Assessing Factors Impacting Electric Vehicle Adoption in Saudi Arabia: Insights on Willingness to Pay, Environmental Awareness, and Perceived Risk

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ABSTRACT

As Saudi Arabia seeks to transition toward sustainable energy, the adoption of Electric Vehicles (EVs) is a key component in reducing carbon emissions and combating climate change. This study explores the factors driving EV adoption, focusing on Willingness To Pay (WTP), Environmental Awareness (EA), Perceived Risks (PR), and Product Attributes (PA). Using a structured survey distributed to 365 respondents, the obtained data were analyzed through the SPSS 27 software, employing regression analysis and factor analysis. The results reveal that WTP and EA are significant predictors of Perceived Value (PV), which, in turn, positively influences consumers' intention to purchase EVs. Conversely, PR negatively impacts Purchase Intention (PI), though these risks are mitigated by favorable PA. The findings highlight a gap between consumer interest in EVs and the existing infrastructure, suggesting that addressing these concerns is crucial for widespread EV adoption in Saudi Arabia. These insights provide actionable recommendations for policymakers and businesses aiming to enhance consumer confidence and facilitate the growth of the EV market in the region.

Keywords-EV; WTP; EA; PR; PA

I. INTRODUCTION

Climate change has become a critical global issue, primarily driven by the increase in Greenhouse Gas (GHG) emissions, which significantly impact ecosystems. These emissions contribute to global environmental crises such as reduced water availability and increased coastal flooding. In response to growing environmental concerns both consumers and governments have taken action. Global temperatures may exceed 1.5 °C by the early 2030s and could rise by 2-3 °C by the end of the century unless strong measures are taken to reduce emissions [1].

The transportation sector accounts for approximately 25% of global CO_2 emissions, with light-duty vehicles being the primary sources of these emissions [2]. Despite efforts over the past decades to introduce alternative energy sources for transportation, the global reliance on petroleum remains significant. Electric Vehicles (EVs) have gained momentum as a potential solution, with global EV sales increasing from 0.79 million units in 2016 to 10.5 million units in 2022 [3]. However, despite this impressive growth, EVs still represent a small fraction of the overall vehicle market. Adoption is hindered by various factors, including high upfront costs and "range anxiety" among potential buyers [4]. Although EVs offer substantial environmental and economic benefits, it is crucial to identify the main factors influencing consumer adoption, especially in regions where EVs are still emerging. While extensive global research on EV adoption exists, a clear gap remains in understanding consumer attitudes and adoption trends in Saudi Arabia. This study aims to address this gap by examining the determinants of EV adoption in the region. The key objectives of this study are to identify the factors that influence EV adoption in Saudi Arabia the most, while addressing the following key research questions: What are the factors that affect consumer behavior and their willingness to purchase EVs.

Several previous studies have identified a range of factors affecting consumer EV adoption, with price being one of the most significant [5-9]. Financial factors include the overall cost of EVs, which is often higher due to its superior design, as well

as maintenance costs compared to Internal Combustion Engine (ICE) vehicles [10]. Other commonly mentioned factors include socio-demographic characteristics [8, 11-14], government policies [7-9, 14], Purchase Attitude (PA) [9, 15, 16], and charging infrastructure [5, 9, 16]. Other studies have highlighted the role of psychological and behavioral factors such as human–nature relationship, risk attitude, deontological awareness, and Environmental Awareness (EA) [8, 10, 17]. Authors in [6], examined the barriers to EV adoption and the results revealed that these challenges such as high purchase prices, battery costs, and the need for a supplementary vehicle due to existing circumstances are significant obstacles. These findings align with those of other studies, such as [18], which also identified price as a key factor influencing EV adoption.

Environmental and societal awareness can encourage consumers to choose EVs over traditional vehicles, provided they have the purchasing power to do so [7, 8]. Authors in [19] found that certain EV characteristics, such as the driving range, are valued more highly than others, like acceleration. This preference may be influenced by the unique needs of consumers in the Nordic region, where longer driving ranges and shorter charging times are prioritized. These findings align with studies that have identified product characteristics [7, 8, 20] and geographic region [13] as key factors influencing consumer preferences.

The Stimulus-Organism-Response (SOR) model is widely regarded as an important framework for understanding human responses to stimuli. Its main goal is to increase the knowledge of how environmental Stimuli (S) impact consumer perceptions (O), which then generate emotions that prompt consumer responses [13, 21, 22]. The SOR model has been applied to study consumer behavior towards green products [19], and more recently, to explain consumer behavior when purchasing EVs, but in a limited number of studies [25]. Authors in [24] proposed a model that accounts for psychological cues and PA, exploring how values and emotions affect consumer utilitarian and emotional tendencies.

Authors in [26] linked the Willingness To Pay (WTP) concept to that of price reservation. Despite advancements in EV manufacturing, there is still a lack of demand due to their higher cost compared to ordinary cars [27]. Prior research indicates that consumers are willing to pay more for safer and higher-quality products [16]. A buyer's purchase intention reflects their propensity to purchase a specific product or service. Authors in [26], examined the willingness of Indian consumers to pay more for EVs utilizing a "beliefs-intention-willingness" model. The finding revealed that the adoption intention and willingness to pay were directly driven by all analyzed factors except financial incentives. Furthermore, EV adoption intention somewhat mediated the relationship between all socio-psychological factors and WTP although full mediation of incentives was proposed. Authors in [29] estimated the WTP of Indian consumers concerning various EV attributes. The findings demonstrated that instead of offering a single WTP estimate, reference dependence gives more realistic WTP estimates by enabling them to fluctuate depending on the qualities of the reference alternative. The interaction of latent variables with vehicle features captures observed preference variation in WTP estimates.

In [29], a national study among Canadian consumers was carried out to explore their views and preferences regarding EVs. Authors in [30-33] analyzed the factors influencing consumer PI and WTP for ecofriendly products in developing countries. The study added two new variables to the theory of planned behavior: environmental concerns and WTP. The results showed the significant effects of environmental concerns and WTP on EV PI.

II. METHODOLOGY

A. Hypotheses Formation

Based on the above literature findings, the following hypotheses can be made:

- H1a: WTP for EVs enhances PV.
- H1b: WTP for EVs has a negative impact on PR.

EA refers to the consumers' understanding of the detrimental impacts of CO_2 emissions produced by conventional cars on the environment, as well as their WTP more when purchasing products that safeguard the environment and society, or at least limit the harm caused to them [8, 13, 17].

Various important trends correlated with energy communities as well as other energy and society-related subjects have been revealed. The results of a study conducted in Costa Rica disclosed that conscious customers are more likely to pay for certified products or goods produced by an equivalently certified company [29]. Based on this realization the subsequent hypotheses can be formed:

- H2a: EA enhances PV.
- H2b: EA has a negative impact on PR.

Environmental cognition is a customers' need to receive greater information about how products effect the environment, with more exposure to "green" information sources impacting their decision to buy [34]. Environmental knowledge consists of facts and concepts related to the natural environment and ecosystems, while environmental concordance involves understanding the connections that influence the environment, whole systems, and shared responsibility for sustainable development [35]. As customers' green consumption mentality is met, their worries regarding new energy cars will diminish [23]. Previous research suggests that consumers with strong pro-environmental values are more likely to engage in environmentally conscious purchases [36]. On the basis of this statement the following hypotheses can be formulated:

- H3a: Environmental cognition improves PV.
- H3b: Environmental cognition has a detrimental impact on PR.

Examining previous studies that addressed the factors influencing customers' choice to purchase an EV, it was found that many of them considered the car's attributes one of the criteria on which the consumer relies to proceed with such a

purchase. These attributes include safety, air conditioning, battery warranty, vehicle range, performance, high usage, engine power, and maximum distance per charge [9, 18]. Authors in [5, 8, 18] discussed that price is a product attribute greatly affecting consumer perception of an EV's value. Product characteristics also influence a consumer's WTP for an EV [18]. Based on the above statements, the following hypotheses can be formulated:

- H4a: PA have a positive impact on PV.
- H4b: PA have a negative impact on PR.

According to [18], utilitarian, hedonic, and social values all positively impact customer satisfaction and PI. Customer satisfaction is influenced by the PV, which varies depending on the consumer and therefore reinforces the latter's desire to buy energy-saving products. In [38], it was found that consumers' propensity to purchase an EV is primarily influenced by the latter's PV. In [34], it was discovered that consumer attitudes and PI were influenced by the PV and PR. PI regarding recycled products is positively affected by the interplay of values, beliefs, and personal norms, as noted in [39]. Conversely, PR has a negative effect on PI while enhancing the relationship between the latter and personal norms. The specific study discusses theoretical and managerial implications and outlines directions for future research, leading to the formulation of the subsequent hypotheses:

- H5a: PV has a positive impact on the intention to buy an EV/EV PI.
- H5b: PR has a negative impact on the intention to buy an EV/EV PI.

Figure 1 outlines the adopted model of this study.

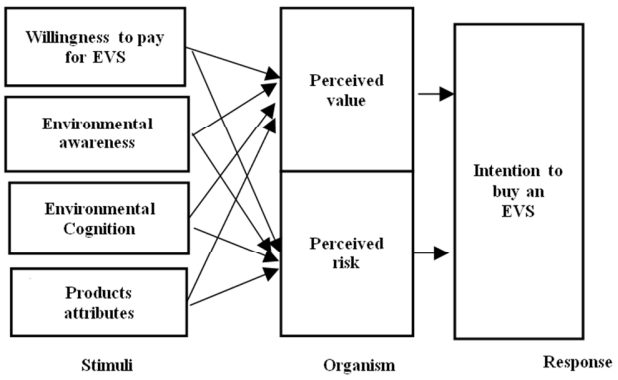

Fig. 1. The research model.

B. Data Collection

Samples were collected from respondents through an online questionnaire, targeting diverse demographic groups. A pre-test involving 20 participants was conducted to ensure its clarity and reliability. Data collection was carried out over an extended period to enhance response rates, with questions randomized to minimize potential biases. The final sample consisted of 363 respondents, providing sufficient statistical power for factor analysis and regression modeling. These methods enabled a comprehensive examination of consumer behavior toward EV adoption, as presented in Table I.

TABLE I. MEASUREMENTS

Variables	Items	Reference
Product Attributes (PA)	4	[40]
Willingness To Pay (WTP) for EVs	5	[25]
Environemntal Awareness (EA)	6	[36]
Environmental Cognition	5	[40]
Perceived Value (PV)	5	[24, 40]
Perceived Risk (PR)	4	[37, 38]
Purchace Intention (PI)	3	[37, 38, 40]

The survey instrument comprised 32 items grouped into seven core constructs related to consumer behavior and sustainability. Each item was measured using a 5-point Likert scale from 1 (Strongly Disagree) to 5 (Strongly Agree). The constructs included:

- PA: assessing perceptions of EV features
- WTP: measuring the willingness to pay more for eco-friendly EVs
- EA: capturing awareness of environmental issues linked to EV adoption
- PV: focusing on the EV benefits
- PR: evaluating concerns about maintenance and charging
- PI: measuring the likelihood of buying or recommending EVs.

TABLE II. FACTOR ANALYSIS

KMO and Bartlett's Test		
KMO Measure and Sampling Adequacy		0.539
Bartett's Test of Sphericity	Approx Chi-Square	16321.304
	df	496
	Sig.	0.000

Data analysis was conducted using SPSS 27, employing three key statistical methods to examine consumer behavior towards EV adoption. Initially, Exploratory Factor Analysis (EFA) was used to identify underlying relationships among the influencing factors, simplifying the complex dataset. Secondly, the Analysis of Variance (ANOVA) was applied to compare attitudes across various demographic groups, highlighting significant differences in EV perceptions. Finally, regression analysis was conducted to assess how specific factors predict the intent to adopt EVs, providing stakeholders with valuable insights. Additionally, correlation matrices and multiple regression analysis were performed to examine relationships between key variables and to test the study's hypotheses regarding drivers' PI.

Table II presents two different tests: the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. KMO is a test conducted to examine the strength of the partial correlation between the variables. KMO values closer to 1 are considered ideal while values less than 0.5 are unacceptable. The Bartlett's test is used to test the null hypothesis that the correlation matrix is an identity matrix,

meaning that the variables are unrelated and not ideal for factor analysis.

From the results, KMO value of 0.539 signified moderate sampling adequacy, supporting the factorability of the correlation matrix for factor analysis Bartlett's test of sphericity ($\chi^2 = 16321.304$, $p < 0.001$) indicated that correlations between items were sufficiently large for exploratory factor analysis. Table III shows the questionnaire and the results.

TABLE III. QUESTIONNAIRE AND RESULTS

Code	ITEMS	LEVEL OF AGREEMENT				
		SD	D	N	A	SA
P1	The market price of electric vehicles is one of my main considerations	32	32	62	83	154
P2	I am more concerned about the interior workmanship of electric cars	27	66	96	48	126
P3	I will consider the safety performance of electric vehicles	24	34	59	45	201
P4	I focus on the overall quality of electric vehicles	32	26	45	42	218
WP1	I would pay more for an electric car if it had a longer driving range on full battery.	42	48	60	90	123
WP2	I would pay more when buying a car if the battery charge time was faster.	24	35	50	139	115
WP3	I would pay more for an electric car if it have the same Acceleration relative to my preferred Gasoline car	51	31	66	141	74
WP4	I am willing to pay more when buying an electric car if it is less polluting than a Gasoline car	59	52	48	96	108
WP5	Willing to pay more for an electric car if it is cheaper in fuel	50	32	94	86	101
EA1	I separate the organic and recyclable waste.	24	50	129	52	108
EA2	I will further reduce my use of water because it is a limited environmental resource.	16	24	51	50	222
EA3	I'm worried even more about the natural resources for future generations.	23	41	78	75	146
EA4	For me, reducing air pollution is vital.	15	23	74	103	148
EA5	Climate change made me realize, even more, the environmental impact caused on the planet.	0	24	73	137	129
EA6	Climate change has increased my environmental awareness	9	32	65	97	160
EC1	Damage to the environment can have serious consequences for the planet and people	9	17	48	92	197
EC2	I am always concerned about environmental issues	18	33	106	81	125
EC3	Electric vehicles help reduce air pollution and protect the environment	18	22	55	87	181
EC4	Purchase of electric vehicles contributes to sustainable social development	25	34	31	125	148
EC5	Buying an electric car helps to raise your environmental awareness and perception.	25	24	94	101	119
PV1	Electricity costs less than petroleum, hence it is cheaper to use.	25	32	94	85	127
PV2	I believe wide adoption of the electric cars has a positive impact on environmental protection.	9	40	58	94	162
PV3	I think the power system of the electric car makes people satisfied	9	49	94	108	103
PV4	More steady operational performance of electric automobiles.	17	59	146	48	93
PV5	Driving an electric vehicle can be enjoyable.	15	50	76	51	171
PR1	It is difficult to use EVs for longer distances due to the lack of charging stations along the roadway	76	51	57	36	143
PR2	Charging an EV isn't possible with an ordinary electric socket.	61	52	117	41	92
PR3	Lack of recharging facilities at home for overnight charging causes inconvenience when using an EV.	58	78	71	38	118
PR4	I'm worried about the difficulties of maintaining electric cars or the availability of replacement components.	36	92	51	60	124
IP1	I would consider buying an electric car	66	17	108	68	104
IP2	I look forward to launching more electric cars	51	25	74	75	138
IP3	I would recommend electric cars to my family and friends	65	28	76	84	110

III. RESULTS AND DISCUSSION

Table IV demonstrates that the communalities in the study ranged from 0.550 to 0.887, with most values exceeding the 0.50 threshold, indicating strong representation of items within their respective factors. Notably, items related to EA and PI demonstrated communalities greater than 0.80, suggesting these concepts are well-represented by their latent constructs. The extraction values from the Principal Component Analysis (PCA), exhibited that several items, including those for EA and PV, achieved communalities of 1.000, further confirming their robust representation in the analysis. The PCA identified six key components that together accounted for 76.88% of the total variance, indicating a well-fitted model. Component 1 combined PA and EA, explaining 41.81% of the EV variance, quality, and environmental consciousness. Component 2 focused on EV infrastructure and usage challenges, accounting for 11.51%, highlighting barriers, such as charging station availability. Component 3 represented environmental cognition, 8.21%, reflecting engagement with sustainability. Component 4 captured WTP, 6.07%, showing readiness to invest in EVs. Component 5 highlighted PR, 4.88%, addressing concerns about battery life and maintenance. Finally, Component 6 reflected PI, 4.40%, encompassing the likelihood of buying or recommending an EV. The overall scale exhibited a Cronbach's Alpha of 0.952, indicating excellent internal consistency. Each construct also demonstrated an alpha value exceeding the acceptable threshold of 0.70, reflecting strong reliability across all survey items.

This section outlines the results of hypothesis testing, which aimed to evaluate the relationships between WTP, EA, PA, PV, PR, and PI for EVs. ANOVA tests were utilized to assess significant differences. The findings are discussed in the context of the proposed hypotheses, as outlined in Table V.

TABLE IV. PCA FACTOR ANALYSIS

Total variance explained				
Component	**Initial eigenvalues**			**Extraction sums of squared loadings**
	% of Variance	**Cumulative %**	**% of Variance**	**Cumulative %**
1	41.810	41.810	41.810	41.810
2	11.511	53.321	11.511	53.321
3	8.209	61.531	8.209	61.531
4	6.075	67.605	6.075	67.605
5	4.875	72.481	4.875	72.481
6	4.402	76.882	4.402	76.882

H1a: WTP for EVs enhances PV. The ANOVA results indicate that WTP significantly impacts PV ($F = 37.609$, $p < 0.001$), confirming H1a. This finding suggests that consumers who are willing to pay more for EVs perceive greater value in them. Higher-income groups, in particular, demonstrate this effect, possibly due to their ability to afford premium sustainable products and their motivation to make eco-friendly purchases.

H1b: WTP for EVs has a negative impact on PR. A significant negative relationship was observed between WTP and PR ($F = 16.438$, $p < 0.001$), supporting H1b. Consumers willing to invest more in EVs perceive lower risks in the latter. This suggests that those with a greater financial capacity are more confident in the technology and benefits of EVs, considering them reliable and safe options.

H2a: EA and societal awareness enhance PV. The ANOVA results demonstrated that EA has a positive impact on PV ($F = 29.693$, $p < 0.001$), supporting H2a. Consumers who are more aware of environmental issues tend to value EVs more highly. Younger age groups and higher-income consumers display higher levels of EA, which correlates with their stronger perception of the EV value.

H2b: EA and societal awareness have a negative impact on PR. EA significantly reduces PR ($F = 10.733$, $p < 0.001$), supporting H2b. This suggests that individuals with higher EA perceive fewer risks in purchasing EVs. An awareness of the environmental benefits of EVs possibly mitigates concerns about their reliability and performance, as consumers recognize the long-term advantages of adopting sustainable technologies.

H3a: Consumers' environmental cognition improves PV. A positive and significant relationship between environmental cognition and PV ($F = 36.186$, $p < 0.001$) supports H3a. Consumers with a stronger understanding of environmental issues perceive greater value in EVs. This indicates that increased environmental education can elevate the perceived worth of sustainable products, thereby encouraging EV adoption.

H3b: Consumers' environmental cognition has a detrimental impact on PR. A negative relationship was found between environmental cognition and PR ($F = 11.834$, $p < 0.001$), confirming H3b. Consumers who are well-informed about environmental issues are less likely to perceive risks associated with EVs. This highlights the importance of promoting environmental cognition to alleviate concerns about EV technology, such as battery life or charging infrastructure.

H4a: PA have a positive impact on PV. The results reveal a significant positive impact of PA on PV ($F = 39.529$, $p < 0.001$), supporting H4a. Key attributes, such as EV quality, performance, and design contribute to higher PV. This finding emphasizes the need for manufacturers to focus on enhancing product features, which directly influence consumers' value perceptions and purchasing decisions.

H4b: PA have a negative impact on PR. ANOVA results confirm a significant negative relationship between PA and PR ($F = 15.785$, $p < 0.001$), supporting H4b. Consumers who prioritize features, such as safety, battery life, and performance are likely to perceive lower risks associated with EVs. Effective communication about these attributes can reduce consumer hesitancy and foster a sense of security in adopting EVs.

H5a: PV has a positive impact on EV PI. The analysis indicates a strong positive relationship between PV and PI ($F = 35.729$, $p < 0.001$), confirming H5a. Consumers who perceive high value in EVs are more likely to purchase them. This suggests that highlighting the financial, environmental, and technological benefits of EVs can increase PI.

H5b: PR have a negative impact on EV PI. The results demonstrate that there is a significant negative impact of PR on PI ($F = 350.511$, $p < 0.001$), supporting H5b. Consumers who perceive higher risks are less likely to buy EVs. Concerns about the infrastructure, maintenance, and long-term performance of EVs are primary barriers to their adoption. Reducing these PR, for instance, through improved charging networks and warranties, could drive higher EV adoption rates.

Overall, the testing hypothesis confirms that WTP, EA, and PA play significant roles in shaping EV consumer perceptions. Consumers who are more willing to pay, are environmentally aware, and appreciate EV attributes tend to perceive higher value and lower risks, ultimately leading to a stronger PI. The findings suggest that enhancing PV and reducing PR are critical strategies for increasing consumer EV adoption. Product improvements, including reliability, design, and performance, alongside efforts to raise EA, can strengthen consumer confidence and drive purchase behavior.

The analysis underscores that PA and EA are significant factors influencing EV adoption. This is consistent with the Technology Acceptance Model (TAM), which posits that perceived usefulness and perceived ease of use directly affect user technology acceptance [34]. In the context of EVs, attributes, such as fuel efficiency, low operating costs, and government incentives are viewed as primary benefits. This finding aligns with the literature emphasizing the role of product innovation in accelerating the adoption of sustainable technologies [39]. Moreover, the EA concept can be understood through the Value-Belief-Norm (VBN) theory, which explains that increased awareness of environmental issues fosters beliefs about individual responsibility and prompts pro-environmental behaviors [40]. As consumers become more conscious of climate change and its implications, EVs are increasingly recognized as an effective means of

reducing personal ecological footprints. This aligns with [41], where it was found that individuals with heightened environmental concerns exhibit a greater propensity to adopt green technologies.

TABLE V. ANOVA RESULTS

Variables	Sum of Squares	df	F	Sig.
PVs				
PAs	589.427	34	39.529	0.000
	143.851	328		
	733.278	362		
WTP for EVs	573.703	34	37.609	0.000
	147.162	328		
	720.865	362		
EA	541.396	34	29.693	0.000
	175.898	328		
	717.295	362		
Environmental Cognition	596.750	34	36.186	0.000
	159.091	328		
	755.840	362		
PR				
PAs	342.064	19	15.785	0.000
	391.215	343		
	733.278	362		
WTP for EVs	343.560	19	16.438	0.000
	377.305	343		
	720.865	362		
EA	267.446	19	10.733	0.000
	449.849	343		
	717.295	362		
Environmental Cognition	299.282	19	11.834	0.000
	456.559	343		
	755.840	362		

Despite identifying several positive drivers, this study also highlights PR as significant barriers to EV adoption. Concerns about charging station availability and uncertainties surrounding battery performance and longevity are critical challenges faced by potential EV buyers. These findings are consistent with former research emphasizing the need for robust charging infrastructure to alleviate consumer anxieties concerning EV range and accessibility [42]. The limited presence of charging stations, especially in rural and suburban areas, can deter consumers from switching to EVs. The Risk Perception Theory provides insights into why consumers may hesitate to adopt new technologies. The study identifies WTP as a crucial determinant of EV adoption, particularly among consumers with higher incomes. This finding aligns with the existing literature suggesting that individuals with greater financial flexibility are more inclined to invest in technologies that promise long-term environmental and economic benefits [27]. However, persistent price sensitivity remains a barrier to widespread EV adoption, highlighting the necessity for pricing strategies that cater to diverse income levels. The PV concept plays a significant role in shaping PI. Many consumers view EVs as investments that yield long-term savings on fuel and maintenance costs, which is consistent with the Economic Theory of Consumer Behavior, which emphasizes the balance between perceived utility and cost in consumer decision-making [43].

The findings of this study carry significant implications for policy and practice. First, governments should prioritize expanding EV charging infrastructure, particularly in underserved urban and rural areas. The development of accessible public charging stations, combined with incentives for private investments in charging facilities, is vital for addressing consumer concerns about charging availability and convenience. Second, implementing financial incentives, such as tax rebates, subsidies, and incentives for early adopters, can substantially reduce the perceived financial burden associated with EV adoption. Educational campaigns designed to communicate the environmental and economic benefits of EVs can foster a more informed consumer base, thereby enhancing their acceptance and adoption.

In conclusion, the study's findings provide significant insights into consumer behavior towards EV adoption, highlighting key factors that influence intentions across different demographics. Notably, the results indicate that younger consumers, particularly those with higher education levels, demonstrate a greater propensity to adopt EVs, reflecting a broader global trend where environmentally conscious attitudes are gaining traction among younger populations. This aligns with findings from other countries, suggesting that similar socio-economic factors may drive EV adoption worldwide. However, the study also revealed distinct differences between Saudi Arabia and other nations. While global trends indicate a strong influence of environmental concerns, Saudi respondents prioritized economic factors, such as fuel savings and governmental incentives, over environmental considerations. This suggests that in regions placing less emphasis on environmental issues, practical benefits play a crucial role in shaping consumer attitudes towards EVs. These findings underscore the need for tailored marketing strategies and policies that consider local contexts. In Saudi Arabia, for instance, initiatives that emphasize cost savings and government support could be more effective in promoting EV adoption. Conversely, in countries where EA is more pronounced, campaigns might focus on sustainability and ecological benefits. Overall, it should be noted that these differences are vital for stakeholders, aiming to enhance EV adoption and align strategies with the unique cultural and economic landscapes of different regions.

IV. CONCLUSIONS

This research sheds light on the multifaceted dynamics influencing consumer Electric Vehicle (EV) adoption, providing both scholars and practitioners with significant insights. In terms of theoretical contribution, this study's findings suggest that consumers' environmental values and beliefs about the EV benefits are crucial determinants of the former's adoption intentions. This aligns with [44, 45], where the importance of integrating individual values with environmental beliefs in promoting sustainable behavior was emphasized. The research further indicates that raising consumer awareness of the environmental benefits associated with EVs can strengthen their intention to adopt this technology. Therefore, it is vital for future theoretical frameworks to incorporate socio-psychological dimensions that

capture the complexity of consumer decision-making processes in sustainable technology adoption.

From a managerial perspective, this study underscores the necessity for stakeholders' manufacturers, policymakers, and marketers to implement targeted strategies that directly address consumer perceptions and concerns regarding EVs. Comprehensive educational campaigns can be pivotal in dispelling misconceptions and highlighting the long-term cost-effectiveness and environmental benefits of EVs. Informed consumers are more likely to adopt sustainable practices, and thus, effective communication strategies should focus on the tangible benefits of EV ownership, including lower maintenance costs and potential savings from government incentives [45].

Although this study provides valuable insights into factors influencing EV adoption, future research should delve into several areas. Longitudinal studies could track changes in consumer perceptions and behaviors over time as the EV market matures and technological advancements occur. Additionally, cross-cultural comparisons could elucidate how cultural values and regulatory frameworks shape EV adoption in various regions, offering insights that could inform global best practices. Despite its contributions, this study is not without limitations. The reliance on self-reported data may introduce biases, as respondents may either overstate or underestimate their actual intentions or behaviors regarding EV adoption. To mitigate this issue, future studies could explore alternative data collection methods, such as behavioral tracking or longitudinal surveys, to yield more accurate insights into consumer behavior.

In summary, this research provides critical insights into the factors influencing consumer adoption of EVs, offering significant contributions to both theoretical frameworks and practical applications. Incorporating consumer insights into policy-making and business strategies will be vital in ensuring that the transition to sustainable mobility is not only achievable, but also widely accepted.

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DATA AVAILABILITY

Data are available from the authors upon request.

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