

CHAPTER 4

EVALUATION ON THE DOMINANT CONSTRAINTS OF THE TECHNOLOGY TRANSFER CHANNELS: A CASE STUDY ON AUTOMOBILE INDUSTRY IN MALAYSIA.

4.1 INTRODUCTION

The previous two chapters provided information on the technology transfer channels. The second chapter provides an in-depth description of each of the channels adopted to transfer technology from abroad. The third chapter evaluates which of these channels are frequently adopted to transfer foreign technology in the Malaysian automobile industry. In further analyzing the technology transfer channels, this chapter will look into the various constraints faced by each of these channels. Chapter four can be divided into two main sections. The first section of this chapter is a descriptive analysis of the identified constraints. The second section analyzes the constraints that are dominant in the technology transfer channel. This analysis is done based on the technology transfer channels that are utilized in the automobile industry in Malaysia, which were discussed in the chapter three.

4.2 DESCRIPTION OF THE CONSTRAINTS.

Chapters two and three identified the various channels through which technology is transferred internationally. Nevertheless, each of these technology transfer channels has various constraints in the process of transferring technology to the developing countries. Anuwar (1996) stated the actual choices of applied technologies open to developing countries are rather limited. He elaborated that the bulk of the technologies have origins in a relatively small number of industrial countries which confer proprietary rights and can thus impose obligations/restrictions upon those permitted by the owners to make use of such technologies. One of the most common restriction is the prohibition of exports of goods produced under licensing or technical assistance agreement. Another

common constraint faced by developing countries is the tied purchase of materials from the licensors. Furthermore, when the licensees in developing countries lack technical, financial and commercial expertise in the technological negotiations, the terms often are very disadvantageous. This appears to be the case among many small and medium scale firms known to be paying royalties for patent agreement that has expired.

In addition, a study by UNIDO (1977) concluded that territorial limitation, restrictions concerning technical assistance, tie-in, grant backs and minimum royalty payment were common constraints in technology transfer agreements. Mingsarn Santikarn's (1981) study shared the same view by presenting the four most general forms of restrictions imposed in the technology transfer agreements being territorial limitations in the form of export restrictions, tie-in clauses, grant –backs and restrictions concerning technical assistance. Moreover, Vaitsos (1994) also supported territorial limitations and tie-in as common constraints in the technology transfer agreements. Thus, it can be concluded, the five major constraints are:

- 1) Territorial limitations
- 2) Restrictions concerning technical assistance
- 3) Grant-backs
- 4) Minimum royalties
- 5) Tie-in

4.2.1 Territorial Limitations

Territorial limitations come in forms of export restrictions and limitation to a specific field of application.

4.2.1a Export Restrictions

Generally, the agreements specify the territory which the recipient is authorized to use the technology and the territory which the recipient is authorized to market the product. The territorial limitations export restrictions may prevail in four forms. They are the total prohibition of exports, allocated areas for a technology recipient's exports,

requirement of approval by the technology suppliers prior to export and a reciprocal market arrangement. Total prohibition confines recipients to supply only to their own domestic market. However, in the second case, the suppliers may agree to allow recipients to export to certain areas. For instance, recipients may not be allowed to export to supplier's domestic market. A reciprocal export arrangement is one where technology suppliers agree not to export to recipient's markets while recipients promise not to export outside the allocated areas. It is often assumed that a total ban on export is the most restrictive among the four conditions and reciprocal export arrangement is often thought to be the most advantageous for a recipient country especially if it is a latecomer in export markets. Such restrictions occur because by selling technology, the technology supplier loses a part of its market (Mingsarn 1981). One of the main clauses entered in contracts of technology commercialization is that of export prohibition. Such restrictive practice generally limits the production and sale of goods utilizing foreign technology, within the boundaries of the particular country only. Some allow exports only to specific neighbouring countries. Restrictive clauses on exports are also based on relative bargaining power, given the market conditions on alternative sources of supply of technology. The receiving countries are in need of a bigger bargaining power, which would be possible with the government policies. Firms with access to information about world market availability, and aided by government assistance can achieve better conditions. Export restriction is dominant in 92% of nationally owned firms with technology agreements in the form of licensing, trade mark and patent (Vaitsos 1994). Mingsarn (1981) showed that 23 contracts in the form of patent, trade mark or licensing in the Thai textile industry had restricted export areas and a total ban on export, in 11 contracts where exports by the technology suppliers were minimal. Restrictions on export territories by the technology supplier may often conflict with restrictions set down by the host country's Government (UNIDO 1977).

4.2.1b Limited to specific field of application

Territorial limitation to specific field of application refers to the "territory" of the production processes in a plant. It refers to the territory or area or part of the production processes that involves sophisticated technology which, is not transferred on minimal

transfer. The technology supplier imposes this constraint so that they control their technology and safeguard their high-end part of technology. Hence, the term "limited to specific field of application" means technology transfer is limited to the simple ones only. This is done by providing training only on basic technology, dispatching experts that are only specialized in specific field and blueprints of specific assemble to the host country. Mingsarn (1981) showed, in the technology transfer of Thai textile industry that the employees of the technology recipient's firm were allowed to be trained in the technology supplier's plant, but they were not allowed to enter any laboratory. In the Philippines also, most of the licensing agreements in the early 1970s (overwhelmingly with U.S. firms) pertained to trade marks, provided only trade names and service marks rather than know-how (Lindsey 1994). Lester (1980), stated efforts by TNC affiliates in the ASEAN region, however, appear to be directed primarily toward upgrading the skills of the ASEAN workers in the form of overseas training or in-house training through the TNC's expatriates are limited to assembly line type of operations and lack of complex production processes and local R&D. The TNC affiliate firms surveyed in the Philippines, reported that their workers were only given on the job training in order to increase proficiency of existing skills of workers and to acquaint them with new improved equipment. The need to develop new skills was seen as much less important (Lindsey 1981). Snow (1977) reported that the 15 firms he interviewed in the Bataan Export Processing Zone in the Philippines, training was on the job, with an emphasis on discipline and socialization to standards of the workplace. Vaitos (1994), in a systematic study undertaken in the petrochemical industry indicated that, during the period when technology was most likely to be sold to developing countries, the original producers of a particular product or process accounted for only one percent of the total licensing of know-how. The remaining 99 percent were divided between "followers" of commercial producers (52%) and engineering firms (47%). Similarly, know-how in electronics sold to developing countries by technology-intensive companies like Philips International or General Electric generally includes know-how on products that have been in commercial usage for some time such as transistorized components for television and radio.

4.2.2 Restrictions Concerning Technical Assistance

For reasons of convenience and cost, the owners of the technology generally limit the scope of the technical assistance. One way is to specify the number of technical personnel to be dispatched, the number of recipient country's trainees to be accepted, and the quantity of blueprints and logbooks as well as to limit the duration of training. Given their general limited pool of highly skilled personnel, firms in the developing countries often lack sufficient knowledge and expertise about the technologies they hope to acquire from their potential suppliers (UNIDO 1977). Technology suppliers are reluctant to disclose full information about their products to the potential buyers until all transactions are completed. This is done to protect the proprietary of the product. As such, valuable technology knowledge is not readily given away. Thus, buyers lacking technical expertise will generally agree to purchase technology without sufficient knowledge of its eventual functional performance and hence value (Anuwar Ali 1996).

Vaitsos (1994) showed that in Bolivia, 24 out of 35 patent or trade mark contracts limited the number of blueprints dispatched for technical assistance to the usage of patents or trade marks due to local control over the ownership. Mingsarn (1981) showed that technical assistance and training abroad of local staff as technology transfer channels in certain firms in Thai reserved maximum training duration and the maximum number of trainees at any one time. Lidsey (1981) showed that for the firms in Philippines, the technology suppliers conducted only short duration on the job training in order to limit the transferred technology knowledge. Lim (1978) concluded that only short training programmes were considered necessary to prepare locals for specific production task which were taught to the majority of the production employees in electronic firms in Singapore by the foreign expatriates.

4.2.3 Grant – Backs

The grant-back constraint occur when the owner of the technology may require the recipient to grant back any improvements on the technology the recipient may develop. Equipment of intricate technical design or a manufacturing process of high

technological content may come into the picture. Hence, the need for the technology recipient's to keep his technology updated may be vital. The recipient, of course, decide to embark on his own research for the purpose without referring to the technology owner, but frequently keeps the technology owner informed of further developments. Hence, a continuing technology transfer agreement may need to include the provision for the recipient to grant back to the owner, license on the improvements he has made, and it is sometimes felt that this should be an exclusive license to safeguard the business of the owner.

In some cases, the two parties may agree to exclude major improvements or patentable improvements from the scope of any grant-backs. When the agreement includes exchange of improvements between home country and host country, such exchange should be on an equal basis. However, the home country commonly requires the improvements made by the host country be granted back with sublicensing rights even when the host country has no such rights. The host country may agree to such unequal terms on the condition that the home country shall not sublicense to manufacturer who compete with the host country manufacturers or to parties who do not agree to grant-back of improvements to the home country together with sublicensing rights (UNIDO 1977). Mingsarn (1981) showed the existence of grant-back constraint in 38 Thai textile firms adopted licensing, know-how agreement, trade mark and patent. 5 of these 38 firms agreed to the grant-back arrangements on unequal terms. For instance, in one firm, the industrial property right of any improvement discovered by either side must belong to the supplier.

4.2.4 Minimum Royalties

When an exclusive technology transfer is granted, the recipient is generally obligated to pay the technology owner a minimum stipulated royalty even if the recipient's sales do not attain a certain reasonable level. In this way, the technology owner attempts to stimulate the recipient to produce the amount of royalty required (UNIDO 1977). The recipients in the developing countries lacking technical, financial and commercial expertise in technology transfer negotiations, often end up with the

unfavorable terms, or may have to pay unreasonably high royalties. Anuwar Ali (1996) showed there are cases where many small and medium-scale firms known to be paying royalties for technologies acquired through patent, trade mark and licensing agreement. These channels require the recipient to pay royalties during the entire period in which the product involved is being manufactured or the process involve the suppliers technology, even if such agreement has expired.

Vaitsos's study on the commercializing of technology in Andean Pact confirmed that in more than 95 % of trade mark and patent contracts, payment of royalties is set as a percentage of sales and not with respect to profits or value added. He further added that the higher the ad valorem tariff rates for intermediate products sold by the parent to a subsidiary, the higher the royalty payment for the transferred know-how. Ng, Hirono and Robert (1986), in the study on technology and skills in ASEAN, showed royalties as a popular mode of payment for contracts involving continuing technical assistance in the use of patents and trade marks. They further added, royalty payments usually ranged from 1% to 5% of net sales, although there was one case where the rate was as high as 30%.

4.2.5 Tie-in

Tie-in means when the owner of the technology obligates the recipient to buy intermediates or components unrelated to the coverage of technology transferred "against the will" of the recipient. In other words, tie-in means the purchase of intermediates and capital goods is made from the same source as that of the technology. As a result, the recipient has to bear a higher cost. Consequently, the import of unrelated components will lead to storage problems (UNIDO 1977). These will have significant effects on the recipients' production cost, as it has to recover the transfer and storage cost as well. Thus, as in the case of tie-in arrangements in technology transfer contracts, benefits for the supplier and costs for the purchaser are not limited only to the explicit payments such as royalties or interest rates, but also include implicit charges in various forms of margins in the concomitant or tied sale of other goods and services.

Tie-in arrangements take various forms in technology commercialization contracts. The majority of the arrangements require the purchase of materials from the supplier of technology. Some of the arrangements also make such tied purchase conditional only if maximum price is paid for the goods purchased. Such tie-in purchases strengthens the position of the technology suppliers, thus enabling them to maximize their gains by selling over-priced components, intermediate inputs, capital equipment and spare parts. Hence, it is not surprise, tie-in clauses on intermediates for Bolivia, Ecuador and Peru appeared in 67% of the nationally owned firms adopted patents, trade mark and know-how agreement (Vaitsos 1994). It is also observed in trade mark and licensing agreement in the early 1970s in the Philippines with U.S. firms included tied-in purchases of raw materials (Lindsey 1994).

4.3 EVALUATION ON THE DOMINANT CONSTRAINTS IN THE TECHNOLOGY TRANSFER CHANNELS: AUTOMOBILE INDUSTRY IN MALAYSIA

This part of the chapter will furnish the complete evaluation result on the dominant constraints in the technology transfer channels applied by the automobile industry in Malaysia. The evaluation will be based on the data collected from the survey. To simplify the evaluation process, the survey data have been transferred into 11 tables (refer table 4.1 to 4.11). Each of these tables provides data on the constraints apparent in technology transfer channels adopted by each of the surveyed automobile firms in Malaysia. Therefore, the purpose of this part of chapter four is to evaluate the dominance of the described constraints in the recognized 11 technology transfer channels identified in chapter three. Evaluation is done on each technology transfer channel whereby, the most dominant constraints are identified in each of the channels.

4.3.1 Technical Assistance Agreement

The survey showed that the most dominant constraint in this channel was restrictions concerning technical assistance as 64% of the surveyed firms that adopted this channel face this constraint (refer table 4.1). The second dominant constraint in this

channel was territorial limitations with 57% of the surveyed firms had this constraint in their technical assistance agreement. On this account, the dominant constraints of this channel are restrictions concerning technical assistance and territorial limitations.

Constraint in the form of territorial limitation in this channel is due to the agreement, which specifies the territory in which the recipient is authorized to use the technology. On limitation to technical assistance agreement, specifically of computerized numerical control (CNC) as well as electric cutting machinery, the technology disbursed is limited to basic knowledge of operating the machines and solving simple problems that occur while operating the machines. In the case of any major breakdowns, these problems had to be referred to the suppliers. Thus, it is the intention of the suppliers to only teach the minimum skills needed to operate and maintain the new machine. In order to achieve the supplier's motive of not broadening the local staffs' technical skill, they often restrict the number of technical personnel dispatched to conduct the training as well as limit the duration of this technical training (normally less than a year). In a study conducted by Jomo (1994) it showed that the Proton workers were only provided technical training for 4 to 8 months in Japan.

Such constraints are dominant in this channel for two main reasons. Firstly, the technology suppliers are not the major shareholders in these automobile firms. Therefore, in order to have control over these firms, the technology owner controls the supply of technology to ensure that these firms continuously rely on them for the upgrading of new technology as well as overcoming the major break downs of the machines. In addition, the suppliers imposed such constraints in order to secure and increase their source of income from the sale of their technology. Secondly, is the lack of technical capabilities in the local automobile firms in operating the CNC machines and electric cutting machines. This is because, prior to the national car projects the local automobile firms only assembled imported CKD units. Furthermore, lack of technical capabilities due to the participation of the inexperienced "bumiputera" in the national car projects enabled technology suppliers like Mitsubishi and Daihatsu to take control over the automobile technology in Malaysia.

4.3.2 Know-how Agreement

From table 4.2, it was noted that 40% of the firms that adopted this agreement had territorial limitations constraint. The next dominant constraint identified was restrictions concerning technical assistance, whereby, 37% of the surveyed firms face this constraint. And the final dominant constraint in this channel was minimum royalties as 30% of the surveyed firms complained of this constraint. Hence, the most dominant constraint in the know-how agreement will be territorial limitations. The second dominant constraint will be restrictions concerning technical assistance and followed by minimum royalties.

Firms that usually adopt this channel are the automobile assemblers and component parts manufacturers that are operating as foreign subsidiaries. One of the main objectives for the technology suppliers to sell their technology to these firms is to capture the Malaysian automobile market. This is in view of the Malaysian government's policy that discourages the imports of CBU units by imposing high tariffs to protect its national cars. Thus, the only motive for these firms to operate is to sell foreign vehicles as well as component parts in the Malaysian market. Therefore, due to the small volume of production the technology suppliers limited the scope of technology by providing only the know-how of assembling these products in Malaysia. This is done by the foreign carmakers by limiting the quantity of blueprints with mainly information on assembling the imported CKD units. This limited blueprints lead to restrictions concerning technical assistance. In addition, these firms are obliged to pay minimum stipulated royalty even as sales do not attain a certain reasonable level may be because the technology suppliers are minimum shareholder of these firms. Its clear the technology suppliers are only interested in the payments for the sold technologies and not in the performance of these firms.

4.3.3 License Agreement

Table 4.3 showed that territorial limitations and restrictions concerning technical assistance were the dominant constraints in this channel. The most dominant constraint in this channel was territorial limitations, whereby, 40% had this constraint. Meanwhile, the

second dominant constraint was restrictions concerning technical assistance as 33% of the surveyed firms that adopted this channel had this constraint.

Territorial limitations in the form of limiting the field of application of the transferred technology occurred in these firms as they relied on the licensor (technology owner) for the rights to use its technical expertise including patent, trade mark and technical assistance. This heavy dependence on the licensor provides the technology owner the opportunity to control the supply of the necessary technical knowledge. The licensors control the supply of technology in order to create continuous demand from these licensee. Such action is taken by the licensors to ensure continuous income from the sale of their technology. At the same time, the licensors without majority share equity in these firms limit the scope of technology provided to ensure these products do not compete with their own products. Therefore, to achieve the licensor's objective of limiting technology that is transferred the licensor implements restrictions on technical assistance that are granted to these firms. This restriction is compounded by the fact that Malaysia is short of skilled manpower to accept and apply the knowledge. Hence, there is no need for the licensor to transfer technology other than the simple ones that can be comprehended by the licensee. All these conditions ensure the licensor remains in control of the technology.

4.3.4 Patent Agreement

In this agreement the most dominant constraint was territorial limitations in the form of limitation to specific field of application with 24% facing this constraint. The control of technology falls in the hand of the foreign counterparts due to the historical background of the Malaysian automobile industry, which has no experience in automobile technology. This is proven true as both Malaysia's national car projects, rely substantially on its Japanese partners, Mitsubishi and Daihatsu for technology supply. Though Proton has made some progress in the creating of its own technology, it is still in the early stages. According to Leutert and Siidhoff (1999) Proton has made great efforts to gain technological independence through the expansion of R&D department, the establishment of an internal casting plant and increasing co-operation with new foreign

ers. However, Proton has thus far not moved beyond technological level of station and, as regard to high-tech components, not even beyond basic technology option.

5 Management Agreement

The survey only identified one dominant constraint in this channel. Table 4.5 showed that territorial limitation was a dominant constraint in 33% of the surveyed firms that adopted this channel. This is because the foreign management staffs in the local automobile firms only ensure that the local products do not infringe the market boundaries other than the local market. Important activities like R&D are not given attention at all, as it does not contribute to the technology owner's income.

3.6 Turn-key Contract

The dominant constraints in this channel were territorial limitations and restrictions concerning technical assistance. From table 2.6 it was identified 13% of the respondents experienced these constraints. This channel is dominant in firms which are in the early stage of development. These firms, as starters are usually low in technological potential. Therefore, to take advantage of this weakness the technology suppliers will limit the knowledge transferred as well as limit the number of skilled personnel seconded, in order to prolong the technology transfer process. This is in line with MIDA's report in 1995 on technology transfer that cited disadvantages of turn-key contract for the host country may lead to technological dependence on the multinational firms.

4.3.7 Training Abroad for Local Staff

Territorial limitations and restrictions concerning technical assistance were identified in table 4.7 as the dominant constraints in this channel. The most dominant constraint of the channel was restrictions concerning technical assistance as 60% of the surveyed firms confirmed the occurrence of such constraint in this channel. And the next

identified dominant constraint was territorial limitations with 47% complained of this constraint

Territorial limitation constraint occurs in the form limiting the transferred technology to specific field of application whereby, the surveyed firms were trained with only simple technologies. For instance, providing training only on operating including maintaining of the imported CNC machines as well as the electrical wire cutting machinery were not designed to broaden technical skills. Another example, know-how on assembling new car models, training was provided to a batch of Proton trainees in the end of 1995 only on how to assemble the Proton Perdana model. Training was also only scoped to simple technologies such as plastic injections, casting parts makers and making of car seats. This limited know-how appears due to the restrictions concerning technical assistance imposed by the technology owner on the technical assistance provided, by reducing the duration of training. In view of this, the casting parts maker had only one-month training at the Japanese technical plant. Only six workers of the plastic injection makers were trained for two weeks to six months in Japan (Sadoi 1998). It was also found that a portion of the training periods was utilized on non-technical motivational courses. When Proton staffs were sent to Japan on a year training in mid-1983, the first four weeks were devoted to Japanese Language training and on the fifth week they were provided courses on Japanese history and society. Only after completion of this course were the Proton trainees were brought to Mitsubishi Motor Corporation's Mizushima Factory for practical operations and engineering training (Jomo 1994).

Thus, the occurrence of territorial limitations as well as restrictions concerning technical assistance in this channel are due to the minority share equity of technology supplier in these firms. Both the casting parts maker and plastic injection maker are 100% "bumiputera" equity owned companies. Similar, Proton and the car seat company had local majority ownership. Hence, the technology supplier, in order to monopolize the technologies supply as well as increase the income from selling the invented know-how enforces such limitations to this channel. The heavy reliance on Japanese as well as other foreign technologies in all of Malaysian national car projects provides a clear indication that Malaysia lacks in technical capabilities. Furthermore, the lack of initiative by the

local automobile firms to invest in research and development enabled the technology suppliers to delay the transfer by limiting the scope of know-how and duration of technical training so that the industry will continue to import their technology.

4.3.8 Visits of Foreign Experts and the long-term contracts of Expatriate Engineers

This channel too was identified as a dominant technology transfer channel in chapter three's general evaluation and comparative evaluation. Similarly, the dominant constraints in this channel are territorial limitations and restrictions concerning technical assistance. From table 4.8 can be seen that the most dominant constraint was restrictions concerning technical assistance as 67% of the surveyed firms that adopted this channel complained of such constraint. The second dominant channel was territorial limitation with 47% suffered from this constraint. Restrictions concerning technical assistance as it is only an alternative channel to training abroad of local staffs. The restrictions present here is in the form of limiting the number of engineers dispatched to local firms. This is clearly seen, whereby, initially in 1985 the number of Japanese staff in Proton was about 100. This number reduced to 30 in 1987. In 1988, only 16 Japanese engineers and management staff were deployed at Proton. As a result, in end of 1995 Proton had to send its staff to MMC Japan in attaining the know-how of assembling Proton Perdana model. Consequently, this directly affects the component parts firms that are Proton's vendors when obtaining technical assistance from these engineers. This clearly confirms the control of MMC over Proton. Furthermore, the restrictions concerning technical assistance occur in this channel, as most of the surveyed firms could not afford to pay too many experts as well as long stay of these expatriates. This is because most of the firms that complain of such constraint in this channel had paid-up capital less than RM50 million and have low volume of production.

Meanwhile, territorial limitations occur in this channel as the technology transferred are only simple technologies such as general machining, machine fitting, stamping, welding, and production of plastic materials and plastic injection moulding process in the surveyed firms. The survey further found there aren't any transfer of sophisticated technology such as forging techniques that is important to transform metal

approximately to required shape in order to minimize machining processes as well as the low designing capability, hence, proving the existence of territorial limitation in this channel. The occurrence of such limitations is clearly present, as in 1987 after three years of commercial operation, Proton's production line could not be operated, even for one day, without the Japanese staff team. Moreover, till early 1994, MMC employees from Japan were still working on the Proton shopfloor by rotation every few months (Jomo 1994). Such territorial limitations occur in this channel because the firms that adopt this channel were wholly local owned or majority of the share equity is owned locally. Thus, the technology owner limited the scope of technologies supplied in order to have a permanent customer.

4.3.9 Engineering Services Agreement

The engineering service agreement was recorded as a dominant technology transfer channel in chapter three. The dominant constraints in this channel were also in the form of territorial limitations as well as restrictions concerning technical assistance. The most dominant constraint was restrictions concerning technical assistance with 56% and the second dominant channel was territorial limitations with 47% (refer table 4.9).

Constraints in the form of territorial limitations as well as restrictions concerning technical assistance occur in this channel because it involves the transfer of knowledge for creating designing capability. The related skills of designing are skills to modify designs, modify molds as well as production equipment. The reluctance of foreign technology owners to transfer such knowledge is because designing capability is an important requirement in adopting automobile technology as well as it involved many years of research and development. Also, the fear that transfer of such knowledge would create Malaysian cars, which will compete with the technology owner's own products. Furthermore, the auto parts suppliers are usually uninterested in investing in innovation, largely due to their small scales and production volumes. They tend to rely on continuous foreign technology, with its attendant long-run costs, rather than investing in in-house technology development (Leutert and Siidhoff 1999).

4.3.10 Supply Agreement

This was also a dominant technology transfer channel. From table 4.9 it was noted that restrictions concerning technical assistance was the most dominant constraint in this channel as 54% of the surveyed firms admitted the occurrence of such constraint. And the second dominant constraint of the channel identified by the survey was territorial limitations with 43% respondents.

These two constraints are dominant in this channel because these firms rely on technical assistance of the machine supplier to obtain the guidance to operate the imported machines. It was shown in the general evaluation in chapter three that the 87% firms that adopted this channel also adopted the training abroad for local staff channel with the supplier in order for them to learn to operate the imported machinery. Therefore, the reasons for the presence of constraints in the form of territorial limitations and restrictions concerning technical assistance are similar to training abroad for local staff.

4.3.11 Trade mark Agreement

In contrast, trade mark agreement is a dominant technology transfer channel only for the automobile assemblers/manufactures in Malaysia. The most dominant constraints in this channel was tie-in. Table 4.11 showed that in this channel 30% of the firms complained of tie-in constraint. The trade mark owner imposes tie-in constraint in order to strengthen its position as technology supplier and also to increase the income from the sale of intermediates and capital goods. This is in line with Lindsey (1994) and Vaitos (1994) that showed tie-in constraint occur in trade mark agreement. The surveyed firms allow for such tie-in to maintain the quality of the product in Malaysia.

4.4 CONCLUSION

From the survey, its clear that the most dominant constraint in the technical assistance agreement, training abroad for local staff, visits of foreign experts and long-term contracts of expatriate engineers, engineering services agreement and supply

agreement was restrictions concerning technical assistance. This dominant constraint occurs in these channels due to the application of these channels simultaneously among assemblers/manufacturers. Furthermore, restrictions concerning technical assistance was dominant, as the same channels were dominant among component parts manufacturers. Moreover, supply agreement and training abroad for local staff was simultaneously adopted among the surveyed component parts manufacturers. In addition, the same constraint occurs in these channels because all these channels involved transfer of technology through transfer of human embodied skills. Thus, in order to achieve the intention of the technology suppliers to have control over the industry's technological development, the supplier restricts the number of experts dispatched, shorten the duration of training and working duration of expatriates in host country. The technology suppliers tend to control technology because all the surveyed firms were established in line with the New Economy Policy that requires the participation of local equity ownership especially "bumiputera" hence, reducing the foreign control over the equity ownership as well as their profit. Hence, in order to have continuous income from the sale of technology the technology suppliers restrict the technical assistance to prolong the technological dependence of these firms. Other than the suppliers tendency to control the technology transfer, this constraint occur also due to the characteristic of the most of the surveyed firms, especially component parts manufacturers that are locally owned with paid-up capital less than RM50million that have low volume of production which, could not afford long duration of training and long-term contracts of expatriate engineers.

On the other hand, in know-how agreement, license agreement, patent agreement, and management agreement the dominant constraint was territorial limitations whereby, the transferred technology are only applicable in specific fields. Territorial limitations in the form of export restriction did not occur because the Technology Transfer Unit that is incharge of screening these agreements does not allow for such restrictions. The similar constraint occur in these channels due to know-how agreement, patent agreement and management agreement are adopted simultaneously by the assemblers/manufacturers. In addition, license agreement also faced the same dominant constraint as the assemblers dominantly adopted it. Furthermore, similar constraint occurs in these channels as all of them transfer technology in the form of written information and know-how. Such

constraints occur in these channels because of lack of technical capability in the surveyed firms. These firms lack technical capabilities due to two reasons. Firstly, no previous experience in the automobile industry. Secondly, weak involvement in research and development in most of the surveyed firms became an advantage to the technology suppliers. Furthermore, the lacked technically and economically proficient technocrats and bureaucrats in automobile technology in the Technology Transfer Unit also lead to existence of such constraints in these channels (Rasiah 1997).

For the similar reasons, restrictions concerning technical assistance and territorial limitations were both dominant constraints in the turn-key contract. Meanwhile, the dominant constraint in the trade mark agreement was tie-in. This is because the firms that are producing products under this channel are normally forced to purchase intermediate products from the trade mark owner to strengthen the position of the technology suppliers as well as to maintain the quality of the product. Inversely, grant-back was a non dominant constraint in the evaluated channels due to most of the surveyed firms were lacking in R&D investment and also because the Technology Transfer Unit only allows the transferability of improvements of technology involved to licensor at a fee. Minimum royalties was also a non dominant constraint as the Technology Transfer Unit (TTU) discouraged royalty payments in motor vehicle assembly. Furthermore, TTU only permitted royalty fee not exceeding 2% of net sales for less sophisticated and assembly operations (Anuwar 1993).

Hence, as a result of the constraints that occurred in the technology transfer channels adopted by the automobile firms, these firms are only involved in producing products with simple as well as basic technology. Leutert and Siidhoff (1999) showed that production of technologically complex parts in automobile firms in Malaysia is limited. Locally produced parts mainly consist of bodywork, accessories, wheels, tyres and electronic components. In contrast, engine parts, suspensions, shock absorbers and gear box components are mostly imported. They also added that, till recent years Proton has made great efforts to gain technological independence through the expansion of R&D department, the establishment of an internal casting plant and increasing co-operation with new foreign partners. However, Proton has thus far not moved beyond technological

level of adaptation and, as regards to high-tech components, not even beyond basic technology absorption. Component production is also inefficient and the technology is basic due to small production volumes and labour intensive techniques, particularly among new Proton and Perodua suppliers. The private assemblers have improved their efficiency, but are still constrained by small production volumes and labour intensive processes to simple technology absorption. Rasiah (1997) also showed that Proton has yet to develop independent engine manufacturing capability and is still dependent on its MMC partner for engine and gear box and also for expertise in several other critical aspects of car manufacturing.

Table 4.1: Dominant Constraints in the Technical Assistance Agreement

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	8	27	5	17	4	13	17	57	12	40	1	3
Restrictions Concerning Technical Assistance	10	33	2	7	7	23	19	64	10	33	1	3
Grant-backs	2	7	0	0	2	7	4	13	25	84	1	3
Minimum Royalties	7	23	4	13	0	0	11	37	18	60	1	3
Tie-in	2	7	0	0	2	7	4	13	25	84	1	3

Source: Survey

Table 4.2: Dominant Constraints in the Know-how Agreement

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	5	17	2	7	5	17	12	40	2	7	16	53
Restrictions Concerning Technical Assistance	5	17	4	13	2	7	11	37	3	10	16	53
Grant-backs	0	0	0	0	2	7	2	7	12	40	16	53
Minimum Royalties	5	17	4	13	0	0	9	30	5	17	16	53
Tie-in	2	7	0	0	2	7	4	14	10	33	16	53

Source: Survey

Table 4.3: Dominant Constraints in the License Agreement

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	4	13	1	3	7	23	12	40	1	3	17	5
Restrictions Concerning Technical Assistance	3	10	3	10	4	13	10	33	3	10	17	5
Grant-backs	1	3	0	0	2	7	3	10	10	33	17	5
Minimum Royalties	2	7	2	7	0	0	4	13	9	30	17	5
Tie-in	2	7	0	0	2	7	4	13	9	30	17	5

Source: Survey

Table 4.4: Dominant Constraints in the Patent Agreement

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	3	10	1	3	3	10	7	24	1	3	22	7
Restrictions Concerning Technical Assistance	2	7	2	7	1	3	5	17	3	10	22	7
Grant-backs	1	3	0	0	1	3	2	7	6	20	22	7
Minimum Royalties	2	7	0	0	0	0	2	7	6	20	22	7
Tie-in	1	3	0	0	0	0	1	3	7	24	22	7

Source: Survey

Table 4.5: Dominant Constraints in the Management Agreement

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable.		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	4	13	2	7	4	13	10	33	0	0	20	67
Restrictions Concerning Technical Assistance	2	7	1	3	1	3	4	13	6	20	20	67
Grant-backs	0	0	0	0	2	7	2	7	8	26	20	67
Minimum Royalties	0	0	0	0	0	0	0	0	10	33	20	67
Tie-in	1	3	0	0	2	7	3	10	7	23	20	67

Source: Survey

Table 4.6: Dominant Constraints in the Turn-key Contract

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	3	10	0	0	1	3	4	13	1	3	25	8
Restrictions Concerning Technical Assistance	1	3	2	7	1	3	4	13	1	3	25	8
Grant-backs	1	3	0	0	1	3	2	6	3	10	25	8
Minimum Royalties	2	7	1	3	0	0	3	10	2	6	25	8
Tie-in	1	3	0	0	1	3	2	6	3	10	25	8

Source: Survey

Table 4.7: Dominant Constraints in the Training Abroad For Local Staff

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	6	20	5	17	3	10	14	47	12	40	4	13
Restrictions Concerning Technical Assistance	8	26	3	10	7	23	18	60	8	27	4	13
Grant-backs	2	7	0	0	1	3	3	10	23	77	4	13
Minimum Royalties	6	20	3	10	0	0	9	30	17	57	4	13
Tie-in	1	3	0	0	1	3	2	7	24	80	4	13

Source: Survey

Table 4.8: Dominant Constraints in the Visits of Foreign Experts and Long-term Contracts of Expatriate Engineers

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	6	20	5	17	3	10	14	47	13	43	3	10
Restrictions Concerning Technical Assistance	10	33	3	10	7	23	20	67	7	23	3	10
Grant-backs	2	7	0	0	1	3	3	10	24	80	3	10
Minimum Royalties	7	23	3	10	0	0	10	33	17	57	3	10
Tie-in	2	7	0	0	2	7	4	13	23	77	3	10

Source: Survey

Table 4.9: Dominant Constraints in the Engineering Services Agreement

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	6	20	5	17	3	10	14	47	11	36	5	17
Restrictions Concerning Technical Assistance	8	26	2	7	7	23	17	56	8	26	5	17
Grant-backs	2	7	0	0	1	3	3	10	22	73	5	17
Minimum Royalties	6	20	3	10	0	0	9	30	16	53	5	17
Tie-in	1	3	0	0	1	3	2	7	23	76	5	17

Source: Survey

Table 4.10: Dominant Constraints in the Supply Agreement

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	4	13	6	20	3	10	13	43	13	44	4	13
Restrictions Concerning Technical Assistance	7	23	2	7	7	23	16	54	10	33	4	13
Grant-backs	3	10	0	0	1	3	4	13	22	74	4	13
Minimum Royalties	5	17	3	10	0	0	8	27	18	60	4	13
Tie-in	1	3	0	0	1	3	2	7	24	80	4	13

Source: Survey

Table 4.11: Dominant Constraints in the Trade Mark Agreement

Constraints	Frequencies											
	Frequently		Sometimes		Rare		Total Applicable		Not Applicable		Didn't Adopt	
	No	%	No	%	No	%	No	%	No	%	No	%
Territorial Limitations	0	0	2	7	0	0	2	7	11	36	17	57
Restrictions Concerning Technical Assistance	2	7	2	7	0	0	4	13	9	30	17	57
Grant-backs	2	7	0	0	0	0	2	7	11	36	17	57
Minimum Royalties	2	7	0	0	2	7	4	13	9	30	17	57
Tie-in	0	0	0	0	9	30	9	30	4	13	17	57

Source: Survey