



**UNIVERSITI TEKNIKAL MALAYSIA MELAKA**

**COMPARATIVE ANALYSIS IN TECHNOLOGY AND  
COSTING BETWEEN HYBRID AND ELECTRIC  
VEHICLE CHOICES IN MALAYSIA**

This report is submitted in accordance with the requirement of the Universiti Teknikal Malaysia Melaka (UTeM) for the Bachelor of Mechanical Engineering Technology (Automotive) with Honours.

by

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This report is submitted to the Faculty of Mechanical and Manufacturing Engineering Technology of Universiti Teknikal Malaysia Melaka (UTeM) as a partial fulfilment of the requirements for the degree of Bachelor of Mechanical Engineering Technology (Automotive) with Honours. The member of the supervisory is as follow:

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## ABSTRAK

Kenderaan elektrik hibrid (HEVs) membuktikan potensi yang besar dalam penjimatan tenaga dan pengurangan pengeluaran asap, selain memberikan pengguna terutamanya pemandu kemudahan dan keselamatan yang terbaik. Dari segi kedinamikan, ekonomi, mesra alam sekitar, keselamatan, dan keselesaan, menggabungkan elektrik dengan petrol dalam satu kenderaan merupakan idea yang baik, walaupun kenderaan elektrik (EV) menggunakan bateri sepenuhnya sebagai sumber utama dan memerlukan ruang yang lebih besar untuk bateri di dalam kenderaan. Kertas kajian ini memfokuskan pendapat pengguna yang munasabah terhadap pemilihan teknologi di Malaysia. Kaedah yang digunakan dalam penyelidikan ini adalah dengan membuat pemerhatian, tinjauan dan wawancara kepada pengguna dan syarikat yang dipilih berdasarkan kategori dapatan (kos dan teknologi). Data telah dikumpul dan disusun daripada borang soal selidik yang diedarkan dan juga daripada perisian Google sebelum dianalisis. Perisian analisis yang digunakan ialah Minitab16. Hasil kajian ini menunjukkan bahawa pengguna Malaysia masih tidak mengetahui kebaikan, kelebihan dan kekurangan bagi kedua-dua teknologi tersebut. Walau bagaimanapun, majoriti pengguna bersetuju untuk memilih teknologi kenderaan hibrid berdasarkan faktor teknologi dan kos.

## **ABSTRACT**

Hybrid electric vehicle (HEVs) proved large potential to save energy and reduce emission and give consumer especially the drivers the great convenience and safety. In terms of dynamic, economy, environmental friendliness, safety, and comfort it is great idea by combining electric and petrol into one vehicle. While electric vehicle (EV) focus on totally use battery as main source and required larger space for batteries in the vehicle. This paper focus on the reasonable consumer opinion in choosing the technology in Malaysia. Method that use in this research by making observation, a survey and interviewing the consumer and company selected based on finding categories (costing and technology). The data compiled from printed and softcopy from Google form before it been analyse. Analysis been applied into Minitab16 software. The result for this research showed the Malaysian consumer didn't aware the goodness or the advantages and disadvantages not only for one technology but for both technologies. Majority agreed to choose hybrid vehicle technology based on technology and costing.

## **DEDICATION**

This report I dedicate to my beloved mother and father, Aliah binti Abdul Rahim and Zakaria bin Salleh, and my one and only brother, Ahmad Zakwan bin Zakaria, who always motivates and support me during this final year project work. Not only that, the person who also been positive and encourage me along this project with his ideas and guidance is Mr. Mohammed Noor bin Hashim as my supervisor project. Mrs. Ezzatul Farahain bin Azmi who always helps me find the solution when I'm loose of ideas. My beloved teammates Ahmad Afiq Afifi bin Ismail, Sallehuddin Kaus bin Abdul Aziz, Mohd. Kamarul Nazreen bin Mohd. Kamal Haslin, and Vikesh s/o Rajendran. Last but not least, thank you all my coursemates, classmates, housemates, roommates, and my best friends who try to calm and understand me.

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## LIST OF SYMBOLS

<b>gCO<sub>2</sub>e/km</b>	Grams in Carbon Dioxide in emission per kilometre
<b>£</b>	United Kingdom dollar
<b>€</b>	Europe dollar
<b>RM</b>	Ringgit Malaysia



## LIST OF ABBREVIATIONS

UTeM	Universiti Teknikal Malaysia Melaka
HEV	Hybrid Electric Vehicle
SUV	Sport Utility Vehicle
PHEV	Plug-in Hybrid Electric Vehicle
ICEV	Internal Combustion Engine Vehicle
EV	Electric Vehicle
APU	Auxiliary Power Unit
TCO	Total Cost of Ownership
GWP	Global Warming Potential
DC	Direct Current
WTO	World Trade Organization
BHP	Brake Horse Power
MAA	Malaysian Automotive Association
MITI	Ministry of International Trade and Industry
PV	Passenger Vehicle
CV	Commercial Vehicle
TIV	Total Industry Volume
YTD	Year-To-Date
GST	Goods and Services Tax
ML	Manufacturing License
MODENAS	Motosikal dan Enjin Nasional Sdn Bhd

AP	Approved Permit
FTAs	Free Trade Agreements
HRDF	Human Resource Development Fund
R & D	Research and Development
JPJ (RTD)	Jabatan Pengangkutan Jalan (Road Transport Department)
VTA	Vehicle Type Approval
PLCs	Public Limited Companies
NAPC	National Automotive Policy Framework
GreenTech Malaysia	Malaysian Green Technology Corporation
TNBES	Tenaga Nasional Berhad Energy Services

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

Year 2018, our country been exposed with the news about in future there will be electric vehicle as one of the vehicle in Malaysia. So far as we knew the hybrid vehicle already exists in Malaysia this few years and it's became one of the most competitive market sales in automobile field. Furthermore, our technology always gone further days by days to achieve the goal for saving our earth from pollutions. It occurs as goal as the issue of global warming which effects the life of creature including ourselves; human. Hybrid is one of the technology that reduce the fuel consumption by combines an internal-combustion engine with one or more electric motors powered by a battery. Whereas, the electric technology is the technology using fully electric system to generates power to the vehicle. For that reason, hybrid and electric technology were one of the greatest topics to be discuss about their pricing in Malaysia market.

Hybrid electric vehicle (HEVs) proved large potential to save energy and reduce emission and give consumer especially the drivers the great convenience and safety. In terms of dynamic, economy, environmental friendliness, safety, and comfort it is great idea by combining electric and petrol into one vehicle. Electric vehicle (EV) focus on totally use battery as main source and required larger space for batteries in the vehicle. This also impact to the weight of the vehicle increase then conventional vehicle. As

logically the heavier the vehicle the more power needed to support the system and the vehicle itself.

## **1.2 Objective**

The aims of the project are:

1. To study and compare the system technology process between hybrid and electric vehicles.
2. To compare the advantages and disadvantages between hybrid and electric vehicles.
3. To analysis consumer opinion with the technology and costing between hybrid and electric vehicles.

## **1.3 Problem Statement**

In this era of technology, hybrid and electric technology become the target to achieve the goals of reducing the global warming. The sources of power energy become renewable energies technology to overcome global warming and reduce the pollutions level. For the both technologies, it's a great ideas to make comparison for several factors as helps consumer to make choices and for engineers' further improvement. The comparison occurs because in future our country, Malaysia will reduce totally the fuel consumption which means the technology from hybrid to electric vehicles. And because of this issue, consumers' especially in Malaysia complains and tried comparing several factors. This is what the researcher will explain by analyse the engine system process

between hybrid and electric vehicles technology. And then, the advantages and disadvantages hybrid and electric technology in this project. Both technologies had their own special character which attracts me to do the analyses in technology and in costing for Malaysia market as my parameter. The main aim in this project is to get the reasonable consumer opinion in choosing the technology in Malaysia.

#### **1.4 Project Scope**

This project focused on:

1. Analyse the comparison of technology and costing that will leads of consumer opinion in Malaysia.
2. This study will focus on two type of technology which are hybrid and electric vehicle. Data gathered by distribution questionnaire were identify and analyse the consumer opinion.
3. The consequence of this study may not be applicable to other study with different parameter specifically for the consumer opinion.
4. The duration of this study is almost one year started on February 2018 until January 2019.

#### **1.5 Project Expectation**

For this analysis, the researcher expect the outcomes for this analysis will help the reader understand the system technology process between hybrid and electric vehicles. And then, it's open up the mind set of Malaysia's consumer in order to accept

the technology of hybrid and electric vehicles. Furthermore, the company that supplies the technologies vehicles explore more about the market sales of the vehicles. Last but not least, the government policy agreed with the ideas on exploring the green technology for global warming to Malaysian user.

## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

Chapter 2 will present about the flow and scope of analysis based on the topic of project. In industry there were several types of categories but in this topics the focus point is based on the automobile vehicle. Automobile vehicle also can be classify in many types but this research focus on two types which are hybrid electric vehicle and electric vehicle. Hybrid vehicle also been divided with several types such as mild, full, and plug-in. In the research the types in hybrid vehicle will focus on plug-in only. And then, the plug-in hybrid vehicle will compare with the electric vehicle in terms of technology. The comparison will focus only two things which are technology and costing. The costing part also been specify into two which are sales price and service maintenance cost. While in service maintenance cost in also been divided into two which are corrective maintenance and preventive maintenance. The division will complied with the sales price to collect the data of research. The research will collect data by three ways which are observation, questionnaire, and interview. The flow of studies for the analysis will show in K-chart for continuing this chapter which is literature review in Figure 2-1.

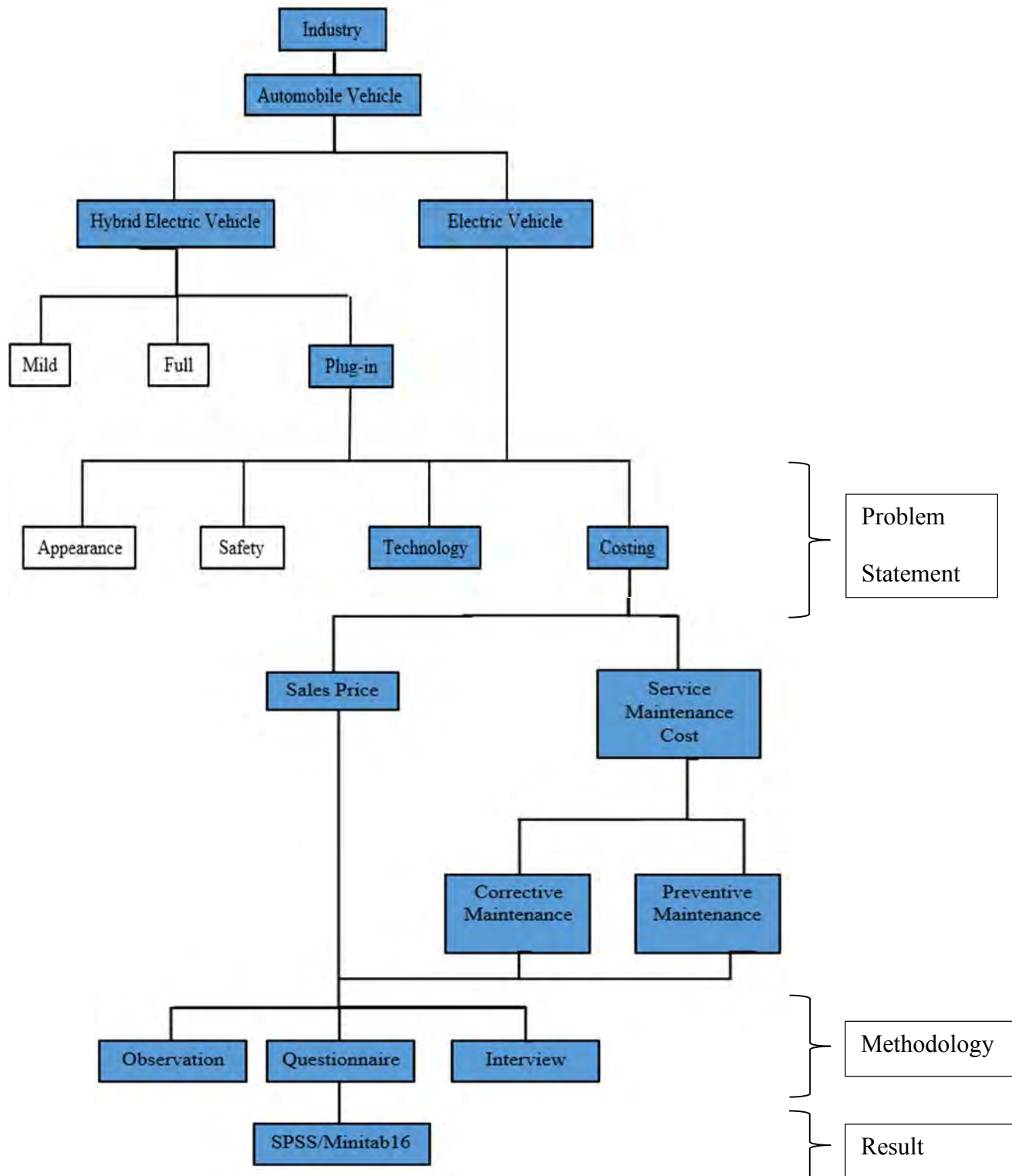


Figure 2-1: K-Chart showing the flow of studies for the analysis.