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Investigating the Moderating Role of Government Incentive Policy on Consumer Adoption of Battery Electric Vehicles (BEV) in Malaysia

Ismail Pandak, Piaralal S.K, Rethina V.S

Faculty of Business and Management, Open University Malaysia (OUM), Malaysia

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Abstract

As concerns about climate change, global warming, and environmental degradation continue to escalate, the adoption of electric vehicles, particularly Battery Electric Vehicles (BEVs), has emerged as a promising solution for a more sustainable future. This study delves into the willingness of Malaysian consumers to embrace BEVs, with a specific focus on the moderating role of government incentives and policies. Drawing upon the Theory of Planned Behaviour (TPB) as the theoretical framework, this study extends the TPB model by incorporating four additional external variables to better understand the factors influencing adoption intention. Employing a quantitative research approach, this investigation utilizes a cross-sectional survey method to collect empirical data from car consumers across Malaysia. The survey instrument, adapted from previous studies, comprehensively assesses nine constructs relevant to this research. Data analysis will be conducted using Structural Equation Modelling (SEM), specifically employing the Partial Least Squares SEM (PLS-SEM) approach, to examine the formulated hypotheses. The findings of this study aim to shed light on the determinants of BEV adoption intention among Malaysian consumers, with implications for policymakers, automotive industry players, and researchers. Further research avenues are also proposed to deepen our understanding of the complex dynamics surrounding BEV adoption in Malaysia.

Keywords: Adoption Intention, Environmental, PBC, Attitude, Government Incentive Policy

Introduction

The World Health Organization (WHO) emphasizes the environmental benefits of Electric Vehicles (EVs) in reducing pollution and energy consumption, particularly when compared to combustion vehicles. Countries like China, the USA, the United Kingdom, and others are rapidly embracing electric vehicle adoption. In Malaysia, the National Automotive Policy 2020 (NAP 2020) and the Low Carbon Mobility Blueprint 2021–2030, spearheaded by the Ministry of International Trade and Industry (MITI) and the Ministry of Environment and Water (KASA), signal a commitment to greener and more competitive automotive development. To bolster EV adoption, the Malaysian government has set ambitious targets,

aiming for 15% EVs by 2030 and 38% by 2040 of the annual total industrial volume (TIV). Positively responding to the government's initiatives in terms of financial and economic incentives, EV sales have gradually increased from 1.6% in 2021, to 3.1% and 4.8% in 2022 and 2023 respectively. However, there are still challenges ahead to achieve the target of 15% by 2030.

The government's focus on developing charging infrastructure is crucial, with plans to construct 10,000 public charging stations by 2025. However, as of October 2023, there are only 1,434 units (1,117 AC, 317 DC) of public charging stations available throughout Malaysia. Malaysia has less than two years to achieve the targeted 10,000 public charging stations (9,000 AC, 1,000 DC). In the year 2021, Malaysia has announced the carbon-neutrality target of 2050 however yet to specify a timeline for banning ICE vehicles and achieving full electrification in the transportation sector. Globally, there are commitments from cars major players to expand the availability of EV models and phasing out internal combustion engine vehicles gradually. Bloomberg NEF projects that by 2037, annual global EV sales will surpass those of ICE vehicles, signaling a transformative shift in consumer preference. This trend is substantiated by increasing awareness of climate change, environmental concerns, and economic considerations.

Consumer challenges include 'range anxiety' and a lack of awareness. Efforts to increase the number of charging stations and raise consumer awareness can address these issues. Collaborative initiatives between government agencies and industries are essential to incentivize consumers to shift from Internal Combustion Engines (ICE) to EVs. Consistent awareness programs and updates to educational content can reshape consumer perspectives, fostering a low-carbon mobility mindset. The transportation sector, consuming 40% of final energy and contributing 30% of greenhouse gas emissions, underscores the urgency of EV adoption in Malaysia. With 16.8 million registered motor vehicles in 2019, the government's commitment to EVs becomes paramount for achieving environmental sustainability. In conclusion, while Malaysia faces challenges in the adoption of EVs, it presents an opportunity for structured approaches and coordinated measures. This proposal aims to analyze determinants affecting BEV adoption in Malaysia, with a focus on the moderating impact of government incentives and policies. Learning from successful cases, especially in China, the research will contribute valuable insights to accelerate the transition to a greener automotive landscape in Malaysia.

Contextual Problem

The transportation sector in Malaysia, accounting for 40% of final energy usage and contributing 30% of greenhouse gas emissions, presents a significant environmental challenge. With a rapidly growing population and a substantial number of registered vehicles, Malaysia faces concerns related to air pollution and escalating carbon dioxide emissions, surpassing 250 million tons annually. Despite the booming transportation sector, the nation is yet to make substantial progress in achieving its environmental targets. The pressing need for a shift towards sustainable solutions is evident, leading to the proposition of integrating Electric Vehicles (EVs), especially Battery Electric Vehicles (BEVs), into the Malaysian economy. However, the adoption of EVs, particularly BEVs, faces hurdles in achieving mass usage and purchase. To address this, a systematic and structured approach is required to identify and scrutinize the factors impeding the green innovation's development. This proposal focuses on analyzing various determinants influencing BEV adoption in Malaysia, with a specific emphasis on the moderating impact of government incentives and policies.

Malaysia's unique case, with heterogeneous policy instruments at both central and regional government levels, provides an interesting opportunity to understand the conditions influencing BEV adoption. Drawing parallels with China, where government policies played a crucial role in EV diffusion success, underscores the importance of examining Malaysia's policy landscape for effective and coordinated measures.

Research Objectives

The study aims to investigate whether Environmental Concerns (EC), Knowledge about Battery Electric Vehicles (BEVs) (KB), Perceived Performance (PP), and Cost Sensitivity (CS) exert a positive and significant influence on the adoption intention of Battery Electric Vehicles (BAI) in Malaysia. Additionally, it seeks to examine whether Subjective Norms (SN), Attitude (AT), and Perceived Behavioural Control (PBC) have a positive and significant impact on the adoption intention of Battery Electric Vehicles (BAI) in Malaysia. Furthermore, the research aims to ascertain whether Government Incentives and Policies (GIP) play a significant role in influencing the adoption intention of Battery Electric Vehicles (BAI) in Malaysia. Moreover, it aims to explore whether Government Incentives and Policies (GIP) moderate the relationships between Environmental Concerns (EC), Knowledge about BEVs (KB), Perceived Performance (PP), Cost Sensitivity (CS), Subjective Norms (SN), Attitude (AT), and Perceived Behavioural Control (PBC) with the adoption intention of Battery Electric Vehicles (BAI) in Malaysia. These objectives are crafted to provide a thorough understanding of the factors influencing the adoption intention of Battery Electric Vehicles (BEVs) in Malaysia, with particular emphasis on individual beliefs, perceptions, and external factors such as government incentives and policies. Through meticulous empirical analysis, this study endeavors to contribute valuable insights to both academic discourse and industry stakeholders committed to advancing sustainable transportation solutions.

Research Questions

The research questions are in tandem with the research objectives and go as follows:

RQ-1: Does EC, KB. PP and CS have a positive and significant influence on BAI, the adoption intention of BEV in Malaysia?

RQ-2: Does SN, AT, and PBC have a positive and significant influence on BAI, the adoption intention of BEV in Malaysia?

RQ-3: Does GIP have a positive and significant influence on BAI, the adoption intention of BEV in Malaysia?

RQ-4: Does GIP moderate the relationships between EC, CS, PP, KB, SN, AT, and PBC with BAI, the adoption intention of BEV in Malaysia?

Significance of the study

The anticipated widespread adoption of Battery Electric Vehicles (BEVs) is poised to play a pivotal role in global energy infrastructure, contributing significantly to CO2 reduction. Developed nations like China, the US, and EU members have already incorporated BEVs into their economies, setting a progressive example. Notably, developing nations, including Malaysia, are actively engaging in research and green technological innovations to embrace this modern solution. The key advantage lies in fostering an emission-free future. This paper serves as a valuable resource for automotive players planning to introduce electric vehicles in Malaysia, providing insights into customer preferences. Additionally, policymakers can utilize this information to formulate interventions and policies that promote BEV adoption,

contributing to enhanced energy efficiency, reduced greenhouse gas emissions, and decreased reliance on fossil fuels in the transportation sector.

Scope and Limitations

This study endeavors to engage respondents from diverse regions in Malaysia, utilizing Microsoft Forms for online questionnaires. Targeting individuals aged 18 and above with intentions to purchase a car within the next five years, the survey spans across each state with an estimated duration of six months. However, inherent limitations exist. The non-probabilistic convenient sampling method may not fully encompass all population segments, particularly in remote areas. Additionally, the English language format may pose challenges for respondents more comfortable in languages like Bahasa Malaysia or Chinese. Future studies should consider multilingual surveys and broader outreach. Focusing primarily on passenger cars (PC) while excluding commercial vehicles (CV) and motorcycles restricts the scope, warranting a more comprehensive study across different vehicle types and geographic locations. The proposed adoption intention model, while drawing from past research, could be further enhanced by identifying additional predictors not covered in this study.

Literature Review

This chapter provides a concise review of recent literature on Battery Electric Vehicle (BEV) adoption intention, focusing on both advanced and developing markets. It seeks to delineate key determinants relevant to BEV adoption, specifically tailored to the transitioning Malaysian market from Internal Combustion Engine (ICE) to EV. The research framework is constructed, emphasizing BEV knowledge, environmental concerns, charging station availability, and purchasing price as potential influencers on adoption intention. Additionally, the literature explores the moderating role of government incentive policies, comparing findings with other countries. This comprehensive review sets the stage for examining relationships and impacts on BEV adoption intention in Malaysia.

Electric Vehicle (EV)

An Electric Vehicle (EV) is propelled by an electric motor drawing power from a rechargeable battery and is capable of external charging (Abd El Halim et al., 2022). This broad category includes Battery-Electric Vehicles (BEVs) exclusively powered by electric motors and vehicles utilizing both electric motors and Internal Combustion Engines (ICE). The global prevalence of EVs, encompassing Battery-Electric, Hybrid-Electric, and Plug-In Hybrid-Electric Vehicles, signifies a transformative shift away from Internal Combustion Engine (ICE) vehicles. This shift aims to address the transportation sector's contribution of 25% to Greenhouse Gas (GHG) emissions in 2022, projected to reach 50% by 2035 without intervention, according to IEA research. The proliferation of EVs is expected to mitigate this environmental impact.

Battery Electric Vehicle (BEV)

A Battery Electric Vehicle (BEV) relies exclusively on stored energy in batteries to power its drivetrain, with the driving range per charge typically ranging from 100 to 750 kilometres, contingent upon battery size and car brand. Driving conditions, climate, and battery specifics historically impact the driving range. Once the battery is depleted, recharging is necessary, and the duration depends on the charging station's capacity. BEVs possess distinct advantages, featuring simpler construction, ease of operation, and environmental benefits as

they produce no Greenhouse Gas (GHG) emissions and operate silently. They are especially environmentally friendly, with electric propulsion delivering high torque instantly.

Hybrid Electric Vehicle (HEV)

A Hybrid Electric Vehicle (HEV) integrates an Internal Combustion Engine (ICE) and an electric powertrain for propulsion. It utilizes the electric propulsion system during low power demand, ideal for urban conditions, reducing fuel consumption during idling (e.g., traffic jams), and lowering Greenhouse Gas (GHG) emissions. For higher speeds, the vehicle switches to the ICE, and both powertrains can collaborate to enhance performance, bridging gaps between gear changes and improving acceleration. The batteries can be charged via ICE or regenerative braking, making HEV an ICE-powered vehicle with an electric propulsion system for enhanced fuel economy.

Plug-in Hybrid Electric Vehicle (PHEV)

The Plug-in Hybrid Electric Vehicle (PHEV) builds on the Hybrid Electric Vehicle (HEV) concept to extend the all-electric driving range. PHEVs utilize both an Internal Combustion Engine (ICE) and an electric powertrain, where the electric motor can serve as the primary driver, requiring a larger battery. While PHEVs can operate solely on electricity, their electric-only range is limited to approximately 50-100 km, depending on battery size. For extended distances, the ICE becomes the primary driver, supported by the battery. PHEVs can be directly charged from the grid, recharge through regenerative braking, and benefit from lower carbon footprints and reduced fuel consumption compared to HEVs.

Fuel Cell Electric Vehicle (FCEV)

A Fuel Cell Electric Vehicle (FCEV), commonly known as a fuel cell vehicle, operates on a fuel cell system that generates electricity through chemical reactions, with hydrogen being the predominant fuel. Stored in specialized high-pressure tanks, hydrogen combines with oxygen from the ambient air in the fuel cell to produce electricity, which powers the electric motor propelling the vehicle. Excess energy is stored in a battery or supercapacitor. Notably, FCEVs emit only water during power generation, distinguishing them from traditional Internal Combustion Engine (ICE) vehicles. FCEVs offer the advantage of carbon-free electricity production, similar to Battery Electric Vehicles (BEVs), but with the added benefit of swift re-fueling comparable to conventional vehicles. However, challenges such as limited hydrogen fuel stations, higher fuel cell costs, and safety concerns related to pressurized hydrogen hinder widespread adoption.

Conceptual Framework of the Study

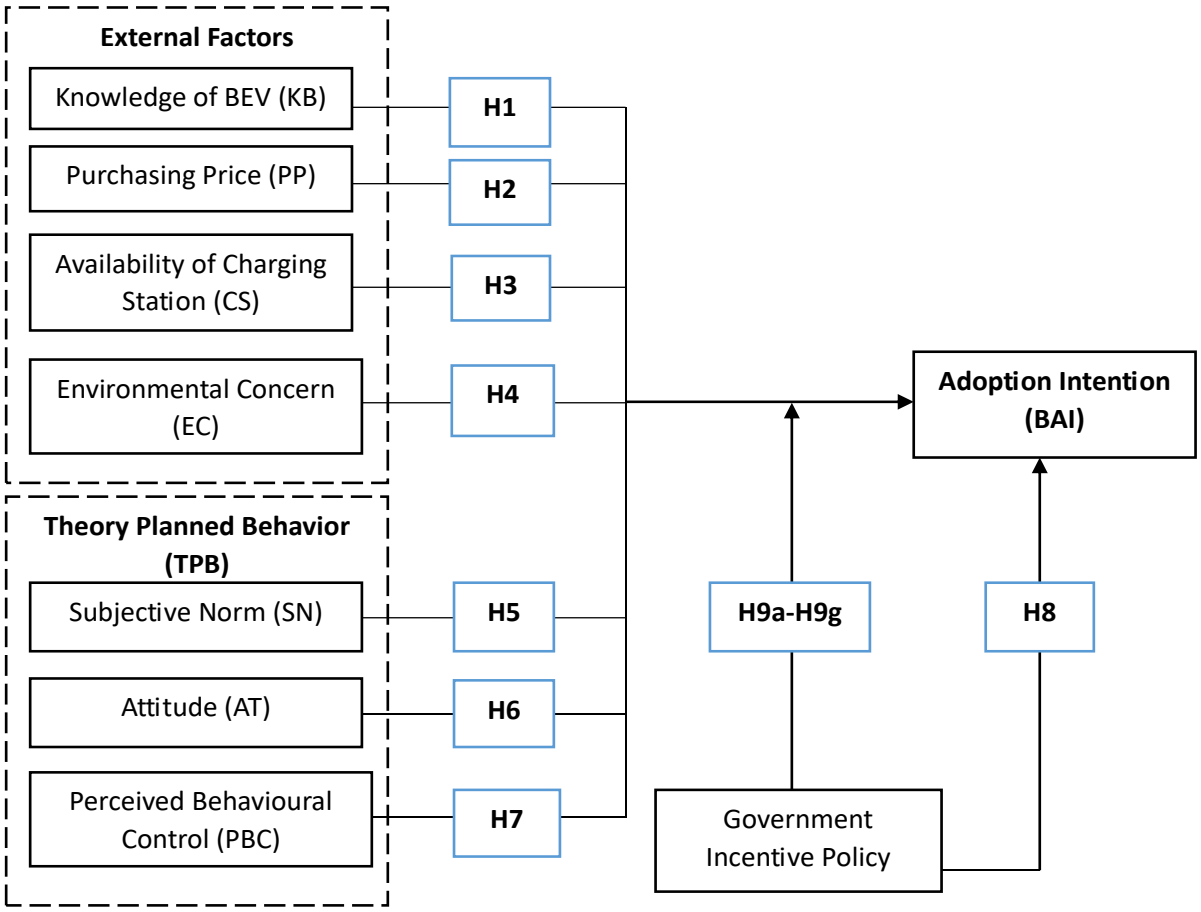

Figure 1.1: Theoretical Framework of the study adapted from the Theory of Planned Behavior (TPB) extended with additional external and moderation factors.

The theory of TPB is applied and extended with the introduction of external variables namely Knowledge about BEV (KB), Environmental Concern (EC), Purchasing Price (PP), and Availability of Charging Station (CS). Additionally, the ambition of this study is also to determine whether Government Incentive Policy (GIP) plays a moderating role in the adoption intention of BEV in Malaysia. The subjects of TPB namely the Subjective Norms (SN), Attitudes (AT), and Perceived Behavioural Control (PBC) are extensively examined by other researchers in both advanced and developing EV markets. The findings about their influence on the adoption intention have varied between geographical locations. Therefore, it is important to understand their impacts on Malaysia. The TPB theory is extended and deepened based on works done by (Dutta and Hwang, 2021; Khaleghiyaraziz, 2021; Ling et al., 2021; Yegin and Ikram, 2022).

Research Hypotheses

The research framework is crafted by hypothesis development after a detailed review of the most recent EV-related literature. Research hypotheses for the study are then derived

from the research framework which predicts the relationships among variables especially towards the issue of the study, the adoption intention of BEV. The expected relationships between variables have been extensively reviewed in the previous sections. Hence, for this study, it is hypothesized that the relationships between variables are as follows:

H1: There is a positive and significant influence of KB, on BAI, the adoption intention of BEV in Malaysia

H2: There is a positive and significant influence of CS on BAI, the adoption intention of BEV in Malaysia

H3: There is a positive and significant influence of PP on BAI, the adoption intention of BEV in Malaysia

H4: There is a positive and significant influence of EC on BAI, the adoption intention of BEV in Malaysia

H5 There is a positive and significant influence of SN on BAI, the adoption intention of BEV in Malaysia

H6: There is a positive and significant influence of AT on BAI, the adoption intention of BEV in Malaysia

H7: There is a positive and significant influence of PBC on BAI, the adoption intention of BEV in Malaysia

H8: There is a positive and significant influence of GIP on BAI, the adoption intention of BEV in Malaysia

H9a: There is a positive and significant moderating effect of GIP on the relationship between EC and BAI, the adoption intention of BEV in Malaysia

H9b: There is a positive and significant moderating effect of GIP on the relationship between KB and BAI, the adoption intention of BEV in Malaysia

H9c: There is a positive and significant moderating effect of GIP on the relationship between PP and BAI, the adoption intention of BEV in Malaysia

H9d: There is a positive and significant moderating effect of GIP on the relationship between CS and BAI, the adoption intention of BEV in Malaysia

H9e: There is a positive and significant moderating effect of GIP on the relationship between SN and BAI, the adoption intention of BEV in Malaysia

H9f: There is a positive and significant moderating effect of GIP on the relationship between AT and BAI, the adoption intention of BEV in Malaysia

H9g: There is a positive and significant moderating effect of GIP on the relationship between PBC and BAI, the adoption intention of BEV in Malaysia

Research Methodology

The research methodology for this study is established to plan the overall steps of the study and conduct an accurate assessment of cause-and-effect relationships between variables i.e., the independent, moderating, and the dependent variables. The study applies quantitative approaches because the results of the study will be used to explain Malaysian general adoption intention of BEV. The quantitative approach allows hypothesis testing which is derived from a review of past research. Even though the qualitative approach has the advantage of exploring the concepts and experiences of people regarding BEV. The result of the qualitative approach could not be generalized to represent the whole Malaysian population against the intention of this study. Therefore, a quantitative approach is more applicable to this study. The quantitative research method provides empirical evidence to

support or reject the established hypotheses from the previous sections. This will allow the researcher to conduct the research by collecting numerical data to be analyzed statistically for its significance and later conclusion can be drawn. In this research, the survey method was chosen due to its practicality in reaching respondents dispersed across various geographical locations, its cost-effectiveness, and its efficiency in swiftly collecting data. The application of Apps like Google Forms or Microsoft Forms makes online surveys even easier to administer. The subsequent section will detail the reasoning behind adopting a structured self-administered questionnaire.

Survey Method

The research methodology employed in this study centered on the cross-sectional survey method, a well-established technique in quantitative research. This approach involved gathering primary data from a representative sample to explore associations among variables. Specifically, a descriptive survey approach was chosen, honing in on a meticulous examination of the population sample to draw general conclusions. The survey method boasted several advantages, including its ability to facilitate broad participation without temporal or spatial constraints, the applicability of results to the broader target population, direct retrieval of information, simplified questionnaire coding, and the exploration of intricate concepts. The decision to use the survey method was rooted in its practicality for reaching respondents dispersed across diverse geographical locations, its cost-effectiveness, and its efficiency in swiftly collecting data. The convenience of administering surveys was further enhanced by leveraging online survey platforms such as Google Forms or Microsoft Forms. The subsequent section of the study will elaborate on the rationale behind opting for a structured self-administered questionnaire, delving into the nuanced considerations that informed these methodological choices.

Survey Questionnaire

In this research, the researcher decided to employ the questionnaire method. A questionnaire is essentially a collection of written instructions that respondents follow to record their answers (Sekaran and Bougie, 2014). The choice of using a survey questionnaire was influenced by several factors, including the availability of resources, the level of precision required, the study's timeframe, budget considerations, and resource availability (Sekaran and Bougie, 2014). The decision to utilize questionnaires is made because they can be easily distributed to diverse groups of respondents and are a cost-effective data collection method. The survey questionnaire used in this study is a self-administered, structured set of questions designed to address the research questions and hypotheses. Section A consists of eleven constructs that are geared to the respondent's socio-demographic information such as gender, age, car ownership, race, monthly income, and some information about travel and vehicle characteristics. Section B of the questionnaire consists of items that are related to the independent variables. While section C of the questionnaire consists of items that are related to the moderating variable and lastly, section D of the questionnaire is on the dependent variable.

Population

The selected measurement unit for this research is the group of individuals who drive cars or car consumers in Malaysia. According to data provided by the Road and Transport Department of Malaysia, there were approximately 16.8 million licensed drivers in Malaysia

as of 2019 which makes up the population of the research. The study focuses on the population in Malaysia from various regions.

Unit analysis and sampling frame

The unit of analysis of this study is the car consumers in Malaysia. The selected study population, which aims to represent the broader population of Malaysia, is drawn from all the states of Malaysia, including the three federal territories. The study aims to collect valid responses from each state and federal territory of Malaysia, totaling about 800 responses, to represent the diverse population of Malaysia.

Sampling design

In this study, a non-probability sampling method will be employed. Non-probability sampling techniques are considered more reliable than other methods and can provide valuable insights into the population (Cavana et al., 2001). Specifically, this study utilized the convenient sampling approach within the category of non-probability sampling. This choice is made because it is the most straightforward method for obtaining information when there is no pre-existing list of potential respondents available. Convenient sampling allows the researcher to collect data from the target respondents in a manner that is convenient, efficient, and feasible. Becker and Bryman (2012) also note that convenient sampling is a widely used and prominent method in the field of organizational studies.

Sampling size

This study strategically targets 800 respondents, representing the diverse population of Malaysia across states, federal territories, and various demographic backgrounds. Various criteria and recommendations contribute to establishing an adequate sample size. Tabachnick and Fidell (2013) propose a formula, N = M + 104, where N is the minimum number of respondents and M represents the number of variables. With nine variables in this study, a minimum of 113 respondents is statistically sufficient. Additionally, Krejcie and Morgan (1970) suggest that a sample size of 384 is adequate for populations exceeding 1,000,000. Guidelines from Hair et al (2017); Sekaran and Bougie (2014) offer valuable insights. Recommendations include sample sizes larger than 30 and less than 500 for most research, ensuring the sample size is ten times the largest number of structural paths, and emphasizing a sample size several times larger than the number of variables in multivariate research. For this study, incorporating seven independent variables, one moderating, and one dependent variable, these guidelines suggest a minimum sample size of 90 car consumers.

However, following Cohen's (1992) guidelines for PLS-SEM and considering eight independent variables in both measurement and structural models, achieving 80% statistical power with an R2 of 0.25 at a 5% significance level requires a minimum sample size of 80 car consumers in Malaysia. Sekaran and Bougie (2014) further recommend a 30% response rate for mail and electronic questionnaires. Anticipating that the total number of respondents will comfortably surpass the minimum requirement, the researcher aims to achieve a robust sample of 800 respondents, ensuring the study's reliability and applicability to the broader Malaysian population.

Measurement Instruments

This section explains the tools employed in this research for measurement purposes and outlines the steps taken to validate these tools for assessing the constructs. Furthermore,

it delves into the scale used for rating the items associated with the constructs and its coding system. Additionally, it offers a concise overview of how the validity and reliability of the measurement instruments were assessed. Lastly, the section touches upon the pilot study that was carried out to test the questionnaires before the main study commenced.

Operationalization of Constructs

In this research, nine variables or constructs are involved, each represented by indicators or items. These indicators serve as measurements indirectly assessing the construct through one or more indicator variables, acting as proxy variables with raw data (Hair et al., 2017). The operationalization process enables the measurement of constructs (Zikmund et al., 2013). The measurement instruments, adapted from previous research, were chosen for their demonstrated high validity and reliability (Becker and Bryman, 2012). This selection ensures that the items align with the dimensions of interest for the studied constructs. Becker and Bryman (2012) highlight the commonality of using existing measurement instruments, emphasizing the advantage of established reliability and validity.

Measurement Scale

The measurement scale in the survey questionnaire, offering predefined response options for posed questions, will be a conventional approach in this research, aligning with established survey research practices (Becker and Bryman, 2012). Categorized by Field (2014), measurement scales fall into four types: nominal, ordinal, interval, and ratio, based on variable characteristics. The nominal scale applies to mutually exclusive categories, like gender types, lacking mathematical utility beyond basic percentages. Similar to the nominal scale, the ordinal scale allows for ranking comparisons but still lacks advanced mathematical operations. The interval scale, commonly used in Structural Equation Modelling (SEM), features equal intervals between data points but lacks a true zero point. This scale permits mathematical operations like mean and standard deviation calculations. The ratio scale represents the highest level, possessing equal intervals and a true zero point, allowing for comprehensive mathematical analysis.

Coding Scale

The coding scale process, involving data tagging and assignment to category groups, will be employed in this study. Subsequently, numerical values will be assigned to facilitate computerized data processing. The Likert scale will be utilized in the survey questionnaire to obtain statistical measures. Past research has indicated that a five-point Likert scale is easily comprehensible to respondents, encouraging them to express their views effectively (Marton-Williams, 1986). The literature further supports the use of a five-point scale, emphasizing its clarity and potential to enhance response rates. Likert scales, classified as ordinal scales, can function as interval scales with clearly defined linguistic attributes reflecting equidistant intervals. Despite various Likert point scales available, the researcher will adopt the five-point Likert scale for its balanced directional categories, including a neutral point for response choices. The decision to avoid the three-point Likert scale is based on its potential for extreme judgments, while the seven-point scale demands more time for respondents to respond. Following the recommendations of Becker and Bryman (2012), the five-point Likert-type scale has been widely adopted by researchers. The measurement scales are pre-coded, a topic addressed in the subsequent section to facilitate computational analysis.

Pilot Study

The researcher will conduct a pilot study before the actual study to assess the quality of the measurement instruments, following the methodology outlined by Cooper and Schindler (2014). This preliminary investigation aims to identify and address any issues with item quality, with the exclusion or revision of low-quality items, ensuring that only effective items are retained for the main survey (Sekaran & Bougie, 2014). Scheduled for October 2023, the pilot study will specifically focus on testing the scale reliability of the research instruments. This step is crucial for gauging respondents' understanding of instructions and questionnaire content, and detecting any weaknesses in design or instrumentation. The Reliability Analysis procedure will calculate Cronbach's Alpha for each measuring item, indicating the internal consistency of the scale. Generally, reliability coefficients below 0.60 are considered poor, those in the 0.7 range are acceptable, and values exceeding 0.8 are considered good (Sekaran & Bougie, 2014).

Data Collection

The data collection for this research will be conducted through a survey utilizing predefined questionnaires set up in Microsoft Forms. The questionnaire method is chosen for its advantages over other quantitative study data collection methods such as interviews and observations (Sekaran & Bougie, 2014). The questionnaire will be instrumental in obtaining information on facts, beliefs, desires, needs, and feelings. The data collection will be officially administered through electronic mail and the social media platform WhatsApp. The survey link, accompanied by a letterhead outlining the study's purpose, will be sent via email. The researcher plans to utilize a web link for the survey, which will be emailed to each operating company and shared via WhatsApp with the Head of Human Resources of the companies. The Head of HR will then disseminate the survey hyperlink to all their employees across Malaysia.

Data Analysis

The most recent EV-related articles were reviewed to study the most appropriate data analysis approaches to be applied to this study. From the review, many studies are found applying Structural Equation Modelling to test their hypotheses. Lashari et al (2021) on the other hand, applied quite a unique analysis method with simultaneous application of Regression Tree and Binary Logistics Regression. For hypotheses testing, different types of software were used like SmartPLS, SPSS, WarpPLS, and LISREL. Meanwhile, the common software used for descriptive analysis is SPSS. The summary of data analysis approaches is displayed in the table below.

In conclusion, the meticulous planning of the research methodology is fundamental to ensuring the study's robustness and applicability. The determination of an optimal sample size, guided by various criteria and recommendations, is a crucial step. This study strategically targets 800 respondents, aiming to represent the diverse population of Malaysia comprehensively. The utilization of formulas such as N = M + 104 and the guidance from Krejcie and Morgan (1970) provide a solid foundation for establishing a statistically sufficient sample size. Additionally, recommendations from Hair et al (2017); Sekaran and Bougie (2014) emphasize the importance of considering factors such as the number of variables and structural paths.

Discussion & Conclusions

In this comprehensive study, the focus is on understanding the dynamics of Electric Vehicle (EV) adoption in Malaysia, a nation undergoing rapid economic growth and facing challenges related to high greenhouse gas emissions from its transportation sector. The study adopts a meticulous research design, incorporating a well-defined survey methodology to gather data from a diverse and representative sample of 800 respondents across various regions of Malaysia. The determination of the sample size follows rigorous guidelines, considering factors such as the number of variables, structural paths, and statistical power. By aligning with recommendations from renowned researchers like Hair et al (2017) and Sekaran and Bougie (2014), the study aims not just to meet but to surpass the minimum response rate, ensuring a robust dataset for analysis.

The research delves into the intricacies of the automotive industry, particularly in the context of EV adoption. With a keen eye on variables such as government incentives, environmental concerns, charging infrastructure, and purchasing prices, the study seeks to unravel the determinants influencing consumers' Electric Vehicle adoption intentions.

Through a comprehensive literature review, the study establishes the groundwork for understanding the different types of EVs, emphasizing Battery Electric Vehicles (BEVs), Hybrid Electric Vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), and Fuel Cell Electric Vehicles (FCEVs). Each vehicle type is scrutinized in terms of its mechanisms, advantages, and challenges, providing a holistic view of the EV landscape. Furthermore, the study adopts a future-oriented approach, employing future tense to discuss the research process, methodology, and expectations. This ensures that the conclusions drawn from the study are forward-looking and relevant for potential future developments.

In conclusion, this study not only contributes to the academic understanding of EV adoption determinants but also holds practical implications for policymakers and automotive industry players in Malaysia. By meticulously planning the research methodology, considering sample size guidelines, and delving into the nuances of EV adoption factors, the study aspires to provide valuable insights for shaping Malaysia's automotive landscape toward a more sustainable and environmentally friendly future.

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