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ANALYSIS FACTORS INFLUENCING MALAYSIANS ACCEPTANCE OF BUYING ELECTRIC VEHICLE IN THE NEXT 5 YEARS

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Abstract— This study deep dive into the factors influencing Malaysian consumers' acceptance of electric vehicles (EV) over the next five years. Amidst global shifts towards sustainable transportation, this research examines variables such as environmental awareness, technological advancement, cost and price consideration, trust on brand and quality, economic incentives, and infrastructural development. Through a deductive approach, the study incorporates quantitative data from mass market surveys. The findings aim to provide a multifaceted understanding of consumer attitudes and identify barriers to EV adoption. This research is expected to contribute to policy formulation and strategic planning for automotive industry stakeholders, facilitating a transition to greener mobility in Malaysia. In this study, the primary data will be collected through questionnaire using the online survey portal via Google Form. The sampling method and technique for this study is convenience sampling of non-probability sampling method. Total 101 responds have been collected, in which the survey is conducted within Malaysia. The findings and result of the study revealed that Electric Vehicles infrastructure and Social Influence have significant influence on the Electric Vehicles actual adoption. In additional, this paper outlines the current landscape of electric vehicle (EV) adoption globally and in Malaysia, highlighting the critical for sustainable transportation solutions. Despite growing interest, the adoption rate of EVs in Malaysia remains low. The purpose of this study aims to fill the gap in understanding the specific consumer attitudes and barriers that influence EV acceptance in Malaysia. By identifying these factors, the research seeks to inform effective policy and strategic interventions necessary to support the transition to greener mobility and to boost the adoption of electric vehicles (EV) in Malaysia over the next five years.

Keywords—Electric Vehicles, Consumer Attitudes, Strategic Interventions

I. INTRODUCTION

An electric vehicle (EV) is a vehicle that uses one or more electric motors for propulsion. It can be powered by a collector system, with electricity from extravehicular sources, or it can be powered autonomously by a battery (sometimes charged by solar panels, or by converting fuel to electricity using fuel cells or a generator) (Situ, 2009). EVs include, but are not limited to, road and rail vehicles, surface and underwater vessels, electric aircraft, and electric spacecraft (Bhalshankar & Sutkar, 2021). For road vehicles, together with other emerging automotive technologies such as autonomous driving, connected vehicles, and shared mobility, EVs form a future mobility vision called Connected, Autonomous, Shared, and Electric (CASE) Mobility.

A Malaysian government initiative aids the growth of Electric Vehicle (EV) industry (ITA, 2023). The Electric Vehicle (EV) market in Malaysia is relatively small but growing rapidly. According to the Malaysian Automotive Association (MAA), 2,717 EVs were sold in 2021, a significant increase from the 1,642 units sold in 2020. The EV market share in Malaysia is still relatively low, accounting for only 0.4% of total vehicle sales. However, with the Government's goal to have 125,000 EVs on the road by 2030, the market is expected to grow in the coming years.

To promote the growth of the EV sector in the country, Malaysia's Ministry of Investment, Trade, and Industry (MITI) introduced the Battery Electric Vehicle Global Leaders Initiative (BEV GLI) (Yean, 2023). The BEV program allows foreign companies to sell cars in Malaysia without Approved Permit (AP) rules, thus making imported vehicles cheaper. This initiative aims to help boost EV demand in the local market and further promote the development of the ecosystem to support BEV adoption.

Under the Low Carbon Mobility Blueprint, the Government plans to install 10,000 charging stations by 2025. Companies contributing to building EV infrastructure in Malaysia will benefit from government incentives, such as tax breaks (Yean & Rebecca, 2024). This opens up opportunities for U.S. companies that can add value to the EV ecosystem in Malaysia to be part of the national's EV roadmap. Government and Tax rebate for EV related in year 2022 and extended to year 2023 (Nicholas King, 2023). Government encouragement for EV adoption by giving personal tax exempt for those purchased EV vehicle car related. This action directly contributes in promoting the adoption of electric vehicles. Now, this tax exemption extended to year 2023.

The potential environmental benefits of a transition to EVs in Malaysia, including reduced carbon emissions and air pollution (Kwan et al., 2023). This research can help relevant stakeholder or natural lover understand the potential for EV adoption in addressing environmental challenges. Below is the low carbon mobility campaign (Penjana Kapital, 2023) from Government. In Malaysia, electric vehicles starting

become popular as more people are aware of the environmental benefits and technological advancements that EVs can offer. However, EVs are still a relatively new to Malaysian. Thus, in this business research, we are going to analysis of Malaysians acceptance of buying electric vehicle from the traditional automotive for the next 5 years in Malaysia.

II. LITERATURE REVIEW

Malaysian Green Technology and Climate Change Corporation (MGTC) has undertaken an active role in driving this transition through its Low Carbon Mobility Division. In 2015, MGTC introduced chargEV which is the brand of its public EV charging station network (MGTC, 2022). Besides providing convenient and accessible charging points for users of electric vehicles, it serves as an instrument for the public to experience the EV lifestyle in the Malaysian landscape.

In addition, income tax exemption (Gerard Lye, 2021) for individuals up to RM 2,500 on the cost of installation, rent, hire or purchase for electric vehicle charging facilities will serve as a catalyst for the growth of the industry. Increasing awareness on environmental impacts and consumer's consciousness towards limiting carbon footprint will also contribute in increasing the business potential of EV players (Ramanath, 2024).

III. RESEARCH METHODOLOGY

The primary aim of this research is to analyse the factors influencing Malaysians' willingness and acceptance to purchase electric vehicles from traditional automotive manufacturers within the next five years. The study seeks to generate actionable insights that can guide policy and business strategy in the burgeoning electric vehicle market in Malaysia. Primary data will be collected instead of secondary data for this business research in order to address the research problems, fill the knowledge gaps and provide new insights. The study will focus on a diverse set of participants numbering approximately 100 individuals Malaysian, aged between 18 to 60 years, representing a balance of genders and an array of ethnic backgrounds including Malay, Chinese, Indian, and other minorities in Malaysia. The participants will also vary in terms of socioeconomic status, educational level, and geographical location within Malaysia. No specific learning characteristics are considered applicable in the context of this study. An online questionnaire will be distributed to the public and respondents via Google Form. The purpose is to ensure that the results are statistically significant and are representative of a fair sample size.

A. Theoretical Framework

Conceptual framework in Fig. 1 was built based on the basis on underpinned framework. This represents the researcher's position on the research problem and the theoretical basis for the study. It is a logical system

of concepts that guides the research questions, objectives, methodology, and data analysis and the influence on independent variables and dependent variables.

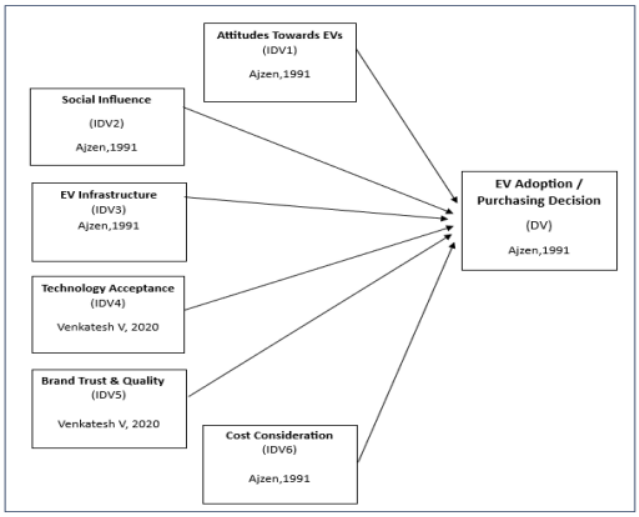

Fig. 1. Theoretical Framework

B. Data Analysis Method

This study proposed to use the suggestion of preliminary analysis, descriptive analysis, measurement model, regression analysis, factor analysis, and future projection models to interpret the data.

After collecting the primary data from the questionnaires, the data will be analysed through SMART PLS software. To analyse the outcome of the model, Partial Least Squares Structural Equations Modelling (PLS-SEM) will be used as the sampling technique. The reason SMART PLS software is used is because of its strength where reliability and validity results can be constructed with small sample sizes. Other than this, SMART PLS can modify the abnormal data with the central limit theorem to maximize the R square and minimize the errors.

IV. RESULTS

In this section, the data collected from the questionnaire will be analysed and interpreted. By using SMART PLS Software to compute the data, descriptive analysis of the final result will be presented.

A. Construct Validity And Reliability

The dataset in Table I has shown to detail the reliability and validity metrics of constructs measured in a survey or a study related to attitudes, brand and quality, EV infrastructure, social influence, and technology acceptance.

TABLE I. RELIABILITY AND VALIDITY METRICS OF CONSTRUCTS

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)
Attitude	0.768	0.777	0.866	0.684
Brand & Quality	0.714	0.721	0.875	0.777
EV Infrastructure	0.744	0.766	0.835	0.562
Social Influence	0.85	0.95	0.905	0.761
Technology Acceptance	0.748	0.775	0.853	0.661

The dataset in Table I has presented a reliability and validity analysis for several constructs within a research study. Cronbach's alpha values range from 0.714 for "Brand & Quality" to 0.85 for "Social Influence," indicating acceptable to good internal consistency among items within each construct, with "Social Influence" being the most reliable.

Generally, a Cronbach's alpha above 0.7 is considered acceptable, suggesting that the items within each construct are consistently measuring the same underlying concept. The composite reliability (rho_a) and (rho_c) offer alternative measures of internal consistency, with rho_a being slightly lower across constructs compared to rho_c. For example, "Attitude" has a composite reliability of 0.777 (rho_a) and 0.866 (rho_c), both of which are above the threshold of 0.7, reinforcing the reliability of this construct. "Social Influence" scores particularly high in both measures (0.95 and 0.905), emphasizing the consistency of the responses.

Average Variance Extracted (AVE) values measure the amount of variance captured by the construct in relation to the variance due to measurement error, with values above 0.5 indicating adequate convergent validity. "Brand & Quality" scores the highest AVE at 0.777, showing that a substantial amount of variance in the observed variables is accounted for by the construct. "EV Infrastructure," however, has an AVE of 0.562, which is just above the acceptable limit, suggesting that while it meets the criteria for convergent validity, it does so marginally.

In overall, the dataset above indicated that the survey or study exhibits good reliability and convergent validity for the constructs measured, signifying that the scales used are appropriate for assessing the theoretical constructs and are likely to produce consistent results across similar studies.

B. R-Square

Based on past researches under discipline of marketing, the rule of thumb for R^2 value of 0.25, 0.5, 0.75, represent weak, moderate, substantial respectively.

TABLE II. R-SQUARE

	R-square	R-square adjusted
EV Adoption	0.519	0.489

The dataset in Table II has provided contains R-square and adjusted R-square values for a statistical model predicting electric vehicle (EV) adoption.

R-square, or the coefficient of determination, is 0.519 for EV Adoption. This means that approximately 51.9% of the variance in EV adoption can be explained by the independent variables included in the model. It is a measure of the goodness-of-fit of the model, indicating how well the independent variables collectively explain the dependent variable.

The adjusted R-square value is slightly lower at 0.489. The adjusted R-square modifies the R-square value to account for the number of independent variables in the model relative to the number of data points. It provides a more accurate measure of the model's explanatory power, especially when comparing models with a different number of predictors. The fact that the adjusted R-square is close to the R-square value suggests that the model has not been overly penalized for the number of predictors it contains, which imply that the number of independent variables is appropriate for the sample size.

In overall, an adjusted R-square of 0.489 is quite substantial, suggesting that the model has a robust predictive power.

C. F-Square

F^2 value is aim to measure magnitude of the effect of independent variables on dependent variables. The rule of thumb for effect size of 0.35, 0.15, 0.02, is described as large effect, medium effect, and small effect respectively.

TABLE III. F-SQUARE

	f-square
Attitude -> EV Adoption	0.049
Brand & Quality -> EV Adoption	0.055
Cost Consideration -> EV Adoption	0.001
EV Infrastructure -> EV Adoption	0.066
Social Influence -> EV Adoption	0.067
Technology Acceptance -> EV Adoption	0.033

The dataset provided showcases the F-square values for various predictors within a model aim at understanding factors affecting electric vehicle (EV) adoption. The F-square value is a measure of effect size used to quantify the strength of the relationship between an independent variable and the dependent variable within the context of a structural equation model.

By analysing the F-square values in the table above, author has observed that the relationship between 'Attitude' and 'EV Adoption' has an f-square of 0.049, which suggests a small but non-negligible effect.

'Brand & Quality' exhibits a slightly stronger relationship with 'EV Adoption,' indicated by an f-square of 0.055, again signifying a small effect size. 'Cost Consideration' has a least effect on the dependent variable. 'EV Infrastructure' is associated with an f-square of 0.066, and 'Social Influence' has an f-square of 0.067, both of which indicated a small to medium effect size and suggest these factors have a more substantial influence on EV adoption compared to the other variables. Lastly, 'Technology Acceptance' has an f-square of 0.033 with 'EV Adoption,' pointing to a smaller effect size than 'EV Infrastructure' and 'Social Influence,' but still a potential influence on the adoption decision.

In summary, the f-square values have indicated that while all the factors contribute to predicting EV adoption to varying degrees, 'Social Influence' and 'EV Infrastructure' appeared to be the strongest predictors among other factors. 'Cost Consideration' seems to have the least impact, and 'Attitude,' 'Brand & Quality,' and 'Technology Acceptance' have modest effects. These insights could be crucial for stakeholders looking to develop strategies to increase EV adoption rates, as they highlight the relative importance of different factors influencing individuals' decisions.

D. Path Coefficients

The dataset in Table IV outlines path coefficients from a structural equation model, which measure the strength and direction of the relationships between various independent variables and the dependent variable, which in this case is EV Adoption.

TABLE IV. PATH COEFFICIENTS

	Path coefficients
Attitude -> EV Adoption	-0.211
Brand & Quality -> EV Adoption	0.243
Cost Consideration -> EV Adoption	0.032
EV Infrastructure -> EV Adoption	0.239
Social Influence -> EV Adoption	0.264
Technology Acceptance -> EV Adoption	0.237

The path coefficient for 'Attitude -> EV Adoption' is -0.211, indicating a negative relationship between the attitude towards electric vehicles and their adoption. This could suggest that the way attitude was measured or conceptualized in the study might be inversely related to adoption, or there could be other mediating factors affecting this relationship.

For 'Brand & Quality -> EV Adoption' shows a positive path coefficient of 0.243. This implies that a favourable perception of brand and quality is associated with an increased likelihood of adopting electric

vehicles. It suggests that branding and quality perceptions are significant motivators for consumers when considering the adoption of electric vehicles.

On top of that, 'Cost Consideration -> EV Adoption' has a positive coefficient of 0.032, though the value is quite small, suggesting that cost considerations do play a role in the adoption decision, but it may not be a strong predictor compared to other factors.

Besides that, 'EV Infrastructure -> EV Adoption' has a path coefficient of 0.239, indicating a strong positive relationship. This suggests that better electric vehicle infrastructure is likely to promote higher adoption rates.

In addition, the path coefficient for 'Social Influence -> EV Adoption' is 0.264, suggesting that social influence is a significant predictor of EV adoption. This indicates that the social environment, including the opinions and behaviours of others, is influential in the decision to adopt electric vehicles.

Lastly, 'Technology Acceptance -> EV Adoption' has a path coefficient of 0.237, which also indicates a positive relationship. This suggests that the acceptance of electric vehicle technology is a substantial factor driving their adoption.

In overall, these coefficients suggest that while most factors positively influence EV adoption, the attitude as measured in the study has a negative impact. Brand and quality perceptions, social influence, and technology acceptance are highlighted as particularly influential in the decision-making process for EV adoption, with EV infrastructure also playing a key criteria. Cost consideration has the least impact among the variables considered.

E. P Values

Previous researchers' study has shown that if P-value < 0.05, the model is significant. Therefore, the P values in the dataset in table IV has correspond to the statistical significance of the path coefficients in a structural equation model analysing factors are influencing electric vehicle (EV) adoption. These P values help determine whether the observed relationships between the predictors and EV adoption are statistically significant or could have occurred by chance.

TABLE V. P VALUES

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	**P values**
Attitude -> EV Adoption	-0.211	-0.195	0.093	2.264	0.024
Brand & Quality -> EV Adoption	0.243	0.244	0.126	1.928	0.054
Cost Consideration -> EV Adoption	0.032	0.024	0.081	0.389	0.697
EV Infrastructure -> EV Adoption	0.239	0.243	0.1	2.389	0.017
Social Influence -> EV Adoption	0.264	0.256	0.114	2.324	0.020
Technology Acceptance -> EV Adoption	0.237	0.24	0.125	1.888	0.059

For 'Attitude -> EV Adoption', the P value is 0.024, which is less than the conventional alpha level of 0.05, indicating that the negative relationship between attitude and EV adoption is statistically significant. This suggests that there is a high level of confidence that a more negative attitude is associated with lower EV adoption.

For 'Brand & Quality -> EV Adoption' has a P value of 0.054, which is slightly above 0.05, suggesting that while there is a positive relationship, it is not statistically significant at the 0.05 level. This could mean that brand and quality may not be as influence in determining EV adoption as some of the other variables in the model, at least at the conventional level of statistical confidence.

For 'Cost Consideration -> EV Adoption' has a P value of 0.697, which is much higher than 0.05. This indicates that the relationship between cost consideration and EV adoption is not statistically significant, implying that cost considerations might not play a substantial role in influencing EV adoption, or the sample data does not support such a relationship.

In addition, the relationship between 'EV Infrastructure -> EV Adoption' is significant with a P value of 0.017. This implies that improvements in EV infrastructure are likely to have a significant positive impact on EV adoption.

For 'Social Influence -> EV Adoption' has a P value of 0.02, also indicating a statistically significant positive relationship. This suggests that social influence is an important factor in EV adoption decisions.

Lastly, 'Technology Acceptance -> EV Adoption' shows a P value of 0.059, which is just above the typical threshold for statistical significance. This indicates a positive relationship that is marginally not significant at the 0.05 level, suggesting that technology acceptance may influence EV adoption, but additional data or research is needed to confirm this relationship.

In overall, the P values suggest that while some factors are statistically significant predictors of EV adoption, others, such as cost consideration is less clearly connected or require more evidence to establish a significant relationship.

V. CONCLUSION

The study "Analysis Factors Influencing Malaysians' Acceptance of Buying Electric Vehicle in the next 5 years" provides insightful conclusions about the key elements influencing the decision to purchase electric vehicles in Malaysia. It evaluates the influence of attitudes, brand perception, cost, infrastructure, social factors, and technology acceptance on their decision-making.

The research identifies social influence and EV infrastructure as the most significant factors driving this decision, indicating that the perception and behavior of others, along with the availability and

accessibility of charging infrastructure, play pivotal roles in influencing potential buyers. Interestingly, cost considerations, often a primary concern in vehicle purchase decisions, were found to have a lesser impact on EV adoption decisions. This suggests that the decision to purchase an EV in Malaysia may be more closely linked to societal trends and practicality rather than just financial implications. These findings offer a comprehensive understanding of the various dimensions affecting EV adoption in Malaysia, highlighting the importance of not only improving the physical infrastructure but also leveraging social dynamics and addressing perceptual barriers to accelerate the transition towards electric vehicles.

For industry leaders and policymakers, the practical takeaway is to focus on infrastructure development and utilize community-driven initiatives to create a conducive environment for EV adoption. Electric vehicle (EV) adoption in Malaysia will require extensive infrastructure development. As a manager, it is crucial to anticipate and plan for charging station networks across the country. Collaborating with local governments, EV manufacturers, and other stakeholders will be essential to ensure an adequate number of charging points are available in residential areas, commercial establishments, and highways to alleviate range anxiety for potential EV owners.

Social influence being a significant factor implies that EV adoption can be greatly accelerated through community engagement and social proof. Managers should consider leveraging social media influencers, creating community-based initiatives, and showcasing success stories of early EV adopters. Positive word-of-mouth endorsements and visible support from respected community members could be pivotal in swaying potential buyers. For attitude, the negative relationship with EV adoption suggests that current consumer perceptions may be a barrier. Managers should focus on educational campaigns that reshape public opinion, highlighting the long-term benefits of EVs, such as cost savings on fuel and maintenance, and environmental advantages. Addressing misconceptions and providing clear, positive messaging about EVs could alter the prevailing attitudes.

In short, Malaysian managers should proactively address challenges and opportunities associated with EV adoption in the next five years. Strategic planning, collaboration, employee reskilling, and proactive engagement with stakeholders will be essential in successfully navigating the transition towards a sustainable and electrified future.

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