CHAPTER 2

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AUTOMOTIVE INDUSTRY'S TECHNOLOGICAL CAPABILITY DEVELOPMENT

2.1 INTRODUCTION

This chapter discusses the development of technological capabilities in local automotive industry. It begins with the definition of technological capability and the types of capabilities under which firms can be categorised. It then discusses the stages of technological capabilities development process firms can adopt to provide an impact on the industry as a whole. It further looks at the technological capability development of Malaysian automotive industry with emphasis on meeting the army's operational requirement. Lastly, the chapter examines the MAF procurement pattern, the implementation of contract clause on the transfer of technology (ToT) in the purchase of military vehicles and the diffusion of ToT in automotive industry in meeting the MAF requirement.

The automotive industry is an important sector in overall industrial development of a nation. The industry provides the opening for development of other industries, as vehicles require various manufacturing processes of different sector of industry to produce vehicle parts. Among others, it involves fabrication, machining, tool making, electrical, electronic, rubber

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and plastic industries to make parts and components. An important aspect in the production is the integration of components, which does not come from a single source. In the case of military vehicles, the integration is more complex as there are other integral systems that need to be fitted to meet the military specifications. In many instances, the vehicles are just the platform or the prime movers to carry weapon systems and their associated equipment. For example, artillery guns and ammunitions are towed by heavy trucks and missiles are mounted on a three-ton vehicle. In addition to the complexity, military vehicles are subjected to extensive and extreme usage in rugged terrain and under adverse conditions. Therefore, the vehicles produced must be more durable than the commercial vehicles. The manufacturers have to ensure the vehicles' technical specifications are more superior before they can fit into military requirement. .

2.2 TECHNOLOGICAL CAPABILITY

2.2.1 Definition

Technological capability refers to those activities, which enable a firm to choose and use technology to create strategic competitive advantage. In other words, technological capability is what firms need to be able to use technology for strategic advantage (*Blanchard ,1995*).

Research has consistently shown that firms differ widely in terms of their technologic capabilities. Their capabilities can be categorised under different types as shown in figure 2.1. The types of firms are as follows:

Type A. This firm is unaware about the need for technological improvement. They are unable to identify what and where they may improve, or how to go about the process of technology upgrading. As

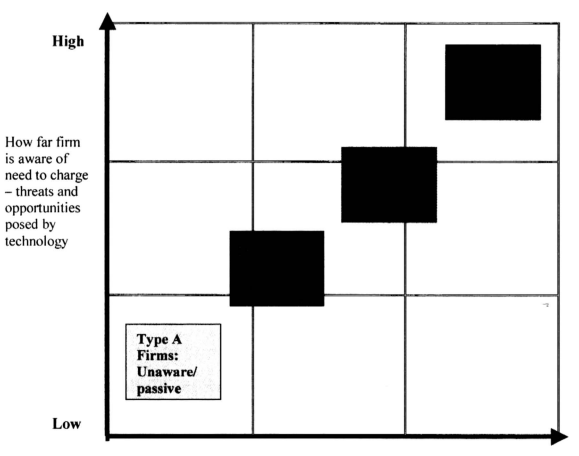

Figure 2.1: Firm Technological Capabilities

such, they are highly vulnerable to competitive forces. They are weak in all major areas of technology acquisition, use development and strategy. .

Type B. These firms recognise the challenge of change and the need for continuous improvements in manufacturing and other technological capabilities. However, they are unclear about doing the process in the most effective way. They often lack skills and experiences in technology. Their external networks are usually poorly developed. Most technological know-how comes from their suppliers and from observing the behaviour of other firms in their sector. Overall, these companies have poorly developed capabilities in most areas of technology strategy, search, acquisition and capability building. However, there are some strength upon which to build.

Type C. These firms have a well-developed sense of the need for technological change. They are highly capable in implementing new projects and take a strategic approach to the process of continuous improvement. They have strong internal capabilities in both technical and managerial areas and can implement changes with skill and speed. However, they tend to lack the capabilities to re-define markets through new technology, or to create new market opportunities. They tend to compete within the boundaries of an existing industry.

Overall, these companies have strong in-house capabilities and think strategically about technology in the medium and long term. In some areas, these firms may be behind the international technology frontier but they have much important strength upon which to build.

Type D. These firms have fully developed sets of technological capabilities and are able to help define the international technology frontier. In many areas, they take a creative and pro-active approach to exploiting technology for competitive advantage. They are at ease with modern strategic framework for innovation and take it upon themselves to "re-write" the rules of the competitive game with respect to technology, market and organisation.

Strong internal resources are coupled with high degree of absorptive capacity, which can enable diversification into other sectors, where their own skills and capabilities bring new advantages. Their technology and market networks are extensive so that they are kept informed about new technological opportunities and remain in touch with suppliers of equipment and ideas.

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2.2.2 Dimension of Technological Capability

Technological capability is made up of several key abilities – to seek opportunities, to select appropriate solutions, to implement change effectively and others. The model of key abilities is shown at figure 2.2.

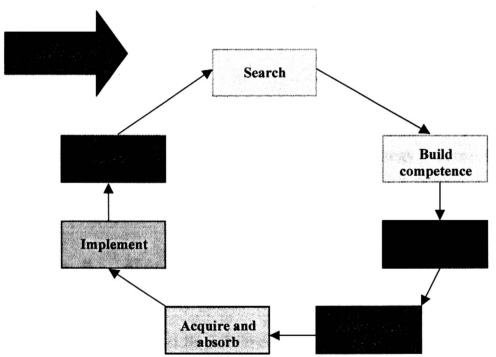

Figure 2.2: Technological Change Cycle

The stages involved in technology capability development are as follows:

Stage 1. Initial awareness of the need to change and willingness to begin looking inside and outside the firm for possible triggers for change.

Stage 2. Searching for triggers for change – picking up demand signals from the market or within the firm about changes needed or picking up signals about potential opportunities raised by new technological development.

Stage 3. Looking at core competencies. Recognition of requirement for technology through a systematic audit of its current competencies and a comparison of those which it need to develop or acquire in order to remain competitive.

Stage 4. Development of a technological strategy – some clear idea of where to change and why.

Stage 5. Assessment and selection – Exploration of range of technological options available. Comparison between all the options available which can be achieved through some form of benchmarking, feasibility study. And other measures. Selection of the most appropriate option based on this comparison.

Stage 6. Acquisition of the technology (either through direct purchase or via some form of license, collaboration or alliance). This is likely to involve transfer of knowledge, specification and property rights.

Stage 7. Implementation and absorption of technology within the firm. This may involve extensive project planning and management of activities and require configuration of both technology and organisation to get a good and workable fit.

Stage 8. Operation of the technology and learning about t. how best to use it. Over time it may involve extensive learning and development, competence is very much the product of this last stage of accumulation and incremental development.

Stage 9. Learning through the process to develop internal capabilities, which will sustain technological development in the long term.

2.3 AUTOMOTIVE INDUSTRY'S TECHNOLOGICAL CAPABILITY DEVELOPMENT IN MALAYSIA.

The most important event ever in the history of Malaysia's industrial development is the launching of the national car by the Prime Minister, Dato' Seri Dr. Mahathir Mohammad , in 1985. It was produced by Perusahaan Ototmobil Nasional (PTOTON), established in 1983 to spearhead the ambitious national car project. The project was initially met with skepticism among the local industrialist and the customers, realising

that Malaysia, being new in the business could not measure to the competitiveness of automotive market. They claimed that the quality of national car would not match those of Japanese makers such as Nissan, Toyota and Honda and many continental car manufacturers. All these names were synonymous with automotive industry among the citizens. However, with the government's strong support in term of protecting the industry and the diffusion of technology from Japan's Mitsubishi Company, the national cars slowly and steadily gained the confidence of the users, and now it has captured more than 64% of the share in passenger car market *(NST, March 2002)*

Many studies were conducted on the development of local automotive industry. One of the areas of study is on the policy intervention by the states. According to Bloomfield (1978) and Torii (1991), automotive industrial development in developing countries can be divided into four stages:

Stage 1: Import and sales of CBU cars by local retailers.

Stage 2: Assembly of imported CKD parts, and domestication of parts production.

- Domestic production of replacement parts and components.
- Domestic production of OEM parts for car assembly

Domestic production (OEM) of key parts : engine and engine-related components.

Stage 3: Domestic production of materials for cars and components.

Stage 4: Domestic design of car bodies and other components.

In relation to Malaysian automotive industry's development, a study by Kamaruddin Abdulsamad (1994) indicates that the government's policy towards the industry can be divided into two phases as follows:

Phase 1 (1967 – 1982). After independence in 1957, the government developed a policy (1963) to promote an integrated industry to strengthen Malaysia's industrial base. The aims then were to reduce imports, save foreign exchanges, create employment , develop strong forward and backward linkages with the rest of the economy, and to transfer industrial technology. The policy was characterised as a period of protective promotion of local assembly. For that, the government approved the setting up of assembly plants for Volvo, Fiat, Mitsubishi, Honda, Puegeot, Mercedes Benz, Daihatsu, Ford, Chrysler and Land Rover. In 1977, the Motor Vehicle Assemblers Association was set up to oversee the industry. By 1980, there were

eleven assemblers, many were Bumiputeras, to encourage them to venture into automotive sector.

During this period, CBUs imports decreased while the import CKD units increased, mainly due to government's protection through high tariffs, stringent import licencing and quantitative restriction. However the proliferation of eleven makes made production of parts expensive, thus resulting in few local contents. To address the problem, the government attempted to rationalise the industry through the development of a "national car" from early 1980s.

Phase 2 (1983 – present). This phase is remembered as the period during which the dream of having our own car was realised. The national automotive project started in late 1982 with the setting up of PROTON, a joint venture between Mitsubishi Company of Japan and Heavy Industry Corporation (HICOM) of Malaysia . The first model, "Proton Saga" rolled out from the assembly plant in 1985. However, the economic recession in 1986 caused a setback in sales and the company suffered losses from 1985 until 1988. The economic recovery in 1989 helped the company register a modest pre-tax profit of RM 32.6 million from a turnover of .RM 820 millions.

In 1993, another national car project, Perodua, was launched. This second car is targeted at the lower income group with the company offering smaller capacity passenger cars named Kancil and family vans named Rusa. Its later addition of products included the 4x4 version called Kembara. The formation of this company involved participation of Permodalan National Bhd. (PNB), Daihatsu Malaysia Bhd, Mitsui Company, UMW Holding Bhd, Med Bumikar MARA Bhd, and Daihatsu Motor Company of Japan.

Having gained valuable experience from the two earlier projects, in 1996 the government approved the production of another joint venture car project between Diversified Resources Berhad (DRB), Citreon of France and Rover of England . The acquisition of Lotus Engineering Plc. of England by DRB is another milestone towards enhancing technological capabilities of Malaysian company in automotive industry. To increase production capacity, DRB decided to open PROTON City in Behrang, Perak in 1996. However, due to the economic downturn in 1997 to 1999, the project was put on hold. In early 2001, it was reported that the project was to be revived.

By looking at the development of local automotive industry, it is evident that it started with the assembly of parts, followed later by the inclusion of local contents, as required by the government policy. This policy

has enabled the other industries to mushroom in support of the automotive industry. Many companies in Malaysia are given the rights to manufacture parts and components from the original equipment manufacturer (OEM) and replacement equipment manufacturer (REM). The finished products are sold to final assembly, repair shops and general customers in the replacement market for used vehicles. The impact of industrial policy on technological development in the automotive industry can be represented as in figure 2.3.

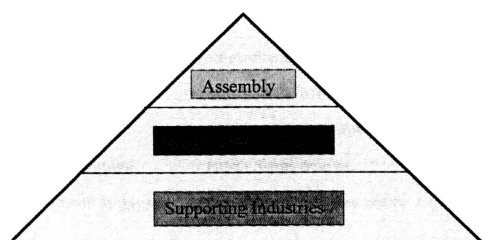

Figure 2.3. Structure of Automotive Industry

2.4 DEFENCE INDUSTRY- TECHNOLOGICAL CAPABILITY DEVELOPMENT THROUGH EQUIPMENT PURCHASES.

2.4.1 Pattern of Purchase

During the initial stage of its formation, the army used vehicles left by the British Army in its routine tasking. Brands such as Bedford, Land Rover and Leyland were frequently referred to as the most popular military heavy trucks then. Following the development of local automotive industry, the army in the 1960s until 1980s, received its supply of vehicles from local companies appointed by the foreign manufacturers. Some of the local companies that supplied the vehicles during those periods were:

Cycle & Carriage	- For 3-ton Mercedes Benz and staff cars.
Federal Auto	- 3 to 10- ton Volvo trucks, recovery vehicles and staff cars.
Emastulin	- 3-ton TATA trucks.
Softweeman	- MAN specialist vehicles.
Sarawak Motors	- HINO 3-ton trucks.
Land Rover Malaysia	- Land Rover vehicles below 1 ton category.

In the middle of 1980s, the government's policies on protectionism and self reliance encouraged a small number of companies to invest in the defence sector. DRB started producing dual-use trucks into the market by assembling its own DRB-HICOM trucks in Pahang, using Isuzu engines. When it secured a contract with the Ministry of Defence in 1997, the brand name of Isuzu Handalan was given to reflect its durability for use in the armed services. The other company, Pesaka Astana concentrated in the

small market by producing customised and special purpose vehicles for the MAF, other government agencies and statuary bodies.

Like the soft skinned vehicles, the Malaysian Army was handed the old Ferret Scout Car and the Panhard armoured personnel carrier when the British left the country. These vehicles proved to be very durable in the Malaysia tropical condition during the earlier part of the emergency. However, their aging machines and bodies could not sustain the ever increasing demands for the use of armoured vehicles in the army operations along Malaysia-Thailand border, especially during the height of Communist insurgencies in late 1960s and early 1970s. In view of that, the government decided to phase out the vehicles and replace them with a fleet of US-Cardilac Cage Commando V150 armoured vehicles in 1974.

The end of communist threats in the late 1980s had changed the emphasis of the army from preparing for counter insurgency warfare to conventional set up. With that shift of scenario, the army needed to increase its mobility and firepower to face the potential conventional forces. Light tanks, the Scorpion and Stormer from UK were added to the hardware inventory in 1982. Later, in 1983 and 1984, RPZ Condor APCs of Germany and Sibmas FSV of Belgium respectively, were purchased to enhance the defence capability of the nation. When the army was called to provide the assistance in the United Nations Peacekeeping Operation, the government

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took advantage of the financial reimbursement from the world body to better equip the army. A fleet of Korean Infantry Fighting Vehicle was bought in 1993 for the use by Malaysian Battalion in Bosnia. The army also bought some specialised vehicles for the deployment in the United Nations operation, mostly through direct negotiation with the manufacturers.

During his visit to Poland in April 2002, the Prime Minister announced that Malaysia would purchase a specific number of MBT from Poland. This much-awaited announcement was in line with the army's modernisation programme which was stalled during the economic crisis in 1997 until 2000. The purchase of PT 92 MBT would cost the government about RM 1 billion. According to the Defence Minister, Dato' Sri Mohd Najib Tun Abd Razak (DSA Bulletin, Apr 2002), the resurgence in the defence equipment procurement was in tandem with the improved economic situation of the nation. He added that with economic improvement, there would be projected increase in the defence expenditure to procure platforms, weapon systems and solutions to meet national requirement. Prior to this announcement, the government has signed a contract with FNS Nurul of Turkey, with DRB-Defence as the local agent, for the supply of ACV 300 Armoured Personnel Carrier. The contract was estimated at RM1.5 billion.

2.4.2 The Impact on Technological Capabilities.

The impact on technological capabilities follows the phase of development of automotive industry discussed earlier in this chapter. In the first phase there was no significant contribution from the purchase of military vehicles towards developing technological capabilities. Units were delivered under CBU and CKD, and in the case of armoured vehicles, all deliveries were in CBUs. Contractors were just required to supply the vehicles without any technological commitment, except on the maintenance. A limited number of army maintenance personnel were sent to the manufacturer's factories for limited maintenance courses, while the familiarisation courses were conducted in the country. All parts and components were obtained from OEM, as the army required the technical specification to follow the NATO standard, which was very stringent.

As the automotive industry entered its second phase of development, companies in the local defence industry started to build their technological capabilities. Government's policies of giving preference to locally assembled and manufactured products had provided the impetus for local companies to venture into assembly and manufacturing activities. As parts of a move towards developing local defence industry, the Treasury has made it mandatory for all contracts to include Transfer of Technology (ToT) under the offset clause in the purchase agreement of principle equipment. This

has resulted in the local companies, wishing to deal with the ministry, establishing collaborations with the foreign manufacturers Multi national companies from the USA and Europe began to open their subsidiaries in Malaysia to seek opportunities in the lucrative defence sector, especially at the start of MAF's modernisation programs in mid-1980s.

Under the offset programme for the purchase of Scorpion and Stormer light tanks in 1982, a project team was attached to the Alvis Company in UK for a period of about two years.. The purpose of this attachment programme was to learn about the manufacturing processes, the maintenance system and other logistics support requirement to ensure the operational capability of the vehicles when they were handed over to the army. A comprehensive training package for technicians was also included in the contract. This group of trained REME technicians formed the backbone of maintenance team that was able to ensure the operational life of the vehicles is achieved until now. The light tanks are now undergoing an upgrading programme to extend their economic life span.

Subsequent purchases of armoured personnel carriers also went through the same arrangement but the participation of local companies in building technological capabilities was lacking. The local companies appointed as the agents merely acted as intermediaries for the manufacturers and later, took the role of spare parts suppliers. Only a few

companies remained genuinely active after securing defence contract, while many disappeared from the scene after receiving the last payment. It was due to this that some of the contract requirement, especially the after sales service and depot maintenance were not met.

More comprehensive offset programmes were implemented with the purchases of Daewoo's KIFV and ACV 300 of Turkey. A number of officers and other ranks were sent to Daewoo's factory in Korea for on-the-job training programme, course on integrated logistics support system and maintenance training. A field technical support team was also sent by the company to Bosnia during the Malaysian Contingent's tour of duty there to assist the army in maintaining the vehicles. A local company, Malaysian Mining Corporation, established a strategic alliance with the Korean counter part to take on the maintenance services of the vehicles and to conduct upgrading works if required by the army.

In 2001, a local defence related company, DRB – DEFTECH, secured a contract to supply 200 units of ACV 300 Armoured Personnel Carrier from Turkey. As stipulated in the contract agreement, the manufacturer, FMC Nurul will manufacture the first 65 units in Turkey, while the remaining 135 units will be manufactured at the local company's premise in Pekan, Pahang. The manufacturer also agreed to transfer the armoured vehicle

technology to DRB-DEFTECH and the Malaysian Army through joint production and technical training.

This agreement is seen as a very important and strategic step towards building Malaysian technological capability in armoured and heavy vehicles sector. At present, Malaysian Army's project team is already stationed in Turkey to monitor the progress of the manufacturing process and the management of training. The prototype is expected to be completed by the end of this year and the project will take three years to complete. A visit to DRB-DEFTECH complex in Pekan shows that infrastructure development is progressing well in anticipation of the launch of the project in early 2003.

The maintenance of equipment is traditionally the responsibility of REME. All REME personnel are technically trained in various trades such as automotive, electrical, electronic and mechanical engineering. REME workshops are located in all brigades to provide technical services and repair of vehicle up to component level. To offset the shortage of manpower and encourage defence industry to develop, the government decided in 1988 to privatise some of the services to private sector. Hence, MMCE took the offer, working in conjunction with OEM, by undertaking the dieselisation programme of Commando V150 APC. The company was later awarded contracts for the upgrading works on Ferret Scout car and overhaul of 4 x 4

RPZ Condor APC. With all these contracts, MMC slowly began to develop its technological capabilities in maintenance and repair.

The requirement for special purpose vehicles for UN peacekeeping operations has opened up a small market for those vehicles. A privately owned Bumiputera company, Pesaka Astana, saw this opportunity by supplying vehicles from the Eastern Block. Later, the company embarked on integratively producing its own heavy tucks under a brand name of AMDAC. This also marked a very important step towards the company's manufacturing capability, although initially it used imported chassis to produce the vehicles.

2.5 SUMMARY

Firms need to have the edge in technological capability in order to stay competitive. Studies have shown that different companies differ widely in terms of their technological capabilities and absorptive capacity. The level of capability depends very much on how far the company is aware of the need to change and how far is the firm prepared and able to change in practice. Technological change is constantly taking place and will affect competitiveness in terms of product and process.

The development of local automotive industry is state -led from the beginning. Policies on protectionism and favourable incentives have enabled the industry to develop from import orientation to export orientation strategy. The national car project provides the launching pad for the industry to venture into more competitive global market, establish more strategic alliances and develop technological capabilities.

The development of defence automotive industry seems to follow the civil automotive sector. Since investment in defence-related business is risky and the market is small, many local companies shy away from the defence sector. Only with favourable policies and incentives were they willing to venture in this highly risky but profitable business. Nonetheless these companies do not have dedicated organisations solely for defence sector but function as dual-purpose entities.