

UNIVERSITI TEKNIKAL MALAYSIA MELAKA



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CHALLENGES AND SOLUTIONS FOR USER ELECTRIC VEHICLE (EV) IN MALAYSIA

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SUPERVISOR DECLARATION

"I/We hereby declare that I/We had read through this thesis and in my/our opinion that that thesis is adequate in terms of scope and quality which fulfil the requirements for the award of Bachelor of Technology Management (High Technology Marketing)"

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DEDICATION

This thesis is dedicated:

To my parents, Rosly Bin Ibrahim and Noraini Binti Mat Saman, who have always been there for me through my ups and downs, providing me the extra push that I needed to accomplish my thesis. Next, DR. Diana Rose Binti Faizal, my supervisor, who has led and motivated me to complete my thesis. Thank you for your assistance and motivation in completing this research. Finally, to my dear friends who have stood by me and supported me through my ups and downs while assisting me throughout the project to complete my thesis.

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ABSTRACT

This study explores the challenges and solutions for using electric vehicles (EVs) in Malaysia. EVs are an environmentally friendly alternative to traditional fossil fuel-powered vehicles, which contribute to pollution and greenhouse gas emissions. Despite Malaysia's rapid development and high number of vehicles, the adoption of EVs has been slow due to several issues. The main challenges include the high price of EVs, largely caused by import taxes, limited charging stations, and a lack of public awareness about the benefits of EVs. Safety concerns, such as the risks associated with EV batteries and charging systems, also discourage adoption. The study aims to understand how these challenges affect EV adoption, identify ways to overcome them, and highlight the benefits of EVs for Malaysia's environment, economy, and society. Solutions include government incentives like tax relief, building more charging stations in urban and rural areas, collaboration between local and international companies, and public awareness campaigns. However, issues like limited resources for infrastructure and low awareness in rural areas remain obstacles.

Keywords : (electric vehicles (EVs), challenges, solutions),

ABSTRAK

Kajian ini meneroka cabaran dan penyelesaian untuk menggunakan kenderaan elektrik (EV) di Malaysia. EV ialah alternatif mesra alam kepada kenderaan berkuasa bahan api fosil tradisional, yang menyumbang kepada pencemaran dan pelepasan gas rumah hijau. Walaupun pembangunan pesat Malaysia dan bilangan kenderaan yang tinggi, penggunaan EV adalah perlahan disebabkan beberapa isu. Cabaran utama termasuk harga EV yang tinggi, sebahagian besarnya disebabkan oleh cukai import, stesen pengecasan yang terhad dan kurangnya kesedaran orang ramai tentang faedah EV. Kebimbangan keselamatan, seperti risiko yang berkaitan dengan bateri EV dan sistem pengecasan, juga tidak menggalakkan penggunaan. Kajian ini bertujuan untuk memahami bagaimana cabaran ini mempengaruhi penggunaan EV, mengenal pasti cara untuk mengatasinya, dan menyerlahkan faedah EV untuk alam sekitar, ekonomi dan masyarakat Malaysia. Penyelesaian termasuk insentif kerajaan seperti pelepasan cukai, membina lebih banyak stesen pengecasan di kawasan bandar dan luar bandar, kerjasama antara syarikat tempatan dan antarabangsa serta kempen kesedaran awam. Walau bagaimanapun, isu seperti sumber yang terhad untuk infrastruktur dan kesedaran yang rendah di kawasan luar bandar tetap menjadi halangan

Kata kunci : (kenderaan elektrik (EV), cabaran, penyelesaian),

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LIST OF ABBREVIATIONS

EV	Electric Vehicle
CBU	Complete Built-up
GHG	Green House Gas

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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will be discussed the background of the study, problem statement, research questions, research objectives, scope and limitations of the study, significant of study and summary of the whole chapter.

1.2 Background of study

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The use of fossil fuels is a concern for the environment and the dependence on these substances threatens the environmental ecosystem, thus forcing a few parties to find other alternatives to replace fossil fuels with more environmentally friendly and greener ones. (Olabi, et al, 2022). While the recovery of waste heat, (Jouhara, et al, 2021) can increase the efficiency of industries in the use of intensive energy such as aluminum (Brough, et al, 2020), cement (Fierro, et al, 2022) and others, unable to control global warming due to the use of fossil fuels. Greenhouse gas (GHG) emissions are a weakness in the transport sector (Sioshansi, et al, 2019). Today, electric vehicles are a revolution in the automotive sector with a lot of research and development being carried out (Abo-Khalil, et al, 2022). With the renewed energy system, the EV market will be able to compete with the automotive market (Alami, et al, 2022). Green technology has been introduced in an effort to reduce greenhouse gases (GHG) such as air pollution which is the gas that causes climate change (Veza, I, et al, 2021).

With the use of efficient power plants that do not emit greenhouse gases (GHG) such as hydro, wind, nuclear and solar power plants, the improvement of air quality will be directly affected by the use of EVs that are able to maintain clean air in addition to the production of power that does not release greenhouse gases (GHG). EV technology has been in the global market for as long as the availability of commercial EVs.

Malaysia is one of the rapidly developing countries in Southeast Asia with a population of 32.7 million in the first quarter of 2021 (Department of Statistics Malaysia. Population & Demography. Department of Statistics Malaysia Official Portal. 2021) and in 2040 it is expected to reach 41.5 million people. In 2019, information as many as 29.96 million vehicles in Malaysia were registered was revealed by the Statistics of the ASEAN Statistics Division for the year 2020. In the same year, Malaysia recorded that every 1000 residents had 925 registered motor vehicles with an average of nine out of ten Malaysians having road vehicles (ASEAN Key Figures, 2020). Perodua and Proton are the national vehicle manufacturers in Malaysia. Perodua has the largest market in 2019 with 38% while 17% is held by Honda followed by Toyota and Proton (Malaysian Automotive Association, 2021). The use of EVs in Malaysia was introduced by Toyota as early as 2009, followed by Honda in 2010, then Nissan and Mitsubishi also introduced BEVs in 2013 (ExpatGo.2020). Foreign manufacturers such as Toyota, Honda, Nissan and so on have brought in their respective electric vehicles in Malaysia while national vehicle manufacturers still use ICE in each of their models. The number of EVs in Malaysia peaked in 2017 and 2018 with nearly 9000 units registered (Omar, et al, 2021). 95% of registered EVs are PHEVs but the BEV segment has increased from 5% to 8% in 2021 (Lim,A, et al, 2021).

1.3 Problem statement

This study aims to find out the challenges faced by manufacturers of the electric vehicle, EV industry in Malaysia.

The first challenge is the price of EV car in Malaysia. High EV prices are always a shadow of the EV culture in Malaysia because high prices will affect the acceptance of this group. The EV contribution of 20% of total vehicle sales by 2025 is targeted for the Malaysian market and is expected to increase to 50% by 2035 (Anzi, M, et al, 2021). With this, it is important to re-examine the issue related to the high purchase price of EVs, thus causing a lack of other users to buy the EVs.

The second challenge is the high market price. The imposition of taxes on imported cars and the limited variety of such cars in the Malaysian automotive market cause the price of EV cars to rise. Only electric cars are sold in Malaysia such as Nissan Leaf, BMW i3s and others that are: complete built-up (CBU) units which are more expensive than completely knocked down (CKD) units in the Malaysian market. The problem faced by the CBU unit, which is imported cars from foreign countries, is that they come with high excise duties, which will most likely increase the price of the car between 60% to 105%. (Dharfizi, et al, 2020). CKD units are cars that are manufactured and assembled by local companies. It will be sold in the Malaysian market at a much cheaper price to Malaysians because it is not taxed and has incentives from the government.

Last but not least, the challenges faced by EVs are in terms of safety and risk. The safety measures and risks involved in operating an EV weigh on many people. Since EVs were introduced, there have been fewer opportunities to properly maintain consumer vehicles. EV cars differ from cars that use an engine because handling for EV cars needs to be given more pressure. This is related to the safety of the user and the risk that must be taken by the user. Parts that have an electrical system must be protected from direct contact and must be covered with a protective layer cover. Only certain tools can access parts of the electrical system.

Electric car charging pot must be separated to avoid electric shock. in addition, EV batteries also have the risk of explosion because they contain chemical and mechanical electricity. The place of the charging pot needs to be maintained regularly so that the

flow of electricity out and in does not occur. The human brain while driving needs to be in good condition because of the different EV power effects. The combination of the human model with the electric car model is to study the effects of vibration on the human brain based on various methods. (Zainal, N.A, et al, 2020).

1.4 Research Question

RQ1: How challenges can affect user electric vehicles in Malaysia.

RQ2: How user electric vehicles overcome the challenges in Malaysia.

RQ3: How the importance of electric vehicles for Malaysian environment, economy and people.

1.5 Research Objective

RO1: To investigate the challenges that affect electric vehicle users in MalaysiaRO2: To define solutions for electric vehicle users in MalaysiaRO3: To determine the importance of electric vehicles for Malaysia's environment, economy, and people.

1.6 Scope and Limitations

This will discuss the scope of challenges and solutions for electric vehicle users and limitations. The first challenge faced by users is the development of infrastructure. This means is in terms of limited charging stations, for the year 2023 there will be less than 500 public charging stations in Malaysia and the charging stations are built unevenly. This only focusing on urban areas. In addition, the cost of owning an electric vehicle (EV) is also one of the challenges. This is because the advance payment for an electric vehicle is high compared to an engine vehicle, causing many consumers to be less interested in owning an EV. Next, consumer education and awareness. In terms of consumer awareness, many consumers are still less interested in owning electric vehicles because they do not know the advantages of EV cars. Lack of knowledge is also the reason why consumers do not want to take the risk of owning an EV vehicle because they are not good at maintaining EV cars compared to engine vehicles that have owned them for a long time.

For the solution, support from the government is very necessary. The government is able to provide support in terms of incentives, by providing more incentives such as tax relief and being able to attract consumers to own electric vehicles. Investment in infrastructure is also able to attract consumers to own electric vehicles by creating charging stations in urban and rural areas. In addition, the involvement of the private sector. Cooperation between local automotive companies such as Proton and private automotive companies such as Perodua is highly encouraged in exchanging expertise in producing electric vehicles. Foreign investment is also able to increase consumer confidence in the development of charging station infrastructure and the manufacture of electric vehicles for local automotive companies. Next, education and public awareness. By doing a campaign that is a public awareness campaign able to raise awareness of the use and benefits of electric vehicles.

For limitations, limited infrastructure development resources, the challenge faced by the government and the private sector is in allocating enough resources to develop charging stations. In addition, the high upfront cost also makes many consumers less interested in owning an electric vehicle. Next, limited education and awareness. Public awareness campaigns may be acceptable to urban dwellers but not to rural dwellers.

1.7 Motivation of study

In the motivation of study tell about previous studies, on the acceptance of electric vehicle (EV) users, it is greatly influenced by the theoretical paradigm of the use of conventional technology such as the use of the UTAUT model (Zhang B.S, et al, 2022).

(Kamble and Upadhyay, 2023), they emphasize that changes to the EV sector are different from the theories, frameworks and views of academics. The end user's view of may not be sufficient with existing studies. The concept of acceptance in various domains such as automotive (KimS, et al, 2022) has been explained by past literature.

The impact of EV use on the environment and human health is low because EVs do not release any pollutants or greenhouse gases (GHG) (Tran, M.-K., 2020). Tailpipe emissions have NOx and particulate matters (PMs) which are the main factors for the pipe. The use of EV batteries, namely Li-ion batteries, can reduce PMs by 4 times and NOx by 20 times (VanMierlo, 2019). With the use of EVs can protect public health and avoid drastic climate change (Tran, M.-K., et al, 2021). The development of smart cities in the future depends on the role of EVs (Lai, C.S, et al, 2020).

1.8 Summary

In Malaysia, as a rapidly developing nation, has seen an increase in vehicle ownership, with most vehicles relying on fossil fuels. This dependency raises serious environmental concerns, such as greenhouse gas emissions and air pollution. To address these issues, EVs have been introduced as a greener alternative. Despite their benefits, the adoption of EVs in Malaysia has been slow due to several challenges, including high costs, limited infrastructure, and low public awareness.

The study sets three main objectives: to investigate the challenges affecting EV users in Malaysia, to evaluate how these challenges are being addressed, and to identify the importance of EVs for Malaysia's environment, economy, and society. To overcome these challenges, the study proposes several solutions. The government can play a key role by providing tax relief, financial incentives, and support for infrastructure development. Public-private partnerships between local companies like Proton and international manufacturers can also help accelerate EV production and improve access to EV technology. Raising public awareness through campaigns and educational programs is another crucial step to help Malaysians understand the

benefits of EVs and how they can contribute to environmental protection and cost savings.

Despite these proposed solutions, some limitations remain. Developing infrastructure like charging stations requires significant investment and planning, which may be challenging for the government and private sector. Additionally, public awareness campaigns may be effective in urban areas but may not reach rural populations. However, the study emphasizes that the benefits of EVs, such as reducing air pollution, improving public health, and supporting the development of smart cities, far outweigh these challenges. With proper strategies and collaboration between stakeholders, Malaysia can make significant progress in adopting EVs and transitioning toward a more sustainable future.



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CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter explain about technology, meaning of electric vehicles (EV), subfields of EV include (define EV and types of EV, models of EV in Malaysia,), explain challenges can affect user EV in Malaysia, explain solutions for user EV in Malaysia and explain about framework.

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2.2 Technology

In the realm of modern society, technology serves as a pivotal force aimed at fulfilling diverse societal needs, addressing challenges, and striving towards collective goals through the application of scientific knowledge and research. As articulated by M. Corccia (2019), technology embodies a systematic integration of technical elements, adeptly navigating social demands and economic dynamics to provide effective solutions.

It functions not merely as a set of tools or innovations, but rather as a comprehensive framework that adapts to the evolving landscapes of human civilization. By harnessing the power of science and leveraging rigorous research methodologies, technology emerges as a transformative agent capable of enhancing human capabilities, fostering innovation, and fostering sustainable development. Its profound impact resonates across various sectors, from healthcare and communication to industry and education, continually reshaping how individuals interact, work, and live.

Thus, technology stands as a testament to humanity's ingenuity and its perpetual quest to overcome challenges and achieve progress in an ever-changing world.

2.3 Understanding of Electric Vehicle (EV)

The "Going green" program is the direction of the world towards a new world (Gazzola, P, et al, 2019). However, the world's increasing dependence on energy is likely to decline day by day. According to the International Energy Agency (IEA), one of the major contributors to climate change is carbon dioxide emissions, the transport sector is the dominant two-thirds contributor to carbon dioxide emissions (IEA. CO2 Emissions from Fuel Combustion 2019, 2022). The largest total energy consumption figures are from cars.

Therefore, the recommendations given by the agency by saving fuel can improve energy efficiency in terms of vehicle energy and can ultimately reduce the statistics of carbon dioxide emissions worldwide (IEA. Electric Car Market Shares in Electric Vehicle Initiative (EVI) Countries, 2020). In order to fulfill the vision of energy entrepreneurship, which is most important in the transport sector, will raise the concern of every country in saving fuel.

The Organization of Motor Vehicle Manufactures (OICA) reports an increase in car production globally which reflects the demand for engine vehicles, i.e. cars that never disappoint (International Organization of Motor Vehicle Manufacturers, 2018). This will help the car manufacturing industry to produce cars that can reduce carbon dioxide emissions. In the end, hybrid cars are a solution that can deal with issues related to fuel emissions, which are carbon dioxide gas emissions, efficiently (Alzahrani, K. et al, 2019).

From the point of view of the level of carbon emissions being the difference between hybrid cars and conventional cars, lower carbon emissions are promised in the production of hybrid cars (Adnan, N, et al, 2018). With that, one of the solutions that can reduce the dependence on the energy transport industry and can increase the efficiency of transport energy is to make hybrid cars as the solution.

Although the statistics in the use of hybrid cars are not as strong as conventional cars, but it needs to be realized. It is proven by statistics released by the IEA, the gap between the hybrid car market and conventional cars is very wide (IEA. Tracking Transport, 2019). The adoption of hybrid cars is relatively low for the whole country but shows a positive graph for some countries. European countries are the highest market for hybrid cars while for countries in Asia, namely China, which recorded a high hybrid car market and also one of the candidates for the highest use of hybrid cars globally (IEA. Electric Car Market Shares in Electric Vehicle Initiative (EVI) Countries, 2019). The Malaysian automotive market shows a low rate of energy-efficient vehicles such as hybrid cars, this is because Malaysia is still in the early stages of moving towards a green trend (Chekima, B, et al, 2015).

Hybrid cars are renewable energy sources meaning plug-in electric vehicles (PEVs), including battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), with the aim of overcoming greenhouse gases (Davis, et al, 2018).

2.4 Subfields of EV

2.4.1 Types of Electric Vehicles (EV)

BEV, which is Battery Electric Vehicle, is a car that is fully powered by electric power. BEV does not use an engine as an internal combustion engine and also does not have any type of liquid fuel as a fuel. A large battery pack is used by BEVs that power autonomous vehicles. The range of BEV batteries that can last from 160 to 250 km, although some BEV models can reach 500 km on a single charge. For example, the Nissan Leaf, which is one of the BEV types of vehicles that fully expects a 62 kWh battery power that can travel as far as 360 km (insideEVs. Nissan Reveals LEAF e-Plus: 62 kWh Battery, 226-Mile Range. 2019).

Next, PHEV vehicles, which are Plug-In Hybrid electric vehicles, are a type of vehicle that is powered by a combustion engine and also uses a charged electric engine. The storage of electrical energy in the grid by PHEVs can re-power this vehicle, which can indirectly reduce fuel consumption during normal driving. Mitsubishi Outlander is one of the PHEV vehicles that has a 12 kWh battery that can move the vehicle as far as 50 km using only the power of the electric engine (Mitsubishi Motors. Mitsubishi Outlander PHEV 2018. 2019). It should be taken into account that the fuel consumption produced by PHEV is higher than that of other car manufacturers (Plötz, P, et al, 2020).

Finally, Hybrid Electric Vehicles (HEV) are vehicles with a combination of an electric engine and a conventional internal combustion engine. Unlike PHEVs, HEVs do not have a grid to generate electrical power but their electrical power is charged through the combustion of the vehicle's engine. They are also generated by electricity through the energy during braking through kinetic energy converted to electrical power. Toyota Prius is a hybrid vehicle that provides a 1.3 kWh battery and can move the vehicle as far as 25 km using only its electric power.

2.4.2 Models of Electric Vehicles (EV)

The electric vehicle (EV) market has undergone a transformative evolution in recent years, emerging as a pivotal segment of the global automotive industry. In 2023, approximately 14 million electric cars were sold worldwide, marking a significant milestone in the transition towards sustainable transportation. This impressive growth is particularly pronounced in three major regions: China, Europe, and the United States, which together account for about 95% of global EV sales.

Leading the charge in this electrifying revolution is the Tesla Model Y, which not only became the best-selling electric vehicle but also topped the charts as the world's best-selling car overall in 2023. Following closely behind is the Tesla Model 3, which has consistently ranked among the top sellers due to its combination of performance, range, and advanced technology (Korean Transport Institute). In third place is the SAIC GM Wuling, a model that highlights the increasing demand for affordable electric vehicles in emerging markets, particularly in China.

China stands out as a dominant force in the global EV landscape, representing around 60% of electric car sales. The country has seen electric vehicles account for over 35% of new car registrations, driven by government incentives, extensive charging infrastructure, and a growing consumer appetite for green technology. Major Chinese manufacturers like BYD and NIO have significantly contributed to this growth by offering a diverse range of models that cater to various consumer needs and preferences (iea).

In Europe, electric vehicles accounted for nearly 25% of global sales in 2023. The continent has been at the forefront of EV adoption, with countries like Norway leading the way; there, electric cars made up an astonishing 93% of new registrations. This trend is supported by stringent emissions regulations and substantial investments in charging infrastructure across European nations. Automakers are responding to this

demand by expanding their electric offerings and committing to ambitious sustainability goals (Virta).

The United States, while accounting for about 10% of global EV sales, has also seen significant growth in electric vehicle adoption, particularly in states like California. California's progressive policies and incentives have fostered an environment conducive to EV growth, encouraging both consumers and manufacturers to embrace electric mobility. Major automakers are ramping up their efforts to introduce new electric models to capture this expanding market.

2.5 Challenges affect EV users in Malaysia

In Malaysia, the adoption of electric vehicles (EVs) is still in its early stages, and several challenges hinder the widespread use of EVs. These challenges primarily relate to the availability of charging infrastructure, the time it takes to charge EVs, and the high upfront cost of purchasing an EV.

One of the main issues is the lack of a sufficient and evenly distributed charging infrastructure. While there are around 1,500 charging stations across Malaysia, most of these are located in urban areas like Selangor and Kuala Lumpur. This creates a significant problem for those living in rural or less developed regions, as they may have limited access to charging points. Furthermore, the scarcity of charging stations along major highways makes long-distance travel inconvenient and potentially stressful for EV owners, as they may struggle to find a place to recharge their vehicles. The uneven distribution of charging infrastructure is a major factor contributing to range anxiety, where drivers worry about running out of battery power before reaching a charging station (Muhammad Umair, et al, 2024).

Another challenge is the time it takes to fully charge an EV. The time required to charge depends on the type of charger being used. For example, Level 1 chargers, which are standard household outlets, take a long time up to 17 hours to fully charge a vehicle with a 24kWh battery. This is not practical for daily use, especially for individuals who rely on their EVs for commuting or other regular activities. While Level 2 chargers provide faster charging times, they still take about 7 to 9 hours for a full charge. The lack of fast-charging stations (DC chargers) in many areas means that many EV owners have no choice but to use slower chargers, which can be inconvenient, especially if they need to use their vehicle frequently or for long trips (Nur Ayeesha Qisteena Muzir, et al,2022)

Finally, the high cost of EVs remains a significant barrier to their adoption. Although the government offers incentives and rebates to help make EVs more affordable, the price of an EV is still much higher than that of a traditional gasoline-powered vehicle. For instance, the Nissan Leaf, an EV, is priced considerably higher than a similar traditional vehicle like the Nissan Almera. This price gap makes EVs out of reach for many people, particularly those from lower-income groups or those who are not yet convinced about the long-term benefits of switching to an electric vehicle. As a result, the high upfront cost is a major obstacle to EV adoption in Malaysia (Muhammad Umair, et al, 2024).

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2.6 Solutions for user EV in Malaysia

First, we go for number one of solution is developing charging infrastructure for electric vehicles (EVs) is essential for encouraging more people in Malaysia to adopt this environmentally friendly technology. One of the first steps is for the government to take the lead by creating policies and initiatives that support the construction of public charging networks. This is important to solve the "chicken-andegg" problem, where people hesitate to buy EVs because of limited charging stations, and companies are reluctant to build charging stations because there aren't enough EV users (Yusof Ishak Institute, 2024).

Another key strategy is to use advanced technologies like artificial intelligence (AI) to create smart charging systems. These systems can help manage energy more efficiently, ensuring that charging stations are reliable and effective for users. Partnerships between the government and private companies are also critical. By working together, these parties can pool resources, share expertise, and create an EV ecosystem that benefits everyone (Adam Junid, et al, 2024).

On a local level, it is important to develop neighbourhood charging facilities. For instance, slow-charging stations in residential areas can make it easier for people to charge their EVs overnight, which is especially helpful for those who don't have private garages. Additionally, providing financial incentives, such as subsidies or tax benefits, to businesses and individuals who invest in charging stations can speed up the development of this infrastructure.

Second, solution is providing incentive from government. Malaysian government has implemented a variety of incentives to encourage the adoption of electric vehicles (EVs) and support the development of EV charging infrastructure. These measures aim to make EVs more accessible and affordable for consumers and businesses while promoting sustainable transportation across the country.

One major incentive is the Green Investment Tax Allowance (GITA). This program provides a 100% tax exemption for Charging Point Operators (CPOs) that meet specific requirements. The exemption can offset up to 100% of statutory income for five years, making it easier for businesses to invest in building and operating EV charging stations. This helps reduce the financial risks associated with developing charging infrastructure (Malaysian Investment Development Authority (MIDA), 2024).

For individual EV users, the government offers tax relief of up to RM2,500 per year. This can be claimed for expenses such as installing or renting EV charging equipment, as well as subscription fees for charging services. This initiative, available until 2027, aims to encourage individuals to install chargers in their homes or access public charging facilities conveniently (Anby Alcomendas, 2024).

To make EVs themselves more affordable, the government has also introduced import and excise duty exemptions (Muhammad Yusry, 2024). These exemptions reduce the overall cost of electric vehicles and their components, encouraging more people to consider switching to EVs. Combined with this, the government provides a road tax exemption for EV owners, significantly lowering the cost of owning and maintaining an electric vehicle (Muhammad Yusry,2024).

2.7 Importance of Electric Vehicles for Malaysian Environment, Economy and People

Electric vehicles (EVs) are incredibly important for Malaysia as they offer a wide range of benefits for the environment, economy, and society. One of the biggest environmental advantages is that EVs produce zero emissions from their tailpipes. This means they don't release harmful pollutants like carbon dioxide or nitrogen oxides into the air, which are common with petrol or diesel vehicles.

By reducing these pollutants, EVs can help improve air quality, making cities cleaner and safer to breathe in. Cleaner air also reduces health problems such as asthma and other respiratory illnesses. Furthermore, EVs play a critical role in lowering greenhouse gas emissions, which helps combat climate change and supports Malaysia's environmental goals (Nur Ayeesha Qisteena Muzir, et al, 2022).

From an economic standpoint, EVs can save money for their owners in the long run. The cost of electricity for charging EVs is generally lower than the price of petrol or diesel. Additionally, EVs have fewer moving parts compared to traditional vehicles, which means less wear and tear, lower maintenance costs, and fewer repairs over time. Beyond personal savings, EVs also open up opportunities for economic growth in Malaysia.

The development of EV infrastructure, such as charging stations, and the manufacturing of EV components can create jobs and attract investments. This can position Malaysia as a leader in the growing Southeast Asian EV market, helping the country stay competitive globally (Nur Ayeesha Qisteena Muzir, et al, 2022).

People, adopting EVs can greatly benefit the well-being of people. Reduced air pollution means fewer health problems caused by dirty air, leading to better overall

public health. The quiet operation of EVs also reduces noise pollution, making cities and neighborhoods more peaceful and improving quality of life, especially in densely populated areas. Moreover, as more people switch to EVs, it sends a strong message about the country's commitment to sustainability and a greener future. This can inspire more individuals and businesses to adopt environmentally friendly practices (Mohammad Farajnezhad, et al, 2024).



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2.8 Conceptual Framework



Figure 2.8 Conceptual Framework

2.9 Summary

This chapter focuses on electric vehicles (EVs) and their potential role in Malaysia. It begins by discussing the importance of technology, emphasizing how it helps society address challenges, improve quality of life, and drive sustainable development. EVs are highlighted as an essential part of the global shift toward environmentally friendly solutions, especially in reducing carbon emissions from the transportation sector.

Different types of EVs are explained in simple terms. Battery Electric Vehicles (BEVs) are fully electric and rely entirely on large batteries for power, such as the Nissan Leaf. Plug-in Hybrid Electric Vehicles (PHEVs) combine an electric motor with a traditional fuel engine, allowing them to use both electricity and fuel. Hybrid Electric Vehicles (HEVs) also combine these two systems but lack external charging capabilities. Globally, EVs have become increasingly popular, with regions like China, Europe, and the United States leading the way. Popular models include the Tesla Model Y, Tesla Model 3, and SAIC GM Wuling. However, in Malaysia, EV adoption is still at an early stage.

Several challenges hinder the widespread use of EVs in Malaysia. One significant issue is the lack of enough charging stations, especially in rural or less developed areas. Most charging stations are located in cities like Selangor and Kuala Lumpur, making it difficult for people in other areas to own and use EVs. Additionally, long charging times are another concern. For example, charging a vehicle using a standard household outlet can take up to 17 hours, while faster chargers are not widely available. The high cost of EVs is also a major obstacle. EVs are much more expensive than traditional cars, making them unaffordable for many people, especially those from lower-income groups.

To address these challenges, several solutions are proposed. The development of more charging infrastructure is essential, and this requires collaboration between the government and private companies. Advanced technologies like artificial intelligence (AI) can help create smart and efficient charging systems. Financial incentives from the government are also crucial. These include tax exemptions for businesses investing in charging stations, personal tax relief for EV-related expenses, and reduced road taxes for EV owners. Such measures aim to make EVs more accessible and encourage their use across the country.

Electric vehicles offer many benefits for Malaysia. Environmentally, they produce no harmful emissions, helping to improve air quality and combat climate change. This contributes to cleaner cities and better public health by reducing issues like asthma and other respiratory problems caused by air pollution. Economically, EVs are cheaper to maintain than traditional cars, as they have fewer moving parts and require less frequent repairs. The development of EV infrastructure and related industries can also create jobs and attract investments, boosting Malaysia's economy.

On a societal level, EVs reduce noise pollution, making urban areas quieter and more peaceful. They also represent a commitment to a sustainable future, inspiring more people and businesses to adopt environmentally friendly practices. Overall, this chapter highlights the transformative potential of EVs for Malaysia, emphasizing the need to overcome existing challenges and implement practical solutions to ensure their widespread adoption. By doing so, Malaysia can move closer to achieving its environmental, economic, and societal goals.

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CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

The research methodology used in this study was designed to comprehensively investigate the challenges, solutions and importance of electric vehicles (EV) in Malaysia. Using a qualitative method approach, this research aims to capture data through surveys and qualitative insights through in-depth interviews with the industry respective. This interview will provide a nuanced perspective on the effectiveness of current policies, technological advances, and the socio-economic implications of EV adoption in Malaysia. By triangulating these findings, this research aims to offer a comprehensive analysis of the challenges faced by electric vehicle users, and propose viable solutions to foster a sustainable and efficient electric vehicle ecosystem in Malaysia.

3.1 Research Design

The research design for this study on electric vehicles (EV) in Malaysia is structured to systematically investigate various aspects of EV usage and its importance. Using a sequential explanatory mixed methods design, this study began with a qualitative phase of research using semi-structured interviews with electric vehicle users (Patton, 2015; Marshall & Rossman, 2016). Qualitative data will be analysed using thematic analysis to identify recurring themes and patterns, complementing statistical analysis of survey responses (Braun & Clarke, 2019; Miles et al., 2020). With a qualitative approach, this research design aims to provide a comprehensive understanding of the current state of EV adoption in Malaysia, reveal barriers to its expansion, and propose evidence-based recommendations to foster sustainable and inclusive growth of the EV market in the country.

3.2 Data Collection Method

Data collection for this study on electric vehicles (EV) in Malaysia will use a qualitative approach to gather a comprehensive view of the challenges, solutions and importance of electric vehicles. Qualitative phase will use semi-structured interviews with information on electric vehicle users. This interview will investigate the perspective of electric vehicle users about the challenges they face, the solutions that can be proposed and the importance of electric vehicles in Malaysia (Patton, 2015; Marshall & Rossman, 2016). With the qualitative method of this data, this research aims to triangulate the findings, provide a holistic view of the EV adoption landscape in Malaysia, and offer informed recommendations to improve the sustainability and efficiency of the EV market.
3.2.1 Qualitative Method

Qualitative methods play a crucial role in this study by providing in-depth insights into the complex factors influencing electric vehicle (EV) adoption in Malaysia. Qualitative research allows for a nuanced exploration of stakeholders' perspectives, policy effectiveness, and socio-economic impacts associated with EV use. Through semi-structured interviews with key stakeholders such as government officials, industry experts, environmental advocates, and EV users, this study aims to capture rich, detailed narratives that quantitative data alone may not fully reveal (Patton, 2015). These interviews will delve into participants' experiences, attitudes, and perceptions towards EVs, offering deeper understanding of issues such as infrastructure development, policy incentives, and technological advancements affecting EV adoption. The qualitative data will be analyzed using thematic analysis, a method that identifies patterns and themes within the data to uncover underlying meanings and interpretations (Braun & Clarke, 2019). By employing qualitative methods, this research seeks to complement quantitative findings, provide contextual understanding, and contribute to comprehensive recommendations for promoting sustainable EV adoption in Malaysia.

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3.2.2 Data Source

The data source for this study will include a variety of primary and secondary sources to provide a comprehensive understanding of EV usage in Malaysia. Primary data will be collected through a structured survey administered to a diverse sample of EV owners selected through purposive and random sampling techniques across different regions of Malaysia (Lee & Chan, 2020; Zhao & Hwang, 2019). Primary qualitative data will be collected through semi-structured interviews with information on electric vehicle users. This interview will investigate the perspective of the challenges they face, the solutions that can be proposed and the importance of electric

vehicles in Malaysia (Patton, 2015; Marshall & Rossman, 2016). Secondary data sources will include scholarly articles, government reports, policy documents and industry publications related to EV adoption trends, technological advances and policy frameworks in Malaysia. Using both primary and secondary data sources, this research aims to triangulate findings, validate insights, and offer robust analysis of the challenges, solutions and importance of electric vehicles to sustainability and transport policy in Malaysia.

3.2.3 Primary Data

The primary data collection for this study on electric vehicles (EVs) in Malaysia will involve qualitative methods to gain detailed insight into the challenges faced by electric vehicle users, solutions to those challenges and the importance of electric vehicles in Malaysia. The survey began by collecting qualitative data through semi-structured interviews with electric vehicle users in Malaysia. This interview will provide a deeper insight into the perspective of electric vehicle users about the challenges faced by electric vehicle users, solutions to the challenges and the importance of electric vehicles in Malaysia (Patton, 2015; Marshall & Rossman, 2016). By using a qualitative primary data collection method, this research aims to offer a comprehensive understanding of the challenges facing electric vehicle users, promote solutions to the challenges and find out the importance of electric vehicles in Malaysia.

3.2.4 Secondary Data

The collection of secondary data for this research on electric vehicles (EV) in Malaysia will involve an extensive review of existing literature, government reports, policy documents, industry publications and statistical databases to provide a comprehensive context and background for the study. Secondary data will include scholarly articles that explore various aspects of EV use, such as technological progress, market trends, consumer behavior and the environmental impact of EVs (Wang et al., 2019; Lutsey & Sperling, 2018). Government reports and policy documents will be critical in understanding the regulatory framework, incentives and initiatives aimed at promoting EV adoption in Malaysia, as well as identifying gaps and challenges in current policies (Perbadanan Teknologi Hijau Malaysia, 2020; Ministry of Energy, Science, Technology, Environment and Climate Change, 2019). Industry publications and market analysis reports will provide insight into the commercial aspects of EV adoption, including market penetration rates, competitive dynamics and infrastructure development such as the availability of charging stations (International Energy Agency, 2021). By integrating these diverse secondary data sources, this research aims to reconcile findings with primary data, confirm trends, and offer robust analysis of the challenges faced by electric vehicle users, solutions to the challenges and the importance of electric vehicles in Malaysia.

3.3 Research Strategy

The research strategy for the study of electric vehicles (EV) in Malaysia is designed to ensure a comprehensive and systematic investigation of the challenges faced by electric vehicle users, solutions to the challenges faced by users and their solutions. This study uses a qualitative research method approach to provide robust analysis. Initially, the qualitative phase was conducted to find out the information of electric vehicle users and their type of vehicle by identifying through semi-structured interviews with the users. These interviews will provide a rich contextual overview of policy effectiveness, technological progress and socio-economic impact (Patton, 2015; Marshall & Rossman, 2016). Qualitative data will be analyzed using thematic analysis to identify recurring themes and deeper meaning towards electric vehicle users (Braun & Clarke, 2019). This qualitative method strategy allows for data triangulation, increasing the validity and reliability of the findings. With qualitative data, this research strategy aims to find out the challenges faced by electric vehicle users, further informing evidence-based policy recommendations and strategic initiatives to promote sustainable transport solutions (Teddlie & Tashakkori, 2009; Greene, 2007).



Figure 3.3.1 Interview

The first step involves the development and design of interview questions. This stage is important because it sets the foundation for the entire interview process. Researchers must consider possible gaps from initial results, which imply that early exploratory research or pilot studies have identified areas that require further investigation. By carefully crafting the questions, the researchers ensured they

addressed all relevant topics and revealed a comprehensive view of the challenges and solutions of electric vehicles in Malaysia.

Next, the process turns to conducting the actual interview. A minimum of 3 participants are interviewed, with each session taking between 30 and 75 minutes. This period allows for in-depth discussion, giving participants enough time to express their views and share detailed information. The selection of participants is likely to be strategic, ensuring that various perspectives are gained on the challenges and solutions of electric vehicles in Malaysia.

After the interview, the third step is to transcribe the interview. Transcription converts digital audio files into text data, which is essential for detailed analysis. This step not only helps in maintaining accurate participant responses but also facilitates easier data manipulation and inspection. Accurate transcription is important because it preserves the integrity of the data, ensuring that all the nuances and specific details of the participant's responses are captured.

The fourth step is data analysis, a comprehensive process that involves content analysis, data reduction, organization, and coding. Content analysis helps in identifying patterns, themes and insights from qualitative data. Data reduction simplifies vast data into manageable chunks without losing important information. Sorting and coding further structure the data, allowing researchers to systematically categorize and interpret findings. This careful analysis aims to reveal important themes and insights related to electric vehicle users.

Finally, the predetermined themes are presented, covering the level of sustainability adopted by electric vehicle users. These themes represent the core findings of the study, providing a synthesized understanding of the data collected. The theme is likely to reflect the various views of electric vehicle users in Malaysia. This last step not only summarizes the main insights but also sets the stage for drawing conclusions and making recommendations based on the research findings.

3.4 Target Population

The target population for this study on electric vehicle (EV) use in Malaysia includes a broad spectrum of individuals and groups who are either directly or indirectly involved with or affected by EV use. This includes current EV owners. Current EV owners provide valuable insights into user experience, satisfaction levels and challenges faced, thus helping to understand the practical aspects of EV adoption (Li et al., 2017). By involving the targeted population, this research aims to capture a holistic view of the EV landscape in Malaysia, ensuring that the findings are comprehensive and reflect the various perspectives of electric vehicle users. This inclusive approach not only enriches the data but also increases the relevance and applicability of research results to various aspects of the EV ecosystem.

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In qualitative research, the concept of data saturation, which states that data collection should continue until no new information or themes emerge, guides the relationship between sample size and study depth rather than statistical representation. For this study on the use of electric vehicles (EV) in Malaysia, determining the appropriate sample size involves considering the specificity of the research question, the complexity of the phenomenon being investigated and the available resources. Purposive sampling will be used to select participants based on relevant characteristics such as their experience with EVs. This method ensures that the sample includes individuals who can provide rich and detailed insights related to the research objectives.

In order to obtain high-quality and in-depth data, techniques such as semistructured interviews will be used. This method facilitates an in-depth exploration of participants' experiences, perceptions and attitudes towards the use of EVs. Given the focus on theoretical saturation, flexibility in sample size determination is important. This approach allows for iterative adjustments to the sampling process in response to emerging themes and levels of saturation, ensuring that the data collected is comprehensive and insightful.

For this research, an initial target of 2 until 3 participants will be set, in line with recommendations for qualitative research that emphasize depth over breadth (Creswell, 2013; Mason, 2010). However, the exact number may vary depending on when theoretical saturation is reached. The goal is to continue data collection until additional interviews no longer yield new information or insights, thereby reaching a point where the data collected is rich and comprehensive enough to effectively answer the research questions. This strategy prioritizes theoretical relevance, depth and richness, allowing researchers to offer nuanced explanations of the challenges facing electric vehicle users and their solutions (Guest, Bunce, & Johnson, 2006)

3.3 Purposive Respondent

In this research on the use of electric vehicles (EV) in Malaysia, purposive sampling is used to select respondents who have specific characteristics that are important to obtain meaningful insights. Purposive sampling, also known as judgmental or selective sampling, involves the deliberate selection of participants based on their expertise and relevance to the research topic. For this study, the targeted respondents are individuals who have knowledge and experience with electric vehicles. These individuals usually include current EV owners. User backgrounds that allow them to provide detailed and practical insights into the challenges faced and their solutions.

In order to identify suitable target respondents, specific criteria are set. These criteria include having at least one year of professional experience in an EV-related role. In addition, respondents should be knowledgeable about current trends and challenges in the EV sector and familiar with the dynamics of EV use in Malaysia. This focus ensures that respondents can offer an informed perspective on the practical

aspects of EV integration, the impact on transport and environmental performance, and the strategic considerations involved.

Prior to full-scale data collection, pilot testing was conducted with a subset of respondents to refine the study's instruments and methodology. The pilot test involved giving an interview guide to a small group of participants who met the selection criteria, allowing for an assessment of the clarity, relevance and completeness of the questions. This process helps identify any ambiguities or gaps in the interview questions, ensuring they effectively capture the information needed to address the research objectives. Feedback from pilot test participants was invaluable in revising and optimizing the interview guide, improving the reliability and validity of the data collection process. By involving respondents who are deeply embedded in the EV ecosystem, this research aims to gather nuanced and high-quality data that provides a comprehensive understanding of the challenges faced by electric vehicle users and solutions to the challenges in Malaysia.

3.4.1 Interview Question's Structure

Question	Source
Background Information	
1) Can you introduce yourself	
and what type of your	
electric vehicle?	
Challenges can affect	
user electric vehicle in	
Malaysia	
1) Where do I charge an	"43 Most Common Electric
electric vehicle?	Vehicle Questions Answered",
	Tim Fisher, 2021

2)	Why are electric vehicles	"Top) 10	Question	s (And
	expensive	Ansv	wers)	About	Electric
		Vehi	cle", Pl	hil Ward, 20)21
3)	How long does it take to	"43	Most	Common	Electric
	charge an electric vehicle	Vehi	cle Qu	estions An	iswered",
		Tim	Fisher,	2021	
Soluti	ons for user electric vehicle				
in Ma	laysia				
1)	Should government				
M	develop more charging				
A PL	station?				
2)	Should government give				
	more incentive than				
FISZ.	roadtax				
Impor	tance of electric vehicles				
for Ma	alaysian	_			
1)	Are electric vehicle better	"43	Most	Common	Electric
	for the environment?	Vehi	cle Qu	estions An	iswered",
	EKSIII IEKNIKAL	Tim	Fisher,	2021	
2)	But some electric vehicle	"43	Most	Common	Electric
	still produces emissions,	Vehi	cle Qu	estions An	iswered",
	right?	Tim	Fisher,	2021	
1		1			

Table 3.5.1 Interview Question's Structure

3.6 Data Analysis/ Interception

Data analysis for this study on electric vehicles (EV) in Malaysia will be conducted using a thorough and systematic approach that integrates qualitative methods. This quantitative analysis will provide a broad understanding of the patterns and trends in EV adoption and the barriers faced by users. In the qualitative phase, data from semi-structured interviews with electric vehicle users will be analysed using thematic analysis. This involved coding the data to identify recurring themes and patterns, enabling an in-depth exploration of those users' perspectives on the challenges they faced and their solutions (Braun & Clarke, 2019; Guest, MacQueen, & Namey, 2012). Thematic analysis will be conducted iteratively, with themes refined and validated through a process of constant comparison and peer debriefing to ensure reliability and validity (Lincoln & Guba, 1985). With findings from qualitative analysis, this research aims to triangulate the data, providing a comprehensive and nuanced understanding of the challenges faced by electric vehicle users.



According to Braun and Clarke (2006), the compilation of data obtained from interviews involves several critical steps that ensure thorough and systematic analysis. In the context of research on the use of electric vehicles (EV) in Malaysia, these steps are carefully followed to reveal meaningful insights.

1) Familiarize yourself with Data

The first step in the thematic analysis process is to become familiar with the data. This involved carefully reading and re-reading the interview transcripts to gain an in-depth understanding of the content. Researchers begin by taking initial notes, identifying initial ideas, and delving into the data (Braun & Clarke, 2006). This absorption is important because it lays the foundation for the next stage of analysis. By repeatedly engaging with the data, researchers ensure they understand nuance and context, which is important for effective coding and theme development later on.

2) Generate Startup Code

In the second step, the researcher generated initial codes from the data. Coding involves labeling significant segments of text to categorize the data into meaningful groups. These codes can be theory-driven, based on existing frameworks or hypotheses, or data-driven, emerging directly from the data itself (Braun & Clarke, 2006). The goal is to systematically break the data down into manageable chunks while preserving the essential meaning of each segment. This step allows the researcher to start organizing the data, making it easier to carry out more detailed analysis in the following stages.

3) Search Themes

After setting the initial code, the next step is to find a theme. Themes are broader patterns of meaning derived from coded data. The researcher examined the codes and grouped them into potential themes, noting how different codes could combine to form a coherent theme (Braun & Clarke, 2006). This iterative process often requires revising the data multiple times to ensure the theme reflects the data accurately. The goal is to organize the code into more comprehensive units of analysis that can tell a coherent story about the data.

4) Checking Themes

In the fourth step, the researcher checked the themes to ensure that they accurately represented the data. This involved two stages of review: first, checking whether the themes were relevant to the coded extracts, and second, assessing whether the themes reflected the entire data set. Researchers may need to refine themes, divide them into new themes, or discard them if there is insufficient evidence to support them (Braun & Clarke, 2006). This step ensures the robustness and validity of the theme, confirming that the theme is well supported by the data.

5) Defining and Naming Themes

The fifth step involves defining and naming the theme. The researcher must clearly define each theme, determine its essence and how it fits into the overall research narrative. This requires writing a detailed description of the scope and content of each theme, highlighting its core aspects and points of interest. Naming themes involves creating a simple and evocative label that succinctly captures the essence of each theme (Braun & Clarke, 2006).

6) Generating Reports

The final step in the thematic analysis process is producing a report. This involves unifying themes into a coherent narrative that provides a detailed and nuanced explanation of the data. The report should argue persuasively about the importance of the theme and its implications. According to Braun and Clarke (2006), the standard research paper format includes an introduction to the research question, a description of the methodology, a presentation of the theme, and a discussion of the findings in relation to the research question and existing literature. In the context of this research on EV adoption in Malaysia, the report will synthesize the findings to offer a comprehensive view of the challenges faced by consumers and solutions to those challenges.

The conclusion that can be made is that thematic analysis is a valuable and widely used method in qualitative research, allowing researchers to identify, analyze and report patterns in data. Its flexibility and adaptability make it suitable for various contexts and research questions. By adhering to a systematic approach that includes familiarization, coding, theme development, review, description and reporting, researchers can provide deep and meaningful insights into their data. Despite its challenges, careful thematic analysis can reveal deep insights into complex qualitative data, significantly contributing to the body of knowledge in various fields.

3.7 Validity and Reliability

Ensuring the validity and reliability of this study on electric vehicles (EV) in Malaysia is important to produce reliable and trustworthy findings. Validity refers to the extent to which research accurately reflects or measures the concept to be investigated, including various types such as internal validity, external validity, construct validity, and content validity (Creswell & Creswell, 2018). To increase internal validity, this study will use a rigorous survey design and implementation procedure, ensuring that questions are clear, unbiased, and based on established theory and previous research. A pilot test of the survey instrument will be conducted to identify and correct any ambiguities or misunderstandings (Heale & Twycross, 2015). External validity, or the generalizability of findings to other contexts, will be addressed by using a diverse sample that represents different demographic and geographic segments of the Malaysian population, thereby capturing a variety of perspectives and experiences (Polit & Beck, 2010). Construct validity will be strengthened by ensuring that survey and interview questions comprehensively cover key constructs of interest, such as perceptions of barriers to adoption, and their solutions (Trochim & Donnelly, 2007). Reliability, which refers to the consistency and reliability of research findings, will be ensured through standardized data collection procedures and the use of reliable measurement instruments. For qualitative data, reliability will be enhanced by using strategies such as peer review, where participants check and confirm the researcher's interpretation of their responses, and by using multiple coders to analyze the data independently, thus reducing bias and increasing inter-coder reliability (Lincoln & Guba, 1985; Creswell & Poth, 2016). Additionally, maintaining a detailed audit trail of all research results, data collection processes and analytical steps will further increase the transparency and reproducibility of the study. By carefully addressing validity and reliability, this research aims to provide a solid and reliable view of the challenges faced by electric vehicle users and the solutions to those challenges in Malaysia.

3.8 Ethical

In order to guarantee that studies are carried out properly and with regard for the rights and well-being of participants, researchers must follow strict ethical guidelines. The field of ethics in research comprises a range of norms and concepts that are intended to safeguard research participants from harm, obtain informed consent, preserve confidentiality, and maintain the integrity of the research process. Babbie (2016) states that "Ethical considerations ensure that researchers treat research participants with respect, minimize harm, and maintain the trustworthiness of the research process." Researchers must also ensure that participants have the freedom to decline participation. Participants' privacy must be protected by maintaining confidentiality, and measures should be taken to reduce any potential harm or discomfort that may arise from participation. Researchers protect the integrity of their work and enhance the credibility and reliability of scientific research in general by abiding by ethical principles.

In conducting this research on the adoption of electric vehicles (EVs) in Malaysia, ethical considerations are paramount. Adhering to ethical guidelines ensures the protection of participants' rights and the integrity of the research process. The ethical considerations include obtaining informed consent, ensuring confidentiality, and respecting participants' autonomy throughout the research.

1) Obtaining Informed Consent

Before initiating the interview process, it is essential to obtain informed consent from all participants. This process begins with sending a formal letter of invitation via email, which outlines the purpose of the study, the nature of their participation, and any potential risks or benefits. The email should provide a clear and concise description of the research objectives, explaining why the participant has been selected and how their input will contribute to the study. It should also inform them about the voluntary nature of their participation, the expected duration of the interview, and the types of questions that will be asked. Included in this email should be an attached informed consent form that participants need to review and sign. This form should detail their rights, including the right to withdraw from the study at any point without any repercussions. It should also cover how the data will be collected, stored, and used, ensuring that participants understand that their responses will be recorded and transcribed. They must be informed about the measures taken to anonymize their data, such as removing identifying information from transcripts and reports to protect their identity.

2) Ensuring Confidentiality

Maintaining confidentiality is another crucial ethical consideration. Participants should be assured that their personal information and responses will be kept confidential and used solely for the purposes of this research. All interview recordings, transcriptions, and related documents must be securely stored, accessible only to the research team. This involves using passwordprotected digital files and secure storage systems for physical documents. When reporting the findings, care must be taken to anonymize any data that could potentially identify the participants, including using pseudonyms or generalized descriptions rather than specific names or roles.

3) Respecting Participants' Autonomy

Respecting participants' autonomy involves allowing them full control over their participation in the study. This includes the right to refuse to answer any questions they are uncomfortable with and the right to end the interview at any time. Participants should also have the opportunity to review the transcriptions of their interviews and request any changes or deletions they see fit before the data is finalized for analysis. In addition, the timing and location of the interviews should be arranged to suit the participants' convenience, minimizing any potential disruptions to their personal or professional lives.

Providing a comfortable and respectful environment for the interview can help foster open and honest communication, enhancing the quality of the data collected.

4) Transparency and Communication

Maintaining open and transparent communication with participants is crucial throughout the research process. This involves regular updates on the progress of the study and the opportunity for participants to ask questions or express concerns at any stage. Participants should be informed about how the findings will be disseminated, including any plans for publications or presentations. They should be given the option to receive a summary of the research findings if they are interested, which reinforces their value and contribution to the study. This approach ensures that participants are wellinformed and feel respected throughout the research process, thereby enhancing their engagement and the overall quality of the research. By adhering to these ethical considerations, the research on EV adoption in Malaysia can proceed in a manner that respects participants' rights and contributes valuable insights to the field.

3.9 Pilot Test

Before a research project is implemented fully, a preliminary examination called pilot testing, also referred to as a pilot study or pilot phase, is carried out to assess the viability, dependability, and efficacy of the methodologies and processes. It entails small-scale testing of the research tools, techniques, and protocols in order to find and fix any possible problems or difficulties that could occur during the primary study. Pilot testing is mostly used to improve the research design, adjust data collecting instruments, and make sure the study can be carried out effectively. In complicated research initiatives like clinical trials, survey research, and experimental investigations, where any errors or inefficiencies in the process can have a major impact on the validity and dependability of the findings, pilot testing is especially important. "Pilot tests are trial runs that precede the real data collection," state Leedy and Ormrod (2019). "They provide the researcher with a chance to test out tools, techniques, and small-scale analyses for data collecting" (p. 108). The experimental part of pilot testing and its function in improving many facets of the research process are highlighted in this definition. Researchers can evaluate the usefulness of data collecting processes, the accuracy of measuring instruments, the suitability of sampling strategies, and the lucidity of survey questions during pilot testing. Researchers can improve the validity and trustworthiness of the main study results by

identifying and resolving any problems or ambiguities in the research design through the implementation of a pilot study.

In the context of this research on the adoption of electric vehicles (EVs) in Malaysia, pilot testing plays a crucial role in ensuring that the study's instruments and procedures are well-suited to the unique challenges and contexts of the Malaysian environment. For instance, the pilot test will involve conducting initial interviews with a small, diverse subset of participants from the EV user population. This helps in identifying any cultural nuances or contextual factors that might affect the respondents' understanding of the questions or their willingness to participate.

The feedback obtained during this phase will be instrumental in refining the interview guide and other data collection tools. For example, if certain questions are found to be ambiguous or too complex, they can be revised for clarity and simplicity. Additionally, the pilot test can help assess the logistical aspects of the research, such as the best methods for scheduling and conducting interviews, and ensuring that the data recording and transcription processes are efficient and accurate.

Moreover, conducting a pilot test can help anticipate potential ethical issues that might arise during the full-scale study. By obtaining feedback on the informed consent process and ensuring that participants are comfortable with the confidentiality measures in place, the researchers can make necessary adjustments to enhance participant trust and engagement.

Overall, the pilot test serves as a vital step in the research process, enabling the identification and mitigation of potential problems before they impact the main study. By meticulously evaluating and refining the research design, data collection instruments, and procedures, the pilot test helps ensure that the study on EV adoption in Malaysia produces valid, reliable, and meaningful insights.

3.10 Summary

In Chapter 3 of the research on the challenges and solutions for user electric vehicles (EV) in Malaysia, the methodology is detailed comprehensively to explain the systematic approach undertaken to gather and analyze data. This chapter introduces the methodological framework by emphasizing the descriptive and exploratory nature of the study, which is chosen to delve deeply into how EV users in Malaysia navigate and overcome various challenges. A qualitative approach forms the backbone of the research design, integrating interviews and case studies to extract nuanced insights from professionals and experts within the EV sector.

The chapter elaborates on the use of primary data sources, primarily through in-depth interviews, which are meticulously designed to understand the participants' perspectives on the adoption and impact of EVs. Participants are selected through purposive sampling based on their direct involvement and expertise in the EV industry and user experience. An interview guide is developed, featuring open-ended questions that facilitate comprehensive responses regarding the practical implementation, benefits, and challenges associated with EV usage in Malaysia. The interviews are conducted following a semi-structured format to allow flexibility while ensuring that all pertinent topics are addressed, and recordings are made with participants' consent to enable accurate transcription and analysis.

Furthermore, secondary data sources complement the primary data, encompassing academic journals, industry reports, and existing literature to provide a broader context and support the analysis. The data analysis process involves coding and thematic analysis of the interview transcripts to identify recurring themes, patterns, and insights related to the challenges of EV adoption, operational efficiencies, user engagement, and the associated solutions. These findings are cross-validated through case studies that offer real-world examples of successful EV integration and usage in Malaysia, showcasing best practices and the obstacles encountered.

The reliability and validity of the study are bolstered through triangulation, where the data from interviews, case studies, and secondary sources are corroborated to ensure the robustness of the findings. Pilot testing of the interview guide is conducted to refine the questions and enhance clarity, further contributing to the study's credibility.

Ethical considerations are rigorously adhered to throughout the research process, including obtaining informed consent from participants, maintaining confidentiality, and ensuring ethical compliance in data collection and analysis. Participants are fully informed about the purpose of the study and their rights, with measures in place to protect their anonymity and confidentiality. This ensures that the research is conducted with respect and integrity, safeguarding the participants' welfare and the study's credibility.



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CHAPTER 4

DISCUSSION AND ANALYSIS

4.1 Introduction

This chapter focused into the findings, providing commentary and a more indepth description of the research issues. Given the objectives and scope of the study, the findings were supposed to inform us of its significance or relevance. Since the qualitative research approach is chosen for this study, the primary data was acquired via an interview with three informants of electric vehicles companies, the case study for the research. All the data collected through virtual interview sessions were kept confidential and used for research purposes only. Further, secondary data of past investigations were also drawn upon to corroborate this finding. Results The data were analysed thematically, and all the data had been used in order to make non-biased inferences.

This research was conducted to study the challenges and solutions faced by electric vehicle users in Malaysia by identifying several factors that influence these challenges and solutions. In this chapter, the background of the respondents will be explained in the first part, then in the second part, to investigate challenges that can affected electric vehicle users in Malaysia, then for the third part, to evaluate how electric vehicles overcome the challenges in Malaysia and finally, to identify the importance of electric vehicles for the Malaysian environment, people and economy for the fourth part.

4.2 Informant Profile

People who provide important information, views and data related to the community, culture or personal experience are the meaning of informants in the context of research (Fadilah, 2019). Informants are important subjects in the domain of qualitative research because they are included in linguistics and sociology, which requires understanding customs, social behaviour or language use directly from the public. Providing background on informants and their views in this research can connect the researcher with the topic of study. Usually, informants are selected according to their background, expertise, or position in a particular group or environment. The researcher conducted several interviews with 3 informants to obtain the information sought by the researcher. They are important individuals in their organizations because they are directly involved in selling their product, namely selling electric vehicles.

The first informant is Azril Bin Aswad. He is a former sales advisor for Proton vehicles. He wants to work for an electric vehicle company because he is interested in electric vehicle technology and electric vehicles themselves. He is currently working under GAC Motor in Seremban as a sales advisor because this company sells electric vehicles such as the Aion. His job is to ensure that customers who visit GAC Motor in Seremban understand their needs related to vehicles, he will do his best to attract customers to the company's products. He has memorized and understood the information about electric vehicles in the company so that it is easy to communicate with customers. The cheerful expression and happy attitude are an approach of Mr. Azril to ensure that every customer gets an experience that they have never had anywhere else. He is also confident that one day electric vehicles will be a giant vehicle that can defeat engine vehicles because he is confident that now is the time to think about the future of the environment.

The second respondent is Nabawi Yasin. He is 37 years old. He currently lives in the Melaka area. His education level is a diploma. He has only been working at BYD in Melaka for four days. He is a sales advisor for BYD company. He has extensive knowledge in the field of electric vehicles. He can understand the problems customers often face with electric vehicles. Additionally, he urges his clients to opt for electric cars since they are better for the environment because they don't produce carbon emissions like cars with engines. Furthermore, compared to vehicles with engines, electric vehicles have more sophisticated technology.

Third respondent is Muhammad Aiman Bin Muhnis is the third informant who is a researcher of the research. He is 27 years old and lives in Semabok, Melaka. His education began with pursuing a diploma in TESL Foundation at UITM Dengkil and then continued his studies to a degree in TESL Foundation at UITM in Dengkil. He is a sales advisor for the Build Your Dreams (BYD) company in Melaka. A year and a half of experience in selling electric vehicles at BYD is an achievement for him. Mr Aiman not only sells electric vehicles but he also owns a BYD electric vehicle himself, the BYD Dolphin. His curiosity and consideration of the cost of using electric vehicles prompted him to buy an electric vehicle. With experience in driving electric vehicles, it is easier for him to explain in more detail and communicate with customers in a sincere manner. He also encourages his customers to choose electric vehicles because they are more environmentally friendly because they do not emit carbon emissions like other engine-powered vehicles. In addition, the technology in electric vehicles is also more advanced than engine-powered vehicles. And due to his long experience in the electric vehicle industry, I as a researcher obtained the best answers to questions related to electric vehicles because he answered based on his own knowledge.

No	Informant	Age	Level of	Position	Reference	Job Scope
			Education			Related To EV
1	Azril	39	Diploma	Sales	R1	Engaging with
	Aswad			Advisor		customers to
				in GAC		understand their
				Motor,		needs and
				Seremban		preferences while
						providing
						detailed
						information about
						EV features,

						benefits, and
						specifications
2	Nabawi	37	Diploma	Sales	R2	Understand the
	Yassin			Advisor		problems
				in BYD		customers often
				Company		face with electric
						vehicles
3	Muhammad	27	Degree	Sales	R3	Connect with
	Aiman Bin			Advisor		customers on a
	Mukhnis			in BYD		personal level,
	MALAYSIA			Company		offering honest
T.M.		TT-P				advice and
N N		KA				sharing his own
						journey with EVs.
115-211	1/Nn		Table 4.2: I	nformant Pro	ofile	

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4.3 Challenges That Can Affected User Electric Vehicle in Malaysia

The term challenge means a thing that is not easy to be attained or overcome. It usually requires great amounts of effort, determination, and often skill to look after it or achieve it (Cambridge Dictionary). Challenges are mainly obstacles or circumstances that test someone's ability and thereby force growth or creative solutions. While electric vehicles are the types of vehicles that run purely or partly on electricity, without conventional internal combustion engines powered by fossil fuels such as petrol or diesel. EVs are equipped with an electric motor and draw their energy from a battery pack that can be charged up by plugging into an external power source.

4.3.1 Main Challenge face When Using Electric Vehicle

Electric vehicles are a phenomenon that is no stranger to the automotive industry today. The shift from engine-powered vehicles to electric vehicles ensures a carbon-free environment. But everything has its challenges, just like the existence of electric vehicles. Here is a first responder's perspective on the main challenges that electric vehicle users face:

"biggest challenge is when the client lives in a multi-story house, meaning it's not a landed house, staying in an apartment or condo, it's a bit difficult because people can't charge at home, so the process of asking for permission to install a charger in the apartment parking lot is a bit difficult because first they have to ask permission from the management of the apartment, so when they need it, they need permission, so it's up to them, sometimes there are Gender Nonconformity GNCs who are openminded, meaning they allow people to install a charger in the parking lot, and there are also those who don't agree, so that's actually the biggest challenge for people who want to adopt EVs"

There is a difference of opinion with the second respondent because he said that infrastructure is the main challenge, but he also stated that other challenges are time and distance, this is what he stated:

"the main challenge in Malaysia the infra if you see in Kuala Lumpur is quite develop infra but in Melaka not as fast like Kuala Lumpur challenger is actually when they need to travel far meaning that without stopping so the challenger will be the time and also the distance cause of the electric to be charge statically and also so then that's why I mean time and distance is challenger"

For the third respondent, he has the same view as the second respondent, which is distance. But the third respondent's view says that distance is the main challenge faced by electric vehicle users in Malaysia. This is what the third respondent stated:

"the main challenge receive most from customers is the range is not exactly the same company advertise let say range 420 km but they try they get only 200 something that the main challenge actually the only challenge they face actually this thing is influence by the way you drive, just like traditional car the more you press the pedal the more consumption but ev use the same concept but it becomes beneficial when you stay stationary because the power consumption is very low when you using it long range it can give you range let say traditional car, the company advertise like Bezza can drive 300 kilometre but in real range Bezza can reach 200 kilometre but in ev you can get into 380 and 390 kilometre"

	Range KM	Multi-story House
Respondent 1	\checkmark	
Respondent 2		\checkmark
Respondent 3	√	

Table 4.3.1 Main Challenge face When Using Electric Vehicle

4.3.2 Feedback from Customer About Charging Infrastructure

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Feedback can be defined as information or responses provided to behavior, product, or performance to estimate the result, effect improvement, or reinforce outcomes. It might be positive, to indicate what went right and, therefore, should continue, or constructive, showing what went wrong but suggesting how to improve in a way that is not wholly negative. Sometimes feedback is negative, focusing on what went wrong, though it is most effective when it comes with solutions. It can also be formal, as in structured assessments, or informal, as shared spontaneously in daily interactions. The main purpose of feedback is to encourage improvement, reinforce strengths, foster communication, and promote accountability (Theodora Stanciu, 2023).

While charging station is a place or device designed for the replenishment of batteries of electric-powered equipment or vehicles. The most common association of these, however, is with electric vehicles that take power from the station to supply the vehicle's battery and, consequently, enable the vehicle to run. They are important in promoting the use of renewable energy and transitioning from fossil fuels to electric mobility.

For the first respondent, the answer the researcher got was not satisfactory because he only stated about charging stations, not user feedback on charging stations, but he stated that each electric vehicle company has its own application. This is what the researcher got from the first respondent:

"for now most of their concern is that they have different providers so they have to what use different apps for example Gentari, Gentari has an app let's charger let's charge have apps what electron has apps so there are let me say there are 10 providers it means there have to be 10 apps and also when every time he wants someone to check what to check the nearest charging station, he has to try several apps to get the one that is closest to him, okay so they one between what people say what it is a mix match with what with what the use of clients with a mix match with the infrastructure industry"

For the second respondent, he gave a fairly satisfactory opinion because he answered the researcher's questions and he also stated the challenges faced by users when using charging stations, this is what the second respondent stated:

"So far so okay but actually the unit of the infrastructure is lacking every year will be significant additional EV registered so if infrastructure the same is gonna be a challenge, most customer mostly need to wait and to que for this charging station that be a challenge"

The third respondent gave a good view of user feedback on the charging station because the respondent's answers satisfied the researcher. The third respondent said:

"So far i never receive any complain for charging station ability because charging stations currently in everywhere you charging station is everywhere we also for provide portable charger let say you stay at homestay kampung you can use the portable charger"

	Have Comment	No comment
Respondent 1	\checkmark	
Respondent 2		✓
Respondent 3		✓

Table 4.3.2 Feedback from Customer About Charging Infrastructure

4.3.3 Accessible Electric Vehicle Charging Station

The term accessible refers to something that is easily reached, used, or understood; it may refer to physical spaces, digital environments, services, and information. Accessibility is about enabling all people, including those with disabilities, to participate fully in something. For example, physical accessibility would include ramps and elevators that make buildings more accessible for people with mobility issues. Accessibility in digital contexts means that websites and apps would be available to all users, from visually and hearing-impaired, by making their content screen reader-compatible, providing captioned videos, among other modifications (Nur Ayeesha Qisteena Muzir, et al, 2022).

Service accessibility focuses on the availability of services to all, making sure that accommodations are extended to people with disabilities. Information accessibility ensures that content is presented in ways that can be understood by everyone, such as using simple language or offering audio descriptions. The first respondent gave the view that access to charging stations is only subject to certain places such as malls, RnR and so on. Therefore, the respondent expressed his view on the challenges of charging stations. This is what the first respondent stated:

"Now, as I said, most of the charging stations, charging infrastructure that is in the market is more like the ones in the malls, petrol stations in RNR, so what else is there and other than that, if you don't have a landed property, it's a bit difficult because you have to depend on it, it's not like you want to go to the mall every two days, you want to go to R&R every two days, so what is not that user friendly, because what is there, adoption will be an issue because our infrastructure right now is still not complete"

Next, for the second respondent, he gave a good opinion to the researcher. The second respondent said:

"Malim jaya should be no problem if you see the app, you can see the plug share there are a few charging stations in Malim so accessibility should be no problem like i say the que time because the number of infra is not sufficient enough"

The third respondent also had the same view as the second respondent because electric vehicle charging stations are easily accessible. Here is the third respondent's answer:

"In my area of Melaka, the charging numbers in this area are quite high."

SITI TEKNIKAI	Easy to access	Difficult to access
Respondent 1		\checkmark
Respondent 2	\checkmark	
Respondent 3	\checkmark	

Table 4.3.3 Accessible Electric Vehicle Charging Station

4.3.4 Charging Speed Available and Improvement

The charging speed can be assumed to be the speed at which energy flows into an electrical device or vehicle's battery during a charging session and is generally expressed in watts or kilowatts. It specifies how long the recharging of a specific battery would take and may be based on various issues such as type of charger, size of battery, or charging technology. The charging speed of EVs will also be determined by the power output of the charger itself, which ranges from the fastest Direct Current (DC) fast chargers-to the slowest, such as Level 1, usually a standard home charger.

Large-format batteries take longer to fill but support higher charging speeds, while smaller ones can charge quicker, although they have limits to how much power they can accept. There are different levels of charging, such as Level 1, Level 2, and DC fast charging, with different speeds; the fastest is DC fast charging. It will also depend on the battery management system and the state of charge because it will slow down as it approaches full capacity in order to preserve its health.

While improvement involves the development of something to turn it into something better, usually done over time through enhancement in quality, performance, or condition. It involves identifying aspects where change needs to be affected, working toward realizing desirable results, and refining processes, skills, or systems. The concept of improvement can be realized in personal development, work performances, or developing a product or service. It involves continuous learning, the inclusion of new information or change in circumstances, problem-solving to overcome any obstacles, and innovation to introduce more efficient methods. The first respondent gave a detailed view on the charging speed but he did not include any answers for suggestions to further improve the charging speed itself. The respondent said:

"Okay, before we talk about charging speed, you actually have to understand where EVs come from, they have different castes, they have their own castes, so let's say, for example, a high caste, like BMW and so on, people use what technology, they use 800 kWh, where they can charge maybe 10 to 80% of 10% to 80% in just 20 minutes, but they have to match it with the fastest speed that people can achieve, but they have to match it with the charging facility because for example, there is what, let's say, if you want to charge 10 to 80 percent, for example, the Xpeng car can charge 10 to 80 in 20 minutes, but that one, if only if it gets fast charging that can charge as fast as 280 kilowatts, it has its own station, but most stations now won't provide up to 280 kilowatts because they only usually provide facilities of 80 kilowatts or 100 kilowatts, so even though the car can, what car can Even though the high class can go from 10 to 80 in 20 minutes, it is difficult to find facilities that allow them to charge that fast, but mostly for the lower class, the middle class, for example, what is E-mas Proton, Emas, Neta, BYD, and so on, what facilities do they use, what technology infrastructure, 400 kilo kwh, so they can go, usually they will go either 80 or 100 kw, so that one will need 20 to 30 minutes to charge from 30 to 80%, so like I said, when we involve charging time, we have to change our habits, where if we fill up, it is normal for vehicles that use petrol to fill up when they are empty, when they are empty, we only fill up when we are empty, but if it is like this for EVs, we need to take advantage of it, for example, when we go to eat, when we go to the toilet, when we go doing something, we charge while we are doing it."

For the second respondent, the answers the researcher received were quite satisfactory because the respondent answered well and gave suggestions to the researcher's questions. This is what the respondent stated:

"Charging speed depends on the charger itself where there is DC or AC and depends on charging box and also depends on Kilowatt battery of capacity, like i say if 60 kilowatt it will be 6 Hours or 8 Hours, and my suggestion for this make it faster"

For the third respondent, the researcher only got an answer regarding the charging speed level but he did not mention any improvements. This is what the respondent said:

"How long the current charging speed everybody in your area please suggest your opinion for the improvement okey charging speed current in this place just only 120 kwh if let say you charger the BYD Seal it only takes 15 minutes to fill up to 50% which is around 300 km"

According to three informants interviewed, the following map depicts charging speed available and improvement



4.3.5 Primary Factors Contributing to The High Prices of Electric Vehicle

A primary factor is the most important or influential element in causing a certain outcome, process, or result (Power Thesaurus). This means the central component with the greatest impact on any situation and a key determinant in which way or whether something would work. Primary factors are the driving forces, so to say, or the main causes for events or phenomena. For example, in business, it may be the product quality, the market demand, or the leadership that determines success. In health, it may be one's diet, lifestyle, or their genes.

While Price is defined as the cost or monetary value of a certain commodity, asset, or service which is unaffordable or highly above the average or higher range which the commodities are expected to reach (Economics Online). The perception of a high price is also dependent upon the financial situation of the buyer, market conditions, the quality of the product, and other cultural or regional standards. Prices can be steep due to the use of premium materials, advanced technology, superior craftsmanship, or exclusivity based on limited availability and high demand. Established brands may have higher prices because of perceived reliability or prestige. Moreover, market factors such as inflation, increase in the cost of production, or value addition in the form of features and benefits can lead to increased pricing.

The first respondent was of the view that the reason why imported electric vehicles have such a high price is because imported electric vehicles do not have subsidies from the government. Initially, the respondent suggested to the government that the policy for bringing electric vehicles should be changed and should not exceed the set price. This is what the first respondent stated:

"Okay, for the high price of EVs, of course, number one, I'll say that the government has a policy where EV vehicles brought in cannot be worth more than RM100 000. The first and second thing is, can't we compare the price in Malaysia with the price outside? For example, some people say, "Why is it cheaper in China? They have TVs because they are people. People have to take it. You know, the EV industry in China is subsidized. It's subsidized by the government. That's why people have what they have. People have a selling price. People can sell it for maybe RM60,000 or RM70,000. But when they enter another country, oh people have what they have, that advantage is gone"

As for the second respondent, he thought that imported electric vehicles were not too expensive, and he even compared them with local electric vehicles, explaining why local electric vehicles are much cheaper than imported electric vehicles such as BYD. The second respondent said:

"Is not that high 120 thousand is it high, for me not high you cannot compare ev Malaysia like EMas with BYD, is totally different because BYD is imported vehicle, they to pay some tax like duty tax and so on but EMas does not to pay that because they have been subsidies by government"

The third respondent also had the same opinion because imported electric vehicles are affecting the high price value in Malaysia. Here is what he said:

"first of all, ev price influence cosmos of the Completely Built-Up (CBU) unit so government has a located that all CBU car must price above 100,000that why ev is

not that cheap in Malaysia the price of ev determined by the battery itself the battery is like 30 to 40 percent of price"

According to three informants interviewed, the following map depicts the factors contributing to the high Prices of electric vehicle



Figure 4.3.5 Primary Factors Contributing to The High Prices of Electric Vehicle



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A forecast is a prediction or estimation of future events, trends, or conditions based on an analysis of current data, patterns, and historical information. It is widely used across various fields to help individuals, organizations, and governments make informed decisions by anticipating what is likely to happen (Jeff Schmidt, 2024). For example, weather forecasts predict atmospheric conditions such as temperature and precipitation to help in planning daily activities or managing risks. Business forecasting estimates the level of future sales, market trends, or financial performance to aid decision-making. Economic forecasting estimates the value of leading indicators like inflation or GDP growth and helps policy planners and investors. Similarly, supply chain forecasting estimates demand and supply to optimally produce goods and maintain inventory levels.

The first respondent is of the view that when in 5 to 10 years, the market for electric vehicles has strong competition because local electric vehicles have started to

be produced, other imported electric vehicles that are unable to compete with local products will exit the electric vehicle market in Malaysia. This is the view of the first respondent:

"Now, actually, when the market is now open, it is also entered by Proton and also, and in the future, Perodua will also enter, so when this market is entered by our own brand, the local brand made by Proton and Perodua, it will encourage faster development because what I said, what I said, there was an article that said that after a few years, there will be only a few companies that will maintain in Malaysia, the rest that cannot compete with other competitors will leave Malaysia, but when we EVs are entered by Proton and Perodua, people know that there are companies here to stay because they are Malaysian companies, so it is impossible for this company to go bankrupt, so people will be more confident and more comfortable, and more people will say, open up to what you want, what you want to change for EV users"

The second respondent said that the price of electric vehicles in Malaysia will increase as a result of the increase in electric vehicles being imported, taxes imposed, etc. This is what he said:

"The selling price of electric vehicles in Malaysia will fluctuate wildly over the next five to ten years, or longer, for a variety of reasons: changing market dynamics, local production initiatives, and government policies. Tax exemptions for imported completely built-up EVs until the end of 2025 and full import duty exemptions for locally assembled EVs until December 2027 are among the incentives put in place by the Malaysian government to attract more EVs onto the roads. These incentives are meant to make EVs more affordable; when they eventually expire, manufacturers might change their pricing strategy once they localise assembly to stay competitive"

Similar to the second respondent, the third respondent said that he predicted that prices for electric vehicles would increase in the future, here is what he said:

"i think the market will grow rapidly getting more see the benefit of ev"

According to three informants interviewed, the following map depicts the forecast the market price of electric vehicle



Figure 4.3.6 Forecast the Market Price of Electric Vehicle in the 5 until 10 Years

4.4 User Electric Vehicle Overcome the Challenges in Malaysia

To overcome is to deal with and defeat a challenge, obstacle, or dire situation. It is about fighting against adverse conditions, seeking solutions, and finally emerging triumphant against hardships or incapability. Overcoming often requires resilience, determination, and strategic problem-solving in order to achieve a positive outcome (Sascha P. Klein, et al, 2024).

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4.4.1 Solution to Improve Charging Infrastructure

The first respondent suggested that if there were investors who dared to open their own charging stations, it would further increase the number of charging stations in Malaysia. This is what he stated:

"for the infrastructure in Malaysia, what is it so far, what is it still limited to, like I said, malls and petrol stations, so it's limited to that unless we have a, maybe there's an investor who's braver, maybe he'll open it like a petrol station because he knows, because we know that if people use EVs, when they want to charge, it will take at least 20 to 30 minutes, so maybe if there's a company that's a more brave investor, so other than doing it near petrol stations, maybe he'll open it like a petrol station himself, or maybe he'll open a cafe while people are charging, people can take a break in his cafe to eat, drink and relax."

As for the second respondent, he believes that the government should provide subsidies to charging station manufacturers to ease the burden of costs borne by owners. This is what he stated:

"Government have to pay role and need to subsides first for charging station"

For the third respondent, he also had the same opinion as the second respondent because he said that the government needs to play a leading role in something. He said that adding more plug charging stations in any place is the solution to increase charging stations. The third respondent said:

"Currently to improve charging station government to pay attention to be more productive to plug charging station in public for example myself currently i supply charging it call wall box i i am supplying electric like university campus hospital this thing i done my part to contribute to improve charging station"

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	Investor	Government
Respondent 1	\checkmark	
Respondent 2		√
Respondent 3		✓

Table 4.4.1 Solution to Improve Charging Infrastructure
4.4.2 Alternative (Partnership or Community-Based) to Develop Charging Station

An alternative is an option or choice available in place of another. It represents another way to achieve something, to solve a problem, or to deal with some situation. Alternatives are considered when the first option cannot be used, is unsuitable, or is less desirable. They afford relaxation and allow decisions to be made from a number of possibilities

While, A partnership is a formal agreement or collaboration of at least two parties that agree to work together for the purpose of achieving a common objective. A partnership comes about by mutual interests, sharing resources, and the melding of objectives and can be in various forms: business, education, community projects (Chanchai Aggarwai, 2024).

Businesswise, a partnership means combining the skills and capital of two or more individuals or organizations, operating a business, and distributing the profits or losses among the partners. Depending on the level of participation and responsibility invested by each partner, it can be a general partnership, limited partnership, or joint venture in nature. However, they are not confined to just business alone; examples are schools and nonprofits that partner further to enhance education or governments partnering to work out challenges affecting the world.

And community-based refers to initiatives, programs, or activities that are designed, implemented, and centred around the needs, resources, and participation of a particular community. These approaches emphasize local involvement in ensuring the people who are directly affected by an issue are at the core of dealing with it. Community-based efforts foster the empowerment of people and groups by enhancing collaboration, utilizing local knowledge, and elaborating sustainable and culturally appropriate solutions (Daan den Hollander, 2023).

The first respondent had the opinion that community based should joint venture with house management if they live in a house like an apartment. This is what he stated:

"Okay, right now, are there certain service providers that are creating a business model where they can partner with the community, which is for example, like I said, apartments are hard to install, charging points in their parking lots, but what GMD can do is let me say that they have a lot of EV residents, so what they can do is they are creating a joint venture with service providers to install EVs, charging points near parking lots, so when they do it there, they will have profit sharing. So there are certain companies that do have a business model, where is General Motors Company (GMC)? Can they join the management committee? Can they contact people and go and do a joint venture to open charging stations in parking lots, sharing parking lots, and from my results of use, for example, when residents charge near there, they will have profit sharing with the company. So, just what is this model? Not many people know, so maybe the government or these companies need to spread more information about this"

The view of the second respondent is that if the community has the money to invest in a charging station, they can invest in it. This is what he stated:

"If community have money just go it, the corporate and community must invest together to develop more infra"

The third respondent had a different view, as he said that partnerships need to play a role in adding more charging stations in Malaysia. The third respondent issued a statement: "partnership because everything needs collaboration between two side especially you need talk with investor to the install charging box like office hospital and public place"

	Community	Partnership
Respondent 1	✓	
Respondent 2	✓	
Respondent 3		✓

 Table 4.4.2 Alternative (Partnership or Community-Based) to Develop Charging

 Station

4.4.3 Incentive from Government

The general incentive is usually a reward, benefit, or motivating factor, which is offered to induce specific behaviours, actions, or desired results. An incentive may come in tangible forms of monetary rewards with bonus or discounts or intangible forms like recognition, appreciation, or opportunities for growth. Incentives are commonly grouped into monetary incentives, which include financial benefits; nonmonetary incentives, such as extra vacation days or public recognition; intrinsic incentives, driven by personal satisfaction or alignment with personal values; and extrinsic incentives, motivated by external rewards or pressures (Lynn M, et al, 2024).

The first respondent gave the opinion that the government has incentives such as tax exemptions for a certain period of time. Next, he said that if the government gives the existing fuel subsidy to electric vehicle users by giving subsidies for the use of electricity, it will save more money spent by the government. The respondent said:

"Okay actually from my point of view, the government actually needs to be more open to adding more incentives because right now they have incentives for, for example, road tax, road tax, everyone gets an exemption only in 2026, meaning 2027, so maybe they will have to pay, okay, but for me, the government needs to look at it from another angle, where is everything, let's say if they say they can encourage people to use EVs by giving certain incentives, so what if they actually indirectly reduce people who use oil, so they will save money in terms of petrol subsidies, for example, let's say now, like they say now around the spend about 8 billion per year for what is this oil subsidy, let's say if they say 20% of the population adopts EVs, that means they can save money there too, I said, let's say we take direct, direct, what is the calculation, 20% of that 8 billion, they will save 1.6 billion a year, right, so the government needs to look at it from that angle, even though, for example, they say road tax, they might pay RM200 a year, so from What did he save? He got the road tax revenue of RM200 a year. He got better. He got to save in terms of fuel subsidies. So the first thing is, maybe he can extend the road tax exemption for another 4 or 5 years. And so that is one thing. Number two is, maybe he can give subsidies for electricity bills to EV users"

The second respondent also had the same opinion as the first respondent. The incentive given by the government is tax exemption. This is what he said:

"The Malaysian government has introduced several incentives to encourage the adoption of electric vehicles, as outlined in the country's National Energy Transition Roadmap. The incentives available range from tax relief to exemption initiatives like the RM2,500 per annum relief in income tax on expenses related to the charging of EVs until 2027 and full import and excise duty exemptions for CBU EVs up to December 31, 2025. Locally assembled EV components are similarly exempted up to December 31, 2027. In addition, EV owners are given road tax exemptions from 2022 until the end of 2025, at the end of which a drastically reduced tax rate will be applied. For electric motorcycles, a maximum tax rebate of RM2,400 is allowed for those earning less than RM120,000 per year. Besides, manufacturers of energyefficient vehicles enjoy considerable incentives in income tax exemption and investment allowance. Incentives in the form of taxes are also given by the government to companies that invest in green technology services, such as EV charging stations."

For the third respondent, he said that by providing incentives it can influence the price of electric vehicles in Malaysia. The respondent said:

"Government incentives can influence the market price of electric vehicles. Right now, the government is offering free tax and no excise duty for EV cars. So, the government has incentives. It will create more interest among people in Malaysia to try EVs"

According to three informants interviewed, the following map depicts the incentive from government



Figure 4.4.3 Incentive from Government

4.5 Importance of Electric Vehicle for Malaysian Environment, People and Economy

Importance is a thing that denotes value, significance, or relevance based on its impact, role, or contribution to a situation, decision, or outcome. It reflects the level of being essential or critical for something to achieve objectives, solve problems, or fulfil needs. The importance of an object, action, or idea is often determined by its influence, benefits, or consequences (Christopher Finn McQuaid, et al, 2025).

While, the environment refers to the ambient conditions, elements, and factors that affect and interact with living organisms. It encompasses everything that affects life, including physical, biological, social, and cultural aspects. The environment can be broadly categorized into two types: the natural environment, comprising air, water, soil, plants, animals, and ecosystems, and the built environment, comprising human-made structures such as buildings, roads, and urban areas (Fon Nestar, 2020).

And people can be understood as human beings considered in an aggregative manner. In a more comprehensive view, people are persons with a common feature defining them by region, culture, or undertaking towards the attainment of an objective. People form the building blocks of societies and civilizations that help create and define progress socially, economically, culturally, and technologically.

Also, the economy is a system of production, distribution, and consumption of goods and services concerned with a community or region. It includes all of the activities and institutions associated with the production of goods and services; income and employment generation; and the creation of demand for goods and services to satisfy human needs and wants. Economic activity involves interplay between households, producers, government, and markets and is influenced by resources, technology, policies, and international conditions (Reserve Bank of Australia).

4.5.1 Electric Vehicle Better Environmental Compare Traditional Vehicle

A traditional vehicle is any transportation powered by an internal combustion engine with conventional fuels such as gasoline or diesel. They have been the predominant mode of transportation for over a century and are powered by the burning of fossil fuel to produce energy, which moves the engine and, in turn, the vehicle (Adnan Khurshid, et al, 2023).

The first respondent believes that electric vehicles are environmentally friendly. He also believes that most of the electricity in Malaysia comes from non-renewable energy, so he suggests that the government increase solar energy in Malaysia to save costs in producing electricity. Here is his opinion:

" for ev what is the use of this on paper yes it is a will be more environmental friendly because it is okay it does not have carbon emissions in Malaysia but we also have to look at what for example in what in most countries it has its own source of electricity the source of electricity itself is what people say what source of electricity in Malaysia if I am not mistaken only 20% of the electricity near Malaysia is from renewable energy for example from is from solar from what dams and so on only 20% meaning even let say if i say i use electricity for aa to charge i have an ev car but 80% of the electricity comes from non-renewable sources so from that point of view it beats the purpose it still it does not have carbon emissions but the carbon emission happens in some else it will be in electric generators that we will burn coal or that use diesel and so on so what from that point of view the government has to what to develop renewable energy in line with the use of ev aa if it says it increases the use of ev but at the same time if it does not develop the use of renewable energy it will create one another problem which is that we will face a shortage of electric supply so If so, he has to, he has to, in line with the meaning, if so that, for example, let's say solar has what, solar has the industry expanding and what if we get more energy from solar, then we will balance it back with the use of electricity."

The second respondent also had the same opinion as the first respondent, stating that electric cars are better for the environment and he also stated that traditional cars produce carbon emissions. In addition, he also stated that electric car batteries can be recycled. This is what the second respondent stated: "Yes, because traditional car more carbon emission and the battery of EV will recycle after 5 or 6 years later"

The third respondent also answered the same as the other respondents, namely that electric vehicles are better environmentally, he also stated a comparison of electric vehicles with traditional vehicles. He said:

"if you compare with traditional car ev is completely environmental friendly i will say not hundred percent let say the moment when you process the fuel until you are using the car both producing condition but ev yes the people are argue the manufacturing the battery will make pollution in greeting the of product will not to do this any position so it will not 100% even the pollution but with made let say if you staying it one palace of ev and one place with the whole place are using traditional car of course ev will make the environment cleaner"

4.5.2 Perceptions of Electric Vehicle toward Comfort, Convenience and Safety

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Perception can be defined as the process by which individuals attribute meaning to information obtained from the environment through their senses. It involves the use of senses such as sight, hearing, touch, taste, and smell in the acquisition of information, which the brain then interprets and organizes into meaningful experiences (Rahul Jain PMP, 2021).

While comfort can be explained as a state of being, having physical, mental, or emotional ease, and well-being with the absence of any pain, stress, or discomfort. Comfort is a feeling of relaxation, safety, and gratification, mostly related to suitable conditions, environments, or experiences (Elena Alyavina, et al, 2020)

And convenience is the state of ease, efficiency, or suitability in performing something to satisfy one's needs with less effort, time, or trouble. It involves comfort and practicality, thus giving more access to activities or processes and making them easier. Convenience, in most instances, is a major factor considered in decision-making because people generally like to save time and avoid hassle (George Wilson, et al, 2024).

Also, safety is when one feels safe and is not hurt, harmed, or otherwise damaged. It has several components, including a process by which a protective environment, system, or practice that does not pose a risk and secures the well-being of individuals, groups, or communities is provided. Safety is an aspect of living that ensures the protection of all perspectives in life, whether physical, emotional, or psychological (INSPQ, 2018).

The first respondent only answered about the comfort of electric vehicles, but he also mentioned convenience and safety. The respondent said:

" in terms of comfort for now of course this ev uses a difference okay the difference between ev and vehicles that use petrol is the limitation in terms of battery usage okay for example let me give for example let me give this ev it has a big battery so part of the battery used for the drive is used for air conditioning what is it used for other systems by those used for sound system can be used for various entertainment system and so on but the limitation faced by cars that use petrol is an the battery is small meaning the battery is only the front battery so to use advanced systems for example is there an ADAS system aa auto driving and so on aa what will make the use of this battery not last long ha that is the advantage of EV so when it has no limitations from the use of electricity then the car can be equipped with more advanced and more luxurious features for example aa with a sound system it has what radar system it has what detection system it has a driving system so with what people say what large battery capacity it can it no longer have it no longer has it is limited to only using the battery for the radio use the battery for what for wipers for lights and etc. because he no longer has any, he is not limited, so from that point of view, what he wants is that he will get better facilities."

As for the second respondent, he only gave the answer "safety", here is the excerpt that the researcher got:

"Safe of not safe depends on that car because every car must do the NCAP, which is crash test, the features of ev are proven because not many cases that ev car blow-out" The third respondent's view is that all the elements of comfort, convenience and safety are present in electric vehicles. This is what he said:

" since ev does not have engine so it does not have vibration and annoying songs and everything so in term of comfort it is very comfortable okey so convenience of course to me traditional car *convenient but if you can tackle the problem actually* ev is more convenience that for example if you are using daily using traditional you need to go to petrol pump then you can fuel up but for ev you can charge at your home but for the safety since ev doesn't engine transmission and everything they can focus the impact wherever they want so they can distribute impact and everything compare to traditional car they need to avoid the engine a voice the transmission and everything"



UNW Benefits are those positive outcomes or gains realized through a particular action, decision, product, service, or situation. It is defined as favourable results or improvements in any area of life which help better a person's or a group's condition for increased well-being, success, or satisfaction. Benefits can either be material or non-material in nature, including physical rewards, monetary rewards, emotional comfort, and personal growth (Abid Haleem, et al, 2022).

The first respondent believes that electric vehicles will create benefits in terms of job opportunities. This is what he stated:

"Okay, when this electric industry is developed in Malaysia, of course number one, it will create more job opportunities and this thing will also change us to provide jobs that are more technology-based, meaning it needs more people who are qualified in terms of electricity, engineering and so on, so it will create high value jobs because if it's like now, for example, if people say that using a vehicle engine and when using this engine, we go to a workshop anywhere, let's say that if that person doesn't have higher education, he just finished SPM, he can just go and work in a workshop and gain experience and become a mechanic without any qualification, but for example, for you to service this EV car, at least you know what to have knowledge on the technical knowledge, you need to have strong technical knowledge, where can people say just by experience, you need to have other basic skills, because for example, this technology will change quickly, so if you say that you don't have basic skills, you can't keep up with the changes in technology, where can the use of cars be? It's been a long time since this engine was said that the technology is mature, where can he learn to repair engines and other engines? If he has learned to repair one engine, he can repair other engines too, so it's not the same as an EV. Once you know an EV, you need to know about the electronic parts and so on, so of course in terms of the economy, which will create high value jobs."

As for the second respondent, he emphasized the advantage of electric vehicles being able to save costs in terms of wear and tear of spare parts. The respondent said:

"Sure, less than 50% of ev can save rather than traditional car cause ev don't have wear and tear part like traditional car."

The third respondent also shared the same views as the second respondent regarding the advantages of electric vehicles, namely that they can save costs. This is what the respondent stated:

"I think absolute yes because ev is give you less hassle less maintenance and less money to use for the consumption so of course ev can contribute for example rapid kl is now using electric even for Melaka using they are using electric bus like Panorama because it is more economical."

4.6 Summary

This research looks at the challenges and solutions for electric vehicles (EVs) in Malaysia and their impact on the environment, people, and economy. It uses

interviews with EV industry workers and data from other studies to explore these issues. A major problem is the lack of charging stations, especially for people living in apartments, where installing chargers is difficult. Many users also experience range anxiety because EVs often don't deliver the driving range they promise. There are too few charging stations, which leads to long waiting times, and users struggle with the need to use multiple apps to locate chargers.

To solve these issues, more charging stations need to be built, with help from private investors and government support. Partnerships between communities and investors can make chargers more accessible in residential areas. High EV prices are another problem, mainly due to taxes and expensive batteries. However, local EV brands like Proton and Perodua entering the market could make EVs more affordable in the future.

EVs are better for the environment because they don't produce emissions like traditional cars. However, since most electricity in Malaysia comes from non-renewable sources, the government needs to increase renewable energy use to maximize environmental benefits. EVs also offer quieter rides, advanced features, and better safety, making them more comfortable and convenient than traditional cars. Government incentives, such as tax breaks and subsidies, are encouraging EV adoption, but more support, like cheaper electricity for EV users, is needed. In summary, EVs have many benefits for Malaysia, including a cleaner environment, lower vehicle maintenance costs, and job creation in high-tech industries. However, challenges like limited charging stations, high prices, and reliance on non-renewable energy need to be addressed through better policies, partnerships, and community involvement.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter highlights the study's summary findings, significant implications, discusses its limitations, and presents recommendations for future research and practical applications. The research objectives outlined in this study were successfully achieved, and the research questions were effectively addressed through the respondents' feedback. The objectives involved obtaining insights from respondents on three objectives: to investigate challenges can affected user electric vehicles in Malaysia, to evaluate user electric vehicles overcome the challenges in Malaysia and to identify importance of electric vehicles for Malaysian environment, economy and people. The respondents provided valuable perspectives that contributed significantly to achieving this aims of study.

5.2 Summary Findings

The research investigates Malaysia's electric vehicle (EV) problems and solutions as well as the effects they have on the country's economy, society, and environment. It investigates these issues using data from other studies and interviews with employees of the EV industry. The absence of charging stations is a big issue, particularly for flat dwellers where installing chargers can be challenging. Because EVs frequently fall short of their promised driving range, many users also suffer from range anxiety. Long wait times result from the scarcity of charging stations, and users find it difficult to find chargers without using multiple apps.

More charging stations must be constructed in order to address these problems, with assistance from the government and private investors. Access to chargers in residential areas can be improved through collaborations between investors and communities. Another issue with EVs is their high cost, which is mostly caused by taxes and costly batteries. However, the entry of area EV brands like Perodua and Proton into the market will probably reduce the cost of EVs.

Since EVs do not produce as many pollutants as conventional cars, they are more environmentally friendly. To optimise environmental benefits, the government must promote the use of renewable energy sources, as the majority of Malaysia's electricity arrives from non-renewable sources. Compared to conventional cars, EVs are more comfortable and convenient because they have better safety, more sophisticated features, and quieter rides. Government subsidies and tax breaks are promoting the use of EVs, but more assistance is required, such as lower electricity costs for EV users.

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5.2.1 Conclusion RO1

From Research Objective 1 (RO1) highlights those challenges and opportunities of using electric vehicles (EVs) in Malaysia. One major issue is the lack of charging stations, especially for people living in apartments or condos where installing chargers requires management approval. Charging stations are mostly found in cities and malls, making access harder for those in smaller towns. Many EV users also experience "range anxiety," as their vehicles often don't travel as far as advertised. Users also face difficulties with the charging network, as they need multiple apps to find stations, and there are often long queues at the available stations. Charging stations are not always easy to access, and faster charging options like DC chargers are still limited. Improving technology and building more charging stations across the country can help reduce waiting times and make EVs more convenient. Another problem is the high cost of EVs. Imported EVs are expensive because of taxes and a lack of government subsidies, while local brands like Proton and Perodua are cheaper due to government support. Batteries, which account for 30–40% of the vehicle's cost, also make EVs more expensive. In the future, local production could lower prices, but changes in government incentives and an increase in imports might cause prices to rise again.

Despite these challenges, EVs have many benefits. They are better for the environment because they don't produce emissions like traditional cars, although Malaysia's reliance on non-renewable energy for electricity reduces some of these benefits. EVs also cost less to maintain, create jobs in high-tech industries, and help reduce dependence on fossil fuels. According to three respondents, to make EVs more popular, Malaysia needs to expand charging infrastructure, lower prices, and increase the use of renewable energy.

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5.2.2 Conclusion RO2

From Research Objective 2 (RO2) define solutions for electric vehicle users in Malaysia. Based on respondent 1, one solution is to encourage private businesses to invest in charging stations, such as creating setups like petrol stations or cafes where users can charge their vehicles while relaxing. The government also needs to provide support by offering subsidies to make it easier for businesses to build charging infrastructure. Based on respondent 2, increasing the number of charging points in public places like universities, hospitals, and offices was also suggested to make charging more accessible.

Community involvement and partnerships can help improve the situation further. For example, EV service providers can work with apartment managers to install shared chargers in parking lots, with both parties benefiting from profit-sharing agreements. Communities with resources can also invest in charging stations, and businesses can collaborate with them to share costs. Partnerships with investors can help add chargers to high-traffic areas like offices and public spaces, making charging more convenient for everyone.

Respondent 2 provide an extensive perspective or ways that the government plays a key role by providing incentives to encourage EV adoption. Current benefits include tax exemptions on EV imports and road taxes until 2025, and similar benefits for locally assembled EV components until 2027. Suggestions for more support include extending the road tax exemption and offering discounts on electricity bills for EV users. Incentives for companies investing in green technologies, like EV charging stations, can also boost progress.

In summary, solving EV challenges in Malaysia requires a mix of private investment, community support, and stronger government incentives. These steps will improve charging access, encourage partnerships, and make EV ownership easier, helping the country transition to more sustainable transportation.

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5.2.3 Conclusion RO3

From Research Objective 3 (RO3) determine the importance of electric vehicles for Malaysia's environment, economy, and people. The value or significance of an item or action is determined by how well it contributes to the success of goals. The environment includes both man-made structures and natural components like ecosystems and air. Humans are seen as the basic elements of society, advancing social, technological, and economic advancement. A community's system of producing, distributing, and consuming goods and services is referred to as its economy.

All of the respondents concur that EVs are environmentally friendly than conventional cars because they produce fewer carbon emissions. However, based on respondent 1, with only 20% coming from renewable sources, Malaysia's dependence on non-renewable energy sources for electricity generation raises concerns. This demonstrates that in order to optimise the environmental advantages of EVs, more funding must be allocated to renewable energy. Additionally, respondents highlighted out that EV batteries can be recycled, but conventional cars produce carbon emissions.

Respondents three stated that EVs provide benefits like more smooth rides because of fewer vibrations and the ability to charge at home in terms of comfort, convenience, and safety. The first respondent emphasised that EVs can accommodate cutting-edge features without strongly reducing battery life. While the third respondent underlined that EVs' design improves impact distribution, the second respondent noted that safety is dependent on vehicle design and crash test results.

Lastly, the advantages of electrifying transport from a financial angle were discussed. The expansion of the electric vehicle sector may result in high-paying positions requiring highly skilled technical abilities, according to respondents. Because EVs have fewer moving parts than conventional cars, they also have lower maintenance costs. Overall, even though electric vehicles have many benefits, their full potential must be realised by addressing important issues with infrastructure and energy sources.

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5.3 Contribution of study

5.3.1 Managerial Level

This study provides valuable insights into the challenges and solutions faced by electric vehicle (EV) users in Malaysia, contributing to our understanding of EV adoption in developing countries. It explores key issues such as the lack of charging infrastructure, range limitations, and the high costs associated with EVs. By focusing on Malaysia, this research highlights how unique social, economic, and infrastructural conditions in emerging markets influence the adoption and use of EVs, which adds a new perspective to existing studies that are often centred on developed nations. The research also incorporates feedback from EV users, offering a deeper understanding of their concerns and behaviors, such as the inconvenience of limited charging stations and difficulties in accessing renewable energy sources. Furthermore, the study draws attention to regional differences in EV accessibility, comparing urban areas like Kuala Lumpur, which have better infrastructure, with smaller regions like Melaka, where infrastructure is less developed. This analysis provides a framework for understanding how regional disparities can affect EV adoption and presents an opportunity for further comparative studies in other developing nations.

5.3.2 Policy Maker

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This research also offers practical recommendations for improving the adoption of EVs in Malaysia. For policymakers, the findings highlight the importance of providing targeted support, such as government subsidies for charging stations, promoting the use of renewable energy, and extending tax exemptions to encourage EV adoption. These measures can help reduce the financial burden on EV users and accelerate the growth of the EV industry. The study also emphasizes the need for collaboration between the private sector and local communities. For example, businesses can invest in setting up standalone charging stations in strategic locations such as malls or rest stops and integrate customer-friendly features like cafes or waiting lounges to enhance the user experience. Additionally, manufacturers can address user concerns by improving EV range accuracy, developing faster charging technologies, and offering portable chargers for more convenience.

The research also identifies the potential of the EV industry to create new economic opportunities by generating high-value, technology-based jobs. It emphasizes the need for training programs to build a skilled workforce capable of supporting the technical requirements of EV manufacturing and maintenance. Moreover, the study suggests that local governments should focus on regional development by prioritizing underserved areas for infrastructure improvements, ensuring that EV adoption benefits are distributed more evenly across the country. Finally, the research highlights the long-term economic benefits of transitioning to EVs, such as reduced maintenance costs for users and the possibility of integrating electric public transportation, which could make transportation more affordable and environmentally friendly for everyone



This study has several limitations that should be acknowledged to provide a clearer understanding of its scope and potential constraints. Firstly, the research is based on data collected from only three informants, which limits the generalizability of the findings. While the insights gained from these individuals are valuable, they may not fully represent the diverse experiences and challenges faced by electric vehicle (EV) users across Malaysia. The small sample size restricts the ability to draw broad conclusions about the issues explored in the study.

Additionally, the geographical focus of the study is quite narrow, with the informants primarily located in regions such as Melaka and Seremban. As a result, the findings may not reflect the unique challenges faced by EV users in other parts of the country, particularly in areas with different levels of infrastructure development or consumer behaviours. This geographical limitation could reduce the applicability of the results to a national scale.

Additionally, the study uses a qualitative research methodology, which is useful for offering deep complicated insights but lacks the quantitative data required for broad

generalizations. This method makes it more difficult to evaluate the frequency or statistical importance of the problems and solutions that have been identified. Additionally, the data collected is based on self-reported information from interviews, which could be biased by social desirability, personal biases, or beliefs. The findings' accuracy and dependability may be impacted by this reliance on subjective replies.

Another important limitation is the study's focus on sales advisors' perspectives, without including input from other key stakeholders such as policymakers, infrastructure developers, or a broader group of EV users. This limited scope may not capture the full range of challenges or solutions within the EV ecosystem. Including perspectives from these other stakeholders could provide a more comprehensive understanding of the issues and allow for a more balanced analysis.

Lastly, the findings' long-term applicability is limited by the electric vehicle industry's fast evolution. As technology continues to progress and governmental regulations change, some of the issues and solutions covered in the report might become dated rather rapidly. This emphasizes the necessity of ongoing study to stay up with the dynamic EV market and the infrastructure that surrounds it.

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5.5 Recommendation for future study

Future research may focus on a number of important issues to help Malaysia's electric vehicle (EV) market expand. First, it's critical to upgrade the EV charging infrastructure, particularly in small towns. Research can look into how communities, businesses, and the government can collaborate to create charging stations that are more easily accessible and effective. Investigating the effectiveness of government incentives, such as tax breaks and subsidies, in motivating people to purchase EVs is another crucial field. These studies might also recommend measures to encourage domestic manufacturing and lower the cost of EVs.

Determining the reasons behind the opposition of certain individuals to convert to electric vehicles requires an understanding of consumer behaviour. Studies can also look into how education initiatives can increase public knowledge of the advantages of EVs. Furthermore, research on EVs' environmental effects can be used to calculate their total environmental impact, particularly in context of Malaysia's electrical supply. It would also be beneficial to investigate renewable energy sources for EV powering.

Research into improving EV technology, such as better batteries and faster charging options, can help make EVs cheaper and more practical. From an economic perspective, studies can look at how the growth of the EV industry can create jobs, improve skills, and save costs for users compared to traditional cars. Forecasting the future of Malaysia's EV market and comparing it with neighbouring countries can help with planning and competition.

Finally, research can address user concerns about EVs, such as comfort, safety, and convenience, to make them more appealing. By focusing on these areas, future studies can help Malaysia transition to a cleaner and more efficient transportation system.

5.6 Summary

This research successfully explored the challenges faced by electric vehicle (EV) users in Malaysia, identified solutions to these challenges, and highlighted the benefits of EVs for the country. Key problems include a lack of charging stations, especially in apartments, range anxiety due to EVs not meeting their promised driving range, high costs caused by expensive batteries, and difficulty accessing charging stations because of long queues and multiple apps needed. To solve these issues, the study suggests building more charging stations with help from both the government and private investors, encouraging partnerships to improve charger access, promoting local EV production to lower costs, and offering better government incentives like tax cuts and electricity discounts.

The study also shows why EVs are important for Malaysia. They are better for the environment as they produce less pollution, though this benefit depends on increasing the use of renewable energy. Economically, EVs can create high-tech jobs and save money on maintenance. They also provide a more comfortable, safer, and quieter driving experience. The research adds to our understanding of how EVs can work in developing countries like Malaysia, offering practical advice to improve EV adoption.

However, the study has some limitations. It relied on a small number of participants and focused on specific areas, so the results might not represent the whole country. It also used interviews, which can have personal biases, and EV technology is changing quickly, which could make some findings outdated.

Future research could focus on building better charging infrastructure, studying government incentives, improving EV technology like batteries and charging speed, and finding ways to use more renewable energy for EVs. By addressing these issues, Malaysia can make EVs more accessible and help the country move toward cleaner, more efficient transportation.

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APPENDICES

Appendix 1: Gantt Chart for PSM 1

WEEK PROJECT ACTIVITIES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Briefing PSM 1							1								
Topic Confirmation & Discussion with Supervisor															
Chapter 1: Introduction Objective, Problem Statement, Scope of study							7	S E M							
Correction								S			_				
Chapter 2: Literature Review Article, Website, Journal, and Book Review				2		5	4	TE		5	9				
Correction								R							
Chapter 3: Methodology Flow Chart of Project Process Data Analysis & Data Collection Procedure	AL	IV			Y	517		BRF		AP					
Correction		-						A							
Preparation & Submission of Proposal	1							K							
Amendment of Proposal															
PSM 1 Report Drafting Preparation for Proposal Presentation Submission								a							
Presentation PSM 1															

Gantt Chart for PSM 2

Week Project Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Briefing & Amendment of																
Questionnaire Construction																
Completion of																
Questionnaire Construction							м									
Completing Data Collection							т									
Through Interview							- -									
Transcription Writing							D									
Checking Data Collection:							-									
Transcription of Interview							s									
Chapter 4 Briefing							Е									
Chapter 4 Draft Submission:							М									
Discussion & Analysis																
Correction of Chapter 4							E									
Chapter 5 Briefing:							-									
Recommendation &							2									
Conclusion							Т									
Chapter 5 Draft Submission							E		7							
Correction of Chapter 5							R									
Preparation & Submission																
of Report							в									
Final Draft Submission							R	•			•					
Presentation PSM 2						~	F				2	2				
Amendment of Report			-								-					
Report Submission							A						-			
UNIVERSITI IEKI		A			AL	. A	K	IA			. A	h A				

APPENDICES

Interview Questions and Transcript



THE CHALLENGES AND SOLUTIONS FOR USER ELECTRIC VEHICLE (EV) IN

MALAYSIA

INTERVIEW TRANSCRIPTON INTERVIEW ONE

Interviewer: Muhammad Syazani Adly Bin Rosly (Degree student at Universiti Teknikal Malaysia Melaka)

> Interviewee: Azril Aswad Time: 4.00 P.M. Date:26/11/2025 Place: GAC Motor, Seremban Acronyms: MSAR, Muhammad Syazani Adly Bin Rosly

MSAR: I do like to express my gratitude for giving me the chance to conduct this interview. My name is Muhammad Syazani Adly Bin Rosly, and I'm interviewing you solely for research purposes. The purpose of this study is to investigate challenges that can affect user electric vehicles in Malaysia, to evaluate user electric vehicles overcome the challenges in Malaysia and to identify the importance of electric vehicles for Malaysian environment, economy and people.

I do appreciate the opportunity to record our conversation to maintain precision. This recording will solely serve the purpose of aiding me in composing my report on the study's findings, and it will be securely stored. The only other person with access to the transcript is the study's supervisor: lecturer Universiti Teknikal Malaysia Melaka, DR. Diana Rose Binti Faizal. As soon as the report is completed, the recording will be destroyed.

I do like to emphasize that your participation in this study is completely voluntary. Our current conversation is held in strict confidence, and your identity will not be included in any reports or documents emerging from this research. Furthermore, if you have any questions or concerns, please don't hesitate to ask through email or WhatsApp text.

MSAR: Can you please help me by providing details about you								
demographics consisting your personal details i.e. age, gender, education								
and other relevant information?								
	33							
Age								
	Male							
Gender								
	Diploma							
Educational background								
	<1yr							
Years of working in GAC Motor,								
Seremban								
	Sales Advisor							
Position in GAC Motor, Seremban								
كنيكل مليسيا ملاك	Engaging with customers to understand							
How is your job scope related to Electric	their needs and preferences while							
Vehicle Industry? EKNKAL M	providing detailed information about							
	EV features, benefits, and							
	specifications							

Can you describe the main challenges your customers face when using electric vehicles in Malaysia?

Okay, for EVs now, the biggest challenge is when the client lives in a multi-story house, meaning it's not a landed house, staying in an apartment or condo, it's a bit difficult because people can't charge at home, so the process of asking for permission to install a charger in the apartment parking lot is a bit difficult because first they have to ask permission from the management of the apartment, so when they need it, they need permission, so it's up to them, sometimes there are GNCs who are open-minded, meaning they allow people to install a charger in the parking lot, and there are also those who don't agree, so that's actually the biggest challenge for people who want to adopt EVs.

MSAR:

What feedback do you commonly receive from customers about charging infrastructure availability?

for now most of their concern is that they have different providers so they have to what use different apps for example Gentari, Gentari has an app let's charger let's charge have apps what electron has apps so there are let me say there are 10 providers it means there have to be 10 apps and also when every time he wants someone to check what to check the nearest charging station, he has to try several apps to get the one that is closest to him, okay so they one between what people say what it is a mix match with what with what the use of clients with a mix match with the infrastructure infrastructure industry

How accessible are EV charging stations for users in your area?

Now, as I said, most of the charging stations, charging infrastructure that is in the market is more like the ones in the malls, petrol stations in RNR, so what else is there and other than that, if you don't have a landed property, it's a bit difficult because you have to depend on it, it's not like you want to go to the mall every two days, you want to go to R&R every two days, so what is not that user friendly, because what is there, adoption will be an issue because our infrastructure right now is still not complete



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

How long the current charging speed available in your area? Please suggest your opinion for the improvement?

Okay, before we talk about charging speed, you actually have to understand where EVs come from, they have different castes, they have their own castes, so let's say. for example, a high caste, like BMW and so on, people use what technology, they use 800 kWh, where they can charge maybe 10 to 80% of 10% to 80% in just 20 minutes, but they have to match it with the fastest speed that people can achieve, but they have to match it with the charging facility because for example, there is what, let's say, if you want to charge 10 to 80 percent, for example, the Xpeng car can charge 10 to 80 in 20 minutes, but that one, if only if it gets fast charging that can charge as fast as 280 kilowatts, it has its own station, but most stations now won't provide up to 280 kilowatts because they only usually provide facilities of 80 kilowatts or 100 kilowatts, so even though the car can, what car can Even though the high class can go from 10 to 80 in 20 minutes, it is difficult to find facilities that allow them to charge that fast, but mostly for the lower class, the middle class, for example, what is E-mas Proton, E-mas, Neta, BYD, and so on, what facilities do they use, what technology infrastructure, 400 kilo kwh, so they can go, usually they will go either 80 or 100 kw, so that one will need 20 to 30 minutes to charge from 30 to 80%, so like I said, when we involve charging time, we have to change our habits, where if we fill up, it is normal for vehicles that use petrol to fill up when they are empty, when they are empty, we only fill up when we are empty, but if it is like this for EVs, we need to take advantage of it, for example, when we go to eat, when we go to the toilet, when we go doing something, we charge while we are doing it.

What do you think are the primary factors contributing to the high prices of EVs in Malaysia?

Okay, for the high price of EVs, of course, number one, I'll say that the government has a policy where EV vehicles brought in cannot be worth more than RM100 000. The first and second thing is, can't we compare the price in Malaysia with the price outside? For example, some people say, "Why is it cheaper in China? They have TVs because they are people. People have to take it. You know, the EV industry in China is subsidized. It's subsidized by the government. That's why people have what they have. People have a selling price. People can sell it for maybe RM60,000 or RM70,000. But when they enter another country, oh people have what they have, that advantage is gone."

MSAR:

How do you foresee the market price of EVs changing in the next 5–10 years

Now, actually, when the market is now open, it is also entered by Proton and also, and in the future, Perodua will also enter, so when this market is entered by our own brand, the local brand made by Proton and Perodua, it will encourage faster development because what I said, what I said, there was an article that said that after a few years, there will be only a few companies that will maintain in Malaysia, the rest that cannot compete with other competitors will leave Malaysia, but when we EVs are entered by Proton and Perodua, people know that there are companies here to stay because they are Malaysian companies, so it is impossible for this company to go bankrupt, so people will be more confident and more comfortable, and more people will say, open up to what you want, what you want to change for EV users.

What are the solutions to improve charging infrastructure for electric vehicles in Malaysia?

for the infrastructure in Malaysia, what is it so far, what is it still limited to, like I said, malls and petrol stations, so it's limited to that unless we have a, maybe there's an investor who's braver, maybe he'll open it like a petrol station because he knows, because we know that if people use EVs, when they want to charge, it will take at least 20 to 30 minutes, so maybe if there's a company that's a more brave investor, so other than doing it near petrol stations, maybe he'll open it like a petrol station himself, or maybe he'll open a cafe while people are charging, people can take a break in his cafe to eat, drink and relax.

MSAR:

What is the other alternative (partnerships or community-based) to develop more charging station?

Okay, right now, are there certain service providers that are creating a business model where they can partner with the community, which is for example, like I said, apartments are hard to install, charging points in their parking lots, but what GMD can do is let me say that they have a lot of EV residents, so what they can do is they are creating a joint venture with service providers to install EVs, charging points near parking lots, so when they do it there, they will have profit sharing. So there are certain companies that do have a business model, where is GMC? Can they join the management committee? Can they contact people and go and do a joint venture to open charging stations in parking lots, sharing parking lots, and from my results of use, for example, when residents charge near there, they will have profit sharing with the company. So, just what is this model? Not many people know, so maybe the government or these companies need to spread more information about this.
Have government has offer the incentives? In what ways can government incentives influence the market price of electric vehicles?

Okay actually from my point of view, the government actually needs to be more open to adding more incentives because right now they have incentives for, for example, road tax, road tax, everyone gets an exemption only in 2026, meaning 2027, so maybe they will have to pay, okay, but for me, the government needs to look at it from another angle, where is everything, let's say if they say they can encourage people to use EVs by giving certain incentives, so what if they actually indirectly reduce people who use oil, so they will save money in terms of petrol subsidies, for example, let's say now, like they say now around the spend about 8 billion per year for what is this oil subsidy, let's say if they say 20% of the population adopts EVs, that means they can save money there too, I said, let's say we take direct, direct, what is the calculation, 20% of that 8 billion, they will save 1.6 billion a year, right, so the government needs to look at it from that angle, even though, for example, they say road tax, they might pay RM200 a year, so from What did he save? He got the road tax revenue of RM200 a year. He got better. He got to save in terms of fuel subsidies. So the first thing is, maybe he can extend the road tax exemption for another 4 or 5 years. And so that is one thing. Number two is, maybe he can give subsidies for electricity bills to EV users

INIVERSITI TEKNIKAL MALAYSIA MELAKA

MSAR:

Are EVs a better environmental option compare to traditional vehicle? If yes, please list what are the factors contribution?

for ev what is the use of this on paper yes it is a will be more environmental friendly because it is okay it does not have carbon emissions in Malaysia but we also have to look at what for example in what in most countries it has its own source of electricity the source of electricity itself is what people say what source of electricity in Malaysia if I am not mistaken only 20% of the electricity near Malaysia is from renewable energy for example from is from solar from what dams and so on only 20% meaning even let say if i say i use electricity for aa to charge i have an ev car but 80% of the electricity comes from non-renewable sources so from that point of view it beats the purpose it still it does not have carbon emissions but the carbon emission happens in some else it will be in electric generators that we will burn coal or that use diesel and so on so what from that point of view the government has to what to develop renewable energy in line with the use of ev aa if it says it increases the use of ev but at the same time if it does not develop the use of renewable energy it will create one another problem which is that we will face a shortage of electric supply so If so, he has to, he has to, in line with the meaning, if so that, for example, let's say solar has what, solar has the industry expanding and what if we get more energy from solar, then we will balance it back with the use of electricity

MSAR: AYSI

What are your perceptions of EV toward the comfort, convenience and safety of EVs to users?

in terms of comfort for now of course this ev uses a difference okay the difference between ev and vehicles that use petrol is the limitation in terms of battery usage okay for example let me give for example let me give this ev it has a big battery so part of the battery used for the drive is used for air conditioning what is it used for other systems by those used for sound system can be used for various entertainment system and so on but the limitation faced by cars that use petrol is a the battery is small meaning the battery is only the front battery so to use advanced systems for example is there an ADAS system as auto driving and so on as what will make the use of this battery not last long ha that is the advantage of EV so when it has no limitations from the use of electricity then the car can be equipped with more advanced and more luxurious features for example aa with a sound system it has what radar system it has what detection system it has a driving system so with what people say what large battery capacity it can it no longer have it no longer has it is limited to only using the battery for the radio use the battery for what for wipers for lights and etc. because he no longer has any, he is not limited, so from that point of view, what he wants is that he will get better facilities.

Do you think that Electrifying Transportation can provide economic benefits?

Okay, when this electric industry is developed in Malaysia, of course number one, it will create more job opportunities and this thing will also change us to provide jobs that are more technology-based, meaning it needs more people who are qualified in terms of electricity, engineering and so on, so it will create high value jobs because if it's like now, for example, if people say that using a vehicle engine and when using this engine, we go to a workshop anywhere, let's say that if that person doesn't have higher education, he just finished SPM, he can just go and work in a workshop and gain experience and become a mechanic without any qualification, but for example, for you to service this EV car, at least you know what to have knowledge on the technical knowledge, you need to have strong technical knowledge, where can people say just by experience, you need to have other basic skills, because for example, this technology will change quickly, so if you say that you don't have basic skills, you can't keep up with the changes in technology, where can the use of cars be? It's been a long time since this engine was said that the technology is mature, where can he learn to repair engines and other engines? If he has learned to repair one engine, he can repair other engines too, so it's not the same as an EV. Once you know an EV, you need to know about the electronic parts and so on, so of course in terms of the economy, which will create high value jobs.



THE CHALLENGES AND SOLUTIONS FOR USER ELECTRIC VEHICLE (EV) IN MALAYSIA

INTERVIEW TRANSCRIPTION INTERVIEW TWO

Interviewer: Muhammad Syazani Adly Bin Rosly (Degree student at Universiti Teknikal Malaysia Melaka) Interviewee: Nabawai Yassin Time: 4.00 P.M Date:19/12/2024 Place: BYD Melaka Acronyms: MSAR, Muhammad Syazani Adly Bin Rosly

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MSAR: I do like to express my gratitude for giving me the chance to conduct this interview. My name is Muhammad Syazani Adly Bin Rosly, and I'm interviewing you solely for research purposes. The purpose of this study is to investigate challenges that can affect user electric vehicles in Malaysia, to evaluate user electric vehicles overcome the challenges in Malaysia and to identify the importance of electric vehicles for Malaysian environment, economy and people.

I do appreciate the opportunity to record our conversation to maintain precision. This recording will solely serve the purpose of aiding me in composing my report on the study's findings, and it will be securely stored. The only other person with access to the transcript is the study's supervisor: lecturer Universiti Teknikal Malaysia Melaka, DR. Diana Rose Binti Faizal. As soon as the report is completed, the recording will be destroyed.

I do like to emphasize that your participation in this study is completely voluntary. Our current conversation is held in strict confidence, and your identity will not be included in any reports or documents emerging from this research. Furthermore, if you have any questions or concerns, please don't hesitate to ask through email or WhatsApp text.

MSAR: Can you please help me	by providing details about your
demographics consisting your persona	l details i.e. age, gender, education and
other relevant information?	
	37
Age	
	Male
Gender	
	Diploma
Educational background	
MALAYSIA	<1yr
Years of working in BYD Melaka	
A	Sales Advisor
Position in BYD Melaka	
***AINO	Understand the problems customers
How is your job scope related to Electric	often face with electric vehicles
Vehicle Industry?	اوىيۇم سىتى يە

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MSAR:

Can you describe the main challenges your customers face when using electric vehicles in Malaysia?

the main challenge in malaysia the infra lah if you see in kuala lumpur is quite develop infra but in melaka not as fast like kuala lumpur challenger is actually when they need to travel far meaning that without stopping lah so the challenger will be the time and also the distance cause of the electric to be charge statically and also so then that's why itulah i mean time and distance is challenger

What feedback do you commonly receive from customers about charging infrastructure availability?

So far so okay but actually the unit of the infrastructure is lacking every year will be significant additional EV registered so if infrastructure the same is gonna be a challenge, most customer mostly need to wait and to que for this charging station that be a challenge

MALAYSIA

MSAR:

How accessible are EV charging stations for users in your area?

Malim jaya should be no problem if you see the app, you can see the plug share there are a few charging station in Malim so accessibility should be no problem like i say the que time because the number of infra is not sufficient enough

NIVERSITI TEKNIKAL MALAYSIA MELAKA

How long the current charging speed available in your area? Please suggest your opinion for the improvement?

charging speed depends on the charger itself where there is DC or AC and depends on charging box lah and also depends on Kilowatt battery of capacity, like i say if 60 kilowatt it will be 6 jam or 8 jam, and my suggestion for this make it faster



How do you foresee the market price of EVs changing in the next 5–10 years The selling price of electric vehicles in Malaysia will fluctuate wildly over the next five to ten years, or longer, for a variety of reasons: changing market dynamics, local production initiatives, and government policies. Tax exemptions for imported completely built-up EVs until the end of 2025 and full import duty exemptions for locally assembled EVs until December 2027 are among the incentives put in place by the Malaysian government to attract more EVs onto the roads. These incentives are meant to make EVs more affordable; when they eventually expire, manufacturers might change their pricing strategy once they localise assembly to stay competitive.

MSAR:

What are the solutions to improve charging infrastructure for electric vehicles in Malaysia?

government have to pay role and need to subsides first for charging station

MSAR:

What is the other alternative (partnerships or community-based) to develop more charging station?

if community have money just go it, the corporate and community must invest together to develop more infra

Have government has offer the incentives? In what ways can government incentives influence the market price of electric vehicles?

The Malaysian government has introduced several incentives to encourage the adoption of electric vehicles, as outlined in the country's National Energy Transition Roadmap. The incentives available range from tax relief to exemption initiatives like the RM2,500 per annum relief in income tax on expenses related to the charging of EVs until 2027 and full import and excise duty exemptions for CBU EVs up to December 31, 2025. Locally assembled EV components are similarly exempted up to December 31, 2027. In addition, EV owners are given road tax exemptions from 2022 until the end of 2025, at the end of which a drastically reduced tax rate will be applied. For electric motorcycles, a maximum tax rebate of RM2,400 is allowed for those earning less than RM120,000 per year. Besides, manufacturers of energy-efficient vehicles enjoy considerable incentives in income tax exemption and investment allowance. Incentives in the form of taxes are also given by the government to companies that invest in green technology services, such as EV charging stations.

MSAR: RSIII I EKNIKAL MALAYSIA MELAKA

Are EVs a better environmental option compare to traditional vehicle? If yes, please list what are the factors contribution?

yes because traditional car more carbon emission and the battery of EV will recycle after 5 or 6 years later

MSAR:

What are your perceptions of EV toward the comfort, convenience and safety of EVs to users?

Safe of not safe depends on that car because every car must do the NCAP, which is crash test, the features of ev are proven because not many cases that ev car blow out

MSAR:

Do you think that Electrifying Transportation can provide economic benefits?

Sure, less than 50% of ev can save rather than traditional car cause ev don't have wear and tear part like traditional car.



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Thank you so much for your kind cooperation and valuable time.



THE UTILIZATION OF ARTIFICIAL INTELLIGENCE (AI) IN ONLINE ADVERTISING AND ITS PERCEIVED EFFECTIVENESS

INTERVIEW TRANSCRIPTION INTERVIEW THREE

Interviewer: Muhammad Syazani Adly Bin Rosly (Degree student at Universiti Teknikal Malaysia Melaka)

Interviewee: Muhammad Aiman Mukhnis Time: 5.00 P.M. Date: 19/12/2024 Place: BYD Melaka Acronyms: MSAR, Muhammad Syazani Adly Bin Rosly



UNIVERSITI TEKNIKAL MALAYSIA MELAKA

MSAR: I do like to express my gratitude for giving me the chance to conduct this interview. My name is Muhammad Syazani Adly Bin Rosly, and I'm interviewing you solely for research purposes. The purpose of this study is to investigate challenges that can affect user electric vehicles in Malaysia, to evaluate user electric vehicles overcome the challenges in Malaysia and to identify the importance of electric vehicles for Malaysian environment, economy and people.

I do appreciate the opportunity to record our conversation to maintain precision. This recording will solely serve the purpose of aiding me in composing my report on the study's findings, and it will be securely stored. The only other person with access to the transcript is the study's supervisor: lecturer Universiti Teknikal Malaysia Melaka, DR. Diana Rose Binti Faizal. As soon as the report is completed, the recording will be destroyed.

I do like to emphasize that your participation in this study is completely voluntary. Our current conversation is held in strict confidence, and your identity will not be included in any reports or documents emerging from this research. Furthermore, if you have any questions or concerns, please don't hesitate to ask through email or WhatsApp text. MSAR: Can you please help me by providing details about your demographics consisting your personal details i.e. age, gender, education and other relevant information?

Age	27
Gender	Male
AV	
Educational background	Degree
Years of working in BYD Melaka	1 and half year
Position in BYD Melaka	Brand & Marketing Manger
How is your job scope related to Electric Vehicle Industry?	Connect with customers on a personal level, offering honest advice and sharing his own journey with EVs.

MSAR:

Can you describe the main challenges your customers face when using electric vehicles in Malaysia?

the main challenge receive most from customers is the range is not exactly the same company advertise let say range 420 km but they try they get only 200 something that the main challenge actually the only challenge they face actually this thing is influence by the way you drive , just like traditional car the more you press the pedal the more consumption but eve use the same concept but it becomes beneficial when you stay stationary because the power consumption is very low when you using it long range it can give you range let say traditional car, the company advertise like Bezza can drive 300 kilometre but in real range Bezza can reach 200 kilometre but in ev you can get into 380 and 390 kilometre

MSAR:

What feedback do you commonly receive from customers about charging infrastructure availability?

so far i never receive any complain for charging station ability because charging stations currently in everywhere you charging station is everywhere we also for provide portable charger let say you stay at homestay kampung you can use the portable charger

MSAR: **MSAR:** How accessible are EV charging stations for users in your area?

In my area of Melaka, the charging numbers in this area are quite high.

MSAR:

How long the current charging speed available in your area? Please suggest your opinion for the improvement?

okey charging speed current in this place just only 120 kwh if let say you charger the BYD Seal it only takes langsung 15 minutes to fill up to 50% which is around 300 km

MSAR:

What do you think are the primary factors contributing to the high prices of EVs in Malaysia?

first of all, ev price influence cosmos of the CBU unit so government has a located that all CBU car must price above 100,000that why ev is not that cheap in Malaysia the price of ev determined by the battery itself the battery is like 30 to 40 percent of price

MSAR:

How do you foresee the market price of EVs changing in the next 5–10 years

i think the market will grow rapidly getting more see the benefit of ev

What are the solutions to improve charging infrastructure for electric vehicles in Malaysia?

currently to improve charging station government to pay attention to be more productive to plug charging station in public for example myself currently i supply charging it call wall box i i am supplying electric like university campus hospital this thing i done my part to contribute to improve charging station



MSAR:

What is the other alternative (partnerships or community-based) to develop more charging station?

partnership because everything needs collaboration between two side especially you need talk with investor to the install charging box like office hospital and public place

Have government has offer the incentives? In what ways can government incentives influence the market price of electric vehicles?

Government incentives can influence the market price of electric vehicles. Right now, the government is offering free tax and no excise duty for EV cars. So, the government has incentives. It will create more interest among people in Malaysia to try EVs.

NITE

MSAR:

Are EVs a better environmental option compare to traditional vehicle? If yes, please list what are the factors contribution?

if you compare with traditional car ev is completely environmental friendly i will say not hundred percent let say the moment when you process the fuel until you are using the car both producing condition but ev yes the people are argue the manufacturing the battery will make pollution in greeting the of product will not to do this any position so it will not 100% even the pollution but with made let say if you staying it one palace of ev and one place with the whole place are using traditional car of course ev will make the environment cleaner

What are your perceptions of EV toward the comfort, convenience and safety of EVs to users?

since ev does not have engine so it does not have vibration and annoying songs and everything so in term of comfort it is very comfortable okey so convenience of course to me traditional car <code>_______convenient</code> but if you can tackle the problem actually ev is more convenience that for example if you are using daily using traditional you need to go to petrol pump then you can fuel up but for ev you can charge at your home but for the safety since ev doesn't engine transmission and everything they can focus the impact wherever they want so they can distribute impact and everything compare to traditional car they need to avoid the engine a voice the transmission and everything

MSAR:

Do you think that Electrifying Transportation can provide economic benefits?

i think absolute yes because ev is give you less hassle less maintenance and less money to use for the consumption so of course ev can contribute for example rapid kl is now using electric even for melaka using they are using electric bus like Panorama because it is more economical.

Thank you so much for your kind cooperation and valuable time.

EVIDENCE









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Faculty of Technology Management and Technopreneurship

CHALLENGES AND SOLUTIONS FOR USER ELECTRIC VEHICLE (EV) IN MALAYSIA

MUHAMMAD SYAZANI ADLY BIN ROSLY

Bachelor Degree of Technology Management

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CHALLENGES AND SOLUTIONS FOR USER ELECTRIC VEHICLE (EV) IN MALAYSIA

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SUPERVISOR DECLARATION

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DEDICATION

3

This thesis is dedicated:

To my parents, Rosly Bin Ibrahim and Noraini Binti Mat Saman, who have always been there for me through my ups and downs, providing me the extra push that I needed to accomplish my thesis. Next, DR. Diana Rose Binti Faizal, my supervisor, who has led and motivated me to complete my thesis. Thank you for your assistance and motivation in completing this research. Finally, to my dear friends who have stood by me and supported me through my ups and downs while assisting me throughout the project to complete my thesis.

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ABSTRACT

This study explores the challenges and solutions for using electric vehicles (EVs) in Malaysia. EVs are an environmentally friendly alternative to traditional fossil fuel-powered vehicles, which contribute to pollution and greenhouse gas emissions. Despite Malaysia's rapid development and high number of vehicles, the adoption of EVs has been slow due to several issues. The main challenges include the high price of EVs, largely caused by import taxes, limited charging stations, and a lack of public awareness about the benefits of EVs. Safety concerns, such as the risks associated with EV batteries and charging systems, also discourage adoption. The study aims to understand how these challenges affect EV adoption, identify ways to overcome them, and highlight the benefits of EVs for Malaysia's environment, economy, and society. Solutions include government incentives like tax relief, building more charging stations in urban and rural areas, collaboration between local and international companies, and public awareness in rural areas remain obstacles.

Keywords : (electric vehicles (EVs), challenges, solutions),

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ABSTRAK

Kajian ini meneroka cabaran dan penyelesaian untuk menggunakan kenderaan elektrik (EV) di Malaysia. EV ialah alternatif mesra alam kepada kenderaan berkuasa bahan api fosil tradisional, yang menyumbang kepada pencemaran dan pelepasan gas rumah hijau. Walaupun pembangunan pesat Malaysia dan bilangan kenderaan yang tinggi, penggunaan EV adalah perlahan disebabkan beberapa isu. Cabaran utama termasuk harga EV yang tinggi, sebahagian besarnya disebabkan oleh cukai import, stesen pengecasan yang terhad dan kurangnya kesedaran orang ramai tentang faedah EV. Kebimbangan keselamatan, seperti risiko yang berkaitan dengan bateri EV dan sistem pengecasan, juga tidak menggalakkan penggunaan. Kajian ini bertujuan untuk memahami bagaimana cabaran ini mempengaruhi penggunaan EV, mengenal pasti cara untuk mengatasinya, dan menyerlahkan faedah EV untuk alam sekitar, ekonomi dan masyarakat Malaysia. Penyelesaian termasuk insentif kerajaan seperti pelepasan cukai, membina lebih banyak stesen pengecasan di kawasan bandar dan luar bandar, kerjasama antara syarikat tempatan dan antarabangsa serta kempen kesedaran awam. Walau bagaimanapun, isu seperti sumber yang terhad untuk infrastruktur dan kesedaran yang rendah di kawasan luar bandar tetap menjadi halangan

Kata kunci : (kenderaan elektrik (EV), cabaran, penyelesaian),

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LIST OF ABBREVIATIONS

EV	Electric Vehicle
CBU	Complete Built-up

GHG Green House Gas



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CHAPTER 1

INTRODUCTION

1.1 Introduction

This chapter will be discussed the background of the study, problem statement, research questions, research objectives, scope and limitations of the study, significant of study and summary of the whole chapter.

1.2 Background of study

The use of fossil fuels is a concern for the environment and the dependence on these substances threatens the environmental ecosystem, thus forcing a few parties to find other alternatives to replace fossil fuels with more environmentally friendly and greener ones. (Olabi, et al, 2022). While the recovery of waste heat, (Jouhara, et al, 2021) can increase the efficiency of industries in the use of intensive energy such as aluminum (Brough, et al, 2020), cement (Fierro, et al, 2022) and others, unable to control global warming due to the use of fossil fuels. Greenhouse gas (GHG) emissions are a weakness in the transport sector (Sioshansi, et al, 2019). Today, electric vehicles are a revolution in the automotive sector with a lot of research and development being carried out (Abo-Khalil, et al, 2022). With the renewed energy system, the EV market will be able to compete with the automotive market (Alami, et al, 2022). Green technology has been introduced in an effort to reduce greenhouse gases (GHG) such as air pollution which is the gas that causes climate change (Veza, I, et al, 2021). Development in electric vehicle (EV) products is expected to contribute to pollution. With the use of efficient power plants that do not emit greenhouse gases (GHG) such as hydro, wind, nuclear and solar power plants, the improvement of air quality will be directly affected by the use of EVs that are able to maintain clean air in addition to the

production of power that does not release greenhouse gases (GHG). EV technology has been in the global market for as long as the availability of commercial EVs.

Malaysia is one of the rapidly developing countries in Southeast Asia with a population of 32.7 million in the first quarter of 2021 (Department of Statistics Malaysia. Population & Demography. Department of Statistics Malaysia Official Portal. 2021) and in 2040 it is expected to reach 41.5 million people. In 2019, information as many as 29.96 million vehicles in Malaysia were registered was revealed by the Statistics of the ASEAN Statistics Division for the year 2020. In the same year, Malaysia recorded that every 1000 residents had 925 registered motor vehicles with an average of nine out of ten Malaysians having road vehicles (ASEAN Key Figures, 2020). Perodua and Proton are the national vehicle manufacturers in Malaysia. Perodua has the largest market in 2019 with 38% while 17% is held by Honda followed by Toyota and Proton (Malaysian Automotive Association, 2021). The use of EVs in Malaysia was introduced by Toyota as early as 2009, followed by Honda in 2010, then Nissan and Mitsubishi also introduced BEVs in 2013 (ExpatGo.2020). Foreign manufacturers such as Toyota, Honda, Nissan and so on have brought in their respective electric vehicles in Malaysia while national vehicle manufacturers still use ICE in each of their models. The number of EVs in Malaysia peaked in 2017 and 2018 with nearly 9000 units registered (Omar, et al, 2021). 95% of registered EVs are PHEVs but the BEV segment has increased from 5% to 8% in 2021 (Lim,A, et al, 2021).

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1.3 Problem statement

This study aims to find out the challenges faced by manufacturers of the electric vehicle, EV industry in Malaysia.

The first challenge is the price of EV car in Malaysia. High EV prices are always a shadow of the EV culture in Malaysia because high prices will affect the acceptance of this group. The EV contribution of 20% of total vehicle sales by 2025 is targeted for the Malaysian market and is expected to increase to 50% by 2035 (Anzi, M, et al, 2021). With this, it is important to re-examine the issue related to the high purchase price of EVs, thus causing a lack of other users to buy the EVs.

The second challenge is the high market price. The imposition of taxes on imported cars and the limited variety of such cars in the Malaysian automotive market cause the price of EV cars to rise. Only electric cars are sold in Malaysia such as Nissan Leaf, BMW i3s and others that are: complete built-up (CBU) units which are more expensive than completely knocked down (CKD) units in the Malaysian market. The problem faced by the CBU unit, which is imported cars from foreign countries, is that they come with high excise duties, which will most likely increase the price of the car between 60% to 105%. (Dharfizi, et al, 2020). CKD units are cars that are manufactured and assembled by local companies. It will be sold in the Malaysian market at a much cheaper price to Malaysians because it is not taxed and has incentives from the government.

Last but not least, the challenges faced by EVs are in terms of safety and risk. The safety measures and risks involved in operating an EV weigh on many people. Since EVs were introduced, there have been fewer opportunities to properly maintain consumer vehicles. EV cars differ from cars that use an engine because handling for EV cars needs to be given more pressure. This is related to the safety of the user and the risk that must be taken by the user. Parts that have an electrical system must be protected from direct contact and must be covered with a protective layer cover. Only certain tools can access parts of the electrical system.

Electric car charging pot must be separated to avoid electric shock. in addition, EV batteries also have the risk of explosion because they contain chemical and mechanical electricity. The place of the charging pot needs to be maintained regularly so that the flow of electricity out and in does not occur. The human brain while driving needs to be in good condition because of the different EV power effects. The combination of the human model with the electric car model is to study the effects of vibration on the human brain based on various methods. (Zainal, N.A, et al, 2020).

1.4 Research Question

RQ1: How challenges can affect user electric vehicles in Malaysia.

RQ2: How user electric vehicles overcome the challenges in Malaysia.

RQ3: How the importance of electric vehicles for Malaysian environment, economy and people.

1.5 Research Objective

RO1: To investigate the challenges that affect electric vehicle users in Malaysia

RO2: To define solutions for electric vehicle users in Malaysia

RO3: To determine the importance of electric vehicles for Malaysia's environment, economy, and people.

1.6 Scope and Limitations

This will discuss the scope of challenges and solutions for electric vehicle users and limitations. The first challenge faced by users is the development of infrastructure. This means is in terms of limited charging stations, for the year 2023 there will be less than 500 public charging stations in Malaysia and the charging stations are built unevenly. This only focusing on urban areas. In addition, the cost of owning an electric vehicle (EV) is also one of the challenges. This is because the advance payment for an electric vehicle is high compared to an engine vehicle, causing many consumers to be less interested in owning an EV. Next, consumer education and awareness. In terms of consumer awareness, many consumers are still less interested in owning electric vehicles because they do not know the advantages of EV cars. Lack of knowledge is also the reason why consumers do not want to take the risk of owning an EV vehicle because they are not good at maintaining EV cars compared to engine vehicles that have owned them for a long time.

For the solution, support from the government is very necessary. The government is able to provide support in terms of incentives, by providing more incentives such as tax relief and being able to attract consumers to own electric vehicles.

by creating charging stations in urban and rural areas. In addition, the involvement of the private sector. Cooperation between local automotive companies such as Proton and private automotive companies such as Perodua is highly encouraged in exchanging expertise in producing electric vehicles. Foreign investment is also able to increase consumer confidence in the development of charging station infrastructure and the manufacture of electric vehicles for local automotive companies. Next, education and public awareness. By doing a campaign that is a public awareness campaign able to raise awareness of the use and benefits of electric vehicles.

For limitations, limited infrastructure development resources, the challenge faced by the government and the private sector is in allocating enough resources to develop charging stations. In addition, the high upfront cost also makes many consumers less interested in owning an electric vehicle. Next, limited education and awareness. Public awareness campaigns may be acceptable to urban dwellers but not to rural dwellers.

1.7 Motivation of study

In the motivation of study tell about previous studies, on the acceptance of electric vehicle (EV) users, it is greatly influenced by the theoretical paradigm of the use of conventional technology such as the use of the UTAUT model (Zhang B.S, et al, 2022). (Kamble and Upadhyay, 2023), they emphasize that changes to the EV sector are different from the theories, frameworks and views of academics. The end user's view of may not be sufficient with existing studies. The concept of acceptance in various domains such as automotive (KimS, et al, 2022) has been explained by past literature.

The impact of EV use on the environment and human health is low because EVs do not release any pollutants or greenhouse gases (GHG) (Tran, M.-K., 2020). Tail-pipe emissions have NOx and particulate matters (PMs) which are the main factors for the pipe. The use of EV batteries, namely Li-ion batteries, can reduce PMs by 4 times and NOx by 20 times (VanMierlo, 2019). With the use of EVs can protect public health and

avoid drastic climate change (Tran, M.-K., et al, 2021). The development of smart cities in the future depends on the role of EVs (Lai, C.S, et al, 2020).

1.8 Summary

In Malaysia, as a rapidly developing nation, has seen an increase in vehicle ownership, with most vehicles relying on fossil fuels. This dependency raises serious environmental concerns, such as greenhouse gas emissions and air pollution. To address these issues, EVs have been introduced as a greener alternative. Despite their benefits, the adoption of EVs in Malaysia has been slow due to several challenges, including high costs, limited infrastructure, and low public awareness.

The study sets three main objectives: to investigate the challenges affecting EV users in Malaysia, to evaluate how these challenges are being addressed, and to identify the importance of EVs for Malaysia's environment, economy, and society. To overcome these challenges, the study proposes several solutions. The government can play a key role by providing tax relief, financial incentives, and support for infrastructure development. Public-private partnerships between local companies like Proton and international manufacturers can also help accelerate EV production and improve access to EV technology. Raising public awareness through campaigns and educational programs is another crucial step to help Malaysians understand the benefits of EVs and how they can contribute to environmental protection and cost savings.

Despite these proposed solutions, some limitations remain. Developing infrastructure like charging stations requires significant investment and planning, which may be challenging for the government and private sector. Additionally, public awareness campaigns may be effective in urban areas but may not reach rural populations. However, the study emphasizes that the benefits of EVs, such as reducing air pollution, improving public health, and supporting the development of smart cities, far outweigh these challenges. With proper strategies and collaboration between stakeholders, Malaysia can make significant progress in adopting EVs and transitioning toward a more sustainable future.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter explain about technology, meaning of electric vehicles (EV), subfields of EV include (define EV and types of EV, models of EV in Malaysia,), explain challenges can affect user EV in Malaysia, explain solutions for user EV in Malaysia and explain about framework.

2.2 Technology

In the realm of modern society, technology serves as a pivotal force aimed at fulfilling diverse societal needs, addressing challenges, and striving towards collective goals through the application of scientific knowledge and research. As articulated by M. Corccia (2019), technology embodies a systematic integration of technical elements, adeptly navigating social demands and economic dynamics to provide effective solutions.

It functions not merely as a set of tools or innovations, but rather as a comprehensive framework that adapts to the evolving landscapes of human civilization. By harnessing the power of science and leveraging rigorous research methodologies, technology emerges as a transformative agent capable of enhancing human capabilities, fostering innovation, and fostering sustainable development. Its profound impact resonates across various sectors, from healthcare and communication to industry and education, continually reshaping how individuals interact, work, and live.

Thus, technology stands as a testament to humanity's ingenuity and its perpetual quest to overcome challenges and achieve progress in an ever-changing world.

2.3 Understanding of Electric Vehicle (EV)

The "Going green" program is the direction of the world towards a new world (Gazzola, P, et al, 2019). However, the world's increasing dependence on energy is likely to decline day by day. According to the International Energy Agency (IEA), one of the major contributors to climate change is carbon dioxide emissions, the transport sector is the dominant two-thirds contributor to carbon dioxide emissions (IEA. CO2 Emissions from Fuel Combustion 2019, 2022). The largest total energy consumption figures are from cars.

Therefore, the recommendations given by the agency by saving fuel can improve energy efficiency in terms of vehicle energy and can ultimately reduce the statistics of carbon dioxide emissions worldwide (IEA. Electric Car Market Shares in Electric Vehicle Initiative (EVI) Countries, 2020). In order to fulfill the vision of energy entrepreneurship, which is most important in the transport sector, will raise the concern of every country in saving fuel.

The Organization of Motor Vehicle Manufactures (OICA) reports an increase in car production globally which reflects the demand for engine vehicles, i.e. cars that never disappoint (International Organization of Motor Vehicle Manufacturers, 2018). This will help the car manufacturing industry to produce cars that can reduce carbon dioxide emissions. In the end, hybrid cars are a solution that can deal with issues related to fuel emissions, which are carbon dioxide gas emissions, efficiently (Alzahrani, K. et al, 2019).

From the point of view of the level of carbon emissions being the difference between hybrid cars and conventional cars, lower carbon emissions are promised in the production of hybrid cars (Adnan, N, et al, 2018). With that, one of the solutions that can reduce the dependence on the energy transport industry and can increase the efficiency of transport energy is to make hybrid cars as the solution.

Although the statistics in the use of hybrid cars are not as strong as conventional cars, but it needs to be realized. It is proven by statistics released by the IEA, the gap between the hybrid car market and conventional cars is very wide (IEA. Tracking Transport, 2019). The adoption of hybrid cars is relatively low for the whole country but shows a positive graph for some countries. European countries are the highest market for hybrid cars while for countries in Asia, namely China, which recorded a high hybrid car market and also one of the candidates for the highest use of hybrid cars globally (IEA. Electric Car Market Shares in Electric Vehicle Initiative (EVI) Countries, 2019). The Malaysian automotive market shows a low rate of energy-efficient vehicles such as hybrid cars, this is because Malaysia is still in the early stages of moving towards a green trend (Chekima, B, et al, 2015).

Hybrid cars are renewable energy sources meaning plug-in electric vehicles (PEVs), including battery electric vehicles (BEVs) and plug-in hybrid electric vehicles (PHEVs), with the aim of overcoming greenhouse gases (Davis, et al, 2018).



2.4 Subfields of EV

2.4.1 Types of Electric Vehicles (EV)

BEV, which is **Battery Electric Vehicle**, is a car that is fully powered by electric power. BEV does not use an engine as an internal combustion engine and also does not have any type of liquid fuel as a fuel. A large battery pack is used by BEVs that power autonomous vehicles. The range of BEV batteries that can last from 160 to 250 km,

although some BEV models can reach 500 km on a single charge. For example, the Nissan Leaf, which is one of the BEV types of vehicles that fully expects a 62 kWh battery power that can travel as far as 360 km (insideEVs. Nissan Reveals LEAF e-Plus: 62 kWh Battery, 226-Mile Range. 2019).

Next, PHEV vehicles, which are Plug-In Hybrid electric vehicles, are a type of vehicle that is powered by a combustion engine and also uses a charged electric engine. The storage of electrical energy in the grid by PHEVs can re-power this vehicle, which can indirectly reduce fuel consumption during normal driving. Mitsubishi Outlander is one of the PHEV vehicles that has a 12 kWh battery that can move the vehicle as far as 50 km using only the power of the electric engine (Mitsubishi Motors. Mitsubishi Outlander PHEV 2018, 2019). It should be taken into account that the fuel consumption produced by PHEV is higher than that of other car manufacturers (Plötz, P, et al, 2020).

Finally, Hybrid Electric Vehicles (HEV) are vehicles with a combination of an electric engine and a conventional internal combustion engine. Unlike PHEVs, HEVs do not have a grid to generate electrical power but their electrical power is charged through the combustion of the vehicle's engine. They are also generated by electricity through the energy during braking through kinetic energy converted to electrical power. Toyota Prius is a hybrid vehicle that provides a 1.3 kWh battery and can move the vehicle as far as 25 km using only its electric power.

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2.4.2 Models of Electric Vehicles (EV)

The electric vehicle (EV) market has undergone a transformative evolution in recent years, emerging as a pivotal segment of the global automotive industry. In 2023, approximately 14 million electric cars were sold worldwide, marking a significant milestone in the transition towards sustainable transportation. This impressive growth is particularly pronounced in three major regions: China, Europe, and the United States, which together account for about 95% of global EV sales.

Leading the charge in this electrifying revolution is the Tesla Model Y, which not only became the best-selling electric vehicle but also topped the charts as the world's best-selling car overall in 2023. Following closely behind is the Tesla Model 3, which has consistently ranked among the top sellers due to its combination of performance, range, and advanced technology (Korean Transport Institute). In third place is the SAIC GM Wuling, a model that highlights the increasing demand for affordable electric vehicles in emerging markets, particularly in China.

China stands out as a dominant force in the global EV landscape, representing around 60% of electric car sales. The country has seen electric vehicles account for over 35% of new car registrations, driven by government incentives, extensive charging infrastructure, and a growing consumer appetite for green technology. Major Chinese manufacturers like BYD and NIO have significantly contributed to this growth by offering a diverse range of models that cater to various consumer needs and preferences (iea).

In Europe, electric vehicles accounted for nearly 25% of global sales in 2023. The continent has been at the forefront of EV adoption, with countries like Norway leading the way; there, electric cars made up an astonishing 93% of new registrations. This trend is supported by stringent emissions regulations and substantial investments in charging infrastructure across European nations. Automakers are responding to this demand by expanding their electric offerings and committing to ambitious sustainability goals (Virta).

The United States, while accounting for about 10% of global EV sales, has also seen significant growth in electric vehicle adoption, particularly in states like California. California's progressive policies and incentives have fostered an environment conducive to EV growth, encouraging both consumers and manufacturers to embrace electric mobility. Major automakers are ramping up their efforts to introduce new electric models to capture this expanding market.

2.5 Challenges affect EV users in Malaysia

In Malaysia, the adoption of electric vehicles (EVs) is still in its early stages, and several challenges hinder the widespread use of EVs. These challenges primarily relate to the availability of charging infrastructure, the time it takes to charge EVs, and the high upfront cost of purchasing an EV.

One of the main issues is the lack of a sufficient and evenly distributed charging infrastructure. While there are around 1,500 charging stations across Malaysia, most of these are located in urban areas like Selangor and Kuala Lumpur. This creates a significant problem for those living in rural or less developed regions, as they may have limited access to charging points. Furthermore, the scarcity of charging stations along major highways makes long-distance travel inconvenient and potentially stressful for EV owners, as they may struggle to find a place to recharge their vehicles. The uneven distribution of charging infrastructure is a major factor contributing to range anxiety, where drivers worry about running out of battery power before reaching a charging station (Muhammad Umair, et al, 2024).

Another challenge is the time it takes to fully charge an EV. The time required to charge depends on the type of charger being used. For example, Level 1 chargers, which are standard household outlets, take a long time up to 17 hours to fully charge a vehicle with a 24kWh battery. This is not practical for daily use, especially for individuals who rely on their EVs for commuting or other regular activities. While Level 2 chargers provide faster charging times, they still take about 7 to 9 hours for a full charge. The lack of fast-charging stations (DC chargers) in many areas means that many EV owners have no choice but to use slower chargers, which can be inconvenient, especially if they need to use their vehicle frequently or for long trips (Nur Ayeesha Qisteena Muzir, et al,2022)

Finally, the high cost of EVs remains a significant barrier to their adoption. Although the government offers incentives and rebates to help make EVs more affordable, the price of an EV is still much higher than that of a traditional gasolinepowered vehicle. For instance, the Nissan Leaf, an EV, is priced considerably higher than a similar traditional vehicle like the Nissan Almera. This price gap makes EVs out of reach for many people, particularly those from lower-income groups or those who are not yet convinced about the long-term benefits of switching to an electric vehicle. As a result, the high upfront cost is a major obstacle to EV adoption in Malaysia (Muhammad Umair, et al, 2024).

2.6 Solutions for user EV in Malaysia

First, we go for number one of solution is developing charging infrastructure for electric vehicles (EVs) is essential for encouraging more people in Malaysia to adopt this environmentally friendly technology. One of the first steps is for the government to take the lead by creating policies and initiatives that support the construction of public charging networks. This is important to solve the "chicken-and-egg" problem, where people hesitate to buy EVs because of limited charging stations, and companies are reluctant to build charging stations because there aren't enough EV users (Yusof Ishak Institute, 2024).

Another key strategy is to use advanced technologies like artificial intelligence (AI) to create smart charging systems. These systems can help manage energy more efficiently, ensuring that charging stations are reliable and effective for users. Partnerships between the government and private companies are also critical. By working together, these parties can pool resources, share expertise, and create an EV ecosystem that benefits everyone (Adam Junid, et al, 2024).

On a local level, it is important to develop neighbourhood charging facilities. For instance, slow-charging stations in residential areas can make it easier for people to charge their EVs overnight, which is especially helpful for those who don't have private garages. Additionally, providing financial incentives, such as subsidies or tax benefits, to businesses and individuals who invest in charging stations can speed up the development of this infrastructure.

Second, solution is providing incentive from government. Malaysian government has implemented a variety of incentives to encourage the adoption of electric vehicles (EVs) and support the development of EV charging infrastructure. These measures aim to make EVs more accessible and affordable for consumers and businesses while promoting sustainable transportation across the country.

One major incentive is the Green Investment Tax Allowance (GITA). This program provides a 100% tax exemption for Charging Point Operators (CPOs) that meet specific requirements. The exemption can offset up to 100% of statutory income for five years, making it easier for businesses to invest in building and operating EV charging stations. This helps reduce the financial risks associated with developing charging infrastructure (Malaysian Investment Development Authority (MIDA), 2024).

For individual EV users, the government offers tax relief of up to RM2,500 per year. This can be claimed for expenses such as installing or renting EV charging equipment, as well as subscription fees for charging services. This initiative, available until 2027, aims to encourage individuals to install chargers in their homes or access public charging facilities conveniently (Anby Alcomendas, 2024).

To make EVs themselves more affordable, the government has also introduced import and excise duty exemptions (Muhammad Yusry, 2024). These exemptions reduce the overall cost of electric vehicles and their components, encouraging more people to consider switching to EVs. Combined with this, the government provides a road tax exemption for EV owners, significantly lowering the cost of owning and maintaining an electric vehicle (Muhammad Yusry, 2024).

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2.7 Importance of Electric Vehicles for Malaysian Environment, Economy and People

Electric vehicles (EVs) are incredibly important for Malaysia as they offer a wide range of benefits for the environment, economy, and society. One of the biggest environmental advantages is that EVs produce zero emissions from their tailpipes. This means they don't release harmful pollutants like carbon dioxide or nitrogen oxides into the air, which are common with petrol or diesel vehicles.

By reducing these pollutants, EVs can help improve air quality, making cities cleaner and safer to breathe in. Cleaner air also reduces health problems such as asthma and other respiratory illnesses. Furthermore, EVs play a critical role in lowering greenhouse gas emissions, which helps combat climate change and supports Malaysia's environmental goals (Nur Ayeesha Qisteena Muzir, et al, 2022).

From an economic standpoint, EVs can save money for their owners in the long run. The cost of electricity for charging EVs is generally lower than the price of petrol or diesel. Additionally, EVs have fewer moving parts compared to traditional vehicles, which means less wear and tear, lower maintenance costs, and fewer repairs over time. Beyond personal savings, EVs also open up opportunities for economic growth in Malaysia.

The development of EV infrastructure, such as charging stations, and the manufacturing of EV components can create jobs and attract investments. This can position Malaysia as a leader in the growing Southeast Asian EV market, helping the country stay competitive globally (Nur Ayeesha Qisteena Muzir, et al, 2022).

People, adopting EVs can greatly benefit the well-being of people. Reduced air pollution means fewer health problems caused by dirty air, leading to better overall public health. The quiet operation of EVs also reduces noise pollution, making cities and neighborhoods more peaceful and improving quality of life, especially in densely populated areas. Moreover, as more people switch to EVs, it sends a strong message about the country's commitment to sustainability and a greener future. This can inspire more individuals and businesses to adopt environmentally friendly practices (Mohammad Farajnezhad, et al, 2024).

2.8 Conceptual Framework



2.9 Summary

This chapter focuses on electric vehicles (EVs) and their potential role in Malaysia. It begins by discussing the importance of technology, emphasizing how it helps society address challenges, improve quality of life, and drive sustainable development. EVs are highlighted as an essential part of the global shift toward environmentally friendly solutions, especially in reducing carbon emissions from the transportation sector.

Different types of EVs are explained in simple terms. Battery Electric Vehicles (BEVs) are fully electric and rely entirely on large batteries for power, such as the Nissan Leaf. Plug-in Hybrid Electric Vehicles (PHEVs) combine an electric motor with a traditional fuel engine, allowing them to use both electricity and fuel. Hybrid Electric Vehicles (HEVs) also combine these two systems but lack external charging capabilities. Globally, EVs have become increasingly popular, with regions like China, Europe, and the United States leading the way. Popular models include the Tesla Model Y, Tesla Model 3, and SAIC GM Wuling. However, in Malaysia, EV adoption is still at an early stage.

Several challenges hinder the widespread use of EVs in Malaysia. One significant issue is the lack of enough charging stations, especially in rural or less developed areas. Most charging stations are located in cities like Selangor and Kuala Lumpur, making it difficult for people in other areas to own and use EVs. Additionally, long charging times are another concern. For example, charging a vehicle using a standard household outlet can take up to 17 hours, while faster chargers are not widely available. The high cost of EVs is also a major obstacle. EVs are much more expensive than traditional cars, making them unaffordable for many people, especially those from lower-income groups.

To address these challenges, several solutions are proposed. The development of more charging infrastructure is essential, and this requires collaboration between the government and private companies. Advanced technologies like artificial intelligence (AI) can help create smart and efficient charging systems. Financial incentives from the government are also crucial. These include tax exemptions for businesses investing in charging stations, personal tax relief for EV-related expenses, and reduced road taxes for EV owners. Such measures aim to make EVs more accessible and encourage their use across the country.

Electric vehicles offer many benefits for Malaysia. Environmentally, they produce no harmful emissions, helping to improve air quality and combat climate change. This contributes to cleaner cities and better public health by reducing issues like asthma and other respiratory problems caused by air pollution. Economically, EVs are cheaper to maintain than traditional cars, as they have fewer moving parts and require less frequent repairs. The development of EV infrastructure and related industries can also create jobs and attract investments, boosting Malaysia's economy.

On a societal level, EVs reduce noise pollution, making urban areas quieter and more peaceful. They also represent a commitment to a sustainable future, inspiring more people and businesses to adopt environmentally friendly practices. Overall, this chapter highlights the transformative potential of EVs for Malaysia, emphasizing the need to overcome existing challenges and implement practical solutions to ensure their widespread adoption. By doing so, Malaysia can move closer to achieving its environmental, economic, and societal goals.

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CHAPTER 3

RESEARCH METHODOLOGY

3.0 Introduction

The research methodology used in this study was designed to comprehensively investigate the challenges, solutions and importance of electric vehicles (EV) in Malaysia. Using a qualitative method approach, this research aims to capture data through surveys and qualitative insights through in-depth interviews with the industry respective. This interview will provide a nuanced perspective on the effectiveness of current policies, technological advances, and the socio-economic implications of EV adoption in Malaysia. By triangulating these findings, this research aims to offer a comprehensive analysis of the challenges faced by electric vehicle users, and propose viable solutions to foster a sustainable and efficient electric vehicle ecosystem in Malaysia.

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3.1 Research Design

The research design for this study on electric vehicles (EV) in Malaysia is structured to systematically investigate various aspects of EV usage and its importance. Using a sequential explanatory mixed methods design, this study began with a qualitative phase of research using semi-structured interviews with electric vehicle users (Patton, 2015; Marshall & Rossman, 2016). Qualitative data will be analysed using thematic analysis to identify recurring themes and patterns, complementing statistical analysis of survey responses (Braun & Clarke, 2019; Miles et al., 2020). With a qualitative approach, this research design aims to provide a comprehensive understanding of the current state of EV adoption in Malaysia, reveal barriers to its expansion, and propose evidence-based recommendations to foster sustainable and inclusive growth of the EV market in the country.

3.2 Data Collection Method

Data collection for this study on electric vehicles (EV) in Malaysia will use a qualitative approach to gather a comprehensive view of the challenges, solutions and importance of electric vehicles. Qualitative phase will use semi-structured interviews with information on electric vehicle users. This interview will investigate the perspective of electric vehicle users about the challenges they face, the solutions that can be proposed and the importance of electric vehicles in Malaysia (Patton, 2015; Marshall & Rossman, 2016). With the qualitative method of this data, this research aims to triangulate the findings, provide a holistic view of the EV adoption landscape in Malaysia, and offer informed recommendations to improve the sustainability and efficiency of the EV market.

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3.2.1 Qualitative Method

Qualitative methods play a crucial role in this study by providing in-depth insights into the complex factors influencing electric vehicle (EV) adoption in Malaysia. Qualitative research allows for a nuanced exploration of stakeholders' perspectives, policy effectiveness, and socio-economic impacts associated with EV use. Through semi-structured interviews with key stakeholders such as government officials, industry experts, environmental advocates, and EV users, this study aims to capture rich, detailed narratives that quantitative data alone may not fully reveal (Patton, 2015). These interviews will delve into participants' experiences, attitudes, and perceptions towards EVs, offering deeper understanding of issues such as infrastructure development, policy incentives, and technological advancements affecting EV adoption. The qualitative data will be analyzed using thematic analysis, a method that identifies patterns and themes within the data to uncover underlying meanings and interpretations (Braun & Clarke, 2019). By employing qualitative methods, this research seeks to complement quantitative findings, provide contextual understanding, and contribute to comprehensive recommendations for promoting sustainable EV adoption in Malaysia.

3.2.2 Data Source

The data source for this study will include a variety of primary and secondary sources to provide a comprehensive understanding of EV usage in Malaysia. Primary data will be collected through a structured survey administered to a diverse sample of EV owners selected through purposive and random sampling techniques across different regions of Malaysia (Lee & Chan, 2020; Zhao & Hwang, 2019). Primary qualitative data will be collected through semi-structured interviews with information on electric vehicle users. This interview will investigate the perspective of the challenges they face, the solutions that can be proposed and the importance of electric vehicles in Malaysia (Patton, 2015; Marshall & Rossman, 2016). Secondary data sources will include scholarly articles, government reports, policy documents and industry publications related to EV adoption trends, technological advances and policy frameworks in Malaysia. Using both primary and secondary data sources, this research aims to triangulate findings, validate insights, and offer robust analysis of the challenges, solutions and importance of electric vehicles to sustainability and transport policy in Malaysia.

3.2.3 Primary Data

The primary data collection for this study on electric vehicles (EVs) in Malaysia will involve qualitative methods to gain detailed insight into the challenges faced by electric vehicle users, solutions to those challenges and the importance of electric vehicles in Malaysia. The survey began by collecting qualitative data through semi-structured interviews with electric vehicle users in Malaysia. This interview will provide a deeper insight into the perspective of electric vehicle users about the challenges faced by electric vehicle users, solutions to the challenges and the importance of electric vehicles in Malaysia (Patton, 2015; Marshall & Rossman, 2016). By using a qualitative primary data collection method, this research aims to offer a comprehensive understanding of the challenges facing electric vehicle users, promote solutions to the challenges and find out the importance of electric vehicles in Malaysia.

3.2.4 Secondary Data

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The collection of secondary data for this research on electric vehicles (EV) in Malaysia will involve an extensive review of existing literature, government reports, policy documents, industry publications and statistical databases to provide a comprehensive context and background for the study. Secondary data will include scholarly articles that explore various aspects of EV use, such as technological progress, market trends, consumer behavior and the environmental impact of EVs (Wang et al., 2019; Lutsey & Sperling, 2018). Government reports and policy documents will be critical in understanding the regulatory framework, incentives and initiatives aimed at promoting EV adoption in Malaysia, as well as identifying gaps and challenges in current policies (Perbadanan Teknologi Hijau Malaysia, 2020; Ministry of Energy, Science, Technology, Environment and Climate Change, 2019). Industry publications

and market analysis reports will provide insight into the commercial aspects of EV adoption, including market penetration rates, competitive dynamics and infrastructure development such as the availability of charging stations (International Energy Agency, 2021). By integrating these diverse secondary data sources, this research aims to reconcile findings with primary data, confirm trends, and offer robust analysis of the challenges faced by electric vehicle users, solutions to the challenges and the importance of electric vehicles in Malaysia.

3.3 Research Strategy

The research strategy for the study of electric vehicles (EV) in Malaysia is designed to ensure a comprehensive and systematic investigation of the challenges faced by electric vehicle users, solutions to the challenges faced by users and their solutions. This study uses a qualitative research method approach to provide robust analysis. Initially, the qualitative phase was conducted to find out the information of electric vehicle users and their type of vehicle by identifying through semi-structured interviews with the users. These interviews will provide a rich contextual overview of policy effectiveness, technological progress and socio-economic impact (Patton, 2015; Marshall & Rossman, 2016). Qualitative data will be analyzed using thematic analysis to identify recurring themes and deeper meaning towards electric vehicle users (Braun & Clarke, 2019). This qualitative method strategy allows for data triangulation, increasing the validity and reliability of the findings. With qualitative data, this research strategy aims to find out the challenges faced by electric vehicle users, further informing evidence-based policy recommendations and strategic initiatives to promote sustainable transport solutions (Teddlie & Tashakkori, 2009; Greene, 2007).

3.3.1 Interview



Figure 3.3.1 Interview

The first step involves the development and design of interview questions. This stage is important because it sets the foundation for the entire interview process. Researchers must consider possible gaps from initial results, which imply that early exploratory research or pilot studies have identified areas that require further investigation. By carefully crafting the questions, the researchers ensured they addressed all relevant topics and revealed a comprehensive view of the challenges and solutions of electric vehicles in Malaysia.

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Next, the process turns to conducting the actual interview. A minimum of 3 participants are interviewed, with each session taking between 30 and 75 minutes. This period allows for in-depth discussion, giving participants enough time to express their views and share detailed information. The selection of participants is likely to be strategic, ensuring that various perspectives are gained on the challenges and solutions of electric vehicles in Malaysia.

After the interview, the third step is to transcribe the interview. Transcription converts digital audio files into text data, which is essential for detailed analysis. This step not only helps in maintaining accurate participant responses but also facilitates easier data manipulation and inspection. Accurate transcription is important because it

preserves the integrity of the data, ensuring that all the nuances and specific details of the participant's responses are captured.

The fourth step is data analysis, a comprehensive process that involves content analysis, data reduction, organization, and coding. Content analysis helps in identifying patterns, themes and insights from qualitative data. Data reduction simplifies vast data into manageable chunks without losing important information. Sorting and coding further structure the data, allowing researchers to systematically categorize and interpret findings. This careful analysis aims to reveal important themes and insights related to electric vehicle users.

Finally, the predetermined themes are presented, covering the level of sustainability adopted by electric vehicle users. These themes represent the core findings of the study, providing a synthesized understanding of the data collected. The theme is likely to reflect the various views of electric vehicle users in Malaysia. This last step not only summarizes the main insights but also sets the stage for drawing conclusions and making recommendations based on the research findings.

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3.4 Target Population

The target population for this study on electric vehicle (EV) use in Malaysia includes a broad spectrum of individuals and groups who are either directly or indirectly involved with or affected by EV use. This includes current EV owners. Current EV owners provide valuable insights into user experience, satisfaction levels and challenges faced, thus helping to understand the practical aspects of EV adoption (Li et al., 2017). By involving the targeted population, this research aims to capture a holistic view of the EV landscape in Malaysia, ensuring that the findings are comprehensive and reflect the various perspectives of electric vehicle users. This inclusive approach not only enriches the data but also increases the relevance and applicability of research results to various aspects of the EV ecosystem.

3.4.1 Sampling Size

In qualitative research, the concept of data saturation, which states that data collection should continue until no new information or themes emerge, guides the relationship between sample size and study depth rather than statistical representation. For this study on the use of electric vehicles (EV) in Malaysia, determining the appropriate sample size involves considering the specificity of the research question, the complexity of the phenomenon being investigated and the available resources. Purposive sampling will be used to select participants based on relevant characteristics such as their experience with EVs. This method ensures that the sample includes individuals who can provide rich and detailed insights related to the research objectives.

In order to obtain high-quality and in-depth data, techniques such as semistructured interviews will be used. This method facilitates an in-depth exploration of participants' experiences, perceptions and attitudes towards the use of EVs. Given the focus on theoretical saturation, flexibility in sample size determination is important. This approach allows for iterative adjustments to the sampling process in response to emerging themes and levels of saturation, ensuring that the data collected is comprehensive and insightful.

For this research, an initial target of 2 until 3 participants will be set, in line with recommendations for qualitative research that emphasize depth over breadth (Creswell, 2013; Mason, 2010). However, the exact number may vary depending on when theoretical saturation is reached. The goal is to continue data collection until additional interviews no longer yield new information or insights, thereby reaching a point where the data collected is rich and comprehensive enough to effectively answer the research questions. This strategy prioritizes theoretical relevance, depth and richness, allowing

researchers to offer nuanced explanations of the challenges facing electric vehicle users and their solutions (Guest, Bunce, & Johnson, 2006)

3.4 Purposive Respondent

In this research on the use of electric vehicles (EV) in Malaysia, purposive sampling is used to select respondents who have specific characteristics that are important to obtain meaningful insights. Purposive sampling, also known as judgmental or selective sampling, involves the deliberate selection of participants based on their expertise and relevance to the research topic. For this study, the targeted respondents are individuals who have knowledge and experience with electric vehicles. These individuals usually include current EV owners. User backgrounds that allow them to provide detailed and practical insights into the challenges faced and their solutions.

In order to identify suitable target respondents, specific criteria are set. These criteria include having at least one year of professional experience in an EV-related role. In addition, respondents should be knowledgeable about current trends and challenges in the EV sector and familiar with the dynamics of EV use in Malaysia. This focus ensures that respondents can offer an informed perspective on the practical aspects of EV integration, the impact on transport and environmental performance, and the strategic considerations involved.

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Prior to full-scale data collection, pilot testing was conducted with a subset of respondents to refine the study's instruments and methodology. The pilot test involved giving an interview guide to a small group of participants who met the selection criteria, allowing for an assessment of the clarity, relevance and completeness of the questions. This process helps identify any ambiguities or gaps in the interview questions, ensuring they effectively capture the information needed to address the research objectives. Feedback from pilot test participants was invaluable in revising and optimizing the interview guide, improving the reliability and validity of the data collection process. By

involving respondents who are deeply embedded in the EV ecosystem, this research aims to gather nuanced and high-quality data that provides a comprehensive understanding of the challenges faced by electric vehicle users and solutions to the challenges in Malaysia.

3.4.1 Interview Question's Structure

Question	Source
Background Information	
1) Can you introduce yourself and	
what type of your electric	
vehicle?	
Challenges can affect user	
electric vehicle in Malaysia	
1) Where do I charge an electric	"43 Most Common Electric Vehicle
vehicle?	Questions Answered", Tim Fisher, 202
2) Why are electric vehicles	"Top 10 Questions (And Answers)
VERSIT expensive KAL	About Electric Vehicle", Phil Ward,
	2021
3) How long does it take to charge	"43 Most Common Electric Vehicle
an electric vehicle	Questions Answered", Tim Fisher, 202
Solutions for user electric vehicle in	
Malaysia	
1) Should government develop more	
charging station?	
2) Should government give more	
incentive than roadtax	
Importance of electric vehicles for	
Malaysian	

1) Are electric vehicle better for the	"43 Most Common Electric Vehicle
environment?	Questions Answered", Tim Fisher, 2021
2) But some electric vehicle still	"43 Most Common Electric Vehicle
produces emissions, right?	Questions Answered", Tim Fisher, 2021

Table 3.5.1 Interview Question's Structure

3.6 Data Analysis/ Interception

Data analysis for this study on electric vehicles (EV) in Malaysia will be conducted using a thorough and systematic approach that integrates qualitative methods. This quantitative analysis will provide a broad understanding of the patterns and trends in EV adoption and the barriers faced by users. In the qualitative phase, data from semi-structured interviews with electric vehicle users will be analysed using thematic analysis. This involved coding the data to identify recurring themes and patterns, enabling an in-depth exploration of those users' perspectives on the challenges they faced and their solutions (Braun & Clarke, 2019; Guest, MacQueen, & Namey, 2012). Thematic analysis will be conducted iteratively, with themes refined and validated through a process of constant comparison and peer debriefing to ensure reliability and validity (Lincoln & Guba, 1985). With findings from qualitative analysis, this research aims to triangulate the data, providing a comprehensive and nuanced understanding of the challenges faced by electric vehicle users.

3.6.1 Thematic Analysis

According to Braun and Clarke (2006), the compilation of data obtained from interviews involves several critical steps that ensure thorough and systematic analysis. In the context of research on the use of electric vehicles (EV) in Malaysia, these steps are carefully followed to reveal meaningful insights.

1) Familiarize yourself with Data

The first step in the thematic analysis process is to become familiar with the data. This involved carefully reading and re-reading the interview transcripts to gain an indepth understanding of the content. Researchers begin by taking initial notes, identifying initial ideas, and delving into the data (Braun & Clarke, 2006). This absorption is important because it lays the foundation for the next stage of analysis. By repeatedly engaging with the data, researchers ensure they understand nuance and context, which is important for effective coding and theme development later on.

2) Generate Startup Code

In the second step, the researcher generated initial codes from the data. Coding involves labeling significant segments of text to categorize the data into meaningful groups. These codes can be theory-driven, based on existing frameworks or hypotheses, or data-driven, emerging directly from the data itself (Braun & Clarke, 2006). The goal is to systematically break the data down into manageable chunks while preserving the essential meaning of each segment. This step allows the researcher to start organizing the data, making it easier to carry out more detailed analysis in the following stages.

3) Search Themes

After setting the initial code, the next step is to find a theme. Themes are broader patterns of meaning derived from coded data. The researcher examined the codes and grouped them into potential themes, noting how different codes could combine to form a coherent theme (Braun & Clarke, 2006). This iterative process often requires revising the data multiple times to ensure the theme reflects the data accurately. The goal is to organize the code into more comprehensive units of analysis that can tell a coherent story about the data.

4) Checking Themes

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In the fourth step, the researcher checked the themes to ensure that they accurately represented the data. This involved two stages of review: first, checking whether the

themes were relevant to the coded extracts, and second, assessing whether the themes reflected the entire data set. Researchers may need to refine themes, divide them into new themes, or discard them if there is insufficient evidence to support them (Braun & Clarke, 2006). This step ensures the robustness and validity of the theme, confirming that the theme is well supported by the data.

5) Defining and Naming Themes

The fifth step involves defining and naming the theme. The researcher must clearly define each theme, determine its essence and how it fits into the overall research narrative. This requires writing a detailed description of the scope and content of each theme, highlighting its core aspects and points of interest. Naming themes involves creating a simple and evocative label that succinctly captures the essence of each theme

(Braun & Clarke, 2006).

6) Generating Reports

The final step in the thematic analysis process is producing a report. This involves unifying themes into a coherent narrative that provides a detailed and nuanced explanation of the data. The report should argue persuasively about the importance of the theme and its implications. According to Braun and Clarke (2006), the standard research paper format includes an introduction to the research question, a description of the methodology, a presentation of the theme, and a discussion of the findings in relation to the research question and existing literature. In the context of this research on EV adoption in Malaysia, the report will synthesize the findings to offer a comprehensive view of the challenges faced by consumers and solutions to those challenges.

The conclusion that can be made is that thematic analysis is a valuable and widely used method in qualitative research, allowing researchers to identify, analyze and report patterns in data. Its flexibility and adaptability make it suitable for various contexts and research questions. By adhering to a systematic approach that includes familiarization, coding, theme development, review, description and reporting, researchers can provide deep and meaningful insights into their data. Despite its challenges, careful thematic analysis can reveal deep insights into complex qualitative data, significantly contributing to the body of knowledge in various fields.

3.7 Validity and Reliability
Ensuring the validity and reliability of this study on electric vehicles (EV) in Malaysia is important to produce reliable and trustworthy findings. Validity refers to the extent to which research accurately reflects or measures the concept to be investigated, including various types such as internal validity, external validity, construct validity, and content validity (Creswell & Creswell, 2018). To increase internal validity, this study will use a rigorous survey design and implementation procedure, ensuring that questions are clear, unbiased, and based on established theory and previous research. A pilot test of the survey instrument will be conducted to identify and correct any ambiguities or misunderstandings (Heale & Twycross, 2015). External validity, or the generalizability of findings to other contexts, will be addressed by using a diverse sample that represents different demographic and geographic segments of the Malaysian population, thereby capturing a variety of perspectives and experiences (Polit & Beck, 2010). Construct validity will be strengthened by ensuring that survey and interview questions comprehensively cover key constructs of interest, such as perceptions of barriers to adoption, and their solutions (Trochim & Donnelly, 2007). Reliability, which refers to the consistency and reliability of research findings, will be ensured through standardized data collection procedures and the use of reliable measurement instruments. For qualitative data, reliability will be enhanced by using strategies such as peer review, where participants check and confirm the researcher's interpretation of their responses, and by using multiple coders to analyze the data independently, thus reducing bias and increasing inter-coder reliability (Lincoln & Guba, 1985; Creswell & Poth, 2016). Additionally, maintaining a detailed audit trail of all research results, data collection processes and analytical steps will further increase the transparency and reproducibility of the study. By carefully addressing validity and reliability, this research aims to provide a solid and reliable view of the challenges faced by electric vehicle users and the solutions to those challenges in Malaysia.

3.8 Ethical

In order to guarantee that studies are carried out properly and with regard for the rights and well-being of participants, researchers must follow strict ethical guidelines. The field of ethics in research comprises a range of norms and concepts that are intended to safeguard research participants from harm, obtain informed consent, preserve confidentiality, and maintain the integrity of the research process. Babbie (2016) states that "Ethical considerations ensure that researchers treat research participants with respect, minimize harm, and maintain the trustworthiness of the research process." Researchers must also ensure that participants have the freedom to decline participation. Participants' privacy must be protected by maintaining confidentiality, and measures should be taken to reduce any potential harm or discomfort that may arise from participation. Researchers protect the integrity of their work and enhance the credibility and reliability of scientific research in general by abiding by ethical principles.

In conducting this research on the adoption of electric vehicles (EVs) in Malaysia, ethical considerations are paramount. Adhering to ethical guidelines ensures the protection of participants' rights and the integrity of the research process. The ethical considerations include obtaining informed consent, ensuring confidentiality, and respecting participants' autonomy throughout the research.

1) Obtaining Informed Consent

Before initiating the interview process, it is essential to obtain informed consent from all participants. This process begins with sending a formal letter of invitation via email, which outlines the purpose of the study, the nature of their participation, and any potential risks or benefits. The email should provide a clear and concise description of the research objectives, explaining why the participant has been selected and how their input will contribute to the study. It should also inform them about the voluntary nature of their participation, the expected duration of the interview, and the types of questions that will be asked. Included in this email should be an attached informed consent form that participants need to review and sign. This form should detail their rights, including the right to withdraw from the study at any point without any repercussions. It should also cover how the data will be collected, stored, and used, ensuring that participants understand that their responses will be recorded and transcribed. They must be informed about the measures taken to anonymize their data, such as removing identifying information from transcripts and reports to protect their identity.

2) Ensuring Confidentiality

Maintaining confidentiality is another crucial ethical consideration. Participants should be assured that their personal information and responses will be kept confidential and used solely for the purposes of this research. All interview recordings, transcriptions, and related documents must be securely stored, accessible only to the research team. This involves using password-protected digital files and secure storage systems for physical documents. When reporting the findings, care must be taken to anonymize any data that could potentially identify the participants, including using pseudonyms or generalized descriptions rather than specific names or roles.

3) Respecting Participants' Autonomy

Respecting participants' autonomy involves allowing them full control over their participation in the study. This includes the right to refuse to answer any questions they are uncomfortable with and the right to end the interview at any time. Participants should also have the opportunity to review the transcriptions of their interviews and request any changes or deletions they see fit before the data is finalized for analysis. In addition, the timing and location of the interviews should be arranged to suit the participants' convenience, minimizing any potential disruptions to their personal or professional lives. Providing a comfortable and respectful environment for the interview can help foster open and honest communication, enhancing the quality of the data collected.

4) Transparency and Communication

Maintaining open and transparent communication with participants is crucial throughout the research process. This involves regular updates on the progress of the study and the opportunity for participants to ask questions or express concerns at any stage. Participants should be informed about how the findings will be disseminated, including any plans for publications or presentations. They should be given the option to receive a summary of the research findings if they are interested, which reinforces their value and contribution to the study. This approach ensures that participants are

well-informed and feel respected throughout the research process, thereby enhancing their engagement and the overall quality of the research.

By adhering to these ethical considerations, the research on EV adoption in Malaysia can proceed in a manner that respects participants' rights and contributes valuable insights to the field.

3.9 Pilot Test

Before a research project is implemented fully, a preliminary examination called pilot testing, also referred to as a pilot study or pilot phase, is carried out to assess the viability, dependability, and efficacy of the methodologies and processes. It entails small-scale testing of the research tools, techniques, and protocols in order to find and fix any possible problems or difficulties that could occur during the primary study. Pilot testing is mostly used to improve the research design, adjust data collecting instruments, and make sure the study can be carried out effectively. In complicated research initiatives like clinical trials, survey research, and experimental investigations, where any errors or inefficiencies in the process can have a major impact on the validity and dependability of the findings, pilot testing is especially important. "Pilot tests are trial runs that precede the real data collection," state Leedy and Ormrod (2019). "They provide the researcher with a chance to test out tools, techniques, and small-scale analyses for data collecting" (p. 108). The experimental part of pilot testing and its function in improving many facets of the research process are highlighted in this definition. Researchers can evaluate the usefulness of data collecting processes, the accuracy of measuring instruments, the suitability of sampling strategies, and the lucidity of survey questions during pilot testing. Researchers can improve the validity and trustworthiness of the main study results by identifying and resolving any problems or ambiguities in the research design through the implementation of a pilot study.

In the context of this research on the adoption of electric vehicles (EVs) in Malaysia, pilot testing plays a crucial role in ensuring that the study's instruments and procedures are well-suited to the unique challenges and contexts of the Malaysian environment. For instance, the pilot test will involve conducting initial interviews with a small, diverse subset of participants from the EV user population. This helps in identifying any cultural nuances or contextual factors that might affect the respondents' understanding of the questions or their willingness to participate.

The feedback obtained during this phase will be instrumental in refining the interview guide and other data collection tools. For example, if certain questions are found to be ambiguous or too complex, they can be revised for clarity and simplicity. Additionally, the pilot test can help assess the logistical aspects of the research, such as the best methods for scheduling and conducting interviews, and ensuring that the data recording and transcription processes are efficient and accurate.

Moreover, conducting a pilot test can help anticipate potential ethical issues that might arise during the full-scale study. By obtaining feedback on the informed consent process and ensuring that participants are comfortable with the confidentiality measures in place, the researchers can make necessary adjustments to enhance participant trust and engagement.

Overall, the pilot test serves as a vital step in the research process, enabling the identification and mitigation of potential problems before they impact the main study. By meticulously evaluating and refining the research design, data collection instruments, and procedures, the pilot test helps ensure that the study on EV adoption in Malaysia produces valid, reliable, and meaningful insights.

3.10 Summary

In Chapter 3 of the research on the challenges and solutions for user electric vehicles (EV) in Malaysia, the methodology is detailed comprehensively to explain the systematic approach undertaken to gather and analyze data. This chapter introduces the methodological framework by emphasizing the descriptive and exploratory nature of the study, which is chosen to delve deeply into how EV users in Malaysia navigate and

overcome various challenges. A qualitative approach forms the backbone of the research design, integrating interviews and case studies to extract nuanced insights from professionals and experts within the EV sector.

The chapter elaborates on the use of primary data sources, primarily through indepth interviews, which are meticulously designed to understand the participants' perspectives on the adoption and impact of EVs. Participants are selected through purposive sampling based on their direct involvement and expertise in the EV industry and user experience. An interview guide is developed, featuring open-ended questions that facilitate comprehensive responses regarding the practical implementation, benefits, and challenges associated with EV usage in Malaysia. The interviews are conducted following a semi-structured format to allow flexibility while ensuring that all pertinent topics are addressed, and recordings are made with participants' consent to enable accurate transcription and analysis.

Furthermore, secondary data sources complement the primary data, encompassing academic journals, industry reports, and existing literature to provide a broader context and support the analysis. The data analysis process involves coding and thematic analysis of the interview transcripts to identify recurring themes, patterns, and insights related to the challenges of EV adoption, operational efficiencies, user engagement, and the associated solutions. These findings are cross-validated through case studies that offer real-world examples of successful EV integration and usage in Malaysia, showcasing best practices and the obstacles encountered.

The reliability and validity of the study are bolstered through triangulation, where the data from interviews, case studies, and secondary sources are corroborated to ensure the robustness of the findings. Pilot testing of the interview guide is conducted to refine the questions and enhance clarity, further contributing to the study's credibility.

Ethical considerations are rigorously adhered to throughout the research

process, including obtaining informed consent from participants, maintaining confidentiality, and ensuring ethical compliance in data collection and analysis. Participants are fully informed about the purpose of the study and their rights, with measures in place to protect their anonymity and confidentiality. This ensures that the research is conducted with respect and integrity, safeguarding the participants' welfare and the study's credibility.



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CHAPTER 4

DISCUSSION AND ANALYSIS

4.1 Introduction

This chapter focused into the findings, providing commentary and a more indepth description of the research issues. Given the objectives and scope of the study, the findings were supposed to inform us of its significance or relevance. Since the qualitative research approach is chosen for this study, the primary data was acquired via an interview with three informants of electric vehicles companies, the case study for the research. All the data collected through virtual interview sessions were kept confidential and used for research purposes only. Further, secondary data of past investigations were also drawn upon to corroborate this finding. Results The data were analysed thematically, and all the data had been used in order to make non-biased inferences.

This research was conducted to study the challenges and solutions faced by electric vehicle users in Malaysia by identifying several factors that influence these challenges and solutions. In this chapter, the background of the respondents will be explained in the first part, then in the second part, to investigate challenges that can affected electric vehicle users in Malaysia, then for the third part, to evaluate how electric vehicles overcome the challenges in Malaysia and finally, to identify the importance of electric vehicles for the Malaysian environment, people and economy for the fourth part.

4.2 Informant Profile

People who provide important information, views and data related to the community, culture or personal experience are the meaning of informants in the context of research (Fadilah, 2019). Informants are important subjects in the domain of qualitative research because they are included in linguistics and sociology, which requires understanding customs, social behaviour or language use directly from the public. Providing background on informants and their views in this research can connect the researcher with the topic of study. Usually, informants are selected according to their background, expertise, or position in a particular group or environment. The researcher conducted several interviews with 3 informants to obtain the information sought by the researcher. They are important individuals in their organizations because they are directly involved in selling their product, namely selling electric vehicles.

The first informant is Azril Bin Aswad. He is a former sales advisor for Proton vehicles. He wants to work for an electric vehicle company because he is interested in electric vehicle technology and electric vehicles themselves. He is currently working under GAC Motor in Seremban as a sales advisor because this company sells electric vehicles such as the Aion. His job is to ensure that customers who visit GAC Motor in Seremban understand their needs related to vehicles, he will do his best to attract customers to the company's products. He has memorized and understood the information about electric vehicles in the company so that it is easy to communicate with customers. The cheerful expression and happy attitude are an approach of Mr. Azril to ensure that every customer gets an experience that they have never had anywhere else. He is also confident that one day electric vehicles will be a giant vehicle that can defeat engine vehicles because he is confident that now is the time to think about the future of the environment.

The second respondent is Nabawi Yasin. He is 37 years old. He currently lives in the Melaka area. His education level is a diploma. He has only been working at BYD in Melaka for four days. He is a sales advisor for BYD company. He has extensive knowledge in the field of electric vehicles. He can understand the problems customers often face with electric vehicles. Additionally, he urges his clients to opt for electric cars since they are better for the environment because they don't produce carbon emissions like cars with engines. Furthermore, compared to vehicles with engines, electric vehicles have more sophisticated technology.

Third respondent is Muhammad Aiman Bin Muhnis is the third informant who is a researcher of the research. He is 27 years old and lives in Semabok, Melaka. His education began with pursuing a diploma in TESL Foundation at UITM Dengkil and then continued his studies to a degree in TESL Foundation at UITM in Dengkil. He is a sales advisor for the Build Your Dreams (BYD) company in Melaka. A year and a half of experience in selling electric vehicles at BYD is an achievement for him. Mr Aiman not only sells electric vehicles but he also owns a BYD electric vehicle himself, the BYD Dolphin. His curiosity and consideration of the cost of using electric vehicles prompted him to buy an electric vehicle. With experience in driving electric vehicles, it is easier for him to explain in more detail and communicate with customers in a sincere manner. He also encourages his customers to choose electric vehicles because they are more environmentally friendly because they do not emit carbon emissions like other engine-powered vehicles. In addition, the technology in electric vehicles is also more advanced than engine-powered vehicles. And due to his long experience in the electric vehicle industry, I as a researcher obtained the best answers to questions related to electric vehicles because he answered based on his own knowledge.

No	Informant	Age	Level of	Position	Reference	Job Scope Related To
	1.1.1		Education	L · C		EV
1	Azril Aswad	39	Diploma	Sales	R1	Engaging with
				Advisor in		customers to
U	NIVER	SITI	TEKNI	GAC	ALAY	understand their needs
				Motor,		and preferences while
				Seremban		providing detailed
						information about EV
						features, benefits, and
						specifications
2	Nabawi	37	Diploma	Sales	R2	Understand the
	Yassin			Advisor in		problems customers
				BYD		often face with electric
				Company		vehicles
3	Muhammad	27	Degree	Sales	R3	Connect with
	Aiman Bin			Advisor in		customers on a
	Mukhnis					personal level, offering

BYD	honest advice and
Company	sharing his own
	journey with EVs.

Table 4.2: Informant Profile

4.3 Challenges That Can Affected User Electric Vehicle in Malaysia

The term challenge means a thing that is not easy to be attained or overcome. It usually requires great amounts of effort, determination, and often skill to look after it or achieve it (Cambridge Dictionary). Challenges are mainly obstacles or circumstances that test someone's ability and thereby force growth or creative solutions. While electric vehicles are the types of vehicles that run purely or partly on electricity, without conventional internal combustion engines powered by fossil fuels such as petrol or diesel. EVs are equipped with an electric motor and draw their energy from a battery pack that can be charged up by plugging into an external power source.

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4.3.1 Main Challenge face When Using Electric Vehicle

Electric vehicles are a phenomenon that is no stranger to the automotive industry today. The shift from engine-powered vehicles to electric vehicles ensures a carbon-free environment. But everything has its challenges, just like the existence of electric vehicles. Here is a first responder's perspective on the main challenges that electric vehicle users face: "biggest challenge is when the client lives in a multi-story house, meaning it's not a landed house, staying in an apartment or condo, it's a bit difficult because people can't charge at home, so the process of asking for permission to install a charger in the apartment parking lot is a bit difficult because first they have to ask permission from the management of the apartment, so when they need it, they need permission, so it's up to them, sometimes there are Gender Nonconformity GNCs who are open-minded, meaning they allow people to install a charger in the parking lot, and there are also those who don't agree, so that's actually the biggest challenge for people who want to adopt EVs"

There is a difference of opinion with the second respondent because he said that infrastructure is the main challenge, but he also stated that other challenges are time and distance, this is what he stated:

"the main challenge in Malaysia the infra if you see in Kuala Lumpur is quite develop infra but in Melaka not as fast like Kuala Lumpur challenger is actually when they need to travel far meaning that without stopping so the challenger will be the time and also the distance cause of the electric to be charge statically and also so then that's why I mean time and distance is challenger"

For the third respondent, he has the same view as the second respondent, which is distance. But the third respondent's view says that distance is the main challenge faced by electric vehicle users in Malaysia. This is what the third respondent stated:

"the main challenge receive most from customers is the range is not exactly the same company advertise let say range 420 km but they try they get only 200 something that the main challenge actually the only challenge they face actually this thing is influence by the way you drive, just like traditional car the more you press the pedal the more consumption but ev use the same concept but it becomes beneficial when you stay stationary because the power consumption is very low when you using it long range it can give you range let say traditional car, the company advertise like Bezza can drive 300 kilometre but in real range Bezza can reach 200 kilometre but in ev you can get into 380 and 390 kilometre"

15	Range KM	Multi-story House
Respondent 1	~	
Respondent 2		✓
Respondent 3	\checkmark	

Table 4.3.1 Main Challenge face When Using Electric Vehicle

4.3.2 Feedback from Customer About Charging Infrastructure

Feedback can be defined as information or responses provided to behavior, product, or performance to estimate the result, effect improvement, or reinforce outcomes. It might be positive, to indicate what went right and, therefore, should continue, or constructive, showing what went wrong but suggesting how to improve in a way that is not wholly negative. Sometimes feedback is negative, focusing on what went wrong, though it is most effective when it comes with solutions. It can also be formal, as in structured assessments, or informal, as shared spontaneously in daily interactions. The main purpose of feedback is to encourage improvement, reinforce strengths, foster communication, and promote accountability (Theodora Stanciu, 2023).

While charging station is a place or device designed for the replenishment of batteries of electric-powered equipment or vehicles. The most common association of these, however, is with electric vehicles that take power from the station to supply the vehicle's battery and, consequently, enable the vehicle to run. They are important in promoting the use of renewable energy and transitioning from fossil fuels to electric mobility.

For the first respondent, the answer the researcher got was not satisfactory because he only stated about charging stations, not user feedback on charging stations, but he stated that each electric vehicle company has its own application. This is what the researcher got from the first respondent:

" for now most of their concern is that they have different providers so they have to what use different apps for example Gentari, Gentari has an app let's charger let's charge have apps what electron has apps so there are let me say there are 10 providers it means there have to be 10 apps and also when every time he wants someone to check what to check the nearest charging station, he has to try several apps to get the one that is closest to him, okay so they one between what people say what it is a mix match with what with what the use of clients with a mix match with the infrastructure industry"

For the second respondent, he gave a fairly satisfactory opinion because he answered the researcher's questions and he also stated the challenges faced by users when using charging stations, this is what the second respondent stated:

"So far so okay but actually the unit of the infrastructure is lacking every year will be significant additional EV registered so if infrastructure the same is gonna be a challenge, most customer mostly need to wait and to que for this charging station that be a challenge"

The third respondent gave a good view of user feedback on the charging station because the respondent's answers satisfied the researcher. The third respondent said:

"So far i never receive any complain for charging station ability because charging stations currently in everywhere you charging station is everywhere we also for provide portable charger let say you stay at homestay kampung you can use the portable charger"

	Have Comment	No comment
Respondent 1		LATSIA WE
Respondent 2		\checkmark
Respondent 3		\checkmark

Table 4.3.2 Feedback from Customer About Charging Infrastructure

4.3.3 Accessible Electric Vehicle Charging Station

The term accessible refers to something that is easily reached, used, or understood; it may refer to physical spaces, digital environments, services, and information. Accessibility is about enabling all people, including those with disabilities, to participate fully in something. For example, physical accessibility would include ramps and elevators that make buildings more accessible for people with mobility issues. Accessibility in digital contexts means that websites and apps would be available to all users, from visually and hearing-impaired, by making their content screen readercompatible, providing captioned videos, among other modifications (Nur Ayeesha Qisteena Muzir, et al, 2022).

Service accessibility focuses on the availability of services to all, making sure that accommodations are extended to people with disabilities. Information accessibility ensures that content is presented in ways that can be understood by everyone, such as using simple language or offering audio descriptions. The first respondent gave the view that access to charging stations is only subject to certain places such as malls, RnR and so on. Therefore, the respondent expressed his view on the challenges of charging stations. This is what the first respondent stated:

"Now, as I said, most of the charging stations, charging infrastructure that is in the market is more like the ones in the malls, petrol stations in RNR, so what else is there and other than that, if you don't have a landed property, it's a bit difficult because you have to depend on it, it's not like you want to go to the mall every two days, you want to go to R&R every two days, so what is not that user friendly, because what is there, adoption will be an issue because our infrastructure right now is still not complete"

Next, for the second respondent, he gave a good opinion to the researcher. The second respondent said:

"Malim jaya should be no problem if you see the app, you can see the plug share there are a few charging stations in Malim so accessibility should be no problem like i say the que time because the number of infra is not sufficient enough"

The third respondent also had the same view as the second respondent because electric vehicle charging stations are easily accessible. Here is the third respondent's answer:

"In my area of Melaka, the charging numbers in this area are quite high."

15	Easy to access	Difficult to access
Respondent 1		✓
Respondent 2	✓	
Respondent 3	~	

Fable 4.3.3	3 Accessible	Electric	Vehicle	Charging	Station
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4.3.4 Charging Speed Available and Improvement

The charging speed can be assumed to be the speed at which energy flows into an electrical device or vehicle's battery during a charging session and is generally expressed in watts or kilowatts. It specifies how long the recharging of a specific battery would take and may be based on various issues such as type of charger, size of battery, or charging technology. The charging speed of EVs will also be determined by the power output of the charger itself, which ranges from the fastest Direct Current (DC) fast chargers-to the slowest, such as Level 1, usually a standard home charger.

Large-format batteries take longer to fill but support higher charging speeds, while smaller ones can charge quicker, although they have limits to how much power they can accept. There are different levels of charging, such as Level 1, Level 2, and DC fast charging, with different speeds; the fastest is DC fast charging. It will also depend on the battery management system and the state of charge because it will slow down as it approaches full capacity in order to preserve its health.

While improvement involves the development of something to turn it into something better, usually done over time through enhancement in quality, performance, or condition. It involves identifying aspects where change needs to be affected, working toward realizing desirable results, and refining processes, skills, or systems. The concept of improvement can be realized in personal development, work performances, or developing a product or service. It involves continuous learning, the inclusion of new information or change in circumstances, problem-solving to overcome any obstacles, and innovation to introduce more efficient methods. The first respondent gave a detailed view on the charging speed but he did not include any answers for suggestions to further improve the charging speed itself. The respondent said:

"Okay, before we talk about charging speed, you actually have to understand where EVs come from, they have different castes, they have their own castes, so let's say, for example, a high caste, like BMW and so on, people use what technology, they use 800 kWh, where they can charge maybe 10 to 80% of 10% to 80% in just 20 minutes, but they have to match it with the fastest speed that people can achieve, but they have to match it with the charging facility because for example, there is what, let's say, if you want to charge 10 to 80 percent, for example, the Xpeng car can charge 10 to 80 in 20 minutes, but that one, if only if it gets fast charging that can charge as fast as 280 kilowatts, it has its own station, but most stations now won't provide up to 280 kilowatts because they only usually provide facilities of 80 kilowatts or 100 kilowatts, so even though the car can, what car can Even though the high class can go from 10 to 80 in 20 minutes, it is difficult to find facilities that allow them to charge that fast, but mostly for the lower class, the middle class, for example, what is E-mas Proton, E-mas, Neta, BYD, and so on, what facilities do they use, what technology infrastructure, 400 kilo kwh, so they can go, usually they will go either 80 or 100 kw, so that one will need 20 to 30 minutes to charge from 30 to 80%, so like I said, when we involve charging time, we have to change our habits, where if we fill up, it is normal for vehicles that use petrol to fill up when they are empty, when they are empty, we only fill up when we are empty, but if it is like this for EVs, we need to take advantage of it, for example, when we go to eat, when we go to the toilet, when we go doing something, we charge while we are doing it."

For the second respondent, the answers the researcher received were quite satisfactory because the respondent answered well and gave suggestions to the researcher's questions. This is what the respondent stated: "Charging speed depends on the charger itself where there is DC or AC and depends on charging box and also depends on Kilowatt battery of capacity, like i say if 60 kilowatt it will be 6 Hours or 8 Hours, and my suggestion for this make it faster"

For the third respondent, the researcher only got an answer regarding the charging speed level but he did not mention any improvements. This is what the respondent said:

"How long the current charging speed everybody in your area please suggest your opinion for the improvement okey charging speed current in this place just only 120 kwh if let say you charger the BYD Seal it only takes 15 minutes to fill up to 50% which is around 300 km"

According to three informants interviewed, the following map depicts charging speed available and improvement



Figure 4.3.4 Charging Speed Available and Improvement

4.3.5 Primary Factors Contributing to The High Prices of Electric Vehicle

A primary factor is the most important or influential element in causing a certain outcome, process, or result (Power Thesaurus). This means the central component with the greatest impact on any situation and a key determinant in which way or whether something would work. Primary factors are the driving forces, so to say, or the main causes for events or phenomena. For example, in business, it may be the product quality, the market demand, or the leadership that determines success. In health, it may be one's diet, lifestyle, or their genes.

While Price is defined as the cost or monetary value of a certain commodity, asset, or service which is unaffordable or highly above the average or higher range which the commodities are expected to reach (Economics Online). The perception of a high price is also dependent upon the financial situation of the buyer, market conditions, the quality of the product, and other cultural or regional standards. Prices can be steep due to the use of premium materials, advanced technology, superior craftsmanship, or exclusivity based on limited availability and high demand. Established brands may have higher prices because of perceived reliability or prestige. Moreover, market factors such as inflation, increase in the cost of production, or value addition in the form of features and benefits can lead to increased pricing.

The first respondent was of the view that the reason why imported electric vehicles have such a high price is because imported electric vehicles do not have subsidies from the government. Initially, the respondent suggested to the government that the policy for bringing electric vehicles should be changed and should not exceed the set price. This is what the first respondent stated:

"Okay, for the high price of EVs, of course, number one, I'll say that the government has a policy where EV vehicles brought in cannot be worth more than RM100 000. The first and second thing is, can't we compare the price in Malaysia with the price outside? For example, some people say, "Why is it cheaper in China? They have TVs because they are people. People have to take it. You know, the EV industry in China is subsidized. It's subsidized by the government. That's why people have what they have. People have a selling price. People can sell it for maybe RM60,000 or RM70,000. But when they enter another country, oh people have what they have, that advantage is gone" As for the second respondent, he thought that imported electric vehicles were not too expensive, and he even compared them with local electric vehicles, explaining why local electric vehicles are much cheaper than imported electric vehicles such as BYD. The second respondent said:

"Is not that high 120 thousand is it high, for me not high you cannot compare ev Malaysia like EMas with BYD, is totally different because BYD is imported vehicle, they to pay some tax like duty tax and so on but EMas does not to pay that because they have been subsidies by government"

The third respondent also had the same opinion because imported electric vehicles are affecting the high price value in Malaysia. Here is what he said:

"first of all, ev price influence cosmos of the Completely Built-Up (CBU) unit so government has a located that all CBU car must price above 100,000that why ev is not that cheap in Malaysia the price of ev determined by the battery itself the battery is like 30 to 40 percent of price"

According to three informants interviewed, the following map depicts the factors contributing to the high Prices of electric vehicle

Primary Factors Contributing to The High Prices of Electric Vehicle Vehicle Import don't get subsidies from government

Figure 4.3.5 Primary Factors Contributing to The High Prices of Electric Vehicle

4.3.6 Forecast the Market Price of Electric Vehicle in the 5 until 10 Years?

A forecast is a prediction or estimation of future events, trends, or conditions based on an analysis of current data, patterns, and historical information. It is widely used across various fields to help individuals, organizations, and governments make informed decisions by anticipating what is likely to happen (Jeff Schmidt, 2024). For example, weather forecasts predict atmospheric conditions such as temperature and precipitation to help in planning daily activities or managing risks. Business forecasting estimates the level of future sales, market trends, or financial performance to aid decision-making. Economic forecasting estimates the value of leading indicators like inflation or GDP growth and helps policy planners and investors. Similarly, supply chain forecasting estimates demand and supply to optimally produce goods and maintain inventory levels.

The first respondent is of the view that when in 5 to 10 years, the market for electric vehicles has strong competition because local electric vehicles have started to be produced, other imported electric vehicles that are unable to compete with local products will exit the electric vehicle market in Malaysia. This is the view of the first respondent:

"Now, actually, when the market is now open, it is also entered by Proton and also, and in the future, Perodua will also enter, so when this market is entered by our own brand, the local brand made by Proton and Perodua, it will encourage faster development because what I said, what I said, there was an article that said that after a few years, there will be only a few companies that will maintain in Malaysia, the rest that cannot compete with other competitors will leave Malaysia, but when we EVs are entered by Proton and Perodua, people know that there are companies here to stay because they are Malaysian companies, so it is impossible for this company to go bankrupt, so people will be more confident and more comfortable, and more people will say, open up to what you want, what you want to change for EV users"

The second respondent said that the price of electric vehicles in Malaysia will increase as a result of the increase in electric vehicles being imported, taxes imposed, etc. This is what he said:

"The selling price of electric vehicles in Malaysia will fluctuate wildly over the next five to ten years, or longer, for a variety of reasons: changing market dynamics, local production initiatives, and government policies. Tax exemptions for imported completely built-up EVs until the end of 2025 and full import duty exemptions for locally assembled EVs until December 2027 are among the incentives put in place by the Malaysian government to attract more EVs onto the roads. These incentives are meant to make EVs more affordable; when they eventually expire, manufacturers might change their pricing strategy once they localise assembly to stay competitive"

Similar to the second respondent, the third respondent said that he predicted that prices for electric vehicles would increase in the future, here is what he said:

"i think the market will grow rapidly getting more see the benefit of ev"

According to three informants interviewed, the following map depicts the forecast the market price of electric vehicle



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4.4 User Electric Vehicle Overcome the Challenges in Malaysia

To overcome is to deal with and defeat a challenge, obstacle, or dire situation. It is about fighting against adverse conditions, seeking solutions, and finally emerging triumphant against hardships or incapability. Overcoming often requires resilience, determination, and strategic problem-solving in order to achieve a positive outcome (Sascha P. Klein, et al, 2024).

4.4.1 Solution to Improve Charging Infrastructure

The first respondent suggested that if there were investors who dared to open their own charging stations, it would further increase the number of charging stations in Malaysia. This is what he stated:

"for the infrastructure in Malaysia, what is it so far, what is it still limited to, like I said, malls and petrol stations, so it's limited to that unless we have a, maybe there's an investor who's braver, maybe he'll open it like a petrol station because he knows, because we know that if people use EVs, when they want to charge, it will take at least 20 to 30 minutes, so maybe if there's a company that's a more brave investor, so other than doing it near petrol stations, maybe he'll open it like a petrol station himself, or maybe he'll open a cafe while people are charging, people can take a break in his cafe to eat, drink and relax."

As for the second respondent, he believes that the government should provide subsidies to charging station manufacturers to ease the burden of costs borne by owners. This is what he stated:

"Government have to pay role and need to subsides first for charging station" For the third respondent, he also had the same opinion as the second respondent because he said that the government needs to play a leading role in something. He said that adding more plug charging stations in any place is the solution to increase charging stations. The third respondent said:

"Currently to improve charging station government to pay attention to be more productive to plug charging station in public for example myself currently i supply charging it call wall box i i am supplying electric like university campus hospital this thing i done my part to contribute to improve charging station"

15	Investor	Government
Respondent 1	✓	
Respondent 2		~
Respondent 3		✓

Table 4.4.1 Solution to Improve Charging Infrastructure

4.4.2 Alternative (Partnership or Community-Based) to Develop Charging Station

An alternative is an option or choice available in place of another. It represents another way to achieve something, to solve a problem, or to deal with some situation. Alternatives are considered when the first option cannot be used, is unsuitable, or is less desirable. They afford relaxation and allow decisions to be made from a number of possibilities

While, A partnership is a formal agreement or collaboration of at least two parties that agree to work together for the purpose of achieving a common objective. A partnership comes about by mutual interests, sharing resources, and the melding of objectives and can be in various forms: business, education, community projects (Chanchai Aggarwai, 2024).

Businesswise, a partnership means combining the skills and capital of two or more individuals or organizations, operating a business, and distributing the profits or losses among the partners. Depending on the level of participation and responsibility invested by each partner, it can be a general partnership, limited partnership, or joint venture in nature. However, they are not confined to just business alone; examples are schools and nonprofits that partner further to enhance education or governments partnering to work out challenges affecting the world.

And community-based refers to initiatives, programs, or activities that are designed, implemented, and centred around the needs, resources, and participation of a particular community. These approaches emphasize local involvement in ensuring the people who are directly affected by an issue are at the core of dealing with it. Community-based efforts foster the empowerment of people and groups by enhancing collaboration, utilizing local knowledge, and elaborating sustainable and culturally appropriate solutions (Daan den Hollander, 2023).

The first respondent had the opinion that community based should joint venture with house management if they live in a house like an apartment. This is what he stated:

"Okay, right now, are there certain service providers that are creating a business model where they can partner with the community, which is for example, like I said, apartments are hard to install, charging points in their parking lots, but what GMD can do is let me say that they have a lot of EV residents, so what they can do is they are creating a joint venture with service providers to install EVs, charging points near parking lots, so when they do it there, they will have profit sharing. So there are certain companies that do have a business model, where is General Motors Company (GMC)? Can they join the management committee? Can they contact people and go and do a joint venture to open charging stations in parking lots, sharing parking lots, and from my results of use, for example, when residents charge near there, they will have profit sharing with the company. So, just what is this model? Not many people know, so maybe the government or these companies need to spread more information about this"

The view of the second respondent is that if the community has the money to invest in a charging station, they can invest in it. This is what he stated:

"If community have money just go it, the corporate and community must invest together to develop more infra"

The third respondent had a different view, as he said that partnerships need to play a role in adding more charging stations in Malaysia. The third respondent issued a statement: "partnership because everything needs collaboration between two side especially you need talk with investor to the install charging box like office hospital and public place"

	Community	Partnership
15		
Respondent 1	~	
Respondent 2	\checkmark	
Respondent 3		~

Table 4.4.2 Alternative (Partnership or Community-Based) to Develop Charging Station

4.4.3 Incentive from Government

The general incentive is usually a reward, benefit, or motivating factor, which is offered to induce specific behaviours, actions, or desired results. An incentive may come in tangible forms of monetary rewards with bonus or discounts or intangible forms like recognition, appreciation, or opportunities for growth. Incentives are commonly grouped into monetary incentives, which include financial benefits; nonmonetary incentives, such as extra vacation days or public recognition; intrinsic incentives, driven by personal satisfaction or alignment with personal values; and extrinsic incentives, motivated by external rewards or pressures (Lynn M, et al, 2024).

The first respondent gave the opinion that the government has incentives such as tax exemptions for a certain period of time. Next, he said that if the government gives the existing fuel subsidy to electric vehicle users by giving subsidies for the use of electricity, it will save more money spent by the government. The respondent said:

"Okay actually from my point of view, the government actually needs to be more open to adding more incentives because right now they have incentives for, for example, road tax, road tax, everyone gets an exemption only in 2026, meaning 2027, so maybe they will have to pay, okay, but for me, the government needs to look at it from another angle, where is everything, let's say if they say they can encourage people to use EVs by giving certain incentives, so what if they actually indirectly reduce people who use oil, so they will save money in terms of petrol subsidies, for example, let's say now, like they say now around the spend about 8 billion per year for what is this oil subsidy, let's say if they say 20% of the population adopts EVs, that means they can save money there too, I said, let's say we take direct, direct, what is the calculation, 20% of that 8 billion, they will save 1.6 billion a year, right, so the government needs to look at it from that angle, even though, for example, they say road tax, they might pay RM200 a year, so from What did he save? He got the road tax revenue of RM200 a year. He got better. He got to save in terms of fuel subsidies. So the first thing is, maybe he can extend the road tax exemption for another 4 or 5 years. And so that is one thing. Number two is, maybe he can give subsidies for electricity bills to EV users "

The second respondent also had the same opinion as the first respondent. The incentive given by the government is tax exemption. This is what he said:

"The Malaysian government has introduced several incentives to encourage the adoption of electric vehicles, as outlined in the country's National Energy Transition Roadmap. The incentives available range from tax relief to exemption initiatives like the RM2,500 per annum relief in income tax on expenses related to the charging of EVs until 2027 and full import and excise duty exemptions for CBU EVs up to December 31, 2025. Locally assembled EV components are similarly exempted up to December 31, 2027. In addition, EV owners are given road tax exemptions from 2022 until the end of 2025, at the end of which a drastically reduced tax rate will be applied. For electric motorcycles, a maximum tax rebate of RM2,400 is allowed for those earning less than RM120,000 per year. Besides, manufacturers of energy-efficient vehicles enjoy considerable incentives in income tax exemption and investment allowance. Incentives in the form of taxes are also given by the government to companies that invest in green technology services, such as EV charging stations."

For the third respondent, he said that by providing incentives it can influence the price of electric vehicles in Malaysia. The respondent said:

"Government incentives can influence the market price of electric vehicles. Right now, the government is offering free tax and no excise duty for EV cars. So, the government has incentives. It will create more interest among people in Malaysia to try EVs"

According to three informants interviewed, the following map depicts the incentive from government



Figure 4.4.3 Incentive from Government

4.5 Importance of Electric Vehicle for Malaysian Environment, People and Economy

Importance is a thing that denotes value, significance, or relevance based on its impact, role, or contribution to a situation, decision, or outcome. It reflects the level of being essential or critical for something to achieve objectives, solve problems, or fulfil needs. The importance of an object, action, or idea is often determined by its influence, benefits, or consequences (Christopher Finn McQuaid, et al, 2025).

While, the environment refers to the ambient conditions, elements, and factors that affect and interact with living organisms. It encompasses everything that affects life, including physical, biological, social, and cultural aspects. The environment can be broadly categorized into two types: the natural environment, comprising air, water, soil, plants, animals, and ecosystems, and the built environment, comprising human-made structures such as buildings, roads, and urban areas (Fon Nestar, 2020).

And people can be understood as human beings considered in an aggregative manner. In a more comprehensive view, people are persons with a common feature defining them by region, culture, or undertaking towards the attainment of an objective. People form the building blocks of societies and civilizations that help create and define progress socially, economically, culturally, and technologically. Also, the economy is a system of production, distribution, and consumption of goods and services concerned with a community or region. It includes all of the activities and institutions associated with the production of goods and services; income and employment generation; and the creation of demand for goods and services to satisfy human needs and wants. Economic activity involves interplay between households, producers, government, and markets and is influenced by resources, technology, policies, and international conditions (Reserve Bank of Australia).

4.5.1 Electric Vehicle Better Environmental Compare Traditional Vehicle

A traditional vehicle is any transportation powered by an internal combustion engine with conventional fuels such as gasoline or diesel. They have been the predominant mode of transportation for over a century and are powered by the burning of fossil fuel to produce energy, which moves the engine and, in turn, the vehicle (Adnan Khurshid, et al, 2023).

The first respondent believes that electric vehicles are environmentally friendly. He also believes that most of the electricity in Malaysia comes from non-renewable energy, so he suggests that the government increase solar energy in Malaysia to save costs in producing electricity. Here is his opinion:

"for ev what is the use of this on paper yes it is a will be more environmental friendly because it is okay it does not have carbon emissions in Malaysia but we also have to look at what for example in what in most countries it has its own source of electricity the source of electricity itself is what people say what source of electricity in Malaysia if I am not mistaken only 20% of the electricity near Malaysia is from renewable energy for example from is from solar from what dams and so on only 20% meaning even let say if i say i use electricity for aa to charge i have an ev car but 80% of the electricity comes from non-renewable sources so from that point of view it beats the purpose it still it does not have carbon emissions but the carbon emission happens in some else it will be in electric generators that we will burn coal or that use diesel and so on so what from that point of view the government has to what to develop renewable energy in line with the use of ev aa if it says it increases the use of ev but at the same time if it does not develop the use of renewable energy it will create one another problem which is that we will face a shortage of electric supply so If so, he has to, he has to, in line with the meaning, if so that, for example, let's say solar has what, solar has the industry expanding and what if we get more energy from solar, then we will balance it back with the use of electricity."

The second respondent also had the same opinion as the first respondent, stating that electric cars are better for the environment and he also stated that traditional cars produce carbon emissions. In addition, he also stated that electric car batteries can be recycled. This is what the second respondent stated:

"Yes, because traditional car more carbon emission and the battery of EV will recycle after 5 or 6 years later"

The third respondent also answered the same as the other respondents, namely that electric vehicles are better environmentally, he also stated a comparison of electric vehicles with traditional vehicles. He said:

"if you compare with traditional car ev is completely environmental friendly i will say not hundred percent let say the moment when you process the fuel until you are using the car both producing condition but ev yes the people are argue the manufacturing the battery will make pollution in greeting the of product will not to do this any position so it will not 100% even the pollution but with made let say if you staying it one palace of ev and one place with the whole place are using traditional car of course ev will make the environment cleaner"

4.5.2 Perceptions of Electric Vehicle toward Comfort, Convenience and Safety

Perception can be defined as the process by which individuals attribute meaning to information obtained from the environment through their senses. It involves the use of senses such as sight, hearing, touch, taste, and smell in the acquisition of information, which the brain then interprets and organizes into meaningful experiences (Rahul Jain PMP, 2021).

While comfort can be explained as a state of being, having physical, mental, or emotional ease, and well-being with the absence of any pain, stress, or discomfort. Comfort is a feeling of relaxation, safety, and gratification, mostly related to suitable conditions, environments, or experiences (Elena Alyavina, et al, 2020)

And convenience is the state of ease, efficiency, or suitability in performing something to satisfy one's needs with less effort, time, or trouble. It involves comfort and practicality, thus giving more access to activities or processes and making them easier. Convenience, in most instances, is a major factor considered in decision-making because people generally like to save time and avoid hassle (George Wilson, et al, 2024).

Also, safety is when one feels safe and is not hurt, harmed, or otherwise damaged. It has several components, including a process by which a protective environment, system, or practice that does not pose a risk and secures the well-being of individuals, groups, or communities is provided. Safety is an aspect of living that ensures the protection of all perspectives in life, whether physical, emotional, or psychological (INSPQ, 2018).

The first respondent only answered about the comfort of electric vehicles, but he also mentioned convenience and safety. The respondent said:

" in terms of comfort for now of course this ev uses a difference okay the difference between ev and vehicles that use petrol is the limitation in terms of battery usage okay for example let me give for example let me give this ev it has a big battery so part of the battery used for the drive is used for air conditioning what is it used for other systems by those used for sound system can be used for various entertainment system and so on but the limitation faced by cars that use petrol is an the battery is small meaning the battery is only the front battery so to use advanced systems for example is there an ADAS system and auto driving and so on an what will make the use of this battery not last long ha that is the advantage of EV so when it has no limitations from the use of electricity then the car can be equipped with more advanced and more luxurious features for example aa with a sound system it has what radar system it has what detection system it has a driving system so with what people say what large battery capacity it can it no longer have it no longer has it is limited to only using the battery for the radio use the battery for what for wipers for lights and etc. because he no longer has any, he is not limited, so from that point of view, what he wants is that he will get better facilities."

As for the second respondent, he only gave the answer "safety", here is the excerpt that the researcher got:

"Safe of not safe depends on that car because every car must do the NCAP, which is crash test, the features of ev are proven because not many cases that ev car blow-out"

The third respondent's view is that all the elements of comfort, convenience and safety are present in electric vehicles. This is what he said:

"since ev does not have engine so it does not have vibration and annoying songs and everything so in term of comfort it is very comfortable okey so convenience of course to me traditional car \Box convenient but if you can tackle the problem actually ev is more convenience that for example if you are using daily using traditional you need to go to petrol pump then you can fuel up but for ev you can charge at your home but for the safety since ev doesn't engine transmission and everything they can focus the impact wherever they want so they can distribute impact and everything compare to traditional car they need to avoid the engine a voice the transmission and everything"

4.5.3 Electrifying Transportation can Provide Economic Benefits

Benefits are those positive outcomes or gains realized through a particular action, decision, product, service, or situation. It is defined as favourable results or improvements in any area of life which help better a person's or a group's condition for increased well-being, success, or satisfaction. Benefits can either be material or non-material in nature, including physical rewards, monetary rewards, emotional comfort, and personal growth (Abid Haleem, et al, 2022).

The first respondent believes that electric vehicles will create benefits in terms of job opportunities. This is what he stated:

" Okay, when this electric industry is developed in Malaysia, of course number one, it will create more job opportunities and this thing will also change us to provide jobs that are more technology-based, meaning it needs more people who are qualified in terms of electricity, engineering and so on, so it will create high value jobs because if it's like now, for example, if people say that using a vehicle engine and when using this engine, we go to a workshop anywhere, let's say that if that person doesn't have higher education, he just finished SPM, he can just go and work in a workshop and gain experience and become a mechanic without any qualification, but for example, for you to service this EV car, at least you know what to have knowledge on the technical knowledge, you need to have strong technical knowledge, where can people say just by experience, you need to have other basic skills, because for example, this technology will change quickly, so if you say that you don't have basic skills, you can't keep up with the changes in technology, where can the use of cars be? It's been a long time since this engine was said that the technology is mature, where can he learn to repair engines and other engines? If he has learned to repair one engine, he can repair other engines too, so it's not the same as an EV. Once you know an EV, you need to know about the electronic parts and so on, so of course in terms of the economy, which will create high value jobs."

As for the second respondent, he emphasized the advantage of electric vehicles being able to save costs in terms of wear and tear of spare parts. The respondent said:

"Sure, less than 50% of ev can save rather than traditional car cause ev don't have wear and tear part like traditional car."

The third respondent also shared the same views as the second respondent regarding the advantages of electric vehicles, namely that they can save costs. This is what the respondent stated:

"I think absolute yes because ev is give you less hassle less maintenance and less money to use for the consumption so of course ev can contribute for example rapid kl is now using electric even for Melaka using they are using electric bus like Panorama because it is more economical."

4.6 Summary

This research looks at the challenges and solutions for electric vehicles (EVs) in Malaysia and their impact on the environment, people, and economy. It uses interviews with EV industry workers and data from other studies to explore these issues. A major problem is the lack of charging stations, especially for people living in apartments, where installing chargers is difficult. Many users also experience range anxiety because EVs often don't deliver the driving range they promise. There are too few charging stations, which leads to long waiting times, and users struggle with the need to use multiple apps to locate chargers.

To solve these issues, more charging stations need to be built, with help from private investors and government support. Partnerships between communities and investors can make chargers more accessible in residential areas. High EV prices are another problem, mainly due to taxes and expensive batteries. However, local EV brands like Proton and Perodua entering the market could make EVs more affordable in the future.

EVs are better for the environment because they don't produce emissions like traditional cars. However, since most electricity in Malaysia comes from non-renewable sources, the government needs to increase renewable energy use to maximize environmental benefits. EVs also offer quieter rides, advanced features, and better safety, making them more comfortable and convenient than traditional cars. Government incentives, such as tax breaks and subsidies, are encouraging EV adoption, but more support, like cheaper electricity for EV users, is needed. In summary, EVs

have many benefits for Malaysia, including a cleaner environment, lower vehicle maintenance costs, and job creation in high-tech industries. However, challenges like limited charging stations, high prices, and reliance on non-renewable energy need to be addressed through better policies, partnerships, and community involvement.



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CHAPTER 5

CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter highlights the study's summary findings, significant implications, discusses its limitations, and presents recommendations for future research and practical applications. The research objectives outlined in this study were successfully achieved, and the research questions were effectively addressed through the respondents' feedback. The objectives involved obtaining insights from respondents on three objectives: to investigate challenges can affected user electric vehicles in Malaysia, to evaluate user electric vehicles overcome the challenges in Malaysia and to identify importance of electric vehicles for Malaysian environment, economy and people. The respondents provided valuable perspectives that contributed significantly to achieving this aims of study.

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5.2 Summary Findings

The research investigates Malaysia's electric vehicle (EV) problems and solutions as well as the effects they have on the country's economy, society, and environment. It investigates these issues using data from other studies and interviews with employees of the EV industry. The absence of charging stations is a big issue, particularly for flat dwellers where installing chargers can be challenging. Because EVs frequently fall short of their promised driving range, many users also suffer from range anxiety. Long wait times result from the scarcity of charging stations, and users find it difficult to find chargers without using multiple apps.
More charging stations must be constructed in order to address these problems, with assistance from the government and private investors. Access to chargers in residential areas can be improved through collaborations between investors and communities. Another issue with EVs is their high cost, which is mostly caused by taxes and costly batteries. However, the entry of area EV brands like Perodua and Proton into the market will probably reduce the cost of EVs.

Since EVs do not produce as many pollutants as conventional cars, they are more environmentally friendly. To optimise environmental benefits, the government must promote the use of renewable energy sources, as the majority of Malaysia's electricity arrives from non-renewable sources. Compared to conventional cars, EVs are more comfortable and convenient because they have better safety, more sophisticated features, and quieter rides. Government subsidies and tax breaks are promoting the use of EVs, but more assistance is required, such as lower electricity costs for EV users.

5.2.1 Conclusion RO1

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From Research Objective 1 (RO1) highlights that challenges and opportunities of using electric vehicles (EVs) in Malaysia. One major issue is the lack of charging stations, especially for people living in apartments or condos where installing chargers requires management approval. Charging stations are mostly found in cities and malls, making access harder for those in smaller towns. Many EV users also experience "range anxiety," as their vehicles often don't travel as far as advertised. Users also face difficulties with the charging network, as they need multiple apps to find stations, and there are often long queues at the available stations.

Charging stations are not always easy to access, and faster charging options like DC chargers are still limited. Improving technology and building more charging stations across the country can help reduce waiting times and make EVs more convenient. Another problem is the high cost of EVs. Imported EVs are expensive because of taxes and a lack of government subsidies, while local brands like Proton and Perodua are cheaper due to government support. Batteries, which account for 30–40% of the vehicle's cost, also make EVs more expensive. In the future, local production could lower prices, but changes in government incentives and an increase in imports might cause prices to rise again.

Despite these challenges, EVs have many benefits. They are better for the environment because they don't produce emissions like traditional cars, although Malaysia's reliance on non-renewable energy for electricity reduces some of these benefits. EVs also cost less to maintain, create jobs in high-tech industries, and help reduce dependence on fossil fuels. According to three respondents, to make EVs more popular, Malaysia needs to expand charging infrastructure, lower prices, and increase the use of renewable energy.

5.2.2 Conclusion RO2

From Research Objective 2 (RO2) define solutions for electric vehicle users in Malaysia. Based on respondent 1, one solution is to encourage private businesses to invest in charging stations, such as creating setups like petrol stations or cafes where users can charge their vehicles while relaxing. The government also needs to provide support by offering subsidies to make it easier for businesses to build charging infrastructure. Based on respondent 2, increasing the number of charging points in public places like universities, hospitals, and offices was also suggested to make charging more accessible.

Community involvement and partnerships can help improve the situation further. For example, EV service providers can work with apartment managers to install shared chargers in parking lots, with both parties benefiting from profit-sharing agreements. Communities with resources can also invest in charging stations, and businesses can collaborate with them to share costs. Partnerships with investors can help add chargers to high-traffic areas like offices and public spaces, making charging more convenient for everyone.

Respondent 2 provide an extensive perspective or ways that the government plays a key role by providing incentives to encourage EV adoption. Current benefits include tax exemptions on EV imports and road taxes until 2025, and similar benefits for locally assembled EV components until 2027. Suggestions for more support include extending the road tax exemption and offering discounts on electricity bills for EV users. Incentives for companies investing in green technologies, like EV charging stations, can also boost progress.

In summary, solving EV challenges in Malaysia requires a mix of private investment, community support, and stronger government incentives. These steps will improve charging access, encourage partnerships, and make EV ownership easier, helping the country transition to more sustainable transportation.

5.2.3 Conclusion RO3

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From Research Objective 3 (RO3) determine the importance of electric vehicles for Malaysia's environment, economy, and people. The value or significance of an item or action is determined by how well it contributes to the success of goals. The environment includes both man-made structures and natural components like ecosystems and air. Humans are seen as the basic elements of society, advancing social, technological, and economic advancement. A community's system of producing, distributing, and consuming goods and services is referred to as its economy.

All of the respondents concur that EVs are environmentally friendly than conventional cars because they produce fewer carbon emissions. However, based on respondent 1, with only 20% coming from renewable sources, Malaysia's dependence on non-renewable energy sources for electricity generation raises concerns. This

demonstrates that in order to optimise the environmental advantages of EVs, more funding must be allocated to renewable energy. Additionally, respondents highlighted out that EV batteries can be recycled, but conventional cars produce carbon emissions.

Respondents three stated that EVs provide benefits like more smooth rides because of fewer vibrations and the ability to charge at home in terms of comfort, convenience, and safety. The first respondent emphasised that EVs can accommodate cutting-edge features without strongly reducing battery life. While the third respondent underlined that EVs' design improves impact distribution, the second respondent noted that safety is dependent on vehicle design and crash test results.

Lastly, the advantages of electrifying transport from a financial angle were discussed. The expansion of the electric vehicle sector may result in high-paying positions requiring highly skilled technical abilities, according to respondents. Because EVs have fewer moving parts than conventional cars, they also have lower maintenance costs. Overall, even though electric vehicles have many benefits, their full potential must be realised by addressing important issues with infrastructure and energy sources.

5.3.1 Managerial Level

5.3 Contribution of study

This study provides valuable insights into the challenges and solutions faced by electric vehicle (EV) users in Malaysia, contributing to our understanding of EV adoption in developing countries. It explores key issues such as the lack of charging infrastructure, range limitations, and the high costs associated with EVs. By focusing on Malaysia, this research highlights how unique social, economic, and infrastructural conditions in emerging markets influence the adoption and use of EVs, which adds a new perspective to existing studies that are often centred on developed nations. The research also incorporates feedback from EV users, offering a deeper understanding of their concerns and behaviors, such as the inconvenience of limited charging stations and difficulties in accessing renewable energy sources. Furthermore, the study draws attention to regional differences in EV accessibility, comparing urban areas like Kuala Lumpur, which have better infrastructure, with smaller regions like Melaka, where infrastructure is less developed. This analysis provides a framework for understanding how regional disparities can affect EV adoption and presents an opportunity for further comparative studies in other developing nations.

5.3.2 Policy Maker

This research also offers practical recommendations for improving the adoption of EVs in Malaysia. For policymakers, the findings highlight the importance of providing targeted support, such as government subsidies for charging stations, promoting the use of renewable energy, and extending tax exemptions to encourage EV adoption. These measures can help reduce the financial burden on EV users and accelerate the growth of the EV industry. The study also emphasizes the need for collaboration between the private sector and local communities. For example, businesses can invest in setting up standalone charging stations in strategic locations such as malls or rest stops and integrate customer-friendly features like cafes or waiting lounges to enhance the user experience. Additionally, manufacturers can address user concerns by improving EV range accuracy, developing faster charging technologies, and offering portable chargers for more convenience.

The research also identifies the potential of the EV industry to create new economic opportunities by generating high-value, technology-based jobs. It emphasizes the need for training programs to build a skilled workforce capable of supporting the technical requirements of EV manufacturing and maintenance. Moreover, the study

suggests that local governments should focus on regional development by prioritizing underserved areas for infrastructure improvements, ensuring that EV adoption benefits are distributed more evenly across the country. Finally, the research highlights the long-term economic benefits of transitioning to EVs, such as reduced maintenance costs for users and the possibility of integrating electric public transportation, which could make transportation more affordable and environmentally friendly for everyone

5.4 Limitation of study

This study has several limitations that should be acknowledged to provide a clearer understanding of its scope and potential constraints. Firstly, the research is based on data collected from only three informants, which limits the generalizability of the findings. While the insights gained from these individuals are valuable, they may not fully represent the diverse experiences and challenges faced by electric vehicle (EV) users across Malaysia. The small sample size restricts the ability to draw broad conclusions about the issues explored in the study.

Additionally, the geographical focus of the study is quite narrow, with the informants primarily located in regions such as Melaka and Seremban. As a result, the findings may not reflect the unique challenges faced by EV users in other parts of the country, particularly in areas with different levels of infrastructure development or consumer behaviours. This geographical limitation could reduce the applicability of the results to a national scale.

Additionally, the study uses a qualitative research methodology, which is useful for offering deep complicated insights but lacks the quantitative data required for broad generalizations. This method makes it more difficult to evaluate the frequency or statistical importance of the problems and solutions that have been identified. Additionally, the data collected is based on self-reported information from interviews,

which could be biased by social desirability, personal biases, or beliefs. The findings' accuracy and dependability may be impacted by this reliance on subjective replies.

Another important limitation is the study's focus on sales advisors' perspectives, without including input from other key stakeholders such as policymakers, infrastructure developers, or a broader group of EV users. This limited scope may not capture the full range of challenges or solutions within the EV ecosystem. Including perspectives from these other stakeholders could provide a more comprehensive understanding of the issues and allow for a more balanced analysis.

Lastly, the findings' long-term applicability is limited by the electric vehicle industry's fast evolution. As technology continues to progress and governmental regulations change, some of the issues and solutions covered in the report might become dated rather rapidly. This emphasizes the necessity of ongoing study to stay up with the dynamic EV market and the infrastructure that surrounds it.

5.5 Recommendation for future study

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Future research may focus on a number of important issues to help Malaysia's electric vehicle (EV) market expand. First, it's critical to upgrade the EV charging infrastructure, particularly in small towns. Research can look into how communities, businesses, and the government can collaborate to create charging stations that are more easily accessible and effective. Investigating the effectiveness of government incentives, such as tax breaks and subsidies, in motivating people to purchase EVs is another crucial field. These studies might also recommend measures to encourage domestic manufacturing and lower the cost of EVs.

Determining the reasons behind the opposition of certain individuals to convert to electric vehicles requires an understanding of consumer behaviour. Studies can also look into how education initiatives can increase public knowledge of the advantages of EVs. Furthermore, research on EVs' environmental effects can be used to calculate their total environmental impact, particularly in context of Malaysia's electrical supply. It would also be beneficial to investigate renewable energy sources for EV powering.

Research into improving EV technology, such as better batteries and faster charging options, can help make EVs cheaper and more practical. From an economic perspective, studies can look at how the growth of the EV industry can create jobs, improve skills, and save costs for users compared to traditional cars. Forecasting the future of Malaysia's EV market and comparing it with neighbouring countries can help with planning and competition.

Finally, research can address user concerns about EVs, such as comfort, safety, and convenience, to make them more appealing. By focusing on these areas, future studies can help Malaysia transition to a cleaner and more efficient transportation

5.6 Summary

system.

This research successfully explored the challenges faced by electric vehicle (EV) users in Malaysia, identified solutions to these challenges, and highlighted the benefits of EVs for the country. Key problems include a lack of charging stations, especially in apartments, range anxiety due to EVs not meeting their promised driving range, high costs caused by expensive batteries, and difficulty accessing charging stations because of long queues and multiple apps needed. To solve these issues, the study suggests building more charging stations with help from both the government and private investors, encouraging partnerships to improve charger access, promoting local EV production to lower costs, and offering better government incentives like tax cuts and electricity discounts.

The study also shows why EVs are important for Malaysia. They are better for the environment as they produce less pollution, though this benefit depends on increasing the use of renewable energy. Economically, EVs can create high-tech jobs and save money on maintenance. They also provide a more comfortable, safer, and quieter driving experience. The research adds to our understanding of how EVs can work in developing countries like Malaysia, offering practical advice to improve EV adoption.

However, the study has some limitations. It relied on a small number of participants and focused on specific areas, so the results might not represent the whole country. It also used interviews, which can have personal biases, and EV technology is changing quickly, which could make some findings outdated.

Future research could focus on building better charging infrastructure, studying government incentives, improving EV technology like batteries and charging speed, and finding ways to use more renewable energy for EVs. By addressing these issues, Malaysia can make EVs more accessible and help the country move toward cleaner, more efficient transportation.



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APPENDICES

73 Appendix 1: Gantt Chart for PSM 1

WEEK	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Briefing PSM 1															
Topic Confirmation & Discussion with Supervisor	2.				L.	($\cdot \epsilon$		9		9.	9			
Chapter 1: Introduction Objective, Problem Statement, Scope of study Correction			Л					S E M E	ЛĒ		Δ	K.		-	
Chapter 2: Literature Review Article, Website, Journal, and Book Review								T E							
Correction								R							
Chapter 3: Methodology Flow Chart of Project Process Data Analysis & Data Collection Procedure								BR							
Correction								A							
Preparation & Submission of Proposal								K							
Amendment of Proposal															
PSM 1 Report Drafting Preparation for Proposal Presentation Submission															
Presentation PSM 1															

Gantt Chart for PSM 2



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APPENDICES

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UNIVERSITIT FINTERVIEW TRANSCRIPTION A MELAKA INTERVIEW ONE

Interviewer: Muhammad Syazani Adly Bin Rosly (Degree student at Universiti Teknikal Malaysia Melaka)

Interviewee: Azril Aswad

Time: 4.00 P.M.

Date:26/11/2024



MSAR: I do like to express my gratitude for giving me the chance to conduct this interview. My name is Muhammad Syazani Adly Bin Rosly, and I'm interviewing you solely for research purposes. The purpose of this study is to investigate challenges that can affect user electric vehicles in Malaysia, to evaluate user electric vehicles overcome the challenges in Malaysia and to identify the importance of electric vehicles for Malaysian environment, economy and people.

I do appreciate the opportunity to record our conversation to maintain precision. This recording will solely serve the purpose of aiding me in composing my report on the study's findings, and it will be securely stored. The only other person with access to the transcript is the study's supervisor: lecturer Universiti Teknikal Malaysia Melaka, DR. Diana Rose Binti Faizal. As soon as the report is completed, the recording will be destroyed.

I do like to emphasize that your participation in this study is completely voluntary. Our current conversation is held in strict confidence, and your identity will not be included in any reports or documents emerging from this research. Furthermore, if you have any questions or concerns, please don't hesitate to ask through email or WhatsApp text.

MSAR: Can you please help me by providing details about your demographics consisting your personal details i.e. age, gender, education and other relevant information?				
Age	33			
Gender	Male			
Educational background	Diploma			
Years of working in GAC Motor, Seremban	<1yr			
Position in GAC Motor, Seremban	Sales Advisor			
How is your job scope related to Electric Vehicle Industry?	Engaging with customers to understand their needs and preferences while providing detailed information about EV features, benefits, and specifications			

NMSARRSITI TEKNIKAL MALAYSIA MELAKA

Can you describe the main challenges your customers face when using electric vehicles in Malaysia?

Okay, for EVs now, the biggest challenge is when the client lives in a multi-story house, meaning it's not a landed house, staying in an apartment or condo, it's a bit difficult because people can't charge at home, so the process of asking for permission to install a charger in the apartment parking lot is a bit difficult because first they have to ask permission from the management of the apartment, so when they need it, they need permission, so it's up to them, sometimes there are GNCs who are open-minded, meaning they allow people to install a charger in the parking lot, and there are also those who don't agree, so that's actually the biggest challenge for people who want to adopt EVs. 87

What feedback do you commonly receive from customers about charging infrastructure availability?

for now most of their concern is that they have different providers so they have to what use different apps for example Gentari, Gentari has an app let's charger let's charge have apps what electron has apps so there are let me say there are 10 providers it means there have to be 10 apps and also when every time he wants someone to check what to check the nearest charging station, he has to try several apps to get the one that is closest to him, okay so they one between what people say what it is a mix match with what with what the use of clients with a mix match with the infrastructure infrastructure industry



How accessible are EV charging stations for users in your area?

Now, as I said, most of the charging stations, charging infrastructure that is in the market is more like the ones in the malls, petrol stations in RNR, so what else is there and other than that, if you don't have a landed property, it's a bit difficult because you have to depend on it, it's not like you want to go to the mall every two days, you want to go to R&R every two days, so what is not that user friendly, because what is there, adoption will be an issue because our infrastructure right now is still not complete

MSAR:

How long the current charging speed available in your area? Please suggest your opinion for the improvement?

Okay, before we talk about charging speed, you actually have to understand where EVs come from, they have different castes, they have their own castes, so let's say, for example, a high caste, like BMW and so on, people use what technology, they use 800 kWh, where they can charge maybe 10 to 80% of 10% to 80% in just 20 minutes, but they have to match it with the fastest speed that people can achieve, but they have to match it with the charging facility because for example, there is what, let's say, if you want to charge 10 to 80 percent, for example, the Xpeng car can charge 10 to 80 in 20 minutes, but that one, if only if it gets fast charging that can charge as fast as 280 kilowatts, it has its own station, but most stations now won't provide up to 280 kilowatts because they only usually provide facilities of 80 kilowatts or 100 kilowatts, so even though the car can, what car can Even though the high class can go from 10 to 80 in 20 minutes, it is difficult to find facilities that allow them to charge that fast, but mostly for the lower class, the middle class, for example, what is E-mas Proton, E-mas, Neta, BYD, and so on, what facilities do they use, what technology infrastructure, 400 kilo kwh, so they can go, usually they will go either 80 or 100 kw, so that one will need 20 to 30 minutes to charge from 30 to 80%, so like I said, when we involve charging time, we have to change our habits, where if we fill up, it is normal for vehicles that 89

use petrol to fill up when they are empty, when they are empty, we only fill up when we are empty, but if it is like this for EVs, we need to take advantage of it, for example, when we go to eat, when we go to the toilet, when we go doing something, we charge while we are doing it.



What do you think are the primary factors contributing to the high prices of EVs in Malaysia?

Okay, for the high price of EVs, of course, number one, I'll say that the government has a policy where EV vehicles brought in cannot be worth more than RM100 000. The first and second thing is, can't we compare the price in Malaysia with the price outside? For example, some people say, "Why is it cheaper in China? They have TVs because they are people. People have to take it. You know, the EV industry in China is subsidized. It's subsidized by the government. That's why people have what they have. People have a selling price. People can sell it for maybe RM60,000 or RM70,000. But when they enter another country, oh people have what they have, that advantage is gone."

MSAR:

How do you foresee the market price of EVs changing in the next 5-10 years

Now, actually, when the market is now open, it is also entered by Proton and also, and in the future, Perodua will also enter, so when this market is entered by our own brand, the local brand made by Proton and Perodua, it will encourage faster development because what I said, what I said, there was an article that said that after a few years, there will be only a few companies that will maintain in Malaysia, the rest that cannot compete with other competitors will leave Malaysia, but when we EVs are entered by Proton and Perodua, people know that there are companies here to stay because they are Malaysian companies, so it is impossible for this company to go bankrupt, so people will be more confident and more comfortable, and more people will say, open up to what you want, what you want to change for EV users.

MSAR:

What are the solutions to improve charging infrastructure for electric vehicles in Malaysia?

for the infrastructure in Malaysia, what is it so far, what is it still limited to, like I said, malls and petrol stations, so it's limited to that unless we have a, maybe there's an investor who's braver, maybe he'll open it like a petrol station because he knows, because we know that if people use EVs, when they want to charge, it will take at least 20 to 30 minutes, so maybe if there's a company that's a more brave investor, so other than doing it near petrol stations, maybe he'll open it like a petrol station himself, or maybe he'll open a cafe while people are charging, people can take a break in his cafe to eat, drink and relax.

What is the other alternative (partnerships or community-based) to develop more charging station?

Okay, right now, are there certain service providers that are creating a business model where they can partner with the community, which is for example, like I said, apartments are hard to install, charging points in their parking lots, but what GMD can do is let me say that they have a lot of EV residents, so what they can do is they are creating a joint venture with service providers to install EVs, charging points near parking lots, so when they do it there, they will have profit sharing. So there are certain companies that do have a business model, where is GMC? Can they join the management committee? Can they contact people and go and do a joint venture to open charging stations in parking lots, sharing parking lots, and from my results of use, for example, when residents charge near there, they will have profit sharing with the company. So, just what is this model? Not many people know, so maybe the government or these companies need to spread more information about this.



Have government has offer the incentives? In what ways can government incentives influence the market price of electric vehicles?

Okay actually from my point of view, the government actually needs to be more open to adding more incentives because right now they have incentives for, for example, road tax, road tax, everyone gets an exemption only in 2026, meaning 2027, so maybe they will have to pay, okay, but for me, the government needs to look at it from another angle, where is everything, let's say if they say they can encourage people to use EVs by giving certain incentives, so what if they actually indirectly reduce people who use oil, so they will save money in terms of petrol subsidies, for example, let's say now, like they say now around the spend about 8 billion per year for what is this oil subsidy, let's say if they say we take direct, direct, what is the calculation, 20% of that 8 billion, they will save 1.6 billion a year, right, so the government needs to look at it from that angle, even though, for example, they say road tax, they might pay RM200 a year, so from What did he save? He got the road tax revenue of RM200 a year. He got better. He got to save in terms of fuel subsidies. So the first thing is, maybe he can extend the road tax exemption for another 4 or 5 years. And so that is one thing. Number two is, maybe he can give subsidies for electricity bills to EV users

MSAR:

Are EVs a better environmental option compare to traditional vehicle? If yes, please list what are the factors contribution?

for ev what is the use of this on paper yes it is a will be more environmental friendly because it is okay it does not have carbon emissions in Malaysia but we also have to look at what for example in what in most countries it has its own source of electricity the source of electricity itself is what people say what source of electricity in Malaysia if I am not mistaken only 20% of the electricity near Malaysia is from renewable energy for example from is from solar from what dams and so on only 20% meaning even let say if i say i use electricity for aa to charge i have an ev car but 80% of the electricity comes from non-renewable sources so from that point of view it beats the purpose it still it does not have carbon emissions but the carbon emission happens in some else it will be in electric generators that we will burn coal or that use diesel and so on so what from that point of view the government has to what to develop renewable energy in line with the use of ev as if it says it increases the use of ev but at the same time if it does not develop the use of renewable energy it will create one another problem which is that we will face a shortage of electric supply so If so, he has to, he has to, in line with the meaning, if so that, for example, let's say solar has what, solar has the industry expanding and what if we get more energy from solar, then we will balance it back with the use of electricity

MSAR:

What are your perceptions of EV toward the comfort, convenience and safety of EVs to users?

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in terms of comfort for now of course this ev uses a difference okay the difference between ev and vehicles that use petrol is the limitation in terms of battery usage okay for example let me give for example let me give this ev it has a big battery so part of the battery used for the drive is used for air conditioning what is it used for other systems by those used for sound system can be used for various entertainment system and so on but the limitation faced by cars that use petrol is aa the battery is small meaning the battery is only the front battery so to use advanced systems for example is there an ADAS system aa auto driving and so on aa what will make the use of this battery not last long ha that is the advantage of EV so when it has no limitations from the use of electricity then the car can be equipped with more advanced and more luxurious features for example aa with a sound system it has what radar system it has what detection system it has a driving system so with what people say what large battery capacity it can it no longer have it no longer has it is limited to only using the battery for the radio use the battery for what for wipers for lights and etc. because he no longer has any, he is not limited, so from that point of view, what he wants is that he will get better facilities.

MSAR:

Do you think that Electrifying Transportation can provide economic benefits?

Okay, when this electric industry is developed in Malaysia, of course number one, it will create more job opportunities and this thing will also change us to provide jobs that are more technology-based, meaning it needs more people who are qualified in terms of electricity, engineering and so on, so it will create high value jobs because if it's like now, for example, if people say that using a vehicle engine and when using this engine, we go to a workshop anywhere, let's say that if that person doesn't have higher education, he just finished SPM, he can just go and work in a workshop and gain experience and become a mechanic without any qualification, but for example, for you to service this EV car, at least you know what to have knowledge on the technical knowledge, you need to have strong technical knowledge, where can people say just by experience, you need to have other basic skills, because for example, this technology will change quickly, so if you say that you don't have basic skills, you can't keep up with the changes in technology, where can the use of cars be? It's been a long time since this engine was said that the technology is mature, where can he learn to repair engines and other engines? If he has learned to repair one engine, he can repair other engines too, so it's not the same as an EV. Once you know an EV, you need to know about the electronic parts and so on, so of course in terms of the economy, which will create high value jobs.

Thank you so much for your kind cooperation and valuable time.

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THE CHALLENGES AND SOLUTIONS FOR USER ELECTRIC VEHICLE (EV) IN MALAYSIA

INTERVIEW TRANSCRIPTION INTERVIEW TWO

Interviewer: Muhammad Syazani Adly Bin Rosly (Degree student at Universiti Teknikal Malaysia Melaka)

Interviewee: Nabawai Yassin

Time: 4.00 P.M

Date:19/12/2024

UNIVERSITI TEKNIKAL MALAYSIA MELAKA Place: BYD Melaka

Acronyms: MSAR, Muhammad Syazani Adly Bin Rosly

MSAR: I do like to express my gratitude for giving me the chance to conduct this interview. My name is Muhammad Syazani Adly Bin Rosly, and I'm interviewing you solely for research purposes. The purpose of this study is to investigate challenges that can affect user electric vehicles in Malaysia, to evaluate user electric vehicles overcome the challenges in Malaysia and to identify the importance of electric vehicles for Malaysian environment, economy and people.

I do appreciate the opportunity to record our conversation to maintain precision. This recording will solely serve the purpose of aiding me in composing my report on the study's findings, and it will be securely stored. The only other person with access to the transcript is the study's supervisor: lecturer Universiti Teknikal Malaysia Melaka, DR. Diana Rose Binti Faizal. As soon as the report is completed, the recording will be destroyed.

I do like to emphasize that your participation in this study is completely voluntary. Our current conversation is held in strict confidence, and your identity will not be included in any reports or documents emerging from this research. Furthermore, if you have any questions or concerns, please don't hesitate to ask through email or WhatsApp text.

MSAR: Can you please help me by providing details about your demographics consisting your personal details i.e. age, gender, education and other relevant information?				
Age	37			
Gender	Male			
Educational background	Diploma			
Years of working in BYD Melaka	<lyr< td=""></lyr<>			
Position in BYD Melaka	Sales Advisor			
How is your job scope related to Electric Vehicle Industry?	Understand the problems customers often face with electric vehicles			

Can you describe the main challenges your customers face when using electric vehicles in Malaysia? the main challenge in malaysia the infra lah if you see in kuala lumpur is quite develop infra but in melaka not as fast like kuala lumpur challenger is actually when they need to travel far

meaning that without stopping lah so the challenger will be the time and also the distance cause of the electric to be charge statically and also so then that's why itulah i mean time and distance is challenger

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What feedback do you commonly receive from customers about charging infrastructure availability?

So far so okay but actually the unit of the infrastructure is lacking every year will be significant additional EV registered so if infrastructure the same is gonna be a challenge, most customer mostly need to wait and to que for this charging station that be a challenge





What do you think are the primary factors contributing to the high prices of EVs in Malaysia?

is not that high 120 thousand is it high, for me not high you cannot compare ev Malaysia like EMas with BYD, is totally different because BYD is imported vehicle, they to pay some tax like duty tax and so on but EMas does not to pay that because they have been subsidies by government

MSAR:

How do you foresee the market price of EVs changing in the next 5-10 years

The selling price of electric vehicles in Malaysia will fluctuate wildly over the next five to ten years, or longer, for a variety of reasons: changing market dynamics, local production initiatives, and government policies. Tax exemptions for imported completely built-up EVs until the end of 2025 and full import duty exemptions for locally assembled EVs until December 2027 are among the incentives put in place by the Malaysian government to attract more EVs onto the roads. These incentives are meant to make EVs more affordable; when they eventually expire, manufacturers might change their pricing strategy once they localise assembly to stay competitive.

MSAR:

What are the solutions to improve charging infrastructure for electric vehicles in Malaysia?

government have to pay role and need to subsides first for charging station

What is the other alternative (partnerships or community-based) to develop more charging station?

if community have money just go it, the corporate and community must invest together to develop more infra



Have government has offer the incentives? In what ways can government incentives influence the market price of electric vehicles?

The Malaysian government has introduced several incentives to encourage the adoption of electric vehicles, as outlined in the country's National Energy Transition Roadmap. The incentives available range from tax relief to exemption initiatives like the RM2,500 per annum relief in income tax on expenses related to the charging of EVs until 2027 and full import and excise duty exemptions for CBU EVs up to December 31, 2025. Locally assembled EV components are similarly exempted up to December 31, 2027. In addition, EV owners are given road tax exemptions from 2022 until the end of 2025, at the end of which a drastically reduced tax rate will be applied. For electric motorcycles, a maximum tax rebate of RM2,400 is allowed for those earning less than RM120,000 per year. Besides, manufacturers of energy-efficient vehicles enjoy considerable incentives in income tax exemption and investment allowance. Incentives in the form of taxes are also given by the government to companies that invest in green technology services, such as EV charging stations.

MSAR:

Are EVs a better environmental option compare to traditional vehicle? If yes, please list what are the factors contribution?

yes because traditional car more carbon emission and the battery of EV will recycle after 5 or 6 years later

MSAR:

What are your perceptions of EV toward the comfort, convenience and safety of EVs to users?

Safe of not safe depends on that car because every car must do the NCAP, which is crash test, the features of ev are proven because not many cases that ev car blow out

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Do you think that Electrifying Transportation can provide economic benefits?

Sure, less than 50% of ev can save rather than traditional car cause ev don't have wear and tear part like traditional car.

Thank you so much for your kind cooperation and valuable time.




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THE UTILIZATION OF ARTIFICIAL INTELLIGENCE (AI) IN ONLINE ADVERTISING AND ITS PERCEIVED EFFECTIVENESS

INTERVIEW TRANSCRIPTION INTERVIEW THREE

UNIVERSITI TEKNIKAL MALAYSIA MELAKA

Interviewer: Muhammad Syazani Adly Bin Rosly (Degree student at Universiti Teknikal Malaysia Melaka)

Interviewee: Muhammad Aiman Mukhnis

Time: 5.00 P.M.

Date: 19/12/2024

Place: BYD Melaka

Acronyms: MSAR, Muhammad Syazani Adly Bin Rosly

MSAR: I do like to express my gratitude for giving me the chance to conduct this interview. My name is Muhammad Syazani Adly Bin Rosly, and I'm interviewing you solely for research purposes. The purpose of this study is to investigate challenges that can affect user electric vehicles in Malaysia, to evaluate user electric vehicles overcome the challenges in Malaysia and to identify the importance of electric vehicles for Malaysian environment, economy and people.

I do appreciate the opportunity to record our conversation to maintain precision. This recording will solely serve the purpose of aiding me in composing my report on the study's findings, and it will be securely stored. The only other person with access to the transcript is the study's supervisor: lecturer Universiti Teknikal Malaysia Melaka, DR. Diana Rose Binti Faizal. As soon as the report is completed, the recording will be destroyed.

I do like to emphasize that your participation in this study is completely voluntary. Our current conversation is held in strict confidence, and your identity will not be included in any reports or documents emerging from this research. Furthermore, if you have any questions or concerns, please don't hesitate to ask through email or WhatsApp text.

MSAR: Can you please help me by providing details about your demographics consisting your personal details i.e. age, gender, education and other relevant information?	
Age	27
Gender	Male
Educational background	Degree
Years of working in BYD Melaka	1 and half year
Position in BYD Melaka	Brand & Marketing Manger
How is your job scope related to Electric Vehicle Industry?	Connect with customers on a personal level, offering honest advice and sharing his own journey with EVs.

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MSAR:

Can you describe the main challenges your customers face when using electric vehicles in Malaysia?

the main challenge receive most from customers is the range is not exactly the same company advertise let say range 420 km but they try they get only 200 something that the main challenge actually the only challenge they face actually this thing is influence by the way you drive , just like traditional car the more you press the pedal the more consumption but eve use the same concept but it becomes beneficial when you stay stationary because the power consumption is very low when you using it long range it can give you range let say traditional car, the company advertise like Bezza can drive 300 kilometre but in real range Bezza can reach 200 kilometre but in ev you can get into 380 and 390 kilometre What feedback do you commonly receive from customers about charging infrastructure availability?

so far i never receive any complain for charging station ability because charging stations currently in everywhere you charging station is everywhere we also for provide portable charger let say you stay at homestay kampung you can use the portable charger

MSAR: How accessible are EV charging stations for users in your area?

In my area of Melaka, the charging numbers in this area are quite high.

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MSAR:

How long the current charging speed available in your area? Please suggest your opinion for the improvement?

okey charging speed current in this place just only 120 kwh if let say you charger the BYD Seal it only takes langsung 15 minutes to fill up to 50% which is around 300 km

MSAR:

What do you think are the primary factors contributing to the high prices of EVs in Malaysia?

first of all, ev price influence cosmos of the CBU unit so government has a located that all CBU car must price above 100,000that why ev is not that cheap in Malaysia the price of ev determined by the battery itself the battery is like 30 to 40 percent of price

MSAR:

How do you foresee the market price of EVs changing in the next 5–10 years

i think the market will grow rapidly getting more see the benefit of ev

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What are the solutions to improve charging infrastructure for electric vehicles in Malaysia?

currently to improve charging station government to pay attention to be more productive to plug charging station in public for example myself currently i supply charging it call wall box i i am supplying electric like university campus hospital this thing i done my part to contribute to improve charging station

What is the other alternative (partnerships or community-based) to develop more charging station?

partnership because everything needs collaboration between two side especially you need talk with investor to the install charging box like office hospital and public place



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Have government has offer the incentives? In what ways can government incentives influence the market price of electric vehicles?

Government incentives can influence the market price of electric vehicles. Right now, the government is offering free tax and no excise duty for EV cars. So, the government has incentives. It will create more interest among people in Malaysia to try EVs.

MSAR:

Are EVs a better environmental option compare to traditional vehicle? If yes, please list what are the factors contribution?

if you compare with traditional car ev is completely environmental friendly i will say not hundred percent let say the moment when you process the fuel until you are using the car both producing condition but ev yes the people are argue the manufacturing the battery will make pollution in greeting the of product will not to do this any position so it will not 100% even the pollution but with made let say if you staying it one palace of ev and one place with the whole place are using traditional car of course ev will make the environment cleaner

NI<mark>MSAR:</mark>SITI TEKNIKAL MALAYSIA MELAKA

What are your perceptions of EV toward the comfort, convenience and safety of EVs to users?

since ev does not have engine so it does not have vibration and annoying songs and everything so in term of comfort it is very comfortable okey so convenience of course to me traditional car \mathfrak{z} convenient but if you can tackle the problem actually ev is more convenience that for example if you are using daily using traditional you need to go to petrol pump then you can fuel up but for ev you can charge at your home but for the safety since ev doesn't engine transmission and everything they can focus the impact wherever they want so they can distribute impact and everything compare to traditional car they need to avoid the engine a voice the transmission and everything

Do you think that Electrifying Transportation can provide economic benefits?

i think absolute yes because ev is give you less hassle less maintenance and less money to use for the consumption so of course ev can contribute for example rapid kl is now using electric even for melaka using they are using electric bus like Panorama because it is more economical.

Thank you so much for your kind cooperation and valuable time.















