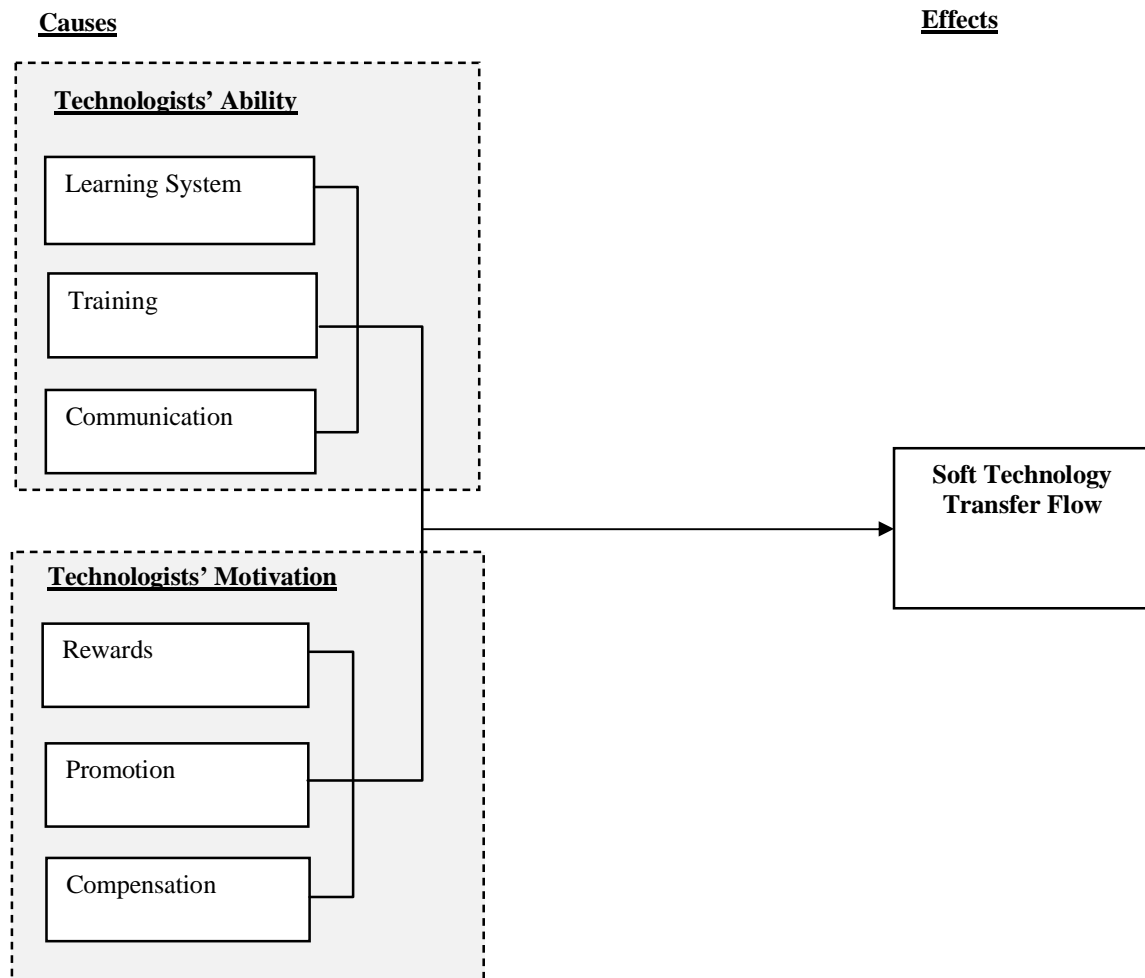


Figure 6: Conceptual Model of Successful Soft Technology Transfer for Japanese MNCs in Malaysia

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