MAINTAINING CONTROL OVER INDUSTRY ARCHITECTURE
THE FUEL RETAILING INDUSTRY

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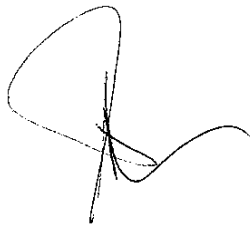ENGINEERING & TECHNOLOGY MANAGEMENT

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DECLARATION

I hereby declare that the thesis is my original work and it has been written by me in its entirety. I have duly acknowledged all the sources of information which have been used in the thesis.

This thesis has also not been submitted for any degree in any university previously.

Tay Kwong Kiat

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SUMMARY

The industry architecture of the fuel retailing sector in SE Asia varies both within and across countries, with roles distributed among the oil companies and other players. These variations, or multiple levels of industry architecture, represent the vertical disintegration of the sector to different degrees. Although the regulatory, technological, infrastructure and social constraints of the different countries may force oil companies to use different industry architecture, these constraints alone cannot explain why even a single oil company would operate with multiple levels of industry architecture within a country. The existing literature, which models the sector simplistically as a dyadic relationship between the oil company and their dealers, does not adequately explain this phenomenon. My This research suggests that the emergence of multiple levels of industry architecture in SE Asia is a result of oil companies using different organization structure depending on different institutional environments to manage the risk of operating in this sector. The study shows that oil companies manage risk by distributing roles within the sector to strike a balance between reducing exposure to risk under respective institutional environments and minimizing the impact should an adverse event occur. It is this balancing act of oil companies varying organization structure to manage risk, even within the same network, that led to the multiple levels of industry architecture in this sector.

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ABBREVIATIONS

ATEX	Appareils destinés à être utilisés en **AT**mosphères **EX**plosives
Auto-LPG	Auto Liquefied Petroleum Gas
BP	British Petroleum
BP MIGAS	Badan Pelaksana Kegiatan Usaha Hulu Minyak dan Gas Bumi
BPH MIGAS	Badan Pengatur Hilir Minyak dan Gas Bumi
C-Store	Convenience Store
CNG	Compressed Natural Gas
COCO	Company–Owned, Company-Operated
CODO	Company–Owned, Dealer-Operated
COE	Centre of Excellence
COF	Centre of Focus
DODO	Dealer–Owned, Dealer-Operated
EMV	Europay, MasterCard and Visa
HSSE	Health, Safety, Security and Environment
IPPCA	Independent Philippine Petroleum Companies Association
LPG	Liquefied Petroleum Gas
MID	Measuring Instruments Directive
MOC	Major Oil Companies
MOPS	Mean of Platts Singapore
NACS	The Association for Convenience and Fuel Retailing
NOC	National Oil Companies
NPPA	New Petroleum Players Association Of The Philippines
OIML	International Organization of Legal Metrology
PDB	Petronas Dagangan Sdn Bhd
PTT	Petroleum AuThority of Thailand
RON	Research Octane Number
SCDF	Singapore Civil Defence Force
SE Asia	Southeast Asia
SMC	San Miguel Corporation
SPC	Singapore Petroleum Corporation
UL	Underwriter's Laboratory

LIST OF OIL COMPANY'S WEBSITES

Bangchak	www.bangchak.co.th/en/index.aspx
BHPetrol	www.bhpetrol.com.my/
Chevron Malaysia	www.chevron.com/countries/malaysia/
Chevron Philippines	www.chevron.com/countries/philippines/
Chevron Singapore	www.chevron.com/countries/Singapore/
Chevron Thailand	www.chevronthailand.com/
ExxonMobil Singapore	www.exxonmobil.com.sg/AP-English/default.aspx
Esso Thailand	www.esso.co.th/Thailand-English/PA/default.aspx
Flying V	www.flyingv.com.ph/
Paktai Oil	www.ptgenergy.co.th/home/index/EN
Pen Petroleum	www.penpetroleum.com.my/
Perry's fuel	http://perrysfuel.com/about-us/
Petronas Dagangan	www.mymesra.com.my/
Pertamina	www.pertamina.com/en/
Pertamina Retail	http://web.pertaminaretail.com/
Petron	www.petron.com/web/
Petron Malaysia	www.petron.com.my/web/
Phoenix Petroleum	http://www.phoenixfuels.ph/the-company/
PTT	www.pttplc.com/en/pages/home.aspx
PTT Philippines	www.pttphils.com/
PTT-RM	www.pttrm.com/front/Home/Index.aspx
Pure Thai Energy	www.pumppure.com/html-th/home/index.php
Seaoil Philippines	www.seaoil.com.ph/
Shell Indonesia	www.shell.co.id/en.html
Shell Malaysia	www.shell.com.my/
Shell Philippines	http://www.shell.com.ph/
Shell Singapore	www.shell.com.sg/
Shell Thailand	www.shell.co.th/en.html
SPC	www.spc.com.sg/home/home.asp
SUSCO	www.susco.co.th/
Total Oil Indonesia	www.id.total.com/en/home.html
Total Oil Philippines	www.totaloil.com.ph/home.html

1 INTRODUCTION

This research argues that the multiple levels of industry architecture in Southeast Asia (SE Asia) reflects the different approaches that oil companies use to deal with the risks of operating in this sector. The fuel retailing sector is the part of the oil industry's fuel distribution infrastructure. The sector serves the motoring public through the ubiquitous fuel retail station which is known by many names such as fuelling station, filling station, gas station, petrol station, service station and retail outlet. The multiple levels of industry architecture are the various combinations of independent economic players and relationships between these players coexisting within a sector and thus the multiple levels represent varying degree of vertical disintegration. From empirical evidence gathered from interviews with professionals in the sector, this research suggests that the varying degree of vertical disintegration is the result of efforts by oil companies modifying the industry architecture to manage risk and uncertainty, that is, by lowering the probability of risk as well as reducing the impact from risk events.

Fuel retailing appears to be a simple task of selling the finished products of refineries mainly gasoline and diesel for motor vehicles. The fuel retailing sector consists of networks of multiple and seemingly identical fuel retail stations spread across a wide area with each network managed from a central location. This service sector is assumed to be relatively straightforward to organize as compared to the industrial sectors. In the academic literature, the organization structure of the fuel retailing sector is modelled with two economic players. One player is the oil company supplying the fuels to a network of fuel retail stations. The other

player is the set of dealers or station managers deployed for the network, with each dealer or station manager managing a fuel retail station. The typical organization structures from the combination of these two economic players are:

(1) oil company operating its fuel retail stations directly with its own employees

(2) oil company operating its fuel retail stations through dealers

(3) independent dealer operating dealer-owned fuel retail stations

In reality, the fuel retailing sector has evolved to be increasingly complex and there are many more economic players than just the oil companies and the dealers participating in the sector. With rising oil prices, the margin from selling fuels is often not enough to offset the fixed operating costs of the fuel retail station. The income for the operator has to be supplemented with earnings from having a convenience store, lubrication bay or car wash within the fuel retail station, but these businesses also bring in new players into the sector. The increasing use of technology allows many manual tasks to be simplified and automated. These automated systems bring in players that can carry out these tasks remotely and allow help-desk and support functions to be outsourced and fuel inventory and fuel leak alarms to be centrally monitored. Changing consumer habits also allow for new and faster ways to pay at the pump. The adoption of the fully unattended self-service model brings in payment specialists and eliminates the needs for pump attendants and cashiers. There are also increasing requirements to comply with regulations, especially those to meet global environmental standards.

Environmental specialists are roped in to monitor fuel retail stations regularly to ensure compliance with these standards.

To address these evolutionary changes to the fuel retailing sector, oil companies modify the organization structures to introduce the new players into the sector, divide tasks among players and realign the relationships between players. Therefore, the academic model of the organization structure based on the two economic players, the oil company and the dealer, is inadequate for this research that seeks to understand why the fuel retailing sector has multiple levels of industry architecture involving multiple players. The basic academic model can only be the starting point for analysing the fuel retailing sector. It has to be extended to include the additional roles and other players in the sector.

To understand a sector that has evolved with new economic players inserted into the value chain, Jacobides suggests an inductive analysis of a sector that allows new analytical insights on how vertical disintegration emerges (Jacobides, 2005). He claims that the study of industry architecture, that is, the "way to divide and organize labour in each sector" (Jacobides, 2008, p. 259), shows us "how some companies manage industry architectures to their advantage" (Jacobides, 2009, p. 71). He suggests studying the "different ways in which roles are distributed among a set of interacting firms" (Jacobides, Knudsen, & Augier, 2006, p. 10). Analysis based on this approach is a practical way of looking at the nature of an industry as opposed to the "generalist preoccupation with macro-trends" (Jacobides, 2008, p. 268). This research scrutinizes the various roles in the fuel retailing sector to uncover the underlying reasons why roles are added, broken up

Figure 1 Oil industry value chain
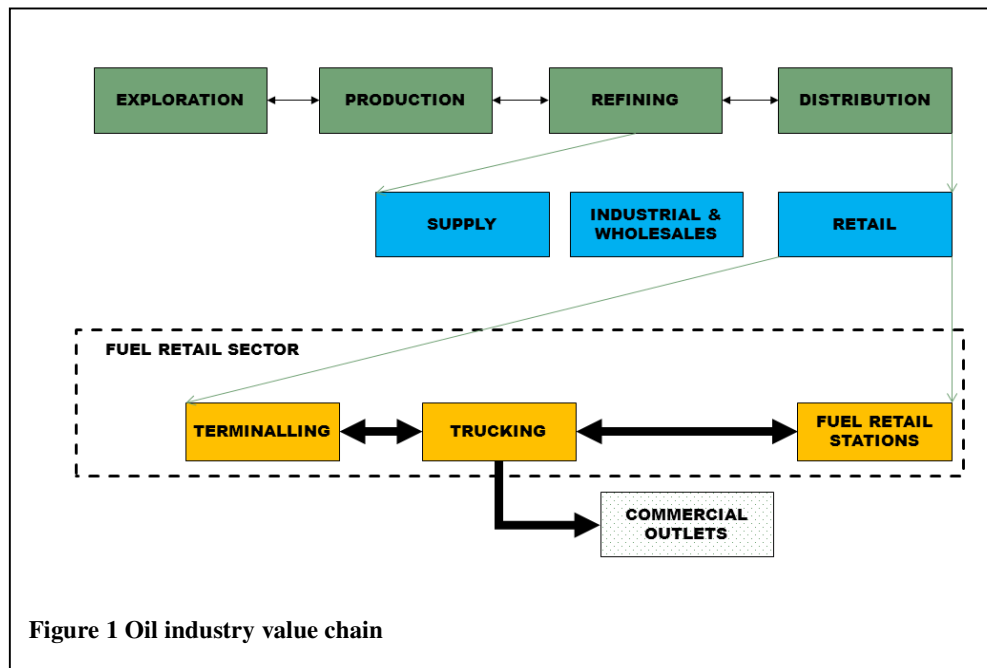
and eliminated by the oil companies and how this changes have resulted in the multiple levels of industry architecture of the sector.

1.1 Industry background of the fuel retailing sector

The oil industry is one of the biggest industries in the world and is usually described to consist of the four vertically integrated processes, namely exploration, production, refining and distribution. The vertical integration of oil industry means that the same oil company is involved in these four processes: searching for crude oil; extracting the crude oil from the ground; shipping this crude oil to refineries to be processed into useful naphtha, kerosene, diesel, gasoline and fuel oil; and distributing these petroleum products to customers.

The petroleum products are delivered in bulk as feed stocks to petrochemical industries, power stations and factories or delivered to large storage tanks in ports

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and airports that supply the fuels for ships and airplanes. A not too insignificant amount of gasoline and diesel is dispatched by barges, pipes and tank trucks[1] into storage tanks, mostly underground tanks, deployed in designated locations around the countries. These locations are either the commercial fuel outlets or the fuel retail stations. The gasoline and diesel are delivered to commercial outlets that are usually owned by companies that have to provide the fuels for their own fleet of buses, taxis and trucks. The gasoline and diesel delivered to the fuel retail stations are sold to the motoring public. This last segment of the value chain that brings the fuels from terminal to fuel retail stations to be sold to the motoring public is the fuel retailing sector and is the subject of this research (Figure 1).

As the oil industry evolved and grew in complexity, the oil companies subdivided the activities of the oil industry into smaller but sizeable chunks (Frankel, 1953) so that these can be easily managed internally by the oil companies. Many of these activities, individually insignificant in comparison to the whole value chain (Figure 1), have since been taken over by specialized players and the industry is no longer as vertically integrated as in the past. This is also the case for the fuel retailing sector which has a complex sub-division of activities that are usually not described and incorrectly lumped together as oil companies' integrated activities.

The fuel retailing sector consists of fuel terminals or depots and the fuel retail stations spread across the country. There are at least half a million fuel retail stations in the world. Each fuel retail station has an expensive underground fuel

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[1] Tank trucks, also known as tankers, tanker trucks and bowsers, are motor vehicles specially designed to carry fuels from the terminal to the fuel retail station.

system stuck at a dedicated location. The fuel system consists of buried steel tanks, pipes and pumps connected to fuel dispensers. The fuel dispensers are the units commonly referred by customers as "pumps". A set of specialized controls and automated monitoring systems ensure that all these components work efficiently and safely for the "pumps" to deliver the correct amount of fuel to the customer's vehicle. The whole system is also engineered to ensure that the fuels do not leak to the ground or into the atmosphere. On a regular basis, either by a request initiated by the dealer of a fuel retail station or an automatically triggered instruction from a central planning centre, the nearby fuel terminal or depot will be alerted to dispatch tankers to replenish the tanks at the fuel retail stations. The location of each fuel retail station is selected for the convenience of customers but the location in some countries may be specifically approved exclusively for the retailing of fuels. Once the fuel retail station is built on it, the location will likely remain as a fuel retail station for the next thirty years or more.

It is usually the oil companies that owned the land and built these fuel retail stations to their own exact specifications. With these specialized assets installed permanently in a fixed location for extended periods and without alternative use, the organization structure for the fuel retailing sector would be vertically integrated, that is, with all the specialized assets owned and value-adding activities done within the oil company. However, the reality is that the fuel retailing sector in SE Asia has varying degrees of vertical disintegration ranging from one extreme with all the activities done within the oil company to the other extreme where almost all of the activities are undertaken by different firms.

Figure 2 Shell's fuel retail stations in SE Asia
Source: Shell's online station locator (www.shell.com)
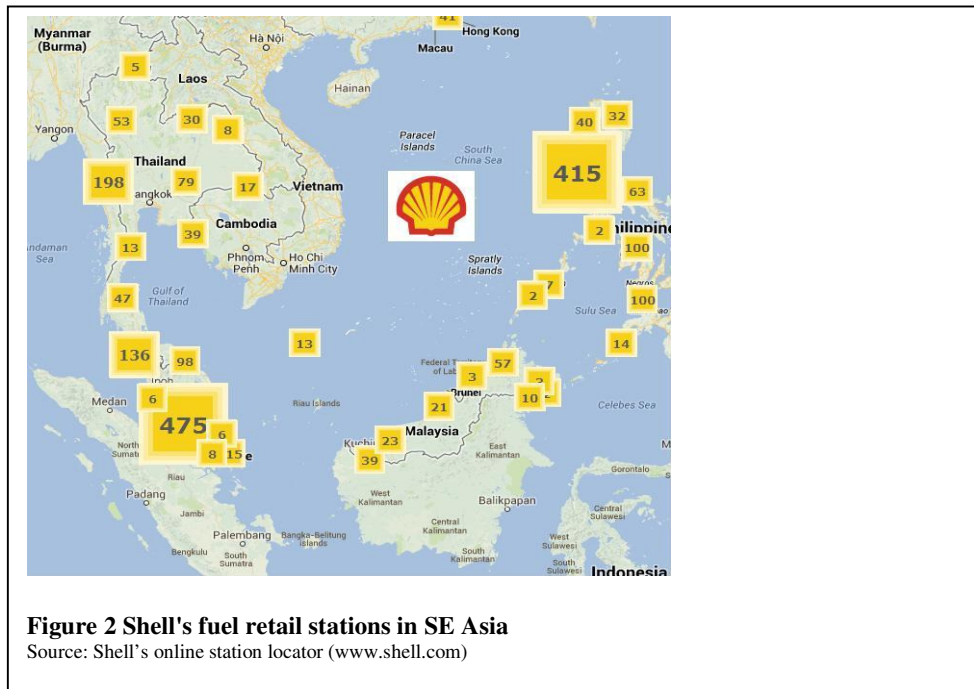
Another characteristic of the fuel retailing sector that shaped its organization structure is the way fuel retail stations are deployed. Fuel retail stations are useful to customers only when these are well spread out across a country. However, a network of thousands of fuel retail stations branded by one oil company and deployed across an archipelago like the Philippines can be difficult to manage. Figure 2 shows the extent of the deployment of Shell's 2,650 fuel retail stations across SE Asia. Each number shown in each box indicates the number of fuel retail stations around a location, typically a city. This spread of fuel retail stations across a country is also the typical deployment for the other oil companies. It is therefore not hard to imagine the complexity of organizing the industry architecture for such a widespread network of fuel retail stations.

1.2 Background of SE Asia's fuel retailing sector

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The organization structure of the fuel retail sector in SE Asia was originally put in place by foreign oil companies and subsequently adapted by national and independent oil companies in response to the regulations and standards, technology and social norms of each country.

When the fuel retailing business in SE Asia was started by the major oil companies and their predecessors, they could not deploy their existing organizational arrangements over to SE Asia and had to seek different ways to operate networks of fuel retail stations in each country. Since then, these executives of Shell, Stanvac[2] and Caltex that set up the network of stations in many of the SE Asian countries have been replaced by new breed of executives and thus the industry architectures of this sector have evolved to be very different from their predecessors and each other.

By 1990's, national oil companies such as Petronas and PTT that started their networks much later than the major oil companies began to establish new ways to organize the fuel retail business as they gained leadership position. Independent oil companies, freed by deregulation to participate in the fuel retail sector, also extended the organization structures based on the niche areas from which they originated in order to compete with the other players. The fuel retail sector in SE Asia was also transformed during this period through the rebuilding the fuel retail stations with standardized design incorporating features to enhance safety and environmental protection, the use of sophisticated electronic-based equipment so that these can be automated and the streamlining of operating procedures such as

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[2] Stanvac was the joint venture of Socony-Vacuum (Mobil) and Jersey Standard (Esso).

introducing self-service and card payment to increase the throughput of each station. This modernization of the fuel retail sector resulted in a change to the industry architecture in that many new players were introduced into the sector.

However, with the eleven countries in SE Asia at different stages of economic development and governed under very different political regimes, some countries do not progress fast enough to have the physical and technological infrastructure to support this modern way of operating a fuel retail network. Countries made up of many islands such as Indonesia and Philippines were limited by the telecommunication and road or rail infrastructure to support efficient delivery of fuels to the fuel retail stations spread across the country. Thus the heterogeneous characteristics of the countries in SE Asia were factors for the different forms of organization structure that were put in place for the fuel retail sector.

There was more than one form of organization structure in use in each country. In Singapore, the network was operated directly and with the fuel retail stations owned by the oil companies. In Indonesia, the fuel retail stations were predominantly owned and operated by dealers. In the other countries such as Philippines, Malaysia and Thailand, there were a mix of these two types of organization structure as well as one other type that has the fuel retail stations owned by the oil company but operated by an independent dealer appointed by the oil company.

The different mix in each country was not because each oil company was employing its choice of organization structure to meet the constraints of the

country's institutional environment. In fact, each oil company implemented more than one organizational structure in each country. At the superficial level, the same type of organizational structure may appear to be similar across different countries. A more detailed examination of the contractual arrangement for the same type of organization structure shows that there were differences, say, between the direct operation used in Thailand and that used in Singapore. These differences were present even for the same oil company operating across the different countries of SE Asia. For example, ExxonMobil contracted with an individual manager to manage each fuel retail station directly in Singapore. In Thailand, ExxonMobil set up a separate business entity, Thai C-Centre, to operate the company-owned fuel retail station directly.

The operations of some of the fuel retail networks in SE Asia grew increasing complex as the business evolved to include convenience store, self-service operation and card payment. These additional activities could no longer be managed by in-house by the oil companies. Instead, specialists in these areas of business were roped in to take up these roles.

1.3 Objective of the research

The fuel retail sector has existed for more than 100 years, yet there was limited research to understand how it was organized and how the organizational structure has evolved. Some researchers claimed that this was due to lack of data or detailed description of the organization structure for qualitative or quantitative analysis because the oil companies were very protective of their information. The literature

review also shows why the existing academic literature, based on the characteristics and constraints in North America cannot be used to explain the fuel retail sector in SE Asia that has evolved to include multiple players within the sector. One reason for the inadequacy of existing theories is that these studies on organizational structure were based on a model with two economic players. The other reason is that there was no attempt to explore the effect of risk management on organization structure of the fuel retail sector.

Based on the background on the fuel retail sector in SE Asia and the inadequacy of academic literature to explain the organization structure that has evolved with multiple players, the research question raised is "Why are there multiple levels of industry architecture of the fuel retail sector in SE Asia?" The multiple levels of the industry architecture represent the vertical disintegration of the sector to different degrees.

The aim of the research is to uncover the underlying cause that has led to the varying degree of vertical disintegration of the fuel retail sector in five countries in SE Asia. To answer this, the research collected the data from five countries in SE Asia including the background on how the organization structure was put in place and the changes made to the organization structure during the period 2000 to 2013 as the fuel retail sector evolved.

As this study looked at five countries with different political, cultural, social and economic characteristics, the analysis took into account the impact of the different institutional environments on the organizational structure. The analysis also

evaluated the organization structure implemented by the different types of oil companies, a factor that was omitted in academic literature.

The study also seeks to understand how the oil companies organized to manage risk. This risk management by players in the fuel retail sector was analysed by using the risk matrix, an engineering tool that is used to determine not only the probability of the occurrence of risk but also the impact should the risk event happens.

1.4   **Organization of the thesis**

The thesis is divided into seven chapters. The second chapter of this thesis reviews the existing literature covering the fuel retailing sector and argues that the literature is too limited in scope and simplistic to adequately explain the multiple levels of industry architecture that have emerged in SE Asia. The third chapter describes the methodology used for this research and how the data for the fuel retailing sector in SE Asia was collected for the research. The fourth chapter analyses each of the five cases and details how oil companies changed their organization structure in response to the constraints within each country. The fifth chapter performs an analysis across the cases by examining the fuel retailing sector along two categories or dimensions, the type of oil company and the type of organization structure. The sixth chapter argues that the emergence of multiple levels of industry architecture in SE Asia is a result of oil companies using different organization structures to deal with the risks of operating in this sector. This chapter also discusses the contributions of this research to the literature and

some limitations of this research. I conclude in the seventh chapter by summarizing the study and suggest how the study can be extended by analysing recent industry developments in greater depth. I also suggest how similar studies can be conducted for other business sectors.

2 LITERATURE REVIEW

Existing literature on the fuel retailing sector is generally restricted to the North American market and models the sector simplistically as a dyadic relationship between oil companies and dealers. Such a description of the sector is inadequate for explaining the multiple levels of industry architecture that have emerged in SE Asia. British economist Penrose (1988), famous for "The Theory of the Growth of the Firm", commented that "even by the late 1950s there had been no serious economic study of the international oil industry". She claims that energy economists are more likely to use hard data and quantitative analysis than the "messier, less precise world of qualitative change and its impact" on the oil industry (Penrose, 1988, p. 19). The study of the fuel retailing sector was also in similar state of being unstudied as this sector is considered a small and insignificant part of the oil industry.

From the 1960s, the literature started to address the economic issues and characteristics of the fuel retailing sector and its organization structure. However, these economic issues addressed in these journal papers are on the issues and characteristics specific to North America and Europe (Lin & Seetharaman, 2013). These issues and characteristics are generally not those encountered by the fuel retailing sector in SE Asia. For example, the literature analyses the impact of the full-service model on the governance structure for fuel retailing sector because the self-service model is banned in two USA states, New Jersey and Oregon (Vandergrift & Bisti, 2001; Johnson & Romeo, 2000; Scott, 2007). The literature also analyses the impact on pump prices and operating hours from the prohibition

of refiner-controlled operations of fuel retail stations (Barron & Umbeck, 1984; Vita, 2000). In SE Asia, self-service is not banned. Instead, the self-service model is enforced in the case of Malaysia to reduce the use of foreign workers and encouraged in Thailand by the government through the raising of the minimum wage for low-skilled workers. With the exception of Malaysia, all other countries in SE Asia permitted oil companies to operate their fuel retail networks directly. Although Malaysia limits each oil company (or refiner) to one operating licence and in a way prevents the oil company from operating the network directly, the pump prices for the country are set by the government and there is no rule as to who can control the operating hours.

The lessons gained from the insight into the USA's fuel retail network cannot be generalized and used for SE Asia's fuel retail network. The basic characteristics of the fuel retailing sector such as franchising and leasing arrangements, price control and service models are also very different between USA and SE Asia. In the USA, prices at the pump are controlled by the dealers and this is used as a key characteristic to analyse the sector (Slade, 1986; 1987; Borenstein, Cameron, & Gilbert, 1997; Png & Reitman, 1994). In SE Asia, prices are set by the government or by the oil companies even for the fuel retail stations that are owned and operated by the dealers. Furthermore, the governments of two countries, Malaysia and Indonesia, have the pump prices set so low that they have to subsidize the fuel retailers and the oil companies.

Another characteristic in these studies is the absence of a national oil company in USA. Although the government of Canada started Petro-Canada, it was no longer

a majority owner of the oil company by the 1990s. Even then, PetroCanada is excluded by Slade (1998) in her study of strategic motivation of oil retail companies because "it may have different objectives" (p. 93). In contrast, the national oil companies, PTT of Thailand, Petronas of Malaysia and Pertamina of Indonesia are state-owned enterprises that are prominent players in the SE Asia's upstream and downstream petroleum activities and protective of their domestic markets (Doshi, 1993). The motives of these important players and the special connections with their respective governments cannot be ignored when analysing the fuel retailing sector of SE Asia (Sklair & Robbins, 2002).

The analysis of the issues and characteristics that are unique to North America's fuel retailing sector and their effects on organization structure are still useful for this research. The organization structures in SE Asia are adopted from the North American market since the majority of the fuel retail networks here are started by the American oil companies. The literature serves as a guide by showing up the differences in the SE Asia's fuel retailing sector that does not have these issues and characteristics.

2.1 Fuel retail firm versus market

Fuel retailing does not involve a production process and is merely the activity of selling fuels to the motoring public by delivering the volatile and combustible liquid safely and efficiently into a motor vehicle. According to economic theory, this activity can be done efficiently through the market with the oil companies as the producers of the fuels taking the role of the wholesaler. The economic

efficiency of the using the market mechanism means that the optimal number of fuel retail stations, the ideal location of these fuel retail stations and the prices of fuels can be determined from supply and demand of the market. This wholesaler approach is the original method when fuels were sold in two-gallon cans from hardware stores, blacksmiths or pharmacies (Melaina, 2007). This was the accepted practice of getting gasoline for cars before 1907.

The dedicated fuel retail station started when someone placed pumps on the curb of the road to serve drive-by customers (Dixon, 1964; Beckman, 2011). It was someone's great foresight to set up a dedicated location for cars to drive right up to a pump to get fuel and the fuel retail station became the dominant method of fuel retailing (Abernathy & Utterback, 1978; Anderson & Tushman, 1990). The fuel retail stations were set up as independent firms reducing the number of players which has widened to include coal, lumber and ice dealers and eliminating the other methods of retailing fuels. Since there is no production cost involved in fuel retailing, consolidating to a network of fuel retail stations would reduce the oil company's effort of having to deal with the greater number of hardware stores, blacksmiths or pharmacies.

There are many definitions of the "market" and the myriads of hardware stores, blacksmiths or pharmacies will fit one of these definitions as the "market" (Rosenbaum, 2000). The change from "market" to the dedicated fuel retail station fits the case for the existence of firm, the fuel retail station, as the result of the reduction in transaction cost. Transaction cost is the cost of making an economic exchange in the market instead of doing it within a firm. Hence, transactions will

be performed within the firm when the costs of doing so are lower than the costs of using the market (Coase, 1937). Another view extending this economic function of the retail firm is one "offering at least one product to consumers at an observable market price, and providing services that can reduce the distribution costs which consumers would incur if they were to transact directly with producers" (Betancourt & Gautschi, 1988, p. 133).

2.2 Vertical integration and asset specificity

How should these networks of fuel retail stations be organized by the manufacturers of the products, in this case, the oil companies? Independent entrepreneurs could set up these dedicated fuel retail station and take supplies from the oil companies to distribute. Indeed this was the case when fuel retailing sector first started in the USA and in UK (Dixon, 1963; 1964). However, the history of the fuel retailing sector in the USA tells us that by 1926, most of the fuel retail stations in the urban cities were set up and operated by oil companies. There are referred to as company-operated stations (Blass & Carlton, 2001), company-owned stations (Shepard, 1993; Taylor, 2000) or direct stations (Slade, 1998). This is more accurately described later as company-owned and company-operated fuel retail stations[3] (Lafontaine & Slade, 2007). Teece (2010) claims that at that time "there was not a large population of experienced candidates qualified to be independent dealers; so the integrated companies had to hire and train employees to manage and operate their retail outlets" (p. 278). Hence, the oil

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[3] Gasoline stations are classified in this literature as owned and operated by the oil company (CC contracts), owned by the company but operated by the dealer (CD contracts), or owned and operated by the dealer (DD contracts).

company refiners integrated forward into retailing to raise quality, improve standards and establish their brands. Thus fuel retailing became integrated into the larger oil industry.

Many theories explaining vertical integration are based on the transaction cost concept. Transaction cost was first mooted by Coase who suggested that "the operation of a market costs something and by forming an organization and allowing some authority (an "entrepreneur") to direct the resources, certain marketing costs are saved" (Coase, 1937, p. 5). This concept of transaction cost as the basis for the existence of firm was developed and expanded further by Williamson (1981; 1988). The difficulty has been to measure transaction costs directly. Instead, uncertainty, frequency and asset specificity are identified as critical dimensions and these dimensions are used to analyse the impact on organization, with asset specificity being considered as the most important dimension (Williamson, 1981).

High asset specificity, which led to significant transaction costs owing to "opportunism", is frequently cited as the reason for vertical integration. According to this theory, firms will be integrated when asset specificity is high and firms will not be integrated when asset specificity is low. The question therefore is whether the fuel retailing sector is integrated into the oil company because of high asset specificity. Not all the literatures on fuel retailing address this question directly, even when they cite Williamson and describe the vertically integrated nature of the sector.

Lafontaine and Slade (2007) believe that asset specificity is far less important for retail contracting than for transacting between firms for intermediate inputs. They claim that the largest gasoline stations were high-volume self-service stations that were the least specialized and that owner of such a station, if terminated by one refiner, could easily switch to another refiner's brand. In arguing against Dnes' view (1993) that fuel retail stations in cities are high value and thus highly assets specific, Lafontaine and Slade (2007) argue that the high asset value is a reflection of the economic value of those city locations and they fail to find a direct relationship between high asset value and high asset specificity. Teece (2010), however, alludes to asset specificity of fuel retail stations when he claims that the forward integration by refiners into retailing is also "to avoid opportunism by non-creditworthy independent operators" (p. 278).

In SE Asia and North America, a fuel retail station may be owned by the oil company or the dealer. The dealership agreement for the oil company to supply fuels and the dealer to operate the fuel retail station may entail further investment by either party so that there is sharing of the total investment. While the share of the dealer may be small in comparison to the total investment, it is a big investment from his point of view. It is therefore unlikely for dealers to jeopardize their investment by antagonizing their respective oil company. With the small number of oil companies and the inadequate number of fuel retail stations in most SE Asian countries, it is also unlikely for oil companies to prey on their own dealers.

There is no ad-hoc brand switching by individual dealers in SE Asia and fuel retail stations are rebranded usually when the whole network are sold by one oil company to another. Brand switching is not cost-free and most oil companies taking over fuel retail stations are reluctant to absorb the risk of using the existing underground fuel system. In line with the observations of Lafontaine and Slade (2007), asset specificity is also not an important consideration for determining the organization structure of the fuel retailing sector in SE Asia.

2.3 Vertical integration and dealership agreement

The fuel retailing sector in North America is not exclusively operated by oil companies. Dixon (1964) also described the evolution of the independent dealers, a group of entrepreneurs that owned the lands that were developed into fuel retail stations. These independent dealers offered multiple brands of fuels and were free to set the prices sold to the end customers, the drivers. Retailing multiple brands means selling fuels branded by the different oil companies from one fuel retail station. This freedom to offer multiple brands of fuels and set prices for these fuels is problematic for the oil companies that believe branding the fuel retail station and price control are important elements in fuel retailing. One method by the oil company to secure exclusive use of the fuel retail station, specifically to sell only its brand and to exert price control, is to assist the independent dealer financially to build the fuel retail station and for the independent dealer, through a contract, to assign part of the fuel retail stations to the oil company. This arrangement evolves subsequently to other dealer agreements with varying terms coined by the different oil companies such as "Commission Agency Agreement",

"Pump and Property Lease", "Lease and Agency", "Lease and License" and "Commission Retail Plan". These arrangements and the agreements between oil companies and dealers were subsequently simplified and consolidated and established in SE Asia as the dealer-owned dealer-operated fuel retail stations.

The primary aim of the contractual arrangements with dealers is for the oil companies to exert control over the sector especially on the pricing and quality of the fuels sold at the fuel retail station without having to own the station and the assets of the station. Another development resulting in another form of dealership was driven by regulations in the USA from the 1930s to limit the growth of chain stores and stop oil companies from controlling pump prices (Borenstein & Gilbert, 1993; Borenstein & Bushnell, 2005). As a result, many of the company-owned and operated sites were turned over to dealers to operate (Dixon, 1964). These fuel retail stations became the company-owned dealer-operated stations, a model that is also a common organizational arrangement in SE Asia.

So with this bit of history, we have the three base organization arrangements established in the North American market and adopted in SE Asia, namely (1) company-owned company-operated stations, (2) company-owned dealer-operated stations and (3) dealer-owned dealer-operated stations.

2.4 Franchising model

Researchers studying the organization structure of fuel retailing took two different tracks. One track took the choice of contractual arrangement as given and studied

the impact from other variables such as price setting (1997; Borenstein & Shepard, 1996; 2002; Slade, 1992) and service time (Png & Reitman, 1994). Another track tried to explain the contractual arrangement from the characteristics of the fuel retail network such as the size of the fuel retail station, penetration of the convenience store tie-in and the observability of the retailer's effort (Vandergrift & Bisti, 2001; Johnson & Romeo, 2000).

One research approach is to treat operating fuel retailing through a dealer as traditional franchising. Traditional franchising is different from the business-format franchising. Business-format franchising, such as those applied for fast-food restaurant and hotel, involves a franchisor without production capability, selling a way of doing business and a trademark to a franchisee. Traditional franchising involves an upstream manufacturer, the producer of the products such as gasoline and diesel, contracting with a downstream retailer such as station dealers, to distribute those products (Lafontaine & Slade, 2007).

The agency theory has been used to predict the choice of contractual form for franchising. Agency theory refers to a contractual agreement with the principal as one party and the agent as the other that stipulates that the principal rewards the agent to carry out certain activities (Eisenhardt K. , 1988). This theory assumes that individuals will maximize their own self-interest and need to be monitored, which may be costly and ineffective (Perrow, 1986; Brickley & Dark, 1987; Brickley, Dark, & Weisbach, 1991). Gasoline retailing is considered an example of a principal-agent problem in a vertical setting (Shepard, 1993).

Shepard (1993) applies the principal-agent analysis to understand the oil company's choice of contractual form of the fuel retail stations in Massachusetts. She finds evidence that stations with service bays tend to be dealer-run because of higher monitoring costs by the principal, while stations that mainly sell gasoline and convenience store products tend to be company-operated because of lower monitoring costs. She implies that the choice of organizational form is selected by assuming that the type of backcourt services is chosen first. This cannot be true as backcourt services can be changed or added later by the appointed dealers.

Taylor (2000) uses data from Los Angeles' fuel retailing sector from 1992 to 1996 to confirm using the vertical principal-agent framework, noting that "as the unobservability of effort becomes more important, refiners offer contracts to downstream retailers that include relatively more performance incentives, but less direct control" (p. 163). In the study, the retailer's effort to maintain cleanliness, stock shelves, keep operating hours and reduce theft with accounting controls can be observed for stations with convenience stores. The retailer's effort for those stations with full service offering automotive repair is treated as unobservable. This method of analysis cannot be applied to understand organization structure in SE Asia's fuel retailing sector because fuel retail stations with convenience stores are not as well developed as those providing repair services. Convenience stores within fuel retail stations are successful only in a few countries and are not a practical option in many fuel retail stations in SE Asia. These two types of backcourt services cannot be compared to determine the choice of organizational structure in SE Asia.

2.5 Fuel retail station configurations

Over the years, the simple activity of selling fuels to the car has evolved into various retail configurations. The academic literature analyses the effect of the difference in retail configuration comprising of full-service, no-frill self-service, 24-hour operations, service bay, and convenience store (Goberman, 1978; Mitchell, 1980; Png & Reitman, 1994; Scott, 2007). Full service in North America means that the fuel retail station will have pump attendants to pump gasoline, check oil and clean windscreens for the customers and as such these pump attendants can provide the additional service of changing lubricating oil and offering repair services. This selling of lubricating oil and vehicle-related products at the forecourt is known in the fuel retailing sector as forecourt business. In this description, the forecourt using pump attendants to pump gasoline is known as forecourt with attended service. Backcourt business, if offered, consists of the combination of convenience store, lube-bay and car wash.

The difference between full-service and self-service has become less distinct with the increased marketing mix of forecourt and backcourt businesses. This is because backcourt businesses always have to be supported by service personnel. The fuel retail business with and without attendants is further complicated by the different ways to pay. Payment can be done indoor to a cashier, outdoor to a cashier at a booth, outdoor to a pump attendant or directly through a payment device on the pump. This is especially relevant when analyzing the organization structure in SE Asia's fuel retailing sector with different retail configurations within a country and across the countries that has implemented the different ways to pay. The fuel retail stations with fully attended service and providing exclusive

forecourt business will have staff to pump the fuel into the car and collect payment from the customers at multiple payment booths set up within the forecourt to speed up the payment process. In the partially attended service model, customers have the choice of pumping fuel or leaving this activity to pump attendants. This arrangement frees the customers to shop at the convenience store and make payment directly to the cashier indoor. In the fully automated fuel retail station that provides self-service, payment using credit or fleet card can be done directly at the "pump". This "pump" is usually a more technologically sophisticated model incorporating a payment device that customers can handle intuitively and safely without any chance of them causing leaks or fire.

To accommodate these different configurations, new players especially those specializing in the other areas of retailing are added into the sector. For example, Walmart, the well-known American general retailer, became a fuel retailer by owning some fuel retail stations, but it also has different contract relationships with refiners or other retailers for other fuel retail stations (Zacks Equity Research, 2012). The use of credit card payment when transacted directly at the pump with the self-service configuration has resulted in higher drive-off and credit card fraud (Peretti, 2009). This brought in the banks and credit card associations with their entourage of fraud and security specialists to reduce these operational risks. Even the no-frill self-service stations were subjected to regulations governing safety, health and environmental protection that have surpassed the skills of the average dealers. For example, the leak protection requirements would require specialists to manage the underground tanks to ensure compliance with environmental regulations (US Environmental Protection Agency, 1995).

Although these reconfigurations add new players and change the roles of existing players including the duties previously handled by the dealers, academic studies address only the role of the dealer and ignore other players supporting the dealer in the fuel retailing sector (Shepard, 1991; Mitchell, 1980). In addition, these papers also assume that the no-frill self-service model is easier to support than the full-service model and that a convenience store needs less skill to run than a service bay. In the study of price discrimination, the full-service model and self-service model are treated as different forms of products such that stations offering both types of services are treated as multiproduct stations (Shepard, 1991; Barron, Taylor, & Umbeck, 2001).

2.6 Industry Architecture of fuel retailing

The fuel retailing sector started with the independent dealer, typically a mechanic, as the sole party selling fuels manually by decanting from a barrel of gasoline or diesel into two-gallon petrol cans and collecting cash from customers (Dixon, 1963). Selling fuel was treated as a secondary business to his main business of repairing vehicles. This has since evolved to the modern fuel retail station with forecourt and backcourt businesses. The forecourt business of selling of fuels is now the main business line but running just forecourt business is increasingly difficult for the dealer to maintain profitability. The reduced profit margin is brought on by the increasing costs of selling an essential commodity that must be "provided at the lowest possible cost, with great reliability and security of supply, while still ensuring a cleaner environment" (West, 2003, p. 47). Thus, the

forecourt business has to be supplemented with secondary or backcourt businesses, which can be any combination of convenience store, lubrication bay and automatic car wash.

There are also different ways of serving customers, either as full service with attendants or self-service with payment booth located at the forecourt or unattended self-service with customers interacting with payment device incorporated into the pump. Depending on the size of the forecourt and the operating hours, there could be more than 2,000 motor vehicles to be served each day. The dealer alone can no longer cope with such volume and the fuel retailing sector is organized to have many other players, many of them behind the scenes but playing increasingly important roles. For example, the roles that support the automated payment device at the pump ensure that the station system, the communication network, the central data switches and the front-end and back-end processors are functioning securely and quickly. These roles are more critical in keeping the fuel retail station operating non-stop than that of the dealer's much reduced role.

With many of these roles inserted between the oil companies and the dealers, the fuel retailing sector is also no longer vertically integrated. Jacobides (2005) notices the vertical disintegration occurring within the sectors when he studied the mortgage banking industry. He analysed the division of labour in the mortgage banking sector and saw how the industry evolves to include different participants and new rules connecting them. He claims that this happened in sectors even when "the underlying products, services, and core technologies remain the same"

(Jacobides, 2005, p. 465). The fuel retailing sector has been in existence for more than a hundred years. While there have been changes and improvements, the main business line of fuel retailing has remain essentially the same. Yet the organization structure is evolving not only to include new players but that the existing players had their roles modified.

Thus the networks of fuel retail stations cannot simply be grouped into a few types of direct-operation, franchise-operation and dealer-operations for in-depth analysis. Even the term franchise operations is ambiguous in that there are many variations as can be seen in the legal cases in the US between franchisees and oil companies, where the definition of the term "franchise" under US legislation was being contested (Every, 1984). The concept of industry architecture recognizes that the "even players who, from a distance, seem to cover the same spot in the value chain, are really quite distinct species" (Jacobides, 2008, p. 259).

Jacobides, Knudsen and Augier suggest that "participants along the value chain, with a distinct view of how the industry architecture should be structured, fought to be the guarantors of quality" (Jacobides, Knudsen, & Augier, 2006, p. 9). They cite historical examples of the case of Port wine in which the shippers gained a reputation over the growers to be the guarantors of quality. Similarly, the producers won against the importers to be the guarantors of quality for French Claret. This fight to be the dominant player in each sector continues today because the guarantors of quality can shape the industry architecture so as "to keep a large part of the industry profits by carving out a comfortable position in their sector" (Jacobides, Knudsen, & Augier, 2006, p. 11). This jostling for position is not new

in the oil industry because it is well-known that multinational oil corporations as "chain keepers are in a position to negotiate better deals and, consequently, extract high profit shares in the value created, while the weak participants are content with the leftovers" (Bougrine, 2006, p. 35).

In the fuel retail sector, the oil companies are assumed to be the guarantor of quality or the chain keepers. Existing literature implicitly agrees with this assumption by placing the oil companies as the principals in the study of agency problems of franchising and as the dominant parties in the different dealership arrangements. There is no academic study to assess whether the oil companies can remain in the dominant position especially when the sector evolves. Trade literature shows the attempt by hypermarkets to usurp this dominant role which will lead to a change in the profitability for the existing players in the fuel retail sector (Morris, 2002; Leto, 2001). Hypermarkets have the strategy of offering gasoline almost at cost to drive volume so as to increase the sales of the higher margin products in their store (Reid, 2004). It is thus necessary that oil companies maintain their dominant role in the industry architecture as the sector evolves to include many new players. These players are taking up critical roles that may be recognized as more important that the roles of the oil companies and the dealers.

2.7 **Risk and uncertainty**

Theories of the firm, organization structure and vertical integration that are based on transaction cost economics automatically adopted risk – or rather, uncertainty – as a core assumption. This is because Coase states that it is "improbable that a

firm would emerge without the existence of uncertainty" (Coase, 1937, p. 5). Williamson also places uncertainty with frequency and asset specificity as critical dimensions for determining the choice of organization structure (Williamson O. E., 1979). However, both Coase and Williamson did not explain how uncertainty would lead to different organization structures (Slater & Spencer, 2000).

"Uncertainty" is distinguished from "risk" by Knight (1921) in his book, Risk, Uncertainty and Profit. He defines "risk" as a measurable quantity such that a decision maker will make the same prediction when given the same information and "uncertainty" as unquantifiable such that required the decision maker to decide based on intuition. He wrote that there were several methods for humans to deal with uncertainty, among them, consolidation and specialization. Thus, Knight's version of organization structure is that uncertainty will lead to the "tendency of the groups themselves to specialize, finding the individuals with the greatest managerial capacity of the requisite kinds and placing them in charge of the work of the group, submitting the activities of the other members to their direction and control" (Knight, 1921, Paragraph III.IX.10).

Some researchers classify uncertainty into different types and compare how the different types of uncertainty impact organizational structure. These comparisons include the study of volume uncertainty versus technological uncertainty (Walker & Weber, 1987), supply versus demand uncertainty (Carlton, 1979) and commercial versus technological uncertainty (Schilling, 2002). Another study into the firms' environments divided uncertainty into primary, competitive and supplier uncertainty and tested hypotheses as to how these different forms of

uncertainty affect the extent of vertical integration (Sutcliffe & Zaheer, 1998). However, the empirical results by classifying uncertainty differently give mixed results with no clear implications for the boundaries of the firm and the extent of vertical integration.

Cheung (1969) noticed that there were a variety of contractual arrangements under the same constraints of competition. He studied "three main forms of contracts in agriculture, namely, a fixed-rent contract (rent per acre stated in cash or in crop), a share contract and a wage contract" (p. 25). The wage contract, that is using farm hands, represents the vertical integrated model. The other two, fixed and share contracts, are vertically disintegrated models with different share of risks among parties. He explains that one type of contract is chosen over the other to disperse risk-bearing and minimize transaction cost. In times of higher uncertainty, he claims that share contracts would be chosen.

However, another researcher, Hanumantha Rao (1971) presented data from India that shows, unlike China, high uncertainty led to fixed contracts. From these two researchers and many others, Allen and Lueck (1995) argue that risk aversion is not useful in explaining contracts. They claim that risk preferences are arbitrarily assumed in the principal-agent model, that the risk sharing model is difficult to test and that it is inappropriate to measure incentives from contracts of varying diverging goods. They claim that there are other important forces shaping contracts. In other words, risk aversion would not help to explain the different vertical organizational structures.

The literature on fuel retailing sector does not address the relationship of risk and uncertainty and organization structure directly, but risk and uncertainty are addressed by researchers studying similar organization structures used in non-fuel retailing sectors. One researcher claims that the industry can use superior control over the assets and capabilities in a vertically integrated structure to achieve superior responsiveness under uncertainty. He claims that in the fashion apparel industry, the bigger players use their vertically integrated structure to respond quickly to mitigate the risk due to volatility inherent in the industry (Richardson, 1996). Martin (1988), in a study on franchising and risk management, claims that "uncertainty does matter in the franchising choice. Given various sites with different risk and expected return characteristics, the firm will take advantage of the opportunity to diversify the risk and to shed locations with higher risk-induced monitoring costs (p. 965)".

This approach to diversify risk can explain why fuel retail stations are converted to different organization structures when a network is purchased by another oil company. This reason is often not highlighted as risk management is often buried in the tactics of management practice. Knight's distinction between risk and uncertainty is also not important in the practice of risk management (Corvellec, 2009). In Hasting's study (2004) of the purchase of the independent retail gasoline chain, Thrifty, by ARCO, she reported that even though there was no remodeling or station expansion done, some of the Thrifty stations were converted to lessee-dealer stations, some were converted to dealer owned company-supplied or jobber-supplied stations, and some were converted to company-operations. Hasting did not offer a reason for the conversion but risk management could have

explained for these conversions since risk assessment exercise is usually done as a due diligence activity for taking over a fuel retail network.

2.8 **Institutional environment and organization structure**

North (1991) defines institutions as the "the humanly devised constraints that structure political, economic and social interaction". The institutional environment, which is shaped by these constraints, can impact organization structure in several ways. Henisz (2000) described the choice of market entry mode by multinational firms on the effects of political hazard, theorizing that multinational firms can partner local firms to alleviate the threat of expropriation in the face of increasing political hazards but warned that this hazard-mitigating benefit may be diminished by increasing contractual hazards with the local firms. This research separates local firms into national and independent firms as these two types of firms are impacted differently by political hazards.

Gulati and Nickerson (2008) suggests that "high levels of pre-existing inter-organizational trust increased the probability that a less formal, and thus less costly, mode of governance was chosen over a more formal one". In other words, higher levels of trusts may support the increase in vertical disintegration by allowing players to cooperate informally. Trust is a form of social norms or informal rules among people and can be used in small community to mitigate impact of risk events.

Oxley (1999) found that in studying the governance modes adopted by firms in countries with weak intellectual property protection is that the use of equity joint venture structure "mitigates appropriability hazards by more closely aligning the incentives of the partners, and providing enhanced monitoring and control capabilities".

2.9 Summary and theoretical gap

The purpose of the literature review is to search for the existing theories that can be used to explain a phenomenon in this case why the fuel retail sector is organized with multiple independent economic players in various combinations and relationships coexisting within a sector. There are several academic studies that address the organization structure of the fuel retail sector but these are based on the model with two economic players and analysed on the characteristics peculiar to the North American markets. These theories are inadequate to explain organization structure of the fuel retail sector in SE Asia that has evolved to include multiple players within the sector.

The impact on the organization structure under constraints such as the restrictions on operating hours, setting prices and operating with the self-service arrangement is easier to explain with two economic players. This model of two economic players has one player represented by the group of oil companies supplying the fuels and the other player represented by the group of dealers operating the fuel retail stations. The literature also uses agency theory to explain the choice of contractual form for franchising. Agency theory treats franchising as a model with two players, the principal as one player that rewards the other player, an agent to

carry out certain activities. This theory claims that the choice of organization structure is based on whether the effort of the agent is observable and unobservable and on whether the principal will have to incur higher monitoring costs.

The fuel retail sector has evolved to include more than just the two players. Yet the academic literature fails to recognize the other players supporting the fuel retail sector as important. For example, the roles of the pump attendants and cashiers are eliminated when operating the fuel retail stations under self-service but this operating mode has to be supported by a different group of players, the system support and the banking system specialists that need not be physically present at the station. However, to keep to the model of two players, one academic analysis treats self-service and full service as different product offerings (Shepard, 1991).

Uncertainty, frequency and asset specificity are identified as critical dimensions in transaction costs and used to analyse the choice of organization structure (Williamson O. E., 1981). But literature on the fuel retail sector does not consider the asset specificity of the fuel retail stations as an important dimension in determining the choice of organization structure. The dimension of frequency is also not a characteristic of the fuel retail sector since players are tied down with long term contracts. This leaves uncertainty as the critical dimension left to explain the choice of organization structure.

Uncertainty is evaluated in the studies on the choice of organization structure by identifying different types of uncertainty, but this approach does not give clear causality (Walker & Weber, 1987; Carlton, 1979; Schilling, 2002; Sutcliffe & Zaheer, 1998). Another academic approach to uncertainty is to relate the risk preferences of players to the choice of organization structure, but the result from these studies is inconsistent (Cheung, 1969; Hanumantha Rao, 1971). One approach that has not been used is to relate risk and uncertainty to organization structure is the application of risk management. Risk management does not separate risk and uncertainty as the purpose of risk management is to reduce the exposure to all types of risk and minimize the impact of a risk event should it occur.

In summary, existing theories cannot explain why the fuel retail sector operates with multiple independent economic players in various combinations and relationships coexisting in the sector. One reason for the inadequacy of existing theories is that these are based on a model with two economic players. The other reason is that there was no attempt to explore the effect of risk management on organization structure of the fuel retail sector. Jacobides suggests that an industry evolves to include different participants and new rules connecting them within a sector. Yet the process of vertical disintegration, the emergence of new intermediate markets, is not understood. He suggests that "on the empirical side, it is desirable to better document and explain vertical disintegration and market creation, as this process has significant implications for industries and the firms within them" (Jacobides, 2005, p. 467).

3   RESEARCH METHODOLOGY

This research is a multiple-case study using qualitative data, inductive logic and the case study approach. The aim of this research is to build theory to explain the cause of the multiple levels of industry architecture in the fuel retail sector. There are many case study research methods but many researchers cited the process of building theory from qualitative case study by Eisenhardt (1989). Her framework on inducing theory from case study is detailed over 8 steps. While this research would have benefitted from using all these steps, this study cannot claim to have followed her research method. Eisenhardt discourages researchers from claiming to follow a particular method. Instead she suggests using "processes that are reported with transparent description, particularly regarding how the theory was inducted from the data (e.g., description of cross-case comparison techniques)" (Eisenhardt & Graebner, 2007, p. 30).

While I do not claim to have followed her framework, I wrote three of the chapters along the logical path described by her research methodology. These three chapters are the a) Within-case analysis, b) Cross-case analysis and c) Discussion. She suggests that the detailed case-study write-up be written as "simply pure description" and that the within-case analysis follows a process to "allow unique patterns of each case to emerge before investigators push to generalize pattern across cases. For cross-case analysis, she suggests "searching for patterns" and not to "leap into conclusions based on limited data" (Eisenhardt K. M., 1989, p. 540). The development of the theory, conclusion, contributions and limitations are then assembled in the discussion chapter.

For research that has cases spanning multiple countries in SE Asia, there are several issues on gathering information and data for the within-case analysis. While many of our contacts in these countries can speak conversational English, trying to understand the reasons behind organizational changes entails more in-depth discussion. There are also cultural barriers and customs that made it difficult for even for someone coming from one country in SE Asia to understand someone in another SE Asian country. I am glad that my colleagues are from various part of SE Asia and have been the ones to gather data and information for the research. This is described in the chapters below.

While it is relatively easier to get data to show that the sector operates with multiple levels of industry architecture in SE Asia, it is much harder to obtain information that can explain the underlying reasons for the sector to be in such a state. Only a careful analysis of a wide range of case studies can reveal patterns in the organization structures within the sector that may point to a plausible explanation.

Information and data on the oil industry including the fuel retailing sector are often shrouded in secrecy (Stevens, 1995). Researchers quickly realized that the amount and quality of information and data released by oil companies vary "depending on their degree of cooperation and their concerns over disclosing proprietary information" (Grant, 2003, p. 498). This disclosure of information is even worse for national oil companies especially on the reasons behind the decisions made by the governments. The applied economist analysing the oil

industry will find "decisions are even more arbitrary, whimsical and difficult to unravel" (Stevens, 1995, p. 130).

To know the underlying reasons for organizational changes, it is necessary for a researcher to immerse himself completely in the fuel retailing sector to know the players and the relationship between them, the daily and ad-hoc activities, the planning, reporting and monitoring processes (Grant, 2003) and learn the specific terms used between players in the sector. He can then interact and discuss with these players at multiple levels using industry terms so as to understand the motives behind each change in organization structure. To meet this requirement of being immersed in the sector, I am fortunate that I have been working in the oil industry from 1979 and to be involved specifically in the fuel retailing sector since 1989.

3.1 Period covered

The period covered by this research is mainly from 2000 to 2013. Since many of the base organizational structures were established prior to 2000, some as early as the start of the fuel retailing sector in SE Asia, the reasons governing the choice of the base organization structures used in the fuel retail network in SE Asia cannot be easily established. Thus this research searches for the reasons behind the modifications made to the organization structure rather than the reasons for the choice of the original organization structures. It is these modifications to the organization structures that cause the sector to be have multiple levels of industry architecture.

Although this research focuses on uncovering the underlying reasons for the organization changes that were implemented after 2000, some organizational adjustments implemented between 1990 and 2000 are included. These implementations are added to the analysis as they remain relevant beyond 2000. However, the information prior to 2000 came from interviewing the older veterans and details of some of these implementations are obtained from single source. The details of the implementations after 2000 are easier to verify among multiple interviewees. Some of the implementations can also be observed in the field and checked against archived documents given by interviewees.

3.2 Leveraging on work experience

This chapter described how I obtained the information for this research by leveraging on my colleagues' work experience and network in the fuel retail sector. My past and present work also gave me the access to the participants in fuel retailing sector and the data in my current company (Table 1). I will describe in a later paragraph on why and how these data were obtained from the field by my colleagues in my current company, Gilbarco Veeder-root.

My initial involvement in organization structure of fuel retailing was as an implementer in Esso Singapore from 1989 to 2000. This background and immersion have been helpful in the research, especially in learning the terms specific to the fuel retailing sector. However, this knowledge cannot explain the choice of a particular organization structure to be implemented or reveal the

underlying reasons for the incremental changes to the organization structure that came later. Truly, I was no different from the fish in the proverb – "I don't know who discovered water, but I'm pretty sure it wasn't a fish."

In 1989, I was part of a small team with project management experience in the refinery tasked to modernize Esso's network of fuel retail stations in Singapore. Similar modernization programmes were also carried out by the other oil companies, Mobil, Caltex, Shell and BP, for their networks across SE Asia. Following the completion of the modernization programme, these oil companies then competed by implementing harmonization and optimization programmes, lowering costs to improve efficiency and reducing risk exposure that might bring down the operation of a fuel retail station or the whole network. Esso Singapore implemented Retail Site Operation Initiative (RSOI) to simplify station-level activities, outsourced non-essential tasks and reduce faults, frauds and accidents.

Safety, health and environmental policies and enforcements are prominent in all oil companies. These programmes are given different acronyms – SHE, HSE, HES and ESH – by different oil companies but are similar in nature. This responsibility was delegated down the management hierarchy and one of the roles

Time period	Company	Position/primary job role	Usefulness for this research
1979 – 1989	Esso Singapore - Esso refinery	Project Engineer/Business Analyst/Financial Analyst	Immersion and basic background of oil industry.
1989 – 1999	Esso Singapore - Esso Marketing	Project management and operations of Esso Singapore's fuel retail network.	Direct operations of fuel retail network in Singapore
2000 – 2002	Crossecom (Singapore office)	General manager	Retail automation of fuel retailing in Singapore, Malaysia and Philippines.
2002 to present	Gilbarco Veeder-Root (Asia)	Technical Director for Asia Pacific.	Participated with colleagues in many oil companies programmes in improving fuel retail networks across SE Asia.

Table 1 Work activities in oil industry
Source: Author

in retail operations was to implement and enforce the company's SHE policies. One prominent change to the SHE programme in the operation of the fuel retail network is to use leading instead of lagging indicators. Lagging indicators measure incidents that have happened such as the number and types of injuries in a month. Leading indicators measure training programmes, audit sessions and incidents such as near misses so that counter-measures can be put in place.

There were many other programmes involving risk management of the fuel retail sector. Two of the programmes specific to Esso are the "Control and Integrity Management System" (CIMS) and the "Operations and Integrity Management System" (OIMS). Another programme undertaken by all major, national and the bigger independent oil companies was the "Underground Risk Management" (URM). The URM programme is to ensure that the underground fuel system is not leaking and the integrity of the underground system was assessed using the risk matrix.

After leaving Esso Singapore in 2000, I worked for Crossecom for two years before joining Gilbarco Veeder-Root (Gilbarco Veeder-Root, 2013). Crossecom was the system solution provider while Gilbarco Veeder-Root (GVR), an American multinational company is the world's largest supplier of equipment and automation systems for the fuel retail network (Gilbarco Inc, 2013).

My colleagues in Gilbarco Veeder-root have to support the equipment supplied to most of the oil companies in Asia. This provided them with the direct access to the executives in these oil companies. Through interactions with these executives, my

colleagues had the opportunities to observe and understand the decisions made by the oil companies in organizing their network. These observations were documented as trip reports in the company.

As mentioned earlier, the information from this research is taken with permission from my current company (see Appendix A). The information on the organizational changes in the sector was collected by my colleagues in Gilbarco Veeder-Root. Why would a supplier of fuel retail station equipment be collecting this information and trying to understand the organization of the sector? In 2002, my new colleagues were faced with difficulties working in a sector that was undergoing significant structural changes. For example, BP had sold its fuel retail networks to independent oil companies, SPC in Singapore and BHPetrol in Malaysia. These two new owners had to scale up their own organizations to maintain their enlarged fuel retail networks. ExxonMobil, formed from the merger of Esso and Mobil, introduced many organizational changes in order to optimize the management of the combined fuel retail network. ExxonMobil and subsequently Shell started to use asset management companies, SKM (Sinclair Knight Merz) to construct fuel retail stations and JCI (Johnson Control, Incorporated) to maintain fuel retail stations. Previously, these construction and maintenance activities were managed by in-house engineers using local contractors. This meant that the existing relationship established between equipment suppliers and oil companies was broken and that the suppliers, like Gilbarco Veeder-Root, had to sell their equipment through the asset management companies that were newly inserted into the sector.

The oil companies have also reduced their support selectively for the fuel retail stations within the network. My colleagues had to understand the different organization structures of the fuel retail networks in order to identify the decision-makers who were responsible for buying equipment and services. For example, a dealer owning and operating a fuel retail station will make his own decisions about buying equipment and maintaining his station. This is not that clear when the land is owned by the oil company but the fuel retail station is operated by a dealer. Some equipment such as the fuel dispensing pump and site automation system were mandated by oil companies and these had to be purchased from nominated suppliers. However, some oil companies passed the rights to choose equipment and service suppliers to the dealers under schemes such as the "branded marketer" arrangement. This is to prevent the consequence of any adverse events arising from faulty equipment at the fuel retail station being linked to their mandated choice.

With the structural changes to organization that affected the relationship between players in the sector, it was important for all the players such as equipment suppliers like Gilbarco Veeder-Root to know the organization structures in the different country. With such knowledge, these suppliers can then establish business relationships with the right parties. It is for this reason that my colleagues gathered information including details of special programmes implemented by oil companies that impacted players in the sector. This information is the source of numerical data that I have tapped on for this research.

3.3 Leveraging on networking with professionals

This research is based on formal and informal interviews and observing what was put into practice by the oil companies. My colleagues that are Filipino, Thai and Malay helped to overcome the difficulties with language, custom and culture in the different countries. In the last decade, my colleagues and I travelled around and beyond SE Asia working with fuel retailers to improve their infrastructure and business operations. The prolonged engagement in the field made us "human instrument" for data collection which allows for more detailed and accurate information to be gathered for analysis. In the chapter "Collecting Evidence", Yin (2002, p. 94) mentioned that "the most distinctive opportunity is related to your ability to gain access to events or groups that are otherwise inaccessible to scientific investigation."

My colleagues in Gilbarco Veeder-root were also invited by oil companies to participate in a number of programmes, convention and seminars, for example ExxonMobil's CRUSO (Company Retail Unattended Site Operations) programme, Petronas' 2011 Technology Showcase, Pertamina's LPG seminar and Chevron's branded marketer deployment. They have also attended exhibitions and conventions arranged annually by PetrolWorld and PEI/NACS (NACS, 2013; Petrolworld.com, 2013; PEI, 2013).

Many of my colleagues travelled extensively, averaging more than one trip a month each. Most trips to Malaysia, Indonesia, Thailand and Philippines were on regular basis as we have established businesses but there were also exploratory trips to Myanmar, Vietnam and Cambodia. Many oil companies in these new

developing nations were interested in improving their fuel retail network and consulted Gilbarco Veeder-root for its expertise. These trips were not limited to meeting the oil company's executives at the head-office but included trips to fuel retail stations and terminals.

The visits to the fuel retail stations and terminals provided opportunities to interact with the dealers and terminal operators. These dealers typically operated under the major oil companies' company-owned dealer-operated model. They explained that their roles were set out by restrictive terms in the contract and that they had to absorb the risks posed by third-party service providers engaged by the oil company. Those dealers operating under dealer-owned dealer-operated model shared about the lack of support and trust between them and the oil company. My colleagues participation on these trips reinforced their "ability to perceive reality from the viewpoint of someone 'inside' the case study rather than external to it" and "such a perspective is invaluable in producing an 'accurate' portrayal of a case study phenomenon" (Yin, 2002, p. 94).

In addition, my colleagues made numerous field trips beyond SE Asia and countries visited include Pakistan, India, China, Japan, Taiwan, HK and South Korea. These trips allowed them to understand the ways networks of fuel retail stations were organized and controlled under different regulations, technological constraints and social norms in Asia. For example, the fuel retail networks of were operated similarly in developed countries like Hong Kong and Singapore. Both countries have fuel retail networks owned and operated by major oil companies with the Hong Kong's networks managed from Singapore as the regional head-

office. It is only from such visits and interactions with the staff that my colleagues and I can understand the reasons for the differences in the two fuel retail networks. In contrast, in developing countries such as Cambodia, Vietnam and Myanmar, the trips provided us the chance to experience and observe first-hand the use of the dispersed fuel retail methods (Melaina, 2007) that predated the dedicated fuel retail stations.

One of the problems in collecting numerical data on organization structure is the difficulty of just getting someone out there to make a count. This includes getting general information such as whether it is dealer-operated or company-operated. Many fuel retail stations regardless of operations are similar in appearance, the dealers are frequently absent from station and the hired professional station managers at the station cannot tell the difference between their operational structure and that of the fuel retail station next door. Fortunately, Gilbarco Veeder-Root, the global leader in fuel dispenser technology and integrated fuelling solutions, was often called to participate in the specialized programmes held by the oil companies and we were given details of the organization structure of the network during these exercises.

One of the programmes implemented by all oil companies and in which we participated was the "Underground Risk Management" (URM) programme. Under this programme, we were given the list of fuel retail stations that were operated directly by oil companies, since only company-owned fuel retail stations were nominated for the URM programme. The mitigation of underground risks for dealers was different from those operated directly by oil companies. This was

because company-owned company-operated sites were exclusively installed with more sophisticated models of leak monitoring equipment so that they can be centrally monitored. Chevron provided the list of dealer-owned dealer-operated stations that would be aggregated under the branded marketer programme. The list of fuel retail stations was given to us as the programme of reducing asset ownership meant that equipment and service providers like Gilbarco Veeder-Root had to sell equipment to the owners and operators of the fuel retail stations directly.

Over the years and by working with oil companies that provided details of their programmes, we built up a database of the types of organization structures for fuel retail networks across SE Asia and how these networks were operated. These were summarized into tables for the different countries for this research.

However, while analysis of the numerical data shows differences in organization structure across and within the countries, these data cannot provide the reasons as to why and how these differences arose. The case studies, which also gather the opinions of the professionals working in the fuel retailing sector in their respective domains, are then used to interpret and explain the causes of these differences.

3.4 Selecting cases

The use of multiple-case qualitative studies is to emulate the scientific research process of conducting multiple experiments. The cases have to be chosen so that the phenomenon would be uncovered through pattern-matching logic that can be

replicated across these cases by treating each case as an experiment (Eisenhardt, 1989; 1991). This approach means that the cases cannot be chosen by sampling such as picking and studying a random sample of the more than twenty thousand fuel retail stations across SE Asia. This is because fuel retail stations are grouped by oil companies into networks that have to operate similarly. For example, an oil company will group and control a network of company-owned company-operated stations with station managers following a strict set of procedures. In the case of a network of dealer-owned dealer-operated stations, the same oil company will control the station operators through contractual arrangements leaving the day-to-day operating procedures to the dealers.

Since samples taken from within the same network in a particular country and under the same oil company will have features that are easily replicated and could thereby suggest a wrong theory, I grouped the 20,000 fuel retail stations in SE Asia into the 60 different networks that were operated by the 40 different oil entities. In this count of entities, Shell in Singapore was counted as a separate entity from Shell in Malaysia because they were organized differently under the constraints imposed by the respective countries. The best approach thus is to choose the cases based on countries and to analyse each country at a deeper level based on the different entities. It is also necessary to recognize that these entities could be major, national and independent oil companies and that some of these entities may have fuel retail networks that in multiple countries.

Of the five cases chosen, Malaysia, Indonesia, Philippines and Thailand have an average of about 4,200 fuel retail stations each. Singapore was added even though

	MOC	NOC	INDEPENDENT
SINGAPORE	SHELL, EXXONMOBIL, CHEVRON		SPC
INDONESIA	SHELL, EXXONMOBIL, CHEVRON, TOTAL	PERTAMINA	
MALAYSIA	SHELL, CHEVRON	PETRONAS	BHPETROL PETRON
THAILAND	SHELL, EXXONMOBIL, CHEVRON	PTT, PTT-BANGCHAK, PTT-RM	PAKTAI OIL
PHILIPPINES	SHELL, CHEVRON, TOTAL	PETRON	SEAOIL, FLYING V, PHEONIX

Table 2 Case study countries with key oil companies

it has a small number of fuel retail stations because it hosted the operational head-office of most of the major oil companies operating in SE Asia. The size of the country or its economic position does not really influence the type of organization structure. For example, Singapore and Brunei are of comparable size and level of economic development, but the organization structure for fuel retail was totally different. Brunei has one major oil company, Shell, and has almost all the fuel retail stations operated as dealer-owned dealer-operated stations. Singapore has four major oil companies that owned and operated fuel retail stations directly. The five cases with the key oil companies chosen for the research are tabulated in Table 2.

The five cases have contrasting or overlapping features. Singapore and Indonesia were on polar ends of organization structure with Singapore operating exclusively with company-owned company-operated stations and Indonesia operating mainly with dealer-owned dealer-operated stations. Malaysia and Indonesia controlled pump prices so as to provide subsidized fuels to its citizens. The full-service model from Thailand with pump attendants and cashiers was in sharp contrast to the practically empty forecourt in Malaysia using the self-service model.

Philippines and Indonesia have similar geographical constraints in that they have to support networks of fuel retail stations on multiple islands.

One concern with the chosen cases would be whether there are replicating features across these heterogeneous countries and with the different oil companies. Surprisingly, there are. For example, all the oil companies, including the independent oil company in Singapore, SPC, used the same organizational arrangement to outsource tanker truck operations and to contract professional station managers. Across the countries, major oil companies enforce similar operating models. For example, Chevron Philippines and Chevron Malaysia implemented the branded marketer scheme under the different constraints of the host countries. There were also organizational changes that were not unique to specific countries or oil companies in the samples that have replicating features. For example, PTT of Thailand formed a separate entity, PTTRM, and kept the existing organizational structure unchanged after taking over ProJet network. This approach was replicated by Pertamina that took over the Petronas network in Indonesia and Petron that took over the ExxonMobil network in Malaysia.

The oil companies in the five case-study countries are also classified into major, national and independent oil companies. Originally, I wanted to treat these groups as another three cases. However, case study based on this classification is difficult. Only major oil companies have sizable networks across countries. National oil companies, Petronas of Malaysia and PTT of Thailand, have networks overseas making them technically regional oil companies but their small network overseas have insignificant impact in the overseas market. Petron which was taken over by

private non-oil company SMC was an anomaly of transiting from a national oil company to an independent oil company. The low profile takeover of SPC by PetroChina has also elevated SPC to an ambiguous position. SPC operates as an independent oil company but it is controlled as if it is under a major oil company.

The major oil companies operating fuel retail networks in SE Asia and chosen for the research are Chevron, ExxonMobil, Shell and Total. The national oil companies chosen are Petronas in Malaysia, Pertamina in Indonesia, Petron in Philippines and PTT, PTT-RM, Bangchak in Thailand. There are many independent oil companies operating in SE Asia and those used in this research are SPC of Singapore, BHPetrol of Malaysia, Paktai Oil of Thailand and SeaOil, Flying V and Phoenix of Philippines.

3.5 **Information gathering**

This research employs many methods to obtain information such as interviews with oil executives, direct observations of the oil company staff and dealers at fuel retail stations, informal discussions with other players in the fuel retail sector, seminars and conferences set up by oil companies and email exchanges. Modern communications provide additional ways of collecting and verifying information through the use of Linkedin, Facebook and instant messaging. Appendix A provides a transcription of an interview and an exchange using Facebook to verify a point with an interviewee.

The data and information for the research was taken from Gilbarco Veeder-Root and were collected by my colleagues. I wrote to the local managing director at the start of the PhD programme for permission to have access to the data (see Appendix A). Since the interviewees are customers of Gilbarco Veeder-Root, I have also written to them formally under company's email to seek permission to interview them. However, follow-up questions and informal discussion sessions with these interviewees were done on private basis. These informal sessions were done face-to-face in the evenings when I visited them in their countries.

This research uses numeric data which are based on a classification of the types of fuel retailing models. Each oil company has its own definition of the different operational structures including different names for them, but these are subsumed under three base organization structures which are elaborated later in the thesis. The numerical data is collated with a reasonably consistent definition of the base organization structures for the analysis.

The interviewees are the oil company executives that manage the network of fuel retail stations (Table 3). They are the engineers, engineering managers, system engineers, network planners and area managers who are tasked to build, operate, manage and maintain the fuel retail stations. A number of interviewees are regional managers or managers that have moved from one oil company to another oil company. These interviewees share their views on the differences in their roles operating in the different countries and with different oil companies. All the interviewees have been in the fuel retail industry for more than 10 years. A number of them have more than 20 years of fuel retail experience.

The formal interviews with professionals in the industry were transcribed for analysis (see example in Appendix A). A number of players, such as dealers and site operators, were not comfortable with being interviewed formally. Instead, informal discussions with these players before and after the formal interviews were used to build up the cases. Some of the interviewees have difficulty expressing in English the reasons for making organizational changes to their network. For example, when I met the operations, construction and procurement managers of Paktai Oil together with my Thai colleague, these managers provided the requirements of what they needed to transform their network but they could not explain the motives for making the transformation. These motives were answered only when my colleague met them separately and over several sessions and as such information under these circumstances was obtained through my colleagues or partners. I have indicated these colleagues in the list of interviewees. To ensure accuracy, the translated information was taken from two or more colleagues and partners.

In chapter 4 of Yin's book (2002) on Case Study Research, Design & Method, the author suggests that the interviews follow "a set of questions derived from the case study protocol" as a way to guide conversation (p. 90). The following questions were developed for the interviews.

a) Background of the interviewee so that the information obtained could be deemed accurate

b) History of the oil company in the country. This was verified from archived materials.

c) Type of Industry Architecture used in fuel retailing (past, present and future)

d) Reason(s) for the change in fuel retailing structure

e) Reason(s) for outsourcing activities (if any) to third party and the choice of third party players

f) Responses to changes in safety and environmental rules (if any)

g) Responses to the introduction of Auto-LPG, CNG, Biofuel and Electric Vehicles

Latest news was also obtained from PetrolPlaza (2013) and Petrolworld (2013), two organizations that collate news and events on the fuel retailing sector. I have also joined several fuel retail groups organized under Linkedin. Some contacts in

Interviewee	Job Title	Oil Company	Type	Countries covered
Mr GP	Regional Engrg manager**	Chevron	MOC	Singapore, Malaysia, Philippines, Thailand
Mr. SS	Regional System Manager**	Chevron	MOC	Singapore, Malaysia, Philippines, Thailand
Mr. RA	Area manager (Malaysia)**	ExxonMobil	MOC	Singapore, Malaysia
Mr. LSH	System operations Mgr**	ExxonMobil	MOC	Singapore, Malaysia, Philippines, Thailand
Mr. GJL	Retail Manager (1989-2004)	Shell	MOC	Singapore
Mr. KS	Retail Manager (2004-2006)	Shell	MOC	Singapore
Mr. WKK	Network Manager**	Total	MOC	Philippines, Indonesia
Mr. KT	Engineering Manager**	Total	MOC	Philippines, Indonesia
Mr. RI	Engineering Manager	Petronas	NOC	Malaysia
Ms. SY	VP (Procurement)**	Petron	NOC	Philippines, Malaysia
(Pa. IS)*	(Hanindo)	Pertamina	NOC	Indonesia
(K. PPS)*	(Flowco Thailand)	PTT	NOC	Thailand, Philippines
Mr. WVP	VP, Marketing	BHPetrol	Independent	Singapore, Malaysia
Mr. TYH	Engineering Manager	SPC	Independent	Singapore
Mr. AM	Business Manager	SeaOil	Independent	Philippines
(K. PJ)	(Gilbarco Thailand)	Paktai Oil	Independent	Thailand

Table 3 Interviewees
* These interviews conducted with the help of translators, who are also part of the industry.
** These interviewees chosen for MOC have responsibility or information for the region.

these groups are former colleagues and friends who are based in countries across Asia. These contacts have also given me insights into the fuel retailing sector in their respective countries.

3.6 **Analyzing data**

The analysis of the research is covered in two sections, a section on within-case analysis and a section on cross-case analysis. This is followed by a discussion consolidating the information from the within-case and cross-case analysis.

The numerical data gathered for the individual oil companies in SE Asia are based on the three types of organization structure namely the company-owned company-operated, company-owned dealer-operated and dealer-owned dealer-operated. The data was first compared against each other to look for common patterns among them but this did not reveal a consistent way oil companies organized their networks in SE Asia.

The data were next collated and compared within each country. There were different numbers of oil companies operating in each country, from one oil company, Shell, operating in Brunei to ten oil companies operating in Thailand and Philippines. The comparison was narrowed to the five case-study cases, each case having more than four oil companies operating in the country. The comparison based on types of oil companies was difficult as each country

typically has only one national oil company[4] and a few SE Asian countries did not

have a national oil company[5]. Although there were more than one major oil

companies in each country, the major oil companies were not represented in every

country. For example, ExxonMobil was not present in the Philippines and

Indonesia and Chevron was not in Indonesia. Notwithstanding this, the

comparison reveals differences between the types of oil companies operating in a

country. The mix of organization structures used by the different types of oil

companies indicated that they reacted differently to the same country's specific

constraints, a view supported by the interviewees.

The oil companies do not use the same name and acronyms for three base

organization structures but the professionals are all familiar with the three

common arrangements. They reported the variations within the three types of

organization structures such as how the site staff and the station manager were

employed and how maintenance, support and administrative tasks were organized.

The analysis shows that there are many variations implemented for the network

even when this analysis is based on the forecourt business. There are even more

variations when the backcourt businesses were taken into consideration. There are

also differences in the support services provided by the oil companies for the

different base organization structure. For example, the support services were

arranged in full for their direct operations and partially for the company-owned

dealer-operated stations. The dealer-owned dealer-operated stations were excluded

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[4] Thailand has two national oil companies, PTT and Bangchak. PTT also operated another entity, PTTRM that manages the network acquired from Conoco.
[5] The acquisition by San Miguel Corp turned Petron of Philippines into an independent oil company.

and were selectively given the provision to opt in to use the services arranged by the oil companies.

The analysis scrutinizes the roles beyond that of the dealer and the oil company. These roles are hidden as functions within the oil company or buried as the multiple tasks given to the dealer. The oil company's functions such as those managing support services or providing network-based processing of payment cards have become distinct roles for the larger network. As the sector evolves, the oil companies have also deemed many roles, traditionally part of corporate functions, to be non-core activities that need not be kept internally. Even the task of managing the network of fuel retail stations is treated as a non-core activity to be given away. Other roles were spilt from the tasks of the dealer that exceeded his skill due to the increased complexity from the backcourt businesses. There were different reasons given by the interviewees for the changes to the roles and why these roles were given to other players. The analysis assembles all the data down to the role level in order to determine the motives behind the organizational changes.

4 WITHIN-CASE ANALYSIS

An in-depth study of each case reveals the complex regulatory, technological, infrastructure and social constraints that compel oil companies to adopt different organization structures, sometimes even within a single country. The background and the organization changes for each of the five cases are described in detail. Many interviewees mentioned risk management when they were describing the organizational changes and as such I am using the risk matrix template to show visually the relationship between organizational changes and risk management. Eisenhardt and Graebner (2007) suggest the "use of extensive tables and other visual devices that summarize the related case evidence are central to signalling the depth and detail of empirical grounding" (p. 29).

For each case, the players in the fuel retailing sector – namely the oil companies and the dealers – operate within the boundaries of a particular country and therefore are bounded by common constraints of the institutional environment such as being restricted by the same regulations, limited equally by the common technological infrastructure and subjected to the usual social practices. The analysis discusses the organizational changes by the three types of oil companies and how these changes relate to risk management. I will elaborate on the three types of oil companies – namely the major, national and independent oil companies – and how risks impact them differently in the following chapter.

The risk matrix template treats risk as having two dimensions. One dimension, represented by the horizontal axis on Figure 3, is the risk exposure, which is the

probability of adverse events happening. The other dimension, represented by the vertical axis on Figure 3, is the risk impact or the severity of the event should an adverse event occur. A two-by-two risk matrix is used to describe qualitatively and visually the effects of the organizational changes. The four quadrants, moving clockwise from the top left, are (1) the high-risk zone, (2) the high-impact low-exposure zone, (3) the low-risk zone and (4) the high-exposure low-impact zone.

The risk matrix is used to show the relationship between organizational changes and risk management. Organizations can either reduce risk exposure or risk impact. On the one hand, organizations can reduce risk exposure through the use of specialized staff, regular training, spot auditing and remote monitoring usually to supplement the added hardware. However, there is a limit to this approach as profitability may be reduced by the greater investment and recurring expenses. On

Figure 3 Risk Matrix - Example
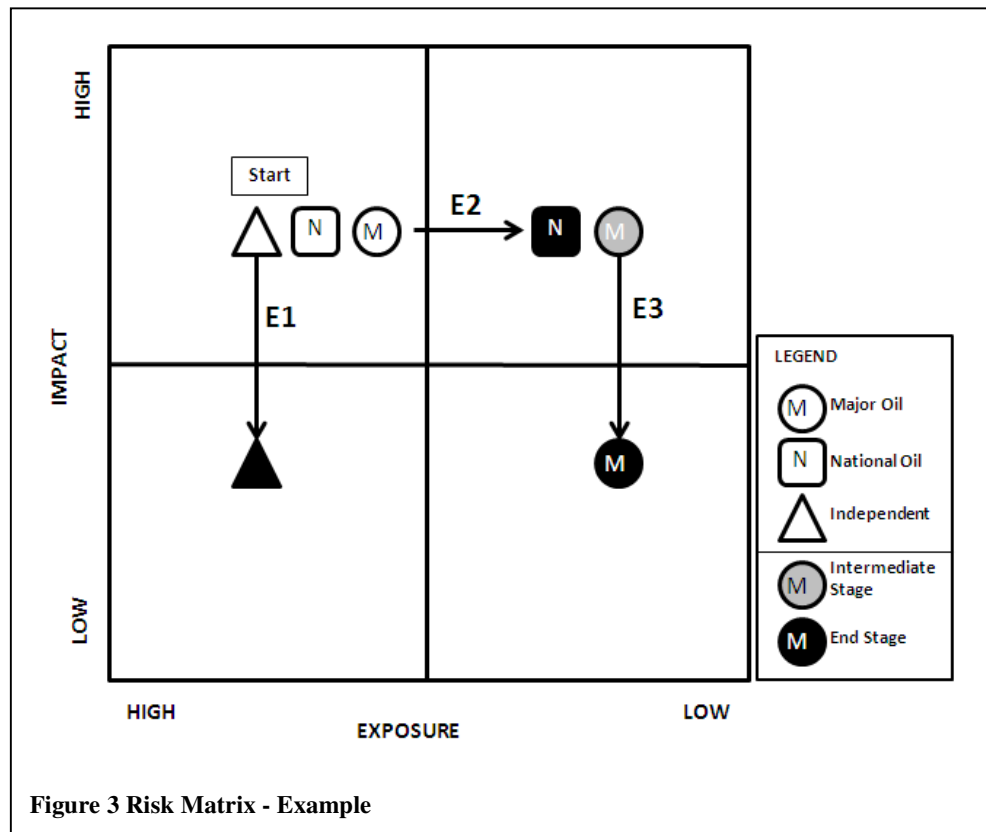
the other hand, organizations can reduce the impact of risk events by sharing the business with specialist players, outsourcing non-core activities or allowing fuel retail stations to be owned and operated by unaffiliated dealers. This approach also reduces profitability by allowing more players into the sector.

I will demonstrate how this relationship between organization changes and risk management can be visualized using the risk matrix template with the example shown in Figure 3. In this risk matrix sample, the three oil companies start in the high risk zone marked by the white triangle, square and circle. The independent oil company represented by the white triangle does an organizational change say by outsourcing its cash handling activity to a specialist to reduce the impact of a risk event. This is shown by the arrow marked "E1" in moving downwards from the start position as the white triangle to its final position marked by the black triangle (Example E1 - Figure 3). Both the major and national oil companies make organizational changes say by investing in chip-based payment system and setting up an internal payment processing centre so as to reduce their exposure to credit card fraud. This is shown by the arrow marked "E2" moving right from the white square, representing the national oil company to the black square (Example E2 - Figure 3). The major oil company that makes the same organizational change is shown as moving from the white circle to the grey circle. The grey circle is an intermediate move meaning that the major oil company has not completed the organizational changes. The major oil company does a further organizational adjustment say by outsourcing part of its card processing on fraud handling to the bank. This is to reduce the impact of credit risk as this will be absorbed by the

bank. This is shown by the arrow marked "E3" moving downwards from the grey circle to its final position as a black circle (Example E3 - Figure 3).

This example explains how the three different types of oil companies that started in the same quadrant on a risk matrix ended up in the different quadrants after undergoing organizational changes. The changes are tagged as E1, E2 and E3. The organization structure of the three types of oil companies following the changes will obviously be different even though the services and offers to the end customers remain essentially the same. This example shows how risk management by oil companies leads to different organizational structures. In the cases below, the organizational changes for each case are tagged similarly for easy reference, S1, S2 and S3 for Singapore, I1, I2, I3 for Indonesia, M1, M2, M3 for Malaysia, T1, T2, T3 for Thailand and P1, P2 and P3 for Philippines.

The case analysis scrutinizes the details of each case to understand the reasons for the organization changes made by the oil companies. The first step was to place the fuel retail organizations at the starting point on the risk matrix framework. This is based on the historical information for each case which I have gathered from sources such as archives and interviews. This initial position is also based on the institutional environment, that is, the constraints from regulations, technology and social norms faced by the oil companies operating in each country. There is more than one starting position in some cases as the three different types of oil companies implemented more than one organization structures concurrently under the same constraints in a country. The positions following these organization

changes plotted on the on the risk matrix are based on the evidences gathered during the research.

4.1 **Singapore**

4.1.1 Background

Oil industry veterans interviewed claimed that the fuel retail networks in Singapore were mostly organized with dealer-operated fuel retail stations at the end of 1980s. These fuel retail stations were owned by five international oil companies – Esso, Mobil, BP, Shell, Caltex and one independent oil company, SPC. These companies supplied fuels and lubricants to unaffiliated dealers contracted to operate the fuel retail stations. The fuels were supplied to the dealers "at 18 to 24 cents per gallon below the pump price so that the dealer was protected from price fluctuation". The fuels and lubricants were supplied strictly on cash-on-delivery basis and the dealer paid a monthly license fee as rental of the fuel retail station.

Under the dealership agreement, "the dealer took all the risks of operating the station but he has a free hand to do whatever he needed to get more profitability

Oil Company	No. of Sites	COCO	CODO	DODO
S P C	40	40	0	0
Chevron	30	30	0	0
Esso / ExxonMobil	65	65	0	0
Shell	58	58	0	0
Total Count	193	193	0	0

Table 4 Stations by type of operations in Singapore
Source: Gilbarco Veeder-Root (Asia) – 2011 Survey

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out of the site. Most of them operated mechanic shop providing tyre and battery replacement and air-conditioning repairs for vehicles and made lots of money from these side businesses". A salesman of that era told me that the head office of the oil company needed only a retail manager and two salesmen to look after all of Esso's 40 fuel retail stations. The two salesmen's role was to collect the monthly rental fee and remind the station managers to keep the station clean and tidy.

The fuel retailing sector is regulated mainly through the Petroleum Act governing how fuels should be stored, transported and sold. The regulations especially on safety, environmental standards and land usage in Singapore were more strictly enforced from the 1990s. The enforcement resulted in low availability of sites designated for fuel retail stations and the closure of unsafe stations. This led to the decline in the number of fuel retail stations. The government of Singapore also designated parcels of land that can be developed as fuel retail station and leased these for 30 years to highest bidder on open tender. Because of the limited number of new fuel retail sites available, usually two or three sites annually, the tender price was extremely high and as such only oil companies with an established network can afford to bid for these sites. This prevented other companies, especially non-oil companies, from entering the fuel retailing sector.

The number of fuel retail stations, already very few, went down further from year 2000 in spite of a steadily growing albeit well-controlled car population (Figure 4). The downward trend started when Esso and Mobil merged to form ExxonMobil in 1999. A few locations with Esso and Mobil stations next to each other were consolidated into single fuel retail station and the whole network was rebranded as

ExxonMobil. In 2004, BP sold its network of fuel retail stations including its one-third share of the Singapore Refining Company to the other partners Caltex and SPC and withdrew from the market.

The government also instituted regulations to protect the environment by ensuring that fuel retail stations are monitored for possible leakage into the ground and that the vapour from the delivery of fuels from tank truck is collected under an internationally approved process known as Stage-1 vapour recovery. In 2009, fuel retail stations located under buildings were removed as the public raised concerns about health, safety and security. This further reduced the number of stations in Singapore.

By 2011, there were four oil companies operating retail network in Singapore – the three major oil companies, ExxonMobil, Shell and Chevron and an independent oil company, SPC. There were only 193 fuel retail stations shared

Figure 4 Singapore vehicle and station population
Source: AJTP Information centre (vehicles); Gilbarco Veeder-Root (Asia) (stations)
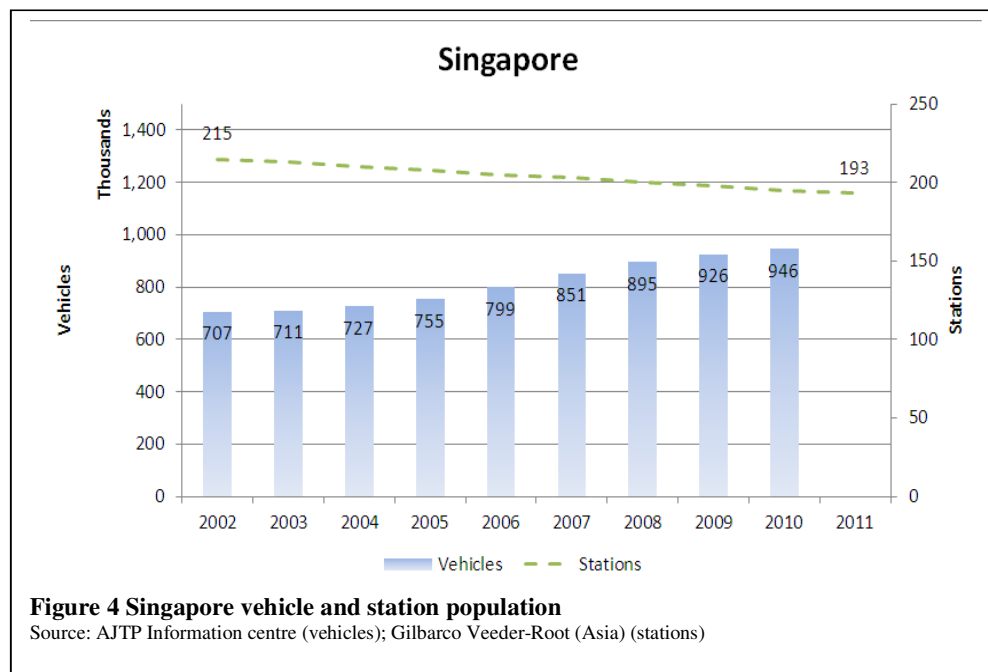
among them (Table 4). The terms used in this table, COCO for company-owned company-operated stations, CODO for company-owned dealer-operated stations and DODO for dealer-owned dealer-operated stations will be elaborated in a later chapter.

With the above information, I place the starting positions for the major oil companies and the independent oil company on the risk matrix under high exposure and high impact at the start of the modernization programme to be described in the following paragraph (Figure 5 and Table 5). At this stage in early 1990's when the oil companies have just brought out the dealers, many fuel retail stations would be in a poor state after being badly maintained by the dealers for many years. Exposure to risk would be significantly high when these fuel retail stations were taken over by the oil companies. By operating the stations directly, the oil companies were also fully accountable for all adverse events.

4.1.2   Modernization/direct operations (S1)

The modernization of the fuel retail network in the 1990s by the major oil companies, Esso, Shell, BP and Mobil, brought the fuel retail stations under the company's direct operations with all the station staff controlled and their salary paid by the oil companies. By the year 2000, all the oil companies claimed to own and operate fuel retail stations directly. The side businesses were stopped and servicing of vehicles was limited to changing lubricants, repairing tyres and replacing batteries.

Figure 5 Risk Matrix – Singapore
Source: Author
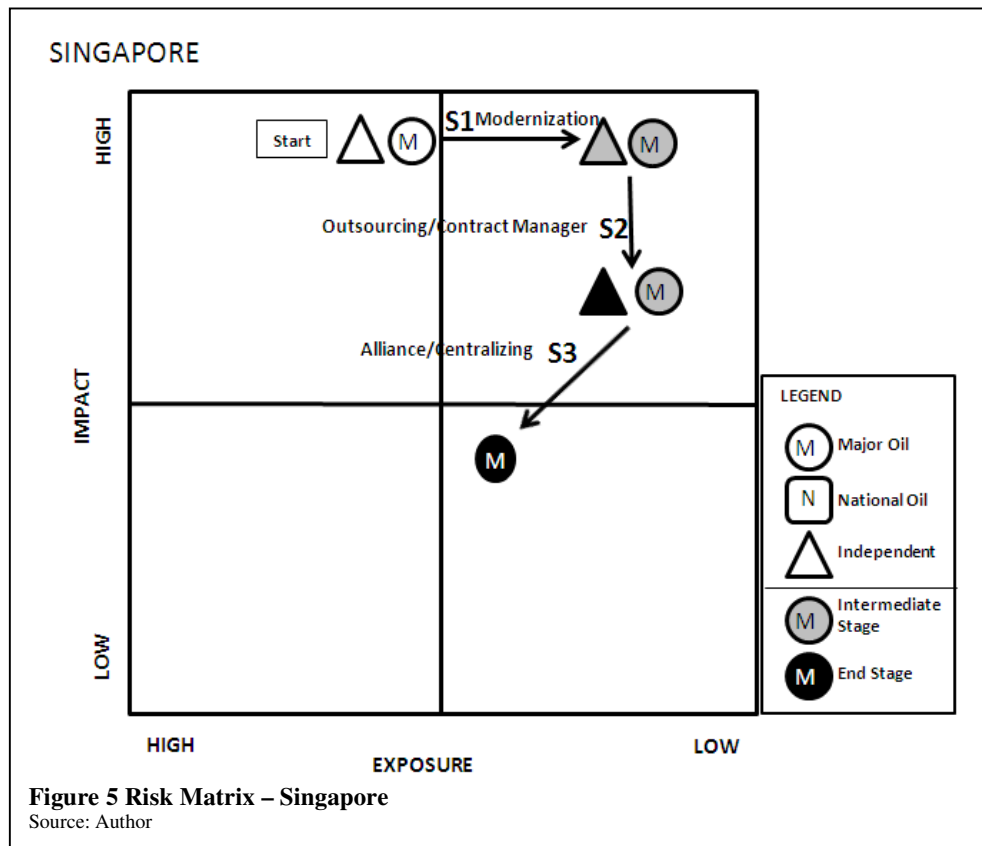
With the whole network using the same company-operated model, the competition was truly only among the four oil players as the station manager's role was only to administer the oil company's procedures at the fuel retail station. Unlike the fuel retail network in USA, the station managers in Singapore were not allowed to set pump prices.

There could be many reasons that drove all the oil companies to choose company-owned company-operated as the preferred way to manage the Singapore network. Many interviewees cited two reasons: first, the limited availability of sites zoned for fuel retail station in Singapore; and second, the increasing risk associated with dealers operating fuel retail stations in their own haphazard ways. This modernization process coupled with the organizational change to bring the

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network under the direct operation of the oil companies lowered the risk exposure but did not lower the impact of any adverse event as elaborated below.

The three major oil companies may have common reasons for using the company-operated model to reduce risk, as adverse events for them could have a global impact on their reputation. However, it was unusual for the only independent oil company, SPC, to use the same company-operated model. From its first fuel retail station in 1984, SPC remained the smallest player with 10 fuel retail stations for two decades until it took over BP's network of 30 fuel retail stations. In 2009, PetroChina bought up the network including a 50-percent stake in the SPC refinery and delisted SPC from the stock market. Except for changing the members of the board of directors, the business structure and the operations remained unchanged. Even the brand name of SPC was taken over by PetroChina. According to managers at SPC, PetroChina operated the majority of fuel retail stations in China with the company-owned company-operated arrangement similar to SPC's.

Three key programmes were initiated during the modernization period. The first was the introduction of the company-branded convenience stores that were operated directly. The convenience stores were branded "TigerMart", "Select", "StarMart" and "On the Run" by Esso, Shell, Caltex and Mobil respectively. The second was the introduction of the environmentally safer double-walled piping and fibreglass-jacketed steel tanks to reduce leaks from underground systems. The existing galvanized pipes and coal-tar-epoxy-coated steel tanks were prone to leak after more than 15 years in operation. The last was the use of integrated

automation to improve manpower efficiency at the station level as well as provide transaction-level details back to the central head office.

These programmes added many new players to the fuel retailing sector and increased the size of teams in the head office required to support the myriads of new activities. An interviewer offered a copy of the organization chart showing the team at the head office supervising the network of 40 company operated fuel retail stations. Of the 23 staff members in the organization chart, only five persons were in direct supervision of the network[6]. Other staff members handled the centralized activities for the company-operated fuel retail stations which included convenience store retailing. The organization also included a position responsible for controls of fraud and another position responsible for health, safety and environmental issues. These roles showed the oil company's emphasis on managing and mitigating operational risk.

The investments in retail automation and modern underground fuel system coupled with direct operations would have reduced the exposure to risk. However, any risk event would subject the oil company to bear the full impact because of the strict application of regulations and standards in Singapore. The modernization and direct operations programme is marked on the risk matrix under "S1" (Figure 5 and Table 5).

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[6] The five persons were the retail manager, one business counsellor for company-owned dealer-operated stations (CODO BC) and three business counsellors (COCO BC) for company-owned company-operated stations.

The strict application of regulations and standards by the government of Singapore was demonstrated by a fuel leak from one of the Shell's underground tanks in May 2013. The entire fuel retail station was shut down by the Singapore Civil Defence Force (SCDF) for more than six months for remediation of the site.

Another example of the strict implementation of rules in Singapore was a study instituted by government on anti-competitive behaviour. Pump prices were not regulated in Singapore but the four oil companies posted the same pump price for the same grade of fuel and moved pump prices up and down in tandem with one another for many years. The Competition Commission of Singapore concluded in its study that "there is no evidence that the petrol players are engaged in anti-competitive collusive behaviour" (Competition Commission of Singapore, 2011).
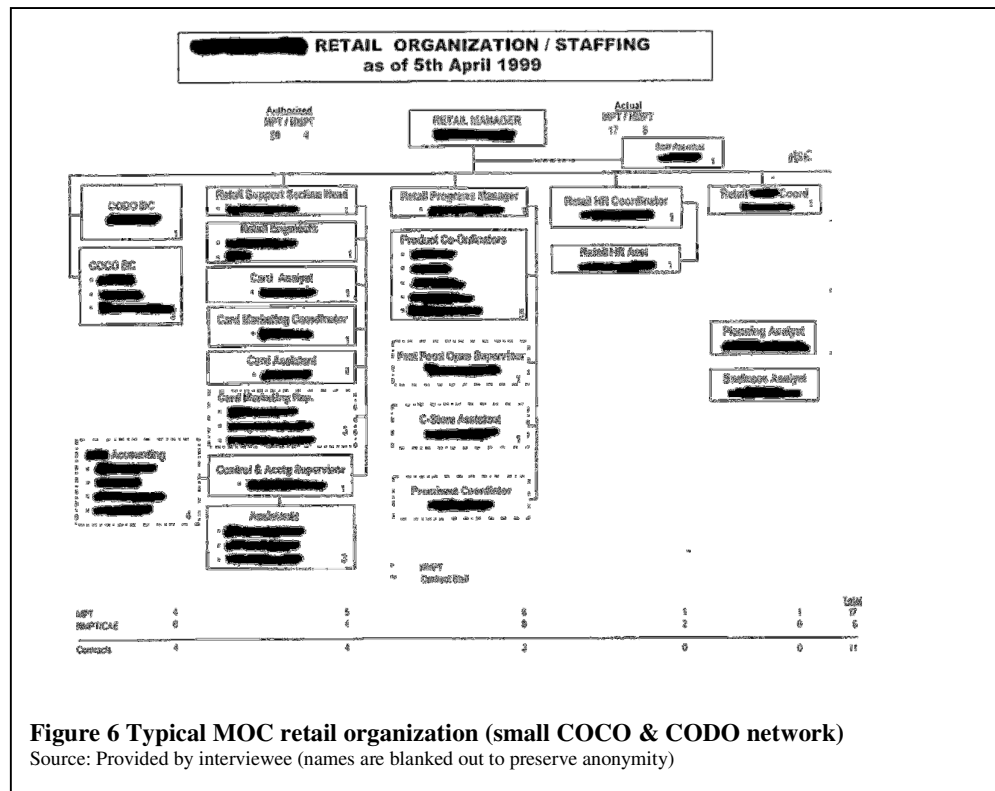
Figure 6 Typical MOC retail organization (small COCO & CODO network)
Source: Provided by interviewee (names are blanked out to preserve anonymity)

These two examples show that the governing authority will hold the oil company responsible for any wrongdoings at the fuel retail stations. Chevron's engineering manager told me during an interview that Singapore was excluded in the branded marketer programme because he was sure that Singapore's law using a legal rule called 'strict liability' would not "allow us to avoid responsibility even if we don't own anything".

4.1.3 Outsourced activities (S2)

There were several modifications to the organizational structure for direct operations implemented prior to 2000 that were used to reduce the impact of risk events. The risk mitigation effect of these modifications is marked with the number "S2" on the risk matrix (Figure 5 and Table 5).

Arrangement by oil companies	Reason	Risk management	Source
Demolished and rebuilt fuel retail stations with latest techniques	Reduced failure of existing equipment	S1	Retired oil industry veterans – Esso, Mobil
Operated fuels and convenience stores directly	Set operating standards for backcourt businesses	S1	Oil industry veterans - Esso, SPC
Outsourced delivery of fuels to specialist logistic companies	Reduced the impact of tanker accident	S2	Oil industry veterans - Esso, SPC
Used contract professional station manager in place of employee for company operations	Reduced the risk of fuel retail station being closed from minor legal incident	S2	Interviewees – SPC, Esso, Caltex
Formed alliance with convenience store specialists	Reduced risks by sharing with specialist on non-core business	S3	Interviewees – ExxonMobil, Shell
Centralized support and use of facilities managers for construction and maintenance	Reduced risks by using specialists to manage fuel retail stations instead of in-house staff	S3	Interviewees – ExxonMobil, Shell, Chevron

Table 5 Risk management – Singapore
Source: Author based on interviews

One modification is to mitigate the risk associated with delivery of fuels to the fuel retail stations by tank trucks or tanker. The tankers were originally owned and driven by drivers hired by the oil companies. For such a small country, all the oil companies have their own terminals and dedicated tankers marked with the company's logo to deliver fuels to their fuel retail stations. Even BP, Caltex and SPC that shared a refinery equally on an offshore island had separate terminals and tankers. The interviewees claimed that to reduce the accountability for tanker accidents, the oil companies "sold all the tankers to dealers so that all these problems (accidents) were passed to dealers". However, with the tanker in the hand of dealers, there were various ways to steal fuels such as discharging incompletely or decanting some of the fuels before arriving at the stations. A further refinement to this mitigation of risk was to pass the tanker ownership and operations to specialist logistic companies. To prevent theft of the fuel by these outsourced partners, the tankers were fitted with special electronic locks in place of numbered plastic seals as tampering of the electronic locks can be easily detected. The tankers delivering fuels to the fuel retail stations were dedicated to each oil company and continued to have the oil company's logo giving the impression that these were still owned by the oil companies. However these tankers and drivers were contracted from specialist haulage companies. One veteran of the oil company explained that this activity was given to these specialist haulage companies after a number of road accidents and incidents of cheating involving tankers managed by the dealers. This arrangement with specialist logistic companies disassociates the risk of fuel delivery from the oil companies.

Another risk mitigation introduced is the use of contract professional managers to manage the station directly. Even though oil companies in Singapore claimed to operate all their stations directly, they did not have employees working at the station. Instead, each station manager was hired as an unaffiliated agent who was asked to form a sole proprietorship company. The team of cashiers and pump attendants needed to run the station was hired under this agent's company but the salaries for the cashiers and pump attendants fully were reimbursed by the oil company. In this way, the oil companies maintained full control of the operations without taking on the risk for minor incidents at the stations. The operation manager explained that an example of a minor incident would be violating the Health Sciences Authority's rules of selling cigarettes to minors. The tobacco retail license was obtained under the sole proprietor's name to limit the risk since the licensee is responsible for the actions and conduct of his employees in selling the cigarettes. The manager claimed that "when such [a risk] event occurs, the station manager can be replaced without causing the station or the network of stations to be closed for the incident".

4.1.4   Formed alliance/centralized supports (S3)

A further innovation to the direct operations by oil companies was to outsource the complete operations of the stations, including the forecourt activities, to non-fuel retailers. Large convenience-store or supermarket players were chosen for their familiarity with the rules and regulations governing non-fuel retailing activities, especially the retailing of food. In 2000s, ExxonMobil outsourced its entire network to Fairprice, a local supermarket player, while Shell outsourced its network to 7-Eleven. Both oil companies explained that these non-fuel retailers

were sufficiently big and well-known so that they could be held accountable by the authority for any risk incidents in their area of expertise. Technically, the fuel retail stations under this arrangement are not operated directly. This raises the risk exposure while lowering the risk impact for non-fuel adverse events for the oil company. However, since the custody, management of fuel inventory and pump price were still controlled by the oil company, the oil companies considered these networks to be still company-operated and bore the risks associated with the fuel business. Hence, this modification to the organization structure is shown on the risk matrix under "S3" (Figure 5 and Table 5).

The four major oil companies managed the retail networks in SE Asia under regional control headquartered in Singapore or Malaysia. Under this central management, the construction and maintenance of stations was outsourced to facilities managers initially by ExxonMobil and subsequently also by Shell. In place of the reduced support staff located in each country, the oil companies set up centralized support located in the different countries of SE Asia. So while the Singapore networks of fuel retail stations were operated directly, it had to be supported, say by a ExxonMobil's wetstock centre in Bangkok, Thailand, by Chevron's engineering Centre of Excellence in Manila, Philippines, and by automation experts drawn from Shell Malaysia. Since this has the effect of increasing exposure with indirect and long-distance support but reducing impact with the improved response to adverse events by specialists, it is marked on the risk matrix under "S3" (Figure 5).

4.2 **Indonesia**

Oil Company	No. of Sites	COCO	CODO	DODO
Pertamina	4200	70	600	3530
Petronas	19	0	19	0
Shell	45	0	45	0
Total	13	0	13	0
Total Count	**4277**	**70**	**677**	**3530**

Table 6 Stations by type of operations in Indonesia
Source: Gilbarco Veeder-Root (Asia) – 2011 Survey

4.2.1 Background

For many years, national oil company Pertamina was the only company allowed to retail fuels in Indonesia. Pertamina was also the oil-and-gas regulator for both upstream and downstream sectors and therefore controlled the supply of fuels and the licensing of participants for the fuel retailing sector. This monopoly by Pertamina coupled with the many inconsistent and ambiguous regulations by the government kept the fuel retailing sector from improving. As a state-owned company in Indonesia, Pertamina operated under the control of a governmental ministry with leaders appointed by the ruling political party (Hertzmark, 2007). Instead of taking charge of the fuel retailing sector directly, Pertamina passed the control of 98 percent of the retail network to dealers and of this more than 85 percent were operated with the dealer-owned dealer-operated model (Table 6).

Although Indonesia's oil industry is one of the oldest in the world and has been producing oil since 1880s, the country became a net importer of oil and had to suspend its membership with OPEC in Jan 2009. With declining sources of oil, Indonesia could have invested in alternative energy for the transport sector. After all, the country has abundant gas which can be used for transportation. However

Indonesia appeared to have difficulty taking advantage of gas resources for transportation as this will require piping the gas across the country and adding compressors at fuel retail stations. During a trip to Jakarta, I observed an existing fuel retail station that had abandoned a complete set of equipment installed for selling compressed natural gas to motor vehicles. Pertamina also tried to implement Auto-LPG by selling this fuel within the existing fuel retail network by using an expensive combination dispensing pump that can dispense both traditional fuels and Auto-LPG. This method minimizes risk impact as the failure of the Auto-LPG as an alternative fuel will not render a pump useless. As with many other programmes to reform the fuel retail sector, incorporating the Auto-LPG within existing stations also failed to succeed.

Indonesia has only 4,200 fuel retail stations. This is obviously not enough for her more than 17,500 islands, of which about 6,000 islands are inhabited. This shortage of fuel retail stations has worsened since vehicle population grew rapidly and exceeded 90 million vehicles in 2010 (Figure 7). Of the 4,200 fuel retail
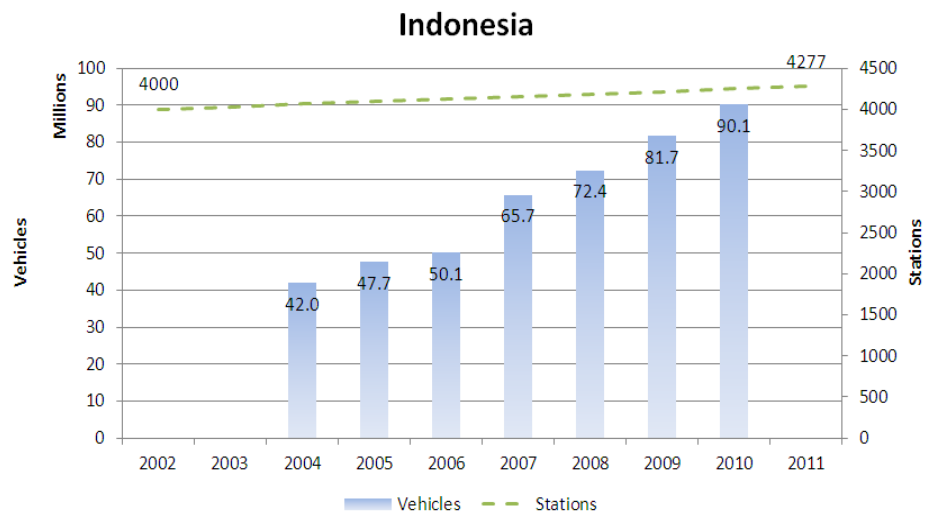
Figure 7 Indonesia vehicle and station population
Source: AJTP Information centre (vehicles); Gilbarco Veeder-Root (Asia) (stations)

stations, 65 percent are on the island of Java and another 19 percent in Sumatra (Pertamina, 2011). Without the adequate coverage by proper fuel retail stations, fuels are sold from bottles in many of the outlying islands. The inadequate coverage also resulted in exceptionally high volume sold at each fuel retail station in the city.

The low margin and inadequate station coverage have also emboldened fuel retail dealers to find illegal ways to earn more money. A common practice at fuel retail stations to cheat customers was by adjusting pumps to deliver 1 to 2 percent less than that stated on the display or by adulterating gasoline or diesel with a lower-cost petroleum product.

An interviewee claimed that Indonesians will find always find a way to

Figure 8 Risk Matrix – Indonesia
Source: Author
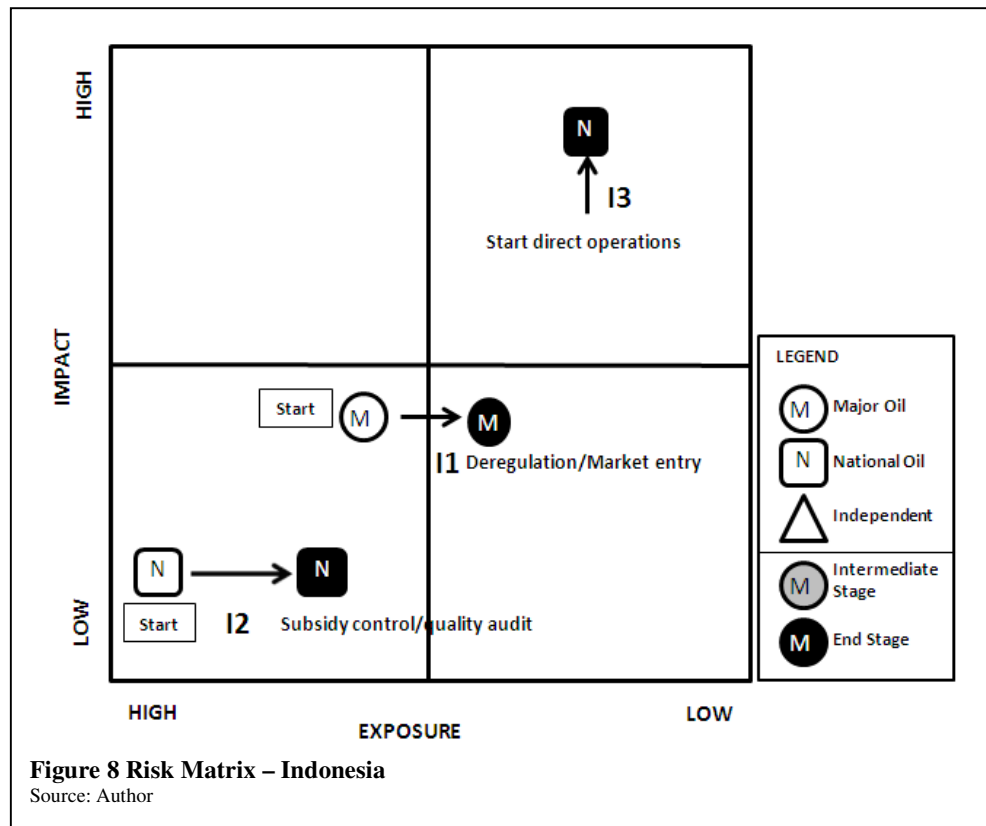
circumvent rules imposed to control them. While taking me on a trip around Jakarta to visit fuel retail stations, he cited the example of the "3 in 1" traffic rule introduced by the government to reduce traffic congestion for cars travelling during peak hours into the city needed to have three passengers. This has resulted in a new business in that you can pay a few rupiah for the 'jockeys', usually a mother with a child, to join you for the ride into the city. He used this example to explain why it was difficult for the government to impose new regulations for the fuel retailing sector as the fuel retail operators will find innovative ways to circumvent the regulations.

Based on the information above, I have placed the starting position for the dominant dealer-owned dealer-operated stations of the national oil company, Pertamina, in the high-exposure low-impact quadrant in the risk matrix (Figure 8). This is based on the Pertamina's lack of control over the fuel retail network. Although there was high exposure from frauds, adulteration and unsafe practices, there was minimal impact from these practices and even from adverse events. Another reason for the high exposure was the lack of investment by these dealers to improve their fuel retail stations and by the Pertamina to increase the size of the network.

The deregulation of the oil and gas industry has permitted foreign participation in the fuel retailing sector from 2004. These foreign oil companies set up network with the company-owned dealer-operated model. These dealers are controlled with the foreign companies' operating processes that will minimize the risk exposure. I have placed the major oil companies entering the market using this

model to have lower risk exposure but they would be subjected to higher risk impact. The reason for the higher risk impact is that the regulatory authorities and the public have higher expectations for foreign oil companies, so these companies will have to bear full responsibility for all risk events.

The following paragraphs discussed the details of several changes to organizational structure made by the oil companies after 2000 in Indonesia (Table 7).

4.2.2 Deregulation and market entry (I1)

In 2003, Pertamina was restructured from a state-owned enterprise into a state-owned limited liability company. The conversion to a limited liability company was to make Pertamina function as a commercial entity so as to improve its performance. But being state-owned, it will still have the benefits and the privileged position with the government. Along with the conversion, the upstream and downstream regulatory and supervisory roles of Pertamina were transferred to two separate government agencies, BP MIGAS and BPH MIGAS respectively.

The removal of the regulatory power for the downstream sector also ended Pertamina's monopoly of the fuel retailing sector. Private oil companies were given permission by the government to enter the retail sector. Although these foreign oil companies that came in to set up network of fuel retail stations were initially restricted from selling subsidized fuels, they were subsequently allowed to sell a limited amount of subsidized fuels from designated stations.

From 2004, three foreign oil companies, Shell, Total and Petronas started their networks and built a total of 77 fuel retail stations by 2011. However, the foreign oil companies had difficulties in implementing the full value chain of the downstream sector. The foreign oil companies had to import fuels for their fuel retail stations because the network did not sell enough volume to justify investment in refinery and terminal. They claimed that they could not gain more volume as they were not allowed to sell subsidized fuels. Even when they were given permission subsequently to distribute subsidized fuel, this was limited to a fixed volume per year and could only be sold from designated stations. Petronas was the first foreign oil company to take up the offer and was permitted to sell up to a limit of 20,440 kilolitres per year of subsidized premium gasoline from four fuel retail stations.

Because of the unequal playing field, Total Oil's manager told me that they had to be smarter in setting up the network in Indonesia. They have opted to set up company-owned dealer-operated stations recognizing that this would cost them more should the business fail. The organization structure based on company-owned dealer-operated stations was chosen to differentiate them from Pertamina with its network of dealer-owned dealer-operated stations. Instead of building its own terminals and having its own tankers to supply the network, Total chose to lease storage and use fuel delivery service from an oil tanking company Vopak as a way to reduce the risk exposure.

In 2011, Petronas, the national oil company of Malaysia, shut down 15 out of its 19 fuel retail stations in Indonesia because of poor sales. Although the company

blamed the poor sales on the anti-Malaysian sentiments by the Indonesian public, this may not be the key reason. Petronas has not been successful in deploying fuel retail network in any of its neighbouring markets. The 19 fuel retail stations Petronas started in Cambodia in 1994 gradually dwindled down to one operating station by 2010 when Petronas decided to pull out. Petronas also sold the 100 fuel retail stations in Thailand to Susco, a local oil company in 2013. These fuel retail stations were acquired from Kuwait Oil in 2005. Petronas' organization and operating model was successful in Malaysia because in its home country, Petronas has the advantage of the special relationship with its own government. In applying the same model in the neighbouring countries, it could not succeed because it did not have the advantage of the connection with the governments in these host countries.

I have marked this on the risk matrix as "I1" (Figure 8 and Table 7) for the foreign oil companies using the company-owned dealer-operated arrangement in the new market and that have mitigated risks by outsourcing terminalling and tanker operations to third-parties. This also recognizes the high risk of failure for inexperienced oil companies in entering a newly deregulated market as shown in the example of Petronas.

4.2.3   Subsidy control/quality audit (I2)

Indonesia did not have proper monitoring and control in place for its fuel subsidy programme. As a result, the programme which was meant to help less fortunate citizens in the country was instead enjoyed by both rich and poor citizens alike. Both diesel and gasoline for transport were subsidized by an amount equal to the

Arrangement by oil companies	Reason	Risk management	Source
Deregulation and market entry	Lower investment from not having own terminal and tanker delivery so that exit costs due to failure will be lower.	I1	Interviewees – Total. Interviewee was ex-Shell seconded from Singapore Archive information on Petronas networks in Indonesia, Cambodia and Thailand
Subsidy control program	Minimized frauds, smuggling, hoarding and adulterations of subsidized fuel at fuel retail stations	I2	Direct observation - Participated unsuccessfully in bid with large system company to offer solution to manage subsidy.
Quality audit of dealer stations	Improved service quality and customer trust especially in making sure accurate amount of fuel given at fuel retail stations	I2	Intertek's case study report. Pertamina's annual report 2011 reported 80% certified.
Introduced company operated stations	Matched major oil company use of company operations which was considered as superior	I3	Reports on Jakarta Post on new company-owned company-operated stations and acquisition of Petronas' network

Table 7 Risk management - Indonesia
Source: Author based on interviews and reports

difference between the pump prices set by the government and the reference price, calculated as MOPS (Mean of Platts Singapore) plus margin and distribution cost. With rising fuel prices, the absolute subsidy amount can be reduced if pump prices can be raised in tandem. But each attempt by the government to raise prices has been met with protest. This has created a huge difference in the pump price of subsidized fuels compared to the market price of fuels.

In 2012, the pump prices for subsidized fuels were raised to 6,500 rupiah (US$0.65) a litre for the lowest-grade gasoline and 5,500 rupiah a litre for diesel. Both fuels were previously retailed at 4,500 rupiah a litre, which was almost half that of non-subsidized fuels at IDR 8,350 and IDR 8,370 for mid- and high-grade

gasoline. This explains why only 1.4 million kilolitres of non-subsidized fuels were sold compared to 25.5 million and 14.5 million kilolitres of subsidized gasoline and diesel respectively.

Interviewees claim that the depressed pump prices and corresponding low margin given to dealers did not incentivize the sector to modernize the fuel retail stations with automation and latest payment technology or to reorganize the sector to incorporate alternative fuels. Instead, the depressed pump prices were the key factor in increasing traffic congestion, smuggling and hoarding of subsidized fuels and encouraging frauds. As a national oil company, Pertamina was also not willing to change the industry architecture as any attempt to do so was seen by the public as trying to remove the subsidy programme.

Pertamina did make several limited and localized attempts to monitor the subsidy programme with station-based computer systems linked to a central system. These attempts were kept low-key so as to avoid antagonizing the public. These solutions controlled smuggling, hoarding and frauds perpetuated by the fuel subsidy and therefore reduced the risks for the oil company. This mitigation of risks is indicated on the risk matrix under "I2" (Figure 8 and Table 7). In early 2012, BPMigas, which took over Pertamina as the upstream oil and gas regulator, called a tender for a sophisticated computerized system to monitor and ultimately control subsidies at fuel retail stations. However, in November 2012, BPMigas was disbanded by the Constitutional Court of Indonesia.

Another attempt to reduce the risks with the dealer-based network was started by Pertamina in 2006. To match the operating standards of foreign oil companies allowed into the fuel retailing sector, Pertamina engaged a consultant, Intertek, to audit and certify the network of fuel retail stations under a programme called Pasti Pas in April 2008 (Intertek Group plc). The fuel retail stations would be regularly assessed mainly on the quantity and quality control of fuels sold to customers. The auditors would also check that the equipment and facilities in the fuel retail stations are properly maintained. This arrangement added a third party to audit the network which is an activity usually done by staff from oil companies mainly for networks under direct operations.

4.2.4   Matched competitors by using direct operations (I3)

The three foreign companies, Shell, Total and Petronas, entered the fuel retailing sector in 2004 and operated the fuel retail stations using the company-owned dealer-operated model. However, these fuel retail stations were built to the high internal standards and the operating procedures, especially those of Shell and Total, and were based on their successful experience gained from retailing fuels in many other countries. Even with the disadvantage of selling only the higher-priced non-subsidized premium fuels and having a limited number of stations, Shell and Total succeeded in making their branded fuel retail stations more trustworthy than Pertamina's.

Pertamina's fuel retail stations were perceived by customers to be providing lower quality, incorrect quantity and poorer service. This perception of foreign brands being better was interpreted by Pertamina's executives to be the result of the
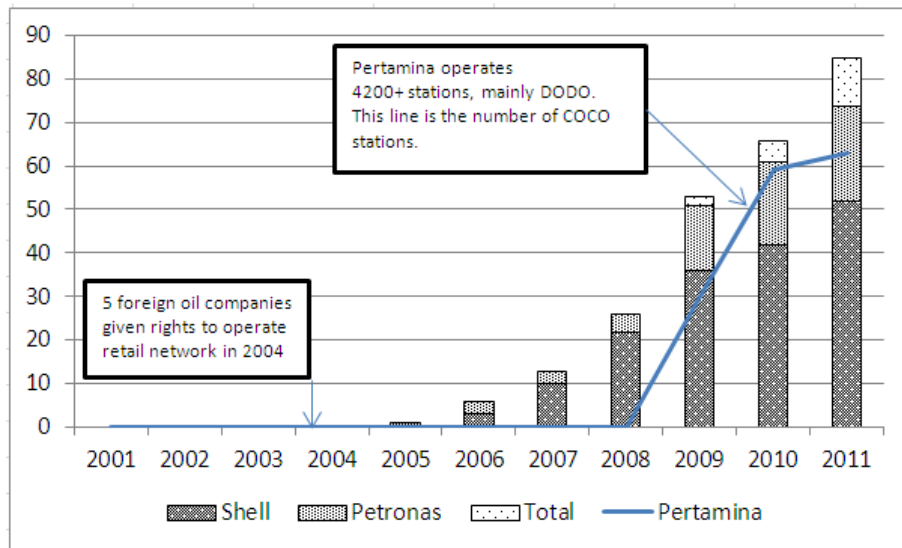
Figure 9 Pertamina's COCO network
Source: Assembled from information given by interviewees and archives

foreign oil companies operating their network under the company-owned company-operated model. This is an incorrect interpretation as the interviewees in the foreign oil companies in Indonesia confirmed that they were operating under the company-owned dealer-operated model. Fearing that this would erode its market share, Pertamina added company-owned stations to match the number of fuel retail stations by the three foreign oil companies and operated them directly (Figure 9). This was in anticipation that Pertamina would be restricted from selling subsidized fuels just like the foreign oil companies. Pertamina's vice president for retail fuel Basuki Trikora Putra said that "the company's COCO stations will be ready to implement the restriction because we have a new design to accommodate the new regulations" (The Jakarta Post, 2010).

In early 2013, Petronas sold its network to Pertamina. Pertamina's investment planning and risk management director Afdal Bahaudin said that "fuel stations formerly belonging to Petronas, acquired by Pertamina would become company-owned, company-operated stations" (The Jakarta Post, 2013). This showed that

Pertamina considered the company-owned company-operated model to be the more superior organization structure. The company-owned company-operated stations improved Pertamina's exposure to risks but would also raise customers' expectation. This would subject Pertamina to greater impact of adverse event. This is shown on the risk matrix as "I3" (Figure 8 and Table 7).

4.3 **Malaysia**

4.3.1 Background

Licenses to operate fuel retail stations in Malaysia were issued preferentially to local Malays or Bumiputera. Fuel retail stations were regulated by the Ministry of Domestic Trade, Cooperatives and Consumerism under the Petroleum Development Act. The Act required oil companies to seek approval from the ministry to develop new fuel retail stations. In addition, the station operators required a license to retail controlled items under the Control Supplies Act 1972 from the same ministry. Accordingly, oil companies can get approval for one licence each to operate a fuel retail station directly. The licenses for the rest of the

Oil Company	No. of Sites	COCO	CODO	DODO
Petronas	995	0	975	20
BHP	325	1	272	52
SMC / Petron (XOM)	558	0	417	141
Chevron	435	0	221	214
Shell	1039	1	817	221
Total Count	**3352**	**2**	**2702**	**648**

Table 8 Stations by type of operations in Malaysia
Source: Gilbarco Veeder-Root (Asia) – 2011 Survey

fuel retail stations in the network went to independent operators as it was the government's policy to grow local entrepreneurs and specifically to increase the business participation of local Malays (Lee, 2005). Therefore, most of the fuel retail stations were either the company-owned dealer-operated and dealer-owned dealer-operated models with the former being the dominant organization structure (Table 8).

Shell and the defunct Standard Oil expanded into fuel retailing sector to cater to the growth of vehicles when Malaysia became the global source for tin and rubber. From the first fuel retail station set up by Standard Oil in KL in 1921, the fuel retail network remained for many decades under the control of foreign oil companies like Esso, Mobil, BP, Shell and Caltex.

In 1974, the national oil company Petronas was founded and it subsequently grew to be a major oil player in the world (Von Der Mehden, 2007). In 1981, Petronas
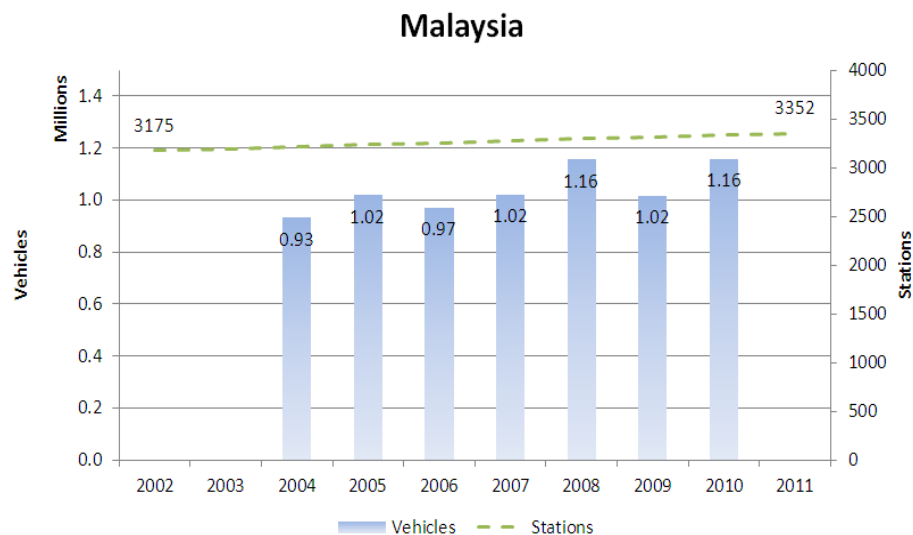
Figure 10 Malaysia vehicle and station population
Source: AJTP Information centre (vehicles); Gilbarco Veeder-Root (Asia) (stations)

Dagangan Sdn Bhd, a wholly owned subsidiary of Petronas, was formed to manage fuel retailing and it has steadily gained position in the fuel retailing sector reaching the number two position in network size (PETRONAS Dagangan Berhad, 2013).

In 1999, Esso and Mobil merged to form ExxonMobil. BP was sold to Boustead Holdings and the chain was reimaged and renamed to BHPetrol (Boustead Petroleum Marketing Sdn Bhd , 2013). In 2011, the network of ExxonMobil was acquired by Petron of Philippines (Petron Malaysia Refining and Marketing Bhd, 2013). Even with the change of oil companies, the country has managed to grow and spread fuel retail stations in line with vehicle growth (Figure 10). There was adequate fuel retail coverage throughout the country and there were no unlicensed fuel retail stations that were common in the other large SE Asian countries.

Although Malaysia has successfully exploited its own oil resources and elevated itself with its oil wealth, this wealth has to be shared with its citizens. Thus Malaysia became one of the countries in the world to subsidize fuels sold from fuel retail stations. Subsidies were given when the actual price of petrol and diesel were higher than the fixed retail pump price set by the government. This pump price included both the wholesale and retail margins. One of the reasons the Malaysian government had to control the issuance of licences for operating fuel retail stations was to stop oil companies being subsidized on both margins[7].

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[7] Wholesale's and dealer's margins were fixed at M$0.05 and M$0.1219 per litre for petrol respectively and M$0.0225 and M$0.07 for diesel respectively.

Fuel subsidies in Malaysia were administered reasonably well but the low pump prices have resulted in abuse and fraud. With the subsidy making these fuels one of the cheapest in the region, vehicles from Malaysia's northern and southern neighbours, Thailand and Singapore, were crossing the border to get its cheap fuels. Interviewees also reported that subsidized fuels were also being smuggled out of the country but said that this illegal activity was most likely carried out from the network of commercial stations selling subsidized fuels to the fishery sector.

With the low fuel prices, Malaysia has had difficulty introducing biofuels. Ethanol-blended gasoline was not possible as there was insignificant ethanol production in Malaysia. While biodiesel from palm oil could be introduced into Malaysia, it could not compete with the low subsidized diesel price. In addition, Malaysian biodiesel industry could hardly survive because of the high price and demand for palm oil internationally. Therefore, there was no network selling alternative fuels in Malaysia.

Based on the background information, I place the start positions of the oil companies at the centre of the risk matrix (Figure 11). The licencing restriction resulted in the enforced company-owned dealer-operated and the dealer-owned dealer-operated arrangements, which meant that risks are shared between the oil companies and the dealers. Other organization changes to manage risk are summarized in Table 9 and elaborated below.

4.3.2   Implemented self-service/ payment at pump (M1)

The robust growth of the Malaysian economy over the period 1990 to 1997 led to a tight labour market that attracted many foreign workers into the work force. A large fuel retail station operating round the clock on three shifts with the fully-attended model requires a team of more than twenty pump attendants and cashiers. These low-paying jobs were not attractive to the local Malaysians and were taken up by foreign workers, mainly from Bangladesh. This led to many concerns such as the over-dependence on these workers, social issues and illegal migrants. Although other sectors such as the construction industry were using more of these foreign workers, the government of Malaysia decided to limit the use of foreign workers in the fuel retailing sector.

In 1997, the government enforced the use of the self-service model for fuel retail stations in the area around the Malaysian capital to reduce the number of foreign

Figure 11 Risk matrix – Malaysia
Source: author
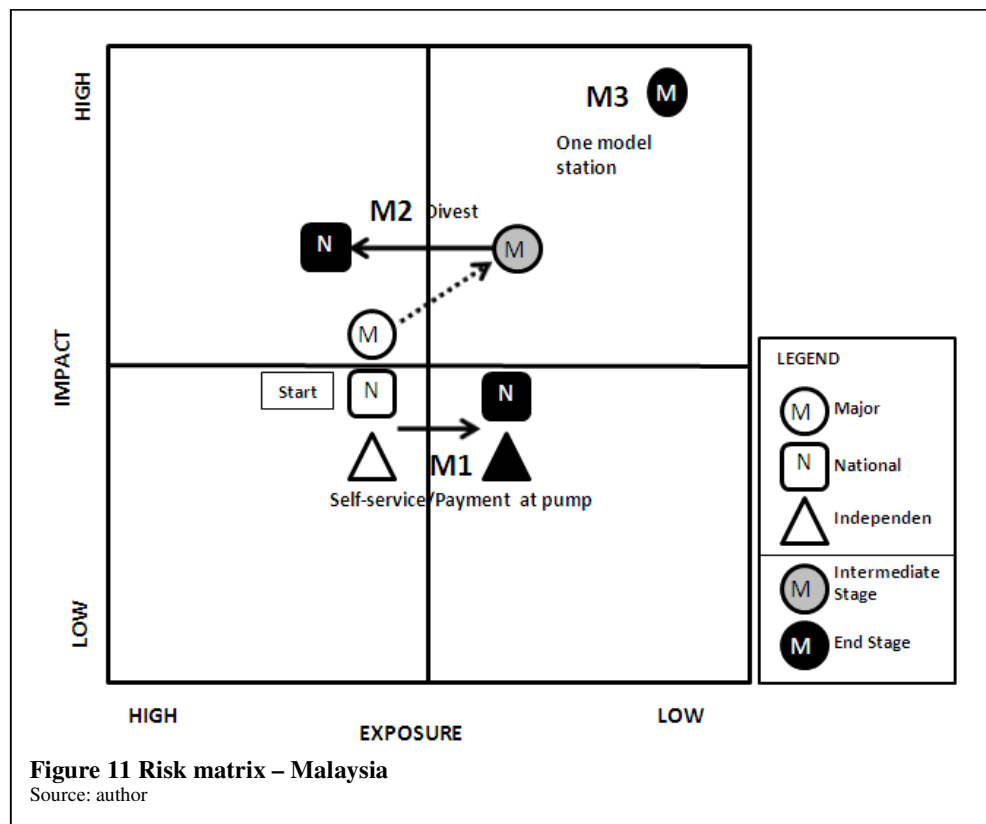
workers coming into Malaysia to work as pump attendants. Foreign workers were allowed to do cleaning work but the station operator would be fined if he was caught using the foreign workers for other work at the fuel retail stations. Following the success with the self-service model for fuel retail stations around the Malaysian capital of Kuala Lumpur, the self-service model was enforced nationwide. In addition, the minimum wage was raised to discourage the use of foreign workers even for other duties at the fuel retail stations.

It is possible to operate the self-service model by requiring the customer to pay at a counter first before walking back to fill up his car. However, the oil companies opted to automate the payment process instead. As a result, the use of credit cards and oil company's dedicated fuel cards directly at the pump became the standard method of payment at fuel retail stations. The use of credit cards was then based on personal information recorded on magnetic stripes became a target for fraud. By 2005, Malaysia has the highest incidence of credit card fraud and these crimes were traced to the fuel retail stations with the use of outdoor payment terminals (Bank Negara Malaysia, 2004). To combat such crimes, Malaysia became the first country in Asia Pacific to adopt the EMV standard for secured card payment in 2005. The EMV standards introduced by the credit card associations – Europay, MasterCard and Visa – use a computer chip on the credit card to prevent fraud. Following the successful introduction, the Malaysian government imposed the self-service model with the EMV-protected chip-based cards nationwide in 2008. This made card payment at the pump a necessity for secured and efficient forecourt operations.

With credit cards now protected by a microchip, fraud from counterfeiting cards was reduced by more than 80 percent. The successful implementation of self-service stations, made possible by sophisticated pay-at-the-pump systems, significantly reduces reliance on low-cost foreign labour and brings in new players skilled with fraud controls and bank processes, taking a part in the value chain. The implementation of the self-service model with payment at the pump is shown in the risk matrix as "M1" (Figure 11 and Table 9).

4.3.3 Sale of ExxonMobil network to Petron (M2)

In 2012, Petron of Philippines acquired Esso Malaysia Berhad and two subsidiaries and became a new fuel retailer in the Malaysian downstream sector. The details of the handover were provided by the employees who were transferred from Esso to Petron. They described the changes made to organization structure before and after the transfer. This is marked on the risk matrix as "M2" (Figure 11).

Prior to selling the network, ExxonMobil introduced a new dealer agreement to overcome the restriction on operating licences described in the background. The dealers that can get licences were the financially stronger but usually older entrepreneurs. These older businessmen were reluctant to follow ExxonMobil's strict operating standards. ExxonMobil introduced a new dealership agreement that provided financial assistance to younger entrepreneurs and in return, ExxonMobil was allowed to exert greater control over the operations. These new dealers paid a multi-tiered licence fee based on per-litre sales of fuel for the use of the fuel retail station. This licence fee that was designed such that these young

dealers earned an amount that was the same as that of a typical company-operated station manager. Unlike an entrepreneur, a station manager under this five-year agreement has a much reduced role as many of the traditional duties at the fuel retail station were arranged and managed centrally by ExxonMobil. These duties, such as ordering for fuels, setting prices and promotions for convenience items and monitoring underground tanks for leaks, were done centrally by experts in Singapore, Thailand and Hong Kong. There were about 100 fuel retail stations placed on this new dealership scheme. This modification to the organization structure is shown as dotted line on the risk matrix marked as "M2" (Figure 11 and Table 9).

When Petron took over the local entity of ExxonMobil, services that had been centralized were not part of the sale of the network. These services had to be re-established by Petron. ExxonMobil has an automated stock replenishment and inventory controlled by its centre in Bangkok and these fuels with the special

Arrangement by oil companies	Reason	Risk mitigation	Source
Implemented self-service with pay at the pump	Required under Malaysian law set up to reduce reliance on foreign workers used at fuel retail station	M1	Interviewees – ExxonMobil, BHPetrol
Implemented the more secured chip-based credit card payment system on pump	Reduced the risks from credit card fraud	M1	Interviewees – Petronas, BHPetrol, ExxonMobil
Sale of ExxonMobil network to Petron	Divestment is part of ExxonMobil's global strategy to shed downstream activities	M2	Interviewees – ExxonMobil, Petron. Published reports on the acquisition
Company direct operation for one site to serve as training centre	To serve as the model for rest of network. Test new processes without increasing risks.	M3	Interviewees – ExxonMobil, BHPetrol

Table 9 Risk management – Malaysia
Source: Author based on interviews

additives were supplied from ExxonMobil's refineries in Singapore. Since Petron could not get its own brand of fuels ready for the market, it had to supply ExxonMobil's Synergy fuels for at least a year after taking over. During this period that Petron was supplying Synergy fuels, it had to maintain ExxonMobil's brand at the fuel retail stations. However, these fuels have to be transported in plain tankers so as to protect ExxonMobil's name and reputation in case of road accidents.

ExxonMobil has a card processing centre consisting of a high-end computer system that provides the payment gateway and the transaction switch for automating the credit and fleet card payment at the pumps. This central service served the ExxonMobil affiliates in Singapore, Malaysia, Thailand and Hong Kong. Although this card processing centre was located in Malaysia, this centre was not sold to Petron as it was not part of the local entity. ExxonMobil has since sold this centre to a payment system provider, Logical, and leased back the payment processing services for its other networks in the region. Since Petron could not issue its own proprietary fleet card, it was forced to continue with ExxonMobil's fleetcard programme and to use the service from Logical. Since ExxonMobil Malaysia was the largest network among the other affiliates in SE Asia, Petron has to pay proportionally a larger fee for the service. The purchase of ExxonMobil's network put Petron with greater risk exposure and high risk impact and is shown on the risk matrix under "M2" (Figure 11 and Table 9).

4.3.4   Maintained model fuel retail station (M3)

In 2000, managers in BHPetrol, Shell, ExxonMobil and Chevron claimed to operate one company-owned company-operated station for each of their networks. This was because each oil company under the Malaysian licencing regulation was given one operating licence. But why should they want to maintain a single fuel retail station under a model that would need a separate set of procedures, a dedicated team to monitor and audit station's staff on performance and inventory control and arrangements with third-party contractors for the upkeep and maintenance of company's infrastructure? According to two of the managers, they kept one fuel retail station with this organization structure so that they can use this model to set the operating standards for the rest of the stations to follow. They trained dealers on new procedures and trialled new concepts at this fuel retail station before deploying them throughout the network. This reduced the risks of introducing new concepts. ExxonMobil gave up the company-owned company-operated station when they sold the network to Petron. Chevron gave up operating one fuel retail station directly when they introduced the branded marketer concept. Petronas as a national oil company chose to operate the network either as company-owned dealer-operated or dealer-owned dealer-operated stations. The use of a model fuel retail station to set the operating standards is shown on the risk matrix as "M3" (Figure 11 and Table 9).

4.4 **Thailand**

4.4.1 Background

Thailand, unlike the Philippines and Indonesia, is not made up of many islands. Thus, one would expect that it should be easier to deploy a network of fuel retail
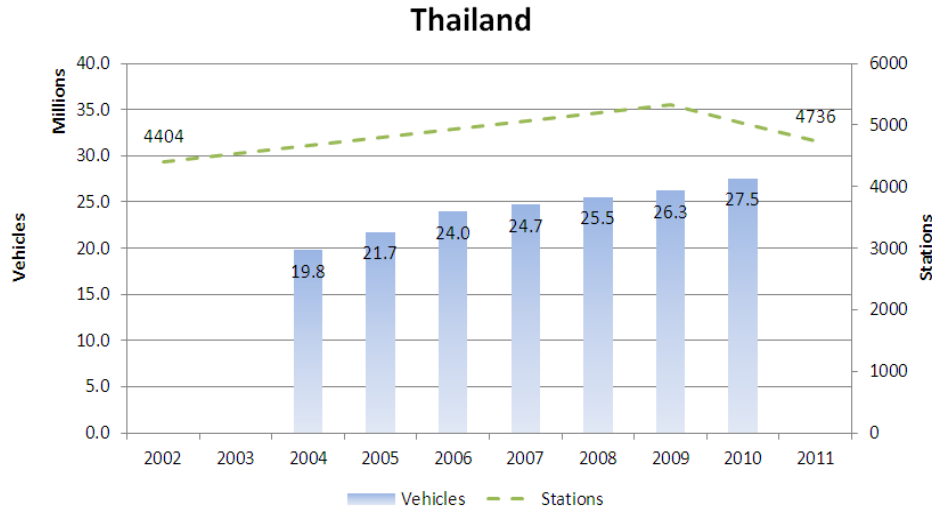
Figure 12 Thailand vehicle and station population
Source: AJTP Information centre (vehicles); Gilbarco Veeder-Root (Asia) (stations)

stations across the country. However, the country was not adequately covered with fuel retail stations. More than 10 percent of the districts in the early 1990s were without any fuel retail stations. The fuel retailing sector was for many years controlled by four oil companies, namely PTT, Shell, Esso and Caltex. No oil trading licences were issued by the government for many years to allow new entrants into the fuel retailing sector. The application for the government permits to build new fuel retail stations was time-consuming and costly because only large-sized fuel retail stations were approved for development.

Following deregulation of the fuel retailing sector in 1991, the Ministry of Energy of Thailand registered the number of fuel retail stations growing nearly six fold from 3,475 in 1991 to 20,252 in 2011. However, the majority of these fuel retail stations could not be found or identified as proper fuel retail stations. A veteran of the oil industry commented that these missing fuel retail stations may not have been built or were abandoned and that the owners may have failed to deregister these defunct stations. The number of fuel retail stations was artificially inflated

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further when those abandoned stations were revived and registered by new owners. The actual count of fuel retail stations given by oil companies totalled less than 5,000[8] (Table 10), which was inadequate to serve the large and growing number of vehicles that has grown to 27.5 million in 2010 (Figure 12).

The fuel retail stations in Thailand do not have standardized designs even for the same oil company. Some fuel retail stations in Bangkok have large toilet facilities to cater for busloads of tourists. There are also fuel retail stations surrounded by small shops set up as part of the station. As one travels further away from the city, there are fewer and smaller fuel retail stations. To supplement the shortfall of fuel retail stations in the outskirts, fuels are retailed out of oil drums. With all these variations in size, type and design of fuel retail stations around the country, there are also no consistent organization structures used for fuel retailing. All the oil companies used a mixture of company direct operation and dealer operations with company- or dealer-owned sites in varying proportions (Table 10).

Bangkok, the capital of Thailand, experienced serious air pollution problems over several decades and transport was identified as the greatest source of air pollutants. This is because motor vehicles registered in Bangkok soared from 600,000 in 1980 to 4,163,000 at the end of 1999. To improve air quality, leaded fuel was phased out in 1996. In 2001, Stage 1 vapour recovery was implemented at fuel retail stations in four main cities. Stage 1 vapour recovery prevents petroleum

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[8] Department of Energy Business of Thailand listed additional 14,019 stations under "others" in 2010 but these could not be located and may not all be real.

vapour from being released into the atmosphere when the tanker truck is discharging fuel into the underground tank.

In 2007, Stage 2 vapour recovery was implemented in Bangkok and Stage 1 was extended to additional ten other provinces. Stage 2 vapour recovery reduces the petroleum vapour escaping from the nozzle when a car is being filled. The implementation of vapour recovery, especially Stage 2 vapour recovery, brought in new players specializing in this field. Besides providing the equipment, these new players have the knowledge to adjust the vapour pump to ensure the recovery of at least 95 percent of the petroleum vapour.

Among the countries in SE Asia, Thailand is the most aggressive in promoting the use of biofuels. Thailand has to import most of the fossil fuels for its domestic consumption. While it lacked this precious commodity, it has abundant

Oil Company	Total No. of Sites	COCO	CODO	DODO
PTT	1200	70	900	230
Bangchak	1100	215	685	200
Paktai	460	300	160	0
SUSCO	144	50	94	0
Petronas	106	0	50	56
Chevron	424	0	100	324
Esso / ExxonMobil	529	200	329	0
Shell	548	0	348	200
Rayong pure	78	78	0	0
PTTRM	147	147	0	0
Total Count	**4736**	**1060**	**2666**	**1010**

Table 10 Stations by type of operations in Thailand
Source: Gilbarco Veeder-Root (Asia) - 2011 Survey

agricultural resources which have been used to make biofuel. The Thai government's policy on the use of biofuels was enacted in 2005 and to promote the increased blend of biofuels in gasoline and diesel, the Ministry of Energy reduced excise tax and lowered the pump prices for blended fuels.

The two main biofuel blends deployed in Thailand from 2005 are E10, which is gasoline with 10 percent of ethanol, and B5, which is diesel with 5 percent of bio-diesel. By 2007, these two blends were sold at most fuel retail stations through the existing fuel dispensing equipment at the station. In 2012, oil companies were forced to upgrade the fuel dispensing equipment when the country introduced E20. Higher blend of ethanol such as E20 has the problem of phase 2 separation that causes the water absorbed by the ethanol blended gasoline to separate from the gasoline. This increases the risks of selling E20 at the fuel retail stations as the precipitated water may get into customer's vehicle and damage the engine.

Another alternative fuel, Auto-LPG, was successful as a result of government subsidy. Taxis and trucks were converted to use Auto-LPG and the number of fuel retail stations providing Auto-LPG rose to 988 stations in 2011. This was still not adequate to serve the growing number of Auto-LPG vehicles and stations dedicated to selling only Auto-LPG were set up. To sell Auto-LPG in existing fuel retail stations, the specialized Auto-LPG dispensing equipment has to be in its own forecourt separated from the existing forecourt. This increases operating costs as another group of pump attendants has to be deployed for the Auto-LPG forecourt.

Based on the background information, I place the start positions of the oil companies at the top right quadrant of the risk matrix (Figure 13). There are more company-owned dealer-operated stations and although there is a lower risk exposure with this type of organization structure, the impact of adverse events is high. The other organization changes to manage risk are elaborated in the next few paragraphs and are summarised in Table 11.

4.4.2 Site staff organization (T1)

Thailand has full attended service at fuel retail stations. This means that the forecourt has a team of pump attendants that fills up the customer car and brings the cash paid by the customer to a payment booth manned by a cashier. It was cheap to hire pump attendants and cashiers at the minimum wage to provide full attended service as a way to compete in the sector. In larger fuel retail stations, there is a payment booth at every pump island, each with a dedicated team of cashier and pump attendants. Another team of pump attendants and cashiers is needed for Auto-LPG that is sold within a fuel retail station as the Auto-LPG dispensers have to be installed in a separate forecourt.

To recruit, train and administer the large pool of pump attendants and cashiers, PTT, the national oil company, set up a subsidiary company specifically to supply manpower for the fuel retail network. This subsidiary company becomes another player in the fuel retail sector. The arrangement makes it easier for PTT to control manpower expenses and reduces its exposure to the rising minimum wage. The minimum wage had been raised several times making the full attended service model increasingly expensive to maintain. Major oil company Esso Thailand took

a different approach by setting up a fully owned subsidiary, Thai C-Centre, to manage the company-owned company-operated stations. This arrangement separates the retail operations from the rest of the downstream business and reduces the impact of any adverse events at the fuel retail stations affecting the rest of the company. These two approaches are marked as "T1" on the risk matrix (Figure 13 and Table 11).

4.4.3   Introduced half-self service (T2)

Thailand's full service model at fuel retail stations was sustainable because of the low wage paid to pump attendants. This operating model with a large team of manual workers has become difficult to maintain with rising wage costs. The number of pump attendants can be reduced or the role eliminated by introducing self-service with the customer filling his own car and making payment directly to the cashier. Even with a full size convenience store and an indoor cashier to collect payment, there is always a payment booth with a cashier in the forecourt.

In 2009, a steep hike to the minimum wage forced fuel retailers to consider self-service as an option and by early 2010, a hybrid process known as half self-service was implemented by PTT. With this half self-service scheme, the customer pays at a kiosk while a pump attendant helps to fill the car. This interim solution was fairly successful and PTT planned to move to self-service model similar to those in Malaysia. However, the poor telecommunication infrastructure and the banks' online payment systems could not support its implementation. Implementing half self-service reduces both the exposure from risks and impact of

adverse risk events. This is marked as "T2" on the risk matrix (Figure 13 and Table 11).

4.4.4 Kept organization structure of acquired networks (T3)

A number of foreign oil companies that started fuel retail network in Thailand did not succeed. The high number of registered fuel retail stations that could not be found also indicates that there were many private or independent oil companies that did not succeed in setting up fuel retail network. Two foreign oil companies, Kuwait Oil and Conoco, started their network of fuel retail stations in 1990 and 1991 respectively. Kuwait Oil built 100 fuel retail stations branded under "Q8" and operated them directly. Conoco built 147 fuel retail stations branded as "JET" and was known to have captured significant market share using the company-

Figure 13 Risk matrix – Thailand
Source: author
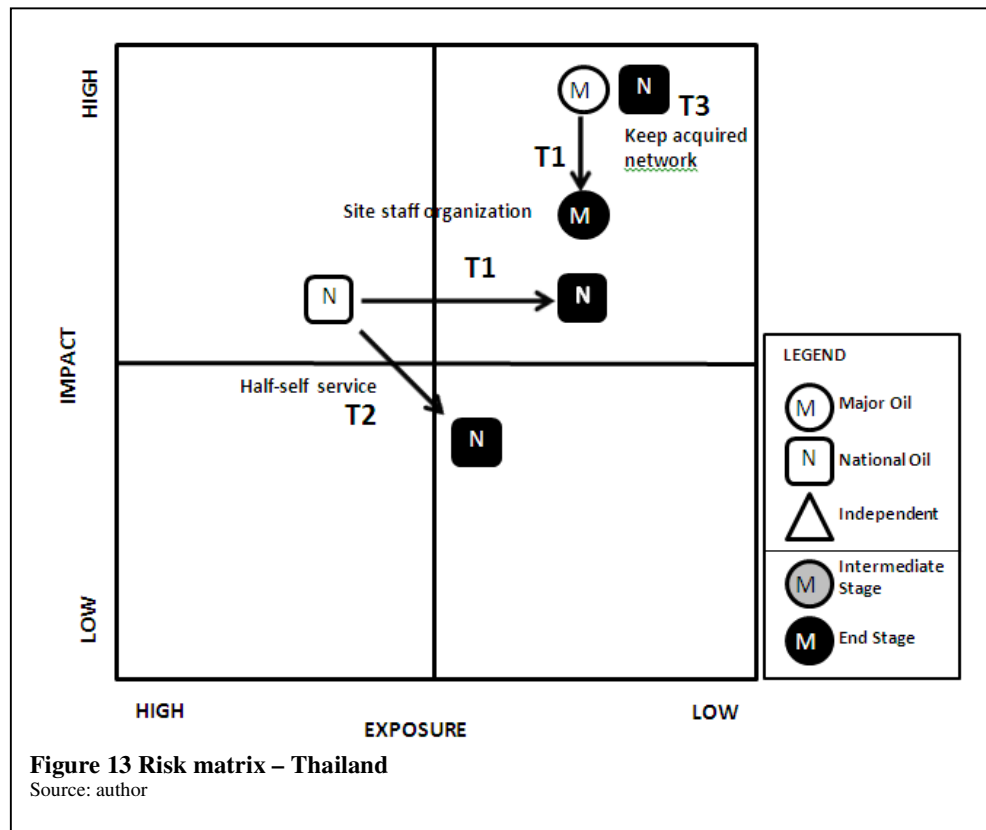
Arrangement by oil companies	Reason	Risk management	Source
Segregated site staff	Reduced risk from hiring and managing large pool of pump attendants and cashiers	T1	Interviewees – ExxonMobil, PTT
Introduced half self-service	Reduced risk from rising wage costs for low cost workers and failure from full self-service implementation	T2	Interviewees – PTT
Kept organization structure of acquired	Reduced risk by keeping COCO operations	T3	Interviewees – PTT-RM, archived data

Table 11 Risk Management – Thailand
Source : Author

owned, company-operated model to maintain a high standard of product quality and service standards.

In 2007, PTT acquired the 147 fuel retail stations operating the JET and Jiffy brands from Conoco. According to the press release on the purchase of these fuel retail stations, PTT stated that the two brands have a good reputation for cleanliness and high quality service. PTT was impressed with the company-owned company-operated model and set up a separate organization, PTT-RM, to keep the organizational structure intact for the acquired network (PTT, 2007). With the company-owned company-operated model, PTT lowers its exposure of risks but it will be subjected to the full impact of adverse events. I have placed this as "T3" on the risk matrix (Figure 13 and Table 11).

4.5 Philippines

4.5.1 Background

The fuel retailing sector of the Philippines was dominated for many years by three oil companies, Chevron, Shell and Petron. These oil companies implemented a combination of company-owned company-operated, company-owned dealer-operated and dealer-owned dealer-operated stations (Table 12). The fuel retail networks were developed by Shell, Caltex and Stanvac as retail outlets for the refined products of the refineries that they had set up in the Philippines. Many of the fuel retail stations were deployed in the main cities and the fuels were supplied from their oil depots at Pandacan, a district adjacent to the Manila city centre.

In 1960, Stanvac, the joint venture between Jersey Standard and Socony-Vacuum broke up and the network of fuel retail stations was divided between Esso and Mobil. In 1973, Esso's fuel retail stations were sold to Petron, a newly organized national oil company while Mobil's fuel retail stations were acquired at a later date by Caltex. Since then, ExxonMobil did not participate in the Philippines' fuel retailing sector. Following Chevron and Texaco merger, the company was renamed ChevronTexaco and subsequently to Chevron while the name Caltex was retained as one of the company's brand. In 2003, Caltex converted its refinery at Batangas, built as the first refinery in Philippines in 1954, into a depot and became a purely marketing and distributing company.

By 2011, the three oil companies, Filipinas Shell Petroleum, Petron and Chevron Philippines owned about one third of the fuel retail stations and they operated a third of these company-owned stations directly. The rest of about sixty percent of the fuel retail stations was organized under the dealer-owned dealer-operated

model. In total, the three oil companies have more than three quarters of the fuel retail stations under their brands.

Following the Oil Deregulation Law passed in Jan 1998, many new fuel retailers came in with different ways to organize the fuel retail stations. These were the independent fuel retailers who formed an association called the New Petroleum Players Association of the Philippines (NPPA) which has since been re-formed as the Independent Philippine Petroleum Companies Association (IPPCA). Many of these new fuel retailers such as Phoenix Petroleum, Flying V, UniOil and SeaOil were originally in niche areas of the oil and gas industry such as in the storage, distribution and transportation of fuels and lubricants.

The country did not impose proper design and operating standards for these new players or were lax in the way they enforced these standards. While Shell, Petron and Chevron implemented the global standards or their higher internal standards,
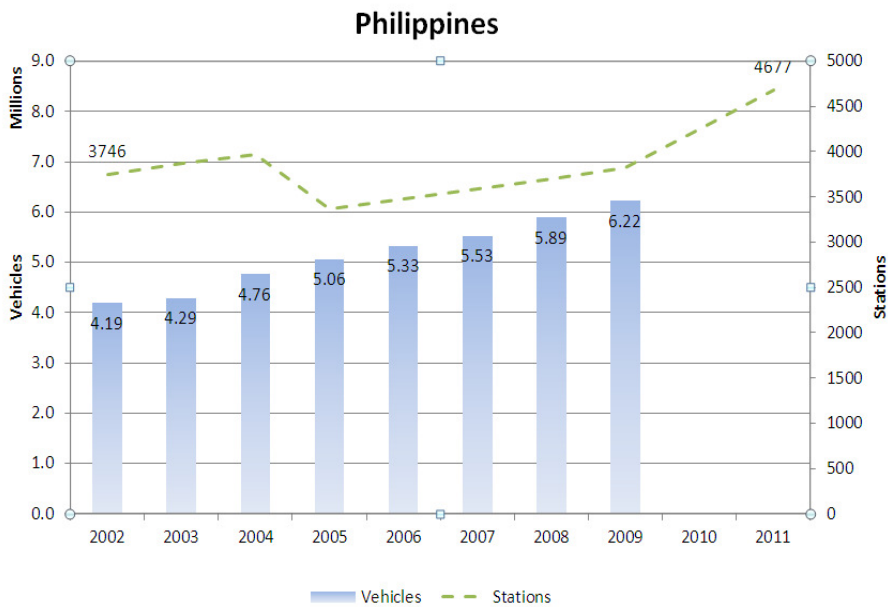
Figure 14 Philippines vehicle and station population
Source: AJTP Information centre (vehicles); Gilbarco Veeder-Root (Asia) (stations)

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Oil Company	No. of Sites	COCO	CODO	DODO
Petron	1900	250	600	1050
SeaOil	210	15	95	100
Flying-V	235	150	50	35
Phoenix Petroleum	220	10	50	160
Eastern Petroleum	25	20	0	5
Uni-Oil	50	0	0	50
PTT	52	2	50	0
TOTAL	175	25	75	75
Chevron	850	100	100	650
Shell	960	150	210	600
Total Count	**4677**	**722**	**1230**	**2725**

Table 12 Stations by type of operations in Philippines
Source: Gilbarco Veeder-Root (Asia) - 2011 Survey

there was no pressure for these new independent fuel retailers to do so. This has resulted in many poorly designed fuel retail stations, sub-standard equipment and bad operating practices in fuel retailing. In 2004, the government restricted the use of overhead tanks and regulated the size of the fuel retail stations. As a result, 349 fuel retail stations were closed (Figure 14). The deregulation of the fuel sector in Philippines brought in more competitors but this has not resulted in a more developed sector.

Deregulation of the oil sector has also resulted in higher pump prices at the fuel retail stations but this increase in price could not offset operating costs resulting from rising oil prices. The erosion in margin encouraged those with fewer scruples to look for illegal ways to make more money. Fuels were smuggled from Malaysia and Indonesia which was easily done because of poor import controls and corruption. There was also adulteration of fuels by mixing low grade fuels into the more popular fuels. The proliferation of these types of fraud was blamed on the

tax structure that created abnormal price differentials among the different fuels. This mismanagement of the fuel retailing sector has been cited as the reason for reduced investment in the sector by the major oil companies.

The many islands of the Philippines made it challenging to develop an efficient fuel retail network of appropriately sized fuel retail stations that could span the entire country. The transportation of petroleum products to the fuel retail stations has to be done with a fleet of inter-island tankers, barges, tank trucks and a pipeline between Batangas and Manila. With the majority of fuel retail stations controlled by the dealers and with the high percentage of dealer-owned dealer-operated stations (Table 12), these dealers were not keen to develop properly designed fuel retail stations and deploy them at rural areas. The fuel retail stations at many locations has only a single fuel dispensing equipment offering gasoline on one nozzle and diesel on the other. The infrastructure needed to deliver fuels to these stations was also sorely lacking. As such, many of these fuel retail stations were difficult to support.

The oil companies operating in the Philippines also faced a number of high-profile risk incidents. In 2010, a pipeline that brought fuels from Batangas and Limay to Pandacan leaked and its use was suspended for almost a year. This created a distribution nightmare for the three oil companies using the pipeline. Shell, who was part owner of the company that owned and operated the pipeline, was fined for the leak. The community around Pandacan, where the depots for the three oil companies were located, has grown and they have called for the relocation of the

oil depots. In response, the government passed a law to force the relocation of these depots.

Based on the background information, I place the start position of the oil companies at the bottom left of the risk matrix (Figure 15). The poor state of the fuel retail sector and being dominated by dealers including more dealer-owned stations raises the risk exposure. The many islands of Philippines that make monitoring difficult also reduce the impact of adverse events.

4.5.2   Monitor remote stations using automation (P1)

The poor infrastructure of the Philippines makes it difficult for oil companies to manage their networks of fuel retail stations across the many islands of the country. Oil companies were unable to monitor the site operators from committing fraud that include adjusting the dispensing meters to under-deliver and adulterating fuels with lower-cost substitutes. Site operators will also not report operational faults or follow proper procedures at the fuel retail stations. These fraudulent activities and faults degrade the oil company's brand and reputation. The traditional approach is for the oil company to deploy large teams with regional offices to monitor the fuel retail stations but this is not always cost-effective.

The two major oil companies, Shell and Chevron, minimize fraud and faults by monitoring the fuel retail stations using sophisticated automation solutions with the support of regional offices around the country. However, they are only willing to implement this for their company-owned company-operated stations.

Nevertheless, they believe that using this operating model will subject the oil company to direct impact from risk events and that using the other organization models would shield them from the full impact of a risk event. So while they installed sophisticated automation solution for the company-owned company-operated stations, they chose to put more of the fuel retail stations under the dealer-owned dealer-operated model to manage the risks.

The independent oil companies, Petron, SeaOil and Flying V took a different approach to monitoring and controlling their dealer-operated stations. Instead of paying for full retail automation, they provided only a key component, the forecourt controller. The forecourt controller is a part of the automation hardware that is connected to the fuel dispensing pumps in the forecourt to monitor and collect all the information on every transaction. The independent oil companies provided the forecourt controller to all their company-owned dealer-operated stations and paid part of the cost of the forecourt controller for the dealer-owned dealer-operated stations. The forecourt controller can be linked to transmit the transaction records of the fuel retail stations to a central system. The oil companies are therefore able to check from a central location whether their dealers are adulterating fuels or buying fuels from other oil companies. One oil company even made the forecourt controller tamper-proofed so that the unit can continue to collect data offline when the network services fail. With the forecourt controller in place, the dealer can pay for other components to get the full retail automation. Using this approach, the independent oil companies have a low-cost way of monitoring of their fuel retail stations across the country from a central location.

This central monitoring lowers their exposure to risk for managing a network of fuel retail stations deployed in the many islands of Philippines.

In using the low-cost scheme to monitor its dealers remotely, I have marked this organization change as "P1' on the risk matrix. This recognizes that the risk exposure of the independent oil company will be reduced through remote monitoring (Figure 15 and Table 13).

4.5.3 Branded Marketer (P2)

Interviewees pointed to the branded marketer scheme as a way for an oil company to share risk with a partner. This scheme was introduced into SE Asia by Chevron. Chevron divided each country into areas. For each area, they choose a partner to own and operate fuel retail stations under the Chevron's brand. These partners are usually those that have been in other niche areas of the oil and gas business. For example, Perry's Fuel Distribution is given the Eastern Laguna territory and Northern Star Energy and Fuel Distribution is made the branded marketer for North Luzon.

Chevron's manager in charge of the regional property and facilities optimization explained the branded marketer concept and compared this with the current use of dealer-owned dealer-operated station. In contrast, a branded marketer will look after 50 to 100 fuel retail stations within a specified region. He claimed that a branded marketer can set up and operate fuel retail stations at lower cost by being dedicated to a segment of the market better than the major oil companies. In addition, the branded marketer will carry all the burden of risk but this is only

Arrangement by oil companies	Reason	Risk management	Source
Remote monitoring dealer-operated stations with automation	Reduced frauds such as adulteration by dealers	P1	Interviewees – Seaoil
Implementation of "Branded Marketer"	Reduced risk from owning fuel retail station's physical asset	P2	Interviewees – Chevron's managers
Set up micro-filling fuel retail stations	Reduced capital expenditure and support of fuel retail stations	P3	Interviewee – Petron. Direct observation and discussion with site operator

Table 13 Risk management – Philippines
Source: Author based on interviews

implementable in countries that do not apply strict liability. With strict liability, Chevron is still liable for damage and loss from incidents at the fuel retail station even when they do not own or operate the station.

Besides setting up new fuel retail stations to expand the network, Chevron encourages these branded marketers to take over the existing dealer-owned dealer-operated stations in their territory. These operating partners are chosen to be financially strong to own the fuel retail stations and reasonably large to absorb the risks of operating such a network. This concept vas implemented in Philippines because the country does not hold the oil company legally responsible for all the adverse events or violations at the fuel retail stations operated by a branded marketer. This branded marketer scheme is marked as "P2" on the risk matrix (Figure 15 and Table 13).

4.5.4   Micro-filling stations (P3)

Micro-filling stations (MFS) is a new fuel retailing concept started by two oil companies, Petron and Flying V. Petron started building Bulilit stations after the oil company was acquired by San Miguel. The other MFS called the Bumble V

stations were built by Flying V, an independent fuel retailer. During a trip to the outskirts of Manila, I interviewed the station manager of a Bulilit station to understand this localization concept. He told me that the owner, a relative living nearby, invested 2.5 million Pesos with Petron to have the land developed into a MFS. Each MFS is about 400 square metres and have two dispensing pumps that can each serve two vehicles simultaneously. The typical set up will have only one dispensing pump (Figure 16).

The manager said that the use of MFS is to take advantage of the community trust in small neighbourhood and to extend the "sari-sari" concept which is the dominant form of neighbourhood retailing in Philippines. Pointing to his wife serving customers and collecting cash, he confirmed that he hires only relatives as employees. The work activities are divided among family members who will work

Figure 15 Risk matrix – Philippines
Source: author
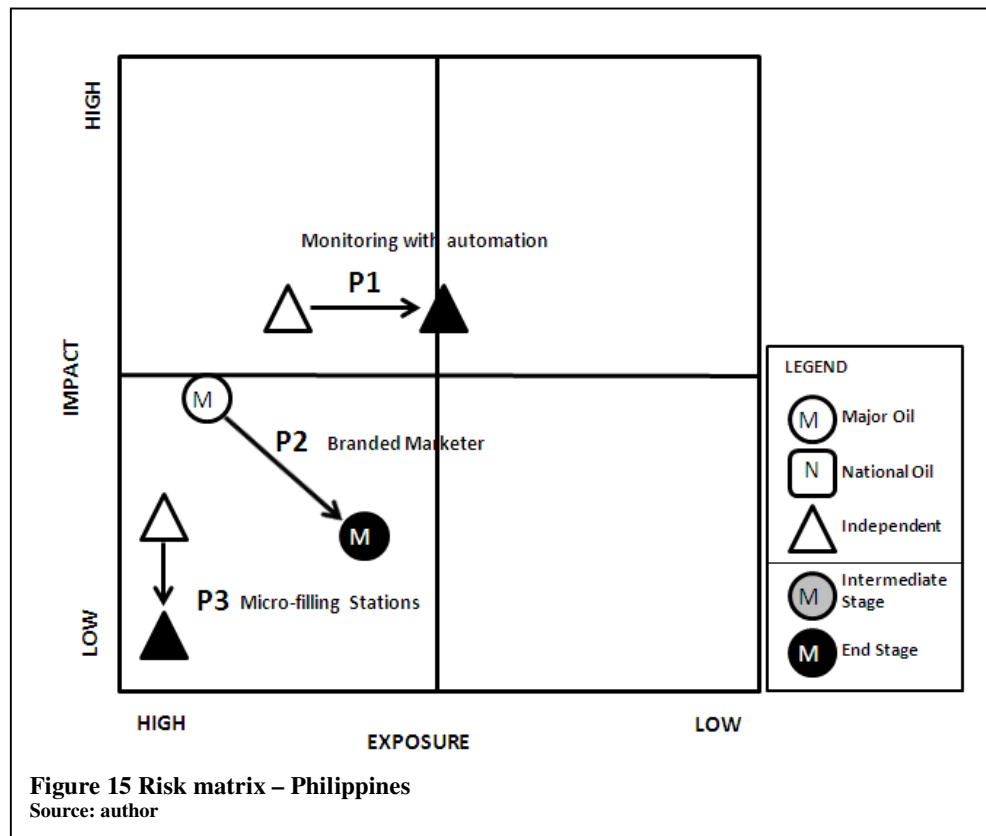
long hours with little or no salary (Matejowsky, 2007). The MFS thus relies on trust between players rather than the proper procedures, processes and contracts. This has the weakness in that the arrangement will fail when trust is lost. Thus MFS cannot be organized using unrelated employees.

Figure 16 MFS and standard fuel retail station
Source: Author

I have placed these dealer-owned dealer-operated micro-filling stations set up by independent oil company as having high risk exposure from using a family-run organization. However, the impact of adverse events would be resolved quietly among the family members and would dampen any impact propagating up the network. I have placed the use of MFS as "P3" on the risk matrix (Figure 15 and Table 13).

5 CROSS-CASE ANALYSIS

Although the regulatory, technological, infrastructure and social constraints identified in the previous chapter explain to some extent why oil companies adopt certain organization structures, these constraints do not adequately explain the diversity of organization structures in the region. As such, this chapter analyses the fuel retailing sector by categories so as to search for patterns that may explain the multiple levels of industry architecture used in SE Asia's fuel retailing sector. The reason for analysing the cases along some specific dimensions or categories is to prevent the researcher from jumping to premature or wrong conclusions (Eisenhardt, 1989). Two dimensions are used in the cross-case analysis of the fuel retailing sector. The first dimension is the type of oil companies, namely major oil company, national oil company and independent oil company. The second dimension is the type of organization structure implemented by the oil companies to manage their network of fuel retail stations.

The first dimension, the type of oil company, has not been used in the literature to analyse the organization structure of the fuel retail sector. There is no national oil company in the USA and as highlighted in the literature review, the researcher analysing the fuel retailing sector in Canada also chose not to include PetroCanada that was originally a national oil company (Slade, 1998). The analysis in the literature is often restricted to the distinction between integrated refiners and non-refiners operating fuel retail stations. In addition, integrated refiners use many different distribution channels including passing the distribution rights to "jobbers". Jobbers are independent players who own fuel retail stations and

operate these stations directly or indirectly using franchisees (Kliet, 2005). The variety of distribution methods makes it difficult to group fuel retail network along this dimension in the US and Canada. However, it is possible to analyse fuel retail networks in SE Asia owned by major, national and independent oil companies.

The second dimension, the type of organization structure, has been analysed in the academic literature and has been based on the interaction between two players, the oil company and the dealer. However, these organization structures are not defined or referenced consistently. The detailed arrangements of these different organization structures were also not fully described in the academic literature. In contrast, there are three common organization structures mentioned by the interviewees in SE Asia. These are the company-owned company-operated stations, company-owned dealer-operated stations and dealer-owned dealer-operated stations. Since many of the organizational changes impacted the roles and players at the level within the organization structure, I have decomposed the organization structure into its components and created a tree diagram to portray how these components can be reconstituted into the different organization structures.

In addition to examining the organization structure along these two dimensions, the cross-case analysis scrutinizes the roles in the fuel retail sector and how these roles were split, consolidated and eliminated as a result of organizational changes.

5.1 Types of oil companies

There are three types of companies in SE Asia, classified as major oil companies, national oil companies and independent oil companies. The first two types of oil companies are usually referred in the trade literature by the acronyms MOC and NOC respectively. The classification of the oil companies chosen for this research is given in Table 14. The websites of these oil companies that were the sources for archive information are listed at the beginning of this document.

5.1.1 Major Oil Company (MOC)

Major oil companies or MOCs are publicly owned oil-and-gas groups that operate in most countries in the world. They are also called Oil Majors and International Oil Companies (IOC). They participate in every part of the value chain including the fuel retailing sector which was initially organized with almost every role handled internally. The MOCs that operated the fuel retail network in SE Asia were BP, Chevron, ExxonMobil, Shell, Total and ConocoPhillips. These MOCs were consolidated from numerous oil companies spawned from the seven pioneer oil companies known as the "Seven Sisters" (Sampson, 1975; Wilkins, 1975). The "Seven Sisters" are the Anglo-Persian Oil Company, Gulf Oil, Socal, Texaco, Royal Dutch Shell, Esso and Mobil. These major oil companies are known by the brands and the logos that they have promoted over the years. Most drivers in SE Asia would easily recognize the trademarks of the fuel retail stations belonging to BP, Caltex, Esso, Mobil, Shell and ProJet.

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Major Oil Companies	Shell, ExxonMobil, Chevron, Total
National oil companies	Pertamina, Petronas, PTT, Bangchak, PTT-RM
Independent oil companies	SPC, BHPetrol, Paktai, Petron, SeaOil, Flying V

Table 14 Classification of oil companies
Source: author

A key strength of major oil companies is that they know exactly how to run their businesses. Through the use of standardized operating procedures, best practices and brand image, they can operate networks of different sizes across multiple countries. As you approach any fuel retail station under their direct care, there will be the signage on the canopy and on a tall frame with their unmistakable brands such as a yellow scallop shell, a red Pegasus or a blooming sunflower. At the entrance into the fuel retail station, one can intuitively get to any pump without the help of station staff by following the directional signs. The pumps are laid out in either in a square grid or in rows similar to starting gate of a horse-racing track that had been refined over the years to optimise traffic flow. The pumps, placed on 100mm high platform called pump islands, are bought from specialist pump suppliers and dressed up to the nines to promote the fuel products and the oil company. If the fuel retail stations have attendants to help with filling up the car, the oil companies even specify the phrases, such as "Full tank, sir?" or "V-power, madam?" for the pump attendants to use to greet each driver.

The standardized station design and operating procedures based on best practices allow major oil companies to scale easily from a small network of less than a hundred fuel retail stations in one country to a network with few hundreds fuel retail stations in another country. These MOCs are also expert in organizing the

fuel retailing sector and they adjust the organizational structures to match the constraints of each host country. Standard Oil Trust, the predecessor of at least three of the current major oil companies, claimed that "(n)ational customs, mores, regulations, legislation, and administration caused the establishment of a remarkably varied pattern in Standard Oil operations abroad and the variety persists in a large measure even today" (Hidy, 1952, p. 423).

However, operating a large retail network and spanning many countries multiplies the exposure to risk simply because there would potentially be a higher number of failures and faults with more equipment and higher incidence of frauds and accidents with a larger pool of staff. At the fuel retailing sector where they sell to end customers, the major oil companies were organized to have almost every role internally within the firm's boundaries. For example, Esso once owned Gilbarco, the company that designed and built fuel dispensing pumps for its fuel retail stations (Gilbarco Inc, 2013). The fuel retail stations operated directly by the company even employed in-house mechanics to service and repair these fuel dispensing pumps, a job that would typically be given nowadays to contractors.

Every staff member in each fuel retail station can be a source of risks for faults, frauds and non-compliance with regulatory requirements. As oil companies expand their networks, they multiply their risk exposure. Among the major oil companies, ExxonMobil is the strictest when it comes to complying with regulations and upholding standards to meet safety, security, health and protection of the environment. As an example, ExxonMobil subject their staff and contractors to regular check for drug and alcohol abuse. This is the counter-

measure to mitigate risks, which is based on lessons learnt from the major spill from crude carrier, Exxon Valdez, an accident claimed to be due to the negligence of the drunken captain (Hosmer, 1988; Harrald, Marcus, & Wallace, 1990).

MOCs apply internal standards that are higher than globally known standards when operating in a host country especially in countries that have ambiguous standards and regulations. Some of the standards applied by MOCs seem extreme. For example, MOCs ban anyone climbing on to the top of tanker to verify the fuel level before the unloading process, a procedure common among dealers worried that they may not receive the correct amount of fuels from the terminal. Another example is to prohibit the use of mobile phones in fuel retail stations based on the unproven concerns that mobile phones pose a fire risk (Burgess, 2007).

The MOCs will not compromise on standards or violate local regulations as any faults or deviations can be costly and have enormous consequences (The Hazardous Waste Consultant, 1999; 2007). But it can be difficult for oil companies to ensure that their standards are not compromised in a fuel retail network spread across a country. This is especially difficult in countries that are lax in enforcing regulations and allow violations by site operators to be easily regularized. This is the reason given by the interviewees that both Esso and Mobil chose not to be in the Philippines and Indonesia's fuel retail sector even though they are active participants in the upstream sector.

The MOCs have progressively removed many internal roles and given them to third-party providers. Some of the maintenance firms taking up roles were formed

by the employees who were retrenched when Esso gave up the mechanic role. Another example is the case of two Shell's employees who were responsible for managing fuel inventory and losses. They resigned from Shell and set up a service to provide underground tank integrity and took the role of monitoring underground tanks for leaks out of Shell (Leighton O'Brien Pty Ltd, 2013). They have since expanded their business to manage underground tanks for other oil companies in the region.

The MOCs have been very successful with their own branded convenience stores. The convenience store as part of the fuel retail station brought convenience to the drivers but within the oil companies, the selling of convenience goods with the multiple suppliers, myriads of items and a different set of regulations is at odds with the retailing of fuels. ExxonMobil and Shell has chosen to resolve this dilemma by using large convenience store retailers for their convenience store operations. They have even expanded the scope of the duty such that these non-fuel retailers are operating the forecourt for the oil companies.

A new industry architecture called the "asset-light model" has emerged in SE Asia, creating a new role of branded marketer. Chevron started this asset-light model by dividing the network in a large country into a number of smaller networks and giving each of these networks to a third party or branded marketer to own and operate. Every asset within the fuel retail station is to be owned by the branded marketer. Only the signage and displays associated with branding are paid for by Chevron. This arrangement allows Chevron to pass all the responsibility and risks to the branded marketers but this can only be implemented in countries that will

not hold the oil company responsible for the sites bearing the brand as an advertisement. This model was possible in Malaysia and Philippines but not in Singapore[9].

Each branded marketer was given an area to operate with full responsibility. An example of a successful branded marketer is Pen Petroleum that has been given the rights to distribute Chevron's fuels and lubricant in Malaysia. Under the agreement with Chevron, Pen Petroleum constructs and maintains the network of fuel retail stations according to the operating standards set by Chevron and organizes the activities from getting fuels from the terminal to delivering these fuels to the customers. In the Philippines, Chevron set up several branded marketers, such as Perry's Fuel, Southern Cross Distribution and RSL Construction, with each branded marketer operating within a specific geographic area.

5.1.2   National Oil Company (NOC)

For many years, the countries in SE Asia were dominated in both upstream and downstream activities by the foreign oil companies such as the major oil companies. The national oil companies were set up by the governments initially to exert control in the development of the country's oil and gas sector, especially in the more lucrative upstream sector. When they were formed, national oil companies, either partly or fully owned by the governments, chose to collect money while allowing foreign oil companies exploit the country's natural

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[9] Chevron was also not able to pass risks and responsibilities to branded marketers in Hong Kong and so this model was also not deployed in Hong Kong.

resources. It was only after the 1970s following the two major global oil crises –
the OPEC oil embargo against the USA in 1973 and the energy crisis in 1979 –
that national oil companies rose to become dominant oil players by being actively
involved in both the upstream and downstream sectors.

The national oil companies included in this study are Petronas of Malaysia,
Pertamina of Indonesia, PTT of Thailand and Petron of Philippines. However,
Petron is no longer a national oil company as the Philippines National Oil
Company, a government entity, sold its entire stake in Petron to Ashmore Group,
a British investment company. San Miguel Corporation subsequently took
controlling interest of Petron in 2008.

There are advantages for national oil companies operating in their own countries.
They are better at interpreting government policies and are more prepared in
implementing new measures introduced by regulators. In Indonesia and Malaysia,
regulations on ways to control of fuel subsidy are a source of difficulties for major
oil companies. As mentioned in the case study on Indonesia, foreign oil
companies were initially restricted from selling subsidized fuels. Even when this
restriction was later lifted, there were limits on the quantity that can be sold and
only at particular fuel retail stations. This restriction was specifically imposed on
foreign oil companies to allow Pertamina more time to improve its fuel retail
stations. This type of restrictive regulation is only possible when Pertamina is also
the regulator for the oil and gas industry.

However, advantages from political connections are often eroded by national oil companies having to serve non-commercial interests and to support policies of the government. The non-commercial interests include supporting plans to control fuel subsidy, improving local employment, promoting welfare and building fuel retail stations in areas that may not be commercially viable. For example, PTT has to set up fuel retail stations in remote area like the northern states of Thailand and Petronas has to deploy fuel retail stations in the border state of Perlis.

As NOCs are part of the government, the organization structure set up by NOCs for fuel retailing is bureaucratic and inefficient. Pertamina operated with the same bureaucratic engine of the government and many schemes to control fuel subsidy or deploy alternative fuels did not succeed. When compared against MOCs, NOCs are known to be inefficient especially when the comparison is analysed from a purely commercial viewpoint (Eller, Hartley, & Medlock III, 2007).

5.1.3   Independent Oil Company

Independent oil companies are private entities that have operations in terminal or niche areas of the oil and gas business. They came into the fuel retailing sector when the fuel retail sector in SE Asia was deregulated for them to participate. Independent oil companies range from reasonable large entities such as those that took over the network of major oil companies in Singapore and Malaysia to smaller entities such as those have emerged after deregulation in Thailand and Philippines. Paktai Oil started business by operating tank farms and distributing petroleum products to fishing industry and factories in South Thailand. SeaOil of Philippines, started as a storage company for petroleum and petrochemical

products, developed a niche in wholesaling of petroleum before taking up retailing of petroleum products. SPC started as a small independent oil company in Singapore sharing a refinery with Caltex and BP. In Malaysia, BHPetrol started fuel retailing by taking over the network of BP. As the participation in the fuel retail sector by private companies was restricted in Indonesia, there were no independent oil companies in Indonesia before 2004.

Independent oil companies use different strategies to develop their networks of fuel retail stations. The smaller and usually localized players use the low-cost approach in building and operating fuel retail stations while the bigger players copy some of the processes of the MOCs. Paktai Oil of Thailand buys divested sites, typically small outlets in the outskirt, and revives them by making low cost changes to brand the fuel retail station with its identity. SeaOil of Philippines builds bigger sites that are located in the city and claims that these are more effective than having many sites of smaller size and located outside the city. Their smaller competitor Flying V has taken the opposite tack by building a chain of micro-filling stations in the villages. However, a common trend among these smaller independent oil companies is to build fit-for-purpose fuel retail stations and run them with minimal amount of staff and support. There is no consistency in the appearance of the fuel retail stations across the network.

Two independent oil companies, SPC and BHPetrol, have grown by acquiring fuel retail stations from the major oil company BP. In absorbing the staff left behind by BP, these two oil companies inherited some attributes of the major oil company. When BP moved out, SPC took over the network of fuel retail stations and

retained some of the operating staff. It has since mirrored whatever the major oil companies did such as operating their Singapore network under the COCO model as well as managing their own branded convenience store, Choice, with in-house staff. Similarly to SPC, BHPetrol inherited some of the BP's staff including top level managers and adopted some of BP's processes such as managing risks.

Petron, classified in this study as a NOC because of its history, was bought out by San Miguel Corporation, a food and beverage company well known for selling beers. That makes Petron an independent oil company and it was under the new management that it started growing a network of fuel retail stations called Bulilit stations, which are very small fuel retail stations located in remote community. This micro-filling station concept extends the retailing strategy of San Miguel Corporation that has been very successful in selling beers and food items to the small remote communities across Philippines.

Independent oil companies also combined roles especially at their central offices, resulting in smaller management teams. They are less rigorous in their approach in managing risks. They allow their dealers to reuse existing old underground tanks, measure and reconcile underground tank inventory manually and operate without automation systems knowing that these approaches will not meet safety, accuracy and environmental standards. As an example, Paktai Oil of Thailand spent money to rebrand stations and replace dispensing pumps when they bought divested sites and gave these to dealers. However, they chose not to replace the old underground tanks and pipes. This is because independent oil companies believe that they will not be fully responsible for risk incidents at the fuel retail stations. There is also

higher level of mistrust between independent oil companies and their dealers. Some dealers will collect the fuels from the terminals to ensure they get the right quantity instead of letting oil companies deliver the fuels to them.

5.1.4   Composition of the types of oil companies across SE Asia

The cross-case analysis shows that the three types of oil companies take different approaches in organizing their respective networks. The major oil companies deploy their networks using the organization structures based on their global experience and then adjust the organization structures in each country according to the constraints imposed on them. National oil companies guided by government policies maintain the organization structures of the networks that they have taken over or copy the organization structures of major oil companies. Independent oil companies are prepared to take more risks and implement simplified organization structures by consolidating tasks so as to lower operational costs. Since the organization structure of SE Asia would be influenced by the particular type of oil companies dominating the fuel retailing sector, I have collated numeric data to determine the type of oil companies that has control over the fuel retailing sector.

Figure 17 Proportion of stations by types of oil companies
Source: Author
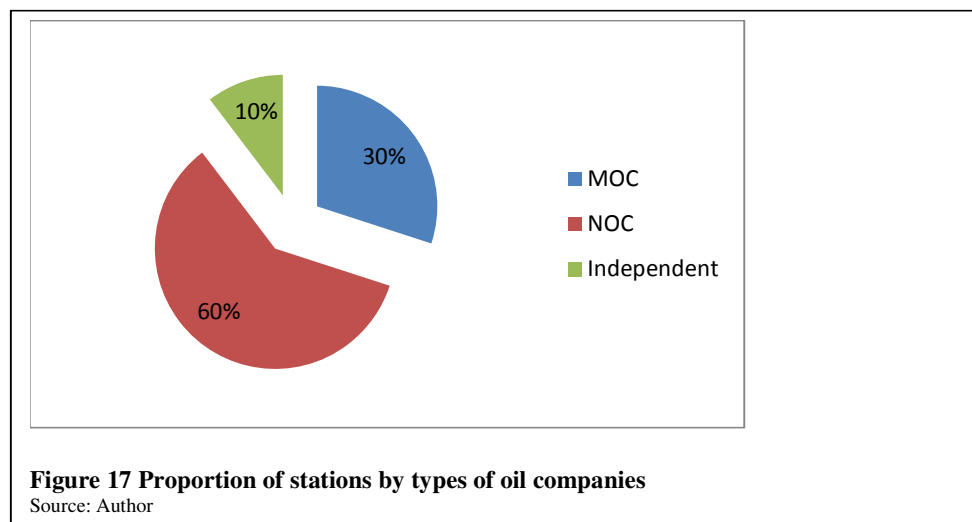
The fuel retail networks in SE Asia were started by the major oil companies at the time when there were no national and independent oil companies. Since the 1970s a number of national oil companies with governmental support became more aggressive in growing their network of fuel retail stations in their respective country. By 2011, the national oil companies controlled 60 percent of the fuel retail stations in the five case-study countries (Figure 17). Following the deregulation of the fuel retailing sector, niche players from the oil and gas industry were allowed into the fuel retailing sector and these new players became the independent oil companies. By 2011, the independent oil companies have taken up 10 per cent of the share of fuel retail stations (Figure 17). Accordingly, the share of the fuel retail stations of the major oil companies withered to 30 per cent. Thus the national oil companies have the major share of fuel retail stations across the five case-study countries.

	1990	2000	2010	2012
MOC	15	17	14	13
NOC	5	5	6	6
Independent	1	10	13	12

Figure 18 Number of oil players from 1990 to 2012
Source: Gilbarco Veeder-root (Asia)
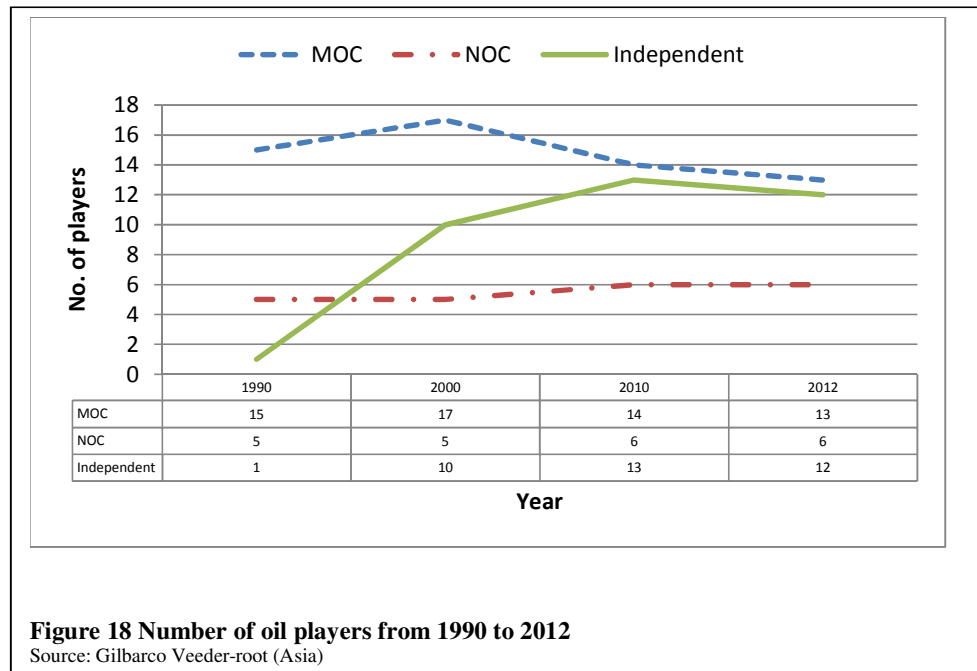
The number of oil players in SE Asia went up because of the increase in independent oil companies that joined the fuel retailing sector after the deregulation of the sector in Thailand and Philippines. The number of major oil companies went down due to the consolidation of oil and gas players and the withdrawal of BP and Conoco from the fuel retailing sector in the region. National oil companies remained stable except for the addition of PTTRM in 2007. PTT, the national oil company of Thailand, created the separate entity, PTTRM, to take over the fuel retail network vacated by Conoco. In this evaluation of oil players in the fuel retailing sector, the oil companies for each country are treated as separate entities. For example, Chevron Singapore, Chevron Malaysia, Chevron Thailand and Chevron Philippines are counted as four separate entities. National oil companies are classified as NOCs only in their respective home country and these are classified as independent oil companies when they set up network in another country. The oil players active from 1990 to 2012 were plotted (Figure 18). By 2012, there were as many independent oil companies as there were major oil companies and twice as many of them as national oil companies.

The types of oil companies exhibit different characteristics in the way they organize their networks. These characteristics that have been gathered from the cases are summarized in Table 15 and are elaborated upon in the following paragraphs.

The major oil companies adhere strictly to regulations and standards imposed on them. This is done to protect their global brand and to manage risk in operating in a host country. However, they also control the industry architecture to capture

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additional value from innovations. Examples of innovation introduced by MOCs are the addition of the convenience store as a backcourt business and the use of self-service with payment made by drivers directly at the pump.

The national oil companies have the advantage of government support including being privy to new regulations and restrictions when they operate in home country. However, this advantage is offset by the needs to serve non-commercial interests. Generally, the national oil companies maintain the existing industry architecture making small incremental improvements to increase market share.

The independent oil companies often choose the low-cost approach. This includes reviving divested fuel retail stations using minimal investments. This approach can be risky but this type of oil companies, especially the smaller entities, appear to be less concerned with regulations and standards. They choose to combine roles so as to operate their networks with minimal staff. Thus the independent oil companies modify the industry architecture for cost purpose.

MOC	
• Strict adherence to regulations and standards to protect global brand and manage risk • Control industry architecture to capture value from innovation, e.g. adding convenience stores, outdoor payment	Innovated by changing business and organization structure to introduce new features to fuel retailing – convenience store and pay-at-the-pump
	Invested in high-end equipment including monitoring systems to minimize exposure to risk, especially for dispersed network with large number of staff
	Changed organization structure to pass risk to third parties through programmes such as the "Branded Marketer" concept
NOC	
• Benefit from governmental support but need to serve non-commercial interests • Maintain existing industry architecture with incremental improvements to increase market share	Operated with organization structures that support and promote government policies
	Kept the more superior organization structure of acquired networks
	Supported non-commercial interest by deploying fuel retail stations in rural areas
Independent oil company	
• Driven mainly using low cost approach with less concern on risk • Modify industry architecture for cost purpose	Less concerned with regulations and standards
	Low-cost approach with smaller and localized network such as buying over divested sites
	Operated with minimal staff with combined roles in fit-for-purpose fuel retail stations

Table 15 Characteristics of oil companies
Source: Author from interviewees

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NOCs have the largest share of fuel retail stations deployed in SE Asia and would presumably have the greatest influence in the organization structure of the fuel retail sector. However, in term of the number of entities, there are more entities operating as independent oil companies and as such these may exert more influence on the type of organization structure. Their more aggressive low-cost approach may have a greater impact in changing the industry architecture of the sector. Although the MOCs have reduced their share of the market, they exert considerable influence within the sector because of their global experience. Their methods of organizing the sector are seen by the other oil companies as superior than their own ways. As the sector evolves, the characteristics of the different types of oil companies will also changes and the indication is that NOC and independent oil companies tend to converge to the characteristics of the MOC.

5.2 Organizational structures

The interviewees and the trade literature refer to three base organization structures commonly found in SE Asia's fuel retail by the acronyms COCO, CODO and DODO. These are the company-owned company-operated stations, company-owned dealer-operated stations and dealer-owned dealer-operated stations respectively. Shell uses CO and DO for company-owned company-operated and dealer-owned dealer-operated respectively and RBA (Retail Business Agreement) for contract with dealers to operate its company-owned stations. Chevron prefers the acronyms COCO, CORO and RORO instead of COCO, CODO and DODO by substituting "R" for retailer in place of "D" for dealer.

The naming convention implies that the organizational structures are only based on two contractual agreements, one for ownership of the land and infrastructure, the other for managing the site operations. The fuel retailing sector in SE Asia is thus based on the combinations of these two contractual agreements. But a deconstruction of the organization structures shows that there were at least four levels of contractual agreements in SE Asia. These four levels result in several variations to the three base organization structures. These four levels and the three base organization structures are described below followed by a summary of the variants commonly found in SE Asia.

5.2.1 Base organization structures

The four levels of contractual arrangements that make up the organization structures in SE Asia are the wholesaler supplying the fuels, the owner of the station, the operator and the site-level operating team.

1. Wholesaler: This is the owner of the brand that distributes fuels to the fuel retail stations. It is usually the marketing subsidiary or a department of the oil company. It serves as the central control of the network.

2. Asset owner: Assets such as land and infrastructure can be owned or leased by either the oil company or a third-party investor designated as the dealer.

3. Operator: If the oil company owns the assets, it may choose to operate the fuel retail station directly or pass the rights to a dealer. In the latter case, a

dealership agreement defines the terms and conditions on operating the fuel retail station including ownership of inventory of fuel at the station. If the dealer owns the assets, similar dealership agreements for dealer-owned stations may include compensation to the dealer to upkeep the oil company's brand image.

4. Site-level operating team: If the oil company retains operating rights, the oil company can appoint an employee or contract an agent as a station manager. Similarly, if the dealer has the operating rights for more than one station, he may employ a manager for each fuel retail station. Otherwise, the dealer is also the station manager. The staff consisting of pump attendants and cashiers may be hired by the contracted agent or the dealer. If an oil company retains operating rights, the staff could even be employees of the oil company or be supplied by a subsidiary providing manpower.

There can be many different organization structures by having different arrangement of these four levels. Through the different permutations of the first three levels, we have the base organization structures commonly used in SE Asia (Figure 19). These are the fuel retail stations owned and operated by the oil company (COCO), fuel retail stations owned by the oil company but operated by dealers (CODO) and fuel retail stations owned and operated by dealers (DODO).

Figure 19 Base organization structures
Source: Author – derived from interviews
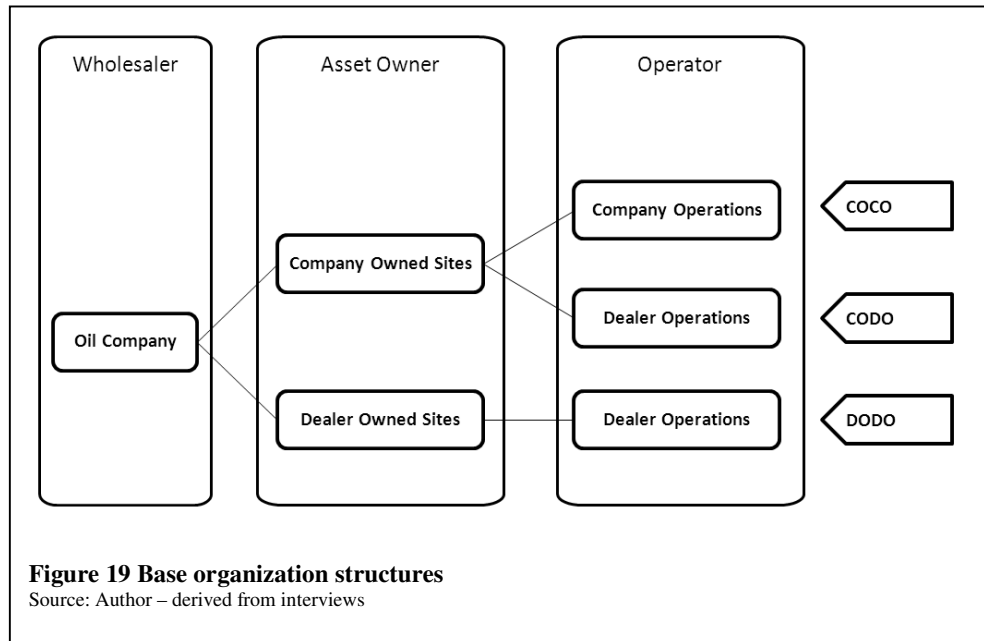
As mentioned in the literature review, the three base organization structures are referred in academic journal with generic terms as company-owned, commissioned-agent, lessee-dealer, open-dealer, dealer-owned (Shepard, 1993; Slade, 1998; Blass & Carlton, 2001) or simplified as refiner-owned and independent retailer (Vandergrift & Bisti, 2001). Lafontaine and Slade (2007) used the terms, CC, CD and DD contracts that are similar to the terms, COCO, CODO and DODO generally used within the fuel retailing sector domain (Kaumanns, 2010; OECD, 2008). The defintions given below for these three arrangements are consolidated from oil-companies' website and the contracts between oil companies and dealers.

1. Company-Owned, Company-Operated (COCO)

These are fuel retail stations where the oil company owns the assets consisting of land and infrastructure. Traditionally, the oil company operates the station directly with its own employees, but over time, variants of the COCO model have

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emerged in which station staff may no longer be the employees of the oil company. The oil company also owns the inventory of fuels and convenience store goods.

2. Company-Owned, Dealer-Operated (CODO)

These are fuel retail stations where the oil company owns station assets including land and infrastructure but delegates the operations to an unaffiliated dealer through a dealership contract. Typically, the dealer has to pay a rental fee for the use of the assets. The dealer owns the fuel inventory once it is delivered into the underground tanks.

3. Dealer-Owned, Dealer-Operated (DODO)

These are fuel retail stations where the dealer owns the assets consisting of land and infrastructure and controls the operations. The oil company provides the brand and advises the dealer on the design of the fuel retail station and how to operate the station according to the oil company's standards. The dealership contract will restrict the dealer from getting fuels from other oil companies.

5.2.2   Variants to the base organization structures

The organization arrangements formed by permuting the first three levels gives the three familiar base organization structures, COCO, CODO and DODO. The fourth level specifies the ways the manager and staff are employed at the fuel retail stations and determines how each station is operated. It is this fourth level that results in a number of variants to the base organization structures (Figure 20). However, oil companies usually refer to the base organization structures without mentioning the variants.

There are three variants of the COCO model. The Thai C-centre in Bangkok, a fully owned subsidiary of ExxonMobil covering part of its network in Thailand, has direct employees operating the fuel retail stations. These are the true COCO stations according to the definition. PTT has modified the COCO structure by assigning employees as the station managers and having another subsidiary provide the pump attendants and cashiers. The third variant is found in Singapore. The station manager operating the COCO station in Singapore is an unaffiliated sole proprietor tasked to hire a group of staff whose salaries are fully reimbursed by the oil company.

There are two variants of the DODO model. This depends on whether the dealer is operating a single fuel retail station or multiple fuel retail stations. The dealer of a single station typically operates the fuel retail station directly and retains the role
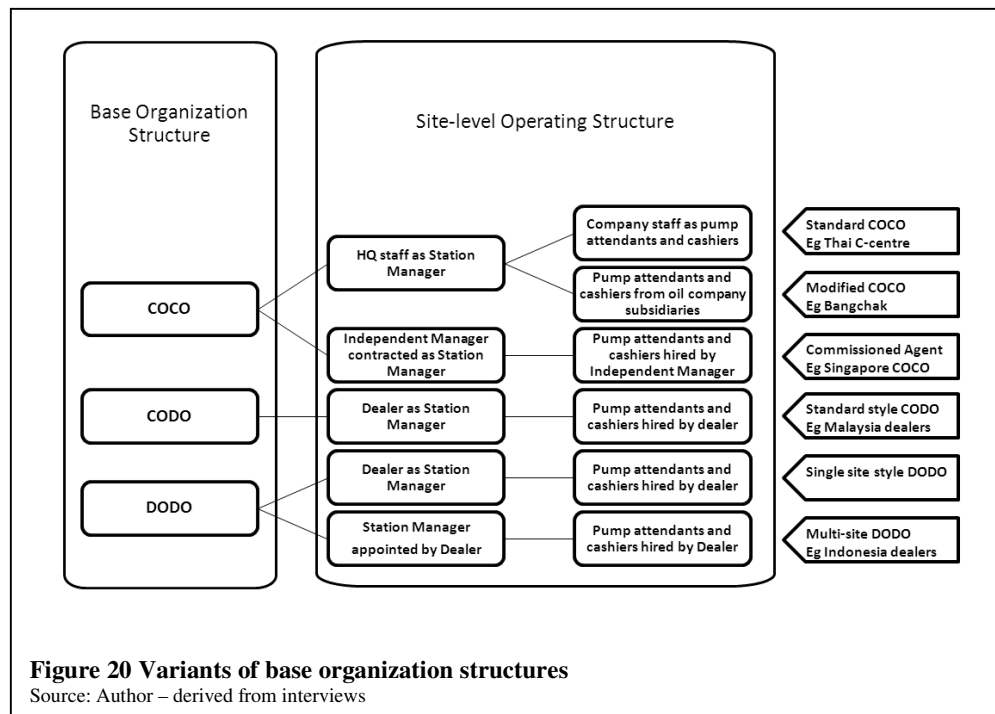
Figure 20 Variants of base organization structures
Source: Author – derived from interviews

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of the station manager. There are dealers with more than one fuel retail station and these are supported by professional station managers appointed by the dealer to look after each station. These are also called "super dealers". A "super dealer" generally operates all the fuel retail stations under the same brand. However, interviewees mentioned that there were such dealers operating with multiple brands in Singapore.

Some variants of the CODO model are difficult to distinguish from the variants of the COCO model. Interviewees of Chevron mentioned the use of commission agents in their company-operated site and called this type of operations the company-owned commission-agent or COCA model. This scheme appears to be similar to the sole proprietor engaged by Esso for its company-operated stations although a commission agent is treated by Chevron as another type of dealer. The difference appears to be the way this manager is compensated. The commission agent receives a variable income based on sales while the Esso-style station manager has a fixed income with a small variable component.

5.2.3   Mix of organization structures in SE Asia

The high-level cross-case analysis above shows that while there are three base organization structures in SE Asia fuel retailing sector, these organization structures are implemented with variations on contractual arrangement between the oil company and the station staff comprising the station manager, the pump attendants and the cashiers. Although each oil company implemented only a selected number of variants for each network, these variants make comparison across the cases difficult to analyse. Instead, the comparison of how the fuel retail

networks are organized across the cases is done using the base organization structures.

The oil companies in SE Asia operate 46 percent of the fuel retail stations with the DODO model, 42 percent with the CODO model and 12 percent with the COCO model (Figure 21). The combined data for COCO and CODO shows that the oil companies own 54 percent of the fuel retail stations and allow 78 per cent of these company-owned stations to be operated by dealers. Although the dealers under CODO model operate under different contract terms from those dealers under the DODO model, both types of dealers are essentially independent businessmen. By grouping all the fuel retail stations operated by both types of dealers, the data shows that 88 per cent of the fuel retail stations are operated by dealers. Thus the dealer-operated model appears to be the dominant organization structure in SE Asia.

Figure 21 Proportion of stations under COCO, CODO and DODO
Source: Author
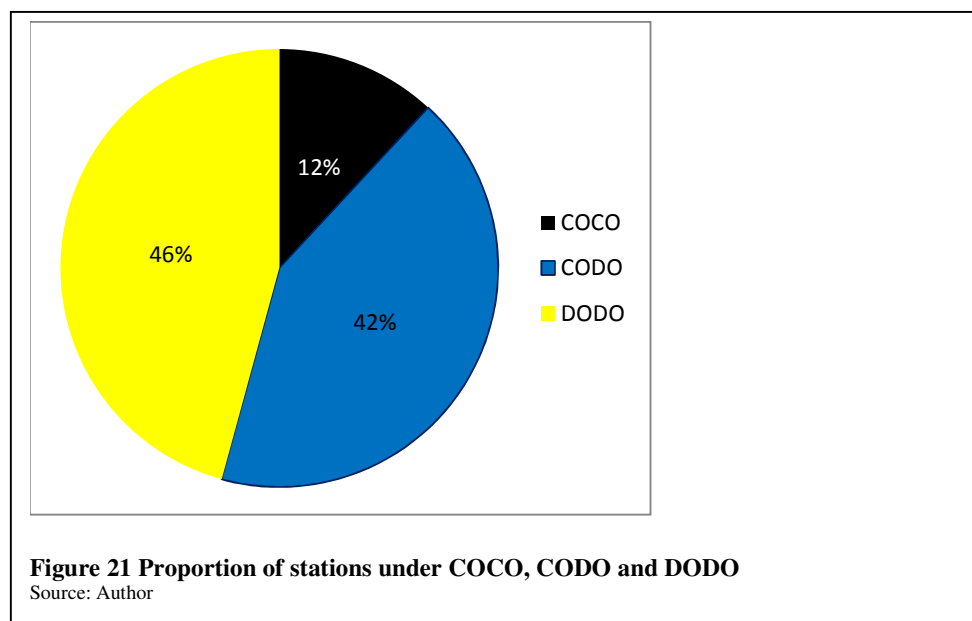
When the data of organization structure is collated for the case-study cases, each country shows a different mix of organization structures (Figure 22). Singapore is organized exclusively on the COCO model, which represents the vertically integrated organization structure centred on the oil company. Indonesia is on the other extreme of having 80 percent of the fuel retail stations organized on DODO model and 18 percent with the CODO model. The DODO model represents the vertically disintegrated organization structure. The CODO model is between the COCO and DODO models in term of its disintegrated structure. The other three countries have a mix of the three base organization structures. Malaysia has almost 80 percent of fuel retail stations under the CODO model. The other two remaining countries have a mix of all three models but show differences with Philippines having more DODO-type fuel retail stations and Thailand having more CODO-type fuel retail stations.

Figure 22 Organization structure by country
Source: Author

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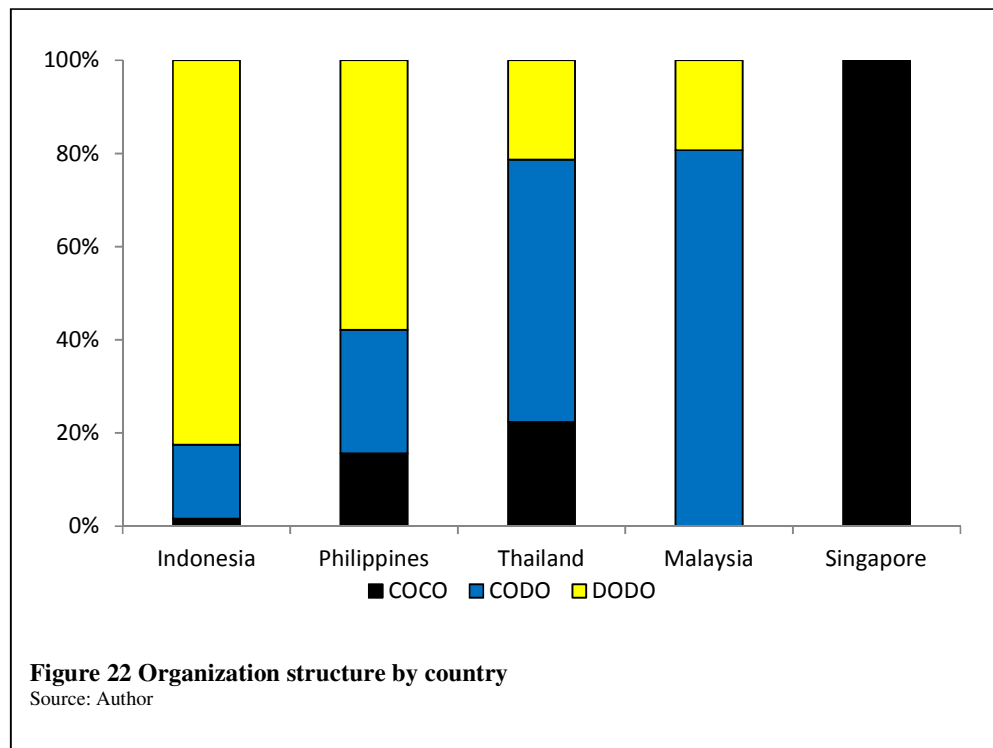
Oil companies in Singapore claim that the COCO model is used because of the limited number of sites assigned for fuel retail stations and the high land price. Pertamina, the national oil company of Indonesia, with a monopoly of the retail sector, is not keen on managing the fuel retailing sector and thus employs mainly the DODO model. Besides having no competitors until recent years, the low margin from selling subsidized fuels also did not incentivize the Indonesian dealers to modernize the operations nor Pertamina to change its organizational structure. The restriction on operating licensing forces the oil companies in Malaysia to use the CODO model. This restriction will not change unless the formula on subsidizing the wholesale and retail margins is changed.

The different organization structures across countries indicate that the structures are influenced by country-specific factors. It is true from the within-case analysis that each country has imposed different constraints on the fuel retail sector. Even

Figure 23 Shell's organization structure by country
Source: Author

Figure 24 Chevron's organization structure by country
Source: author
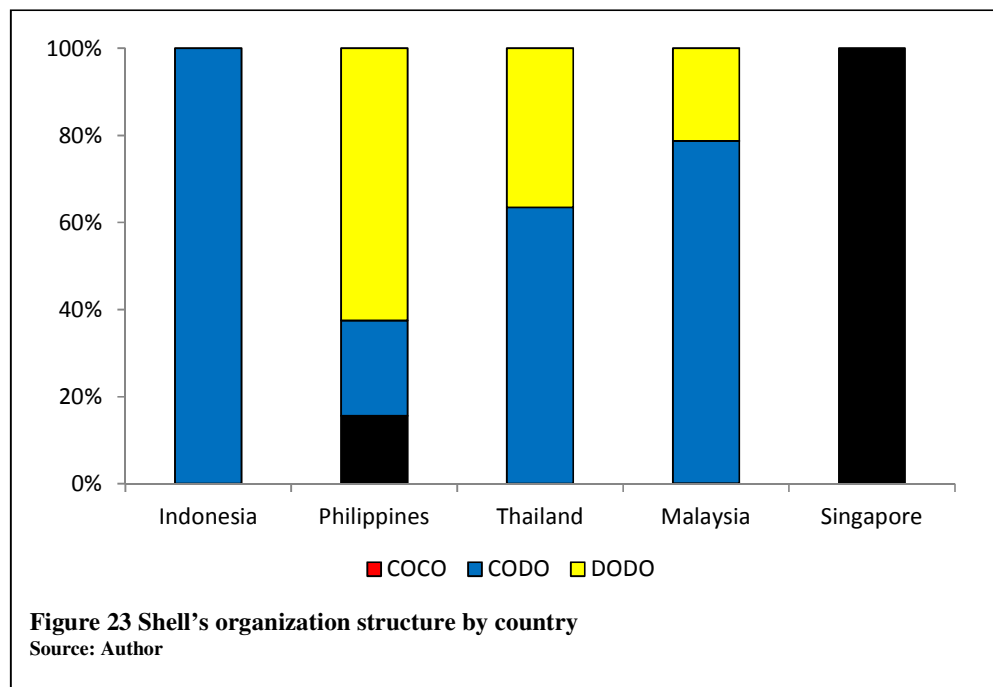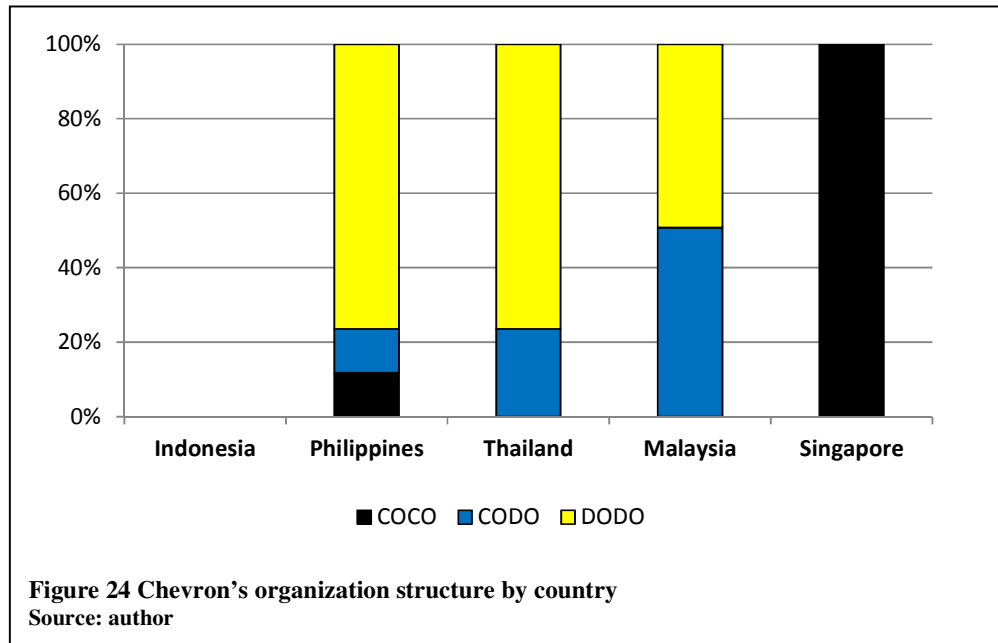
MOCs that have networks in the different countries have to implement different organization structures. One explanation is that the oil companies deployed in different countries are different commercial entities even though they operate under the same brand. For example, Shell Singapore is a different commercial entity from Shell Filipinas. Even though they take guidance from common regional managers, each entity has to implement the organizational structure that fits within the constraints of the country.

The mix of organization structures within a country is harder to understand. There is more than one organization structure used in each of the case-study countries with the sole exception of Singapore. This mix is especially notable in the case of Thailand and Philippines which have all three base organizational structures. Both countries have deregulated the retail sector within the last few years and encouraged the entrance of new independent oil companies. The different independent oil companies were more varied in their strategies, with some taking a low-cost approach to manage a larger network with less staff and others trying to

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match the bigger players and by being more nimble. The mix within a country is therefore the result of the different types of oil companies deploying their choice of organization structures.

Another interesting view from the data is that an oil company may deploy more than one type of organization structure within a country. Shell has fuel retail networks in each of the five countries and 15.4 percent of the fuel retail stations under its brand. Yet it did not deploy a standard organization structure across all these countries and within each country. Instead, Shell implemented different organization structures in each of these five countries (Figure 23) that mirrored the mix by country for the consolidated oil companies (Figure 22). A similar mix of organization structures is observed for Chevron across SE Asia. Chevron has 10.3 percent of the fuel retail stations and deploys networks in four countries (Figure 24). The implementation of a mix of industry architecture within a single country by the same oil company indicates that country-specific constraints cannot be the only reason driving organization structure in a sector.

5.3 Industry Architecture of the fuel retailing sector

While the use of the three base organization structures is convenient way to classify the contractual arrangements of the fuel retailing sector, the organizational structures are more complex and have multiple players assigned to different roles within the industry architecture. These roles vary across networks as well as among fuel retail stations of the same brand and some roles can be split among more than one player. For example, the oil companies have a retail manager

handling both the commercial arrangements and running the day-to-day processes. In other usually larger oil companies, the duty of the day-to-day operations is undertaken by another person, typically called the retail operations manager. And when the operation is outsourced to a convenience store specialist or a branded retailer, the role of this retail operations manager does not disappear but is taken over by the convenience store specialist. The responsibility of the retail manager is also significantly reduced as part of his duties has also been removed. For example, when ExxonMobil gave the job of managing their fuel retail network in Singapore to FairPrice, a local supermarket retailer, the whole retail team at the head office was disbanded. A similar change at the Shell's corporate office happened when the operations of the network was outsourced to 7-Eleven.

5.3.1 Centralized roles

A central head office with a team led by a retail manager is often considered to be an indispensable part of a fuel retail network. The type, size and location of the network determine the roles and complexity of the head office. For example, the regional office of the major oil company, ExxonMobil, in Singapore supported the fuel retail networks in Singapore, Hong Kong, Malaysia, Thailand, Guam and Japan with each country operating with a different mix of COCO, CODO and DODO models. Each regional office has a team of managers, each overseeing an area and supported by roles such as area managers and territory managers. In contrast, the head office for SeaOil, an independent oil company, combines several roles into a skeletal team that is sufficient for running its small network of 210 fuel retail stations in Philippines, operating mainly with the CODO and DODO models. The evolution of the fuel retailing sector has undermined the need

for the head office and all the roles within, as oil companies evaluate whether these roles are necessary and whether these roles can be centralized and outsourced.

When non-fuel activities are added to the fuel retailing sector, the head office has to be expanded and roles added to manage these activities that are traditionally not part of fuel retailing. It was still possible in the past for dealers to manage the non-fuel activities that are closely related to fuel retailing such as such as lube bay and car wash services without head office support, as many of the dealers were mechanics by training. The move to include convenience stores into fuel retailing, however, is a different matter. A new role of a convenience store management at the head office is needed to support dealers with the logistics of managing thousands of convenience store items, seasonal promotions and inventory controls. Many existing roles at the head office that are used to deal with the four or five fixed fuel products have to be supplemented to support convenience store operations with its changing list of products.

Card payment at fuel retail stations has gained popularity in some countries, with increasingly more complex payment arrangements including promotional and discount vouchers, stored value cards, fleet and loyalty cards. This raises the need for the role of card operations which has found its way into the head office. Oil companies such as ExxonMobil, Shell and BP have set up their own card processing centres to process their own fleet and loyalty cards, which need a large supporting staff and specialized equipment. Besides processing their own issued cards, credit card transactions are also routed through their own card centre before

being forwarded to the banks. This is done so that the oil companies can use the card transaction volume of their networks to negotiate with the banks for a lower merchant fee. For those oil companies that are not keen to have such in-house capabilities, the card processing function can be outsourced to banks or third-party acquirers so that only the business functions of dealing with fleet and loyalty cards are kept within the oil companies. This has the advantage of passing the risks associated with card processing to the banks.

Terminal operations are usually centralised and the team managing this for a country is located at one of the terminals. The two main players are the terminal superintendent and the tanker operator. Almost all the big oil companies have outsourced the tanker operations to logistics specialists because tanker operation is not considered a core business activity. However, in the past, tankers were owned and operated by oil companies directly. To reduce the risks associated with accidents, the tankers were sold to logistics specialists and leased back by the oil companies for exclusive use, so that these tankers were parked in the evening at the terminal. Some independent oil companies that started as terminal or tanker operators continued to maintain their own fleet of tankers to service their networks of fuel retail stations.

Even in small countries like Singapore, each oil company has its own dedicated terminal even though doing so does not make economic sense. Similarly, large countries with many islands like the Philippines can provide better coverage by sharing terminals, yet each oil company has its own dedicated terminals across the country. Although they do occasionally borrow supplies from each other and use

third-party terminals, these companies will not forge long-term sharing arrangements. Obviously, the terminal is considered to be a core function of fuel retailing.

The terminal serves more than just the network of fuel retail stations. They provide bulk supply of fuels to commercial facilities serving construction, bus and taxi companies. This business, usually termed as "Commercial and Wholesales", is not part of this research. However, the introduction of branded marketers could potentially skew the business of fuel retailing more towards the wholesaling of fuels, making the terminal superintendent's role more critical than the retail manager's.

5.3.2   Other roles

A number of roles vacillate between being handled in-house and being outsourced to third parties. Although treated by oil companies as non-core activities, these roles exist in the industry architecture in some form or are subsumed under other roles. These are often targeted by oil companies as roles that could be outsourced to third parties.

The network manager seeks land for the deployment of fuel retail stations and is very important when oil companies are growing their networks of fuel retail stations, but his role can be given to real estate specialists. Similarly, the brand manager's job is threatened by the advertising specialists. To avoid keeping the roles needed to maintain or supervise the maintenance of station equipment with in-house staff, the oil companies are willing to pay equipment suppliers for

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extended warranty and post-warranty support for equipment. PTT in Thailand has even opted for a rental scheme for automation equipment so that they have to pay only for reports without having to own the hardware.

Two roles taking care of management controls and health, safety, security and environment advisory (HSSE) have become increasingly important in bigger oil companies, especially for company-operated stations. These roles help to manage the risks faced by the oil companies operating a network of fuel retail stations. The control advisor assists the retail manager by providing guidance on fraud and non-compliance with regulations. The HSSE manager looks after risks associated with health, safety, security and environmental protection.

Third-party service providers and suppliers such as contractors and convenience goods suppliers are not usually considered as part of the value chain. They are also not considered as being specific to any particular sector. In reality, many of these roles have become very specific to the fuel retailing sector. There are several ancillary roles and corresponding actors such as fuel equipment suppliers, non-fuel equipment suppliers and contractors. A few new roles were added after year 2000 when there was significant consolidation of the fuel retailing sector. The new actors for these roles included facilities managers that were contracted to reduce the need for in-house engineering expertise.

5.3.3 Managing the industry architecture

A characteristic of the fuel retail sector is that not all the roles described above are present in the different organization structures in SE Asia. On one extreme, a

Figure 25 Models of industry architecture
Source: Author
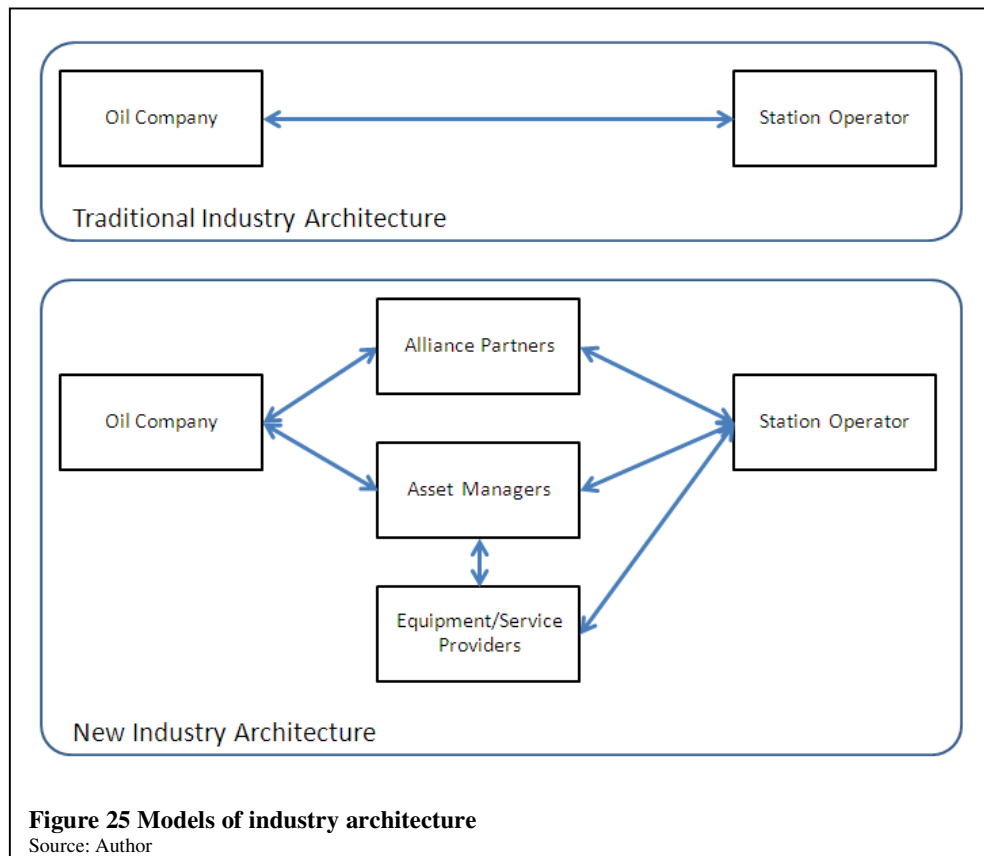
major oil company operating a large network of fuel retail stations with its own branded convenience store and full-attended service configuration operating 24 hours using the COCO model will have most of these roles, with each role taken up by an individual or a team. On the other extreme, an independent oil company operating with DODO model and with its station selling fuels and accepting cash during retail hours will have the dealers at the fuel retail stations and a small team at the head office taking on multiple roles. Between these two extremes, we have a variety of combination of roles as a result of the different type of oil companies, the different configurations of fuel retail stations and the base organization structures.

The original roles when the fuel retail sector started in SE Asia were the oil company as the wholesaler and the dealer as the operator (Figure 25). The role of

the operator became differentiated as a result of the oil company taking the operator's role with its own employees and with two kinds of dealers, one operating its own sites and the other operating sites owned by the oil company. Other roles were added when minor activities grew to be significant with more fuel retail stations added to the network, more types of fuel products were offered and higher volume of transactions were sold from each fuel retail station.

The evolution of the fuel retail sector has changed the relative importance of each role. The retail manager role has been reduced significantly while the roles of terminal, alliance and asset managers gained prominence with the move towards the branded marketer model. The use of the self-service model made the specialists providing and supporting the automation and the payment processing more important. An increasingly percentage of the operator's margin is also being deducted by these service providers. The rearrangement of players in the industry architecture has resulted in station operators building stronger links to third-party players such as those providing support services, equipment maintenance and automation solution and reducing their reliance on the team at the central head office. The result of the rearrangement is that the oil companies, especially the bigger oil companies, have inserted a layer of players between themselves and the fuel retail operators (Figure 25).

5.4 Impact of institutional environment

Although the oil companies should, for efficiency reason, operate with the same organization structure across all their networks, the within-case studies by country

showed that this was not possible with each country imposing its own set of regulations and standards that differs with other countries. Furthermore, regulations in some country can be biased against a particular form of organization structures, especially when such organizational form may not be in alignment with the country's economic and political agenda. Technological advancement has made it possible to improve productivity by allowing customers to fuel their own vehicles and to make payment directly at the pump without help. The use of this self-service model can improve productivity by eliminating the pump attendants and cashiers at fuel retail station. However, this improvement can be blocked by players in the sector or end customers intending to keep to existing social norms.

5.4.1 Biased regulations and standards

Biased regulations and standards impact industry architecture by excluding certain players while enabling other players to develop relevant capabilities.

First, controlling and restricting participation allow players with insufficient capabilities taking up roles within a sector. Regulations that control participation can skew the industry architecture by mismatching capabilities and roles. Controlling participation in a sector can range from making it illegal for a refiner to participate in fuel retailing, restricting the number of stations operated by a single entity, restricting the use of the COCO model or controlling the issuance of operating licences. The issuance of operating licences was not transparent in Indonesia and Philippines and was stringently controlled in Malaysia. With reference to the case study on Malaysia, the licence to operate stations was

preferentially given to certain groups of Malaysians to encourage local entrepreneurship and to prevent oil companies from earning both the retail and wholesale margins. This licensing restriction had several implications for the industry architecture of the fuel retail sector. On one hand, dealers who could get licenses, usually older but financially stronger, did not have the skills to operate modern, highly automated stations. On the other hand, younger and better educated Malaysians who could get licences did not have working capital, had to be sponsored but loan arrangement by oil companies were deemed as attempt by oil companies to set up COCO operations and circumventing the regulation. Under this regulation, the fuel retail sector in Malaysia settled on a combination of CODO and DODO with a higher proportion of CODO as the next best choice under this constraint. And as reported in the case study of Indonesia, the fuel retail sector was closed to foreign participation until year 2000. Even after deregulation, the country did not allow participation for the full downstream sector forcing foreign oil companies to import fuel and have these stored and distributed out from third party depots, a role that these foreign oil companies considered as a core activity and usually done in-house.

Second, lenient application of standards enables new entrants to gain capabilities required to play specific roles within the sector. The use of common set of technical standards in an industry ensures that products or services that have to work together in a shared environment are compatible and interoperable. It was important in the fuel retail sector to have standards that ensure that the fuels are handled safely and that these will not leak into the ground or into the atmosphere. When these standards and the regulations enforcing these standards were not

established, the fuel retail sector was dominated by incumbent oil companies that claimed to have the specialized domain knowledge on the retailing of fuels. Many standards were established as a result of painful experiences. Once these standards became established globally, it was subsequently adopted in SE Asia. However, the lenient way these standards were enforced led to lower capability requirements for players especially for those outside of the domain seeking a role in the industry architecture of the sector. New players such as convenience store specialists, taxi fleet operators and logistics managers profess to have the necessary skills to operate fuel retail stations by claiming to follow these standards. The case studies of Singapore reported that the Shell and ExxonMobil networks were given to 7-11 and Fairprice respectively. Even without domain knowledge, these convenience store retailers can operate the fuel retail stations because many of the equipment and processes have been standardized and implemented by the oil companies. Roles such as the construction and maintenance of fuel retail equipment were also no longer considered specialized and these were outsourced to facility managers by ExxonMobil and Shell in the case studies. Even the system specialists providing support for fuel retail automation were roped in to support the fuel dispensing pumps.

Third, price control encourages players to adopt organizational arrangements that condone the use of unconventional methods including frauds. Regulating pump prices distorts normal market mechanisms and dampens the competitive spirit. Conversely, the freedom to set pump price made fuel retailing profitable even under intense but unimpeded competition. To capture the full margin, fuel retailers opted to have all the roles contained within the oil company. Singapore

did not control pump price and accordingly, the COCO model was chosen by all the players in Singapore to maximize profitability. However, two countries, Malaysia and Indonesia were burdened by ever-increasing fuel subsidies because of their policy of depressing local fuel prices. Generally, under competitive pricing, the pump price of a fuel would rise above the cost price of the fuel, thus allowing the difference to cover both the wholesale margin and dealer margin. By setting the selling price of fuels at the fuel retail station below the cost price, the oil companies had to be subsidized for the difference between fixed selling price and market price. This subsidy can be kept small if the pump price can be raised in tandem with the market price for the fuel. While it was possible for Malaysia to increase pump price, it was extremely difficult to do so in Indonesia as this would be raised as a political issue during elections. Thus, the retail margin remained small in Indonesia and at about half that of Malaysia. Limited by the small margin, oil companies in Indonesia chose to use the DODO model, engaging dealers to own and operate fuel retail stations. Although the higher and more predictable margin was sufficiently attractive for Malaysia to use more of the CODO, the profitability of the smaller and less popular fuel retail stations was not certain. Hence, to maximize profit, retailers in Malaysia and Indonesia, especially DODO dealers, supplemented their income by adulterating fuels, smuggling and tampering pumps to under-deliver. These frauds also brought in new players into the sector that provided the oil companies and regulators with services to control such frauds. An example of fraud bringing in new players is the case of Malaysia having to implement the secured EMV card payment. This implementation brought in the players from the banks, card payment associations and payment systems.

5.4.2   Shifting social norms

Customer acceptance of novel customer service paradigms in the fuel retail sector drives the reorganisation and elimination of certain roles within the sector. Novel customer service paradigms such as the self-service model or adding a convenience store as a backcourt business can be difficult to introduce in countries where there are ingrained attitudes on how customers should be treated and what businesses can be combined with fuel retailing.

While the self-service model is acceptable in Malaysia and Singapore, it has limited acceptability in Thailand, Philippines and Indonesia because of different customer expectations of service in these countries. In Thailand, Philippines and Indonesia, the customers sit in their cars expecting everything from filling up the fuel tank and collecting payment to be done by the pump attendant. In Malaysia, customers have to make payment at the pump or at a counter before filling up their tank. In Singapore, customers made payment at the indoor counter after getting his car filled by the pump attendant. The different social norms and difficulty in deploying self-service stations resulted in the different industry architectures for deploying stations under self-service or full service modes. The full service model was sustainable in Thailand, Philippines and Indonesia which have abundant low-skill workers willing to work as pump attendants at minimum wage. With the steep increase in minimum wage in Thailand, it was more cost-effective to move to the self-service model. However, this model could not find acceptance and a compromised arrangement known as half self-service model was implemented in a small number of fuel retail stations. In this arrangement, the

customer pays at the payment booth set up near the pump while the pump attendant fills up the car. The full service model and the unwillingness of drivers to leave their vehicle also make it impossible for convenience store retailing to be successfully implemented in these countries.

6   DISCUSSION

The research question is "Why are there multiple levels of industry architecture of the fuel retail sector in SE Asia?" The literature review shows that the academic theories use a model based on two economic players which is then used to analyse the characteristics peculiar to the North American markets. These theories are therefore inadequate to explain organization structure of the fuel retail sector in SE Asia that has evolved to include multiple players within the sector. The fuel retail sector in the countries of SE Asia also has characteristics that are different from that of North America. Another gap in academic literature is that there was no attempt to explore the effect of risk management on the organization structure of the fuel retail sector. Therefore this research has to induce a different theory from the information and numerical data in SE Asia's fuel retail sector to explain the phenomenon of the multiple levels of industry architecture.

The following chapters in the discussion show how the theory is induced. This is summarized as follows. I first identify that the organizational changes show a consistent pattern when plotted on a risk matrix across the 5 cases. This pattern indicates the impact of risk management as a cause of the multiple levels of industry architecture. I looked at why risk management has become more important and how the practice of risk management has been delegated upwards to higher management. I showed that there are differences between standard technical approach and the higher management approach in managing risk. In the latter approach, the players in the sector can modify their organization structures to manage risks by selectively integrating roles or segregating roles, sharing risk

and centralizing services. This is shown when the organization structures of the fuel retail sector are analysed down to the role level. Therefore this research suggests that the fuel retailing sector in SE Asian countries operates with multiple levels of industry architecture as a result of organizational changes made by oil companies to manage risk.

Jacobides (2005) suggests using an inductive analysis to understand how a sector evolves to include new economic players and how vertical disintegration emerges. The inductive process or inductive reasoning is the process of gathering information from observations and looking for patterns of regularity in these observations to infer an emergent theory (Yin, 2002; Ketokivi & Mantere, 2010; Eisenhardt & Graebner, 2007). This is done by reviewing the within-case analysis and cross-case analysis until themes, concepts and relationships between variables begin to emerge (Eisenhardt K. M., 1989; Eisenhardt & Graebner, 2007). There are advantages and disadvantages for an industry participant in looking for patterns of regularity. One advantage is that once a pattern of regularity is picked up during field observations and interviews, he can check for the same pattern at other networks quickly through his contacts and from archived data. However, the disadvantage is that his long-term immersion in the sector may desensitize him such that he can easily miss or dismiss some patterns of regularity as unimportant, which is a form of information-processing bias (Eisenhardt K. M., 1989, p. 540).

While gathering information from the field, a recurring theme did emerge. A number of interviewees explained that the organizational changes or at least several organizational changes implemented by the oil companies during the

period of the research were for the oil companies to manage risk. They implied that the organizational structures were modified to reduce the exposure to operational risks or to reduce the impact of a risk event when the exposure of such risks cannot be reduced at reasonable cost. But at that stage of the research, there was no distinct pattern when comparing the organizational changes across the countries to put risk management as the intended purpose for these changes.

To make it easier to visualize the risk management approaches taken by the oil companies in making organizational changes, the effects of these changes are plotted on the risk matrix for each case and described in the within-case analysis. This graphical technique makes it easier to compare and explain the pattern of regularity than using tables to categorize the organizational changes (Eisenhardt & Graebner, 2007). The pattern of regularity is not immediately apparent from the individual cases but the pattern is more evident when the risk matrices for the five cases are placed side by side (Figure 26). The meaning of the pattern shown on the risk matrices will be discussed in the following paragraphs.

6.1 **Risk management**

Risk management has become increasingly more important in business because of greater risk exposure from increased regulatory requirements, competitive pressures, improving technology and changing consumer habits. What is even more important and difficult to manage is the impact from an adverse risk event. A business can suffer serious consequences if an adverse event is not properly contained or mitigated. Besides financial costs, a risk event can cause long lasting

damage to the reputation of a company. Risk is an inescapable part of business and even though operational risks from faults, frauds and accidents cannot be predicted, they should be prevented or their consequences lessen to an acceptable level (Boodman, 1987).

While there are many types of risks and many ways to classify risks, the main type of risks faced by a mature fuel retail sector in a politically stable region is operational risk. Risk management, especially for operational risk, is often delegated to down the organization hierarchy. At the lower level of the organization hierarchy, the approach to risk management is usually the three-step process of identifying the risk, measuring the risk and handling the risk, with the last step being the main focus (Close, 1974). Thus the main trust of risk management at this organization level is to reduce the probability of incidents primarily by adding hardware, systems or processes. These approaches are usually not designed to contain the impact or consequence of a risk event when it occurs.

Risk management has since been elevated upwards the organization hierarchy with the new roles of the chief risk officer and the chief compliance officer although these positions are more common in the financial sector than the other sectors (Accenture, 2011; Corbett, 2004). Following BP's Deep Horizon disaster in the Gulf of Mexico, the CEO of the company announced "a major reorganization, aimed at averting yet another disaster. He created a new safety division with broad powers to intervene in company operations. And BP finally appointed a board member with expertise in process safety" (Burke, 2011). The higher level of oversight to risk management allows managers more ways to

manage risk such as creating or modifying organization structures that will lower the probability of risk events as well as reduce the impact of risk event when these events occur.

In a recent article, Kaplan and Mikes (2012) place risk under three categories and suggest different approaches to manage them. The first risk category, preventable risks, is to be managed through guidance and monitoring. The second risk category, strategy risks, is to be managed by reducing the probability that the assumed risks actually materialize and to contain the risk events should they occur. The third category, external risks, is to be managed by focusing on identify the risk and mitigating the impact. It is this comprehensive managerial approach to risk management that I suggest as the reason behind the changes to the organization structures for the fuel retailing sector that led to the multiple levels of industry architecture.

6.1.1 Pattern from risk matrices

The risk matrix for each of the five cases developed during the within-case analysis shows the effects of organizational changes made by the oil companies with respect to risk exposure and risk impact (Figure 5, Figure 8, Figure 11, Figure 13 and Figure 15). These changes are not plotted for the individual oil company but are grouped under the types of oil companies. The types of oil companies, MOC, NOC and independent oil company, have been described in the cross-case analysis and summarized in Table 15 on how they manage risk. The initial points marked on the risk matrix represent the risk positions of the oil companies prior to the organization changes. These initial placements are

supported by the background details of the fuel retailing sector that took into account the constraints placed by the country on the oil companies.

Examining the risk matrices across the cases, these initial placements are in the low-risk-exposure, high-risk-impact quadrant for those operating COCO model (eg: Singapore S1 - Figure 5), low-risk-exposure, high-risk-impact quadrant for the DODO model (eg: Indonesia I2 and Philippines P3 - Figure 8 and Figure 15) and in the middle of the risk matrix for the CODO model (eg: Malaysia M2 and Thailand T1, T2 - Figure 11and Figure 13). This is consistent with the general view by interviewees that the risk positions of the COCO and DODO models are at the extreme ends and that the CODO model is in between these two models. The initial placements show that oil companies avoided two quadrants on the risk matrix, the high risk quadrant and the low risk quadrant.

The effects on risk management of the organization changes are shown on the risk matrix by the shift in positions as indicated by the direction of the arrow. A shift to the right or left indicates that the change in the organization structure lowers or raises risk exposure respectively. A shift downwards or upwards indicates the change in the organization structure lowers or raises risk impact respectively. The risk matrix shows that the organization changes for the five cases generally lower the risk exposure or lower the impact from risk events. This pattern is more obvious with the risk matrices of five cases are placed side by side (Figure 26), as one can then notice that the arrows generally point to the right and/or downward.

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Figure 26 Risk matrix of cases
Source: author
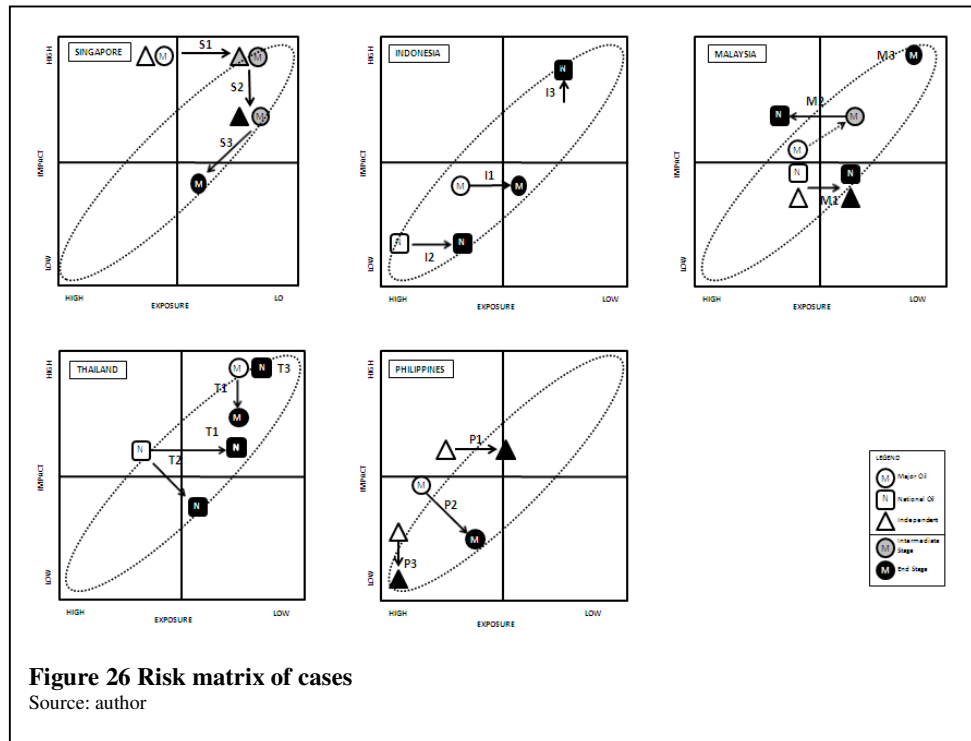
The correlation from the pattern is not perfect as there are anomalies with the organizational changes for two cases. The first anomaly is the use of alliances in Singapore such as using convenience store specialist to operate the fuel retail stations. This organizational change increases the risk exposure for the oil company (Singapore S3 - Figure 5 and Table 5). However, this organizational change is implemented to lower the risk impact by getting these alliance partners to absorb the risk impact associated with convenience retailing. The other anomaly is the case of the sales of ExxonMobil's network to Petron in Malaysia (Malaysia M2 - Figure 11 and Table 9). The sales did not include many of the supporting roles which have been centralized by ExxonMobil. As a result, Petron ended up in a worst position on the risk matrix relative to ExxonMobil's original position.

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This pattern of regularity observed with the risk matrix is unlikely to be observed by the existing empirical studies attempting to find the relationship between organizational structure and risk or uncertainties. This is because the existing studies try to classify risk preferences of the players or the type of risks faced by the players in the sector. For example, one of the academic approaches is to associate the risk preferences of the economic players to the choice of organizational structures (Cheung, 1969; Hanumantha Rao, 1971). Since the economic players are not individuals but firms with multiple decision-making individuals, it is unrealistic to aggregate the risk preferences of multiple individuals to represent the risk preference of a firm (Simon, Herbert and Associates, 1986).

6.1.2   Dealing with risk

The pattern that emerges from these cases highlights an approach to dealing with risk that is very different from the typical approach of risk mitigation. Typically, when the risk matrix is used to mitigate risks, a risk assessment is first performed to identify situations in the high-risk zone. Technology and hardware are then added to resolve the situations in the high-risk zone and moving them to a low-risk zone(Figure 27). For example, a steel tank has greater risk of leaks from corrosion with increasingly more years underground and the risk assessment under the Underground Risk Management (URM) programme will place older steel tanks in the high-risk quadrant. The risk exposure is lessened by replacing the steel tank with a double-walled tank. A double-walled tank has the steel tank wrapped completely with a fibre-glass jacket that will reduce the corrosion of the steel tank. This lowers the probability of leak and hence this improvement moves

the risk away from the high risk zone. If the tank cannot be replaced or it is too expensive to do so, the alternative method would be to put sensors underground near the tank that can detect the presence of fuel. This sensor tied to an alarm then alerts the site operator in the event of a leak for quick corrective action. This limits the size of the leak and reduces the impact of the adverse event by restricting the leak to the fuel retail station.

In summary, the action to reduce risk exposure is shown visually on the risk matrix by moving its position from the left side towards the right. The action to reduce the impact of risks is represented on the risk matrix by moving downwards. The aim of risk mitigation is to eliminate the source of the risks, control the exposure to risks or provide barriers to avoid the risks so as to move the situations towards the low-risk zone, the quadrant at the bottom left of the risk matrix (Figure 27).

Figure 27 Typical approach in risk management
Source: Author
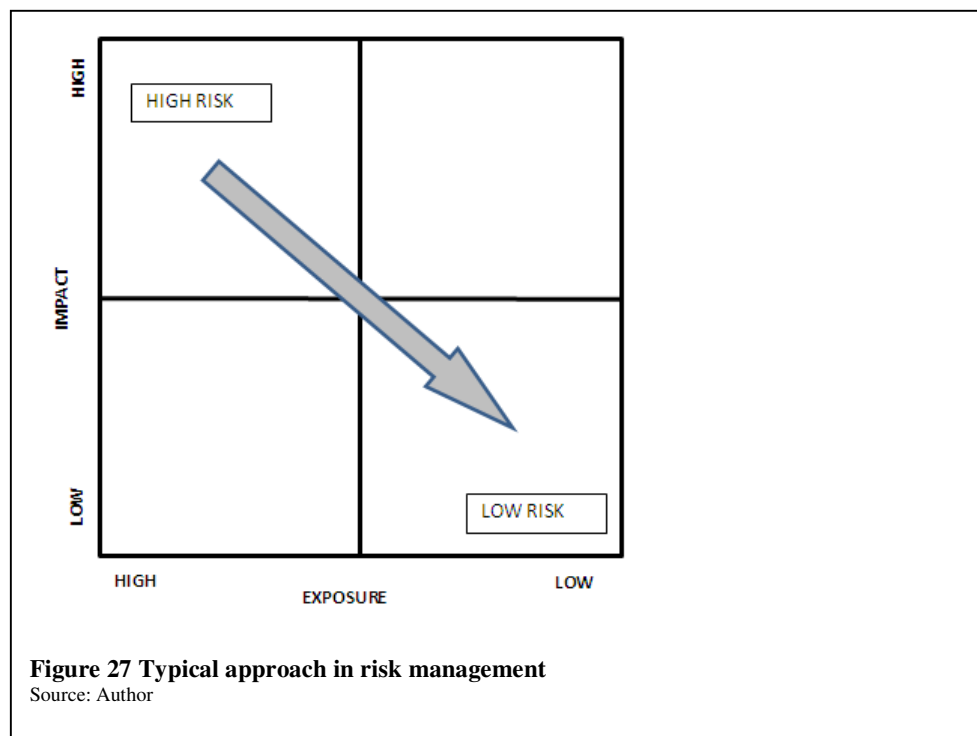
In contrast, the pattern that emerges from the five cases shows that the initial organization structures are not in the high-risk and low-risk quadrants. Subsequent organizational changes are implemented by the oil companies to reduce risk exposure and minimize risk impact but these are still implemented to keep the risks outside the high-risk and low-risk quadrants. This initial and final positions after organizational changes are within the shaded oval area on the risk matrix in Figure 28.

This approach to risk management through the use of organizational structures as observed from the risk matrices and within-case analysis differs from the typical approach of risk mitigation in two ways. The first difference is that the base organization structures are already designed to avoid the high-risk and low-risk quadrants. The second difference is that the changes to the organization structure

Figure 28 Risk management - modifying industry architecture
Source: Author
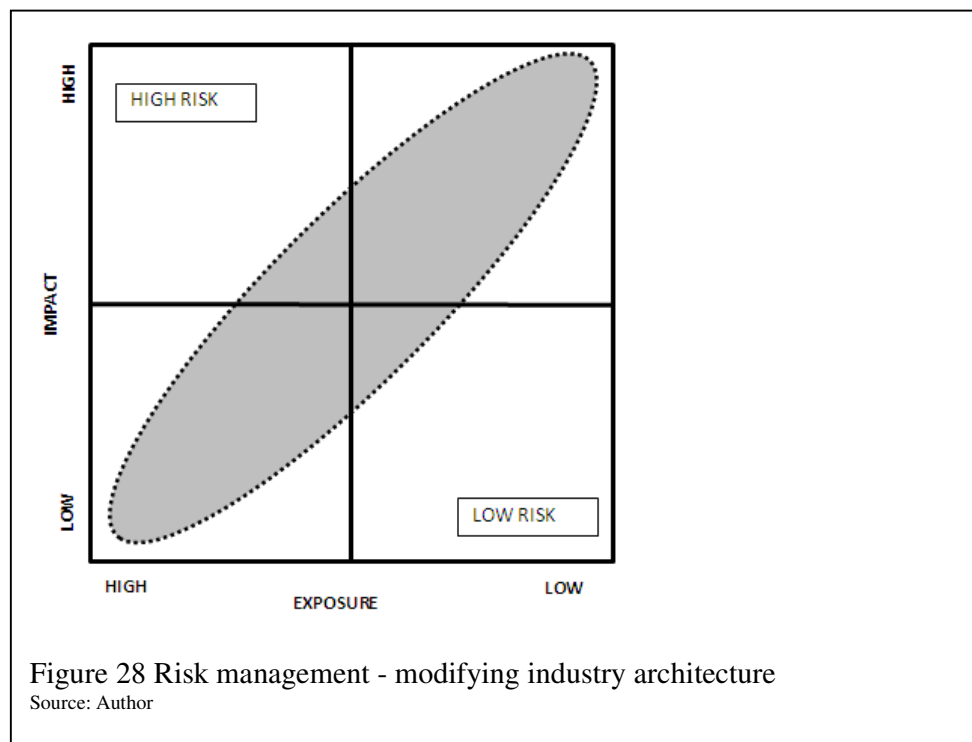
to avoid are made to reduce risk exposure and minimize risk impact but not to the extent of moving the risk position of the oil companies into the low-risk quadrant.

Although being in the high-risk quadrant provides the best financial returns for the players willing to take higher risk, the returns can be easily wiped out by a bad incident with high impact. Likewise, being in the low-risk quadrant may not give any financial returns to each player as the earnings are diluted by sharing the revenues with more players taking up the additional roles needed to reduce the impact of risk events. Rather, players modify their organization structures to manage risks by selectively integrating roles, segregating roles, sharing risk with specialists and centralizing services. As a result, this approach results in the organization structure of the sector having multiple and different endpoints on the risk matrices after the organization changes.

6.2   **Managing risk leads to multiple level of industry architecture**

The pattern that emerges from the cases plotted on the risk matrices suggests that risk management is the reason for the vertical disintegration of the sector. But this inference from the pattern has to be supported by the evidence provided by the cases and replicated across the cases. The following discussion summarizes the details of the within-case and cross-case analyses. I argue that the vertical disintegration of the sector is the result of risk management by the players in the dominant role of the guarantor of quality in the industry architecture.

The fuel retail sector did not start with one integrated organization structure but from three base organization structures, COCO, CODO and DODO with each structure having a different risk-sharing proportion among two players, the oil company and the station operator. There are also three types of oil companies, MOC, NOC and independent oil company, operating in SE Asia and each has different ways to organize the sector to manage risk. There is more than one way to modify the organization structure to manage risk such as integrating roles, segregating roles, sharing risk with specialist and centralizing services. There is also a trade-off from either reducing the risk exposure or by minimizing the impact should a risk event occurs. The result from the combinations of the types of oil companies, the base organization structures and the different ways of modifying the organization structure to manage risk has led to the vertical disintegration of the sector.

6.2.1   The base organization structure and types of oil companies

The cross-case analysis also shows that the organization structures in SE Asia are based on the three base organization structures, COCO, CODO and DODO. Each of these organization structures has a different proportion of risk-sharing among the players. In SE Asia, the COCO model is perceived to be more superior especially in reducing risk exposure. The COCO organizational structure has incorporated the procedural checks, engineering controls and periodic audits that identify and stop potential risk events. These processes to manage risk are possible because all the roles are kept within the COCO organization. Unlike the COCO model, the DODO model permits the dealers to own the fuel retail stations, pay for the fuels upon delivery and use their own procedures to manage the fuel

retail stations. The oil companies can therefore detach themselves from any involvement with the DODO stations such that any risk incidents are borne by the dealers. The traditional risk-sharing organizational arrangement for fuel retailing is the CODO model. Under this model, the oil company invests in all the land, structure and equipment and appoints a dealer to operate and be fully responsible for all the operational risks at the stations. In other words, the risks associated with fraud, leaks and accidents are borne by the dealer. The oil companies only have to bear the risks associated with equipment failure.

The cross-case analysis also shows that the three types of oil companies operating in SE Asia, MOC, NOC and independent oil companies react differently to the constraints imposed on them. The constraints especially those from regulations are not only different across the countries but these are also imposed unequally in some countries on each type of oil companies. These constraints are perceived as operational risk and accordingly, each type of oil companies will take different routes in organizing their network of fuel retail stations to manage this risk. MOCs proactively modify the organization structure to manage risk in order to protect their global brands. Even with preferential governmental support, NOCs have to protect their networks in their home country against operational risks. This is especially important when the deregulation of the fuel sector allows competitors into the sector. The independent oil companies may have less concern about risk when they are small and thus modified the organization structure so as to reduce investment and recurring operating costs. But as they gain bigger share of the market, they have to organize their networks to reduce risk exposure and impact.

6.2.2 Role of the oil companies as guarantors of quality

The main business line of fuel retailing has remained essentially the same even though the sector has evolved to be more complex with the addition of new backcourt businesses and adoption of new technologies. Therefore, the addition of new players to handle these new activities and tasks into the sector seems obvious as the reason for the vertical disintegration of the sector. However, this reason does not "ask the question of whether firms can choose whether to make or buy" (Jacobides, 2005, p. 467). This simplistic reason is insufficient as the analyses of the fuel retail sector shows that the oil companies can choose not to add new players and instead take up the new activities and tasks as internal functions.

But why should this choice of allowing or disallowing new players into the sector be up to the oil companies? To answer and support this, we have the suggestion that participants in sector fought to be the guarantors of quality so as to "keep a large part of the industry profits by carving out a comfortable position in their sector" (Jacobides, Knudsen, & Augier, 2006, p. 11). The academic literature and trade literature both show that the oil companies fought to be in this role (Hidy, 1952; Dixon, 1964; Bougrine, 2006; Kliet, 2005; Reid, 2004).

The players in their role as guarantors of quality, while receiving the larger proportion of the profits, are also responsible for the larger proportion of risk in the sector. In the case of the fuel retail sector, oil companies in this role as the guarantors of quality have to undertake a larger proportion or even all the risks. But as discussed earlier, managing risk may entail carving up roles, including internal roles, to be given to the third parties so that impact from a risk event can

be shared. But this means that there is a trade-off between reducing risk exposure and minimizing risk impact and that making the wrong trade-off may undermine the oil companies' positions as guarantors of quality.

6.2.3   Modifying organization structure to manage risk

As discussed in the cross-case analysis, new roles are added when the fuel retailing sector evolves to include backcourt businesses, incorporate increased use of technology and cater to new consumer's habits. These additional roles provide the oil companies with the opportunity to organize the structure of the fuel retail sector. The oil companies can have these roles added internally as a function within their organization or have these roles taken up externally by third parties. The pattern on the risk matrices shows that the organization structures are modified by the oil companies at the level of roles in order to manage risk. There are several ways detailed in the analysis on how the oil companies modify their organization structure at the role level to manage risk. These are summarized below.

a)   <u>Integrating control and supervisory roles to reduce risk exposure</u>

The COCO organization structure is designed with internal supervisory roles in the oil company that reduce the exposure to risk. This model is described in the within-case case of Singapore (Singapore S1 - Figure 5 and Table 5). This model is considered to be more superior by many oil companies in SE Asia. For example, PTT continued with this model when they bought over the network from Conoco (Thailand T3 - Figure 13and Table 11). Pertamina added fuel retail stations under the COCO model to match the competitors following deregulation of the sector

(Indonesia I3 - Figure 8 and Table 7). These COCO model has the roles that provide the monitoring, training, coaching and auditing of employees deployed to operate the fuel retail stations. These roles help to reduce the exposure to the risk from frauds, faults and accidents. Such roles are frequently omitted in the CODO and DODO arrangements as the CODO and DODO dealers are given the task to implement these activities for their fuel retail stations. Instead of moving to the COCO model, NOCs and the independent oil companies adds these supervisory roles for their CODO and DODO fuel retail stations to get the same protection against frauds, faults and accidents. An example would be Pertamina using an external auditor to monitor their DODO stations (Indonesia I2 - Figure 8 and Table 7). In the case of Malaysia where the oil companies are restricted from operating the network directly, MOCs maintain one station each under the COCO model to set the operating standards and trial new business concepts at this fuel retail station before deploying them throughout the network. This is done to reduce the risk of introducing new business concepts (Malaysia M3 - Figure 11and Table 9).

b) <u>Segregating roles to minimize risk impact</u>

By segregating the staff at the fuel retail station from the station operator or the oil company, the oil companies can reduce the full burden of risk when operating directly. An example is the use of professional station manager to handle station operations under the COCO model in Singapore (Singapore S2 - Figure 5 and Table 5). In Thailand, the risk associated with manpower is reduced and mitigated by using a separate subsidiary to provide the pump attendants and cashiers (Thailand T1 - Figure 13 and Table 11). In Philippines, the micro-filling station

concept reduces risk impact by having each small fuel retail station operated under a family arrangement (Philippines P3 - Figure 15 and Table 13). Other arrangements to reduce operating risk include using security guards to collect, count and deposit cash and logistics-company to handle fuel delivery and (Singapore S2 - Figure 5 and Table 5).

c) Sharing risk burden with specialists

Another way to reduce risk is to insert a role between the oil company and the myriad of supporting players. This new role is usually assigned to a specialist that can undertake the burden of risk on behalf of the oil company. An example of this is the use of asset managers by two MOCs, ExxonMobil and Shell, to handle the construction and maintenance of station equipment for their networks in SE Asia (Singapore S2 - Figure 5 and Table 5). This same approach can also be used for managing day-to-day operational activities. These two MOCs have also formed alliances with convenience store specialists to operate entire stations in Singapore (Singapore S3 - Figure 5 and Table 5). An extreme case of this approach would be the use branded marketers by Chevron (Philippines P2 - Figure 15 and Table 13). In this case, Chevron introduces these third parties to take over all the retailing activities under its brand. This can only be implemented in countries without the strict liability of making the oil company answers for every adverse event.

d) Centralizing roles to offload risks to third parties

The use of modern technology such as communication over the internet has provided new ways for oil companies to manage a network of fuel retail stations. Many common services for a fuel retail network can be centralized so that these

tasks are handled remotely. The centralization of services is no longer implemented simply for efficiency as they are often done to reduce risk exposure. This is illustrated by the organization of regional support services such as the wetstock centre in Bangkok by ExxonMobil and Centre of Excellence by Chevron (Singapore S3 - Figure 5 and Table 5). Third party service providers are also coming in to take over the complete support services such as wetstock monitoring and help desk for retail automation. In taking up the services provided by these third party service providers such as the professional card processing centres, oil companies can offload the risk that they face in keeping these services in-house (Malaysia M1 - Figure 11 and Table 9).

6.2.4 Concluding remarks

The high-level differences from the types of oil companies and the base organization structures indicate that risk management as the motive in structuring the organization in the fuel retail sector. Although the three base organization structures are contractually different especially in terms of the oil company's responsibility for adverse events, the fuel retail stations are not differentiated clearly to the public. This is because in trying to project their brands and to maintain the role as the guarantors of quality, oil companies create the impression that every detail at the fuel retail station is mandated by them. This public image makes it difficult for the oil companies to avoid responsibility, especially moral responsibility, when an adverse event occurs at the fuel retail station regardless of the organizational structure. In addition, the regulations in some countries do not separate the station operator from the brand provider even when the burden of risks is clearly delineated in the contract. As the sector evolves and matures, this

need to manage risk becomes more important. Accordingly, this research shows that the oil companies modify the organization structure to reduce risk and minimise risk impact.

An oil company can use more than one organization structure in a single country as a way to manage risk. It can also manage risk by modifying the organization structure at the role's level. Roles can be modified to be taken up by players to lower exposure to risk or inserted between existing roles to minimise risk impact. This provides many possibilities in arranging the players and roles in the sector. It is the combination of the different approaches to lower risk exposure and to minimize risk impact that led to the multiple levels of industry architecture.

This research suggests and supports with the evidence presented in the cases that the fuel retailing sector in SE Asian countries operates with multiple levels of industry architecture as a result of organizational changes made by oil companies to manage risk.

6.3   Contributions and limitations

6.3.1   Contributions

This research makes the following contributions. The existing literature is focused on the characteristics and issues of the North American fuel retail sector. I have provided the characteristics and issues that are observed in SE Asia's fuel retail sector. I have introduced into the cross-case analysis the different types of oil companies operating in the fuel retail sector and the constraints placed upon them

by the host countries. I have detailed the roles of many other players in the fuel retail sector contributing to the value chain. I have argued that it is insufficient to analyse the fuel retail sector on a model based on two economic players consisting of the dealer and the oil company. Therefore my contribution is to change the approach when evaluating the effect of risk and uncertainty on organizational structure. Instead of focusing on the type of uncertainty or the risk preferences of the players, this research focuses on the oil companies' approaches in managing risk.

The study reveals that there are many ways to organize the fuel retail sector to reduce exposure to risk and to minimize the impact should such adverse event occurs. It is these different ways of organizing to minimize risk by the different types of oil companies operating under different constraints that led to the sector having multiple economic players combined in different ways. The study also suggests that an oil company can use more than one organization structure in a single country as a way to manage risk even under the same constraint of the host country. The oil company can modify the organization structure at the level of roles. Roles can be split or consolidated in such a way that the modified roles can be taken up by players to lower exposure to risk. Alternatively, roles can be added and inserted between existing roles so as to minimise risk impact. The key contribution of the research is to suggest that the oil companies modify the organization structure in order to manage risk. It is the combination of the different approaches to lower risk exposure and to minimize risk impact that led to the multiple levels of industry architecture.

6.3.2 Limitations

This study has several limitations as this research is based on the qualitative approach for a specific business sector in a region with information gathered through interviews by a single researcher. The research may also be biased because of the experience and qualifications of the researcher. The interpretation may be skewed towards a technical viewpoint because of the current job role of the researcher.

The analysis is based on the fuel retailing sector and risk management may not be as important in other business sectors or even in other retailing sectors. Fuel retailing is unique and different from general retailing in that it involves specialized equipment in dedicated locations to sell and deliver a product that is potentially combustible and dangerous into the customer's vehicle. This makes risk management a critical requirement in the fuel retail sector. Since risk may be less important in other sectors, this result cannot be generalized to all other sectors.

The study compares the information from five countries with fuel retail networks that were established more than fifty years ago. The characteristics and issues of a matured sector in these countries are certainly different from the characteristics and issues of the sector in countries that are just starting to develop their fuel retail industry. The risk exposure and impact of a risk event faced by a newly developed sector will be different and risk management may not be as important. Therefore the findings cannot simply be extrapolated to another region that has fuel retail networks at a different stage of development.

The study may be limited by the period of the study and may be relevant for this period only. The period from 2000 to 2013 marks the era when the MOCs were shifting their priorities to the upstream segment which resulted in the consolidation of the downstream segment and that included the consolidation of the fuel retail sector. It is also during this period that the national oil companies gained prominence operating in their home country. Thus, the effect of the risk management is relatively weighted towards the changes by outgoing MOCs and strengthening NOCs. The cross-case analysis also points to the growing number of independent players and as such the future effect of organization changes may be skewed towards the actions of these independent oil companies.

6.3.3   Alternative explanations

There are other explanations offered by the interviewees as possible reasons for the organization changes. It is not unusual to get very diverse views from interviewees and Jacobides suggests several techniques to deal with these "unsupported arguments" (Jacobides, 2005, p. 469). The two usual reasons offered are efficiency improvements and the gains from specialization. These were the official reasons given by the interviewees for some of the organizational changes during formal interviews. During informal discussions, these same interviewees offered risk management as the alternative reason for the same organizational changes. The discussion here will explain why risk management is the more likely reason and the underlying motive for the organization changes.

6.3.4 Efficiency reason

The efficiency reason is often given for organizational changes accompanying increased use of retail automation and centralized services. However, retail automation and centralized services for the fuel retail sector were introduced together with an even larger support and monitoring team. Many tasks such as monitoring the inventory of the fuels in the underground tanks are part of the station operators' original duty and the procedures have been perfected over the years. Monitoring fuel inventory serves two purposes. One purpose is to plan for fuel replenishment of the fuel retail stations. A central location receiving inventory data from the fuel retail stations can use the information to improve the efficiency of the terminal such as optimizing the despatching of tankers to replenish fuels for the network. The other purpose is to monitor the inventory variance between the amount of fuel received from the terminal and the amount of fuel sold. The station operator monitors the inventory variance to ensure that the underground system is not leaking, the meters at the station are calibrated and fuels are not being stolen. Having the variances for all the fuel retail stations sent to a central location does not improve efficiency since the inventory variance of one station is usually not useful for another station.

In summary, the centralized monitoring of the underground tanks from Bangkok by ExxonMobil's own wet-stock centre adds more recurring costs, specialized equipment and increases manpower. Similar programme by Chevron and Pertamina incur even higher recurring costs as this task is outsourced to third party. Therefore this type of organizational changes cannot be done for efficiency reasons. It is done primarily to manage risk especially when the programme is

implemented only for stations operated directly by the oil company and is not extended to dealers that have the legal responsibility for ensuring the integrity of their underground tanks.

The efficiency reason is also not supported by the retail automation programme implemented by the independent oil companies in Philippines that have smaller networks. These independent companies have implemented systems that allow them to retrieve transactions across their networks and gather them in a centralized location. The purpose of such systems is primarily to monitor fraud and adulteration of fuel. The savings from efficiency for a small network cannot offset the initial investments and recurrent costs of a centralized system.

6.3.5   Gains from specialization

The other reason for the organizational changes is the gains from specialization by forming alliances with specialist players and outsourcing tasks to third parties. The oil companies have successfully introduced and managed their own brands of convenience store. While these oil companies originally did not have the skills to operate convenience retailing, they have acquired those skills by hiring and forming teams internally that specialize in convenience retailing. Thus the motive for forming alliances with convenience store specialists to take over the operations of the fuel retail network cannot be to realize the gain from specialization. In giving up this role to form alliances with convenience store specialists, the team that the oil company had groomed to manage the own convenience store has to be disbanded.

Common services can be shared among the oil companies and there are gains from specialization with a single party providing the same service to all the oil companies. However, this is not the case in actual practice. An example of realizing gains from specialization would be getting a specialist to operate a common terminal and using a logistics company to deliver fuel to the fuel retail stations. But terminals in SE Asia are considered core business by the oil companies and are not shared. Although tanker trucks are outsourced to logistics companies, these trucks are dedicated to each oil companies and have to follow the exact procedures dictated by the oil companies. The restrictive arrangement shows that the oil companies outsource the task in order to manage risk rather than to gain from the specialized skills of logistic companies.

6.4 Implication of research findings

The research shows that oil companies can implement more than one organization structure in a single country as a way to manage risk. The larger players, specifically the major oil companies, are increasingly organizing the fuel retail networks preferentially to avoid the impact of risk incidents instead of organizing the network to reduce the probability of incidents occurring. These oil companies spread the impact of risk events by sharing this with multiple specialist players, on the assumption that these specialist players will be responsible in the event of a risk incident.

However, letting third parties monitor and respond to risk event especially those risks relating to safety and environmental protection can be potentially dangerous.

These third parties may not be as competence as the oil companies and the division of responsibility among multiple players may result in some areas of risk being neglected or left unmanaged. Thus, policymakers and regulators must take this restructuring approach into account when setting and implementing policies and standards.

7 CONCLUSION

This research covers the industry architecture of the fuel retailing sector across five SE Asian countries. While it may not be surprising that the industry architecture would be different among the heterogeneous countries, what is unusual is that it is also different within a single country and that an oil company will also use a mix of organizational structures or multiple levels of industry architecture within the same country. The research shows that oil companies organize the network as a way to manage risk. Risk can be managed by lowering the likelihood of a risk event happening and by minimizing the impact should such an event occur.

The oil companies do not have to bear the full burden of risks. An industry architecture that is structured to predominantly lower the likelihood of a risk event is very different from industry architecture structured to shield itself from the full impact of risk events. In the example of the fuel retailing sector, risk exposure was reduced by operating fuel retail stations directly whereas impact from risk was lowered by operating with multiple independent partners. Similarly, risks can be shared among equal partners by bearing responsibilities according to their respective areas of expertise. But there is a trade-off in each of the choices such as the amount of revenue and profit that have to be shared or in the amount of cost and effort expended to keep the risk at bay. It is this balancing act that oil companies vary the organization structure to manage risk, even within the same network.

As the fuel retailing sector evolves, the supporting roles may become more prominent. The emergence of convenience stores in the fuel retail station has led to the convenience store operator replacing the dealer as the key role at a fuel retail station. Similarly, the trend for customers to use payment cards at the pump may result in the financial industry taking a higher profile at the fuel retail station. Even the telecommunication sector may play a bigger role when the more secured payment using the near-field communication (NFC) feature of mobile phones becomes prevalent.

The move to an asset-light operating model has also crystalized the concept of renting assets instead of paying for the assets needed to operate a fuel retail station. Some oil companies are looking at paying a per-transaction fee for cloud-based information system so as to move away from owning and having to regularly upgrade their automation systems. This suggestion of lowering investment capital can be extended to a network of fuel retail stations with all equipment and land funded by a financial investor, thus replacing the traditional concept of a network of fuel retail stations owned by an oil company or his dealers dedicated to the sale of fuels.

This research shows that the academic model of the two economic players in the fuel retail sector consisting of the oil company and the station operator is less useful in explaining organizational structure as the sector evolved. The fully unattended fuel retail station is already a reality in some countries. The oil company has gone back to the old days of being a wholesaler and it is no longer necessary for the dealer to be physically present at the fuel retail station. Those

support roles have taken over the main roles in recognition of the importance of operational tasks such as replenishing the tanks with fuels, keeping the retail automation system running, monitoring the underground fuel system, moving the payments to the banks and ensuring that the equipment are well maintained. The fully unattended fuel retail station is therefore operated by the set of players taking up these support roles and eliminating the role of the dealer.

The impact on industry architecture uncovered by this research may be applicable to other industries. A number of industry sectors have also evolved similar models to manage their outlets spread across nations. The hotel industry has moved from the traditional company-operated hotel chains to the franchise model. The franchise arrangement for hotel is not unlike the DODO model in fuel retailing. Besides company-operated and franchised hotels, the brand owner of hotel chain also manages hotels owned by individual investors or investment funds that lack the skill to do so. This is different from the CODO model in fuel retailing in that ownership and operatorship are swapped and may be appropriately termed as DOCO. Franchising has become a popular model for players in the retail sector such as McDonalds, 7-Eleven and Subway to expand their network and avoid the investments and liabilities associated with a traditional company-owned, company-operated chain.

Just as in the fuel retailing sector, examining the business models of the sector does not give a complete explanation of vertical disintegration. Only through a close examination of the industry architecture can we see that some roles are under threat of being taken over by other firms. For example, "The Economist"

described a virtual hotel that was leased from a property firm by an individual or an investment fund who then engaged a well-established hotel franchisor or a hotel management firm to operate the hotel, with staff supplied by a manpower firm and with a restaurant under the care of an external caterer (The Economist, 2009).

Going forward, there are four case studies that may prove fruitful for future research. The first would be a detailed case study on the takeover of the ExxonMobil network in Malaysia by Petron (San Miguel Corporation, 2011). The second would be a case study on the takeover of BP network in Malaysia by Boustead Holding and renamed BHPetrol. These two case studies can be contrasted for the organizational differences between independent oil companies after taking over the network and staff of the major oil companies. Can Petron compete by imposing the Philippines's industry architecture against BHPetrol maintaining the already tested and localized industry architecture? The third would be the takeover of the Conoco-Philips retail network by PTT and renamed PTT-RM. This will show up the organizational differences between a major oil company and a national oil company within the country. Lastly, there were a few failures of oil companies setting up fuel retail networks in SE Asia, Conoco-Philips in Thailand and Malaysia and Petronas in Indonesia, Thailand and Philippines, and these cases may be used to understand the negative consequences of using the inappropriate industry architecture.

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APPENDIX A

1. <u>Request for access into company's database of information</u>

From: Tay, Kwong Kiat   Sent: Thu 22/05/2008 09:19
To: Yap, Francis
Cc:
Subject: PhD

Hi Francis

I have been accepted as a part-time candidate for PhD at NUS. Tentatively, I will be exploring the subject of Global Product Development by Global team. I will be funding the study myself. I will do most of the research/study outside office hours. However, I may occasionally have to attend seminars and conferences relating to the above. Generally, the first part of PhD is to prepare for the qualifying exam.

Since the subject is very close to the work that I am currently involved in, I may study the company's approach (Danaher's) in this area. If I need to use data (usually source of data is hidden in academic papers), I will seek the company's permission first.

Thank you for your understanding.

<We are now on Microsoft Exchange. Please reply to kktay@veeder.com>

Regards
Tay Kwong Kiat
Technical Director
Gilbarco Veeder-Root Asia Pte Ltd
HP: 96170113

2. <u>Request for interview</u>

From: Tay, Kwong Kiat   Sent: Fri 01/06/2012 15:34
To: susan.yu@
Cc:
Subject: PhD

Hi Susan

How are you doing?

I need a favor from you. I need to talk to you for about an hour or less as part of my research. I know you have been travelling and I am travelling as well. Next week, I am in KL to catch up with your folks in KL (Jacob, Raymund Borromeo, Anwar, Zamri). So if you are in Singapore in the second half of the month or in June and have an hour to spare, please let me have the time to talk to you.

Let me provide a bit of background of my research. Since I am in fuel retailing, I have opted to contribute to the academic world my understanding of this business. My research focuses on the organizational structure of fuel retailing or in current academic lingo, the industry architecture of fuel retailing. I am trying to explain why there are the different structures (COCO, CODO, DODO) and how these relate to the MOC, NOC and independent in the SE Asia. I have picked 5 countries viz Singapore, Malaysia, Philippines, Thailand and Indonesia and the oil players (XOM, Shell, Total, SeaOil, Pertamina etc) in these countries.

I am doing what is known as "participant-observer" methodology. It is based mainly on using qualitative analysis ie interviews or equivalent. There is a process called "grounded theory building" which allow less formalized data gathering ie I don't have to be specific in my questioning. I am talking to many different oil professionals so as to find out some grains of truth. I have placed Petron as Philippines NOC. Petron, PTT and Petronas have crossed over to another country and I am interested in the challenges that you are facing. For example, will [   ] operate to meet the requirements (regulatory and standards) or to continue to operate in the same way as in the home country?

Best Regards

Tay Kwong Kiat
Technical Director

GILBARCO VEEDER-ROOT

3. <u>Request for verification of information</u>

From: [   ] <[   ]@total.com>   Sent: Mon 14/05/2012 10:08
To: Tay, Kwong Kiat
Cc:
Subject: Help on information

Hi Tay,

I have relocated to Jakarta since Feb. If you happen to be here I would be happy to discuss with you in person ☺. Else you can call me at + [   ]. All the best in your studies.

Regards, KK

From: Tay, Kwong Kiat [mailto:kktay@gilbarco.com]
Sent: Monday, May 14, 2012 8:48 AM
To: [   ]
Subject: Help on information

Hi [   ]

I am on a PhD program and doing my final stage. I have to verify some information about oil companies for my research.
Are you travelling this week? If not, I would like to pop by to have a chat with both of you.

Thanks in advance.

Best Regards

4. Sample:Transcript of a formal interview

Interviewee: G*** P***

Present Company: Chevron
Present position in company: ****
Company in fuel retailing: Chevron
Position in fuel retailing: ****
Date of interview: 2nd Aug 2011
Time of interview: 3:00pm – 5:30pm
Place: Chevron House, Singapore

Q. Please explain the term RORO that you have been using.
A. Three are 5 business models that we apply to retailing of fuel. These are
> 1) COCO – Company Owned Company Operated
> 2) COCA – Company Owned Commission Agent
> 3) CORO – Company Owned Retailer Operated
> 4) RORO – Retailer Owned, Retailer Operated
> 5) Branded Marketer

The COCO model is the same COCO model used by the other oil majors, namely ExxonMobil. We own the land and operate the site with our own staff.

The COCA model, Company Owned Commission Agent, addresses the issues relating to permitting and labour. We have an agent, basically a person who is assigned to hire a bunch of workers to operate the site. We pay these staff indirectly through this agent. [Comment from interviewer during conversation – Esso still uses the term COCO for this type of operations, even though it is clear that the agent, usually the station manager, and all the staff are not Esso employees.] This agent has to take up all the permits needed to operate the station. An example would be for him to take up the license to sell cigarette. He has to enforce the rules to maintain these licenses. If he breaks the law, say selling cigarettes to under-aged person, he gets thrown out and we find a replacement agent. We can continue to operate the site with the new retailer. The site is not barred from selling cigarette. [Comment from interviewer: In other words, the difference between this and COCO is to remove the risks associated with employment and licenses. <Agreed by interviewee>].

The CORO model, Company Owned Retailer Operated, is the typically dealer operated station with the land and structure still owned by us. This key to this model is that the station operator now owns the fuel, which is delivered to him. The fuel is at his risk but since we owned the site, we are responsible for the clean up.

The RORO model, Retailer Owned Retailer Operated model is similar to the DODO used by other oil majors. The site and the inventory of fuel belong to the dealer. However, fuel is still delivered to the station by Chevron. We use a third party hauler to do this but we have the liability for the fuel before it reaches the station.

Branded marketer is the way we are pushing into our network that can accept this model. This is not permitted in some countries where the law did not allow us to avoid responsibility even though we don't own anything. We do not even deliver fuel to these branded marketers. In other words, we collect money when they come and pick up fuel from the rack. In USA, they are called jobbers. The difference between branded marketer is that this is a player that may owned 50 to 100 sites while the RORO is typical a single site player. We can get the branded marketer to arrange for trucks to collect fuel from us.

Q: What the reason for moving into the branded marketer model?
A: I have been through the debate covering the vertically integrated oil business. Here, I mean the upstream and downstream. One school of thought is that the average weighted cost of funds is higher for the higher risk business and vice versa. Obviously the upstream has the higher risk. The theory is that the application of a single cost of fund would appear low for the upstream but high

for the downstream. For us in Engineering, this makes the appropriation of CAPEX for downstream harder. By the way, I was told ExxonMobil did not buy this theory.

This theory does apply to branded marketer model. The branded marketer has a lower cost of fund for being dedicated to this segment of the market. A further cost efficiency for them is that they can keep the network of sites to a locality. By having a HQ surrounded by sites that are within reach, these branded marketer can improve their cost position better than us as the oil major since we have to attend to a larger geographical spread.

We are also not subjected to any risk. There has been debate as to whether we can since our brand is still at the station. However, our lawyers have looked at this issue and found the differences in the application of liabilities. An example, say Canada, would make the oil company liable even though they claimed to have no ownership and do not participate in the operations of the site. Under this type of condition that we cannot escape the liability (the term used by the lawyer is strict liability), we will not have this arrangement as we are better off running the site to prevent incident. This can even be for a locality within a country. We have to operate directly in California because of the liability. We don't have to do in Nevada. Here, the branded marketer will have the advantage.

So, in summary, a branded marketer will have a lower average cost of fund, have a lower compliance cost and generally more efficient.

Q: Is this branded marketer model applicable for all the countries here?
A: No. This cannot be applied to Singapore and HK. The rules in these countries are well established and we don't want to change the stability of these operations. We will apply this branded marketer concept for Malaysia, Philippines and Thailand. The lawyer considered this to be of normal liability and if any incident happens, we may suffer some for our brand image but the people seem to have short memory.

We still will maintain a few COCA, CORA. This is to maintain expertise within the company.

Q. Why don't you sell off if this preferred model cannot be applied in, say HK? Is this because this would be too expensive to attract buyers?
A. Actually, I did propose that we sell off HK. Sinopec was outbidding everyone for sites in HK. I thought that we should sell and get out with a good price.

Q: What is your assessment on whether this model will be successful here?
A: It is hard to tell now. We have seen this applied in USA and the branded marketers are successful. They can even provide better service. One of the views was that the service level is worst in non-COCO sites. But this turn out not to be true. When the branded marketer becomes successful, they will start buying up the RORO.

Q: Do you mandate the equipment that the site has to buy?
A: No. That is why we are arranging for our suppliers to meet these investors (brand marketer owner) so that they can make their own decision on what to buy. The only thing we will mandate is the use of the POS system. The reason is that the common POS system will give the retailer the advantage of having a common fleet card and loyalty scheme. We can also use this to check on whether the branded marketer has been selling our oil.

Q: With the fuel being sold at the rack, there is no way you know if the branded marketer has been buying from others and selling under your brand.
A: Yes, but if they are caught doing this; we will dismiss them and remove our signage. Yes, the signage belongs to us. We will also mark our fuel. As you know, each oil company have special additives and we can easily check. We will conduct checks so as to provide deterrent.

5.   Transcript of a chat session

/// Start of chat message done via facebook on 23 Oct 2013.
Hi Anwar

 I did my thesis defence and encountered this question:

This is regarding stations under DODO that I believe XOM Malaysia and now Petron have a few of these in Malaysia. If the DODO dealers are not happy with the commercial terms working with, in your case, XOM and now Petron, cant they just switch to another oil company, say Shell or Petronas? What is stop them from taking fuels from the cheapest suppliers and do this as and when they like since they owned the site.Regards

Tay Kwong Kiat....

1:19pm
DODO dealers are bounded by the DODO agreement. In the case of DODO, we give them the brand to sell our products. Therefore they can only sell our products. The agreement is normally signed for 10 years. DODO dealers has to abide by this agreement. Normally we will caveat the land to ensure that dealers don't renege on their word. The terms are normally negotiated and trashed out before the agreement is signed.....

1:20pm
If they are not happy, they cannot walk away as we have caveated the land....

1:22pm
They cannot even sell the land?....

1:22pm
Not before the agreement expires and the caveat lifted.We invest in signages and some equipment like POS so investment is substantial.Cannot allow them to walk away like that....

1:24pm
So switching cannot and has not been happening, even they find a better deal say with Petronas.....

1:25pm
R u thinking of doing a DODO in Malaysia? It is viable u know. U can set up a Malaysian Pte Ltd company with some Malaysian share holders like me to do a DODO.Cannot switch flag before agreement expires....

1:26pm
No. Just to answer an academic question. Thanks.....

1:27pm
By the way Petronas don't do DODO....

1:28pm
Is this caveat way not too legal like the NDA?....

1:29pm
Caveat is a legal instrument that u put on a land that does not belong to you but you hv an interest....

1:30pm
Okay. I was given data that Petronas has a small number of dodo, about 10%.....

1:31pm

Those are not DODO. They are mini outlets or "white stations". We have them too and they come under our I&W business..Govt request Petronas to "adopt" them bcoz they serve the rural community.....

1:32pm
Oh the white pumpers. No brand on it, right.....

1:33pm
They used to hv no brands but when Petronas adopted them, they are now branded Petronas.But their retail std is still lagging. Bcoz these are mom pop operations....

1:35pm
With the brand, that force them to sell only Petronas. But being rural, I guess they can cheat.....

1:36pm
That is the problem. All oil cos don't like dealing with these mini outlets bcoz of the inherent risks like environmental hazards. But Govt has other priorities....

1:38pm
Thanks. Good info for me.