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A proposed model of electric vehicles user acceptance in developing countries: Mediating role of technophilia

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Abstract
Purpose: This study investigates people's attitudes and perceptions toward electric vehicles (EVs) in developing countries in the context of escalating concerns about carbon emissions and global warming. It aims to develop a model of EV user acceptance in these nations, with a specific focus on the mediating role of technophilia. By doing so, the study seeks to provide a comprehensive understanding of factors influencing EV adoption, aiding in promoting sustainable transportation choices in developing countries.
Design/methodology/approach: A questionnaire, aligned with the conservation of resources theory (COR) and self-determination theory (SDT), will assess consumer perceptions and factors influencing EV acceptance. This study will collect 400 samples in Malaysia and Indonesia using purposive sampling and targeting high-income respondents.
Findings: The study creates an integrated model of EV acceptance in Malaysia and Indonesia, incorporating TPB, innovation diffusion theory, and relevant technological literature. The model includes four independent variables (charging infrastructure, environmental and social values, EV performance), one mediating variable (technophilia), and the dependent variable (EV acceptance). The research establishes nine hypotheses to explore relationships within the model.

Research limitations/implications: The study is limited to reliance on theoretical frameworks that, while promising, may lack comprehensive empirical support in the specific context of EV acceptance in Malaysia and Indonesia. Further, the study acknowledges the scarcity of empirical evidence and theoretical foundations in certain aspects, highlighting the need to interpret the findings carefully.
Originality/value: The scenario proposes targeted interventions and policies to promote EV development, align with the transition to a low-carbon society, enhance public perception and acceptance of EV technology, and foster sustainable mobility solutions.

Keywords: Electric vehicles, EV acceptance, Technophilia, Social and environmental values, Charging infrastructure.

Introduction

Society has been increasingly mindful of the environment in recent years, with a particular focus on the transportation sector due to its significant contribution to greenhouse gas (GHG) emissions. The transportation industry accounted for around 14% of world greenhouse gas emissions, according to The International Energy Agency (2017). It is projected that by 2030, this percentage would rise to comprise 50% of all greenhouse gas emissions. Consequently, multiple countries are transitioning towards mitigating greenhouse gas (GHG) emissions and environmental contamination in the transportation industry by diminishing the reliance on fossil fuels. Electric vehicles (EVs) offer a viable solution for urban transportation as they reduce reliance on oil and the resulting air pollution, resulting in notable health and environmental benefits (Wu et al., 2019). Previous research has shown that electric cars (EVs) can result in a 30-50% decrease in carbon dioxide emissions and a 40-60% improvement in fuel economy compared to vehicles that rely on traditional fuels (Liu et al., 2019).

Global governments implement policies and initiatives to mitigate carbon emissions (Ustun et al., 2011). The United Kingdom has set a target to decrease carbon emissions by 45% by the year 2020, as stated by Huang and Infield in 2009. EU member states intend to decrease emissions by 20% according to the European Commission in 2010. Malaysia and Indonesia, both classified as developing nations, have implemented sustainable environmental regulations. Malaysia's Ministry of International Trade and Industry (MITI) engaged in a series of conversations with domestic electric vehicle (EV) industry stakeholders regarding EVs and the advancement of the local EV sector (Tan, 2022). It was unanimously decided by all parties to give priority to the construction of efficient and high-quality infrastructure for charging stations. It is necessary to create specific incentives to encourage local industry participants to participate in the electric vehicle (EV) ecosystem. The ministry has recommended the inclusion of further electric vehicle (EV) incentives in the Budget for the year 2023. In October 2022, the previous administration extended the current import tariff and excise duty exemption for Completely Built-Up Electric Vehicles (CBU EVs) in the Budget 2023 until December 31, 2024. The existing duty-free program for completely built-up electric vehicles (CBU EVs) will terminate on December 31, 2023. As for locally-assembled electric vehicles (CKD EVs), the duty-free scheme will remain in effect until December 31, 2025. In addition, the exemption of approved permit (AP) fees for electric vehicles (EVs) was also part of the package. This has the potential to further reduce the cost of imported EVs, provided that enterprises pass on the savings from AP fees to customers (Tan, 2022). In Indonesia, the present government has implemented several programs to encourage vehicle users to use electric vehicles (Gunawan et al., 2022).

EVs are relatively new in the Malaysian and Indonesian automotive industries compared to developed countries such as Japan, the USA, or Europe. In developing countries such as Malaysia and Indonesia, governments are ready for EV adoption, and measures have been taken toward promoting the use of EVs by the EV industry players (Adnan et al., 2017). Since EVs are an emerging sustainable renewable energy and technology, a few studies have been performed on the factors of public acceptance and adoption of EVs (Adnan et al., 2016; Sang & Bekhet, 2015). However, studies on the antecedents of EV acceptance in developing countries in Indonesia and Malaysia are scarce. Therefore, the study investigates the relationship between charging infrastructure, environmental values, social values, electric vehicle performance, and technophilia toward EV acceptance. The study addresses the following research question: Is there any relationship between charging infrastructure, environment values, social values, electric vehicle performance, and technophilia?

Literature Review

Electric Vehicles Acceptance

The acceptance of electric vehicles is contingent upon a confluence of factors encompassing ecological apprehensions, governmental regulations, charging infrastructure development, consumer awareness, financial deliberations, and individual inclinations. The adoption of EVs has garnered significant attention in numerous nations as a potential solution for mitigating carbon emissions and decreasing reliance on traditional fossil fuel sources. The escalating apprehensions regarding air quality and climate change have engendered an expanding fascination with electric vehicles as a more environmentally benign and enduring means of transportation. The research conducted by Ali, Sitinjak, Md Said, Hassim, Ismail, and Simic (2023) has shed light on the noteworthy inclination among Malaysians to embrace electric vehicles, primarily driven by their perceived environmental advantages. The acceptance of electric cars is significantly influenced by the presence and implementation of government policies and incentives. Malaysia has implemented various measures to foster the adoption of EVs, including providing tax incentives and rebates. The significance of incentives in shaping consumer preferences and facilitating the widespread acceptance of electric vehicles is highlighted in the study conducted by Hopkins, Potoglou, Orford, and Cipcigan (2023). The presence and accessibility of charging infrastructure play a pivotal role in shaping the level of acceptance towards electric vehicles. The imperative to mitigate range anxiety necessitates the expansion of charging networks. The study by Liang, Qiu, Liu, He, and Mauzerall (2023) elucidated the imperative of augmented investment in charging infrastructure to cultivate heightened EV adoption, specifically emphasizing urban locales. The primary impediment to the widespread adoption of electric vehicles in Malaysia persists in the form of the initial purchase cost. Albatayneh, Juaidi, Jaradat, and Manzano-Agugliaro, (2023) have underscored the significance of recognizing that EVs can generate substantial cost savings over an extended period. However, it is crucial to acknowledge that the initial investment required for acquiring an EV act as a deterrent for numerous prospective consumers. This matter could be resolved by implementing inventive financial mechanisms and collaborations with esteemed financial establishments. As the general knowledge and comprehension surrounding EVs expand, coupled with the sustained governmental incentives to promote their adoption, it is plausible to anticipate a progressive surge in the societal acceptance of electric cars. Nevertheless, it is imperative to acknowledge the significance of tackling the obstacles pertaining to infrastructure and pricing to facilitate the extensive acceptance and utilization of said innovations within the nation.

In order to investigate the possible scope of research on electric vehicles (EVs), the researcher performed a co-word analysis using VOS Viewer, a robust software tool designed for visualizing bibliometrics (He, 1999). Figure 1 presents the visual outcomes of the keyword co-occurrence analysis. The pale blue hue of the region signifies the terms that are associated with their frequencies. Based on the visual representation in Figure 1, there are two distinct conclusions that might be drawn. The predominant research methodologies include agent-based modeling, expressed preference analysis, surveys, and system dynamics. Two often used theories for constructing research models are the theory of planned behaviour (TPB) and the technology acceptance model (TAM). Previous scholars that have studied the factors that influence customers' adoption of electric vehicles can be categorized into three broad groups. The primary focus is on the product and its surrounding elements, with the associated keywords encompassing the overall cost of ownership, battery and battery storage, charging and charging stations, electric mobility, price, smart charging, fast charging, and smart grid. The second part pertains to policy matters, encompassing climate policy, incentives, social welfare, subsidies, public policy, and other relevant topics. The third category encompasses personal variables, including views, customer preferences, environmental concerns, and range anxiety.

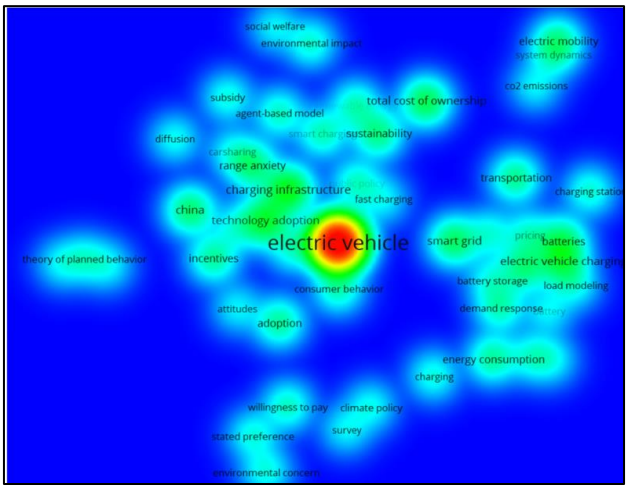

Figure 1: Density visualization network using keyword co-occurrence analysis

Although numerous scholars have conducted studies on EVs, studies on EV acceptance are still relatively low. In fact, previous literature focused intensively on certain factors, such as incentives and charging infrastructure, and there are no comprehensive measures to further widespread EV technology and EV acceptance.

Charging Infrastructure and EV Acceptance

In terms of charging infrastructure, it is crucial for drivers to have convenient and user-friendly access to charging stations. This is because electric vehicles (EVs) require frequent charging, especially for long-distance journeys. EVs may face challenges in achieving mainstream adoption without a comprehensive charging infrastructure. Governments worldwide, including the United States, are making significant investments in the expansion of charging infrastructure to facilitate the expansion of the electric vehicle (EV) market. This involves the installation of public charging stations in urban areas, key roads, and other travel routes. Furthermore, businesses allocate resources towards the development of exclusive charging infrastructure to cater to the needs of their staff and customers. This encompasses workplace charging stations as well as charging stations located at shopping malls, hotels, and other public

areas. These initiatives are contributing to the increased availability and ease of use of electric vehicles (EVs), and are a crucial element in facilitating the shift towards a more environmentally friendly future. Academics concur that the presence of charging infrastructure plays a crucial role in influencing the adoption of electric vehicles in the market. In their study, Santos and Davies (2020) found that 75% of participants believed that a well-established charging infrastructure would significantly or somewhat contribute to the adoption of electric vehicles. Convenient availability of charging stations holds significant importance (Giansoldati et al., 2020). One can reasonably assume that the presence of charging infrastructure has a substantial and favorable impact on the acceptability of electric vehicles.
H1: Charging infrastructure has a significant relationship with EV acceptance.

Environment Values and EV acceptance
Based on Khuc et al. (2023), nowadays, many people and scholars worldwide are very concerned about the environmental challenges that the world is facing. EVs are marketed as zero-emission vehicles, but their production also has an environmental cost, primarily from the mining and production of lithium-ion batteries (Rimpas et al., 2023). Environmental concerns are also considered when determining the severity of environmental issues that need to be fixed; according to Jabeen et al. (2023), concerns about the environment include finding solutions to environmental issues by involving important environmental variables. They also investigate how consumer hedonic and environmental motives influence consumers' intentions to buy environmentally friendly vehicles.

Empirical research conducted in Malaysia has demonstrated that driving an electric vehicle (EV) in an urban environment consumes a lower amount of energy. Electric vehicles (EVs) utilize regenerative braking to collect energy during the braking process. Specifically, the electric motor operates as a generator by transferring energy from the car's wheels to the battery-powered electric motor. According to recent research by Muzir et al. (2022), electric vehicles (EVs) are considerably more efficient when driving on discontinuous urban routes compared to uninterrupted freeways due to the regenerative braking mechanism's ability to recycle energy. Furthermore, introducing electric vehicles (EVs) into the Malaysian automotive market has changed the sector, making it more environmentally friendly and less reliant on gasoline (Aderibigbe & Gumbo, 2023). Therefore, the following hypothesis is proposed:
H2: Environmental values have a significant relationship with EV acceptance.

Social Values and EV Acceptance
The adoption of electric vehicles (EVs) represents a substantial and undeniable revolution for the transportation sector (Tan et al., 2023). While some countries are making significant advancements in the adoption of electric vehicles (EVs), many others are lagging behind (Ramachandaramurthy et al., 2023). The achievement of a carbon-neutral global society will remain unattainable until there is widespread global acceptance of electric vehicles (Wittmann, 2023). This article examines the acceptability of electric vehicles (EVs) in Malaysia, with the goal of identifying issues and devising effective solutions to promote the use of EVs.

Social values and acceptability of EVs, as defined by Ramachandaramurthy et al. (2023), is the extent to which an individual desires to obtain a specific new technology and how it influences their behavior and society as a whole. The adoption of social values can significantly impact the quality of selection (Eppstein, et. al., 2011). The future trajectory of the transportation system is influenced by various elements, including political, economic, social, technological,

and environmental aspects. In order for social worth to exist, it is essential for individuals to possess the motivation to actively participate in a society that upholds comparable values and perspectives (De Vecchi & Sala, 2023). In addition, individuals will only be permitted to engage in the community if they adhere to public legislation, societal standards, principles, and regulations. Individuals often associate themselves with a certain group, which is known as social identity, and this has a substantial impact on their decision to adopt electric vehicles (Corradi et al., 2023). Based on these arguments, it is hypothesized that:
H3: Social values have a significant relationship with EV acceptance.

Electric Vehicles Performance
Electric vehicles have emerged as a prominent and environmentally conscious alternative to conventional internal combustion engine vehicles, owing to their enhanced cleanliness and sustainability attributes. The evaluation of EV performance holds significant importance as it directly impacts consumer acceptance and overall market saturation. One of the salient characteristics inherent to electric vehicles is their remarkable acceleration, which can be attributed to the instantaneous delivery of torque. Multiple scholarly investigations, such as the comprehensive research conducted by Alanazi (2023), shed light on the superior acceleration capabilities exhibited by EVs compared to their conventional counterparts. This particular attribute not only serves as a significant factor in enhancing the overall driving experience but also serves as a noteworthy indicator of the immense potential that electric propulsion holds in the realm of sports and high-performance automobiles. The review conducted by Alzehawi, Faris, Darsivan, and Rafeeq (2023) scrutinized the progressions in battery technology and their consequential effects on the augmentation of the EV range. Advancements in the realm of lithium-ion batteries, coupled with the emergence of solid-state batteries, hold considerable potential in augmenting the driving range, mitigating range anxiety, and enhancing the adaptability of electric vehicles across diverse domains. The impact of efficiency extends beyond its influence on the driving range, encompassing both the economic and environmental dimensions of EV operation (Hu et al., 2023). With the rapid progression of technology, EVs have been consistently enhancing their performance metrics, effectively mitigating significant apprehensions such as range anxiety and charging durations (Kosuru & Kavasseri Venkitaraman, 2023). The aforementioned advancements play a pivotal role in facilitating the broader acceptance of electric vehicles, particularly within the framework of sustainability and diminished emissions. Thus, hypothesis 4 is proposed.
H4: EV performance has a significant relationship with EV acceptance.

Technophilia and EV Acceptance
Technophilia refers to a person who is enthusiastic about information technology. The advancement of technology has created modern machines that benefit consumers as well as the social environment. Osiceanu (2015) claims that technophilia is one of the new technologies that has its own strong value and attraction to use. Previous literature stated that technophilia significantly influences the intention and adoption of electric cars (Abbasi et al., 2021). It is specifically associated with consumers who are open to receiving new technology. These consumers always hope and are eager to find something more innovative that benefits their future (Rogers, 2003). Axsen & Kurani (2012) found that consumers with EV cars will always share their experience by expressing their good emotions to others, which strongly influences others to adopt such technology. The sharing of knowledge specifically tells others about the usefulness of the technology and the worth of adopting it. Technophilia is expressing emotions toward new technology and motivating others to adopt and accept that technology (Abbasi et al., 2021). EVs' innovation and performance determine consumers' main value in accepting

innovative technology (Gerpott & Mahmudova, 2010). Fazel and Akzeptanz (2014) found that technophilia significantly influences consumers to use and adopt new technology. Therefore, the following hypotheses propose that.
H5: Technophilia has a significant relationship with EV acceptance.

Mediating Role of Technophilia
According to Biswas and Roy (2015), the introduction of new items has an impact on consumers who are seeking innovative technology. Consumers have a tendency to share their experiences with new technologies with others while operating electric vehicles (EVs) (Axsen & Kurani, 2012). According to the literature, having knowledge and awareness of technology and being cautious about new items might lead to an increased likelihood of consumers making a purchase (Egbue & Long, 2012). Charging infrastructure and environmental values are expected to significantly influence EV acceptance through technophilia (Abbasi et al., 2021). Based on the arguments, the following hypotheses are developed:
H6a: Technophilia positively mediates the relationship between charging infrastructure and EV acceptance.
H6b: Technophilia positively mediates the relationship between environmental values and EV acceptance.

Technophilia is defined as a strong attraction and enthusiasm for new technology (Osiceanu, 2015). Technophilia is a crucial factor that is able to boost individual emotions and responses towards the performance of new technology. These innovative technologies may affect consumers' values and affect the sociological environment when new technology is worth using (Morton et al., 2011). Findings from the previous studies technophilia give significant value to user attitude and behavior (Dastjerdi et al., 2019), acceptance anxiety (Briz-Ponze et al., 2017), enjoyment (Zhang et al., 2015) and satisfaction (Yoon, 2016). Osiceanu (2015) claimed that technophilia gives a positive view and benefits in improving their life when open to new technology. Many other studies found that technophilia is associated with various adoptions and usage, such as photovoltaics (Palm, 2020), electronic cigarettes (Zavala et al., 2019), and electronic vehicles (Schluter & Weyer, 2019). However, very few studies have examined technophilia in relation to social values and acceptance. Technophilia has been measured as a moderator in technology acceptance (Han et al., 2021; Atif et al., 2023); however, there is little mediation between social values and acceptance. Hence this study proposes.
H6c: Technophilia positively mediates the relationship between social values and EV acceptance.

Technophilia is a crucial factor in explaining behavioral responses and acceptance of technology. The behavioral response specifically explains how the performance of the new technology has been used. The EV performance for this study is defined as how implementing a new technology system will meet individual needs that benefit them in operating advanced technology (Khazaei, 2019). Supported by the previous literature, the EVs performance will bring better performance than the previous car technology (Ali et al., 2019). In particular, when the performance of the new technology is high it affects the technophilia. Consumers are eager to have technophilia when they individually know the performance of the new technology is worth it for them. As such, they have now started to accept the new advanced technology such as EVs automobiles (Abbasi et al., 2021). The higher the technophilia, the better the performance, which leads to EV acceptance (Han et al., 2021; Venkatesh et al., 2003). Abbasi (2021) found that technophilia significantly influences intention toward EVs. Many previous studies measured technophilia as a determinant of technology acceptance and intention (Abassi

et al., 2021; Abbasi et al., 2019); however, few studies analyze technophilia as a mediator between performance and acceptance. Wolff and Madlener (2019) claimed that there is a lack of research on how EVs adapt to driving new technology. Hence, it remains unclear from the perspective of EV acceptance technology. Han et al. (2021) claimed that people with higher technophilia will be open to adopting new technologies and positively perceive new technology performance usage. In the present study, technophilia will give strong value to EV performance, which will finally lead to EV acceptance. Thus, technophilia would play a mediating role in the relationship between EV performance and acceptance. Based on the above reasoning, the present study proposed the following hypotheses

H6d: Technophilia positively mediates the relationship between EV performance and EV acceptance.

Conservation of Resources Theory and Self-Determination Theory

The study is underpinned by two (2) theories; Conservation of Resources Theory (COR) and Self-Determination Theory (SDT). The suggested conceptual framework is derived from the COR theory, formulated by Hofball (1989), which posits that individuals universally want to obtain, sustain, and safeguard their personal resources. Previous studies highlight the significance of the COR theory in the implementation and utilization of technological acceptance. This theory aids stakeholders, including government policy-makers and players in the electric vehicle (EV) industry, in comprehending how individuals make decisions by evaluating the potential gain or loss of resources. Furthermore, according to the COR hypothesis, individuals will experience a decrease in negative emotions and an increase in the rate of resource acquisition when they perceive an increase in available resources. Building on the COR theory, which has been successfully applied in the technology acceptance area before (Deng et al. G, Wen, 2023), the researchers anticipate that social and environmental values, charging infrastructure, EV performance, and technophilia would stimulate EV acceptance.

SDT is a broad theory of human personality and motivation in human interaction with the social environment. It was introduced by Deci and Ryan (2002) whereby the theorists suggest that humans can become self-determined when the three (3) basic psychological needs, namely autonomy, competence, and relatedness, are full-filled (Deci & Ryan, 2002). Scholars in the past have validated the needs as the most predictive and dependable mediators of engagement, motivation, and well-being (Peters et al., 2018), especially in the case of engaging in their self-interest. Relatedness. Relatedness refers to the feeling of connectedness or connection with others through interaction, creating a sense of belonging and enjoyment (Ryan & Deci, 2000). The ownership of EVs may offer a sense of belonging to the modern technology-based society. Moreover, the product could provide a source of interaction and conversation of experience among EV communities offline or online (Ruiz, 2020), as users prefer to connect with other users for advice on EV usage rather than reading the training manuals (Wright et al., 2021). As a result, technophilia is expected to connect EV users with the EV communities and is expected to positively and significantly influence EV acceptance. Autonomy. Scholars define autonomy as the sense of control over one's actions and choices of activities (Chen et al., 2014). In relation to EV acceptance's autonomous behavior, refers to the choices the customers make on when and how to interact with EV. Humans will more than likely take a leading role in the decision to use the EV. As a result, technophilia is expected to improve when users can make their own choices and accept EV technology. Competence. It refers to one's ability to execute an action successfully and achieve the desired goal, eventually increasing human motivation (Deci & Ryan, 2000). In other words, the individual must feel capable of functional performance, participation, and achieving one's goals. The self-interest of EV technology (technophilia) will

promote a sense of competence and motivation to operate EV technology, which is essential for a feeling of accomplishment.

Proposed Research Model

In previous literature, many factors influenced electric vehicle user acceptance. However, in this study, four (4) factors influencing and mediating the role of technophilia are proposed in assessing the promotion of sustainable transportation choices in developing countries. Figure 2 exhibits the proposed conceptual research model.

Methods

This research proposes a comprehensive model for EV acceptance and investigates the intricate relationships among various factors including charging infrastructure, environmental values, social values, and EV performance. Additionally, the study aims to explore the mediating role of technophilia among EV users in Malaysia and Indonesia. This is a comparative study on collecting data from Malaysia and Indonesia to enrich the understanding of diverse sociocultural and economic contexts. The study intends to select the countries due to multiple reasons. First, the take-up rate of EVs in Malaysia and Indonesia is the lowest in Asia, representing 0.3 and 0.1 percent, respectively (Statistica.com, 2023). Second, since Malaysia and Indonesia are still in the early stages of adopting EVs, both countries are committed to developing a better future for the next generations by shifting toward a sustainable environment, particularly in the transportation industry. Numerous initiatives have been done to accomplish the mission, such as a series of constructive discussions with the EV industry players, development of EV policymaking, and EV ecosystem, including EV as one of the national agenda, incentives allocation for the industry players and users, and more.

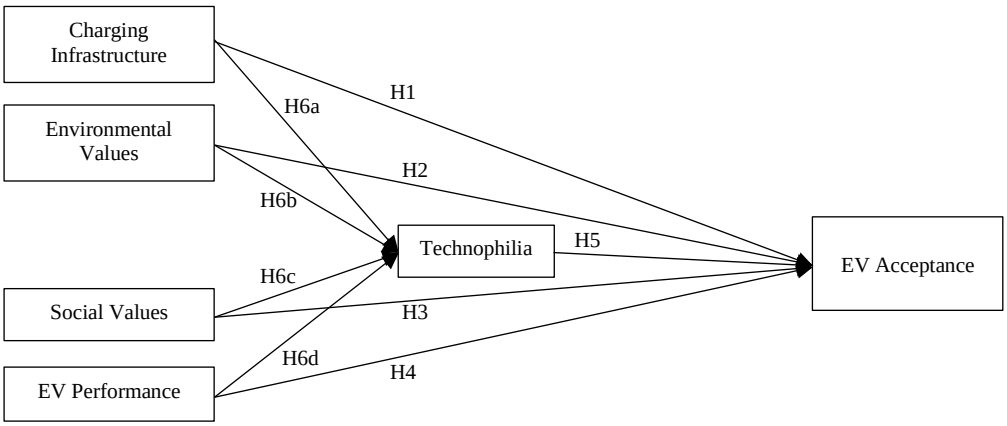

Figure 2: Proposed conceptual framework of this study.

A quantitative approach will be adopted to achieve these goals, involving the design of tailored questionnaires for data collection. The selection of participants will be based on purposive sampling, ensuring that the research captures insights from a specific target group. The questionnaire will draw on insights from previous studies, but before the actual distribution, a pre-test will be carried out to identify any necessary refinements regarding question wording and response options.

The study will specifically target 400 respondents who are active EV users located in the regions of Klang Valley, Selangor in Malaysia, and Surabaya in Indonesia. The decision to collect data from Malaysia and Indonesia is justified by the need to understand the factors

influencing the acceptance of electric vehicles (EVs) in diverse Southeast Asian contexts. Both countries represent emerging markets with significant potential for EV adoption but exhibit different socio-economic, cultural, and infrastructural characteristics. A comparative study allows for identifying common factors and country-specific determinants, providing a comprehensive understanding of the barriers and drivers of EV acceptance in the region. This approach enables the development of tailored strategies that can effectively address the unique challenges and leverage the opportunities in each country.

Klang Valley in Malaysia and Surabaya in Indonesia were chosen as the focal points for data collection due to their economic significance, urbanization levels, and representativeness of the broader urban population in each country. Klang Valley, encompassing Kuala Lumpur's capital and surrounding areas, is Malaysia's most developed and densely populated region. It is a hub for economic activities, technology adoption, and infrastructure development, making it an ideal location to study consumer attitudes towards EVs. Surabaya, the second-largest city in Indonesia, is a major economic center in East Java. It mirrors the urban dynamics and infrastructural challenges present in many Indonesian cities, providing valuable insights into the factors affecting EV acceptance in an Indonesian urban context. By focusing on these urban centers, the study can capture the perspectives of a significant portion of potential EV users who are likely to influence the broader market trends in their respective countries.

The required primary data will be obtained through a self-administered questionnaire. Since it was not feasible to get the list of all drivers in Malaysia and Indonesia, a non-probability purposive sampling method will used to collect 400 samples drawn from two different locations to gain greater variance in the outcome and based on similar previous studies (Klabi & Binzafrah, 2023; Mohamad et al., 2016). The decision to target 400 respondents is grounded in the need for a statistically significant sample size to ensure the research findings' reliability and validity. A sample size of 400 allows for robust statistical analysis, reducing the margin of error and increasing the confidence level of the results. This sample size is adequate to capture the diversity of opinions and experiences within the target population, enabling the identification of meaningful patterns and correlations in the data.

The study intends to collect 200 samples in Malaysia and 200 samples in Indonesia because the sample is appropriate based on a previous study by Öztürk & Barutçu (2022) specifically targeted those who are aware and intend to adopt EV technology. The rationale for collecting data from 200 respondents in each country is to achieve a balanced comparative analysis. By ensuring an equal number of respondents from Malaysia and Indonesia, the study can accurately compare and contrast the factors influencing EV acceptance in both contexts. This balanced approach minimizes potential biases that could arise from unequal sample sizes and enhances the generalizability of the findings to the broader populations in both countries. The basis for selecting 200 respondents per country lies in the principles of statistical power and representativeness. This sample size is sufficient to detect significant differences and similarities between the two groups, providing a clear understanding of the underlying factors affecting EV adoption in Malaysia and Indonesia.

The data analysis plan for this study will be informed by insights from the literature on EV acceptance and consumer behavior theories. The study plans to cross-validate the results of a regression analysis. Nunally (1978) suggested that if one wants to select the best variables from as many as ten possible ones, there should be between 400 and 500 samples. The collected data will be analyzed using the Structural Equation Modelling - Partial Least Square (SEM-PLS)

method due to this research's nature of testing a hypothetical framework from a prediction perspective (Hair Jr et al., 2017; Koay et al., 2020; Leung et al., 2020). This advanced statistical technique allows for examining complex relationships and provides a comprehensive understanding of the factors influencing EV acceptance.

The data analysis plan for this study includes several rigorous techniques to ensure comprehensive and reliable insights. Initially, descriptive analysis will be conducted to compute means, standard deviations, and frequencies, clearly summarizing the sample's demographic characteristics and key variables. Comparative analysis techniques such as t-tests and ANOVA will be employed to identify significant differences between the Malaysian and Indonesian samples, highlighting unique and shared factors influencing EV acceptance in each context.

Further, exploratory factor analysis (EFA) will be used to uncover the data's underlying structure and identify potential constructs measured by the questionnaire items. Reliability assessment, through Cronbach's alpha, will ensure the consistency of the items. Confirmatory factor analysis (CFA) will follow to validate the measurement model, confirming the constructs identified in the EFA and ensuring their reliability and validity.

Once the measurement model is rigorously evaluated, the structural model will be tested and validated. This involves examining the hypothesized relationships between variables and assessing the model's overall fit. This quantitative approach is designed to provide valuable insights into the acceptance of EVs in Malaysia and Indonesia, elucidating the complex dynamics that drive EV adoption in these emerging markets.

Discussion and Conclusion

The comparative study on the acceptance of electric vehicles (EVs) in Malaysia and Indonesia reveals several key insights. The primary factors influencing EV acceptance in both countries include environmental values, social values, charging infrastructure, and EV performance. However, the relative importance of these factors varies between the two nations due to differing socio-economic and cultural contexts. In Malaysia, the study highlights that environmental values and social values play a more significant role in shaping consumer attitudes towards EVs. This is likely due to higher environmental awareness and a stronger societal push for sustainable practices. Conversely, in Indonesia, the availability and convenience of charging infrastructure are paramount. Given the archipelagic nature of the country and the varying levels of infrastructure development, the ease of access to charging stations becomes a critical determinant for potential EV users. Furthermore, the study finds that technophilia, or the affinity towards new technologies, is a mediator in the acceptance of EVs in both countries. This suggests that individuals who are more inclined towards adopting new technologies are also more likely to embrace EVs, highlighting the importance of targeting tech-savvy demographics in promotional campaigns.

Theoretical and Practical Implications

The findings of this study contribute to the theoretical understanding of EV acceptance by integrating concepts from the Theory of Planned Behavior (TPB), Technology Acceptance Model (TAM), Unified Theory of Acceptance and Use of Technology (UTAUT), Self-Determination Theory (SDT), and Conservation of Resources (COR) theory. Specifically, the study underscores the relevance of intrinsic motivation, as posited by SDT, in driving sustainable behavior such as EV adoption. It also validates the role of external resources and

infrastructure, as highlighted by COR theory, in influencing consumer decisions. By applying these theories to the context of Malaysia and Indonesia, the study provides a nuanced understanding of how cultural and infrastructural differences impact EV acceptance. This theoretical framework can be used as a basis for future research to explore EV adoption in other emerging markets, allowing for a comparative analysis across different regions.

The study offers several practical implications for policymakers and industry stakeholders. In Malaysia, efforts should focus on enhancing public awareness about the environmental benefits of EVs and leveraging social values to drive adoption. Public campaigns and incentives that highlight the ecological advantages and align with the societal push toward sustainability can be effective. In Indonesia, the primary focus should be on expanding and improving the charging infrastructure. Government initiatives to install more public charging stations are essential, particularly in urban areas and along major highways. Partnerships with private enterprises to develop workplace and commercial charging facilities can also support the growth of the EV market. Additionally, targeting tech-savvy individuals through digital marketing and providing incentives for early adopters can accelerate the adoption process in both countries. Tailored marketing strategies emphasizing EVs' technological advancements and superior performance can appeal to this demographic.

Limitations and Suggestions for Future Research

In today's dynamic business landscape and the ever-expanding global market, the acceptance of EVs is a critical consideration. This research explores a conceptual model that identifies the key factors influencing EV acceptance, comprising environmental values, social values, charging infrastructure, and EV performance to foster sustainable development. The goal is to pinpoint the most influential factors in a given context, aiding in EV technology's effective planning and introduction to pursue sustainability and environmental goals.

Furthermore, fewer studies use technophilia as a mediator in EV acceptance, and the majority analyze it as a direct relationship and a moderator function. Therefore, this paper has attempted to review the relationship of all the factors and has found that all can potentially lead to EV acceptance. Meanwhile, by identifying all the factors, this study will benefit policymakers, legislators, and technology providers concerning the key factors influencing the acceptance and adoption of EVs within the context of sustainable development. It seeks to facilitate the development of effective strategies and approaches for promoting EV adoption among the public.

Moreover, for future research plans, this study is interested in leveraging theories related to EV acceptance and diffusion to identify critical factors shaping consumer behavior, public perception of EV technology, and their collective impact on fostering sustainable development. This study is more in-depth in EV acceptance due to limited empirical evidence and theoretical support. Even though limited researchers suggest exploring the impact of various contextual and influencing factors on the widespread adoption of EVs in the Malaysian and Indonesian context. Previous research on EV acceptance has predominantly utilized perspectives such as the Theory of Planned Behavior (TPB), TAM (Technology Acceptance Model), and UTAUT (Unified Theory of Acceptance and Use of Technology) 1 & 2. However, there has not been prior research utilizing the perspectives of COR theory and SDT developed by Deci and Ryan (Ryan & Deci, 2017) in explaining the acceptance of EVs. This study will adopt the perspectives of SDT and COR. Within the framework of SDT, behaviors are more likely to persist if based on intrinsic motivation, or specifically in this research, technophilia. This

motivation stems from pleasure and satisfaction from engaging in the behavior. Environmental-friendly behavior, including the acceptance of electric vehicles, is expected to be greater with the mediation of technophilia.

The next phase of this study involves the development of a data collection instrument to assess EV user acceptance and public perception of EV technology in Malaysia and Indonesia. Statistical analysis will be performed using software called Multigroup SEM-PLS. Participant responses were converted into numerical values, which were then subjected to factor analysis to understand the underlying factor structure influencing the acceptance behavior of electric vehicles. The aim is to generate valuable insights and knowledge in the domain of EV acceptance and public perception, which can be instrumental in advancing sustainable mobility in these countries.

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