PROJECT VIABILITY FRAMEWORK FOR PRIVATIZED HIGHWAY PROJECTS IN MALAYSIA

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For my lovely wife, 'Ateeq Maisurah Hj. Mahmud, big thanks for the love, patient, support and understanding of my destination.

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ABSTRACT

The construction sector is one of the indicators of national economic growth and contributed in average of 4% annually to Malaysia's Gross Domestic Product (GDP) and 6% to the national economy between 1995 - 2015. The excellent of construction growth was mainly from projects implemented under the "Public-Private Partnership" (PPP) and through privatization. Under the 10th Malaysian Plan, 52 projects with an estimated value of RM62.7 billion will be implemented under Private Finance Initiatives (PFI) for infrastructure works. In fact, the privatization project involves the investment of huge amount of money and project viability depends on the revenue collected against the expenses incurred during the concession period. This research aims to evaluate the project viability and the correlation between the costs and revenue collected for the entire concession period. A comprehensive framework for project viability of highway privatization projects was developed based on the research findings obtained via the use of descriptive analysis and statistical technique analysis. Eleven (11) urban highway projects located in Klang Valley were identified to evaluate the project viability. The techniques of Life Cycle Cost (LCC) are used by the respondents in their projects. The research findings show the most preferred technique used by respondents are Internal Rate of Return (IRR) and Net Present Value (NPV). In sustaining the highway projects, the costs incurred during the concession period should be managed efficiently. The average expenses incurred by the companies for operation and maintenance cost were RM23.22 million and RM21.03 million respectively. Four (4) variables were used to evaluate project's viability and to identify variables which significantly correlated with the revenue of the project namely operation cost, maintenance cost, actual toll traffic, and revenue. Traffic volume was the variable that correlated positively to the revenue with 44%, followed by the operation cost and maintenance cost with 28% respectively. Traffic volume was the nucleus and dominant variable which contributed to the revenue of the project. Based on the NPV, seven (7) projects (63.6%) were found to be viable and four (4) projects (36.4%) were considered not viable. This research highlighted the viability of the privatized highway projects for an entire concession period. Based on the findings of the current study, a comprehensive framework for future project evaluation comprising of eight (8) components of commercial and technical evaluation for the privatization of highways in Malaysia is recommended.

ABSTRAK

Sektor pembinaan merupakan satu petunjuk terpenting pertumbuhan ekonomi negara dan telah menyumbang secara purata sebanyak 4% setahun terhadap Keluaran Negara Kasar dan 6% kepada ekonomi negara antara 1995 – 2015. Pertumbuhan yang memberangsangkan ini dipacu oleh pelaksanaan projek melalui kerjasama awam swasta (PPP) dan secara Penswastaan. Di bawah Rancangan Malaysia Ke 10, sebanyak 52 projek infrastruktur bernilai RM62.7 bilion akan dilaksanakan melalui kaedah Inisiatif Pembiayaan Swasta (PFI) untuk kerja –kerja infrastruktur. Pada dasarnya, projek penswastaan ini melibatkan modal pelaburan yang besar di mana daya maju projek adalah bergantung kepada pendapatan yang dikutip berbanding modal yang dibelanjakan sepanjang tempoh konsesi. Penyelidikan ini dijalankan bertujuan untuk menilai daya maju projek dan kolerasi antara kos yang dibelanjakan dengan pendapatan yang dikutip bagi tempoh konsesi. Satu kerangka kerja yang komprehensif untuk menentukan daya maju projek lebuh raya penswastaan dibangunkan melalui dapatan kajian dengan menggunakan kaedah analisis deskriptif dan teknik statistik analisis. Sebelas (11) projek lebuh raya dalam bandar di Lembah Kelang telah dikenal pasti untuk penilaian daya maju projek. Teknik Kos Kitaran Hayat (LCC) digunakan oleh responden dalam projek tersebut. Dapatan kajian menunjukkan bahawa teknik yang banyak digunakan oleh responden adalah teknik kadar pulangan dalaman dan teknik nilai terkini bersih. Bagi memastikan lebuh raya kekal berdaya maju, kos yang dibelanjakan hendaklah diurus dengan efisyen. Purata perbelanjaan oleh sesebuah syarikat untuk kos operasi dan penyenggaraan adalah antara RM23.22 juta dan RM21.03 juta. Empat (4) parameter digunakan bagi mengukur daya maju projek dan untuk mengenal pasti parameter yang menunjukkan kolerasi yang signifikan ke atas pendapatan syarikat iaitu kos operasi, kos penyenggaraan, jumlah trafik sebenar dan pendapatan. Jumlah trafik menunjukkan parameter yang memperolehi kolerasi positif iaitu sebanyak 44% disusuli kos operasi dan kos penyenggaraan masing – masing iaitu 28%. Jumlah trafik merupakan nuklues dan parameter dominan terhadap pendapatan ke atas projek. Berdasarkan nilai terkini bersih (NPV), tujuh (7) projek atau 63.6% didapati berdaya maju manakala empat (4) projek atau 36.4% adalah tidak berdaya maju. Kajian ini memberi fokus terhadap daya maju projek lebuh raya penswastaan untuk sepanjang tempoh konsesi. Berdasarkan kepada penemuan kajian semasa, satu kerangka kerja yang komprehensif bagi menilai daya maju projek lebuh raya penswastaan yang mengandungi lapan (8) komponen penilaian komersial dan teknikal disyorkan untuk digunapakai.

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LIST OF ABBREVIATIONS

BOT	-	Build, Operate and Transfer
CA	-	Concession Agreement
EPU	-	Economic Planning Unit
GSL	-	Government Soft Loan
HPU	-	Highway Planning Unit
KKR	-	Kementerian Kerja Raya
IRR	-	Internal Rate of Return
LCC	-	Life Cycle Cost
MHA	-	Malaysia Highway Authority
NEP	-	National Economic Planning
NPV	-	Net Present Value
PFI	-	Private Finance Initiative
PPP	-	Public Private Partnership
RMK	-	Rancangan Malaysia
WLC	-	Whole Life Cycle
CBS	-	Cost Breakdown Structure
BCR	-	Benefit Cost Ratio
FYRR	-	First Year Rate of Return
ROI	-	Return on Investment
HNDP	-	Highway Networking Development Plan
OPP	-	Outline Perspective Plan

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter is an introduction to a study on the economics and benefits of the privatisation of highways in Malaysia in term of project viability and value for money in the context of life cycle costing (LCC). It deliberates on the background of the problems, the research questions, the statement of the problem i.e. the specific issue and the aim and objectives of the study. It also highlights the significance and contribution of this study to the current body of knowledge and the motivation for carrying out the study. It also defines the delimitation or scope of the research. This chapter also provides an outline of the research methodology and the organisation of the thesis.

1.2 Problem Statement

Malaysia is a multi-racial and multi-religious country in South East Asia with a population of about 32.4 million people and a land area of 329,613 square kilometres. It is an economically successful country with encouraging economic and physical growth and development (Mydin et al., 2014). Apart from year 1997 to 2000 and 2006 to 2009 when it suffered serious economic downturns, the country has for the last 25 years recorded a favourable economic growth of about 6% per annum.

The period between 1995 to 2015 also saw a boom time for the Malaysian construction industry. It has recorded a growth of an average 4% annually and contributed about 6% to the national economy (Alaloul et al., 2016) like other developed country Australia contributes 3.5-5% (Pan and Thomas, 2014) and provided nearly 1,000,000 jobs to Malaysians so much so it was dubbed as "the engine of growth" of the country (Khan et al., 2014). It was period that saw the construction of many landmark projects such as the Putrajaya Township and Administrative Centre, KLCC, KL Tower, KLIA, the light rapid transport facilities such as the LRT and ERL, double trekking railways and network of high quality roads and highways that connect the major towns and cities in the country.

Many have suggested that the encouraging economic growth of the country since 1985 was attributed to the privatisation strategy and policy launched in 1983, two years after it was announced by the Prime Minister. In order to formalised the policy, the Economic Planning Unit of the Prime Minister Department produced a "Guideline on Privatisation" in 1985. Later, in 1991, it published the "Privatisation Master Plan". All these were the efforts to streamlined the privatisation policies and programmes towards the country's greater growth and development.

As mentioned by Jomo & Tan (1985), privatisation has been credited to enhancing economic growth of the country. Resources can be released for corporate expansion through efficiency gains. Growth can be generated by allowing private entrepreneurship in sectors that were previously monopolised by the government. Many of the privatisation endeavours in Malaysia involved projects with high capital costs and large externalities, which were once regarded to be beyond the capacity of the private sector. This was the reason for the state traditionally undertaking many of the investments in the first place. With increasing realisation that the private sector is incapable of solely bearing the financial costs and associated risks of sizable projects (such as infrastructure construction and provision of public services), the role of the state has become central in privatisation. A privatisation may improve enterprise profitability for the private owners concerned, although such changes may not necessarily benefit the public or consumers. Privatisation has been one of the strategies to improve Malaysia's economic growth.

In the Seventh Malaysia Plan (1991-1995) the privatisation programme has been accelerated and efforts have been made to strengthen the implementation process and procedures (Myeda and Pitt, 2014). The privatisation programme continued in the Eighth Malaysia Plan and by the 9th and 10th Malaysia Plans it became an important machine of growth for the country. It has been reported that the programmes have contributed towards the increased of the efficiency and productivity of the privatised entities, it has benefited the public and spurred the economic growth of the country.

According to Mohd-Noor et al. (2011), by the end of 9th Malaysia Plan (2006 – 2010), almost 514 nos. privatised and PPP projects in the transport, roads and highway, communication, health and energy sectors have been established (7MP, 8MP, 9MP). In the Tenth Malaysia Plan (2011 – 2015) 52 more projects valuing about RM62.7 billion were implemented under the privatisation and public-private partnership initiatives (Ismail, 2013b).

The Malaysian economy was challenged by the other factors internally or externally. The CIDB (2015/2016), recorded in 2015, the Malaysian economy faced a sequence of weak global momentum such as low prices in major national commodity, diminishing value of the Ringgit against major world currencies and the rise in consumer good's price. These factors did not adversely impact growth of our economy structure due to the comprehensive plan taken such as Economic Transformation Programme (ETP) and Government Transformation Programme (GTP). The achievement of economy growth and its performance by Malaysia recorded grew remarkably 5.0% (2015) instead of 6.0% in 2014.

Construction sector is continued to grow and is expected to growth at 7.9% in 2016. There are a following on going mega infrastructure projects and government's social projects. The mega projects such as Pan Borneo Highway, development of new township and the extension of the public rail transport during RMK11 will also contribute to the construction sector growth.

The construction sector predicted to be a prominent sector to contribute to the GDP. The construction sector will derive huge benefits from project development

activities over the 5 years duration of the RMK11. It was recorded in the second quarter, the number of project recorded by CIDB is 2,179 projects valued at RM590.0 billion.

For year 2014 – 2017, the performance of construction sector rapidly increased. The construction sector recorded a high percentage of the year. Table 1.1 below show the percentage of construction growth start 2014 to 2016 % 2017 (forecast):

Table 1.1:GDP contributed by construction sector

Growth by Economic Activity	**DOS**		**BNM**	**MOF**		**MIER**	
	2014	2015	2016*	2016**	2017*	2016*	2017**
Construction sector	11.7	8.2	8.1	8.7	8.3	8.2	9.1

Note: * (estimate) ** (forecast)

Source: DOSM, BNM, MOF (*ER 2016/2017), MIER

Table 1.1 shows the construction industry was consistently sustain by an average (including estimated and forecasted) of 8.9%. The percentage of growth shows that this sector was a main engine to contribute the GDP of our economy.

For instance, the performance of construction sector was sustainable in year 2016 with the amount invested was RM131.0 billion and increase to RM138.0 billion. See Table 1.2 below.

Table 1.2: Expenditure by each sector of Malaysia Economy

Construction Category	**RM Billion**	
	2016	**2017**
Government development projects	27.0	27.0
Housing projects	32.0	35.0
Commercial projects	12.0	13.0
Industrial projects	27.0	30.0
Infrastructure projects	33.0	33.0
Total	131.0	138.0

Source: CIDB, 2015/2016

The privatization program launched by the Government includes the privatization of roads and highways construction throughout the country. It started with the construction of North Klang Straits Bypass (NKSB) in 1983 which was undertaken by Shapadu Company Ltd. It was followed by the construction of the Jalan Kuching Highway by Kamunting Corporation Ltd. In 1986.

In 1977, the Federal Government decided to embark on the construction of a toll expressway from Bukit Kayu Hitam to Johor Bahru as a package of highway privatization. It involved the taking over of 350km of the North South Expressway which had been constructed by the Malaysian Highway Authority (MHA). After the successful completion of the North South Expressway (PLUS) in 1994, several more toll highways have been constructed. These include Shah Alam Expressway (KESAS), ELITE Expressway, Second Link Expressway and Penang Bridge.

After the successful completion of the North-South Expressway in 1987, several more toll highways have been constructed. These include the, Kesas Highway, Elite Highway, Linkedua Highway and Penang Bridge. By 2012, the total length of toll highways, federal roads, and state roads in Malaysia is 150,872.17 km (HPU, KKR, 2012). Out of these, 28 highways with a total length of about 1,731.1 km are privatised toll highways (MHA, 2012). By the end of 2014, a total of 1,798 km privatised toll expressway have been constructed in the country and thus ranking Malaysia as one of the best in Southern Asia, the third after China and Japan and the fifth in the world in term of highway construction and networking.

By 2020, the total length of toll highways, federal roads and state roads in our country is 150,872.17km (Highway Planning Unit, KKR, 2012). Out of these, there are 28 highways with a total length about 1,731.1km are privatized toll highways (MHA, 2012). In year 2014, a total length of privatized toll highways is 1,798km have been constructed and thus ranking Malaysia as one of the best in Southern Asia, the third after China and Japan and fifth in the world in terms of highway construction and networking (Mohd. Nasir, 2016).

In 2016, six (6) more highway projects are being constructed under the privatization and PPP programs. They are as follows:

i) Damansara – Shah Alam Expressway (DASH)
ii) Sungai Besi – Ulu Kelang Expressway (SUKE)
iii) East Klang Valley Expressway (EKVE)
iv) West Coast Expressway From Banting – Taiping (WCE)
v) Duta – Ulu Kelang Extension Expressway (DUKE2)
vi) Maju Expressway Extension From Cyberjaya – KLIA (MEX2)

As stated in the Privatization Master Plan 1995, the main objectives of the Government's Privatization Policy are as follows:

i) To relieve the financial and administrative burden of the Government
ii) To improve efficiency and increase productivity
iii) To facilitate economic growth
iv) To reduce the size and presence of the public sector in the economy
v) To help meet the national development targets

Meanwhile, the aim and objectives of the road and highways privatization policy have also been drawn to complement those stated in the Privatization Master Plan. The objectives of the highway privatization are as follows:

i) To provide an efficient network of roads and highways that can supplement the existing ones which had reached their capacity at the time
ii) To alleviate traffic congestion along the Federal Route 1 Corridor
iii) To facilitate a fast, uninterrupted, safe and comfortable ride that will save time and money to all the users

One the part of the Government, it expects the following from the privatization of highways are:

i) Efficient use of resources, saving of government funds and more efficient services for the citizens
ii) Reduce its financial burden and risk from the privatization of the construction, management, maintenance and operation of highways
iii) The capital facilities to be more effectively and economically designed, constructed and managed, thus giving the country a better road and highway systems
iv) Give value for money (VFM) to the customers and users in the forms of high quality, well maintained, safer network of roads and highways
v) Better travelling facilities
vi) Better accident and emergency services, and
vii) Significant reduction of travelling time

At the same time, a review of the terms and conditions on the concession contracts brought to light not only the rights and obligations of the parties such as government and the concession company, but also the scope and nature of services or facilities to be provided by the concession companies under the contract.

Emmannuel (2010) stated that the implementation of the privatised or PPP projects requires the involvement of the government and private enterprises. Private companies are unable to raise the funding to cover all project costs unless the toll charges are imposed to the road users. As far as the private companies are concerned, they are motivated by sustainable business and optimum profit.

They would expect that their investments will give them favourable return and value for money in the form of profit and a long-term business. At the same time, they are fully aware of the high, long-term risk that they have to assume when investing in a privatisation projects. These companies may gain their return from direct revenue collections i.e. toll collections, or from an amortised payment by the government for the capital and operational expenditures.

According to Kai (2004), in order for the private companies (operator) to be able to properly and effectively manage the required service level, they have to set out

a good capital expenditure strategy for the whole of the concession period i.e. for next twenty years or so. He also pointed out that the service levels for highways need to be based on long-term affordability. Maintenance aspects are also very important and should be planned thoroughly and effectively and be resolved through long-term financial aspects. Hence, the assessment of financially viability is considered crucial to ensure that a project is viable and profitable within a concession period.

As mentioned by Jomo & Tan (1985), privatisation has been credited to enhancing economic growth of the country. Resources can be released for corporate expansion through efficiency gains. Many of the privatisation endeavours in Malaysia involved projects with high capital costs and large externalities. A privatisation may improve enterprise profitability for the private owners concerned, although such changes may not necessarily benefit the public or consumers (Kwek & Ng, 2007).

On the part of the government, it expected return and benefits from the highway privatisation are exemplified by the aim and objectives of the privatisation of highways defined in the Privatisation Master Plan, 1995 and in the Highway Planning Blueprint 2010. They are further defined in the terms and conditions of the concession contract. The salient terms and conditions of Concession Agreement will be explained in Chapter 2.

Both the government and the private companies want the "best value for money" for their investment in the highway privatisation programmes. What does it mean by the best value for money? Best value for money can be described as the most advantageous combination of cost, quality, and sustainability to meet customer requirements. In other word, value for money means to achieve the best return and performance for the money being spent and that price is not the sole indicator of value. Best value for money has also been referred to as the best return gained from the investment within the costs that is in good quality, and is delivered within time to the client or company.

Based on the given definitions, it is pertinent to ask whether we are getting "the best value for money" for the investments in the highways i.e. *getting the best return*

and performance for the money being spent or getting the best return from the investment within the costs that is in good quality, and is delivered within time to the client or company.

Since the many of the privatised highways have been operating for more than 20 years, it is very apt to re-evaluate the return and benefits of the highway privatisation projects and determine whether we are getting the value for money. Based on the listed expected return and benefits and the given definitions, it can be deduced that in the context of highway privatisation in Malaysia, the best value for money is much concerned with the cost – capital, maintenance and operation, revenue, return and/or benefits – toll collections, facilities and services to be provided, sustainability, concession period, traffic volume, etc.

The value for money (return or benefits) from the investment can be said to be a function of concession period, traffic volume, cost (cost per kilometre) and revenue (toll charge per kilometre). The average concession period for various stretches of privatised toll highways are between 20 – 40 years. It is a long stretch of time, involving a long-term investment which is characterised by high capital cost, variable maintenance and operating costs, income uncertainty and high financial risk. Therefore, it is vital for the investors (both the government and concession company) to thoroughly and meticulously evaluate the viability (viable means able to exist successfully, workable and sustainable) of the project by forecasting the initial and running costs, return, benefits and sustainability of the investment over the concession period.

Another investment assessment technique which is also commonly used in construction projects is the life cycle costing (LCC), whole life costing (WLC) or some may call it life cycle cost analysis (LCCA). In the earlier days, it was called the "cost-in-use technique". It is one of the techniques used in value management exercise to assess the value of an asset over its entire life.

LCC has be defined by Business Dictionary (2015) as "the Sum of all recurring and one-time (non-recurring) costs over the full life span or a specified period of a

good, service, structure, or system. In includes purchase price, installation cost, operating costs, maintenance and upgrade costs, and remaining (residual or salvage) value at the end of ownership or its useful life".

According to Kirk and Dell I'sola (1981), LCC is an economic assessment of an item, area, or system of a facility that considers all the significant costs of ownership over its economic life, expressed in terms of equivalent dollars. Archna Moh (2016) defined Life cycle costing as "a system that tracks and accumulates the actual costs and revenues attributable to cost object from its invention to its abandonment. Life cycle costing involves tracing cost and revenues on a product by product base over several calendar periods. She also defined Life Cycle Cost (LCC) of an asset as "The total cost throughout its life including planning, design, acquisition and support costs and any other costs directly attributable to owning or using the asset". Above statement also echoing from the previous research conducted by Sarpin (2015) and Shari (2011).

As in the case of NPV and IRR, LCC or WLC has also its own merits and demerits and preference of usage.

The merits and demerits of each technique provides some form of guidelines for the executives to make a choice on the method to be used for their project. But there are other factors which influence the choice. They include the familiarity of the executives with the chosen techniques, the availability of technical people (expertise) who can use them and the willingness of the top management to use the chosen techniques.

In any case, more importantly, the technique should be able to provide accurate and reliable information on the viability of the privatised highway project which, as mentioned earlier, is the function of cost (capital, maintenance, operation cost), concession period, traffic volume, cost (cost per kilometre) and revenue (toll charge per kilometre).

There are several techniques that can be used to evaluate the viability of an investment, they include Net Present Value (NPV), Internal Rate of Return (IRR), Life

Cycle Costing, Whole Life Costing, Payback Period, Return of Investment (ROI), Accounting Rate of Return (ARR), Profitability Index, etc.

However, in this study the focus is only on the discounted cash flow group of method i.e. the Net present value (NPV) and the internal rate of return (IRR) and life cycle costing technique. Mohd Nadzri and Dzulkarnain (1996) specified that IRR and NPV resulted a highest score for evaluating of project's viability with 82.67% and 80.67% respectively. The primary methods of evaluation i.e. the payback period and return of investment will not be discussed here.

The Net Present Value (NPV) and Internal Rate of Return (IRR) are called the secondary methods of assessment while payback period and return of investment are called primary methods of assessment. It has been said that almost 80% of companies in the US, UK and Asian countries are using the NPV and IRR methods to evaluate their investment, while about 20% are using the primary methods of evaluation as the run-up to using the secondary methods.

Once the corroborated CBS is established, it is necessary to then develop a cost-revenue matrix (or cash-flows) that can be used to plot and discover some useful patterns or relationships between the various cost elements, revenue, concession period and traffic volume. Matrix means "a group of numbers or other symbols arranged in a rectangle that can be used together as a single unit to solve particular mathematical problems".

It is hoped that these matrices will provide a true picture or the pattern of the cost, income, time and traffic volume variables and the correlation between them. As claimed by some quarters, the return has not been encouraging despite the increase in the volume of traffic and the periodical increase in toll rate because they mentioned that the capital, maintenance, operating, management and financing costs have been disproportionately high over the years.

The fact that a number of toll highways have been in operation for last 25 years implies that the investments have been profitable to the concession companies and the

government has enjoyed the benefits. But based on the positive and negative feedback from the public, it would be fair and beneficial now to objectively re-assess (re-evaluate) the return and benefits of the privatised toll highways. The said re-evaluation can be carried out more methodically and empirically by analysing the data and information of previous and current privatised highways that have been collected by the MHA throughout the years. It is the exercise can be carried out by applying the concept of "Data Mining" and "Intelligent Information Management".

As mentioned earlier the concession period for the highway privatisation projects ranged between twenty to forty years. Throughout the period, the concession companies must efficiently and effectively manage the operating, maintenance, overheads, financing and tax costs. According to Bull (1993), 60% of the total construction budget in most developed countries has been spent on repair and maintenance. Flanagan (1989) states that 55% of the total cost over a span of forty years are for operation and maintenance costs. But what about Malaysia? What is the pattern like?

As claimed by the then Ismail Md. Salleh (MHA, 2011), stated that 75% of the toll collected by the concession companies went to debt servicing while 20% is spent on maintenance and overheads. So, he asked "What's left is very little?" Meanwhile, Noorizah Abd. Hamid (MHA, 2011) said that the company prefers to stretch the tenure of the borrowings to have a shorter debt, which is free period towards the end, in order to continue refinance the loans. In the first year of operation, the shareholders did not see any return because highways typically have long gestation period.

One may ask, is this statement based on scientific study or a mere opinion and is it very true today after two decades in operation? If so, why then more companies are motivated to invest in the highway privatisation projects?

The foregoing discussion brought to light several pertinent issues or problems which are central to this study. As mentioned, there many investment evaluation techniques that can be used to assess the viability or the return of investment projects such as the highway privatisation projects. The choice of the techniques used in the

evaluation of privatised highway projects depends on several factors including those non-technical such the availability of experts to use the selected technique, the familiarity of the executives with the technique, urgency and the willingness of the top management to use the chosen techniques.

One of the techniques that can be used to evaluate the cost and benefits of an investment project is the LCC technique. However, literature search suggested that this technique has never been used for highway investment analysis. However, in analysing the project cost and return it is necessary to establish a corroborated cost breakdown structure (CBS) based on data and information extracted from past and current projects. It has been said that not all projects have the same cost components. Some projects may incur some costs but may not be present in some other projects.

Many of the privatised highways have been in operation for more than 20 years. Based on the positive and negative feedback from the public and the claims by a few operators that more than 75% of the toll collected went to debt servicing and 20% is spent on maintenance and overheads, it is proper now to re-evaluate the return and benefits of the privatisation of the highways.

The re-evaluation can be carried out more methodically by analysing the data and information of previous and current privatised highways which have been collected by the MHA over the years. This exercise necessitates the development of a cost-revenue matrix using the CBS and the application of the concept of LCC, Data Mining and Intelligent Information Management. They involve the collation of the cost data i.e. capital, operating, maintenance, overhead and management costs and toll revenue taken from number of past projects, development of cost matrix and comprehensive data analysis to produce some form of useful patterns or relationship between the various groups of data.

For the purpose of re-evaluating the return and benefits of privatised highway projects, it is essential to analyse and seek the following information, both in numerical and graphical forms:

a) The trends or pattern of the total and annual costs incurred by the project throughout the concession period.
b) The trend or pattern of the total and annual revenue collected throughout the concession period.
c) The trend or pattern of the annual increase and decrease of the traffic volume throughout the concession period.
d) The trend or pattern of the increase or decrease of toll rate throughout the concession period.
e) The correlation between the costs incurred, revenue collected, traffic volume and concession period.

It was highlighted that privatisation of highways promised several other benefits to the government and the users in particular. They include the reduction of traffic congestions, providing a fast, uninterrupted, safe and comfortable ride that will save time and money to all the users, better travelling facilities such as R&R, rest areas, motor-cycle shelters and better accident and emergency services.

1.3 Research Questions

What have been discussed so far brought to light several pertinent questions that need to be addressed in order to determine whether the projects are successful operated and getting a good return and whether we can learn something from the experience of more than two decades of highway privatization. The questions are as follows and they will form the structure of this research:

a) What is the common technique used to evaluate the viability of privatised highway projects used by the concession companies when bidding for the projects?
b) Why the company is using a certain evaluation technique and LCC method to evaluate project viability?
c) What is the CBS of the highway projects and what are the breakdown of the cost elements of the project throughout the concession period in term

of the capital cost, total and annual financial cost, total and annual operating costs, total and annual maintenance cost, the toll rate per kilometre, total and annual toll collections.

d) What is the regularity of the increase of toll rate throughout the concession period and what is the average concession period of the various privatised highways?
e) What is the pattern or relationship between the traffic volume, capital cost, financial cost, operating costs, maintenance costs, toll rate, toll revenue and profits of the privatised highways throughout the concession period?

1.4 Research Objectives

Based on the highlighted research questions, the objectives of the research are as follows:

i) To identify the common techniques used by the concession companies to assess the viability of their investment in the privatised highway projects;
ii) To examine the usage of LCC to evaluate the costs and profit of highway projects.
iii) To determine the relationship between the cost and revenue elements of highway privatisation projects throughout the concession period.
iv) To determine the level of the benefit entertained by the concession companies during concession period;
v) To develop a framework for the viability of privatisation of toll highways for use by the MHA for future projects.

1.5 Delimitation of the Research

This research is limited to the following only:

i) Eleven (11) privatised highway projects/operators located in the Klang Valley under the category "Urban Highway" will be studied. They are as project brief:

   a) Project 1: Connects Jalan Duta in the west to Ampang in the east and Karak in the north
   b) Project 2: Stretch from UPM to Balakong and forms an orbital ring encircling Kajang Town and surrounding areas
   c) Project 3: Start at Jalan Sultan Ismail in central Kuala Lumpur and follows the river reserve westwards to end at Taman Ampang Utama
   d) Project 4: Linking Shah Alam to Rawang and is the north – western link of the Kuala Lumpur Outer Ring Road
   e) Project 5: Starts from northeast from Kemuning Interchange of the Shah Alam Expressway near Kota Kemuning to the Federal Highway Route 2 Interchange (Bulatan Selangor) near Shah Alam.
   f) Project 6: Stretch between Subang Jaya and Kuchai Lama linking to the Kuala Lumpur – Seremban Highway and between Federal Highway Route 2 at Petaling Jaya Selatan and Taman Medan
   g) Project 7: Extend from UPM Interchange in the south of the Istana Interchange in Kuala Lumpur
   h) Project 8: Stretching from Sri Petaling Interchange in Kuala Lumpur to the Pandamaran Interchange in Klang
   i) Project 9: Stretching from Sri Damansara in the north to Puchong, Putrajaya and USJ in the south.
   j) Project 10: Linked between Kerinchi Link – Damansara Link – Penchala Link
   k) Project 11: Start at Kampung Pandan Interchange in Kuala Lumpur and ends at the Putrajaya Utama Interchange

ii) The operation year began from the first year of operation towards the end of the concession period.

1.6 The Significance of The Research

This research intends to investigate and evaluate the viability of privatised highway projects in Malaysia. The analyses were conducted to correlate the variables of costs and revenue of the project. The findings obtained would benefit private companies who need to manage the operation and maintenance cost during concession period and to reach break-even earlier.

This research is intending to evaluate the cost incurred or invested by the concession companies during the concession period against revenue collected. From here, the projects' break-even can be determined. The projects' break-even will show the profit achievable at the particular year of operation within the concession period and will predict the remaining concession year for each project. Knowing the projects' break-even at the particular year of operation can be the point to determine the reasonable concession period to be granted to a concession company.

The research findings can facilitate the government in determining the best and reasonable concession period to be granted. The toll rate can be calculated to determine the need whether to maintain the existing rate or to increase the rate every three or five years as currently practiced or introduce a flat toll rate for the whole concession period.

Currently, for new projects started under RMK-10 and RMK-11 (2016 – 2020), the grant of concession period is given to a company from fifty-five to sixty years, which is considered a period long enough for the company to enjoy the profits.

1.7 Research Methodology

The present study combines qualitative and quantitative approaches to gather available data and material on the viability and profitability of privatised highway projects in Malaysia. The research will be entirely based on existing facts and document assessments hence will be executed using a document evaluation approach. All information will be gathered from existing concession agreements, annual reports, journals, books, articles, and other publications or other sources available both online and offline. Additionally, interview sessions will be conducted to the related parties involved in the projects.

1.8 Organisation of The Thesis

The dissertation consists of six (6) chapters. A brief summary of the chapters is outlined as follows:

Chapter 1: Introduction

This chapter explains the background of research, issues related to the research, research methodology, and the growth of the country's economic sector. One of the prominent sector that has contributed to the country's economic growth is construction sector. This chapter also explains the project implementation on the basis of privatisation and public finance initiative (PFI) basis. This chapter also briefly covers the involvement of the government and the private sector through the Malaysian Planning - RMK7 to RMK11 in highway privatisation projects.

Chapter 2: Privatisation of Highway Projects In Malaysia

This chapter explains the history of the privatisation highway projects in Malaysia. What is the privatisation concept, policy of privatisation, government's involvement of the projects and the overview of the privatisation highway projects

implemented in Malaysia. This chapter also will describe the past and current overview of the privatisation of highway projects, the process of approval of the projects, the challenges of the privatisation projects, the impact of the project implementation to the economy etc.

Chapter 3: Life Cycle Costing and Its Applications in Construction Projects

This chapter reviews the literature on the concept of life cycle costing (LCC), objectives of LCC, its process, its methodology and technique used, and the application in the construction industry. This chapter also covers the elements of LCC, inputs required for LCC calculation, and the calculation of viability of highway projects using the LCC method.

Chapter 4: Research Methodology

This chapter describes the research methodology adopted in the study, which is a combination of qualitative and quantitative methods. The chapter also describes the process of data collection and analysis technique adopted to achieve the research objectives.

Chapter 5: Data Analysis

This chapter describes the data analysis procedure, which consisted of document assessment (factual data) and structured interviews with selected industrial players. The data obtained were analysed via statistical analysis (linear regression and multiple regression model) and spreadsheet using Microsoft excel.

Chapter 6: Conclusion

This chapter concludes the study and proposes further research. It summarises the findings derived based on the research objectives outlined. The findings will be further explored in further research.

1.9 Research Plan Chart

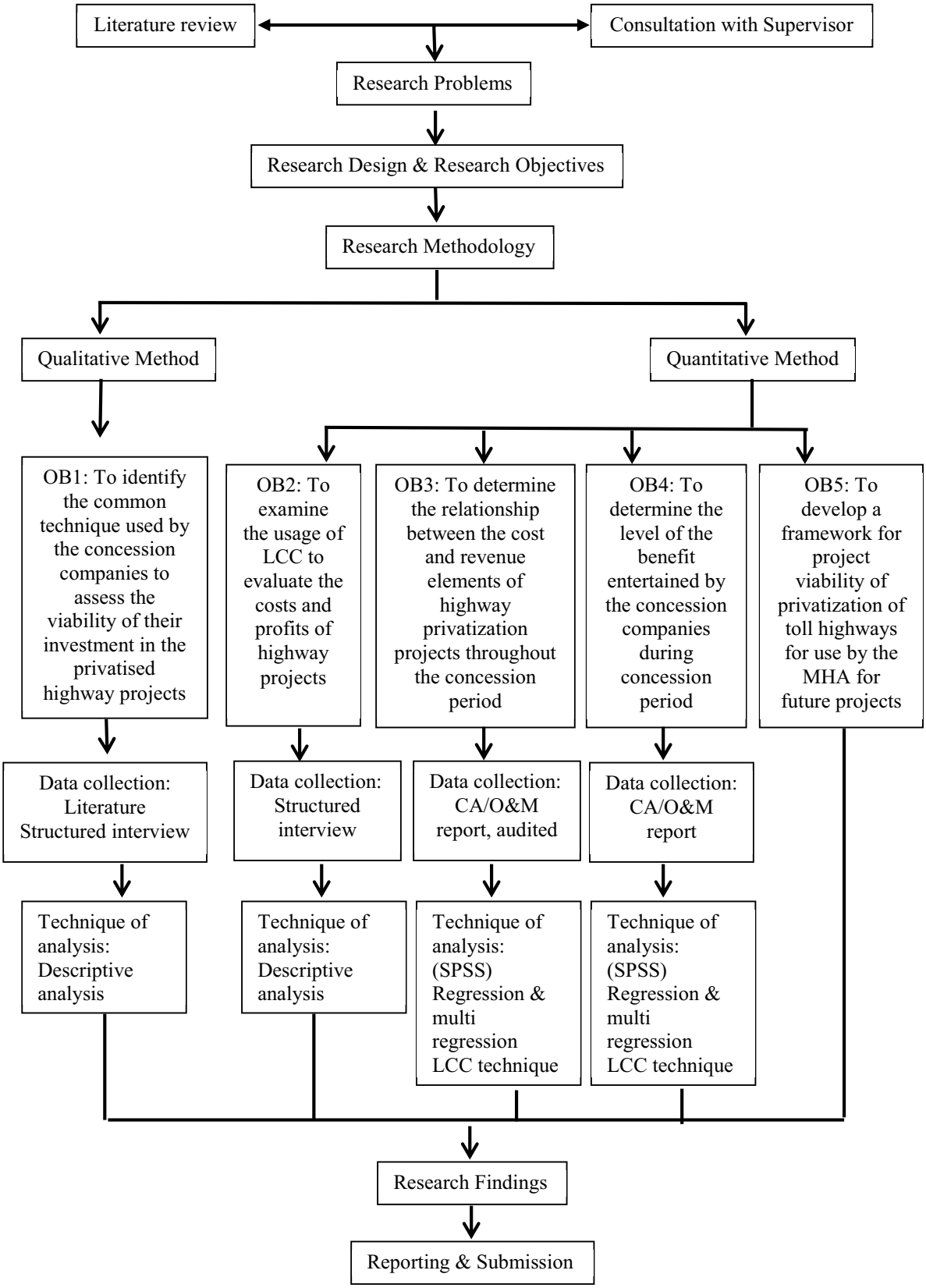

Figure 1.1 Research plan chart

1.10 Summary

This chapter provided an overview of the research background and the problem statement regarding privatization of highways in Malaysia and its economic effect on Life Cycle Costing (LCC). This chapter also describe the criteria of privatization and public finance initiative (PFI) project implementation; also covered engagement of Malaysian government and the private sector in highway projects. The objectives of this research were then articulated based on the research questions. This was followed by a description of the research outcomes, research significance, overview of research methodology and research scope and limitations. Finally, an overview of the thesis structure was presented to show how the chapters interconnect. The next chapter presents the literature review.

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