Chapter 5

Thai Automotive Industry: Opportunities and Challenges

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Thai Automotive Industry: Opportunities and Challenges

Somrote Komolavanij, Chawalit Jeenanunta and Veeris Ammarapala

Abstract

The automotive industry started in Thailand more than 50 years ago. This paper seeks to trace the developments within the industry since then, that is, in terms of technology transfer, research and development (R&D) as well as innovations involving the automotive manufacturers and their suppliers, especially the local (Thai) ones who supply automotive parts. Technology transfer and innovations among local companies are among the indicators of sustainable growth within the Thai automotive industry. In this study, ten companies in the automotive industry were selected for interviews, which focused on the kinds of relationships existing among the companies comprising the automotive cluster of Thailand. Two of these companies were automotive manufacturers and eight were auto parts makers (first, second and third tiers). Based on the interviews, it was found that there were strong relationships between the automotive makers and the suppliers. However, the relationships were in terms of support for and technology transfer in the manufacturing process aimed at reducing manufacturing costs and improving the quality of the auto parts rather than achieving product innovation. The innovation of process improvement was done via the auditing process between the automotive manufacturers and the suppliers, as is required by ISO/TS 16949. The automotive maker and automotive supplier relationship was partly defined by joint product innovations or technology transfer in product innovations.

1. INTRODUCTION

The automotive business in Thailand evolved from importing cars and trucks from overseas to meeting the country's vehicle demand. Today Thailand is one of the major automotive manufacturers in the world. The automotive industry is now an important component of the Thai economy, accounting for about 10.5% of the country's total Thailand's GDP in 2008 belonging to automotive sectors. Thailand has a very strong and successful automotive cluster. Thailand was originally an agricultural country and thus had no technology of its own in automotive manufacturing. Thus it is interesting to

understand the development of the automotive cluster in Thailand.

The successful automotive cluster of Thailand began with investments from foreign automotive manufacturers, resulting in the formation of groups among automotive suppliers, which in turn became clusters later. After almost sixty years since the 1950s, the automotive industry has been firmly established in Thailand. But what does the future hold for the industry?

R&D is one of the key factors that ensures the success and sustainability of the automotive industry. It facilitates the innovation of both products and the manufacturing process. Product innovation can keep customers' interest while manufacturing innovation can reduce the costs of manufacturing. R&D is key to understanding the evolution of the industry, especially in terms technology transfer from automotive manufacturers to their suppliers at all tiers.

The following section provides an overview of the Thai automotive industry. Section 3 presents the results of interviews with ten Thai cases within the automotive industry. The last section explains the policy implications of the state of the supporting technology transfer, R&D and innovations within the industry.

2. AUTOMOTIVE INDUSTRY IN THAILAND

2.1 Thai Automotive Industry Exports and Growth

The automobile and automobile parts industry is one of Thailand's most important industries. At present, Thailand is the center of large manufacturers all over the world. Thailand, which is already the largest automotive manufacturer in Asia-Pacific, can potentially become the world's small car hub. Thailand is the largest producer in Southeast Asia and the world's second largest producer of and market for pickup trucks. It was also the world's 12th largest automobile producer in 2008 (up from 15th in 2007). It is also a production hub and exports motorcycles to manufacturers in Japan.

Table 1 Total Export Value of Automotives from Thailand (in millions USD)

	2006	2007	2008	January-October 2008	January-October 2009
Total exporting value of automotives	15,073	17,812	20,846	17,955	12,817

Source: TAI (2009).

In 2009, there were 16 assemblers in Thailand's automobile industry with a combined production of 1.4 million units. About 50.76% of production comprised pick-up trucks and 43.72% passenger cars. Thailand's car industry is already a global export hub for one-ton pickup truck. Of its total production, Thailand exports 40% one-ton pickup trucks. Based on the report of the Thailand Automotive Institute (TAI) in 2009 (Jan-Oct), the automobile and auto parts industry exported units valued at 435,154 million baht (US$12,817 million), up from 28.72% in 2008 as shown in Table 1 (TAI, 2009).

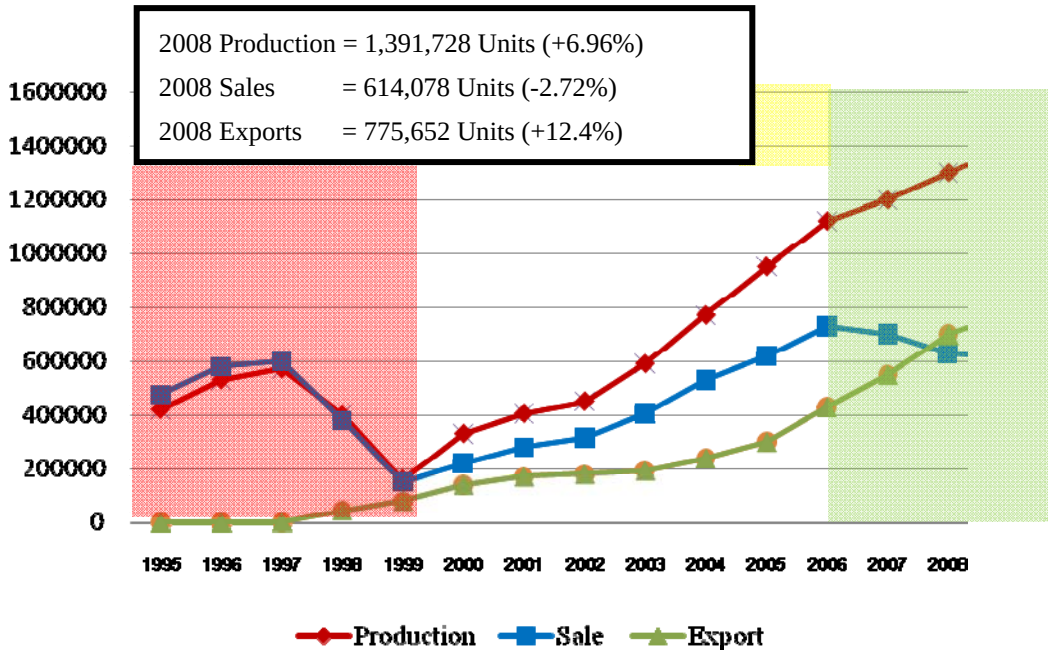


Figure 1 Thai Automotive Growth

Source: Thailand Automotive Institute, as February 12, 2009 (Asawachintachit , 2009).

As shown in Figure 1, the Thai automotive industry's growth came in three phases. The first phase was marked by the Tom Yam Kung crisis during the period 1997 to 1998, when the global economy decelerated and the value of Thai baht fluctuated, which in turn led to a significant decline in automotive production at 30% (Amano, 2009). Between 1999 and 2005 – the second phase – the economy started to recover. Also, major automotive maker Toyota selected Thailand as its largest manufacturing base for pick-up trucks in Asia (Amano, 2009). The Japanese firm also launched its Innovative International Multi-purpose Vehicle project as part of its efforts to increase its export of complete pick-up trucks and its parts and beef up sales and production for the domestic market in Thailand, which grew to an average of 35% per year from 1999 to 2005 (Praisuwan, 2006). The last phase, beginning in 2006, was marked by the breakout of the Hamburger crisis, which manifested in high gasoline prices, high inflation rate, and a fluctuating economy that adversely affected automotive sales (TAI, 2009). In 2008, the Thai government enforced a policy granting reduced taxes to automobile makers using substitute energy. However, this policy led only to a marginal industry growth of 6.96% (Asawachintachit, 2009).

The Thai government is setting its sights on turning the country's automotive industry into the major production base of eco cars in Asia and making it the 10th largest automotive hub in the world by 2011 (Hart-rawung, 2008). At present, Thailand is called the "Detroit of Asia," after one of the US's largest manufacturing hubs.

As seen in Figure 2, original equipment manufacturer (OEM) parts as Thailand's major exports were continuously increasing from 2002 to 2008. Spare parts and engines, among others, made a small amount of exports. Most parts and accessories of motor vehicles are exported to Japan, Indonesia, Malaysia, and the United States, where the world's major automobile manufacturers are based.

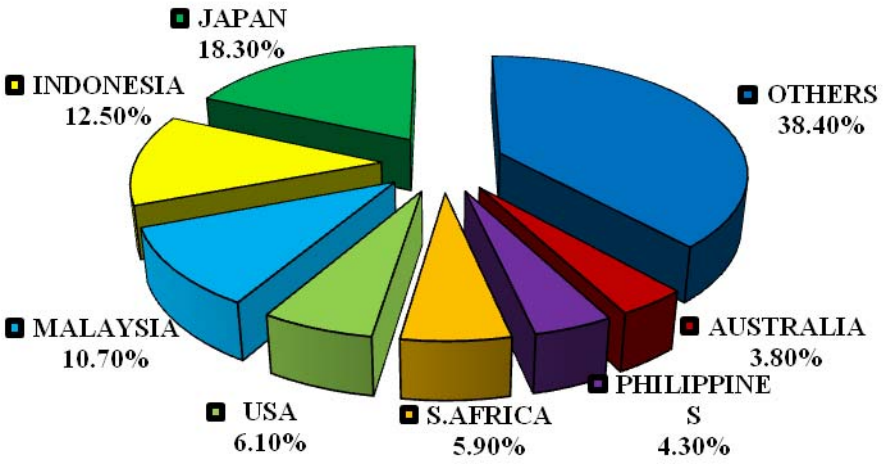


Figure 2 Export Market for Part and Accessories of Motor Vehicle in Year 2008

Source: Ministry of Commerce Thailand, as of March 2009 (MOC, 2009).

2.2 Automotives Manufacturers and Their Suppliers

As shown in Figure 3, Thailand's suppliers are located in – listed in order of number of their suppliers – Bangkok, Samutprakarn, Chonburi, Rayong, and Pathumthani. Most of automotive assemblers are located in Samutprakarn province, for instance, Toyota, Isuzu, Nissan, Hino, and etc. Many auto firms are located on Thailand's Eastern seaboard where most of its suppliers are in Bangkok, next is Samutprakarn, Chonburi, Rayong, and etc.

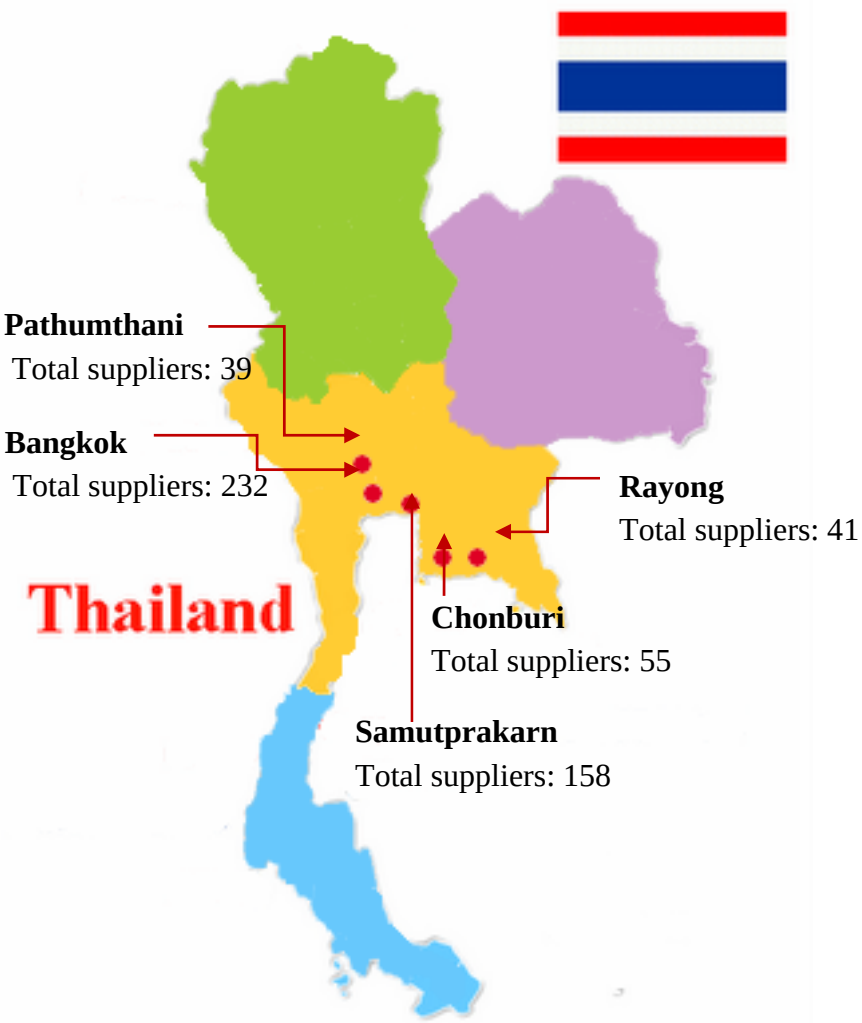


Figure 3 Principal Auto Parts Production Sites in Thailand

Source: Thailand Board of Investment (Praisuwan, 2006).

Thai auto parts industry is composed of approximately 16 auto assemblers, 648 first-tier or **OEMs**, and 1,641 of 2nd- and 3rd-tier manufacturers, as show in Figure 4. The country's first-tier suppliers mostly consist of global auto parts makers and their partners and a few Thai companies. Thailand has managed to turn its auto parts industry into a world-class base due to its economies of scale growth strategy and export-oriented approach. This has led automakers from all over the world to establish their manufacturing bases in Thailand.

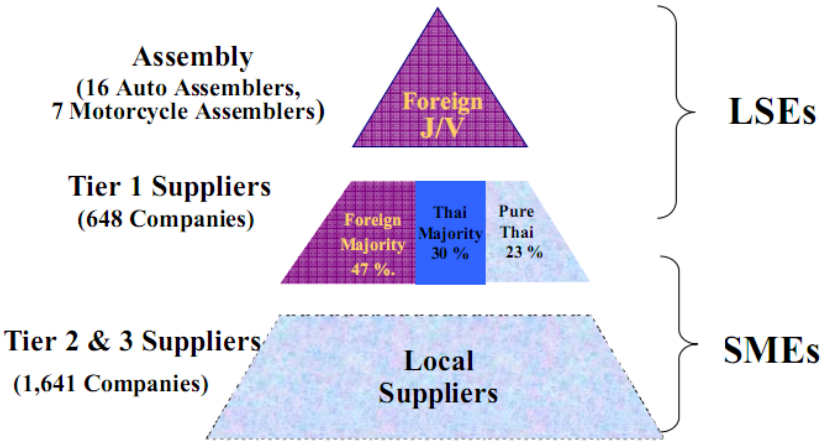


Figure 4 Structure of Thai Automotive Industry

Source: Thai Automotive Institution, 2009 (Asawachintachit, 2009).

Table 2 Total Production of Automobile Industry in 2007

Manufacturer	Passenger Cars	Pickup Trucks	Heavy Trucks	Total
Toyota Motor	200,000	350,000	-	550,000
Isuzu Motors	-	200,000	20,000	220,000
Mitsubishi	50,000	150,000	6,000	206,000
General Motors	40,000	120,000	-	160,000
Auto Alliance	-	155,000	-	155,000
Nissan	36,000	98,400	5000	139400
Honda	120,000	-	-	120,000
Hino Motors	-	-	28,800	28,800
Thonburi	16,300	-	-	16,300
Yontrakij	12,000	-	-	12,000
BMW	10,000	-	-	10,000
Thai Swedish	10,000	-	-	10,000
TATA	-	35,000	-	35,000
Total	494,300	1,108,400	59,800	1,662,500

Source: Thai Automotive Institution, adapted from the Office of Small and Medium Enterprise Promotion (OSMEP, 2008).

Toyota Motor Thailand Co., Ltd has the most production capability in the automobile industry, which is estimated at 550,000 units per year or about 33% of total

industry production. The second-ranked manufacturers are Isuzu (Thailand) Co., Ltd. and MMC Sittipol Co., Ltd., which is the manufacturer of Mitsubishi. These firms can produce 220,000 units and 206,000 units per year, respectively, or about 13% of total production, as seen in Table 2.

2.3 Automotive Associations and Organizations in Thailand

There are four main associations and organizations in Thailand that support and collaborate with the automotive industry, namely:

The Thai Automotive Industry Association (TAIA)

TAIA was established in 1981 as the central organization of automobile members, which comprise automobile assemblies, motorcycle assemblies, auto parts and automobile engine industries. TAIA's objective is to gather news and information among automobile members, thus playing a key role in the exchange of information among and facilitating meetings among industries and with relevant association in and outside Thailand. Moreover, TAIA coordinates with the government by providing advice, among others, related to the automobile industry.

Thai Auto Parts Manufacturers Association (TAPMA)

TAPMA, which was created in 1987, is a union of auto parts manufacturing companies from the private sector to serve as the central agency for automobile parts makers in the country, tasked to protect, support and develop Thai industries. The 578-strong TAPMA coordinates with the government in drafting and implementing policies vital to the industry. As the representative of the private-sector auto parts industry, it identifies problems and obstacles facing the industry to the government. It also represents the Thai auto parts industry in relevant negotiations on the international stage.

Moreover, TAPMA defends the legal rights of members and serves as a venue for members to exchange view. Lastly, it serves as an auto industry information and news clearinghouse for both domestic and international members.

Thailand Automotive Institute (TAI)

Organized in 1998, TAI is responsible for researching and proposing appropriate policies to the government. It also facilitates coordination among Thai automotive industries and helps set the standards for auto parts. Moreover, the institute extends testing services required for auto parts certification, gathers and disseminates information on the auto business among its members. The 652-strong institute also further ensures the industry's global competitiveness through human resource development and R&D undertakings.

Automotive Industry Club (AIC)

Established in 1976 under the Federation of Thai Industries, AIC consists of manufacturers, distributors, importers and exporters of cars and motorcycles. As the focal point for members and relevant agencies, notably government and private agencies, the Club's activities are aimed to promote information sharing as well as facilitate joint solutions to industry concerns, thus enhancing its competitiveness and its growth (Thaibestjob, 2006).

3. FINDINGS FROM CASE STUDIES

Case studies focusing on several companies yielded the following results.

3.1 Toyota Motor Corporation

Toyota Motor Corp. was established in Japan in 1937 by prominent Japanese

industrialist Kiichiro Toyoda (Monden 1993). In 1956 the Toyota Motor Sales was set up in Thailand to sell the Japanese car maker's units. In less than a decade, in 1964, Toyota built an automobile assembly factory at North Samrong in 1964 under a new name, Toyota Motor Thailand.

Today, Toyota runs four plants in Thailand, namely, the Samrong plant, Thai Auto Works, Gateway plant, and Ban Pho plant in Chachoengsao (Surasak 2005). The head office is located in Samutprakarn.

There are currently 135,000 associates, 119 dealers, and 312 showrooms for Toyota cars in Thailand. Suppliers to auto parts manufacturers (Tier 1) total 151. Approximately, 70% of Toyota supplier firms are joint ventures between Japanese firms while the rest involve Thai companies. Of the total production, 40% are sold locally while the rest are exported to other countries.

Supply chain of Toyota Motor Thailand

The Toyota Production System (TPS) undertakes the supply chain of the Japanese car firm. To meet the market demand, TPS constantly seeks to have a short lead time in production processes and to keep the lowest inventory possible. To reach these objectives, applies methods called Just-In-Time and 'Jidoka', which means "the decision to stop and fix problems as they occur rather than pushing them down the line to be resolved later."

Factors for choosing suppliers

Toyota's choice of suppliers is based mostly on three factors: quality, cost and culture. In determining the quality of suppliers, the firm considers all the production processes to check whether they meet the established standards. In assessing costs, suppliers are expected to offer the least costs possible. Reliability and trust are prime

components of the culture factor.

Since Toyota is a Japanese company, its suppliers are mainly Japanese. The choice of Japanese suppliers rather than local (Thai) suppliers is based on the idea that they have passed the standard test of production from the head company in Japan, making them more reliable than the latter. Engaging Japanese suppliers also enables Toyota to save significant lead time and costs, among others, by avoiding the need to find new suppliers in Thailand, which need to be subjected to the requisite tests.

Performance measurement of suppliers

In order to measure the performance of each supplier, Toyota follows the "Reward strategy," whereby each supplier is assigned a total score of 100 at the beginning of the year. This score is correspondingly reduced in case of, say, failed quality or delayed shipments.

At the end of the year, Toyota releases the suppliers' individual scores, which will correspondingly affect the volume of orders suppliers will get in the following year.

Collaboration with Toyota (Thailand)

Prior to achieving an effective system of collaboration, Toyota had to deal with many problems, notably those involving defects in the working process. It soon embarked on reducing such defects to achieve shorter lead times. Until then Toyota had been experiencing difficulty in forecasting the release of new products. For example, popular models, which were in high demand in the market, were met with production delays and longer lead times.

To address the situation and meet market demand, Toyota decided to apply the collaboration technique in its production processes where it helps suppliers produce the right amount of auto parts for Toyota. Toyota divided its departments into two sections

based on functionality. One works with suppliers and the other with dealers. For instance, the purchasing, quality control, and parts logistic department takes care of suppliers. The marketing, sales, and vehicle logistics collaborates with dealers.

For new products, Toyota applies the assured quality method by testing the trial parts in terms of quality and capacity of production three months before launching a new product model. In addition, collaboration between the marketing and production planning departments makes production forecasting more accurate.

The major collaborative activities in Toyota involve information sharing, joint decision-making, and resource and skills sharing. Part of information sharing is dealers showing its monthly orders to Toyota Motor Thailand to facilitate efficient production planning and balance the workload of suppliers. Then the production plan is sent to suppliers in three forms. The first one is a three-year plan, which allows suppliers to project future market demands so it can anticipate production needs. The second is a yearly plan, which forecasts the production within one year. It provides the number of units be produced for each model during the year. The last, a monthly plan, is more specific than the yearly plan as it allows suppliers to determine the particular number of auto parts that are actually needed.

Toyota has an inventory-checking center run by the marketing department that checks the inventory level of dealers. The center keeps track of all products by using a barcode. Once the dealer sells the product, Toyota knows which model to produce for that dealer. Once Toyota uses the auto parts in an assembly, the checking center also knows which auto parts have been used.

Toyota also follows the cross-functional management principle. This means it assigns individuals in one department to work with different departments within the company so that they will how other departments work. This helps employees become more effective as they learn the ropes running other departments.

For resource and skills sharing, Toyota allows its specialists to train its suppliers in specific aspects of its manufacturing process. Each supplier is required to attend the training at least once a year in order to maintain the required production quality.

As part of its collaborative efforts, Toyota also enables its suppliers to learn about the Toyota Production System (TPS). Occasionally, the TPS team also randomly evaluates the system and the production processes of its suppliers.

Toyota is the only automobile company in Thailand that undertakes such an initiative for its suppliers.

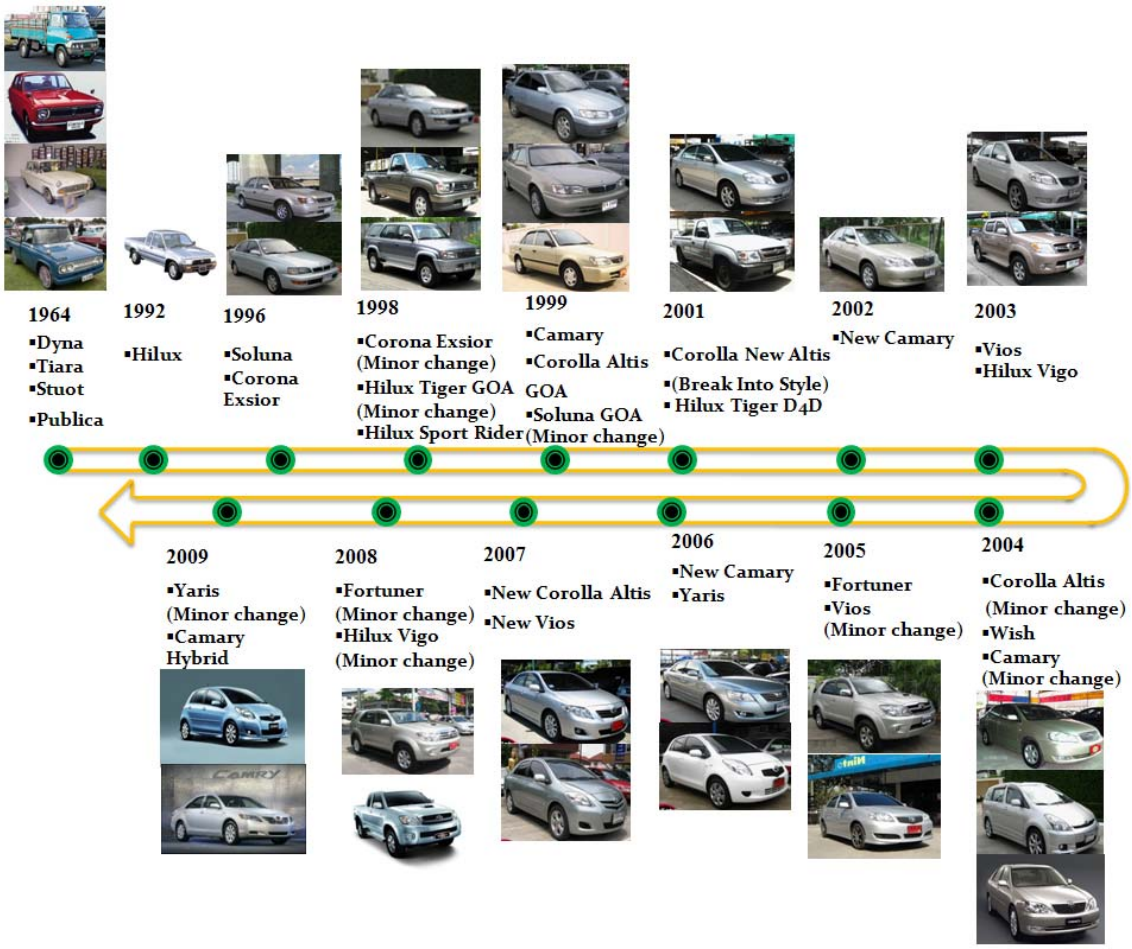


Figure 5 The Innovation of Toyota (Thailand)

This time phase graph shows how innovations in the product development of

Toyota automobiles have evolved in Thailand since 1964. In the earlier stage, Toyota assembled automobiles using the complete knocked-down or CKD method, that is, each auto part was imported and assembled with other parts in Thailand. Afterwards, Toyota set up an assembly plant in Thailand, which now is the most modern and the most efficient automobile assembly plant in the Southeast Asian region.

R&D center of Toyota (Thailand)

The Toyota Technical Center Asia Pacific (Thailand) Co. Ltd. (TTCAP-TH), a research and development base for Toyota in the Asia-Pacific region, officially opened on May 11, 2005. The center was established in response to the needs of the region's automotive market, which was increasingly becoming complex. This R&D center plays an important role in enabling the Toyota Motor Corporation to design and modify vehicles and component parts that have been developed from Japan to meet the demands of the Asian market.

The center cost a total of 2.7 billion baht and was built on an area measuring 320,000 square meters on Bang-na Trad Road KM. 29.5 in Samutprakan province. Currently, it has a total of 290 employees. The TTCAP-TH's ultimate objective is to become a true R&D center, providing design, research and development services as well as producing prototype vehicles and component parts for the region.

Obstacles amid collaboration between Toyota and its suppliers

Notwithstanding its close communication with its suppliers, Toyota's forecast volumes will not always be as accurate as expected. Uncertainties over Thai economy contribute to uncertainties over actual and projected demands, which in turn will have an impact on suppliers' production. Sometimes Toyota has to adjust its production to meet in order to balance orders to suppliers. Occasionally, such adjustment may not

achieve the desired results, resulting in a production peak. This in turn affects suppliers in terms of excess safety stock, which means additional costs. Toyota also faces many problems on the logistics side, including government requirements, traffic congestion and suppliers' strike.

Benefits of collaboration with Toyota (Thailand)

By collaborating with Toyota, suppliers are able to determine the volume of auto parts that needs to be produced. It also facilitates a significant reduction of the total supply chain processes in Toyota as well as of the costs of automobiles produced. Thus without collaboration, the suppliers will not know the amount of production needed, resulting in higher stock and inventory costs.

Collaboration also allows for a shorter lead time and faster response time to customers, and consequently, higher customer satisfaction alongside more effective management system. Due to the close relationship between Toyota and its suppliers, production capability becomes more flexible even amid fluctuations in market demand. Moreover, inventory turnover and asset turnover of Toyota are high, which can be seen as a reflection of corporate efficiency. Figure 6 summarizes Toyota's networks and its activities.

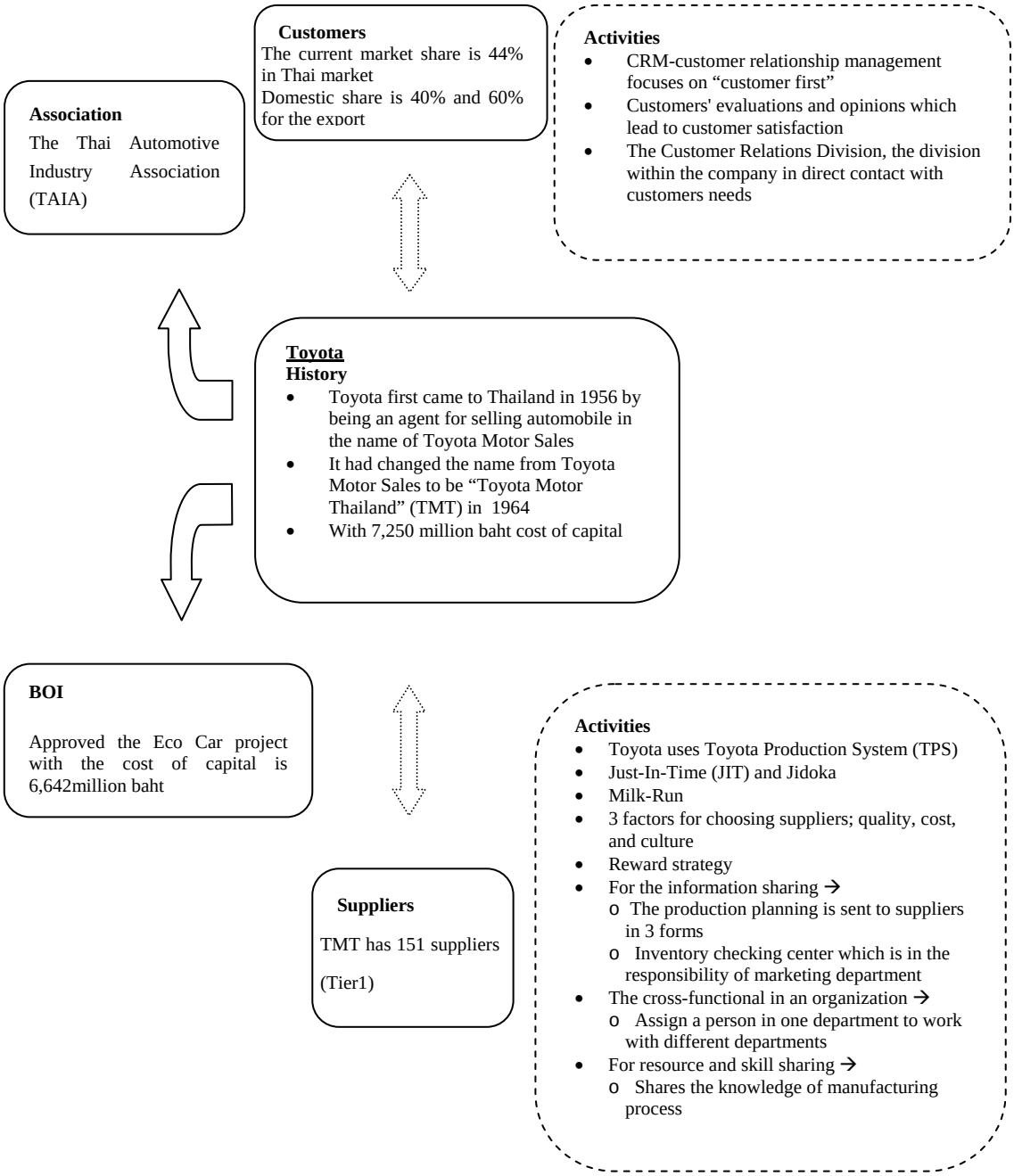


Figure 6 The Linkages between Toyota and Partners

3.2 Nissan Motor (Thailand) Co., Ltd.

Nissan's profile

Established in 1933, Nissan currently manufactures vehicles in 16 countries around the world, including Japan. The Japanese car maker has produced an extensive range of mainstream cars and trucks, initially for domestic consumption and later, beginning in the 1950s, for the international market.

In 1960 the company's first assembly plant was set up under the name Siam Motors & Nissan Co., Ltd. On April 21, 2009, it changed its name to Nissan Motor (Thailand) Co., Ltd. The ratios of major shareholders are as follows: a) Nissan Motor (Thailand) Co., Ltd. – 75%; and b) Siam Motors Co., Ltd. – 25%. Nissan's share of the capital investment is 1,900 million baht in capital. It has 92 dealers and around 164 service centers in Thailand. Its total workforce is 2,920. As of 2009, Siam Nissan had 5.6% share of the market.

Supply chain of Siam Nissan

The main production of Siam Nissan is divided into two components: the completed unit (a car) and automobile parts. Its supply chain process consists of three departments, namely, sales, and production and logistics departments, which work in tandem.

The supply chain for a complete build-up unit begins with dealers doing the initial estimate forecast for Siam Nissan. The sales department plans and discusses the capacities that suppliers have to produce to meet orders. After that, all completed production will be sent to the supply chain department. The products are then delivered to dealers by using third-party logistics providers.

For the production line of automobile parts, the Nissan center sends the orders through the export vehicle operation, which serves as the operation center gathering

orders from other countries and sending them to the nearest manufacturers in each area. The supply chain department of Siam Nissan receives the orders and brings them through the production process. All automobile parts are delivered to supply chain department, which then takes care of exporting them to other countries.

Factors for choosing suppliers

The Siam Nissan has 248 suppliers, which are mainly 1st-tier suppliers that provide automobile parts to the company. Almost 80% of its suppliers are Japanese while 20% are Thai.

The main factors for choosing Nissan suppliers are best expressed in the acronym "QCDT," which stands for *quality*, *cost*, *development*, and *time*. Suppliers have to meet the qualified standard at the lowest cost possible. Moreover, the company also focuses on the development potential of each supplier. The last factor is the shortest time within which suppliers can meet the order.

All potential suppliers are subjected to a bidding process, where the standards or requirements stipulated are the same across all countries where Nissan operates. These are part of Nissan's global policy. Each department of Siam Nissan scores each bidder or potential supplier according to QCDT. The scores are then tallied so that the supplier with the highest score is finally selected and wins the bid. In terms of the ratio of suppliers, 80% of them are Japanese companies operating in Thailand.

Performance audit

Siam Nissan's purchasing department audits the quality and performance of its suppliers every year. Latest scores are compared with the previous year's. Audit scores are ranked A, B, C, D, and F, that is, arranged from highest to lowest. Suppliers who get F undergo retraining under the auspices of Nissan so they can meet the company's

standards.

Collaboration activities in Siam Nissan

Collaboration activities between Siam Nissan and its suppliers involve joint decision making and sharing of resources and skills.

As part of its formation activities, Siam Nissan conducts monthly meetings with its suppliers to exchange information and discuss problems faced by the latter and which are relevant to the former. The marketing department shares certain information such as sales production data with its dealers. The firm also uses its information technology (IT) system to connect with suppliers and dealers.

Synchronized decision making involves production planning, production process development, training activities and efficient work procedures within the organization. Using the milk run system in the logistics process, Siam Nissan has classified logistics companies into zones. It makes decision alongside suppliers and logistics providers in order to deliver the products from suppliers' manufactures to Nissan's plant.

To facilitate sharing of resources and skills, Siam Nissan assigns a team that conducts training and knowledge sharing for suppliers that fall below the standards of Nissan. Knowledge sharing specifically revolves around models and designs, and is aimed at ensuring suppliers meet Nissan's quality standards as stipulated in the contract. It must be pointed out that only the Nissan headquarters in Japan shares R&D information with its suppliers**.**

Nissan's R&D center in Thailand

The Nissan Technical Center South East Asia Co., Ltd (NTCSEA) is the R&D base for Nissan in the Southeast Asian region and other counties. It was established in 2003 at a cost of 224.5 million baht. The center, which has 114 employees, was set up on

Bangna-Trad Highway Km.22 in Samuthprakarn province. Nissan Motor (Thailand) Co., Ltd. held 100% of shares in NTCSEA, which is tasked to develop vehicles for the region and other countries and ensure that all specifications meet local market requirements and Nissan's standards. The main activity of NTCSEA is to create performance innovations.

Obstacles in collaboration between Siam Nissan and suppliers

Despite enjoying the benefits of collaboration with its suppliers such as shorter lead times and reduced production costs, which translate to higher customer satisfaction, Nissan is still faced with some obstacles.

The first problem involves differences in policies or business strategies between Siam Nissan and suppliers. Suppliers generally rely on the policies of Toyota Motor Thailand, which has the highest market share in the automotive industry. Another problem is the lack of a budget to support R&D undertakings. Weak management support for collaborations within Nissan is also cause for concern because each department has its own way of doing things and rarely coordinates with other departments within the organization. Figure 7 summarizes all the activities of Nissan's partners.

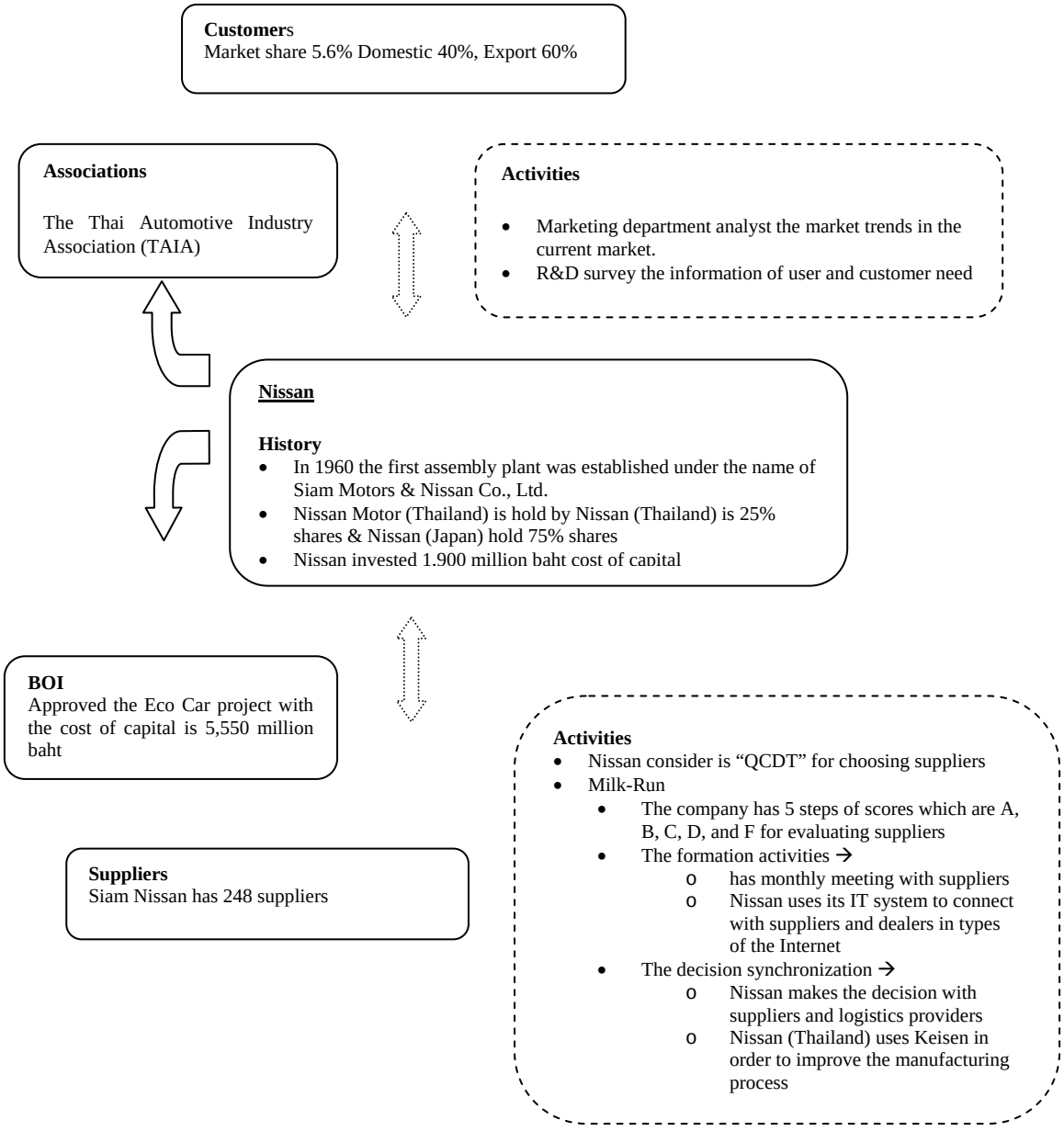


Figure 7 The Linkages between Nissan and Partners

3.3 Michelin (Thailand) Co. Ltd.

First Michelin, which was established in 1898, has constantly developed its product and creates innovations for highly reliable products and services. The firm has over 117,500 employees worldwide and operates in six geographical zones, namely, Europe, North America, South America, Africa and Middle East, and Asia-Pacific, particularly China. Moreover, it has a global sale network covering 170 countries.

In Thailand Michelin set up its operations in 1987, comprising three tire manufacturing factories and one wire-manufacturing factory. It operates under Siam Michelin Co., Ltd., Siam Tyre Phra Pradang Co., Ltd., and Michelin Research Asia (Thailand) Co., Ltd. The Michelin products consist of tires for passenger cars, motorcycles, aircraft, trucks, and civil engineering vehicles. Sixty percent of production line consists of passenger car/light truck tires.

The company has over 3,600 workers and a registered capital of USD 12 million. Its customers are partly foreign and mainly local manufacturers of vehicles. As an automotive parts supplier, Michelin's market share as of 2007 was 17.1%.

Supply chain of Siam Michelin

The stage preceding production is to forecast product demand by the marketing and sale department. In the forecasting process, the department discusses with the supply chain department the volume of production that needs to be produced. The purchasing department then allocates the orders to its suppliers and seeks confirmation of delivery date.

The marketing and sale department forecasts the quantity of product every eight months and reforecasts four months before production starts. Using the make-to-stock manufacturing process, the firm produces all products based on sales forecasts and are

stocked in the warehouse. Michelin (Thailand) uses a third-party logistics provider.

Factors for choosing suppliers

The main supplier of Michelin has two sections: material and non-material. The first consists of rubbers, wires, etc., the second machinery, maintenance, among others. Michelin chooses suppliers based on the quality of their products and ability to meet the former's specifications. The company then examines the risks, if any, of engaging the services of a potential supplier. Almost 80% of its suppliers are local manufacturers while the rest are foreign ones. Michelin's suppliers number approximately 3,500.

Performance measurement of suppliers

Michelin evaluates its suppliers yearly or as the need arises. It mainly focuses on the production sale and product quality. If suppliers have failed in terms of production sale two to three consecutive times, they are subjected to an evaluation by Michelin. Consistent with its fair business policy, Michelin supports its suppliers over the long term to achieve business objectives. The company specifically helps its suppliers by undertaking certain activities such as transferring, shipping, warehousing, packaging and related services. It also follows the supplier relationship management approach to further improve its relationship with its suppliers. Michelin sends a team to suppliers to teach the needed specific knowledge and skills on the production process and machinery with the end in view of gaining high production sale and reducing lead times in working processes.

Obstacles confronting Michelin and its suppliers

The main obstacle facing Michelin lies in delayed product transfers. This is followed by the substandard quality of products, which the company promptly brings to

the suppliers' attention. Beyond that Michelin also lends its support to its suppliers to enable them to improve their products and continue meeting the requirements of Michelin.

R&D center of Michelin (Thailand)

Michelin Research Asia (Thailand) Co., Ltd. serves as the company's R&D center in Asia-Pacific. Based in Bangkok (located on the 16th Floor, SPE Tower, Phaholyothin Road), the center is instrumental. The firm is the world's major innovator in tire manufacturing, especially radial tires. The R&D center has been instrumental in this regard, as it constantly pursues innovations, R&D and product tests to meet demands in the Asian market. Michelin also develops its production system for its manufactures and its product specifications**.**

Innovations in Michelin (Thailand)

Michelin's innovations are based on two factors: customer needs and competitor analysis. Product innovation strategic planning consists of three levels: the long-term plan, which covers 5 to 10 years; the medium-term plan, which extends to a period of three to five years, during which market trends in the near future are studied; and the short-term plan, which consists of projected market and customer needs over a period of one year.

The production design team checks the raw materials used by potential suppliers alongside their potentials in terms of quality, cost, and time. The firm's software used in marketing, sale, logistics, etc. in Thailand is based on the systems and applications developed by IBM, a multinational computer, technology and IT consulting company. The software used in the logistics and supply chain department is developed by the Michelin team in France.

The obstacles to product innovations in Michelin are delays in coming up with product designs consistent with customer needs, limited time for research, delays in inventing new products, the high costs of investing in new projects, limited R&D budget, and product imitation by competitors. Figure 8 shows the linkage of Michelin and partners.

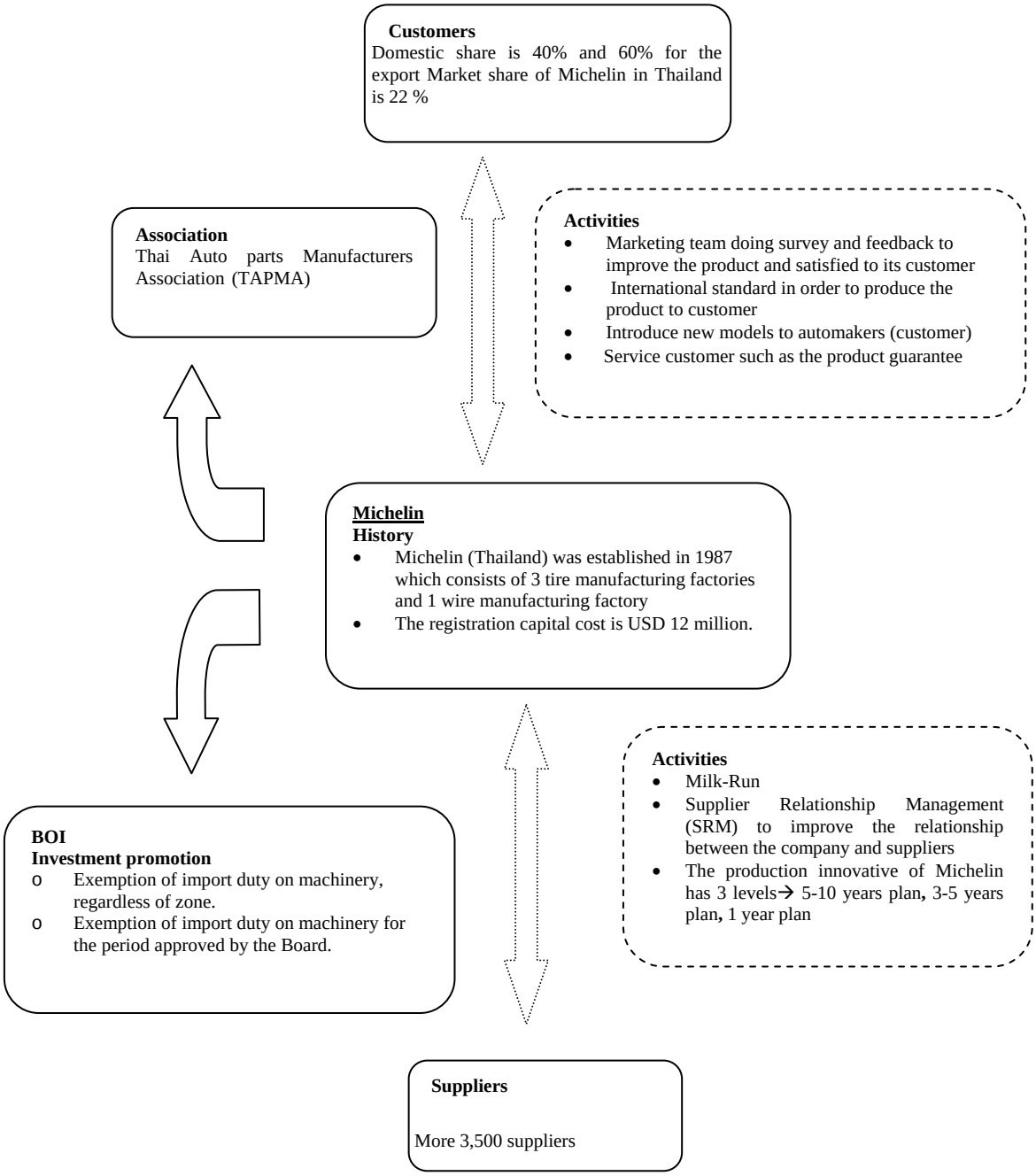
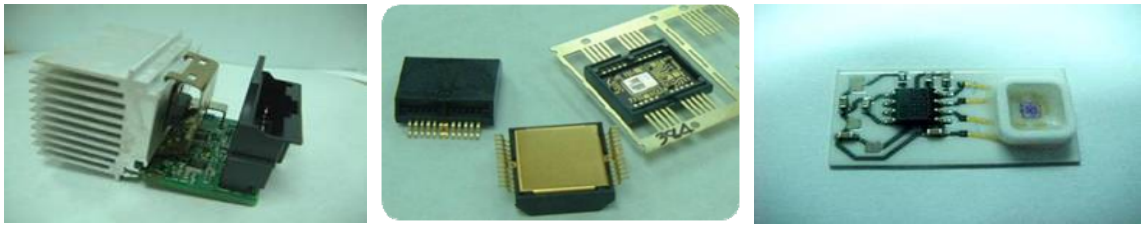


Figure 8 The Linkages between Michelin and Partners

3.4 Fabrinet Co. Ltd.

Fabrinet was founded in January 2000 in Thailand by acquired the Thailand Seagate Facility. It is a manufacturing services company specializing in the engineering and manufacture of complex optical, mechanical, and electronic components, modules, and subassemblies for a wide range of industries, including the automotive industry.

The following figure shows some of its automotive products. Fabrinet is a second-tier supplier in the automotive industry. Its customers are based around the world, namely, those in the US, EU countries and China. One of them is Systron Donner Automotive Division, which belongs to BEI Technologies, Inc. It manufactures inertial sensors for the automotive market. Originating in Thailand in 2000, Fabrinet has expanded its operations to include offices in China and the US and now boasts more than 5,000 employees.



Power Module | Positional Sensor | Differential Pressure Sensor

Figure 9 Automotive products of Fabrinet

Factors for choosing suppliers

The operations of Fabrinet focus on cost, quality and service. These are the same factors that the firm considers when choosing its suppliers. By applying the concept of "Asia Low-Cost Vendor Base," Fabrinet puts a premium on high quality, excellent service and low production cost.

R&D and innovations

Since Fabrinet acquired facility and employees for Seagate (Thailand), all the technology, knowhow, skill and customers were transferred from Seagate as well. Fabrinet has its own R&D team that focuses on the improvement of the manufacturing process. Notwithstanding the many innovations and patents in the manufacturing process, cooperation is lacking between the company and client firms for product innovations. Fabrinet usually makes products based on customer designs. The relationship between Frabrinet and its customers lies mainly in quality audit as required by TS16949 (ISO16949).

3.5 Brother Auto Parts and Engineering Co. Ltd.

This company's products are metal stamping parts. It is a first-tier supplier for Mitsubishi and second-tier supplier for Honda.

Figure 10 shows examples of the company's products while Figure 11 shows examples of basic machines used in the factory.

Stamping Die

Stamping Part

Assembly Jig

Figure 10 Examples of Products

Milling

CNC

Robot Welding

Figure 11 Examples of Machines

R&D and innovations

There is no innovation involving the automotive manufacturers. Brother Auto Parts makes parts according to its clients' specifications. Mitsubishi and Honda audit the company once a year based on the requirements of ISO/TS 16949. Since there is no innovation, all processes of the company are quite simple. There are several basic manufacturing machines such as milling machines, CNC mills, and robot welding equipment. The labor-intensive manufacturing process depends on the skills of workers.

3.6 Wisdom Autoparts Co. LTD.

This company's main product is the metal structure of the car seats. It is the second tier of many Japanese automotive manufacturers and one of the suppliers for the Big Three, namely, General Motors, and Chrysler.

Figure 12 Example of Car Seat Structure

R&D and innovations

There is no innovation involving to the automotive manufacturers. The company

makes parts based on the design of first-tier suppliers. The latter audits this company once a year based on the requirements of ISO/TS 16949. This company has around 30-40 third-tier suppliers. There is no technology transfer between the company and its suppliers. Every year, the company audits its third-tier suppliers based on the ISO requirements.

3.7 Mahle Co., Ltd.

The development and production of pistons and piston systems is the core business of Mahle, which was established about 90 years ago. In Thailand, Mahle took over Isumi Piston Company five years ago. Today the company supplies pistons to pick-up (truck) car manufacturers in Thailand (e.g., Isuzu, Nissan, Mitsubishi). Thailand being the world's largest manufacturer of pick-up trucks, Mahle's role as a major supplier of main engine parts is very important. Figure 13 shows examples of pistons.

Figure 13 Examples of Pistons

R&D and innovations

As pistons are the major parts of auto engines, the piston designs normally come together with engine designs. As part of standard practice, automotive manufacturers

complete the engine designs and select the first-tier suppliers of pistons based on the cost and quality of the latter's manufacturing processes. Once a supplier is selected, sample engines are made and tested. At this stage, if the engines do not perform as expected owing to the poor design quality of the piston used, the piston supplier will undertake the necessary design adjustment.

In the past, all engine designs and adjustments were done in Japan. Today, all designs are still performed in Japan, but the adjustments mostly happen in Thailand, which is now one of the world's main pick-up car manufacturers. Mahle and Isumi Piston (in Thailand) have recently completed production of pistons based on the design of their client automotive manufacturers.

Mahle has a long history of manufacturing and design technology. As a firm believer in the importance of R&D and innovation, it has invested millions of US dollars in research centers in many cities across the globe such as Stuttgart, Northampton, Detroit (Farmington Hills, Novi), Tokyo (Kawagoe, Okegawa), Shanghai and São Paulo (Jundiaí). Unfortunately, it has yet no research center in Thailand. Be that as it may, research would do well to focus on finding new solutions to increasing the efficiency of the piston system such as reduction of fuel consumption and exhaust gas emissions as well as extended engine lives.

Mahle has expanded its business in Thailand by going into a joint venture with Siam Tennex, a manufacturer of filter systems for automotive engines.

Relationships with suppliers

The most important aspect of Mahle's relationship with its suppliers, which number several hundreds, lies in ensuring product quality, reducing lead times and keeping costs at a reasonable level. Mahle sees to it that its suppliers are duly informed about its specific requirements so the latter can plan its production well.

3.8 Summit Auto Seat Co., Ltd.

The company was established in 1972 as a manufacturer of seating and interior trim parts.

R&D and innovations

The automotive parts produced by the company can be classified into two:

1. Those that are made specifically for cars already in production. The parts follow the existing design of the car model.
2. Those that are intended for cars that are not yet in the market and in production elsewhere. The company designs the product, which must be approved by the OEM company.

For each new production order, the OEM will provide only specifications and drawings alongside other product requirements. The material and some aspects of the design are assumed by the supplier, which in turn is expected to have its own R&D.

Summit Auto Seat (SAS) has to focus on R&D to ensure efficient product design and production process, not to mention cost reduction.

Here are some important facts about SAS:

- 30% of SAS's suppliers were chosen by an OEM group, and the remaining 70% by SAS.
- The growth of China's auto part industries has adversely affected Thai suppliers. Yet some of the latter may source some auto parts from China.
- The global sourcing strategy was set up by an OEM, particularly NISSAN.
- The signed agreement between SAS and its suppliers stipulates protection of trade secrets. The former also registers patent to protect any novelty or

innovation.

3.9 DENSO (Thailand) Co., Ltd.

NipponDenso was established in Japan in 1949 after being separated from Toyota Motor Co., Ltd. Currently, DENSO operates in 32 countries in four regions, namely, Japan; North, Central and South America; Australia, and Asia. It first came to Thailand in 1972 and was registered as DENSO (Thailand) Co., Ltd. The 7,800-strong company has eight subsidiaries in Thailand, collectively known as Thai DENSO Group. They are as follows:

- DENSO (Thailand) Co., Ltd.
- DENSO Tool & Die (Thailand) Co., Ltd.
- Sian DENSO Manufacturing Co., Ltd.
- Toyota Boshoku Filtration System (Thailand) Co., Ltd.
- Anden (Thailand) Co., Ltd.
- DENSO Sales (Thailand) Co., Ltd.
- Siam KYOSAN DENSO Co., Ltd.
- DENSO International Asia Co., Ltd.

The products that Denso produces are car air conditioning systems, power-train control systems, engine-related components for motorcycles and construction machinery, and meters

Factors for choosing suppliers

DENSO consider its suppliers based on the concept of QCDS:

- Quality: meet the product quality standards
- Cost: provide the lowest product cost possible

- Delivery: deliver products to DENSO on time
- Safety: ensure product safety during delivery and prior to assembly

Eighty percent of DENSO's suppliers are Japanese and the rest are Thai.

Performance measurement of suppliers

DENSO assesses its suppliers' performance, on the basis of which they are given scores ranging from A to D (A being the highest and D the lowest). In its yearly performance audit of its suppliers, the company puts a premium on time, quality, and safety. Every month, suppliers have to report about safety prior to delivery of products to DENSO.

DENSO's customers can audit DENSO in case of failed car parts to improve the quality of their working processes.

Collaboration obstacles between DENSO and suppliers

Although DENSO's suppliers do not offer the lowest price compared to other suppliers, some of them have been in business with DENSO for a long time. DENSO has difficulty finding new suppliers that can offer it the lowest price of products. Toyota's parts ordering system is considered more advanced and complex than DENSO's, which has an effect on the old system used by its suppliers, who still need to learn about the Toyota Production System (TPS).

3.10 Murakami Ampas (Thailand) Co., Ltd. (MATCO)

Murakami Ampas (Thailand) Co., Ltd. (MATCO) is a joint venture established in 1996 at a cost of 100 million baht. Located in Bangpoo Industrial Estate, the company's main business is manufacturing of automobile rear view mirrors. It is composed of

Murakami Manufacturing (Thailand) Co., Ltd., which produces inner mirrors; Murakami Saikyo (Thailand) Co., Ltd., which makes molds; and Ampas Industries Co., Ltd. The Murakami group has plants located in Japan, specifically in Fujida, Yaizu, Oigawa and Kyusyu. Moreover, it has plants in China and the US.

With the advent of the global economic crisis in October 2008 to June 2009, the demand for the company's products was reduced by 70% of the total production. From June 2009 to December 2009 the demand declined by around 30%. This year's market forecasts for MATCO indicate a production increase of about 25% compared with 2008.

MATCO is the first-tier supplier of Toyota, for whom it delivers about 80% of its product requirements. As a Toyota supplier, MATCO applies the TPS. MATCO produces parts suited to the requirements of its major customer, Toyota. MATCO also uses the Kan-ban system to reduce the inventory cost and shorten lead times.

MATCO is part of Toyota's milk run system, which refers to procurement logistics and material flow planning to deliver products according to demand both within and between production plants.

Based on this system, MATCO's trucks pick up the exact amount of products to deliver to designated plants. Toyota provides order volume forecasts, on the basis of which MATCO estimates the raw materials that will be needed for its production. A six-month forecast has about 50% accuracy, a four-month forecast 70% and a two-month forecast 90%.

MATCO chooses its suppliers on based on QCDS: quality, cost, delivery, and safety. The quality of the product must meet the standard requirements while ensuring the lowest cost possible. The supplier must be able to deliver on time in keeping with the TPS system. Lastly, suppliers are expected to have a safe environment for their production processes.

MATCO's audit team from the purchasing, production and quality assurance

department assesses the suppliers' performance yearly. The firm assigns scores ranging from A to D based on the performance audit results. Suppliers who get a score of D undergo a retraining under the MATCO team so they can improve and develop further their production processes.

MATCO shares information with its suppliers and customers such as those on demand forecasts, production plans, cost reduction, stock level and point of sale. Moreover, it shares competition information such as those on blueprints, marketing, business, and new product development. MATCO jointly makes business decisions with both customers and suppliers such as those pertaining to daily production plan, and operations problem solving. Strategic decisions are also shared with its partners such as those dealing with project plans, marketing plans and standard operations. In addition, MATCO jointly develops business plans with its suppliers and customers.

MATCO sends its development team to suppliers to teach and evaluate their respective capacities. The firm has its own training center, which it shares with its suppliers.

Despite anticipated annual increases of material and labor costs, selling prices must remain stable, or reduced if possible. Customers always ask for a 2-3% price reduction every two year. Production innovations are focused on productivity and quality. The inventory level must be gradually reduced. Using milk run delivery system, MATCO's process improvements, which were initiated by Toyota, should lead to a gradual reduction of competition cost. Every month the top management measures innovations and graph them accordingly. The results are announced and disseminated in the form of posters displayed in conspicuous places within MATCO's departments.

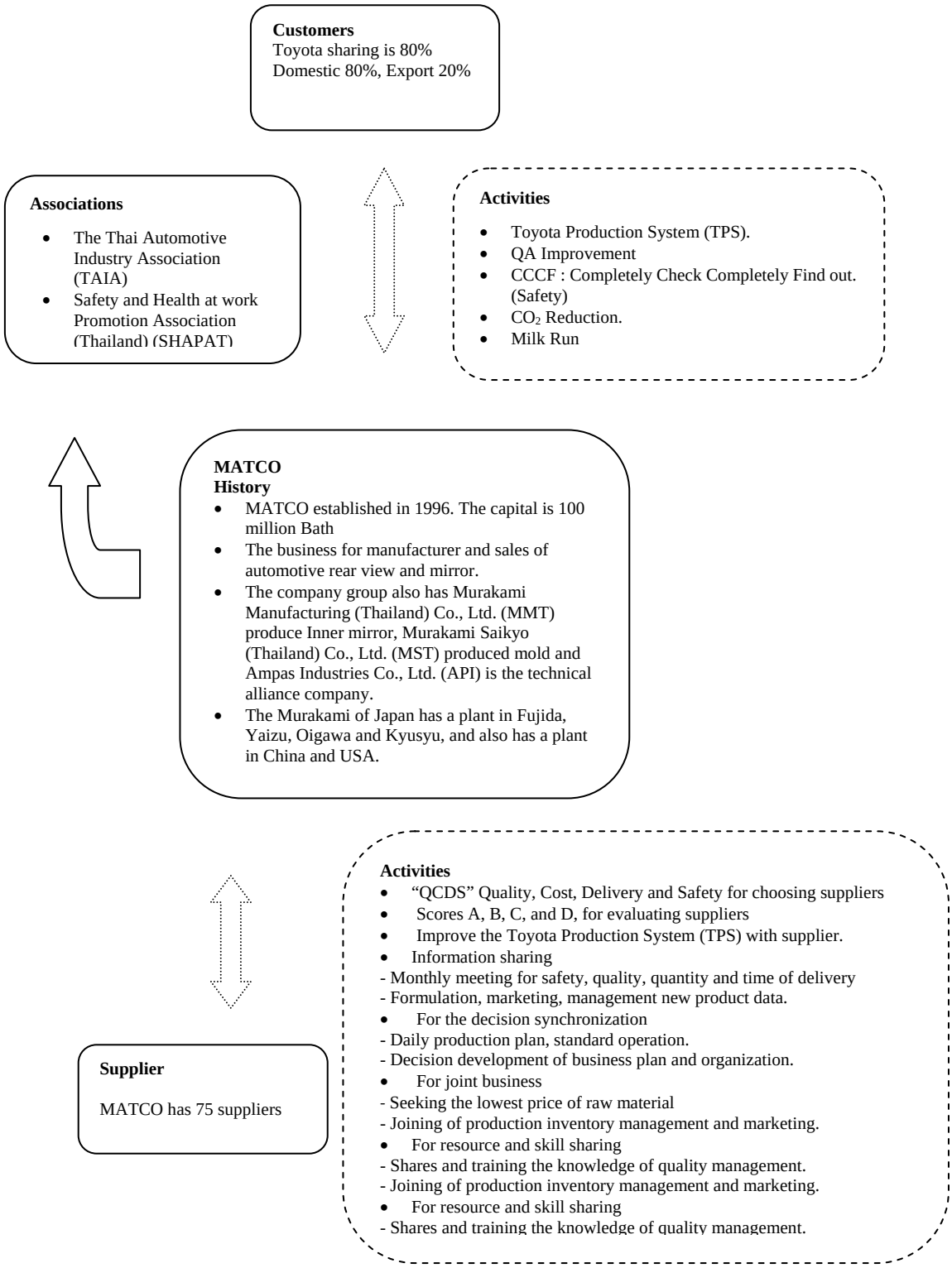


Figure 14 The Linkages between MATCO and Partners

Among the obstacles to innovations are lack of information, high installation costs for new equipment, high costs of testing machines, the need to modify machines to improve quality. Where collaboration between supplier and client firms is concerned, lack of trust and lack of suitable supporting organization are among the innovation hurdles. Information sharing between customers and suppliers suffers from inaccuracy and mistrust. Figure 14 represents the linkage of the company to its partners.

4. SUMMARY OF FINDINDS AND POLICY IMPLICATIONS

Following are the main findings based on the foregoing case studies:

- There are few Thai companies among first-tier auto parts suppliers, most of whom are foreign companies or joint ventures between Thai and foreign companies.
- Thai suppliers mainly found among second-tier groups, which supply secondary auto parts such as stamping tools and accessories. These auto parts do not require high production technology.
- Technology transfers normally involve improvements of production processes to meet quality assurance or quality control and cost reduction targets. Another apparent focus of technology transfer is the management system such as what Toyota has done by initiating the TPS for its suppliers. As a result, innovations are confined to processes at the expense of product innovation.
- Automotive manufacturers and foreign first-tier suppliers confine product innovations within the companies. Local companies produces parts based according to the automotive makers' specifications.
- Most Thai companies acquire equipment and knowhow from abroad, which they then adapt to their needs.

- Although some Board of Investment policies were enforced to persuade industries to conduct more R&D, most of the resulting researches were patterned after existing innovations, with few attempts toward originality.
- Despite the Thai government's efforts to promote innovations and R&D, there have not been any major impacts on industries and society alike.
- There has been no research collaboration between companies and universities or local experts toward product development. Collaborations between these sectors were largely focused on improving management systems.

Policy Recommendations

- The government could set up a more effective strategy that encourages technology transfer.
- Government could enforce a strategy that will encourage the research community in Thailand to focus more on commercially viable researches rather than simply publishable ones.
- Government could reshape the educational system to make Thai people more interested in conducting research and development.
- The academic community should aim to produce more students that will support the local automotive industry, among others, by enabling to develop an innovative mindset.
- More industry people should be involved in designing and developing university curricula for such as areas as engineering, sciences and technology.
- University should serve as the linkage between industry and education.

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