**RESEARCH IN MANAGEMENT OF TECHNOLOGY AND BUSINESS**
e-ISSN: 2773-5044

**RMTB**

Vol. 5 No. 1 (2024) 346-364
https://publisher.uthm.edu.my/periodicals/index.php/rmtb

# The Relationship between Perceived Benefit and Perceived Risk Toward Electric Vehicle (EV) Purchase Intention Among Consumers in Kuala Lumpur

**Kevin Phua Chin An[1], Nor Kamariah Kamaruddin[1]***

[1] *Department of Management & Technology, Faculty of Technology Management and Business, Universiti Tun Hussien Onn Malaysia, 86400 Batu Pahat, Johor, MALAYSIA*

*Corresponding Author: nkamariah@uthm.edu.my
DOI: https://doi.org/10.30880/rmtb.2024.05.01.026

**Article Info**

Received: 31 March 2024
Accepted: 30 April 2024
Available online: 30 June 2024

**Keywords**

Perceived Benefit, Perceived Risk, Electric Vehicle Purchase Intention, Consumers in Kuala Lumpur

**Abstract**

Fossil fuel reliance in energy production worsens climate change due to greenhouse gas emissions. The increased number of conventional vehicle owners leads to higher energy consumption, exacerbating greenhouse gas production and posing energy security and environmental concerns. Electric vehicles (EVs) offer a promising solution to reduce this dependency and combat environmental challenges. Conducting a thorough study is crucial to grasping the factors affecting the purchasing intentions of conventional vehicle users, ensuring the sustainability of electric vehicle (EV) users, and improving EV purchase strategies. The study's objective is to clarify the level of perceived benefit, perceived risk, and electric vehicle (EV) purchase intention, as well as identify the relationship between perceived benefit and perceived risk toward Electric Vehicle (EV) purchase intention among consumers in Kuala Lumpur. The respondents in this study were 399 vehicle license holders in Kuala Lumpur, Malaysia. The response rate was 78.20% and data was collected and analysed using the Statistical Package for Social Science (SPSS). This research used a quantitative approach and an online survey was conducted by using a questionnaire as the research instrument. The Descriptive analysis and Spearman analysis were employed. It signifies a moderate level of perceived benefit and a high level of perceived risk, thus supporting all the hypotheses. Moreover, the findings report findings for this study are likely to reveal a positive relationship between perceived benefits and perceived risks towards electric vehicle (EV) purchase intention. Furthermore, this research can heighten awareness among environmentally conscious individuals, prompting an evaluation and potential adjustment of their transportation preferences. The Malaysian government offers incentives, such as import duty, excise duty, and sales tax exemptions, to encourage electric vehicle (EV) ownership and promote green sustainability.

## 1. Introduction

In recent times, there has been notable growth in the global market for electric vehicles (EVs). This study examines the relationship between perceived benefits and perceived risks influencing the purchase intention of electric vehicles (EVs) among consumers in Kuala Lumpur. The sample comprises consumers in Kuala Lumpur holding vehicle licenses, chosen as they represent a potential group likely to adopt EVs, and their perspectives on environmental sustainability can influence vehicle usage habits. The introduction of electric vehicles (EVs) as environmentally conscious alternatives is anticipated to witness global expansion (Yamada *et al.*, 2018). The recent advancements in vehicle technology and infrastructure have contributed to a promising growth in the purchase of electric vehicles (EVs). Even if readily available and reasonably priced automobile models, as well as a robust charging infrastructure, are prerequisites for electric vehicle (EV) purchase, more is needed to convince consumers to adopt electric vehicles (EVs) completely. While there is a gradual acceptance of electric vehicles (EVs) among consumers in Kuala Lumpur, their adoption remains significantly lower compared to conventional gasoline-powered vehicles. The Malaysian government is aggressively driving electric vehicle (EV) adoption through several measures (Chan, 2021). The government unveiled the Electric Mobility Plan in 2019, which aims to increase the amounts of electric vehicles (EVs) on the road and create a robust charging infrastructure (Chan, 2021). In addition, the government is offering subsidies and tax breaks to encourage the purchase of electric vehicles (EVs). Malaysia is also looking to expand its charging infrastructure, to have 125,000 stations across the country by 2030. Although the infrastructure is currently very outdated, especially in rural areas, this may deter some potential e-vehicle buyers (Kaur, 2023). However, the cost of e-vehicles remains a major deterrent for many buyers.

According to CarSifu, (2018), the purchase of battery electric vehicles (BEVs) in Malaysia is poised to accelerate in 2023 due to increased government incentives and the availability of more cost-effective models. In the updated Budget 2023, the government listed more EV-related benefits, such as excise and import duty exemptions for BEVs. For locally assembled models, these exemptions are valid until December 31, 2025, and for completely built-up (CBU) cars, they are valid until the end of 2023. Parallel initiatives are being carried out to support the electric vehicle (EV) charging infrastructure, to install 10,000 EV charging points by 2025. The cost that is incurred for battery replacement and concerns about battery life may also influence the purchase decision. Another factor affecting the adoption of EVs is the problems that can arise, such as range anxiety or concern that the battery will run down if there is no charging station nearby (Mukherjee & Ryan,2020). Even though electric vehicle (EV) technology has advanced, some buyers are still concerned about the shorter range of e-vehicles compared to gasoline-powered cars (Buhmann & Criado, 2023). According to a study, many Malaysian consumers are still unaware of EVs and their benefits (Liang *et al.*, 2023). The purchase of electric vehicles (EVs) can be accelerated by raising awareness of their benefits, such as lower operating costs, lower emissions, and a more pleasant driving experience, which can help reduce barriers. According to Carley *et al.* (2019), these financial benefits can help buyers look past the higher initial cost of electric vehicles (EVs) and make them more attractive. Overall, although electric vehicle (EV) adoption in Malaysia is gradually increasing, it is still in its infancy.

### 1.1 Introduction Problem Statement

The primary concern revolves around the limited awareness regarding the advantages of electric vehicles (EVs). This may result in a dearth of awareness among the general population regarding the benefits and features of electric vehicles. Even though perceived benefit and perceived risk towards electric vehicle purchase intention generates an enormous amount of attention from scholars and educators across the globe (Kumar and Alok, 2020). In the past decade, publications related to Electric Vehicles (EVs) have gained substantial momentum. The volume of research on electric vehicle (EV) purchases has significantly expanded, increasing from 14 articles in 2011 to 203 in 2021. These articles examine a range of topics connected to the adoption of electric vehicles, including viewpoints, human behaviour, and associated issues (Nguyen *et al.*, 2019). According to P. Li et al, (2022), the purchase rate of electric vehicles (EVs) among consumers, especially in Kuala Lumpur, Malaysia, is relatively low compared to conventional vehicles. This is attributed to a lack of exposure to the benefits of owning an EV, such as cost savings on maintenance and environmental preservation by reducing pollution. Many consumers hold the perception that electric vehicles (EVs) are too expensive to adopt, charging stations are not readily available in their locations, and the cost of replacing electric vehicle (EV) batteries is a significant obstacle, preventing them from researching the advantages of owning an electric vehicle (EV) (Carley *et al.*, 2019).

The second issue is relatively about the cost of ownership for electric vehicles (EVs). Customer acceptance behaviour toward electric-powered vehicles may be swayed by cost and technical considerations (Wang *et al.*, 2018c). Different countries have different regulations and initiatives, which, in addition to the cost and technology-related considerations, have played a significant role in the general public's tempered purchase of electric vehicles (D. Jaiswal *et al.*, 2021). It is essential to consider the benefits, acceptance, and intentions related to electric vehicles, which involve consumer behaviour when making purchasing decisions (Loengbudnark *et al.*, 2022). Consequently, the acquisition of an electric vehicle may entail long-term financial implications for

consumers (Featherman *et al.*, 2021). Conversely, the competitive position of electric vehicles has been impeded by their elevated prices and diminished energy densities (D. Jaiswal *et al.*, 2021). Nonetheless, there is a discernible upswing in the availability of electric vehicle models within the automotive market, evident through numerous manufacturers integrating electrically powered vehicles into their product portfolios. The limited comprehension of the comprehensive cost of owning electric vehicles has the potential to hinder users' intentions to procure them (Simsekoglu &Nayum, 2019).

The study underscored a third issue, shedding light on the environmental consequences arising from emissions of conventional gasoline-powered vehicles, ultimately contributing to pollution. Approximately 25% of the world's total greenhouse gas emissions are attributable to the transportation sector, and by 2030, it is predicted that this percentage will rise from 23% to 50% (IEA, 2021a). With escalating environmental concerns, there is a growing imperative to establish a sustainable ecology, particularly among Kuala Lumpur consumers who represent potential electric vehicle buyers. This underscores the significance of promoting sustainable consumption (Pandey and Mishra, 2022). Consequently, transportation is recognized as a significant barrier to achieving sustainable economies (Linzenich *et al.*, 2019). The Paris Agreement, signed by 196 countries, signifies a collective commitment to undertake diverse measures aimed at restricting global warming to below two degrees relative to preindustrial levels (UNFCCC, 2015). Globally, the rise in the number of private car owners has coincided with significant energy consumption, which has led to an increase in greenhouse gas emissions (Xu *et al.*, 2019) and the emergence of pressing issues about environmental preservation and energy security (Huang & Ge, 2019).

The fourth issue is related to the context of the study, most of the previous studies were conducted in developed countries such as Australia and mostly in European countries (Asadi *et al.*, 2021). According to the OECD, European countries experienced a higher level of market maturity in terms of EV purchases, with established markets and higher penetration rates. Hence, this study seeks to investigate the determinants that impact electric vehicle (EV) purchases in Asian countries focusing on Malaysia since there are still limited studies focusing on the Malaysian context (Asadi *et al.*, 2021). Government regulations, policies, and legal frameworks have significantly influenced consumers' willingness to purchase electric vehicles (EVs) (Babu Narasimhan *et al.* 2019). These factors have contributed to the availability of facilities and benefits that consumers experience, enhancing the convenience of adopting EVs for their transportation needs, and enabling them to travel from one location to another (Panicker *et al.*, 2019).

Therefore, to achieve the research objectives the level of electric vehicle (EV) purchase intention, perceived benefit and perceived risk towards electric vehicle (EV) purchase intention among consumers in Kuala Lumpur are determined. Furthermore, the relationship between perceived benefit and electric vehicle (EV) purchase intention among consumers in Kuala Lumpur also determined. Consequently, the relationship between perceived risk and electric vehicle (EV) purchase intention among consumers in Kuala Lumpur is identified.

## 1.2 Scope of the study

This scope of the study focused on electric vehicle (EV) purchase intention towards consumer behaviour intention among Federal Territory of Kuala Lumpur consumers. It also focused on the financial, environmental benefit, psychological benefit, physical safety risk, financial risk, and performance safety risk factors that influenced electric vehicle (EV) purchase intention. The study focused on the population of registered cars in Kuala Lumpur as its respondents. They are vehicle licensed holders, this particular group was selected as respondents because it is crucial to understand their opinions and intentions to determine whether electric vehicles would be their first choice when adopting a vehicle for transportation purposes.

# 2.0 Literature Review

## 2.1 Definition and Types of Electric Vehicles (EV)

The term "EV" denotes "Electric Vehicle." An electric vehicle serves as a mode of transportation propelled by one or more electric motors, distinguishing itself from traditional internal combustion engines that rely on fossil fuels (Pandey *et al.*, 2021). Electric cars can be categorized into various types based on their energy sources and design. Plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs) are the two most common types among them. PHEVs integrate a rechargeable battery, an electric motor, and an internal combustion engine that can be re-fueled by connecting to an external power source (Jung *et al.*, 2022). Another category is fuel cell electric vehicles (FCEVs), utilizing electricity generated from hydrogen fuel cells. Compared to conventional vehicles, they promise lower greenhouse gas emissions and better air quality, the regulatory framework, government financial incentives, and social and economic factors that influence customer acceptance and market penetration and promote the use of electric vehicles (IAE, 2020). New developments in autonomous driving, vehicle-to-grid connectivity, and the potential impact of electric vehicles on the electric grid could also be discussed. It assists academics and policymakers in comprehending the opportunities, challenges, and potential solutions related to

electric vehicle technology, thus contributing to the development of sustainable mobility and the shift to a low-carbon future (EEA, 2021). Even there is a gradual acceptance of electric vehicles (EVs) among consumers in Kuala Lumpur, Malaysia, their adoption remains significantly lower compared to conventional gasoline-powered vehicles. The Malaysian government is aggressively driving EV adoption through several measures (Chan, 2021). The government unveiled the Electric Mobility Plan in 2019, which aims to increase the amount of EVs on the road and create a robust charging infrastructure (Chan, 2021).

In addition, the government is offering subsidies and tax breaks to encourage the purchase of EVs. Malaysia is also looking to expand its charging infrastructure, to have 125,000 stations across the country by 2030. Although the infrastructure is currently very outdated, especially in rural areas, this may deter some potential e-vehicle buyers (Kaur, 2023). However, the cost of e-vehicles remains a major deterrent for many buyers. The cost that is incurred for battery replacement and concerns about battery life may also influence the purchase decision. Another factor affecting the adoption of EVs is the problems that can arise, such as range anxiety or concern that the battery will run down if there is no charging station nearby (Mukherjee and Ryan, 2020). Even though EV technology has advanced, some buyers are still concerned about the shorter range of e-vehicles compared to gasoline-powered cars (Buhmann & Criado, 2023). According to a study, many Malaysian consumers are still unaware of EVs and their benefits (Liang *et al.*, 2018). The purchase of EVs can be accelerated by raising awareness of their benefits, such as lower operating costs, lower emissions, and a more pleasant driving experience, which can help reduce barriers. Subsidies and tax breaks, as well as government incentives, can significantly influence consumer adoption of EVs. According to Rauh *et al.* (2020), these financial benefits can help buyers look past the higher initial cost of EVs and make them more attractive. Overall, although EV adoption in Malaysia is gradually increasing, it is still in its infancy. Adoption is expected to increase in the future with government incentives, improved charging infrastructure, lower costs of e-vehicles, and greater customer awareness.

## 2.2 Electric Vehicle (EV) Purchase Intention

TAM is commonly known as the Technology Acceptance Model. This model assumes that perceived benefits, purchase costs, and safety concerns have an impact on intention. In addition to purchase intentions, TAM contains another latent construct level, attitudes. According to Featherman *et al.* (2021), consumers choose products based on contradictory beliefs. Thus, instead of grouping conflicting beliefs into attitudinal variables, we can analyse consumers' purchase decisions more precisely. The capital cost or purchase price of Electric Vehicles (EVs) should receive particular attention given the considerable investment involved (Rahmani & Loureiro, 2019). There is also evidence that safety concerns are important factors influencing the purchase of EVs. Consumer awareness and the decline in EV prices are expected to drive higher purchase rates in the future. Aside from fuel economy and ease of maintenance, EVs are also projected to be environmentally friendly (Schouten, 2022). The idea of examining how technologies, particularly renewable energy technologies, are adopted and accepted involves several concepts and ideas. The Theory of Reasoned Action (TRA), formulated by Fishbein and Ajzen in 1975, posits that an individual's behaviour is shaped by their intention to engage in that behaviour, influenced by their attitude and subjective norms. Ajzen's (1991) Theory of Planned Behaviour (TPB), an extension of TRA, elaborates on behavioural intentions, incorporating attitude, subjective norms, and perceived behavioural control. TPB asserts that an individual's belief in their capability to perform a specific action plays a crucial role. The Technology Acceptance Model (TAM), part of a lineage of technology adoption models, was introduced subsequently. In certain respects, the TAM model can be thought of as a forerunner of Rogers' 1962 Diffusion of Innovations (DoI) model. According to Bass (1969), the Riccati differential equations model supports DoI, concentrating more on temporal diffusion properties, which are less relevant for understanding cross-sectional phenomena. According to Lee *et al.* (2011), TAM provides a better snapshot of adoption based on its cross-sectional approach (Lee *et al.*, 2011).

A variation of TAM has been formulated by Venkatesh & Bala (Venkatesh & Bala, 2008) and referred to as the Unified Theory of Technology Adoption and Use (UTAUT), derived from Davis's (1989) TAM. According to TAM, prospective customers make decisions and form views on particular technologies based on their perceptions (Park *et al.*, 2018; Wang *et al.*, 2018). Important psychological factors that affect consumers' attitudes and intentions toward new technology are perceived utility and perceived ease of use An attitude toward a particular technology, in this context, refers to an assessment of it that influences its use intention, or vice versa. Several studies have found that attitudes toward a particular technology and intentions to use it are positively correlated (Park *et al.*, 2018; Perry, 2016; Wang *et al.*, 2018; Yang *et al.*, 2020). Furthermore, Wang *et al.* (2018) demonstrate that attitudes toward the technology are directly correlated with perceived benefits. Based on Featherman *et al.*'s findings (2021), salient beliefs influence attitude, with negative beliefs leading to perceived risks and positive beliefs leading to perceived benefits. Perceived benefits refer to the advantages consumers perceive, while perceived risks refer to the potential drawbacks consumers perceive (Featherman *et al.*, 2021; Yang *et al.*, 2020). Additionally, consumers are more likely to hold a positive opinion of a particular technology if they find it easy to use (Kim & Shin, 2015). In contrast, consumer behaviour decision models rarely take benefits and risks into consideration (Featherman *et al.*, 2021).

This study explores the impact of various theories on individuals' intentions to purchase electric cars (EVs), with a particular emphasis on the Technology Acceptance Model (TAM). TAM provides insights into how potential consumers develop their perceptions and approve of specific technologies (Park *et al.*, 2018; Wang *et al.*, 2018). The adoption of new technology is influenced by two psychological aspects: perceived usefulness and ease of use. Attitude, defined as the judgment of the acceptability or rejection of technology, is described by Wang *et al.* (2018). According to Yang *et al.* (2020), attitudes toward technology show a positive correlation with intentions to use it. Moreover, there is a direct association between perceived utility and attitudes toward the technology (Wang *et al.*, 2018). Significant beliefs, as highlighted by Featherman *et al.* (2021), shape attitude, where positive beliefs result in perceived benefits and negative beliefs lead to perceived risks. Consumers, as indicated in studies by Kim *et al.* (2007, 2018) and Yang *et al.* (2016), typically formulate their perception of value through a comprehensive evaluation of the benefits and risks associated with a product or service.

Essentially, individuals base their decisions on a careful evaluation of the inherent risks and benefits associated with a product or service. This study underscores the importance of thoroughly assessing the value of electric vehicles (EVs), considering both the dimensions of benefits and risks. The research aims to explore how these dimensions influence consumers' willingness to adopt EVs, a process where consumers make trade-offs between the risks and benefits of products, as emphasized by Kim *et al.* (2018). Perceived benefits encompass consumers' confidence in potential positive outcomes, while perceived risks involve concerns about potential adverse outcomes Additionally, when consumers perceive technology as user-friendly, they are more inclined to form a favourable opinion of it. Therefore, consumer behaviour research models should integrate perceived benefits and risks (Featherman *et al.*, 2021). For example, see Fig. 1.

## 2.3 Factors Influence the Electric Vehicle (EV) Purchase Intention

This current study concentrates on two specific factors, namely perceived benefits and perceived risks, that influence electric vehicle (EV) purchase intention, amidst various other contributing factors. Perceived benefits refer to the positive attributes associated with EV ownership, while perceived risks relate to potential drawbacks or concerns. Both factors considerably impact a person's intention to purchase EVs. However, adhering to recommendations (Voinov *et al.*, 2022), this current study narrows its focus to two critical factors—perceived benefits and perceived risks. A detailed discussion of these factors is provided in the subsequent sub-section.

### 2.3.1 Perceived Benefit

As for perceived benefit, it can be viewed from various angles, differentiating between societal and individual benefits. In the context of EVs, the minimal operational costs may be an advantage for users. Because EVs provide superior energy efficiency and, thus, fuel economy. Jena discovered that EV consumers recognize fuel economy as a benefit. Regarding societal benefits, EVs are considered environmentally favourable due to their ability to eschew petroleum consumption and reduce vehicle emissions. (Jena 2020; Yang *et al.* 2020). In response to the reduction in vehicle emissions, air quality, and human health, they were improved (Giresh Kumar *et al.*, 2021). In their study, Costa *et al.*, (2020) verified that EV was associated with mortality reductions related to delicate particulate matter (PM2.5). In addition, because EVs are calmer than gasoline vehicles, their noise emissions are lower (Loengbudnark *et al.*, 2022).

The perceived benefits to the user must be so compelling that they outweigh the perceived disadvantages for the new technology to be commercially successful (Carley *et al.* 2019). The lower operating costs of an EV can bring personal benefits to users. This is due to the excellent fuel economy and energy efficiency of EVs. In addition to having better fuel efficiency, EVs require less maintenance and are cheaper to move (Loengbudnark *et al.*, 2022). In terms of social advantages, EVs are viewed as environmentally friendly because they don't use any petrol, which reduces car emissions. Better air quality and consequently better human health were also the result of reducing emissions from vehicles (Gireesh Kumar *et al.* 2021). As noted by J. Wu et al identified the two most important factors or obstacles to EV diffusion as managerial benefits and the risk of recharging. They also found that perceived values of adoption intent were greatly enhanced by financial incentives and environmental concerns (J. Wu et al, 2019). Consumers carefully consider the perceived benefit of their actions, that is, the relationship between what they receive and what they give, before engaging in an action. The perceived benefit is the optimistic assumptions or beliefs about the outcomes of behaviour (Geronikolos & Potoglou, 2021).

Customers look for practical benefits when buying products with environmentally friendly features (Cudjoe *et al.*, 2020). When given the opportunity, consumers typically favour perceived benefits over the environmental friendliness of a product or service. According to existing research, the perceived benefit has a significant influence on the intention to engage in environmentally friendly behaviour, including purchase behaviour (Liu *et al.*, 2019), purchase intention, and acceptance of electric vehicles. Previous studies have shown that the carbon footprint associated with EV energy use can be greatly reduced or even eliminated when electric vehicles are charged with renewable energy sources such as solar and wind power (Costa *et al.*, 2020). By integrating renewable energy,

electric cars can save gasoline, which in turn supports the transition to a more sustainable energy system (Vargas *et al.*, 2020). Compared to conventional vehicles, EVs have a simpler powertrain. In a conventional vehicle, there are numerous moving components, including pistons, valves, and a sophisticated transmission system (Cecere *et al.*, 2018). These parts require regular maintenance, lubrication, and replacement of standard electric vehicle components including an electric motor, power electronics, and either a single-speed transmission or no transmission at all. By comparison, electric vehicles (EVs) have fewer moving parts. Because of their simplicity, component failures and frequent repairs are less likely, which lowers maintenance costs for electric vehicle (EV) owners (Wicki *et al.*, 2022).

### 2.3.2 Perceived Risk

A major problem is the higher initial cost of an electric vehicle (EV) compared to a conventional car. However, it is critical to consider the total cost of ownership. As fuel and maintenance costs decrease over time, EVs tend to be less expensive (Yang *et al.*, 2018). Tax credits, grants, and subsidies are also offered by governments in many countries to close the price gap and encourage e-vehicle adoption. Economies of scale and technological advancements will narrow the price gap even further. Furthermore, a shortage of charging stations contributes to Malaysia's inadequate EV infrastructure. Currently, Malaysia has only 600 electric vehicle (EV) charging stations (ASEAN BRIEFING, 2022). Early adopters of EVs could consider the limited choice of EV models and variants as problematic. However, as the EV industry grows, automakers are expanding their model line-ups and offering a variety of vehicles to meet different customer needs. Customers now have a wider choice of vehicle sizes, styles, features, and prices as more models become available, which reduces the perceived risk of having few options (Cui *et al.*, 2021).

Financial incentives, such as rebates and tax credits, have a positive impact on customer decision-making by reducing the financial risks associated with EV purchases. In general, the higher initial cost of EVs constitutes a major barrier to adoption (Song & Potoglou, 2020). In addition, knowing and presenting the total cost of ownership, which includes operational savings, can be very important in building consumer confidence and EV purchase intent. The imported vehicles in Malaysia usually have high prices due to high taxes on imports, weak local currency, and a combination of small market size. Tax incentives and financial subsidies are essential in encouraging EV uptake and are viewed positively by potential buyers (Santos & Davies, 2020). Furthermore, a common misconception is that EVs are more dangerous in collisions because of their high-voltage batteries. While it is true that EVs have high voltage systems, they are equipped with numerous safety features to protect their occupants and first responders (Danielis *et al.*, 2020). According to Seebauer *et al.* (2019), Using certified chargers and following proper handling rules further reduces the risk because the fear of explosions in EV batteries is often exaggerated. To reduce the risk of thermal runaway and explosions, lithium-ion batteries used in EVs are equipped with several safety features, including thermal protection and battery management systems. Although rare, battery fires can often be well contained and pose no greater risk than a typical car fire (Song & Potoglou, 2020).

Electric vehicles (EVs) are becoming increasingly popular as an environmentally friendly replacement for conventional internal combustion engine vehicles, but their high initial cost continues to prevent their widespread adoption. The shift toward environmentally friendly transportation has sparked interest in electric automobiles as a practical replacement for conventional gasoline-powered vehicles (Adnan *et al.*, 2018). One major obstacle to the widespread use of electric automobiles, meanwhile, is their expensive starting cost. Electric vehicles require advanced battery technology, and the high cost of batteries significantly increases the overall cost of electric vehicles (EVs) (Cui *et al.*, 2021). The development of electric cars involves significant research and development (R&D) costs. According to Zarazua de Rubens (2019), the cost of electric car development, design, testing, and validation is borne by automakers which proves the high upfront costs are ultimately a result of the early R&D costs incurred in the development of electric vehicles. Electric cars are produced in much smaller volumes than conventional internal combustion engine vehicles (Koty, 2022). Due to the limited economies of scale created by this limited mass production, manufacturing costs are higher which also require additional investment to build a reliable charging network, that possibly reflected in the price of EVs (Wang *et al.*, 2018b).

### 2.3.3 Past Studies on the Relationship between Perceived Benefits and EV Purchase Intention

Based on the study conducted in Australia by consumers on EV purchase intention it is found that perceived benefit has a positive relationship between EV purchase intention (Rietmann & Lieven.,2019). According to previous research, the determinants frequently considered in electric vehicle (EV) purchases include incentives, costs, and the availability of charging infrastructure. Rietmann & Lieven (2019) conducted a comprehensive analysis across 20 countries, examining the impact of policy changes on electric vehicle market shares. Their findings indicated a positive correlation between purchase price, monetary incentives, and the percentage market share for EVs, particularly in countries with higher government incentives. Utilizing a covariance-based structural equation model, their study provided valuable insights into the influence of these factors. Purchase incentives

serve as an effective strategy to stimulate demand for plug-in hybrid electric cars (PHEVs) and hybrid electric vehicles (HEVs). These incentives, which can include tax credits and rebates, have been shown to positively influence consumer purchase intention for electric vehicles, thereby playing a significant role in the promotion of sustainable transportation, according to a meta-analysis of 32 research conducted by Hardman *et al.* (2017). Moreover, Giansoldati *et al.* (2020) noted the importance of convenient access to charging stations for EV adoption.

Consumers in Italy showed positive EV purchase intentions based on perceived benefits, according to a survey conducted in Italy (S. Franz` o et al, 2022). EV purchase is hindered by an absence of charging stations, particularly along highways, along with the challenge of high initial costs, according to an Italian study involving 870 licensed drivers. Similarly, an electric vehicle installation infrastructure that is well-developed would also influence 75% of respondents in the Santos & Davies (2020) survey. An analysis was conducted of 143 questionnaires completed by experts and stakeholders from the UK, Germany, Austria, Spain, and the Netherlands. A parallel study conducted by Bienias *et al.* (2020) in Poland examined the perspectives of recent EV purchasers and found that 35% would only consider purchasing an EV if its cost was comparable to a traditional vehicle. In a recent econometric study, it was determined that consumers' willingness to pay (WTP) is influenced by their family size, location, ability to discern between vehicle classes, and perception of the environmental benefits of electric vehicles. Consequently, a well-functioning charging infrastructure in conjunction with financial incentives shapes the market dynamics significantly.

Hypothesis 1: Perceived benefit has a positive relationship with Electric Vehicle Purchase Intention.

### 2.3.3 Past Studies on the Relationship between Perceived Benefits and EV Purchase Intention

Based on a study conducted in India consumers on EV purchase intentions, perceived risk is directly related to EV purchase intentions. An emerging nation like India faces various challenges in adopting electric vehicles (EVs), including range anxiety and extended charging times (Shukla *et al.*, 2014). It has been suggested that consumers are reluctant to embrace EVs due to concerns about their limited range (Junquera *et al.*, 2016; Kim *et al.*, 2014, 2018) and prolonged charging times (Carley *et al.*, 2013; Kim *et al.*, 2018). These apprehensions are classified as perceived risks, which significantly influence the intention to purchase an electric vehicle. Researchers such as Li *et al.* (2017) and Wang *et al.* (2018) suggest that performance, physical aspects, and financial considerations influence perceived risks of EVs. When consumers compare electric vehicles with gasoline or diesel vehicles, they often find flaws in several aspects, including maximum range and top speed (Jensen *et al.*, 2013). A physical risk can result from uncertainties surrounding electric vehicles, their safety, and reliability (Chen & He, 2003; Wang, Wang *et al.*, 2018). There is a risk of monetary and resource loss associated with the high cost of EVs and their batteries (Degirmenci & Bremner, 2017). There are several challenges associated with recharging EV batteries, including finding a charging station and waiting in line (Schuitema *et al.*, 2013; Weldon *et al.*, 2018).

A study of Malaysian consumers' intention to purchase electric vehicles suggests that perceived risk is a complex aspect that is difficult for consumers, as well as researchers, to comprehend (Chan, 2021). As a result of the potential loss consideration, consumers are less likely to enjoy consumption, and purchase decisions become more complicated. In previous research, Sumathi (2017) suggests that people search for information as a way to relieve uncertainty about future outcomes (Sumathi, 2018). Furthermore, individual biases can strongly influence risk evaluations (Ahmad *et al.*, 2019). According to Ahmad Zarkasi (2019), consumers have cognitive minimization and mood maintenance-oriented tendencies, leading them to actively avoid risks in making decisions or purchasing to maintain positive mood states. Consequently, the decision-making process should consider the potential risks and dangers.

Hypothesis 2: Perceived risk has a positive relationship with Electric Vehicle Purchase Intention.

## 2.4 Research Framework

Based on the TAM model, empirical findings, and hypotheses discussed above. It derives the research framework as shown in Fig. 1. Based on the conceptual framework, it showed that perceived benefit and perceived risk have a relationship between electric vehicle (EV) Purchase Intention.

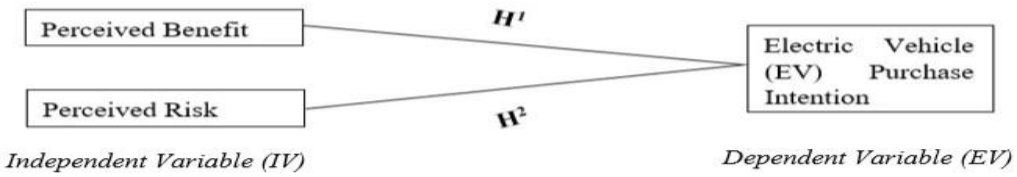


**Fig. 1** *Research framework*

## 3. Research Methodology

The framework for the research methods and procedures of a study is called the research design. It can also be described as the establishment of parameters for data collection and analysis that attempt to balance the cost-effectiveness of the procedure with relevance to the research objective. This study employed a quantitative methodology, and a questionnaire survey was used as the research instrument. Google Forms was used to develop online forms with various questions to measure both independent variable (IV) perceived benefit and perceived risk and dependent variable (DV) electric vehicle (EV) purchase intention. To analyse all the data gathered for this study, the researcher used the statistical software IBM SPSS Statistics 27 for Windows. This study employed a cross-sectional survey, a form of observational research that investigates information from a population or representative subgroup over a specific period.

## 3.1 Research Design

A study of Malaysian consumers' intention to purchase electric vehicles suggests that perceived risk is a complex aspect that is difficult for consumers, as well as researchers, to comprehend (Chan, 2021). As a result of the potential loss consideration, consumers are less likely to enjoy consumption, and purchase decisions become more complicated. In previous research, Sumathi (2017) suggests that people search for information as a way to relieve uncertainty about future outcomes (Sumathi, 2018). Furthermore, individual biases can strongly influence risk evaluations (Ahmad *et al.*, 2019). According to Ahmad Zarkasi (2019), consumers have cognitive minimization and mood maintenance-oriented tendencies, leading them to actively avoid risks in making decisions or purchasing to maintain positive mood states. Consequently, the decision-making process should consider the potential risks and dangers.

## 3.2 Population and Sampling

### 3.2.1 Population

The population, as defined by Shukla (2020), refers to the entire set or grouping of units to which the study's outcomes will be applicable. Malaysian consumers from the Federal Territory of Kuala Lumpur make up the study's population. The Kuala Lumpur Federal Territory was selected for the sample of this study since it contains the most registered cars in Malaysia (6,525,432 cars) (MAA,2019). The desired response demographic comprised people of different colours, religions, and so forth. Only those participants in the study who had a driver's license and prior driving experience were given the questionnaire.

### 3.2.2 Sampling

According to Krejcie and Morgan (1970), list the sample size that matches the size of the population in their study sample size determination table. Therefore, a sample size of 399 respondents would be required for this study, whose total population was 6,525,432 (MAA,2018).

### 3.2.3 Sampling Technique

According to Kumar (2011), three sampling methods can be identified: Probability sampling, nonprobability sampling, and 'mixed' sampling. Random sampling can be both expensive and laborious. In this study, a purposive sampling technique was selected for data collection.

### 3.2.3 Sampling Technique

The researcher created a questionnaire as a data collection tool for a survey of consumers in Kuala Lumpur, Malaysia. All the items from sections A, B, C, and D are adopted from previous empirical studies (Hu *et al.*, 2023). The items instrument is going to be measured in the research questionnaire using a 5-point Likert scale as ratings are in the range between 1 to 5. The questionnaire design features four sections. Section A covers demographic information which consists of gender, age, education level, monthly income, and car ownership, utilizing a nominal scale as recommended by Hu *et al.* (2023). Sections B, C, and D focus on perceived benefits, perceived risks, and purchase intention, respectively, employing a Likert scale ranging from 1 to 5, as suggested by Hu *et al.* (2023).

## 3.4 Data Collection

There are two types of data used in this study which are primary data and secondary data. Further explanation will be given in the next subsection.

### 3.4.1 Primary Data

Researchers employ three primary methods for collecting data: questionnaires, observation, and interviewing. In this study, the preference is for utilizing a questionnaire as the primary data collection method. The distribution of this questionnaire specifically targets individuals holding a driving license in Kuala Lumpur, Malaysia. The primary aim of the questionnaire is to clarify the connection between perceived benefits and perceived risks regarding electric vehicle (EV) purchase intentions among consumers in Kuala Lumpur, Malaysia.

### 3.4.2 Secondary Data

Secondary data pertains to sources previously published in alternative forms. It proves beneficial in shaping the design of subsequent primary data studies and offers a baseline for comparison with the collected primary data results (Kabir, 2016). The categorization of secondary data included four groups, consisting of publications from government or semi-government sources, past research, personal records, and mass media. The research extensively utilized common secondary data sources, including books, journal articles, newspapers, and statistics available through government websites, among others.

## 3.5 Data Analysis

The data collected through the results of the questionnaire survey were processed and presented for discussion. The research uses the relevant computer applications, including Microsoft Excel and SPSS, to examine the large number of respondents. Tables and charts are used to present the questionnaire results. To identify the relationship between the variables, correlation analysis has to carry out as the demographic will be using descriptive analysis to analyse the collected data.

### 3.5.1 Reliability Analysis

Reliability analysis is a crucial method to assess the internal consistency and reliability of variables in research. The Cronbach's Alpha reliability coefficient is commonly used to measure reliability, with a value of 1.00 indicating perfect reliability, while values of 0.00 or lower indicate questionnaire unreliability. The range of 0.80 to 0.90 is commonly utilized in most research. Table 3.5 displays the internal consistency measured by Cronbach's Alpha. The interpretation of Cronbach's Alpha values is as follows: A value of $\alpha \geq 0.9$ is considered very good, while a range of $0.7 \leq \alpha < 0.9$ indicates good reliability. Values between $0.6 \leq \alpha < 0.7$ are considered acceptable, and those in the range of $0.5 \leq \alpha < 0.6$ are deemed poor in terms of reliability. If $\alpha$ exceeds 0.5, it is considered unacceptable in terms of reliability.

### 3.5.2 Descriptive Analysis

Descriptive analysis is the fundamental step in the data analysis process, serving to present data in a more accessible and manageable format. In the present study, descriptive analysis was utilized to delineate the profile of respondents, encompassing variables such as gender, age, education level, monthly income, and car ownership. The mean or average was employed as a measure of central tendency to evaluate the data. Based on Sullivan's interpretation of agreeableness, the average mean values were classified into the following categories: values ranging from 1.00 to 2.33 denote weak agreement, those ranging from 2.34 to 3.67 signify moderate agreement, and values ranging from 3.68 to 5.00 represent strong agreement.

Research in Management of Technology and Business Vol. 5 No. 1 (2024) p. 346-364

### 3.5.3 Correlation Analysis

Correlation analysis is employed to evaluate the relationship between the dependent variable, electric vehicle (EV) purchase intention, and various independent variables, such as consumer behaviour factors like perceived benefit and perceived risk. Typically, correlation analysis includes the use of Pearson and Spearman correlation coefficients. Pearson correlation is applied when the data are normally distributed, while Spearman correlation is utilized for non-normally distributed data. The Pearson correlation coefficient is calculated by multiplying the two standard deviations by the ratio of the sample of the two variables, indicating the strength of linear correlations. However, Pearson correlation may yield a weak correlation coefficient, as it does not capture strong linear relationships between variables. Moreover, the presence of outliers can influence the correlation coefficient, rendering it non-resistant. According to Dudovskiy (2018), Spearman's Rank correlation involves sorting the data and assigning ranks, with 1 denoting the lowest rank. In cases where a data value appears multiple times, equal values are assigned the average rank. Table 3.5.3 presents the nominal degree of relationship based on coefficient values (r). A range of 0.8 to 1.0 signifies a very strong relationship, 0.6 to 0.8 indicates a strong association, 0.4 to 0.6 reflects a moderate connection, 0.2 to 0.4 suggests a weak association and 0.0 to 0.2 signifies a very weak or negligible relationship between variables.

## 4. Results and Discussion

This chapter presents the findings from examining the information obtained from the surveys given to participants in Kuala Lumpur, Malaysia. Software called SPSS (Statistical Package for the Social Sciences) was used to analyse all of the data that had been gathered. This chapter included a wide range of subjects, such as correlation analysis, normality test, descriptive analysis, demographic analysis, and reliability analysis.

### 4.1 Response Rate

A total of 399 sets of questionnaires were distributed to the respondents. A total of 312 sets were responded to and returned. The response rate of the study reflected is 78.2% as indicated in Table 1

**Table 1** *Response rate*

| Population | Sample Size | Distributed Questionnaires | Returned Questionnaires | Percentage (%) |
|---|---|---|---|---|
| 6,525,432 | 399 | 399 | 312 | 78.2% |

### 4.2 Demographic Analysis

**Table 2** *Demographic analysis*

| Demographic | Details | Frequency | Percentage (%) |
|---|---|---|---|
| **Gender** | Male | 204 | 65 |
| | Female | 108 | 35 |
| **Age** | 18-24 years old | 152 | 49 |
| | 25-34 years old | 68 | 22 |
| | 35-44 years old | 54 | 17 |
| | 45 years old and above | 38 | 12 |
| **Education Level** | SPM | 45 | 14 |
| | STPM | 47 | 15 |
| | DIPLOMA | 25 | 8 |
| | ASSOCIATE DEGREE OR | 146 | 47 |
| | BACHELOR DEGREE | | |
| | MASTER | 28 | 9 |
| | PHD DEGREE | 21 | 7 |
| **Your Monthly Income** | RM2500-5000 | 201 | 64 |
| | RM5001-10000 | 68 | 22 |
| | RM10000 and above | 43 | 14 |
| **Do You Own A Car?** | Yes | 191 | 61 |
| | No | 120 | 39 |

Table 2 illustrates questions about demographic information in Part A of the questionnaire, encompassing aspects such as gender, age, education level, monthly income, and vehicle ownership.

## 4.3 Descriptive Analysis

### 4.3.1 Descriptive Data for Perceived Benefit

**Table 3** *Descriptive data for perceived benefit*

| Statement | Mean | Interpretation |
|---|---|---|
| 1. In contrast to traditional vehicles, electric cars incur lower maintenance costs. | 3.64 | Moderate |
| 2. In comparison to traditional vehicles, electric cars experience fewer mechanical issues, leading to savings in maintenance costs. | 3.38 | Moderate |
| 3. Using an electric vehicle contributes to environmental responsibility. | 3.61 | Moderate |
| 4. EVs can reduce carbon emissions. | 2.57 | Moderate |
| 5. Using an electric vehicle reflects environmental consciousness. | 3.02 | Moderate |
| 6. Using an EV can provide joy and enjoyment. | 2.96 | Moderate |
| 7. Compared to traditional vehicles, EVs produce less noise during moving. | 3.34 | Moderate |
| 8. The minimal vibration of EVs during driving provides a comfortable experience. | 3.77 | High |
| **Total Average** | **3.29** | **Moderate** |

Therefore, the overall mean level of perceived benefit towards electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia is 3.29 which indicates there is an average level of perceived benefit towards electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia.

### 4.3.2 Descriptive Data for Perceived Risk

**Table 4** *Descriptive data for perceived risk*

| Statement | Mean | Interpretation |
|---|---|---|
| 1. The maximum speed of EVs falls short of my expectations. | 3.03 | Moderate |
| 2. The range of EVs doesn't align with my travel requirements. | 3.58 | Moderate |
| 3. The charging time of EVs consumes a significant portion of my time. | 3.70 | High |
| 4. I have concerns about the risk of spontaneous combustion while driving an EV. | 3.67 | High |
| 5. Charging EVs is time-consuming, and I have concerns about the risk of fire. | 3.63 | Moderate |
| 6. I have concerns about the safety of using EVs. | 3.94 | High |
| 7.EVs are expensive to purchase. | 3.94 | High |
| 8. The cost of replacing EV batteries is high. | 3.95 | High |
| 9. The high initial acquisition cost and the expense of battery replacement purchase electric vehicles are less appealing when compared to conventional vehicles, a variation from the previous outcome. | 3.59 | Moderate |
| **Total Average** | **3.67** | **High** |

Thus, the overall mean of the level of perceived risk toward electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia is 3.67 which indicates there is a high level of perceived risk toward electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia.

### 4.3.3 Descriptive Data for Electric Vehicle (EV) Purchase Intention

**Table 5** *Descriptive data for electric vehicle (EV) purchase intention*

| Statement | Mean | Interpretation |
|---|---|---|
| 1. I am contemplating the purchase of an electric vehicle. | 4.28 | High |
| 2. I would be open to recommending EVs to others if they prove to be advantageous. | 3.94 | High |
| 3. I anticipate the prompt introduction of a broader range of EV models into the market. | 3.94 | High |
| 4. I intend to buy an EV in the future. | 3.95 | High |
| 5. I plan to acquire EVs soon. | 3.59 | High |
| 6. If I find the need to purchase a new car in the future, I am inclined to choose an EV. | 4.28 | High |
| **Total Average** | **3.99** | **High** |

Therefore, the overall mean level of electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia is 3.99 which indicates there is a high level of electric vehicle (EV) purchase intention among consumers in Kuala Lumpur.

## 4.4 Normality Test

**Table 6** *Result of the normality test*

| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | df | Sig. |
| **Dependent Variable** | | | | | | |
| Electric Vehicle (EV) Purchase Intention | .208 | 312 | <.001 | .870 | 312 | <.001 |

Based on Table 6, the p-value for the electric vehicle (EV) purchase intention is <0.001. The test for normality indicates that the p-values for the dependent variables are below 0.05. Consequently, since this data does not follow a normal distribution, the study will continue with the Spearman correlation analysis.

## 4.5 Correlation Analysis

The Spearman's Correlation Coefficient analysis demonstrated a robust relationship between perceived benefit and EV purchase intention, with a correlation coefficient (r) of 0.610. This finding supports the hypothesis (H1), indicating a substantial positive association between the two variables. Additionally, the analysis revealed a strong relationship between perceived risk and EV purchase intention, with a correlation coefficient (r) of 0.675. This result also supports the hypothesis (H2), signifying a significant positive relationship between the two variables.

# 5. Conclusion

## 5.1 Discussion Based on Research Objectives

This research aims to determine the relationship between perceived benefit and perceived risk towards Electric Vehicle (EV) purchase intention by examining two factors: perceived benefit and perceived risk. This research included 399 driving license holders from Kuala Lumpur, Malaysia. However, only 312 surveys were gathered successfully over the internet. Hence, the outcomes manifest the alignment with the objective, as evidenced by the analysed results. Each obstacle has been systematically tackled, substantiated by the corroborative statements and elucidations from the preceding study. The examination of all objectives was conducted utilizing the descriptive analysis, Spearman test, and correlation analysis, with detailed explanations grounded in the research goals of the study. To identify the level of electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia.

### 5.1.1 To identify the level of electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia.

Based on the descriptive analysis conducted, it showed that the overall mean for electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia is 3.99 which indicates there is a high level of electric vehicle (EV) purchase intention among consumers in Kuala Lumpur. This result is in line with the studies conducted by N. Adnan *et al.* (2018) who found that the awareness of Malaysian consumers towards electric vehicles is increasing. Electric vehicles (EVs) play a vital role in decreasing carbon emissions and mitigating air pollution, in line with Malaysia's dedication to environmental sustainability and air quality improvement. The introduction of a diverse range of electric vehicle models by global automakers in the Malaysian market provides consumers with increased choices, fostering alignment with the nation's environmental objectives.

### 5.1.2 To determine the level of perceived benefit towards electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia.

Based on the conducted descriptive analysis, the overall mean for perceived benefit toward electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia, is 3.29, indicating an average level of electric vehicle (EV) purchase intention. This result is consistent with studies by Asadi *et al.* (2021), which found that the higher the level of perceived benefit, the higher the level of electric vehicle (EV) purchase intention among consumers. When the advantages of purchasing an electric vehicle (EV) include incentives such as tax exemptions, rebates, and reduced import duties provided by the Malaysian government, coupled with environmental conservation and low maintenance costs, it undoubtedly appeals to consumers, influencing their intent to choose an EV over conventional vehicles. This is because when consumers weigh these advantages against the backdrop of their individual preferences and needs, the correlation between the perceived benefits and the intention to purchase an EV becomes more pronounced.

### 5.1.3 To clarify the level of perceived risk towards electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia.

Based on the descriptive analysis conducted, it showed that the overall mean for perceived risk towards electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia is 3.67 which indicates there is a high level of electric vehicle (EV) purchase intention among consumers in Kuala Lumpur. This result is coherent with the studies conducted by X. Hu *et al.* (2023) who found that a higher level of perceived risk tends to correlate with a more cautious approach and, consequently, a potentially lower purchase intention for electric vehicles (EVs). The pro-environmentalists are more intent on purchasing the EV due to their environmental concern, especially the quality of the water and air The alignment between findings and previous research underscores the significance of perceived risk in shaping consumer attitudes toward EV purchase. As consumers in Kuala Lumpur exhibit a comparatively lower perceived risk, it suggests a favourable environment for increased EV purchase intention, potentially influenced by factors such as improved technology, greater awareness, or supportive government initiatives. Occasionally, concerns arise regarding the safety of electric vehicles (EVs). Fortunately, technological advancements, particularly in the competitive electric vehicle industry, effectively address and mitigate these worries.

### 5.1.4 To examine the relationship between perceived benefit and electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia.

The fourth objective of this study is to investigate the connection between perceived benefits and electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia. Utilizing Spearman Correlation Analysis, the results reveal a significant relationship between perceived benefit and the intention to purchase an electric vehicle. This finding aligns with the research of Leendertse *et al.* (2016), where perceived benefit was identified as a positive influence on consumer intentions to purchase electric vehicles. According to research carried out by Ray *et al.* (2019), perceived benefit is the idea that consumers can expect positive outcomes after taking action, which affects their decisions and actions. Bunsen *et al.* (2019) concluded that electric vehicles are fuel-free, low-polluting, smooth to operate, and low-cost compared to conventional internal combustion engines. Schuitema *et al.* (2013) defined Electric Vehicle purchase intention as the buyer's reaction to EV technology, encompassing aspects such as endorsement, utilization, or the procurement for acquiring a transportation tool. Innovative consumers are more likely to experiment and embrace novel concepts (Lee *et al.*, 2021). Thus, creative people willing to try new things will be drawn to electric vehicles, widely regarded as a new form of transportation technology. In a comparative study involving developed nations and China, Zhang *et al.* (2018) identified a statistically significant correlation between perceived benefits and Electric Vehicle (EV) purchase intentions. In Malaysia, many individuals rely on personal transportation, partly influenced by the considerable distances

involved, leading them to perceive driving as the most viable option. Between 2010 and 2019, Malaysia witnessed the presence of over 500,000 passenger vehicles on its roads, ranking the transport sector as the second-largest contributor to pollution (AAM, 2019; Birol, 2019). Nevertheless, despite this, the proportion of electric vehicles sold in Malaysia is still quite small, accounting for a very small portion of all vehicles sold. Therefore, there is sufficient reason to conclude that there is a significant relationship between perceived benefit and electric vehicle (EV) purchase intention. However, this hypothesis is further accepted because the data shows a strong correlation between the perceived benefit and electric vehicle (EV) purchase intention.

### 5.1.5 To investigate the relationship between perceived risk and electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia.

The study's fifth objective involves investigating the correlation between perceived risk and electric vehicle (EV) purchase intention among consumers in Kuala Lumpur, Malaysia. To address this objective, Spearman correlation analysis was employed. This analytical approach finds support in the work of Grabner-Kräuter and Faullant (2008), who identified perceived risk as comprising uncertainties, particularly those associated with potential errors and security gaps in technology. According to Sumathi's (2018) research, consumers might lose personal time, financial resources, and privacy when they purchase electric vehicles (EVs). The study uncovered consumers in Kuala Lumpur, Malaysia, perceive EVs as dynamic technological innovations that swiftly adapt to changing consumer desires and needs. Consequently, consumers often grapple with uncertainties regarding the reliability of the product, including concerns about the lifespan of batteries and motors, the comparatively high price of EVs, and unforeseen maintenance costs. Earlier studies suggest that to mitigate uncertainty in purchase outcomes, consumers may resort to heuristics as decision-making shortcuts, as exemplified in Redon *et al.* (2006) study. The research investigated the efficacy of mitigating risk concerns and promoting the purchase of EV technology. Li *et al.* (2020) suggest that the government gives early adopters incentives such as tax breaks, favourable parking and charging rates, and purchase subsidies. Compared to EV purchase intentions that decline due to perceived risks such as limited driving range and extended charging times), Jain *et al.* (2021) found that governmental support simultaneously mitigates the adverse effects of perceived risks. Further alleviating perceived risks among potential buyers, the government should encourage companies to build more charging stations. Furthermore, Zeng *et al.* (2021) suggest enhancing purchase intentions by establishing EV experience centres or arranging EV exhibitions to cultivate positive attitudes towards EVs. Therefore, there is sufficient evidence to conclude a significant relationship between perceived risk and Electric Vehicle (EV) purchase intention. Hence, based on the data that have been analysed and discussed, the second hypothesis of this study is accepted.

## 5.2 Limitation of Study

To enhance the robustness of the study, it is advisable to broaden the data collection efforts by targeting respondents from diverse regions across the country. This approach aims to ensure a more accurate understanding of the situation, preventing the collected data from solely reflecting the perspectives of Malaysian car owners in a specific region. Additionally, acknowledging a limitation in the study's methodology, the reliance on limited cross-sectional studies for a quantitative analysis poses a challenge in accurately determining the relationship between perceived benefit and perceived risk toward electric vehicle (EV) purchase intention. A potential remedy for this limitation is to consider adopting a longitudinal survey method to obtain more accurate and dynamic insights over time. Furthermore, the research's exclusive reliance on survey responses introduces the risk of bias in the dataset. To address this, it is recommended to diversify data sources or employ complementary research methods to ensure a more comprehensive and unbiased representation of the factors influencing EV purchase intention.

## 5.3 Recommendation for Future Researchers

To broaden the geographical scope of the research beyond Kuala Lumpur and achieve results applicable to the entire population of car owners across Malaysia, it is advisable to extend the study to include other states. This expansion aligns with the recommendation to employ a mixed-method approach, as advocated by Creswell *et al.* (2006) and supported by Assan (2021), combining quantitative and qualitative methodologies. Following a sequential design, the research would initiate with the quantitative phase, utilizing surveys. However, to address potential bias in survey responses (Podsakoff *et al.*, 2023), it is recommended to adopt a longitudinal approach, conducting assessments before and after a designated period. This not only helps capture changes over time but also enhances data reliability, minimizing bias and ensuring the acquisition of real-time information throughout the study period. The integration of both quantitative and qualitative insights in the mixed-method approach proves advantageous in providing a comprehensive understanding of the model under investigation.

## Acknowledgement

The authors would like to thank the Faculty of Technology Management and Business, Universiti Tun Hussein Onn Malaysia for its support.

## Conflict of Interest

Authors declare that there is no conflict of interests regarding the publication of the paper.

## Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** K.P.C.A. and N.K.K.; **data collection:** K.P.C.A.; **analysis and interpretation of results:** K.P.C.A. and N.K.K.; **draft manuscript preparation:** K.P.C.A. and N.K.K. All authors reviewed the results and approved the final version of the manuscript.

## References

Adnan, N., Md Nordin, S., bin Bahruddin, M. A., & Ali, M. (2018). How trust can drive forward the user acceptance to the technology? In-vehicle technology for autonomous vehicle. Transportation Research Part A: Policy and Practice, 118, 819–836. https://doi.org/10.1016/j.tra.2018.10.019

Ajzen, I. (1991). The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T

Asadi, S., Nilashi, M., Samad, S., Abdullah, R., Mahmoud, M., Alkinani, M. H., & Yadegaridehkordi, E. (2021a). Factors impacting consumers' intention toward adoption of electric vehicles in Malaysia. Journal of Cleaner Production, 282. https://doi.org/10.1016/j.jclepro.2020.124474

Asadi, S., Nilashi, M., Samad, S., Abdullah, R., Mahmoud, M., Alkinani, M. H., & Yadegaridehkordi, E. (2021b). Factors impacting consumers' intention toward adoption of electric vehicles in Malaysia. Journal of Cleaner Production, 282. https://doi.org/10.1016/j.jclepro.2020.124474

Assan, T. E. B. (2021). Factors which influence sustainable implementation of corporate governance systems in an institution of higher learning. South African Journal of Higher Education. https://doi.org/10.20853/35-1-4414

Babu Narasimhan, P., Marcovecchio, P., Hamers, A. A., & Hedrick, C. C. (2019). Nonclassical Monocytes in Health and Disease. https://doi.org/10.1146/annurev-immunol-042617

Birol, M., Wojcik, S. P., Miranker, A. D., & Rhoades, E. (2019). Identification of n-linked glycans as specific mediators of neuronal uptake of acetylated α-synuclein. PLoS Biology, 17(6). https://doi.org/10.1371/journal.pbio.3000318

Buhmann, K. M., & Criado, J. R. (2023). Consumers' preferences for electric vehicles: The role of status and reputation. Transportation Research Part D: Transport and Environment, 114. https://doi.org/10.1016/j.trd.2022.103530

Cecere, G., Corrocher, N., & Guerzoni, M. (2018). Price or performance? A probabilistic choice analysis of the intention to buy electric vehicles in European countries. Energy Policy, 118, 19–32. https://doi.org/10.1016/j.enpol.2018.03.034

Chan, J. H. (2021). Malaysia Low Carbon Cities Conference Promoting Low Carbon Mobility in Malaysia through Development of Electric Mobility.

Costa, E., Horta, A., Correia, A., Seixas, J., Costa, G., & Sperling, D. (2021). Diffusion of electric vehicles in Brazil from the stakeholders' perspective. International Journal of Sustainable Transportation, 15(11), 865–878. https://doi.org/10.1080/15568318.2020.1827317

Creswell, J. W., Shope, R., Clark, V. L. P., & Green, D. O. (2006). Spring 2006 How Interpretive Qualitative Research Extends Mixed Methods Research. In RESEARCH IN THE SCHOOLS Mid-South Educational Research Association (Vol. 13, Issue 1).

Cudjoe, D., & Han, M. S. (2020). Economic and environmental assessment of landfill gas electricity generation in urban districts of Beijing municipality. Sustainable Production and Consumption, 23, 128–137. https://doi.org/10.1016/j.spc.2020.04.010

Cudjoe, D., Yuan, Q., & Han, M. S. (2020). An assessment of the influence of awareness of benefits and perceived difficulties on waste sorting intention in Beijing. Journal of Cleaner Production, 272. https://doi.org/10.1016/j.jclepro.2020.123084

Cui, M., & Zhang, D. Y. (2021). Artificial intelligence and computational pathology. In Laboratory Investigation (Vol. 101, Issue 4, pp. 412–422). Springer Nature. https://doi.org/10.1038/s41374-020-00514-0

Danielis, R., Rotaris, L., Giansoldati, M., & Scorrano, M. (2020). Drivers' preferences for electric cars in Italy. Evidence from a country with limited but growing electric car uptake. Transportation Research Part A: Policy and Practice, 137, 79–94. https://doi.org/10.1016/j.tra.2020.04.004

Featherman, M., Jia, S. (Jasper), Califf, C. B., & Hajli, N. (2021). The impact of new technologies on consumers beliefs: Reducing the perceived risks of electric vehicle adoption. Technological Forecasting and Social Change, 169. https://doi.org/10.1016/j.techfore.2021.120847

Geronikolos, I., & Potoglou, D. (2021). An exploration of electric-car mobility in Greece: A stakeholders' perspective. Case Studies on Transport Policy, 9(2), 906–912. https://doi.org/10.1016/j.cstp.2021.04.010

Grabner-Kräuter, S., & Faullant, R. (2008). Consumer acceptance of internet banking: The influence of internet trust. International Journal of Bank Marketing, 26(7), 483–504. https://doi.org/10.1108/02652320810913855

Hardman, S., Chandan, A., Tal, G., & Turrentine, T. (2017). The effectiveness of financial purchase incentives for battery electric vehicles – A review of the evidence. In Renewable and Sustainable Energy Reviews (Vol. 80, pp. 1100–1111). Elsevier Ltd. https://doi.org/10.1016/j.rser.2017.05.255

Hu, X., Zhou, R., Wang, S., Gao, L., & Zhu, Z. (2023). Consumers' value perception and intention to purchase electric vehicles: A benefit-risk analysis. Research in Transportation Business and Management, 49. https://doi.org/10.1016/j.rtbm.2023.101004

Jain, S., Nehra, M., Kumar, R., Dilbaghi, N., Hu, T. Y., Kumar, S., Kaushik, A., & Li, C. zhong. (2021). Internet of medical things (IoMT)-integrated biosensors for point-of-care testing of infectious diseases. Biosensors and Bioelectronics, 179. https://doi.org/10.1016/j.bios.2021.113074

Jaiswal, D., Kaushal, V., Kant, R., & Kumar Singh, P. (2021). Consumer adoption intention for electric vehicles: Insights and evidence from Indian sustainable transportation. Technological Forecasting and Social Change, 173. https://doi.org/10.1016/j.techfore.2021.121089

Junquera, B., Moreno, B., & Á�lvarez, R. (2016). Analyzing consumer attitudes towards electric vehicle purchasing intentions in Spain: Technological limitations and vehicle confidence. Technological Forecasting and Social Change, 109, 6–14. https://doi.org/10.1016/j.techfore.2016.05.006

Kaur, S., Tiwari, V., Kumari, A., Chaudhary, E., Sharma, A., Ali, U., & Garg, M. (2023). Protective and defensive role of anthocyanins under plant abiotic and biotic stresses: An emerging application in sustainable agriculture. In Journal of Biotechnology (Vol. 361, pp. 12–29). Elsevier B.V. https://doi.org/10.1016/j.jbiotec.2022.11.009

Kengue Mayamou, P., & Michel, S. (2020). Mobile Money : décryptage d'une succes story africaine. Management & Data Science. https://doi.org/10.36863/mds.a.14027

Kim, S. Il, Lee, K. H., Mun, H. A., Kim, H. S., Hwang, S. W., Roh, J. W., Yang, D. J., Shin, W. H., Li, X. S., Lee, Y. H., Snyder, G. J., & Kim, S. W. (2015). Dense dislocation arrays embedded in grain boundaries for high-performance bulk thermoelectrics. Science, 348(6230), 109–114. https://doi.org/10.1126/science.aaa4166

Kim, S., Kim, D., Cho, S. W., Kim, J., & Kim, J. S. (2014). Highly efficient RNA-guided genome editing in human cells via delivery of purified Cas9 ribonucleoproteins. Genome Research, 24(6), 1012–1019. https://doi.org/10.1101/gr.171322.113

Kumar, P., Assistant, J., & Director, R. (2020). Challenges and Opportunities created by Covid-19 for ODL: A case study of IGNOU. In Peer-Reviewed, Refereed, Indexed Journal with IC (Issue 6). http://igram.ignou.ac.in/

Kumar, R. R., & Alok, K. (2020). Adoption of electric vehicle: A literature review and prospects for sustainability. In Journal of Cleaner Production (Vol. 253). Elsevier Ltd. https://doi.org/10.1016/j.jclepro.2019.119911

Lee, P. S. N., Leung, L., Lo, V., Xiong, C., & Wu, T. (2011). Internet Communication Versus Face-to-face Interaction in Quality of Life. In QUALITY OF LIFE RESEARCH: RESPONSES TO EMERGING ISSUE IN A CHANGING WORLD (Vol. 100, Issue 3).

Lee, S., Abdullah, A., Jhanjhi, N., & Kok, S. (2021). Classification of botnet attacks in IoT smart factory using honeypot combined with machine learning. PeerJ Computer Science, 7, 1–23. https://doi.org/10.7717/PEERJ-CS.350

Leendertse, W., Langbroek, M., Arts, J., & Nijhuis, A. (2016). Generating Spatial Quality through Co-creation: Experiences from the Blankenburgverbinding (The Netherlands). Transportation Research Procedia, 14, 402–411. https://doi.org/10.1016/j.trpro.2016.05.092

Li, C., Yang, Y., & Ren, L. (2020). Genetic evolution analysis of 2019 novel coronavirus and coronavirus from other species. In Infection, Genetics and Evolution (Vol. 82). Elsevier B.V. https://doi.org/10.1016/j.meegid.2020.104285

Li, P., Xia, X., & Guo, J. (2022). A review of the life cycle carbon footprint of electric vehicle batteries. Separation and Purification Technology, 296. https://doi.org/10.1016/j.seppur.2022.121389

Liang, L., Liu, M., Elefteriades, J., & Sun, W. (2023). Synergistic integration of deep neural networks and finite element method with applications of nonlinear large deformation biomechanics. Computer Methods in Applied Mechanics and Engineering, 416. https://doi.org/10.1016/j.cma.2023.116347

Linzenich, A., Arning, K., Bongartz, D., Mitsos, A., & Ziefle, M. (2019). What fuels the adoption of alternative fuels? Examining preferences of German car drivers for fuel innovations. Applied Energy, 249, 222–236. https://doi.org/10.1016/j.apenergy.2019.04.041

Liu, Y., Ouyang, Z., & Cheng, P. (2019). Predicting consumers' adoption of electric vehicles during the city smog crisis: An application of the protective action decision model. Journal of Environmental Psychology, 64, 30–38. https://doi.org/10.1016/j.jenvp.2019.04.013

Loengbudnark, W., Khalilpour, K., Bharathy, G., Taghikhah, F., & Voinov, A. (2022). Battery and hydrogen-based electric vehicle adoption: A survey of Australian consumers perspective. Case Studies on Transport Policy, 10(4), 2451–2463. https://doi.org/10.1016/j.cstp.2022.11.007

Nguyen, R. T., Eggert, R. G., Severson, M. H., & Anderson, C. G. (2021). Global Electrification of Vehicles and Intertwined Material Supply Chains of Cobalt, Copper and Nickel. Resources, Conservation and Recycling, 167. https://doi.org/10.1016/j.resconrec.2020.105198

Pandey, P. C., Koutsias, N., Petropoulos, G. P., Srivastava, P. K., & Ben Dor, E. (2021a). Land use/land cover in view of earth observation: data sources, input dimensions, and classifiers—a review of the state of the art. In Geocarto International (Vol. 36, Issue 9, pp. 957–988). Taylor and Francis Ltd. https://doi.org/10.1080/10106049.2019.1629647

Pandey, P. C., Koutsias, N., Petropoulos, G. P., Srivastava, P. K., & Ben Dor, E. (2021b). Land use/land cover in view of earth observation: data sources, input dimensions, and classifiers—a review of the state of the art. In Geocarto International (Vol. 36, Issue 9, pp. 957–988). Taylor and Francis Ltd. https://doi.org/10.1080/10106049.2019.1629647

Panicker, V. S., Mitra, S., & Upadhyayula, R. S. (2019). Institutional investors and international investments in emerging economy firms: A behavioral risk perspective. Journal of World Business, 54(4), 322–334. https://doi.org/10.1016/j.jwb.2018.12.002

Park, E., Lim, J., & Cho, Y. (2018). Understanding the emergence and social acceptance of electric vehicles as next-generation models for the automobile industry. Sustainability (Switzerland), 10(3). https://doi.org/10.3390/su10030662

Podsakoff, N. P., Freiburger, K. J., Podsakoff, P. M., & Rosen, C. C. (2023). Annual Review of Organizational Psychology and Organizational Behavior Laying the Foundation for the Challenge-Hindrance Stressor Framework 2.0. Annu. Rev. Organ. Psychol. Organ. Behav. 2023, 10, 165–199. https://doi.org/10.1146/annurev-orgpsych-080422

Rahmani, D., & Loureiro, M. L. (2019). Assessing drivers' preferences for hybrid electric vehicles (HEV) in Spain. Research in Transportation Economics, 73, 89–97. https://doi.org/10.1016/j.retrec.2018.10.006

Redon, R., Ishikawa, S., Fitch, K. R., Feuk, L., Perry, G. H., Andrews, T. D., Fiegler, H., Shapero, M. H., Carson, A. R., Chen, W., Cho, E. K., Dallaire, S., Freeman, J. L., González, J. R., Gratacòs, M., Huang, J., Kalaitzopoulos, D., Komura, D., MacDonald, J. R., … Hurles, M. E. (2006). Global variation in copy number in the human genome. Nature, 444(7118), 444–454. https://doi.org/10.1038/nature05329

Rietmann, N., & Lieven, T. (2019). How policy measures succeeded to promote electric mobility – Worldwide review and outlook. Journal of Cleaner Production, 206, 66–75. https://doi.org/10.1016/j.jclepro.2018.09.121

Santos, G., & Davies, H. (2020). Incentives for quick penetration of electric vehicles in five European countries: Perceptions from experts and stakeholders. Transportation Research Part A: Policy and Practice, 137, 326–342. https://doi.org/10.1016/j.tra.2018.10.034

Schuitema, G., Anable, J., Skippon, S., & Kinnear, N. (2013). The role of instrumental, hedonic and symbolic attributes in the intention to adopt electric vehicles. Transportation Research Part A: Policy and Practice, 48, 39–49. https://doi.org/10.1016/j.tra.2012.10.004

Seebauer, S., Ortner, S., Babcicky, P., & Thaler, T. (2019). Bottom-up citizen initiatives as emergent actors in flood risk management: Mapping roles, relations and limitations. Journal of Flood Risk Management, 12(3). https://doi.org/10.1111/jfr3.12468

Simsekoglu, Ö., & Nayum, A. (2019). Predictors of intention to buy a battery electric vehicle among conventional car drivers. Transportation Research Part F: Traffic Psychology and Behaviour, 60, 1–10. https://doi.org/10.1016/j.trf.2018.10.001

Song, R., & Potoglou, D. (2020). Are existing battery electric vehicles adoption studies able to inform policy? A review for policymakers. In Sustainability (Switzerland) (Vol. 12, Issue 16). MDPI. https://doi.org/10.3390/su12166494

Sullivan, G. M., & Artino, A. R. (2013). Analyzing and Interpreting Data From Likert-Type Scales. Journal of Graduate Medical Education, 5(4), 541–542. https://doi.org/10.4300/jgme-5-4-18

Vargas, J. E. V., Seabra, J. E. A., Cavaliero, C. K. N., Walter, A. C. S., Souza, S. P., & Falco, D. G. (2020). The new neighbor across the street: An outlook for battery electric vehicles adoption in Brazil. In World Electric Vehicle Journal (Vol. 11, Issue 3). MDPI AG. https://doi.org/10.3390/WEVJ11030060

Wang, B., Wang, X., Guo, D., Zhang, B., & Wang, Z. (2018). Analysis of factors influencing residents' habitual energy-saving behaviour based on NAM and TPB models: Egoism or altruism? Energy Policy, 116, 68–77. https://doi.org/10.1016/j.enpol.2018.01.055

Wang, S., Fan, J., Zhao, D., Yang, S., & Fu, Y. (2016). Predicting consumers' intention to adopt hybrid electric vehicles: using an extended version of the theory of planned behavior model. Transportation, 43(1), 123–143. https://doi.org/10.1007/s11116-014-9567-9

Wicki, M., Brückmann, G., & Bernauer, T. (2022). How to accelerate the uptake of electric cars? Insights from a choice experiment. Journal of Cleaner Production, 355. https://doi.org/10.1016/j.jclepro.2022.131774

Xu, J., Gan, Z., Cheng, Y., & Liu, J. (2019). Discourse-Aware Neural Extractive Text Summarization. http://arxiv.org/abs/1910.14142

Xu, Y., Zhang, W., Bao, H., Zhang, S., & Xiang, Y. (2019). A SEM-neural network approach to predict customers' intention to purchase battery electric vehicles in China's Zhejiang Province. Sustainability (Switzerland), 11(11). https://doi.org/10.3390/su11113164

Yamada, I., Takamatsu, A., & Ikeno, H. (2018). Complementary evaluation of structure stability of perovskite oxides using bond-valence and density-functional-theory calculations. Science and Technology of Advanced Materials, 19(1), 101–107. https://doi.org/10.1080/14686996.2018.1430449

Yang, H., Yu, J., Zo, H., & Choi, M. (2016). User acceptance of wearable devices: An extended perspective of perceived value. Telematics and Informatics, 33(2), 256–269. https://doi.org/10.1016/j.tele.2015.08.007

Zeng, Z., Li, K., Wang, X., Ouyang, S., Zhang, Z., Liu, Z., Sun, J., Ye, X., Kang, W., & Yu, J. (2021). Low urinary iodine is a protective factor of central lymph node metastasis in papillary thyroid cancer: a cross-sectional study. World Journal of Surgical Oncology, 19(1). https://doi.org/10.1186/s12957-021-02302-6