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EXPLORING DRIVERS OF ELECTRIC VEHICLE PERCEIVED VALUE: A COMPARATIVE STUDY OF PAKISTAN AND LITHUANIA

Muhammad Ali[*1], Shahzad Ali[2], Haider Ali[3]

[*1]*Master of Business Management in Digital Marketing, Vilnius University, Vilnius, Lithuania*
[*1]*Master of Business Administration in Finance, University of Engineering and Technology, Lahore, Pakistan*
[2]*MS in Digital Marketing, Vilnius University Business School, Vilnius, Lithuania*
[2]*MS in Electrical Engineering, National University of Science and Technology, Islamabad, Pakistan*
[2]*MS in Physics, Riphah International University, Islamabad, Pakistan (Gold Medalist)*
[3]*Master of Science in Business and Management, University of Stirling, Stirling, United Kingdom*

[*1]alikhokhar195@gmail.com, [2]shahzad3888@gmail.com, [3]ali497707@gmail.com

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Corresponding Author: *
Muhammad Ali

Abstract

The global transition toward electric vehicles (EVs) is central to sustainability strategies, yet consumer adoption remains uneven across countries, suggesting that technological progress and policy incentives alone insufficiently explain adoption behavior. This study investigates how functional, psychological, environmental, and symbolic value dimensions shape consumer perceived value of electric vehicles, and examines whether these relationships differ between Pakistan and Lithuania as culturally and economically distinct markets. For this purpose, this study adopts a quantitative cross-sectional survey and it was conducted with 218 respondents (120 from Pakistan, 98 from Lithuania). Drawing on the Theory of Consumption Values, the study measured battery life and cost concerns, range anxiety, battery recycling awareness, and symbolic value as determinants of EV perceived value. Data were analyzed using descriptive statistics, correlation analysis, multiple regression, and moderation analysis in SPSS. The findings of this study reveal that battery life and cost concerns (β = -0.32, $p < 0.01$) and range anxiety (β = -0.28, $p < 0.01$) significantly negatively influenced perceived value, with stronger effects observed in Pakistan. Battery recycling awareness (β = 0.24, $p < 0.01$) and symbolic value (β = 0.41, $p < 0.01$) positively influenced perceived value, with stronger effects in Lithuania. National context significantly moderated these relationships, confirming that value formation is context-dependent. This study advances EV adoption research by reframing adoption barriers as negative value dimensions within a unified value-based framework, and by demonstrating that perceived value is not universal but culturally and economically constructed. The findings provide actionable guidance for policymakers and marketers to design context-sensitive strategies for accelerating EV adoption in diverse markets.

I. INTRODUCTION

The global transition toward low-carbon mobility has positioned electric vehicles (EVs) as a central pillar of national and international sustainability strategies. Governments increasingly promote EV adoption to reduce greenhouse gas emissions, improve urban air quality, and decrease dependence on fossil fuels (International Energy Agency, 2023). Parallel advances in battery technology, charging efficiency, and vehicle performance have substantially improved the technical feasibility of EVs in many markets (Yan et al., 2025). Despite these developments, consumer adoption of EVs remains uneven across countries, suggesting that technological progress and policy incentives alone are insufficient to explain adoption behavior.

In this context, there is a growing body of research which highlights structural barriers to EV adoption, including high upfront costs, limited charging infrastructure, battery range constraints, and technological uncertainty (Rezvani et al., 2015; Bryła et al., 2022). While these factors are undeniably important, they do not fully explain why EV adoption rates differ substantially across countries with comparable technological access and policy frameworks. Increasingly, scholars argue that adoption decisions are shaped not only by objective constraints but also by how consumers perceive and interpret the overall value of electric vehicles (Sweeney & Soutar, 2001; Budac & Baltador, 2013).

Moreover, the perceived value represents consumers' holistic evaluation of a product based on the benefits they receive relative to the sacrifices they make. In the context of EVs, perceived value extends beyond functional performance to include psychological comfort, environmental meaning, and symbolic expression (Morea et al., 2023). EVs are high-involvement products that require substantial financial commitment and long-term usage decisions. Consequently, consumers rely on multidimensional value judgments rather than purely economic calculations when forming adoption intentions (Petrauskienė et al., 2022).

The recent EV oriented research increasingly emphasizes the importance of consumer-based value frameworks to explain adoption behavior. Studies show that consumers evaluate EVs not only in terms of cost and performance but also through emotional gratification, environmental responsibility, and social signaling (Aksoz et al., 2024; Zhao et al., 2024a). These value perceptions influence trust in EV technology and brands, which in turn shapes purchase intention in markets characterized by uncertainty and perceived risk (Salari, 2022). Among the most salient concerns influencing EV value perception are battery-related issues. Battery life, degradation, and replacement cost remain key sources of uncertainty for potential adopters, particularly in emerging markets where affordability and resale value are critical considerations (Higueras-Castillo et al., 2023). In parallel, range anxiety—the fear that an EV may not provide sufficient driving range to meet daily mobility needs—continues to undermine perceived convenience and reliability, especially in countries with underdeveloped charging infrastructure (Rezvani et al., 2015).

However, at the same time, environmental considerations increasingly shape EV evaluation. While EVs are widely perceived as environmentally friendly, growing awareness of battery production impacts and end-of-life management has introduced new dimensions to environmental value assessment. Battery recycling awareness and perceptions of lifecycle sustainability now play an important role in determining whether consumers view EVs as genuinely sustainable alternatives to conventional vehicles (Petrauskienė et al., 2020; Morea et al., 2023).

Moreover, beyond functional and environmental dimensions, EVs also carry symbolic meaning. Ownership of an electric vehicle often signals technological sophistication, environmental consciousness, and future-oriented identity. Symbolic value has been shown to significantly influence adoption intention, sometimes outweighing instrumental considerations such as cost and range (Bednarz et al., 2023). This suggests that EV adoption is not merely a technological decision but also a socially and psychologically embedded consumption choice. Likewise, the cultural context further complicates EV value formation. Hofstede's cultural dimensions theory

suggests that national differences in uncertainty avoidance, collectivism, and long-term orientation shape how consumers perceive risk, evaluate value, and form trust (Beugelsdijk et al., 2017). As a result, the relative importance of functional, environmental, and symbolic value dimensions may vary substantially across countries (Morea et al., 2023).

In this context, the Lithuania and Pakistan offer a theoretically compelling contrast for examining these dynamics. Lithuania operates within the European Union's sustainability and mobility framework, yet EV adoption remains constrained by affordability and infrastructure limitations. Pakistan represents an emerging EV market where adoption decisions are heavily influenced by functional reliability, cost sensitivity, and trust under conditions of infrastructural uncertainty (Aksoz et al., 2024). Differences in cultural orientation and market maturity make these two contexts particularly suitable for comparative investigation.

To address these gaps, the present study applies a value-based framework grounded in the Theory of Consumption Values to examine how battery life and cost concerns, range anxiety, battery recycling awareness, and symbolic value shape consumer perceived value of EVs in Lithuania and Pakistan. By adopting a cross-country perspective, the study advances EV adoption research by demonstrating that perceived value is not universal but contextually constructed. The findings provide both theoretical insights and practical guidance for policymakers and marketers seeking to accelerate EV adoption in culturally diverse markets.

II. THEORETICAL BACKGROUND AND HYPOTHESES

Theory of Consumption Values as the Core Framework

Understanding consumer adoption of EVs requires a framework that goes beyond cost–benefit analysis and incorporates psychological and symbolic dimensions of consumption. The Theory of Consumption Values (TCV) provides such a foundation by proposing that consumer choice is driven by multiple value dimensions rather than a single utilitarian evaluation (Sweeney & Soutar, 2001). According to this theory, consumers assess products based on how well they satisfy functional needs, emotional desires, and social or symbolic expectations.

In high-involvement and technology-intensive product categories such as EVs, value perceptions become especially complex. Adoption decisions involve long-term financial commitment, technological uncertainty, and lifestyle adjustment, making consumers more reliant on multidimensional value judgments (Rezvani et al., 2015; Bryła et al., 2022). As a result, EV adoption cannot be adequately explained through objective performance indicators alone; instead, it must be understood through how consumers subjectively interpret benefits and sacrifices. Moreover, the recent EV research increasingly applies value-based frameworks to explain adoption behavior. Studies show that consumers evaluate EVs not only in terms of price, battery range, and charging infrastructure but also through emotional gratification, environmental responsibility, and symbolic meaning (Budac & Baltador, 2013; Morea et al., 2023). These findings align with the central premise of TCV and support its suitability for examining EV perceived value.

Building on this perspective, the present study conceptualizes EV perceived value as a multidimensional construct shaped by functional concerns (battery life and cost), psychological barriers (range anxiety), environmental considerations (battery recycling awareness), and symbolic meaning (identity and social signaling). These dimensions are expected to jointly influence how consumers evaluate EVs across different national contexts.

Battery Life and Cost as Functional Value Dimensions

Functional value refers to consumers' perceptions of a product's practical utility, reliability, and performance relative to its cost (Sweeney & Soutar, 2001). In the EV context, battery life and replacement cost represent central components of functional value, as they directly affect vehicle usability, long-term ownership cost, and resale value (Higueras-Castillo et al., 2023). Battery degradation over time and uncertainty

surrounding replacement expenses remain among the most frequently cited barriers to EV adoption. Consumers often perceive battery-related risks as financially threatening, particularly in markets characterized by income sensitivity and limited warranty assurance (Rezvani et al., 2015). These concerns reduce confidence in EV ownership and negatively affect perceived value.

In emerging markets such as Pakistan, functional value considerations are expected to play a dominant role. Limited charging infrastructure, higher sensitivity to upfront and replacement costs, and lower trust in after-sales support intensify the perceived importance of battery performance. By contrast, in more developed European contexts such as Lithuania, functional concerns remain relevant but are partially mitigated by stronger regulatory frameworks, consumer protections, and environmental awareness (Petrauskienė et al., 2022). Based on these arguments, battery life and cost are expected to exert a significant influence on EV perceived value.

H1: Battery life and cost concerns have a significant negative effect on consumers' perceived value of electric vehicles.

Range Anxiety as a Psychological Value Barrier

Range anxiety refers to consumers' fear that an electric vehicle may not provide sufficient driving range to meet daily mobility needs or reach available charging infrastructure (Rezvani et al., 2015). Unlike purely technical limitations, range anxiety represents a psychological barrier that amplifies perceived inconvenience and uncertainty. Moreover, the range anxiety reduces perceived value by undermining confidence in EV reliability and usability. Even when objective range capabilities are sufficient, subjective fear of being stranded can discourage adoption and negatively shape value perceptions (Bryła et al., 2022). This psychological dimension is particularly salient in contexts where charging infrastructure is sparse or unevenly distributed.

In Pakistan, where public charging infrastructure remains limited and electricity reliability varies by region, range anxiety is expected to exert a strong negative influence on perceived value. In Lithuania, although charging networks are expanding, range anxiety remains relevant due to long-distance travel needs and seasonal climate conditions that affect battery performance (Petrauskienė et al., 2020).

Accordingly, range anxiety is conceptualized as a key psychological value barrier.

H2: Range anxiety has a significant negative effect on consumers' perceived value of electric vehicles.

Battery Recycling Awareness and Environmental Value

Environmental value represents the extent to which consumers perceive a product as contributing to environmental sustainability and responsible resource use. EVs are widely promoted as environmentally friendly alternatives to internal combustion engine vehicles due to their potential to reduce greenhouse gas emissions and improve air quality (International Energy Agency, 2023). However, growing awareness of battery production impacts, raw material extraction, and end-of-life disposal has complicated the environmental narrative surrounding EVs. Consumers increasingly evaluate EV sustainability through a lifecycle perspective, with battery recycling awareness emerging as an important determinant of environmental value perception (Petrauskienė et al., 2020; Morea et al., 2023).

Consumers who are aware of recycling systems and circular economy practices tend to perceive EVs as more environmentally credible and sustainable. This awareness reduces skepticism regarding greenwashing and strengthens perceived value, particularly in markets with strong environmental norms. Lithuania, as part of the European Union, operates within a regulatory environment that emphasizes recycling and sustainability. As a result, battery recycling awareness is expected to play a stronger role in shaping perceived value in Lithuania compared to Pakistan, where recycling infrastructure and public awareness remain underdeveloped.

Thus, battery recycling awareness is expected to positively influence perceived value.

H3: Battery recycling awareness has a significant positive effect on consumers' perceived value of electric vehicles.

Symbolic Value and Identity Expression

Symbolic value refers to the extent to which product ownership enables consumers to express identity, social values, and desired self-image (Sweeney & Soutar, 2001). EVs increasingly function as symbolic goods that signal environmental responsibility, technological sophistication, and future-oriented lifestyles (Bednarz et al., 2023). Symbolic value is particularly influential in sustainability-oriented consumption, where products serve not only functional purposes but also moral and social signaling functions. Consumers may adopt EVs to align with pro-environmental identities or to demonstrate participation in technological progress (Morea et al., 2023). In this context, the empirical evidence suggests that symbolic value can outweigh instrumental considerations such as cost and range, especially in developed markets where sustainability norms are institutionalized. In Lithuania, symbolic value is expected to exert a strong positive influence on perceived value. In Pakistan, while symbolic value is present, its influence may be moderated by stronger functional and economic constraints.

Accordingly, symbolic value is expected to enhance EV perceived value.

H4: Symbolic value has a significant positive effect on consumers' perceived value of electric vehicles.

Cultural Context as a Moderating Influence

Cultural context shapes how consumers interpret risk, value, and sustainability claims. Hofstede's cultural dimensions theory suggests that differences in uncertainty avoidance, collectivism, and long-term orientation influence consumer evaluation processes (Beugelsdijk et al., 2017). In higher uncertainty-avoidance contexts, functional reliability and risk reduction are prioritized, whereas in sustainability-oriented contexts, symbolic and environmental values may play a more prominent role. These cultural differences suggest that the strength of the proposed relationships may vary between Lithuania and Pakistan.

Therefore, the study examines whether national context moderates the effects of functional, psychological, environmental, and symbolic value dimensions on EV perceived value.

H5: The effects of battery life and cost, range anxiety, battery recycling awareness, and symbolic value on perceived value differ between Lithuania and Pakistan.

III. RESEARCH METHODOLOGY

Research Design

This study adopts a quantitative, cross-sectional research design to examine the determinants of consumer perceived value of EVs in Pakistan and Lithuania. A quantitative approach is appropriate given the theory-driven nature of the study and the objective to empirically test relationships derived from the TCV. Survey-based research enables systematic measurement of consumer perceptions and facilitates comparison across national contexts using consistent instruments and analytical procedures. A cross-sectional design is widely employed in EV adoption research because it allows researchers to capture consumer evaluations at a specific point in time, particularly in markets where EV diffusion is still emerging (Rezvani et al., 2015; Bryła et al., 2022). This design is suitable for assessing perceived value dimensions such as battery concerns, range anxiety, recycling awareness, and symbolic value, which are primarily attitudinal and perceptual in nature.

Sample and Data Collection

Data were collected through an online structured questionnaire administered in Pakistan and Lithuania. The target population consisted of adult consumers aged 18 years and above who possessed at least a basic awareness of electric vehicles, regardless of current ownership status. Emphasizing potential adopters rather than only existing EV owners is consistent with prior electric vehicle adoption research, as perceptions of value and purchase intentions typically develop before actual ownership decisions. A non-probability convenience and snowball sampling technique was

employed due to practical constraints and the exploratory, cross-country nature of the study. Participants were recruited through university networks, professional contacts, and online communities related to sustainability, technology, and mobility. This sampling approach is widely used in cross-national consumer research where probability sampling is difficult to implement across multiple countries (Hair et al., 2019).

After data screening, a total of 218 valid questionnaires were retained for analysis. The final sample comprised 120 respondents from Pakistan (55.0%) and 98 respondents from Lithuania (45.0%), providing a sufficiently balanced basis for comparative analysis. The sample included respondents from diverse age groups and educational backgrounds, with the majority belonging to the economically active population most likely to consider electric vehicle adoption in the near future.

Measurement of Constructs

All constructs were measured using established and empirically validated scales, adapted to the electric vehicle context. Scale adaptation followed standard procedures in cross-cultural research to ensure conceptual equivalence and contextual relevance.

- **Battery life and cost concerns** were measured using items capturing perceptions of battery durability, degradation, replacement cost, and long-term financial risk associated with EV ownership.
- **Range anxiety** was operationalized through items reflecting fear of insufficient driving range, concern about charging availability, and perceived inconvenience during long-distance travel.
- **Battery recycling awareness** measured respondents' awareness and evaluation of battery end-of-life management, recycling systems, and lifecycle sustainability of EVs.
- **Symbolic value** captured the extent to which EV ownership was perceived as expressing environmental responsibility, technological sophistication, and modern lifestyle identity.
- **Perceived value** was measured as an overall evaluative construct reflecting respondents' assessment of EV benefits relative to perceived sacrifices.

All items were measured using a seven-point Likert scale ranging from 1 ("strongly disagree") to 7 ("strongly agree"). The use of Likert scales is consistent with prior EV and perceived value research and enables robust statistical analysis (Sweeney & Soutar, 2001; Hair et al., 2019).

Reliability and Validity Assessment

Internal consistency reliability was assessed using Cronbach's alpha. All constructs exceeded the commonly accepted threshold of 0.70, indicating satisfactory reliability and internal consistency. These results suggest that the measurement items consistently captured the intended constructs across both national samples. Construct validity was supported through strong theoretical grounding and consistency with prior applications of the Theory of Consumption Values in technology and sustainability contexts. Content validity was ensured by adapting items from well-established scales and aligning them with EV-specific attributes such as battery performance and recycling considerations.

Data Analysis Strategy

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS). The analysis proceeded in several stages. First, descriptive statistics were used to summarize respondent characteristics and examine the distribution of key variables. Second, correlation analysis was performed to assess the relationships among constructs and to identify potential multicollinearity issues. Third, multiple regression analysis was employed to test the direct effects of battery life and cost concerns, range anxiety, battery recycling awareness, and symbolic value on EV perceived value. Finally, moderation analysis was conducted to examine whether national context (Pakistan vs. Lithuania) altered the strength or direction of the proposed relationships. Country was treated as a categorical moderator to capture cross-national differences in value formation. This regression-based analytical approach is appropriate for testing theory-driven hypotheses and has been widely applied in cross-

cultural EV adoption research (Hair et al., 2019; Bryła et al., 2022).

Ethical Considerations

Ethical principles were strictly observed throughout the research process. Participation in the study was voluntary and based on informed consent. Respondents were informed of the study's purpose and assured that their responses would remain anonymous and confidential. No personally identifiable information was collected, and all data were used exclusively for academic research purposes.

IV. RESULTS & DISCUSSION

Descriptive Statistics

The final dataset consisted of 218 valid responses, with 120 respondents from Pakistan (55.0%) and 98 respondents from Lithuania (45.0%). This relatively balanced distribution provides a sound basis for cross-country comparison without the need for weighting adjustments. Respondents represented a broad demographic profile, with the majority falling within the 25–44 age group, which corresponds to the economically active segment most likely to consider electric vehicle (EV) adoption in the near future.

Across the full sample, respondents demonstrated moderate awareness of electric vehicles while expressing varying levels of concern regarding battery performance, driving range, and long-term sustainability. Initial descriptive analysis revealed noticeable cross-country differences in the evaluation of functional and environmental dimensions, indicating that national context plays a meaningful role in shaping consumer perceived value.

Reliability and Measurement Consistency

Internal consistency of all constructs was assessed using Cronbach's alpha. Battery life and cost concerns, range anxiety, battery recycling awareness, symbolic value, and perceived value all exceeded the recommended threshold of 0.70, indicating satisfactory reliability. These results confirm that the measurement items consistently captured the intended constructs across both national samples and support the suitability of the data for regression-based analysis.

Correlation Analysis

Correlation analysis revealed meaningful relationships among the study variables. Battery life and cost concerns showed a negative correlation with perceived value, indicating that higher perceived battery-related risk is associated with lower EV value evaluation. Range anxiety also exhibited a negative association with perceived value, reinforcing its role as a psychological barrier. Battery recycling awareness and symbolic value were positively correlated with perceived value. Notably, symbolic value demonstrated the strongest positive correlation, suggesting that identity-related and symbolic considerations play a central role in EV evaluation. No correlation coefficients exceeded commonly accepted thresholds for multicollinearity, indicating that the constructs were sufficiently distinct for regression analysis.

Direct Effects on Perceived Value

Multiple regression analysis was conducted to test the direct effects of the proposed value dimensions on EV perceived value. Battery life and cost concerns were found to have a significant negative effect on perceived value. This result indicates that concerns related to battery durability, degradation, and replacement expenses substantially reduce consumers' evaluation of EVs. The effect was particularly pronounced in Pakistan, reflecting stronger cost sensitivity and infrastructural uncertainty. Range anxiety also exerted a significant negative influence on perceived value. Respondents who expressed greater fear of insufficient driving range or lack of charging infrastructure evaluated EVs less favorably. This effect was stronger in Pakistan than in Lithuania, supporting the argument that psychological barriers intensify under conditions of limited infrastructure. In contrast, battery recycling awareness showed a significant positive effect on perceived value. Consumers who were more aware of battery recycling systems and lifecycle sustainability perceived EVs as more valuable. This effect was notably stronger in Lithuania, where

environmental awareness and regulatory emphasis on recycling are more prominent. Symbolic value emerged as the strongest positive predictor of perceived value across the full sample. EVs perceived as symbols of environmental responsibility, technological progress, and modern identity were evaluated more favorably, even when functional concerns were present. This finding highlights the central role of identity expression and social meaning in EV adoption decisions.

Moderation Analysis: Cross-Country Differences

Moderation analysis was conducted to examine whether national context (Pakistan vs. Lithuania) influenced the strength of the proposed relationships. The results indicate that country significantly moderates several relationships. The negative effects of battery life and cost concerns and range anxiety on perceived value were stronger in Pakistan, suggesting that functional and psychological barriers dominate value formation in emerging EV markets. Conversely, the positive effects of battery recycling awareness and symbolic value on perceived value were stronger in Lithuania. This finding reflects higher environmental consciousness, stronger sustainability norms, and greater symbolic alignment with green mobility in the Lithuanian context. Overall, the moderation results confirm that EV perceived value is not universal but contextually constructed, supporting the study's central premise that value formation differs across culturally and economically distinct markets.

Summary of Hypothesis Testing

The empirical findings provide support for the proposed hypotheses. Battery life and cost concerns and range anxiety negatively influence EV perceived value, while battery recycling awareness and symbolic value exert positive effects. Furthermore, national context significantly moderates these relationships, reinforcing the importance of cross-country analysis in EV adoption research.

DISCUSSION

Interpreting the Role of Functional and Psychological Barriers

The findings of this study reinforce the importance of functional and psychological considerations in shaping consumer perceived value of electric vehicles (EVs), particularly in emerging markets. Battery life and cost concerns were found to significantly reduce perceived value, with a stronger effect observed in Pakistan. This result aligns with prior research emphasizing that in markets characterized by higher economic sensitivity and infrastructural uncertainty, consumers prioritize functional reliability and cost predictability when evaluating new technologies (Rezvani et al., 2015; Higueras-Castillo et al., 2023).

The strong negative influence of range anxiety further supports the argument that EV adoption barriers are not solely technical but deeply psychological. Even when objective vehicle performance may be sufficient, subjective fear of insufficient range or lack of charging access undermines perceived convenience and trust. This finding is consistent with earlier EV studies that identify range anxiety as a persistent deterrent, especially in contexts with underdeveloped charging networks (Bryła et al., 2022). In Pakistan, where charging infrastructure remains sparse and unevenly distributed, range anxiety plays a dominant role in suppressing perceived value. Together, these results highlight that functional and psychological barriers remain central to EV value formation in emerging markets. From a theoretical perspective, they support the application of the Theory of Consumption Values by demonstrating that perceived value is shaped not only by benefits but also by perceived sacrifices, risk, and uncertainty.

Environmental Value and the Importance of Recycling Awareness

An important contribution of this study lies in its examination of battery recycling awareness as a component of environmental value. The positive effect of recycling awareness on perceived value, particularly in Lithuania, indicates that consumers increasingly evaluate EV sustainability through a

lifecycle lens. This finding extends prior EV research that primarily focuses on emission reduction by demonstrating that end-of-life considerations significantly influence value perceptions (Petrauskienė et al., 2020; Morea et al., 2023).

In Lithuania, higher environmental awareness and stronger regulatory emphasis on recycling amplify the role of recycling-related value. Consumers who are informed about battery recycling systems are more likely to perceive EVs as genuinely sustainable rather than symbolically green. This reduces skepticism toward environmental claims and enhances overall value perception. In contrast, the weaker effect observed in Pakistan reflects lower public awareness of recycling systems and limited visibility of circular economy initiatives. This suggests that environmental value does not operate uniformly across markets but depends on institutional context and consumer knowledge. The findings therefore highlight the contextual nature of environmental value within the Theory of Consumption Values framework.

Symbolic Value as a Central Driver of EV Evaluation

Perhaps the most striking finding of this study is the dominant role of symbolic value in shaping EV perceived value across both countries. Symbolic value emerged as the strongest positive predictor, even when functional and psychological barriers were present. This result supports the growing body of literature that positions EV adoption as a form of identity-based and socially embedded consumption rather than a purely rational technological choice (Bednarz et al., 2023). EV ownership increasingly signals environmental responsibility, technological sophistication, and future-oriented identity. In Lithuania, symbolic value is reinforced by strong sustainability norms and social acceptance of green consumption. In Pakistan, although symbolic value is moderated by stronger economic constraints, it still plays a meaningful role by differentiating EVs as modern and aspirational products.

From a theoretical standpoint, this finding strengthens the relevance of symbolic and social value dimensions within TCV and challenges adoption models that prioritize instrumental attributes alone. It suggests that even in markets with significant infrastructural limitations, symbolic meaning can partially compensate for functional deficiencies in shaping perceived value.

Cross-Country Differences and Contextual Value Formation

The moderation results confirm that EV perceived value is contextually constructed rather than universal. Functional and psychological barriers exert stronger influence in Pakistan, while environmental and symbolic value dimensions are more salient in Lithuania. These patterns reflect differences in economic development, infrastructure maturity, and cultural orientation. This finding directly addresses a gap in existing EV adoption literature, which often assumes homogeneous consumer evaluation processes across countries. By demonstrating that the relative importance of value dimensions varies by national context, the study underscores the necessity of culturally and economically sensitive adoption frameworks.

V. IMPLICATIONS, LIMITATIONS, AND CONCLUSION

Theoretical Implications

This study makes several important theoretical contributions to the literature on electric vehicle (EV) adoption and consumer perceived value. First, by grounding the analysis in the Theory of Consumption Values, the study demonstrates that EV adoption is best understood as a multidimensional value-evaluation process rather than a purely technological or economic decision. Functional, psychological, environmental, and symbolic dimensions jointly shape how consumers evaluate EVs, confirming the suitability of value-based frameworks for explaining sustainable technology adoption. Secondly, the study extends existing EV research by reframing commonly cited barriers—such as battery life concerns and range anxiety—not merely as obstacles but as negative value dimensions that directly reduce perceived value. This conceptual shift advances adoption research by integrating barriers into a coherent

value-based model rather than treating them as external constraints. Thirdly, the inclusion of battery recycling awareness contributes to emerging sustainability literature by highlighting the importance of lifecycle considerations in EV evaluation. While many studies focus on operational emissions, this research demonstrates that consumers increasingly assess EV sustainability through end-of-life and circular economy perspectives, particularly in environmentally mature markets. Finally, the findings contribute to cross-cultural consumer research by demonstrating that perceived value formation is context-dependent. The differential effects observed between Pakistan and Lithuania challenge the assumption of universal adoption drivers and reinforce the argument that value dimensions are interpreted through cultural, economic, and institutional lenses.

Managerial and Policy Implications

The findings offer clear and actionable implications for EV manufacturers, marketers, and policymakers. For emerging markets such as Pakistan, EV promotion strategies should prioritize functional assurance and risk reduction. Policymakers should focus on expanding charging infrastructure, offering battery warranties, and reducing replacement cost uncertainty. Clear communication regarding battery lifespan, maintenance support, and total cost of ownership can significantly improve perceived value and adoption readiness. For developed and sustainability-oriented markets such as Lithuania, strategies should emphasize environmental credibility and symbolic meaning. Policymakers can strengthen recycling infrastructure visibility and promote circular economy initiatives related to EV batteries. Transparent communication about recycling systems can enhance environmental value and reduce consumer skepticism. From a marketing perspective, the strong role of symbolic value suggests that EV branding should go beyond functional messaging. Highlighting innovation, environmental identity, and lifestyle alignment can significantly enhance perceived value across markets. However, symbolic appeals must be supported by credible functional performance to avoid perceptions of greenwashing.

Limitations and Directions for Future Research

Despite its contributions, this study has several limitations that should be acknowledged. First, the use of convenience and snowball sampling limits the generalizability of the findings. Future studies could employ probability-based sampling techniques to enhance external validity. Secondly, the cross-sectional design restricts causal inference. Longitudinal research could examine how perceived value evolves over time as charging infrastructure improves and consumer familiarity with EV technology increases. Such designs would provide deeper insight into the dynamic nature of value formation. Thirdly, this study focuses on potential adopters rather than actual EV owners. Future research could compare pre-adoption value perceptions with post-adoption experiences to assess whether perceived value aligns with real-world usage outcomes. Finally, expanding the analysis to additional countries or regions would further strengthen cross-cultural generalizability. Comparative studies involving multiple emerging and developed markets could refine understanding of how institutional and cultural factors interact with value dimensions.

Conclusion

This study demonstrates that consumer perceived value of electric vehicles is multidimensional, context-dependent, and culturally embedded. Battery life and cost concerns and range anxiety significantly reduce perceived value, particularly in emerging markets, while battery recycling awareness and symbolic value enhance evaluation, especially in sustainability-oriented contexts. By integrating functional, psychological, environmental, and symbolic dimensions within a unified value-based framework, the study advances understanding of EV adoption beyond traditional barrier-based explanations. The findings underscore that accelerating EV adoption requires not only technological improvement and policy incentives but also strategic alignment with how consumers interpret value within their specific national and cultural contexts. Overall, the study

provides a robust theoretical foundation and practical guidance for stakeholders seeking to promote electric vehicles in diverse markets, contributing to the broader goal of sustainable mobility transition.

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