A Systematic Review of Consumer Perception and Purchasing Behavior of Electric Vehicles

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ABSTRACT

Purpose: *This literature review aims to analyze the factors influencing consumer perception and purchasing behavior towards electric vehicles (EVS), examining both the opportunities and challenges associated with EV adoption.*
Design/Methodology/Approach: *This literature review incorporates data from diverse sources, including textbooks, scholarly articles from Google Scholar, ResearchGate, and Academia databases, and a thesis retrieved from the Shodhganga repository.*
Findings/Result: *Environmental concerns, government incentives, and technological advancements drive electric vehicle (EV) adoption, though high costs, range anxiety, and inadequate charging infrastructure pose challenges. Addressing psychological factors and enhancing battery development, charging networks, and financial incentives are essential for wider EV acceptance.*
Originality/Value: *This review synthesizes a wide range of research findings on EV adoption, highlighting both the progress made and the remaining challenges. It provides a comprehensive overview of the factors influencing consumer perception and behavior towards EVs, serving as a valuable resource for researchers, policymakers, and industry stakeholders.*
Paper Type*: Systematic literature review*
Keywords: Electric vehicles, consumer perception, purchasing behavior, adoption barriers, government incentives, ABCD Analysis.

1. INTRODUCTION :

Electric vehicles (EVs) are heralded as a viable near-term vehicle technology aimed at reducing dependency on fossil fuels and mitigating greenhouse gas (GHG) emissions associated with conventional vehicles (CVs) [1]. These vehicles encompass a range of types including Hybrid Electric Vehicles (HEVs), which combine an internal combustion engine with an electric motor for improved fuel economy, Plug-in Hybrid Electric Vehicles (PHEVs), which have a larger battery for extended electric-only driving range, and Battery Electric Vehicles (BEVs) that run solely on battery power and produce zero emissions. The adoption of EVs is influenced by several factors including technological advancements, government incentives, and increasing consumer awareness, all of which are crucial for driving market growth [1]Electric vehicles offer numerous advantages over internal combustion engine vehicles, notably reduced dependence on oil and lower emissions, which address both energy crises and environmental pollution [2]. BEVs, in particular, are lauded for their zero emissions and absence of oil consumption, making them a promising solution for urban air quality improvement [3]. Additionally, EVs powered by renewable energy can significantly reduce pollution, with technologies like fuel cells (fcs) presenting zero emissions with water as the only byproduct [4]. Lower operating costs due to cheaper electricity and reduced maintenance requirements also make EVs economically attractive [5]However, several challenges impede the widespread adoption of EVs. High purchase prices, limited driving range, and long charging times are significant barriers [1], [5]. The development of traction batteries is crucial, with lithium-ion batteries currently dominating due to their high energy density, efficiency, and long cycle life, despite challenges related to charging rates, lifespan, and reliability [2]. The need for a robust charging infrastructure network, which involves optimal placement of charging

stations and addressing grid impact, is another critical factor for EV adoption [2]. Additionally, issues such as range anxiety and the environmental impact of battery production and disposal need to be addressed [5], [6]Consumer perception and purchasing behaviour towards electric vehicles are shaped by various factors including psychological, social, and economic aspects. Despite the environmental and economic advantages of EVs, consumer adoption is often hindered by high upfront costs, range anxiety, and lack of charging infrastructure [1], [7]. The perceived effectiveness of individual actions on the environment also play a significant role. Understanding and addressing these barriers is crucial for promoting EV adoption [7]Government incentives, such as subsidies and tax exemptions, aim to mitigate the financial barriers and enhance the attractiveness of EVs [8] Furthermore, advancements in battery technology and the establishment of extensive charging infrastructure can alleviate range anxiety and improve consumer confidence in EVs [9]. Overall, while the technical and economic aspects of EVs are important, addressing the psychological and social dimensions is equally crucial for fostering a positive consumer perception and encouraging the widespread adoption of electric vehicles [1], [7]

2. OBJECTIVES :

1) To examine the factors influencing consumer perception of electric vehicles (EVs).
2) To identify the key determinants of consumer purchasing behavior towards EVs.
3) To analyze the barriers and challenges hindering the widespread adoption of EVs.
4) To assess the impact of government incentives and policies on EV adoption.
5) To explore the role of technological advancements in shaping consumer preferences for EVs.
6) To identify research gaps and future research directions in the field of EV adoption.

3. METHODOLOGY OF DATA COLLECTION :

A comprehensive review of existing literature was conducted using various academic databases such as Google Scholar, researchgate, Academia, and Shodhganga, employing relevant keywords like "electric vehicles," "consumer perception," and "purchasing behavior." Studies published in peer-reviewed journals, conference proceedings, and reputable industry reports were included, with a focus on consumer perceptions and behaviors towards EVs. Key findings, methodologies, and limitations of the included studies were extracted and analyzed to identify common themes, patterns, and research gaps.

4. RELATED RESEARCH WORK :

The transition to electric vehicles (EVs) is influenced by various factors, making consumer perception and purchasing behavior a multifaceted issue. Research in India highlights that while environmental concerns and trust in technology drive positive perceptions of EVs, barriers such as high costs, insufficient infrastructure, and limited social acceptance hinder widespread adoption [10]. These findings are mirrored in other regions; for instance, in Australia, perceived advantages of EVs, including vehicle design, environmental impact, and safety, significantly shape consumer preferences. Financial incentives, particularly upfront rebates, play a crucial role in encouraging EV purchases, especially among Millennials who are less price-sensitive compared to other generations [11]. Liao, Molin, and van Wee [12] provide a comprehensive review, identifying financial incentives, technical attributes like driving range, and charging infrastructure as pivotal in shaping EV preferences. They emphasize the importance of addressing the heterogeneity in consumer preferences, driven by socioeconomic and psychological factors, through dynamic policy interventions. Egbue and Long [13] further underline the socio-technical barriers to EV adoption, pointing out that consumer concerns about driving range and high costs need to be mitigated to foster wider acceptance. In Belgium, a survey by Lebeau et al. [14] Found that while consumers appreciate the low operating costs and environmental benefits of EVs, high purchase prices, limited driving range, and insufficient charging infrastructure are significant drawbacks. The study advocates for government intervention in standardizing charging infrastructure and providing financial incentives to increase consumer confidence. Peters and Dütschke [15] also emphasize the role of modern technology attitudes and environmental consciousness in influencing EV purchase willingness, though they note that barriers such as high costs and inadequate infrastructure must be overcome through targeted marketing and increased social awareness. In India, Varghese, Abhilash, and Pillai [16] explore the relationship between consumer awareness and purchase intention, noting that while there is recognition of the environmental benefits and governmental initiatives

promoting EVs, there remains a lack of knowledge about the technology and infrastructure needs. Addressing these knowledge gaps is crucial for enhancing EV adoption. Similarly, Tupe, Kishore, and Johnvieira [17] stress the need for a robust charging infrastructure and consumer education to overcome barriers such as high costs and limited driving range, which currently hinder market penetration. Secinaro et al. [18] provide a thematic analysis of EV consumer behavior, identifying key factors like price consciousness, environmental concern, and consumer perception as major influences on purchase intentions. They suggest future research focus on exploring external and subjective factors, including the impact of tax incentives and the role of mobility services. In China, He, Zhan, and Hu [19] emphasize the impact of personal innovativeness and environmental concern on EV purchase intentions, recommending that enhancing perceptions of monetary benefits and symbolic value while addressing concerns about risks and costs can effectively promote EV adoption. Brase[20]identifies that individual consumer choices are often driven by immediate concerns about performance and range, as well as the perceived social value of owning an EV. Addressing these immediate performance and usage concerns, alongside emphasizing the values associated with EV ownership, can significantly influence purchasing behaviour. Overall, the literature underscores the complexity of consumer perception and purchasing behaviour towards EVs, highlighting the need for targeted policies, incentives, and education to overcome barriers and promote wider adoption. The interplay of environmental awareness, financial incentives, technical attributes, and social influences forms the foundation for understanding and facilitating the transition to electric vehicles, thereby paving the way for a more sustainable transportation future.

Table 1: To gain a comprehensive understanding of electric vehicles (EVs), this literature review encompassed articles from Google Scholar, ResearchGate, Academia, and Shodhganga published over the last three decades. The review includes papers published between 1990 and 2020, ensuring a broad temporal perspective on EV research.

Sl No.	Filed of Research	Focus	Outcome	Reference
1	Environmental science	The environmental implications of electric cars, particularly the lead pollution from the production and recycling of lead-acid batteries	Electric cars, contrary to their intended purpose, may not offer the promised environmental benefits due to significant lead pollution	Lave, Hendrickson, and mcmichael (1995)[21]
2	Market segmentation, marketing communication strategies, and electric vehicle drive.	Studying the impact of different marketing strategies, and understanding how families use electric vehicles in their daily lives	Four market segments were identified based on EV attitudes. Information acceleration effectively promotes positive attitudes. Families can incorporate EVs despite range and cargo limitations.	Gärling (2000).[22]
3	Electrical and electronic engineering	Electric vehicle technology	Advancements in technology and environmental concerns are driving the development of electric vehicles, but challenges like high costs and limited infrastructure need to be addressed for widespread adoption.	Chan (1993). [23]
4	Consumer behavior regarding electric vehicles	Identifying factors that discourage potential buyers.	The fear of a dead battery is a major deterrent, more so than limited range or speed.	Chéron and Zins (1997). [24]

5	Transportation and energy	Analysing the potential demand for electric motorcycles (EMs) in Taiwan using stated preference modelling	Female motorists are the potential target market for EMs. The study also discusses the developmental and energy-use issues of EMs.	Chiu and Tzeng (1999). [25]
6	Innovation management	The challenges of radical product innovation in complex systems, using the electric vehicle as a case study	The outcome underscores challenges for incumbent firms in acquiring new skills and technologies, emphasizing the pivotal role of government intervention and industry collaboration in fostering innovation.	Dyerson and Pilkington (2000). [26]
7	Consumer behaviour and market research for alternative-fuel vehicles	Identifying the relationships between intentions to purchase alternative-fuel vehicles, attitudes towards the environment, perceived importance of convenience and economy of ownership and operation, and consumer uncertainties	Environmental concerns are paramount in explaining initial consumer reactions to alternative-fuel vehicles, and that uncertainty about fuel availability is a major concern for consumers. Additionally, economic incentives alone may not be enough to overcome consumer concerns and reservations about alternative-fuel vehicles.	Golob, Kitamura, and Occhiuzzo (1992). [27]
8	Consumer behaviour regarding electric vehicles	Understanding how households will adapt to and optimize the use of EVs, given their limited range and long recharge times.	Price incentives could make EVs primary household vehicles, used more often than gasoline cars. The research emphasizes the role of information, experience, adaptive responses, and market optimization in EV market development.	Turrentine, Lee-Gosselin, Kurani, and Sperling (1992). [28]
9	Energy and environmental science	The impacts of large-scale electric vehicle use in southern California	Electric vehicles have the potential to enhance load shapes, improve operational efficiency, and lower average electricity rates. However, their anticipated environmental benefits may be limited by increased emissions from power generation sources.	Ford (1995). [29]
10	Environmental science and transportation	Predicting the market penetration of electric and clean-fuel vehicles in Southern California.	Stated preference survey and demand modeling method to estimate the effect of vehicle attributes on consumer purchase decisions.	Golob, Kitamura, Bradley, and Bunch (1993). [30]
11	Transportation and energy	Projecting the use of electric vehicles (EVs) based on data from household vehicle trials	Households can use EVs for most daily trips, but some trips will shift to other vehicles. Experience with EVs does not change perceptions of desired vehicle range.	Golob and Gould (1998). [31]
12	Public opinion on electric vehicles (EVs)	How opinions about EVs' environmental	Environmental support declines generally but increases among EV trial participants, who prioritize	Gould and Golob (1998). [32]

		impact change over time and with experience.	cost and range over environmental benefits when considering purchases.	
13	Electric and hybrid vehicle technology	Tracing General Motors' (GM) efforts in developing electric and hybrid propulsion systems.	Comprehensive overview of GM's electric and hybrid vehicle development, highlighting the technological advancements and challenges over several decades.	Rajashekara (1994). [33]
14	The impact of electric vehicles (EVs) on air pollution	Modelling the change in pollutant levels in Maricopa County, Arizona, due to the introduction of EVs.	EVs can lead to a net reduction in pollutants, but the extent of the reduction depends on factors like EV efficiency and power generation sources.	Kekoster, Morrow, Schaub, and Hubele (1995). [34]
15	Consumer behaviour regarding electric vehicles (EVs)	Analysing the factors that influence consumers' willingness to purchase EVs in India.	Environmental concerns, value for money, driving range, and infrastructure are significant factors influencing the purchase intention of EVs.	Kurani, Turrentine, and Sperling (1994). [35]
16	Consumer behaviour and market demand for electric vehicles (EVs)	Testing the "hybrid household hypothesis," which suggests that multi-car households would be willing to purchase a limited-range EV as part of their vehicle fleet	Significant number of households would purchase an EV, even with limited driving range, due to the value of home recharging and other EV attributes.	Kurani, Turrentine, and Sperling (1996). [36]
17	Electric vehicle (EV) technology.	Reviewing recent EV programs and their propulsion systems in North America, Europe, and Japan.	Comprehensive overview of EV development, including technical data, comparisons of different electric drives, and predictions for future trends in traction motor and controller development.	Chang (1993). [37]
18	Creation of the Japanese electric vehicle (EV) industry.	How firms overcome barriers to collaboration and cooperation in the face of uncertainty	An analysis of the evolution of interfirm relational skills in both bilateral and multilateral contexts, showing how these skills are used to overcome the risks and uncertainties inherent in developing a new industry.	Patchell (1999). [38]
19	Technological systems and innovation	Strategies for shifting technological systems, using the transition to electric vehicles as a case study.	Three strategies—technology forcing, strategic niche management (experimentation), and creating new alliances (technological nexus)—combine effectively to drive change.	Schot, Hoogma, and Elzen (1994). [39]
20	Market research for electric vehicles (EVs).	The potential demand for EVs among multi-vehicle California households.	Many households are interested in buying electric vehicles, especially for daily commutes and errands, and that different types of electric vehicles will appeal to different people depending on their needs and preferences.	Turrentine, T., & Kurani, K. S. (2001). [40]

21	Electrical and electronic engineering	Electric vehicle technology	A comprehensive overview of electric vehicle (EV) technology covers comparisons of electric drive systems and battery technologies, discussions on market size, and explores potential impacts of EV adoption.	CC (2004). [41]
22	Energy economics and consumer behaviour.	Combining stated and revealed preference research to simulate the neighbour effect in the adoption of hybrid-electric vehicles (HEVs)	Incorporating stated preference data improves the behavioral realism of energy-economy models and that the neighbour effect plays a significant role in HEV adoption.	Axsen, Mountain, and Jaccard (2009). [42]
23	Consumer preferences for alternative fuel vehicles	Examining factors that would encourage individuals to purchase hybrid electric or alternatively fuelled vehicles in Ireland	Fuel costs and purchase price are the most influential factors, while concerns about greenhouse gas emissions and vehicle registration tax have less impact on consumer choices.	Caulfield, Farrell, and mcmahon (2010). [43]
24	The impact of government incentives on the adoption of hybrid-electric vehicles (HEVs)	Analysing how HEV adoption correlates with socioeconomic factors and government incentives using US state registration data.	Strong relationship between gasoline prices and HEV adoption, but a much weaker relationship between incentive policies and HEV adoption. Incentives that provide payments upfront appear to be the most effective.	Diamond (2009). [44]
25	Environmental impact and effect on the electricity market of a large-scale introduction of electric cars in Europe.	Reviewing existing literature to assess the potential of electric vehicles to reduce greenhouse gas emissions and their impact on energy demand and the power sector.	Highlights benefits like emissions reduction and challenges such as electricity generation carbon intensity, stressing the need for battery technology and charging infrastructure research.	Hacker, Harthan, Matthes, and Zimmer (2009). [45]
26	Cultural politics of technology adoption	Understanding user behaviour and perceptions in relation to electric vehicles (EVs)	That EV users develop new driving patterns and meanings around EVs, contributing to a shift in the cultural understanding of automobility.	Gjøen and Hård (2002). [46]
27	Consumer behavior regarding cleaner vehicles	Identifying attitudinal barriers to the adoption of cleaner vehicles in the UK	Car buyers have limited knowledge of cleaner car technologies, environmental impacts of road transport, and car ownership costs, highlighting a gap between attitudes and actions.	Lane and Potter (2007). [47]
28	Technological and market evolution of electric two-wheelers (E2Ws) in China	Identifying the key forces driving and resisting E2W market growth and their potential impact on the wider adoption of electric vehicles (EVs)	E2W market growth is likely to continue, driven by technology improvements, regulatory support, and public transit shortcomings, and that this growth could accelerate EV adoption through battery and motor innovation.	Weinert, Ogden, Sperling, and Burke (2008). [48]
29	Consumer behaviour in	Understanding the factors influencing	Disposable income is the main driver for purchasing a car, and	Shende (2014). [49]

	the Indian automobile passenger car market.	customer preferences for different car segments and their purchase decision process.	that different car segments prioritize different factors, with price being a major driver across all segments.	
30	Consumer adoption of electric vehicles (EVs)	Analysing the effects of consumer knowledge, perceived risk, perceived usefulness, and financial incentives on EV adoption intention in China.	Consumer knowledge and perceived usefulness positively influence EV adoption intention, while perceived risk negatively affects it, and financial incentives have no significant effect.	Wang, Wang, Li, Wang, and Liang (2018). [50]
31	The impact of electric car purchases on car use	Comparing the car buying and usage behaviors of electric car buyers and conventional car buyers in Norway	Electric cars are often bought as second cars and may not reduce overall car usage. Electric car owners tend to use their cars more for daily trips and have different motivations than conventional car buyers.	Klöckner, Nayum, and Mehmetoglu (2013). [51]
32	Environmental awareness and electric vehicle (EV) adoption in Japan	Investigating the factors influencing the purchase intention of non-EV owners and the post-purchase satisfaction of EV owners	Environmental awareness directly influences non-EV users' intent to buy electric cars, but only indirectly affects EV users' satisfaction through their evaluation of the cars.	Okada, Tamaki, and Managi (2019). [52]
33	Electric vehicle (EV) adoption and satisfaction	Korean early adopters prioritize cost savings while Chinese early majority users focus on environmental concerns when adopting EVs.	Environmental concerns are more important for Chinese EV buyers, while economic motives are more important for Korean EV buyers, and that usage satisfaction is high in both groups but higher in Korean early adopters.	Chu, Im, Song, and Park (2019). [53]
34	Acceptance of battery electric vehicles (BEVs)	Role of direct experience in shaping the evaluation of BEV attributes, attitudes, and purchase intention.	Direct experience, even short-term, can positively influence the evaluation of BEVs and increase the willingness to purchase them.	Schmalfuß, Mühl, and Krems (2017). [54]
35	Consumer preferences and interactions with electric vehicle (PEV) charging infrastructure	Investigating consumer preferences for charging locations, payment methods, and the impact of charging on electricity grids.	Home and work charging are preferred, charging should not be free, and PEV charging will not significantly impact electricity grids in the short term.	Hardman et al. (2018). [55]
36	Consumer preferences for plug-in electric vehicles (PEVs)	Characterizing heterogeneity in preferences and motivations regarding PEVs, including plug-in hybrids (PHEVs) and electric vehicles (EVs)	PHEVs are the most likely PEV to have broad market appeal and that car buyers have high degrees of heterogeneity in both preferences and motivations.	Axsen, Bailey, and Castro (2015). [56]
37	Consumer demand for plug-in electric	Relationship between consumer awareness of public charging infrastructure and	Public charger awareness is linked to interest in electric vehicles (PEVs) but this link weakens when	Bailey, Miele, and Axsen (2015). [57]

	vehicles (PEVs)	interest in purchasing PEVs in Canada.	considering other factors like home charging availability.	
38	Consumer behaviour and electric vehicle adoption	Green self-identity, environmental concern, and moral obligation influence electric car adoption attitudes and intentions differently across cultures.	Green self-identity, environmental concern, and moral obligation significantly influence consumer attitudes and intentions towards electric car adoption, but the strength and type of influence vary across cultures.	Barbarossa, Beckmann, De Pelsmacker, Moons, and Gwozdz (2015). [58]
39	Consumer attitudes towards electric vehicles.	Effects of product user stereotypes and self-image congruence on attitudes towards electric vehicles.	Simulating EV driving in a computer game improved perceptions of EV owners and attitudes towards EVs, but not purchase intention.	Bennett and Vijaygopal (2018). [59]
40	Adoption of battery electric vehicles (BEVs).	The role of incentives in promoting BEVs in Norway.	Exemption from purchase tax and VAT are critical incentives for over 80% of BEV buyers, while exemption from road tolls or bus lane access are decisive factors for a substantial number of BEV owners.	Bjerkan, Nørbech, and Nordtømme (2016). [60]
41	Electric vehicle (EV) drivers' perceptions and experiences.	Responses to recharging plug-in battery electric vehicles.	UK EV drivers preferred recharging to refuelling, becoming more relaxed about charging frequency over time. Public charging infrastructure wasn't necessary but could promote EV use. Drivers became more aware of the environmental impact of driving and charging EVs.	Bunce, Harris, and Burgess (2014). [61]
42	Public perceptions of electric vehicles (EVs) and their drivers.	Interactions between EV drivers and the general public in the United Kingdom.	Electric vehicles (EVs) are associated with three types of meanings: negative stereotypes, mixed views, and positive acceptance. More interaction with EV drivers and modern EVs can improve public perception of EVs.	Burgess, King, Harris, and Lewis (2013). [62]
43	Consumer stated intent to purchase plug-in electric vehicles.	Factors influencing interest in plug-in electric vehicles (PEVs).	Interest in buying or leasing electric vehicles is low, with more interest in plug-in hybrids than all-electric models. Early adopters are often highly educated, environmentally conscious, and previous hybrid owners, and their interest is influenced by perceived disadvantages of electric vehicles.	Carley, Krause, Lane, and Graham (2013). [63]
44	User evaluation of electric vehicles (EVs).	Methods for assessing the acceptance of EVs in everyday use and identifying factors influencing their acceptance.	Current electric vehicles can meet most daily needs despite limited range, and attitudes towards them are generally positive. Environmental factors, like CO_2 emissions, are key in evaluating EVs.	Cocron et al. (2011). [64]

45	Adoption of electric vehicles (EVs).	Factors influencing the adoption of EVs, including government incentives, charging infrastructure, and consumer preferences.	The effectiveness of government incentives is unclear, public charging infrastructure is important but its impact on adoption is uncertain, and there is a significant gap between stated preferences and actual purchases of EVs.	Coffman, Bernstein, and Wee (2017). [65]
46	Consumer attitudes towards electric vehicles (EVs).	The effects of government incentives on EV adoption, and how these incentives differentially affect people in various stages of change towards EV use.	Policy incentives like free parking and bus lane access boost electric vehicle (EV) adoption more effectively than expensive subsidies. People closer to adopting EVs are less influenced by subsidies.	Daziano and Chiew (2012). [66]
47	Consumer purchase intentions for electric vehicles (EVs).	Role of environmental performance compared to price value and range confidence regarding consumer purchase intentions for electric vehicles (EVs).	The environmental performance of EVs is a stronger predictor of attitude and thus purchase intention than price value and range confidence.	Degirmenci and Breitner (2017). [67]
48	Purchase intentions for pure electric vehicles (PEVs) among urban households in China.	Whether cost factors are the dominant factors influencing households' purchase intentions under subsidy contexts.	Cost factors do not significantly influence urban households' purchase intentions for PEVs in China under subsidy contexts, and people are more concerned about cruising power and charging-facility availability.	Dong, Zhang, Wang, and Wang (2020). [68]
49	Market penetration of plug-in hybrid electric vehicles (PHEVs).	Sensitivity analysis of factors influencing PHEV market penetration using an agent-based model.	Providing consumers with readily available estimates of lifetime fuel costs and increasing gasoline prices could significantly enhance PHEV market penetration and improve fleet efficiency.	Eppstein, Grover, Marshall, and Rizzo (2011). [69]
50	Electric vehicle (EV) acceptance.	Understanding psychological barriers to EV range and comfortable range.	EV users adapt to range successfully, but psychological interventions can further improve comfortable range and range utilization.	Franke, Neumann, Bühler, Cocron, and Krems (2012). [70]
51	Range preferences in electric vehicle (EV) users.	Factors that influence range preferences of potential EV customers who had the opportunity to test an EV.	Range preferences of EV users are higher than their average range needs and decrease over time with EV use. Experience with EVs leads to more accurate range preference estimates.	Franke and Krems (2013). [71]
52	Forecasting the demand for electric vehicles.	Developing a comprehensive methodology to forecast the demand for electric	The research develops a comprehensive approach to forecasting electric vehicle demand, considering survey	Glerum, Stankovikj, Thémans, and

		vehicles, accounting for attitudes and perceptions.	design, model estimation, and factors like attitudes towards leasing and practical car aspects in consumer decision-making.	Bierlaire (2014). [72]
53	Consumer willingness to adopt electric motorcycles in Solo, Indonesia.	Evaluating the extent to which electric motorcycles are a potential replacement for gasoline-powered motorcycles.	Electric motorcycles have potential, but need competitive pricing and performance compared to gas motorcycles. Speed, range, charge time, and price matter to consumers, especially charge time. Better battery technology and infrastructure could boost adoption. Younger, non-smoking, environmentally conscious individuals with positive e-bike views are more likely to buy electric motorcycles.	Guerra (2019). [73]
54	Electric vehicle (EV) purchase intentions.	Analysing variations and determinants of purchase intentions for EVs in China, Brazil, and Russia.	Purchase intentions for EVs are higher among Chinese citizens than Brazilians and Russians, and are influenced by social networks, pollution, and charging infrastructure.	Habich-Sobiegalla, Kostka, and Anzinger (2018). [74]
55	Consumer intention to adopt electric vehicles (EVs).	Investigating the impact of functional and non-functional values on EV adoption intention, and the mediating role of attitude.	Functional values directly and indirectly influence electric vehicle adoption, while non-functional values influence it indirectly through attitude.	Han, Wang, Zhao, and Li (2017). [75]
56	Effectiveness of financial purchase incentives for battery electric vehicles (BEVs).	Systematic review of literature to understand the effectiveness of purchase incentives in increasing BEV sales.	Purchase incentives are effective in promoting BEV sales, but should be applied at the time of purchase, promote BEVs and high-electric range PHEVs, and be designed with longevity in mind. VAT and purchase tax exemptions are most effective.	Hardman, Chandan, Tal, and Turrentine (2017). [76]
5	Electric vehicle (EV) adoption.	Compares the socio-demographic profiles, attitudinal profiles, and mobility patterns of battery electric vehicle (BEV) users and conventional vehicle (CV) users, and examines the factors influencing their intention to use or purchase BEVs.	BEV users tend to be wealthier, more educated, and hold positive attitudes towards EVs compared to CV users. Symbolic attitudes are key for CV users considering EVs, while driving range is a concern for current BEV users.	Haustein and Jensen (2018). [77]
58	Consumer purchase intention for electric vehicles (EVs)	The factors influencing EV purchase intention in Beijing, China	Attitude, perceived behaviour control, cognitive status, product perception, and monetary incentive policy measures have significant positive effects on	Huang and Ge (2019). [78]

			consumers' intentions to purchase EVs in Beijing.	
59	Consumer adoption of eco-innovations	The factors that drive and hinder the adoption of alternative fuel vehicles (AFVs)	Adopters and non-adopters of AFVs differ on norms, attitudes, novelty seeking, and perceived innovation attributes.	Jansson (2011). [79]
60	Consumer attitudes towards electric vehicle purchasing intentions in Spain.	Consumer perceptions of charging times, price, and driving range.	The higher a consumer's perception of the price of electric vehicles and the longer charging times are, the less willing a consumer is to buy a new electric car.	Junquera, Moreno, and Álvarez (2016). [80]
61	Consumer adoption of electric vehicles (EVs).	The factors that affect a consumer's adoption of an EV in India	Attitude emerged as a strong mediator, influencing the adoption of electric cars.	Khurana, Kumar, and Sidhpuria (2020). [81]
62	Plug-in Hybrid Electric Vehicles (PHEVs).	Understanding factors influencing the potential for PHEV market penetration.	Financial and battery-related concerns remain major obstacles to widespread PHEV market penetration.	Krupa et al. (2014). [82]
63	Electric Vehicle Adoption	Factors influencing the adoption of electric vehicles, including antecedents, mediators, moderators, consequences, and socio-demographics.	Charging infrastructure, cost, and government policies are key factors influencing electric vehicle adoption. The study recommends tailored policies for different consumer segments to promote EV adoption	Kumar and Alok (2020). [83]
64	Consumer acceptance of full electric vehicles.	Factors influencing individual intentions towards the adoption of full electric vehicles in Macau.	Environmental concerns, perception of environmental policy, and perception of economic benefit are key factors influencing the adoption of full electric vehicles.	Lai et al. (2015). [84]
65	Electric vehicle adoption	Effect of policy incentives on electric vehicle adoption, as well as the influence of socio-psychological determinants	Policy incentives have a positive influence on electric vehicle adoption, and the probability of adoption increases for people further along in the process of behavioural change.	Langbroek, Franklin, and Susilo (2016). [85]
66	Consumer attitudes about electric vehicles (EVs)	Pricing analysis and policy implications.	Consumers are willing to pay a similar amount for electric cars as they are for regular cars, and they are not willing to pay much more even if they could save money on fuel.	Larson, Viáfara, Parsons, and Elias (2015). [86]
67	Consumer behaviour regarding battery electric vehicles (BEVs)	Identifying the factors that influence consumers' intentions to adopt BEVs.	There are three main types of influencing factors: demographic, situational, and psychological.	Li, Long, Chen, and Geng (2017). [87]

68	Electric vehicle adoption	The factors that affect the public's intention to purchase electric vehicles in China.	Consumer attitudes towards price, subsidies, performance, environmental concerns, and demographics like age and gender significantly influence their willingness to buy electric vehicles.	Lin and Wu (2018). [88]
69	Electric car adoption	The determining factors of the usage intention of electric cars and the differences between early and late usage intention segments.	Emotions and the attitude towards the electric car are the strongest determinants of usage intention, followed by the subjective norm.	Moons and De Pelsmacker (2012). [89]
70	Consumer behaviour in the automobile market	Comparing the socio-psychological characteristics of conventional and battery electric car buyers.	Battery electric car buyers have a significantly different socio-psychological profile from conventional car buyers, particularly in how they evaluate convenience and performance attributes.	Nayum, Klöckner, and Mehmetoglu (2016). [90]
71	Electric vehicle adoption	Identifying early adopters of electric vehicles in Germany.	The most likely early adopters are middle-aged men with technical professions living in rural or suburban areas.	Plötz, Schneider, Globisch, and Dütschke (2014). [91]
72	Electric vehicle adoption in developing countries	Identifying the barriers and opportunities related to different types of electric vehicles (EVs)	Electric two-wheelers (E2Ws) are more feasible than electric four-wheelers (E4Ws) in developing countries due to their lower purchase price.	Rajper and Albrecht (2020). [92]
73	Consumer adoption of electric vehicles (EVs)	How private car drivers' perception of vehicle attributes may affect their intention to adopt EVs	Electric vehicles' practical benefits are important because they relate to the enjoyment of driving and the identity associated with owning one.	Schuitema, Anable, Skippon, and Kinnear (2013). [93]
74	Battery electric vehicle (BEV) adoption.	Exploring public perception barriers to widespread adoption of BEVs in Tianjin, China	Consumer interest in BEVs is relatively low and a large proportion of the respondents have a “wait and see” attitude.	She, Sun, Ma, and Xie (2017). [94]
75	Gendered dimensions of electric vehicle (EV) adoption and vehicle-to-grid (V2G) preferences	How perceptions, attitudes, values and identities towards electric mobility differ by gender in the Nordic region	Men use cars (conventional and electric) more than women, while women have stronger preferences for environmentally friendly or safety attributes of vehicles.	Sovacool et al. (2019). [95]
76	Adoption of electric vehicles (EVs).	Understanding the key barriers to EVs in the UK and Germany	Challenges like the high cost of electric cars and the lack of enough charging stations are making it difficult for them to become as popular contrary to what some theories predicted.	Steinhilber, Wells, and Thankappan (2013). [96]

77	Adoption of electric vehicles (EVs)	The factors that affect the intention to buy EVs in Thailand	Performance, environmental concerns, and price-premium are the most important factors influencing the intention to buy EVs in Thailand.	Thananusak, Rakthin, Tavewatanaphan, and Punnakitikashem (2017). [97]
78	Consumer behaviour in the electric vehicle market	The key factors influencing consumers' purchase of electric vehicles.	Consumer control over resources, social influence, environmental awareness, and technology acceptance are the main factors influencing the purchase of electric vehicles.	Tu and Yang (2019). [98]
79	Electric vehicle adoption in Sweden.	The experiences of early adopters of electric vehicles in Sweden	Current electric vehicle drivers are mostly well-educated men with medium-high incomes, using EVs for personal use and charging them at home overnight.	Vassileva and Campillo (2017). [99]
80	Consumer behaviour regarding hybrid electric vehicles (HEVs)	Predicting Chinese customers' intention to adopt HEVs, using an extended model of the theory of planned behavior (TPB).	Environmental concern indirectly influences intention to adopt hybrid electric vehicles through attitudes, social norms, perceived control, and personal morals.	Wang, Fan, Zhao, Yang, and Fu (2016). [100]
81	The purchasing intentions of Chinese citizens on new energy vehicles (NEVs)	How consumers respond to current preferential policies regarding NEVs	Financial benefits, infrastructure readiness, environmental concerns, and policy privileges positively impact purchasing intentions, while the NEV's cruising range does not.	Wang, Zhao, Yin, and Zhang (2017).[101]
82	Young consumers' intention towards buying green products in India	Extending the Theory of Planned Behaviour (TPB) by incorporating environmental concern and environmental knowledge	The extended TPB model better predicts young consumers' intention to purchase green products than the standard TPB model, and environmental concern is the most significant predictor.	Yadav and Pathak (2016). [102]
83	Analysing the IEDRA model of student campus placement determination	Uses the ABCD framework to evaluate the model's practicality and usefulness for students and other stakeholders	ABCD model can be used in research as a primary analysis technique in various areas or sectors.	Shenoy and Aithal (2017). [103]
84	Higher education	Effectiveness of a stage model intervention technique using the ABCD analysis framework	ABCD analysis effectively evaluates systems and concepts, proving useful in analyzing the higher education stage model.	Aithal, Shailashree, and Kumar (2016). [104]
85	Business model analysis	Introducing the ABCD model for analysis: Advantages, Benefits, Constraints, and Disadvantages.	The ABCD model is a simple yet systematic technique for analyzing the effectiveness of any business model, strategy, concept, or system.	Aithal (2016). [105]

5. NEW RELATED ISSUES :

Emerging issues in the maturing EV market include environmental impact of battery production and disposal, ethical sourcing of raw materials, strain on electricity grids, and consumer preferences for diverse EV features.

6. IDEAL SOLUTION AND PRESENT STATUS :

The ideal solution for increased EV adoption involves both technological advancements (like improved battery technology and charging infrastructure) and non-technical strategies (such as financial incentives, education, and social influence campaigns). While EV sales are growing and infrastructure is expanding, challenges remain, including high prices, unevenly distributed charging stations, and varying levels of consumer awareness.

7. RESEARCH GAP :

Existing research on EV adoption offers valuable insights, but there is a noticeable gap in academic papers focusing on consumer perceptions and buying behaviour towards EVs in Dakshina Kannada. Despite journalistic coverage of the region's EV market growth, there appears to be a lack of academic research papers. Dakshina Kannada stands out for its strong environmental consciousness, expanding economy, and heavy reliance on two-wheelers. Understanding the factors that drive EV adoption here is crucial for developing effective marketing and policy strategies. Integrating qualitative methods such as interviews and focus groups would provide deeper insights into consumer motivations and concerns. Addressing this gap would enrich the literature and guide targeted efforts to promote EV adoption in Dakshina Kannada.

8. RESEARCH AGENDAS :

1. How do consumer perceptions and behaviors towards EVs evolve over time as individuals gain firsthand experience and the technology matures?
2. What are the cross-cultural differences and similarities in the factors influencing EV adoption across diverse socioeconomic and geographical contexts?
3. What are the underlying motivations, anxieties, and decision-making processes driving consumer choices regarding EVs, as revealed through qualitative research?
4. How do consumers perceive and value emerging EV features such as autonomous driving, vehicle-to-grid integration, and advanced driver assistance systems, and how do these perceptions influence their purchase decisions?
5. How do consumer perceptions and purchase intentions towards EVs specifically in Dakshina Kannada differ from other regions, given its unique environmental awareness, economic growth, and transportation patterns?

9. ANALYSIS OF RESEARCH AGENDAS :

The research agendas outlined prioritize understanding the dynamic and multi-faceted nature of EV adoption. They emphasize the need for longitudinal, cross-cultural, and regionally-focused studies to capture the evolving perceptions and diverse motivations of consumers. Additionally, the agendas highlight the importance of incorporating qualitative methods to gain deeper insights into consumer behavior, especially regarding emerging concerns related to sustainability and technology. By addressing these research gaps, we can develop more effective strategies for promoting widespread EV adoption and a sustainable transportation future.

10. FINAL RESEARCH PROPOSAL :

10.1 Title: A Study On The Perception And The Buying Behavior of The Consumers Towards Electric Vehicles (EVs) in Dakshina Kannada District.

10.2 Purpose: This research aims to explore what influences consumer perceptions and purchasing decisions regarding electric vehicles (EVs) in Dakshina Kannada, India. It focuses on identifying the unique barriers and motivators that shape EV adoption in this region, known for its strong environmental consciousness, rapid economic development, and heavy reliance on two-wheelers. By delving into consumer attitudes, preferences, and decision-making processes, the study aims to provide

insights that can guide tailored strategies to encourage EV adoption and promote sustainable transportation in Dakshina Kannada.

10.3 Research and investigative Objectives are to:

1. Identify and evaluate the main factors influencing consumer perceptions of EVs in Dakshina Kannada.
2. Examine the specific obstacles and motivators affecting EV purchasing behaviour in Dakshina Kannada.
3. Investigate how socio-demographic factors influence EV adoption in Dakshina Kannada.
4. Compare and contrast the attitudes and behaviours of EV owners and non-owners in Dakshina Kannada.
5. Develop recommendations for policymakers, manufacturers, and marketers to encourage EV adoption in Dakshina Kannada.

10.4 Proposed methodology:

- **Study Population:** The study population will comprise adult residents of Dakshina Kannada district who either own a vehicle or are potential vehicle buyers. This will include both current EV owners and non-owners to capture a wide range of perspectives.
- **Study Sample:** A mixed sampling method will be employed, combining convenience sampling to recruit EV owners through EV dealerships and online forums, and random sampling to select non-EV owners from the general population.
- **Study Instruments:** Data collection will primarily involve a structured questionnaire to gather quantitative data on consumer demographics, perceptions of EVs (e.g., environmental benefits, cost, range anxiety, charging infrastructure), purchasing intentions, and information sources. Additionally, in-depth interviews and focus group discussions will be conducted to elicit qualitative insights into consumer motivations, concerns, and decision-making processes.
- **Study Procedure:** A questionnaire will be administered online and in-person, while in-depth interviews and focus groups will provide richer qualitative insights. Data analysis will involve statistical techniques for quantitative data and content analysis for qualitative data. Secondary data from relevant sources will also be collected to supplement the primary research findings
- **Limitations of the Proposal:** The study's findings may be limited to the specific context of Dakshina Kannada and may not be generalizable to other regions. The reliance on self-reported data may introduce some degree of bias.

11. ABCD ANALYSIS OF FACTORS INFLUENCING CONSUMER PERCEPTION AND BUYING BEHAVIOR TOWARDS ELECTRIC VEHICLES (EVS) :

Using the ABCD analysis framework (Advantages, Benefits, Constraints, and Disadvantages) to study consumer perceptions and buying behavior towards EVs offers a structured approach. This method helps identify the advantages and benefits of EV adoption, like environmental sustainability and fuel cost savings, as well as the constraints and disadvantages, such as infrastructure limitations and high initial costs. Applying this framework will provide nuanced insights into the factors shaping consumer behaviour towards EVs in this region [103].

Table 2: ABCD Analysis: Consumer Perception and Purchasing Behaviour of Electric Vehicles.

Constructs	Features
Advantages	Reduced dependence on fossil fuels and lower emissions
	Potential for zero emissions (BEVs)
	Improved urban air quality
	Lower operating costs (electricity vs. Gasoline)
	Reduced maintenance requirements
	Government incentives (subsidies, tax exemptions)
	Perceived as innovative and technologically advanced
Benefits	Environmental benefits (reduced pollution, combating climate change)
	Economic benefits (lower fuel and maintenance costs)
	Health benefits (improved air quality)

	Energy security benefits (reduced reliance on oil)
Constraints	High upfront purchase price
	Limited driving range and range anxiety
	Long charging times
	Lack of extensive and reliable charging infrastructure
	Battery technology limitations (cost, lifespan, charging speed)
	Consumer habits, social norms, and psychological barriers
Disadvantages	Environmental impact of battery production and disposal
	Potential strain on electricity grids with increased adoption
	Limited model variety compared to conventional vehicles
	Concerns about battery degradation and replacement costs

12. FINDINGS :

- **Environmental Benefits**: EVs reduce dependence on oil and lower emissions compared to internal combustion engine vehicles.
- **Technological Advancements**: Development of traction batteries, especially lithium-ion batteries, is critical for EV progress.
- **Infrastructure Needs**: A strong charging infrastructure is essential for widespread EV adoption.
- **Psychological and Social Factors**: Habits and social norms significantly influence consumer perception and behaviour towards EVs.
- **Government Incentives**: Subsidies and tax exemptions help overcome financial barriers, making EVs more appealing to consumers.

Despite the advantages and government support, barriers like high upfront costs, range anxiety, and inadequate charging infrastructure remain. Addressing these along with psychological and social factors is crucial for encouraging broader EV acceptance.

13. LIMITATIONS OF THE STUDY :

The literature review mainly covers studies from specific regions like India, Japan, Australia, China, US, Thailand, Macau and some of the European countries, limiting the generalizability of findings globally due to cultural and economic differences. It also primarily relies on published academic literature, potentially missing insights from unpublished studies or grey literature such as government reports and industry analyses. Additionally, the rapid evolution of the EV landscape means some cited studies might be outdated, not reflecting current consumer perceptions and behaviours. Finally, the review lacks a cohesive theoretical framework to integrate the various factors influencing EV adoption, complicating the synthesis of findings into a comprehensive model of consumer behaviour.

14. SUGGESTIONS FOR FUTURE RESEARCH :

1. Expand geographically to include diverse cultural and economic contexts for a holistic understanding of global EV adoption factors.
2. Integrate both quantitative and qualitative methods to capture a comprehensive view of consumer perceptions and behaviors, including underlying motivations and barriers.
3. Conduct longitudinal studies to track changes in consumer perceptions and behaviours over time as the EV market matures.
4. Focus on emerging markets to understand their unique challenges and opportunities in promoting EV adoption.
5. Assess the effectiveness of various government policies and incentives to inform policymakers on the most impactful strategies for encouraging EV uptake.

15. CONCLUSION :

The literature review reveals that consumer perception and purchasing behavior towards EVs are influenced by a complex interplay of technological, economic, psychological, and social factors. While environmental concerns and government incentives play a significant role in promoting EV adoption, barriers such as high costs, limited range anxiety, and inadequate charging infrastructure remain

significant hurdles. Future research should adopt a broader perspective, encompassing diverse cultures and economies, while incorporating a mixed-methods approach to gain a deeper understanding of consumer motivations. Longitudinal studies and a focus on emerging markets would further enrich our knowledge in this rapidly evolving field. Ultimately, a comprehensive understanding of consumer perceptions and behaviours is essential for developing effective strategies to promote the widespread adoption of electric vehicles and achieve a sustainable transportation future.

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