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Article

An interpretative phenomenological analysis: Is Indonesia prepared for electric vehicles?

Amit Joshi[1,*], Saharsh Jain[2], Puneet Kumar Gupta[2]

[1] Gandhi Memorial Intercontinental School, Jakarta 14410, Indonesia
[2] ICFAI Business School, ICFAI University, Dehradun 248001, India
*** Corresponding author:** Amit Joshi, ihsojtima@gmail.com

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Abstract: The transition towards sustainable transportation is critical for Jakarta, where traditional gas-powered vehicles contribute substantially to air pollution and adverse health effects. Battery- Powered Electric Vehicles (BEVs) represent a viable alternative, backed by technological advancements and government interventions like subsidies. However, despite these initiatives, BEV adoption remains influenced by factors beyond just price. This study explores consumer perceptions and the determinants of BEV demand using Interpretative Phenomenological Analysis (IPA). The qualitative research, conducted through semi-structured interviews with 10 male participants aged 25 to 40, examines key factors impacting BEV adoption, such as price sensitivity, availability of substitutes, production costs, and externalities. Additionally, the study identifies the role of information gaps and government awareness campaigns in shaping consumer preferences. Findings indicate that price disparities, substitute availability, and infrastructure limitations significantly influence BEV adoption. Economic considerations, coupled with consumer awareness of environmental impacts, are pivotal in driving demand. The research suggests that enhancing infrastructure, providing accurate information, and implementing supportive policies could accelerate BEV adoption in Jakarta. This study contributes valuable insights for policymakers and stakeholders seeking to promote sustainable transportation and mitigate negative externalities in Indonesia's capital.

Keywords: electric vehicles; factors price; government; Jakarta; pollution

1. Introduction

The transportation sector in Jakarta is not just the backbone of modern society but also a pivotal driver of Indonesia's economic growth [1]. However, this sector's reliance on traditional gas-powered vehicles comes at a severe environmental cost, with urban air pollution being one of the most pressing challenges. Alarmingly, traditional gas cars account for 44% of pollution in Jakarta's urban areas, leading to significant health risks and reduced productivity [2]. This underscores the urgent need for transformative changes in the transportation paradigm. Emerging advancements in battery-powered electric vehicles (BEVs) present a critical opportunity to address these challenges. BEVs, free from carbon emissions, mark a revolutionary shift toward sustainable transportation, offering a cleaner and more efficient alternative to internal combustion engines [3]. In the Indonesian context, where rapid urbanization exacerbates environmental concerns, this transition is particularly significant. Recognizing this potential, the government has implemented ambitious fiscal policies, including subsidies for 200,000 electric two-wheelers and 36,000 electric cars, as part of its strategy to reduce carbon emissions [4].

Despite these initiatives, the adoption of BEVs remains a challenge. Existing research primarily highlights price sensitivity and government interventions, yet few studies explore the nuanced determinants of BEV demand in Indonesia. Factors such as consumer perceptions, infrastructure limitations, and behavioral elasticity remain underexplored [5,6]. Additionally, while much of the global discourse focuses on developed markets, the Indonesian context—with its unique socio-economic dynamics and infrastructure constraints—requires targeted investigation.

This study addresses a critical gap by focusing on demand-side determinants specific to Indonesia, providing a comprehensive understanding of the interplay between subsidies, consumer behavior, and infrastructure development. By doing so, it seeks to inform both policymakers and stakeholders about the levers necessary for accelerating the mass adoption of BEVs in Jakarta and beyond. The findings have broader implications, offering a roadmap for other emerging economies grappling with similar challenges.

2. Literature review

The transportation sector in Indonesia, particularly in rapidly urbanizing areas like Jakarta, remains integral to economic growth and development. Asri and Budi [7] underscore the critical role of transportation infrastructure and the vehicle industry in facilitating access to markets, labour, and essential services. However, while the vehicle industry has been central to economic expansion, it has also exacerbated environmental challenges, particularly through the increased use of privately owned, gas-powered vehicles [8]. These vehicles, while providing economic benefits, contribute significantly to air pollution and environmental degradation, which have serious health and economic repercussions [9,10].

2.1. Environmental and health impacts of gas-powered vehicles

The environmental costs of continued reliance on traditional internal combustion engine (ICE) vehicles have been well-documented in recent Indonesian literature. Syuhada et al. [2] note that gas-powered vehicles are responsible for 44% of air pollution in Jakarta, leading to heightened levels of respiratory diseases, such as asthma, among the population [11]. This research emphasizes the urgent need for sustainable transportation alternatives to mitigate the harmful health outcomes caused by pollution. Furthermore, the study by [12] establishes a direct link between transportation emissions and reduced public health, with implications for work productivity, which can negatively affect the overall economy.

The environmental degradation associated with vehicle emissions has sparked a broader conversation about sustainable urban development in Indonesia. Huda et al. [13] argue that addressing transportation-related pollution is essential not only for improving public health but also for advancing urban sustainability. However, while much of the existing research focuses on the negative externalities of conventional vehicles, there remains a gap in comprehensive studies examining how these environmental impacts intersect with other social factors, such as urban planning and socioeconomic inequality. These are important dimensions to explore, as they can shape the success of policies aimed at reducing air pollution in urban areas like Jakarta.

2.2. Technological innovations: The shift toward electric vehicles (EVs)

In recent years, the global shift toward more sustainable transportation technologies has accelerated, with electric vehicles (EVs) emerging as a leading alternative to traditional gas-powered vehicles. The development of battery-powered electric vehicles (BEVs) has been identified as a promising solution to curb CO2 emissions and reduce the environmental impact of transportation. Unlike ICE vehicles, BEVs produce zero direct emissions, making them particularly suitable for cities with severe pollution problems, such as Jakarta. Mahmud [14] and Amiruddin et al. [15] further argue that EVs are more energy-efficient, offering long-term economic benefits while also mitigating the harmful effects of transportation-related air pollution.

While the technological shift towards EVs is promising, it is not without challenges. Recent studies indicate that the widespread adoption of EVs in Indonesia faces several barriers, particularly related to infrastructure. Murtiningrum et al. [16] highlight that the limited availability of charging stations and battery-swapping facilities remains a major obstacle to the mass adoption of EVs in urban centres. Moreover, the study by Yuniza et al. [17] stresses that consumer hesitancy toward new technologies and the lack of a robust EV infrastructure are key factors preventing the expansion of BEVs in Jakarta and other urban areas.

Recent studies, including those by Lazauardy et al. [18], have emphasized the importance of technological advancements in addressing these infrastructural gaps. For example, innovations in fast-charging stations, battery durability, and vehicle range are critical in overcoming the limitations of current EV technologies. However, despite these advancements, the adoption of EVs remains slow due to insufficient infrastructure development, which hinders consumer confidence in the reliability and convenience of these vehicles.

2.3. Government policies and consumer behaviour

Government intervention plays a significant role in encouraging the adoption of electric vehicles. Setiawan et al. [19] highlight the Indonesian government's fiscal measures and subsidies aimed at promoting the use of BEVs. The policies, which include incentives for electric two-wheelers and cars, are part of a broader strategy to reduce the country's dependence on fossil fuels and reduce CO_2 emissions. Minister Luhut Pandjaitan's initiatives, such as providing subsidies for 200,000 electric two-wheelers and 36,000 electric cars, aim to make EVs more affordable and accessible to the Indonesian public [20].

However, recent findings by Shepherd et al. [21] and Syamnur et al. [22] suggest that while government subsidies are crucial, the demand for EVs remains highly elastic and influenced by factors beyond price alone. Consumer behaviour is shaped by a combination of factors, including social norms, the perceived environmental benefits of EVs, and the availability of charging infrastructure. These studies indicate that non-price factors such as consumer attitudes toward sustainability, the influence of peer behaviour, and government policies promoting sustainable transport will likely play a more significant role in shaping the demand for electric vehicles than price alone. Moreover, there is a gap in research regarding how these non-price factors differ across urban and rural populations. While most studies focus on urban centres like

Jakarta, few have examined how rural areas or smaller cities experience and respond to EV policies. Rural areas may face different challenges related to transportation infrastructure, including longer distances between charging stations and less access to subsidies or incentives. Addressing this gap could help policymakers design more targeted strategies that account for regional disparities in transportation access and infrastructure development [23].

2.4. Critical engagement and gaps in the literature

Despite the wealth of literature on transportation in Indonesia, there remain significant gaps that warrant further investigation. First, while much of the existing research has focused on the economic and environmental impacts of transportation, there is a limited exploration of how transportation policies influence social behaviour and societal norms. The role of social influence, community engagement, and cultural perceptions of sustainability are critical factors that could shape EV adoption but have yet to be explored in depth.

Second, while urban areas like Jakarta are often the focus of studies, research on transportation dynamics in smaller cities and rural regions is lacking. As Indonesia continues to develop, understanding the unique challenges faced by non-urban areas—such as limited access to government incentives, charging infrastructure, and the economic viability of EV adoption—will be essential to creating inclusive and sustainable transportation policies.

Lastly, although government subsidies and fiscal incentives have been identified as crucial drivers for EV adoption, their long-term effectiveness remains unclear. Recent studies suggest that subsidies alone may not be sufficient to overcome the infrastructural and behavioural barriers to EV adoption [24]. Future research should explore a more comprehensive approach that includes strategies to foster behavioural change, expand infrastructure, and build public trust in emerging technologies.

The literature on Indonesia's transportation sector reveals a complex interplay between economic development, environmental concerns, and technological innovation. While gas-powered vehicles have been a cornerstone of economic growth, their environmental costs—particularly air pollution—pose serious challenges to urban sustainability. The shift toward electric vehicles represents a key solution to these issues, with government policies playing a critical role in fostering adoption. However, significant gaps remain in understanding consumer behaviour, regional transportation dynamics differences, and government interventions' long-term effectiveness. Future research should aim to fill these gaps by critically examining the role of infrastructure, social norms, and consumer attitudes in driving sustainable transportation transitions in Indonesia [25].

3. Theoretical foundation

The study of transportation systems and electric vehicle (EV) adoption is inherently multidisciplinary, intersecting fields such as economics, urban planning, environmental science, and technology adoption. To provide a coherent framework for analyzing the dynamics of EV adoption in Indonesia, the study draws on established theories within the field of sustainable transportation, consumer behaviour, and

innovation diffusion. Specifically, the Technology Acceptance Model (TAM) and Diffusion of Innovations Theory (DOI) serve as the theoretical underpinnings, allowing for an analysis of both consumer perceptions and the broader socio-technical dynamics influencing EV adoption.

3.1. Technology acceptance model (TAM)

The Technology Acceptance Model (TAM), developed by Davis (1989), is widely used to assess how users come to accept and adopt new technologies. TAM posits that perceived usefulness and perceived ease of use are the primary factors influencing users' acceptance of new technologies. In the context of electric vehicles, perceived usefulness refers to how beneficial consumers believe EVs are in terms of reducing environmental impact and providing long-term cost savings. Perceived ease of use refers to the convenience of using EVs, including factors like the availability of charging infrastructure, battery life, and the overall user experience [26].

TAM has been successfully applied in various studies to understand the adoption of green technologies. For instance, studies on EV adoption in developed markets like the United States [27] and Europe [28] have employed TAM to examine how individuals perceive and interact with EV technologies. While TAM provides a strong basis for exploring the behavioural factors influencing consumer adoption, this study diverges from previous work by focusing on the unique context of Indonesia, where infrastructural challenges, cultural factors, and government policies significantly influence consumer attitudes and decisions regarding EVs.

In the case of Indonesia, TAM can be extended to consider external variables, such as government policies (e.g., subsidies and incentives), social norms, and the availability of EV infrastructure, which play a crucial role in shaping consumer perceptions. For example, the role of government subsidies and fiscal incentives can be integrated into the TAM framework to examine their impact on both the perceived usefulness and ease of use of EVs. This allows for a nuanced understanding of how external factors influence the adoption of sustainable transportation in emerging markets.

3.2. Diffusion of innovations theory (DOI)

Another foundational theory for this study is the Diffusion of Innovations (DOI) theory, developed by Everett Rogers (1962). DOI provides a framework for understanding how new technologies spread across populations. The theory highlights the role of innovation characteristics (relative advantage, compatibility, complexity, trialability, and observability) in influencing the rate and extent of adoption. This model has been widely used to study the adoption of various technologies, including electric vehicles, in both developed and developing countries [29].

DOI posits that adoption is influenced by five adopter categories: innovators, early adopters, early majority, late majority, and laggards. In the Indonesian context, the rapid urbanization of cities like Jakarta and the increasing environmental concerns may accelerate the adoption of EVs among early adopters and environmentally conscious consumers. However, challenges such as the high cost of EVs, limited infrastructure, and societal perceptions may delay broader adoption among the late

majority and laggards. By applying DOI, this study seeks to examine how EVs are likely to diffuse across different segments of the population, considering factors like the relative advantages of EVs over traditional gas-powered vehicles and the compatibility of EVs with local socio-cultural norms.

This study will also integrate a critical perspective on the socio-technical barriers identified in the DOI framework. While previous studies have focused on the individual characteristics of EV adoption (e.g., consumer preferences, and attitudes), this research shifts the focus to how social, economic, and infrastructural factors create barriers to the adoption of EVs. The Indonesian context, where infrastructure development lags behind demand for electric vehicles, presents a unique opportunity to explore how the diffusion of EVs is impeded by factors like insufficient charging stations and battery-swapping facilities.

3.3. Extension of theoretical framework

While TAM and DOI provide robust theoretical foundations, this study also seeks to extend these frameworks by incorporating a contextual layer that addresses the socio-economic and cultural specificities of Indonesia. Most previous studies on EV adoption have focused on developed countries, where factors such as income levels, technological infrastructure, and environmental awareness differ substantially from those in developing nations like Indonesia.

In particular, the role of government intervention in shaping adoption dynamics has been underexplored in the context of emerging markets. By integrating insights from policy diffusion theory, which explores how policy initiatives spread across regions and affect innovation adoption [30], this study aims to provide a more holistic view of the drivers of EV adoption in Indonesia. Government policies, such as subsidies for EV purchases and the development of EV charging infrastructure, represent a crucial external factor influencing the adoption curve. This research will assess how these policies interact with market and consumer behaviour to influence the overall rate of adoption.

The theoretical foundation for this study combines well-established models in technology adoption and diffusion with contextual insights into the Indonesian socio-political landscape. By extending the Technology Acceptance Model (TAM) and Diffusion of Innovations Theory (DOI), this research contributes to a deeper understanding of EV adoption in Indonesia, a rapidly developing market. It also highlights the role of government intervention and infrastructure development, providing valuable insights for policymakers aiming to facilitate the transition toward sustainable transportation. This work therefore offers a theoretical contribution by applying and extending existing models to a new context, with a focus on the unique barriers and opportunities presented by emerging economies.

4. Methodology

This study employs Interpretative Phenomenological Analysis (IPA) as a qualitative research method. Originally proposed by Martilla and James [31], IPA aims to explore and understand in detail an individual’s lived experience and perspective on a specific phenomenon. Smith [32] emphasized that IPA is particularly

well-suited for small sample sizes that require in-depth, nuanced analysis. The method has gained widespread applicationacross various disciplines, as noted by Chaudhary [33], Gill [34], and Donovan and Macaskill [35]. In this study, IPA is used to examine consumer perceptions and preferences

regarding Battery Electric Vehicles (BEVs). A sample size between 1 and 15 participants was considered appropriate for this type of research. Three key parameters were used for sample selection to ensure relevant representation: age, gender, and legal permission to drive [36] Specifically, citizens of Jakarta between the ages of 25 and 40 were targeted, as this age groupholds significant decision-making power regarding vehicle purchases [37]. Since, in Jakarta, male members typically make purchasing decisions for vehicles, only male participants were selected for the interviews (Logsdon, [38]. Additionally, possessing a valid driving license, a legal requirement for vehicle operation, was a key criterion, as licensed drivers are more likely to make informed decisions regarding vehicle ownership.

The sample consists of 25 citizens from Jakarta, allowing for a diverse range of perspectives. Semi-structured interviews were employed to explore the significance and impact of BEVs from the consumers' viewpoint. Each participant was carefully selected to ensure that the interviews provided subjective insights, enabling the researcher to gain an in-depth understanding of consumer perceptions. This qualitative approach offers valuable context to better understand the factors influencing the adoption of BEVs in Jakarta.

4.1. Data collection and analysis

For data collection, semi-structured in-depth interviews were employed to gather insights from consumers. This method allowed for open-ended questions, which provided participants with the freedom to express their opinions without constraints or predetermined boundaries [39]. The use of open-ended questions is particularly suited for Interpretative Phenomenological Analysis (IPA) as it encourages deep exploration of the participants' subjective experiences and perceptions. To ensure the reliability and validity of the interview questions, two field experts reviewed and validated the content before conducting the interviews. The interviews were carried out in private settings, ensuring that the participants felt comfortable and could express their thoughts freely. The timing of the interviews was arranged to suit the participants' availability, reflecting a key consideration in the IPA process, which emphasizes participant convenience to foster a conducive environment for meaningful dialogue [40]. Each interview lasted approximately 30–40 min, providing sufficient time to delve into consumer perceptions and preferences regarding Battery Electric Vehicles (BEVs).

The data collected from these interviews followed the analytic framework recommended bySmith and Osborn [41], ensuring a rigorous and systematic approach to interpretative phenomenological analysis. All interview records (transcripts) were thoroughly read multipletimes. Special attention was paid to the terminology and language used by participants,

particularly those that provided meaningful insights into the factors influencing consumer demand for BEVs. Primary data was systematically noted based on the transcripts. Common themes and factors affecting consumer demand for BEVs were

highlighted and recorded. These themes ranged from economic concerns to technological preferences and environmental awareness. The main factors influencing demand were identified, and the datawere then analyzed for similarities and differences among the participants' responses. This stage involved comparing the insights to discover both converging and diverging viewpoints. The identified factors were categorized based on their relevance and significance to the research question. The categories were ranked in order of importance to reflect the prominence of each factor. This final categorization helped in forming the basis for further discussion and recommendations in the study.

This step-by-step approach ensured that the research remained consistent with the principles of IPA, focusing on the subjective experiences of participants while generating rich, interpretative data. The insights obtained were valuable in understanding not only the consumer preferences for BEVs but also the broader market dynamics in Jakarta.

4.2. Interview questions

Awareness of BEVs:

Are you familiar with the new Battery Electric Vehicles (BEVs) currently available in Jakarta? If so, what do you know about them?

Current Transportation Preferences:

What are your typical transportation choices*, and how do they meet your daily needs in termsof cost, convenience, and environmental impact?*

Interest in BEV Ownership:

Would you consider purchasing a BEV shortly*? Why or why not?*

Key Decision-Making Factors:

What specific factors would you consider *most important when deciding whether to purchase a BEV? For example, would you prioritize cost, performance, environmental benefits, or the availability of charging infrastructure?*

5. Results

In this section, the findings from the analysis of 10 interviews, conducted using the Interpretative Phenomenological Analysis (IPA) technique, are thoroughly examined. The

Insights derived from the interviews have been grouped into four key factors that emerged as significant in shaping consumer demand for Battery Electric Vehicles (BEVs) in Jakarta. These factors are the price of BEVs, the Price of Substitutes, Ownership Costs, and Access to Information. Each of these factors reflects the critical considerations identified by private consumers when evaluating BEV ownership, providing a nuanced understanding of thedynamics influencing demand in the city's transportation sector.

Factor 1: Price of BEV's

A significant majority of the consumers interviewed unanimously identified the price of Battery Electric Vehicles (BEVs) as one of the most influential factors affecting their demand in Jakarta. The high upfront cost of BEVs compared to conventional gasoline-powered cars emerged as a substantial barrier for most

consumers. Participants consistently expressed concerns that BEVs remain significantly more expensive to purchase, despite the availability of government subsidies and incentives. This price disparity was perceived as a major deterrent to wider adoption, particularly among middle-income households.

Several respondents indicated that the initial purchase price of BEVs is currently prohibitive for the average consumer, especially when compared to traditional vehicles, which are often perceived as more affordable and accessible. While interviewees acknowledged that BEVs could offer long-term savings through reduced fuel and maintenance costs, the higherupfront investment remains a key obstacle for those considering a switch from gasoline vehicles. The cost-benefit analysis that consumers engage in tends to prioritize immediate financial outlays, which makes BEVs less attractive in the short term.

Moreover, participants highlighted that the availability of financing options, such as loans orinstalment payment plans, would significantly impact their willingness to purchase a BEV. For many, the absence of flexible and attractive financing arrangements makes the financial burden of purchasing a BEV more daunting. Respondents suggested that increased access toaffordable financing would ease the initial cost barrier and potentially drive higher demand among consumers who are environmentally conscious but constrained by budgetary limitations. Some interviewees also pointed out that, despite government subsidies, the overall impact of these incentives is still insufficient to bridge the price gap between BEVs andgasoline cars. They mentioned that while these subsidies help reduce the cost to some extent,they do not make BEVs competitively priced for the mass market. Consumers suggested thatmore aggressive pricing strategies, such as larger subsidies or tax rebates, could stimulate demand, especially if paired with better financing options.

Finally, a few participants expressed concern about the long-term depreciation of BEVs, noting that uncertainties around battery lifespan and potential resale value contribute to

Their hesitancy. For these consumers, the perceived risk of rapid technological changes or potential declines in BEV resale prices adds another layer of financial concern.

In summary, the price of BEVs remains one of the most critical factors affecting demand in Jakarta. The higher initial costs, combined with limited financing options and concerns over depreciation, play a decisive role in shaping consumer attitudes toward BEVs. For BEVs to achieve broader adoption, policies and industry efforts will need to focus on making these vehicles more financially accessible through targeted subsidies, improved financing schemes,and clearer communication of long-term savings and value propositions.

> *Participant 1: "As an expat living in Jakarta, the high upfront costs of electric vehicles are a significant barrier for me. While I understand that owning a BEV would likely lead to long-term savings on fuel and maintenance, the initial investment is simply beyond my current budget. Despite the potential benefits, the financial strain at the time of purchase makes it difficult tojustify the switch."*
>
> *Participant 7: "Money is a critical factor for me. Purchasing a car requires months of planning,as it's a significant financial commitment. To make such a purchase, I would have to sacrificeother expenses. While I would love to own an*

expensive or luxurious car, the exorbitant pricemakes it out of reach. The vehicle I choose must fit within my budget, no matter how much I desire a more premium option."

Factor 2: Price of Substitutes

A significant number of consumers highlighted the availability and price of substitute vehicles as a critical factor influencing their decision to adopt Battery Electric Vehicles (BEVs). The presence of alternative transportation options, such as public transit, hybrid cars, and traditional gasoline-powered vehicles, plays a substantial role in shaping consumer demand for BEVs. These alternatives, often perceived as more affordable or convenient, create price-sensitive competition that impacts the adoption of electric vehicles in Jakarta.

Many respondents indicated that Jakarta's public transportation system, which includes buses, commuter trains, and emerging rapid transit solutions, offers a cost-effective alternative to owning a private vehicle. For many middle- and lower-income consumers, public transit remains a cheaper and more accessible option, making the high upfront cost of a BEV less justifiable. Additionally, improvements in public transport infrastructure, such as the expansion of bus and metro networks, have provided more reliable commuting options, further reducing the need for private BEV ownership.

The growing availability of hybrid cars, which combine internal combustion engines with battery-powered motors, presents a middle ground for consumers who are looking for environmentally friendly vehicles without fully committing to a BEV. Participants noted that hybrid cars offer the flexibility of both fuel and electric power, making them less reliant on the still-limited charging infrastructure in Jakarta. Additionally, hybrids tend to be priced lower than BEVs, making them a more attractive option for those who are conscious of bothenvironmental impact and cost. This makes hybrids a direct competitor to BEVs, especially forconsumers hesitant about full electrification due to infrastructure concerns or range anxiety.Conventional gasoline-powered cars remain the dominant choice for most consumers, largelydue to their lower purchase price and familiarity. Despite growing awareness of environmental issues, participants expressed that gas vehicles continue to be more affordable, particularly in terms of upfront costs. The widespread availability of gas stations and repair services also adds to the convenience of owning traditional cars, making them a lower-risk investment for many consumers.

Consumers noted that unless the price difference between BEVs and traditional gas cars narrows significantly, it would be difficult to justify purchasing a BEV, particularly when fuel prices in Jakarta remain relatively stable. The cost of fuel, though subject to fluctuation, is stillseen as manageable compared to the high upfront costs of electric vehicles, further dampening the demand for BEVs. Some interviewees mentioned the increasing use of ride-sharing services (such as Gojek and Grab) and micro-mobility solutions (e-scooters, bike-sharing) as viable substitutes for owning a BEV. These services offer on-demand transportation at a fraction of the cost of owning a private vehicle, and for urban residents who primarily travel short distances, they often prove to be more convenient and affordable.As these services become more widely available and reliable, they present a growing alternative that may further suppress demand for private BEVs.

Participants highlighted that government policies—such as subsidies for public transportation or fuel—can influence the competitiveness of substitutes. If the Indonesian government continues to offer subsidies for fossil fuels or support public transport development, it could discourage consumers from making the switch to BEVs. Conversely, policies that incentivize the adoption of BEVs or increase the cost of traditional vehicles (e.g., through taxes on emissions) could tilt consumer preferences away from substitutes and towards electric cars.

Participant 3: "I would consider switching to an electric car if there were more charging stations and if hybrid cars weren't available. Right now, the other alternatives like hybrids suitmy needs better."

Participant 5: "Hybrid cars, which also run on batteries, have become more affordable over the years, and there are so many models to choose from. Plus, public transportation has become cleaner and cheaper, so I don't really feel the need to switch to an electric car right now."

Factor 3: Ownership Costs

Consumers also identified a range of benefits and costs associated with owning and operatingBattery Electric Vehicles (BEVs) as significant factors influencing their decision-making process.

One of the primary concerns raised by consumers is the availability of charging infrastructure. Many participants expressed anxiety about the limited number of charging stations in Jakarta,which can lead to range anxiety—the fear of running out of battery power before being ableto recharge. This issue is particularly pertinent for individuals who frequently travel longer distances or live in areas without convenient access to charging facilities. Consumers emphasized the need for more widespread and accessible charging options to make BEV ownership feasible and convenient.

The upfront cost of purchasing a BEV remains a significant barrier for many consumers. Despite the potential for savings in fuel and maintenance over time, the initial investment required for electric vehicles is often higher than that for traditional gasoline cars. This cost disparity makes it challenging for many to justify the switch, especially for budget-conscious consumers. Although BEVs generally require less maintenance than conventional vehicles dueto fewer moving parts, some consumers expressed concerns about potential maintenance costs related to battery replacement and repair. The longevity and performance of batteriesare crucial considerations, as replacements can be expensive. Participants noted that a clearer understanding of long-term maintenance costs is necessary for them to feel comfortable transitioning to electric vehicles. Consumers recognized that one of the most compelling benefits of owning a BEV is the potential savings on fuel costs. Many participantspointed out that electricity is generally cheaper than gasoline, leading to lower overall operating expenses. They highlighted the fact that, as fuel prices continue to rise, the cost-effectiveness of electric vehicles becomes increasingly attractive. This potential for savings can be a strong motivating factor, especially for individuals who drive frequently or over longdistances.

Participants also expressed a growing awareness of the environmental benefits associated with electric vehicles. Many consumers are motivated by the desire to reduce their carbon footprint and contribute to a more sustainable future. The perception that BEVs produce

fewer greenhouse gas emissions compared to traditional vehicles appeals to environmentallyconscious consumers, making the switch to electric vehicles more attractive.

Some respondents mentioned the government incentives available for electric vehicle purchasers, such as tax credits, rebates, and subsidies, as a key benefit. These incentives can significantly offset the initial purchase price, making BEVs more financially accessible. However, consumers indicated that a better understanding of these programs and their long- term implications would further enhance their willingness to invest in electric vehicles.

Finally, consumers noted the rapid advancements in battery technology and electric vehicle features as a compelling reason to consider BEVs. Improvements in battery efficiency, range, and charging speed have made electric vehicles more practical for everyday use. Many participants expressed optimism about future developments that could further enhance the performance and affordability of electric cars, making them a more viable option for a widerrange of consumers.

Participant 2: "While the initial cost of purchasing an electric car may be higher, I recognizethat the long-term savings on fuel and maintenance could ultimately make it a more cost-effective option. However, I also need to consider additional investments, such as batteryreplacement and installing charging stations at home to keep the vehicle operational*." Participant 10: "Cost is a significant factor for me when contemplating a switch to an electriccar. I want to ensure that the overall cost of ownership, including charging expenses andbattery maintenance, is reasonable compared to that of a traditional gasoline-poweredvehicle."*

Factor 4: Correct and Prudent Information

Consumers emphasized the critical importance of having accurate and comprehensive information when contemplating the purchase of electric vehicles (EVs). They highlighted several key areas where informed decision-making is essential, as a lack of knowledge can hinder potential buyers from fully understanding the benefits and responsibilities associatedwith electric car ownership.

Participants expressed a desire for detailed information regarding the performance characteristics of electric cars, including acceleration, range, and battery life. Understanding how an electric vehicle compares to traditional gasoline-powered cars in terms of performance can greatly influence their purchase decisions. Participants noted that misinformation or lack of clear data about an EV's capabilities could lead to reluctance to make the switch. They emphasized the need for transparent specifications to help them make confident choices. They also pointed out the importance of knowing the maintenance requirements and overall operating costs associated with electric vehicles. Many potential

buyers are unaware that EVs typically require less maintenance than traditional vehicles dueto fewer moving parts. However, they expressed concerns about potential battery replacement costs and the need for charging infrastructure at home. Participants stressed thenecessity of having reliable information about ongoing costs, such as electricity rates for charging, to make informed comparisons between electric and gasoline vehicles.

Interestingly, a significant number of respondents indicated that they were not fully aware ofthe pollution and environmental impact caused by traditional gasoline vehicles. Participants acknowledged that better understanding the emissions associated with gas cars, including their contribution to air pollution and climate change, could sway their decisions toward electric vehicles. They expressed the need for educational campaigns that highlight the ecological benefits of EVs, emphasizing how choosing electric could help mitigate the environmental damage caused by fossil fuel consumption.

The participants indicated a lack of awareness regarding available government incentives andsubsidies for electric vehicle purchases. Many participants were unsure about existing programs that could lower the upfront costs of buying an EV or provide financial benefits forthose who choose to go electric. Access to this information is crucial, as it can significantly affect their purchasing power and overall affordability of electric vehicles.

Another area of concern is the availability and accessibility of charging infrastructure. Consumers expressed the need for clear information on where to find charging stations, the types of chargers available, and the costs associated with charging. Understanding the charging process and the time required to recharge an electric vehicle is essential for consumers who might otherwise feel anxious about range limitations.

Finally, participants emphasized the value of real-world experiences and reviews from other electric vehicle owners. They noted that hearing about the pros and cons of EV ownership from current users could provide invaluable insights and help alleviate concerns. Access to testimonials and detailed reviews could serve as a bridge to understanding the realities of electric vehicle ownership, allowing potential buyers to make more informed decisions.

In summary, the consumers' insights underscore the need for correct and prudent information when considering the purchase of electric cars. Addressing knowledge gaps about performance, maintenance, environmental impact, available incentives, charging infrastructure, and real user experiences can empower consumers to make informed decisions, ultimately increasing the adoption of electric vehicles in the market.

> *Participant 4: "Having reliable* information *about maintenance costs is crucial for me. I want to comprehend the long-term implications of owning an electric car, including potential repairexpenses and battery replacement costs."*
>
> *Participant 6: "Before transitioning to* an *electric car, I would like to gather comprehensive information about the charging infrastructure in my area. It's important to know the availability of charging stations and any associated ownership costs."*

6. Discussion

The findings indicate that key economic factors—price, availability of substitutes, and costs—play a crucial role in shaping consumers' perceptions and preferences regarding electric cars,thereby influencing their demand. To understand the complexity of this market, each of thesefactors can be analyzed using economic theory.

6.1. Price

Price is a fundamental determinant of demand, especially in price-sensitive markets, and electric vehicles (EVs) are no exception. According to the law of demand, when the price of agood rises, ceteris paribus, the quantity demanded falls. This principle is especially pertinentto electric cars, which typically have a higher upfront cost compared to internal combustion engine (ICE) vehicles. This price disparity can deter consumers, particularly in lower- or middle-income brackets. However, it's important to evaluate not just the initial purchase price but the total cost of ownership over time. EVs have lower running costs due to cheaperelectricity, fewer mechanical failures, and reduced maintenance. Studies have shown that electric cars can cost 50-75% less to operate per mile than gasoline vehicles, due to lower fueland maintenance expenses [42].

Findings affirm established economic principles, such as the law of demand, and align with studies emphasizing price as a critical determinant in markets with high elasticity [43,44]. The concept of total cost of ownership (TCO), which shows BEVs' long-term cost advantages, has been well-documented. The reduced operational costs of BEVs compared to internal combustion engine (ICE) vehicles strengthen their economic appeal in the long run, confirming earlier findings [45,46]. Some consumers still hesitate despite the lower TCO, due to limited understanding of these cost savings. Behavioral economics suggests that short-term cost perceptions often outweigh long-term benefits [47]. Addressing this disconnect might involve financial literacy programs to emphasize TCO's value.

From a long-term perspective, when consumers factor in these reduced operating costs, thetotal cost of ownership can be comparable to or even lower than that of traditional vehicles.Thus, although the price elasticity of demand for EVs may be high in the short term, over thelifetime of the vehicle, the elasticity may decrease as consumers perceive greater economic value from lower operational costs [48]. In regions where electricity isabundant and cheap, the economic advantage of EVs becomes even more pronounced, potentially driving a shift in consumer preferences. [49–51].

6.2. Availability of substitutes

The presence of substitutes, such as gasoline-powered vehicles, hybrid cars, and public transportation, also significantly impacts the demand for electric cars. In microeconomic theory, the availability and attractiveness of substitutes determine the elasticity of demand for a good. In the case of EVs, traditional ICE vehicles remain strong substitutes, particularly

when consumers value features like longer driving ranges and the widespread availability of refueling stations.

The elasticity of substitution between BEVs and ICE vehicles is a recurring theme in the literature [52]. As infrastructure improves, ICE vehicles' comparative advantage diminishes. Unlike in developed markets, where charging infrastructure has expanded rapidly, Jakarta's limited facilities exacerbate the substitution effect. This might explain why, despite similar technological advancements, adoption rates lag behind those of developed nations.

However, as the technology behind EVs improves—especially in terms of battery life, charging infrastructure, and performance—the appeal of substitutes begins to wane. The concept of "cross-price elasticity of demand" is useful here: as the price of gasoline fluctuates, so does the relative attractiveness of electric cars. In periods of rising fuel costs, consumers may be more likely to opt for EVs, which are cheaper to operate [53]. Additionally, improvements in charging networks and reductions in range anxiety are makingEVs more viable, narrowing the perceived advantages of ICE vehicles. As these factorscontinue to shift, the elasticity of substitution will likely decrease, driving higher adoption rates of electric vehicles. [54–57].

6.3. Costs (production and externalities)

Declining production costs aligns with reports like Bloomberg NEF [58], which highlight falling lithium-ion battery costs. Additionally, subsidies and carbon taxes as mechanisms to internalize externalities have been supported by studies [59]. In markets like Indonesia, where fossil fuel subsidies persist, traditional vehicles retain an artificial price advantage, contradicting findings from countries with strict carbon taxation [60].

Costs in the context of electric vehicles include not only production costs but also the externalities associated with both EVs and traditional cars. Historically, the production of EVs—particularly the cost of batteries—has been much higher than that of ICE vehicles. However, economies of scale and advancements in battery technology have led to significantcost reductions.

In addition to direct production costs, externalities play a significant role in shaping demand for EVs. Fossil fuel-powered vehicles produce negative externalities such as air pollution andgreenhouse gas emissions, which impose social costs that are not reflected in the market price of gasoline vehicles. Governments worldwide are addressing these externalities by implementing subsidies, tax incentives, and rebates for EVs, effectively reducing their price and making them more attractive to consumers [61]. Furthermore, the imposition of carbon taxes or emission trading systems in some countries places additional costs on gasoline-powered vehicles, indirectly encouraging a shift toward electric cars.

The availability of these government incentives and policies influences the demand for EVs. In markets with strong policy support for EV adoption, such as Norway and the Netherlands,demand for electric cars has surged as the financial and regulatory frameworks favor cleaner alternatives. These policies are designed to internalize the social costs of traditional vehicles,thereby aligning private consumer decisions with broader environmental goals [62–65].

6.4. Correct and prudent information

One key factor influencing consumer decisions about battery electric vehicles (BEVs) is the lack of awareness about the negative externalities associated with traditional gasoline cars.

The study echoes findings on the importance of awareness in shaping consumer choices [66]. Public knowledge about environmental benefits and the risks of ICE vehicles directly influences BEV adoption. While developed markets have achieved

higher consumer awareness through education campaigns, Jakarta's lack of emphasis on sustainability education limits BEV growth, highlighting a regional gap in awareness strategies [67].

Many consumers may not fully recognize the harmful effects of gas-powered vehicles on theenvironment, such as air pollution and greenhouse gas emissions [68]. This highlights the critical role of government intervention in providing accurate and relevant information to the public. By implementing educational campaigns and initiatives, the government can increase awareness of the environmental impacts of gas cars and encouragethe adoption of cleaner alternatives like electric vehicles [69] Informed consumers are more likely to make sustainable choices, leading to a shift toward greener transportation options. As public awareness of gas car externalities grows, demand for electric vehicles may rise, spurring innovation and investment in the industry [70]. From an economic standpoint, addressing this awareness gap can yield positive societal outcomes. By internalizing the environmental costs of gas cars, government actions can incentivize BEV adoption, resulting in long-term benefits such as reduced air pollution and improved public health [71]. Providing accurate information about the environmental impact of gas cars is crucial for promoting BEV adoption and supporting sustainable economic growth. Government efforts to raise awareness can drive positive environmental and economic outcomes by encouraging a transition to cleaner transportation options [72]. The **Figure 1** illustrates the factors that pays a crucial role in Jakarta in influencing the demand for BEV. It also demonstrates the outcome of using BEV, that is reduction in carbon emission and improvement in health index of Jakarta.

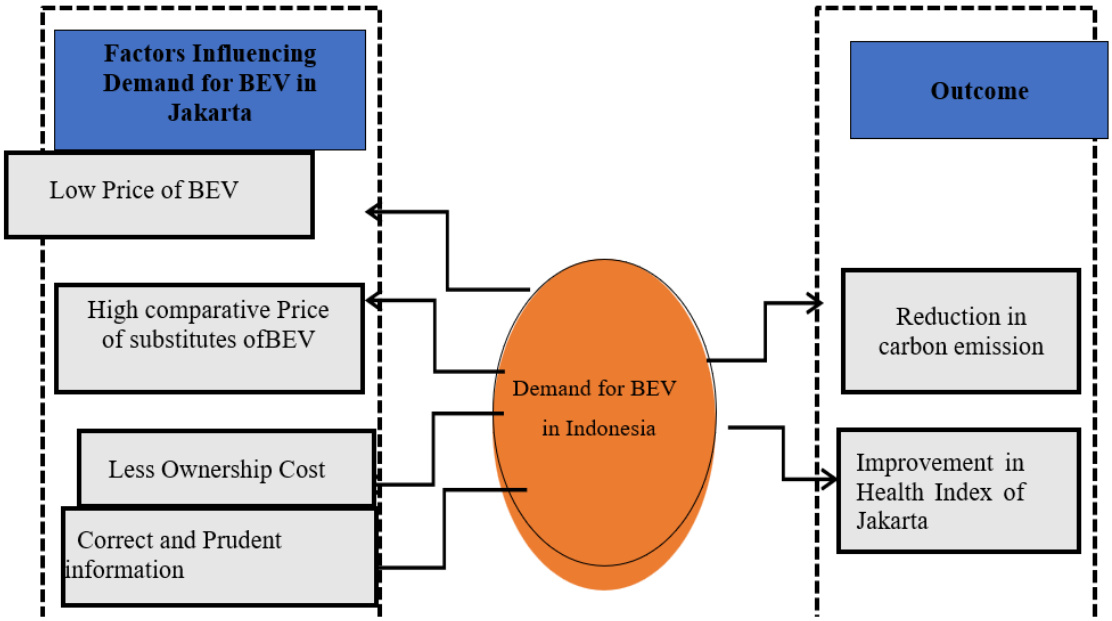

Figure 1. Conceptual framework of factors affecting demand for BEV.

6.5. Analysis

The interpretative Phenomenological Analysis (IPA) conducted provides valuable qualitative insights into the underlying motivations, perceptions, and experiences driving consumer behavior toward Battery Electric Vehicles (BEVs) in

Jakarta [73]. The study reveals several key factors that influence the demand for BEVs, offering crucial implications for both policymakers and stakeholders in the electric vehicle (EV) market. The findings highlight the importance of addressing consumer concerns around price, availability of substitutes, ownership costs, and information awareness to promote the adoption of BEVs. Future research could build on these insights by incorporating quantitative analyses and longitudinalstudies to offer a more comprehensive understanding of the dynamics of BEV adoption and inform targeted policy interventions aimed at promoting sustainable transportation in Jakarta [74,75].

One of the most significant factors highlighted by the study is the price of BEVs. The data indicates that price plays a critical role in influencing the quantity demanded, with consumersshowing a clear preference for more affordable options. The law of demand suggests that

when the price of a good decreases, the quantity demanded increases and BEVs are no exception [76]. In this context, the Indonesian government's decision to provide subsidies to increase BEV sales is well justified. By reducing the price of BEVs, subsidies alignwith consumer preferences, effectively lowering the barriers to entry for a wider demographic [77]. Government subsidies operate by reducing the cost of production for BEV manufacturers, which in turn leads to lower retail prices [78]. This price reduction directly addresses consumer price sensitivity and could stimulate demand for BEVs,as more individuals are motivated to switch from conventional, carbon-emitting vehicles to electric alternatives. Additionally, from an economic perspective, this aligns with the principleof the law of equi-marginal utility, where consumers maximize their utility by choosing goodsthat offer the most satisfaction for their expenditure. By lowering the price, subsidies allow consumers to derive higher utility from BEVs relative to gasoline-powered vehicles, thereby promoting their adoption. [79]. Another key factor influencing BEV adoption in Jakarta, as identified by the study, is the availability and affordability of substitutes, particularly traditional gasoline vehicles and publictransportation. The substitution effect under the law of demand explains that when the priceof one good rises, consumers tend to switch to cheaper substitutes [80]. BEVs are subject to this effect, as many consumers compare them with gasoline cars, which are often cheaper and more widely available. Gasoline-powered vehicles, with their established infrastructure and variety, may still seem like a more convenient option for many consumers, particularly in the absence of competitive BEV pricing [81–83]. The study reveals that consumers make purchasing decisions based on a direct price comparison between gasoline vehicles and BEVs. In cases where gasoline cars are available at significantly lower prices, many consumers are more likely to opt for these vehicles, despitethe long-term cost benefits of BEVs. This highlights the need for further government action to not only reduce the price of BEVs but also to make electric alternatives more attractive byaddressing the broader economic environment. Ownership costs, including charging infrastructure and maintenance, also pose significant challenges to BEV adoption in Jakarta [84]. The study reveals that a lack of sufficient charging stations and the high upfront costs of home charging infrastructure deter many consumers from considering BEVs as a viable alternative. While BEVs typically have lower maintenance costs due to fewer moving parts, the limited availability of charging stations increases the perceived hassle and inconvenience for potential buyers. This underscores the importance of

government intervention in improving infrastructure to support the growing demand for electric vehicles [85–88] Expanding the charging network is essential to alleviate range anxiety and make BEVs a practical choice for everyday use. The government could implement initiatives that incentivize property owners, businesses, and local authorities to install charging stations, particularly in residential and urban areas [89]. Similar programs have been successfully implemented in other countries, such as Norway, where comprehensive charging infrastructure has contributed to high rates of BEV adoption [90]. The study also reveals a significant gap in consumer awareness about the benefits of BEVs and their positive impact on the environment. Many citizens in Indonesia are unaware of howBEVs contribute to reducing carbon emissions and improving air quality, leading to a degree of indifference toward adopting electric vehicles [91] This lack of awareness poses a barrier to market growth, as consumers may not fully appreciate the long-term advantages of transitioning to electric vehicles [92]. To address this, government-led educational campaigns could play a crucial role in raising public awareness. By highlighting the environmental and economic benefits of BEVs, such campaigns could encourage more consumers to consider electric vehicles as a viable and responsible option [93] Furthermore, these campaigns could foster a sense of environmental stewardship, aligning consumer choices with broader sustainability goals. Public education initiatives could also promote greater investment in andinnovation around BEV technology, creating a positive feedback loop that drives market growth and accelerates the transition toward a low-carbon economy [94,95].

7. Theoretical contributions

This study makes several noteworthy contributions to the theoretical understanding of consumer behavior in the context of sustainable transportation, particularly with respect to electric vehicles (EVs). By employing Interpretative Phenomenological Analysis (IPA), the research delves deeply into consumer motivations, perceptions, and decision-making processes. The findings contribute to behavioral economics by identifying cognitive biases, such as short-term cost aversion and lack of awareness about long-term benefits. This aligns with theories on bounded rationality and provides empirical evidence on how such biases impact EV adoption. The study highlights how price sensitivity and the availability of substitutes influence demand elasticity. By integrating microeconomic concepts like the substitution effect and cross-price elasticity into the analysis, the research bridges theoretical constructs with real-world consumer behaviors. By emphasizing the role of negative externalities associated with gasoline-powered vehicles, the study reinforces the theoretical arguments for government intervention in correcting market failures. This underscores the applicability of Pigouvian taxes and subsidies in aligning private choices with social welfare objectives. The role of infrastructure in mitigating range anxiety and fostering BEV adoption adds a new dimension to network effect theory, suggesting that consumer utility is not solely determined by individual ownership but also by the collective development of supportive systems.

8. Practical implications

One of the key insights from the study is that price plays a significant role in influencing consumer demand for BEVs. This underscores the importance of continued government subsidies and financial incentives to lower the cost of electric vehicles. Policymakers can leverage this by offering tax breaks, rebates, or direct financial subsidies to both manufacturers and consumers. Such measures would reduce the initial purchase price of BEVs, aligning with consumer preferences for affordability and driving higher demand. Moreover, introducing long-term financial incentives, such as exemptions from road taxes and tolls, would make BEVs more attractive to the price-sensitive segments of the market.

The study highlights that ownership costs, particularly the lack of charging infrastructure, remain a major barrier to BEV adoption in Jakarta. This calls for strategic investments in expanding the city's network of public charging stations. Policymakers should prioritize infrastructure development by collaborating with private businesses, shopping centres, and residential communities to incentivize the installation of charging stations in key urban areas. To further support BEV ownership, providing grants or subsidies for home charging station installation could also be an effective way to alleviate concerns about convenience and operational costs.

The findings also reveal a lack of consumer awareness regarding the benefits of BEVs and their potential environmental impact. This suggests a need for targeted public education campaigns to increase awareness about the long-term cost savings, environmental advantages, and government incentives related to BEVs. These campaigns could be led by government agencies, non-governmental organizations (NGOs), or automotive companies. Highlighting the benefits of BEVs through media channels, community outreach, and public demonstrations can reshape public perceptions and encourage more consumers to consider electric vehicles as viable alternatives.

The study points to the significant role that substitutes, such as gasoline-powered vehicles, play in influencing consumer choices. To counter this, the government could introduce disincentives for the purchase of gasoline cars, such as increased taxes or fees for higher carbon-emitting vehicles. Additionally, offering exclusive perks to BEV owners, such as preferential parking spots, access to restricted lanes, or reduced vehicle registration fees, can further sway consumer preferences toward BEVs. These initiatives would help reduce the attractiveness of gasoline-powered vehicles and support a faster transition to electric transportation. From the perspective of automotive manufacturers, the study's findings provide insights into the factors influencing consumer behavior, allowing them to better tailor their product offerings to meet market demands. Manufacturers can capitalize on this by focusing on producing more affordable BEVs with competitive features, while simultaneously working to reduce production costs through technological advancements. They can also engage in partnerships with governments to explore innovative business models, such as battery leasing or subscription services, that reduce the upfront costs for consumers and encourage BEV ownership. In the broader context of sustainable urban development, the insights gained from this study support Jakarta's long-term environmental goals. Policymakers should view BEV adoption as a critical part of

their strategy to reduce carbon emissions, improve air quality, and promote cleaner transportation. Aligning BEV adoption policies with wider sustainability initiatives, such as integrating EVs into public transportation fleets or incentivizing corporate fleets to switch to electric vehicles, can accelerate the shift toward a low-carbon economy. These efforts benefit individual consumers and contribute to Jakarta's efforts in meeting its international climate commitments.

9. Limitation of the study

While the Interpretative Phenomenological Analysis (IPA) provides valuable insights into thedemand for Battery Electric Vehicles (BEVs) in Indonesia, the study is not without limitations.One key limitation is the subjective nature of IPA itself. Since the method relies on the researcher's interpretation of qualitative data, the perspectives, experiences, and preconceptions may have influenced the analysis, potentially affecting the validity and reliability of the findings. This inherent subjectivity poses a risk of bias, as different researchers might interpret the same data in diverse ways.

Additionally, the findings of this study are contextually specific to Jakarta, shaped by the city'sunique socio-cultural, economic, and regulatory environment. Factors influencing consumer behavior and preferences for BEVs in Jakarta may not necessarily apply to other regions in Indonesia, let alone other countries. Jakarta's urban infrastructure, government policies, andconsumer market dynamics are distinct, meaning that the conclusions drawn from this studymight not be generalizable to broader or international contexts.

Another limitation relates to the dynamic nature of consumer behavior. Attitudes and preferences toward BEVs are likely to evolve due to advancements in technology, shifts in market conditions, changes in government policies, and broader societal trends. The findingsof this study reflect consumer behavior at a specific point in time, which may not fully account for potential future shifts or emerging trends in BEV adoption. The rapid pace of innovation in the electric vehicle market, combined with growing environmental awareness and evolving consumer expectations, suggests that the preferences uncovered in this study may not remain static.

Furthermore, while IPA excels at offering rich qualitative insights into individual lived experiences and subjective interpretations, it does not provide comprehensive quantitative data on the broader factors influencing BEV demand. The study's focus on personal narratives may overlook larger systemic factors, such as macroeconomic trends, industry dynamics, or the role of competitive forces within the automotive market, which could also have asignificant impact on BEV adoption in Jakarta.

Lastly, the study's scope is limited by its qualitative approach, which may not capture a holisticview of the complexities underlying BEV adoption. Broader market trends, consumer demographics, industry forecasts, and quantitative analyses could complement the rich, nuanced findings of IPA to offer a more complete picture of the factors influencing BEVdemand.

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