International Journal of Business and Society, Vol. 26 No. 3 2025, 1211-

COMPARATIVE ANALYSIS OF ELECTRIC VEHICLE PURCHASE BEHAVIOR ACROSS GENERATIONS X, Y, AND Z: THE MEDIATING ROLE OF ENVIRONMENTAL CONCERN

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ABSTRACT

This paper studies the generational differences in electric vehicle-buying behavior among Generations X, Y, and Z in the Philippines with a focus on the mediating role of concern for the environment. As the world is gearing towards sustainable mode of transport, knowing how each age group views EV adoption has gained importance. It looks at different marketing approaches and purchase decisions through the prism of environmental awareness and buying power, alternately influenced by values and motivation. The respondents from Generation X and Generation Y seem to include environmental sustainability and social responsibility into their buying decisions, while Generation Z places its priority on innovation, convenience, and technology. Such generational differences tell of the need to create segmented marketing campaigns for more successful policy strategies to ensure adoption of EVs across all age groups. A descriptive-correlational design was applied in the study. Data gathering used a questionnaire sampled from a total of 740 respondents residing across the Philippines. The instrument development proceeded from a literature review and underwent inspection in a prospective pilot study with three environmental experts to ensure the items were clear and reliable. The survey was composed of items meant to measure the demographic profile, environmental concern, and purchase intention towards an electric and electricvehicle. Descriptive statistics summarized demographic data and response patterns. Special emphasis was laid on testing the mediation of environmental concern between generational cohort and purchase intention. Further testing for PLS SEM Version 8 Partial Least Squared Structural Equation Modelling was done in support of accurate and credible reporting of each outcome. The finding therefore provides more-informed strategic insights for policymakers, manufacturers, and marketers to foster sustainable consumption and to speed up the transition to clean transportation. With the addressing of generation-specific motivators and barriers by stakeholders, they can design proper programs for the general acceptance of electric vehicles in the Philippines.

Keywords: E-Vehicles, Gen X, Y, Z, purchasing behavior.

Submission: 16th November 2024
Accepted: 12th September 2025
https://doi.org/10.33736/ijbs.8268.2025

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1. INTRODUCTION

1.1. The growing threat of Climate Change

The burgeoning peril that climate change and environmental degradation pose has compelled individuals, governments, businesses, and even enterprises to rethink their consumption pattern-based practices for a safer Earth. Growing demand for eco-friendly products can be viewed to be a response to the environmental crisis. In simple terms, such products are considered environmentally-friendly, which are produced and used under processes that cause minimal harm to the environment, be it renewable processes, emission reduction into the atmosphere, biodegradability, or re-entry into the recycling process (Barbu et al., 2022). Today's consumers are hence more environmentally aware, thanks to public awareness about the rise in sea level, air pollution, extreme weather occurrences, and biodiversity loss. The media has considerably helped the cause of environmental awareness. Initiatives by awareness campaigns and CSR programs have promulgated environmental awareness. As Amoako et al. (2020) found, green knowledge and awareness positively influence the consumer behavior so that it leads to the buying decision more so in the youth segment. This implies that purchase is no longer just an economic or a functional decision; it is indeed an ethical issue. Therefore, several consumers tend to patronize enterprises and products that represent their core values related to sustainability and care for the environment.

1.2 *The Rise of Electric Vehicles*

Electric vehicles (EVs) is presently an important technological domain that tackles carbon emissions. However, while EVs are a concept dating from the late 1800s, its development and adoption have exponentially risen in the recent few decades, thanks to technology improvements, policy support, and changing consumer preferences (Vijayakumar, 2021). Governments worldwide give tax incentives, invest in charging infrastructure, and regulate emissions to promote the adoption of electric vehicles. In Southeast Asia, attempts to scale the EV ecosystem are underway, with public and private interventions relieving the infrastructural and cost challenges in the Philippines and Indonesia (Uy et al., 2024). The Electric Vehicle Industry Development Act was developed in the Philippines to provide a regulatory framework to enable EV adoption through incentives and infrastructural development (Base et al., 2024). In Indonesia, the national strategies also try to ensure energy security by promoting solar-powered EVs and building rooftop solar charging stations (Fitriana et al., 2024). Such initiatives signify the increasing realization of sustainable transportation. Yet, these efforts aside, barriers such as high purchase costs for the vehicles, limited availability of charging infrastructure, and low customer confidence remain (Tsala & Adam, 2023). Therefore, to speed up the mainstream acceptance of electric vehicles, it is important that behavioral elements driving EV purchase intentions be considered, especially as they differ by demographic group.

1.3 Generational Differences: X, Y, Z

Consumer behavior across age groups does vary. Members of the generational cohorts are said to have different attitudes toward technology and sustainability, sharing experiences, values, and socioeconomic conditions (Lee, Circella, Mokhtarian, & Guhathakurta, 2020). Generation X (1965-1980) has economic recessions and tech upturns in its backdrop and is accordingly a

practical and cost-conscious generation concerning purchasing decisions. While they may consider the environmental aspects of EVs, on the other hand, would question the price and reliability. Generation Y or Millennials are considered to be all things 'green,' tech-friendly, and socially conscious. It is now evidenced through research that Millennials often like to favor brands that uphold sustainability values and are willing to embrace new technology, including electric vehicles (Agustini et al., 2021). Generation Z (born between 1997 and 2012), on the other hand, are the digital native generation and had been exposed to environmental activities and solar-harnessing technologies ever since childhood; they tend to choose from brands that treated social and environmental issues with earnest concern and would rather go with emerging green technologies (Gaspar et al., 2023). Social media trends, peer networks, and pro-environment identity are a few of the deciding factors behind their purchase decisions. It is of paramount importance to understand generational viewpoints as every generational coalition fashions market trends and directions of policies**.**

The increasing attention to generational point of view creates a huge research gap into the differential approaches to purchases of alternative cars-power and solar-in Southeast Asian countries, most especially the Philippines. Some studies dealt with environmental concern and EV adoption independently, but only a few studied environmental concern as a mediating factor between generational identity and actual purchase behavior. Hence, making this unexplored terrain an area could be investigated through empirical research, which would, instead of merely generational comparisons of attitude, dig deep into the psychology of attitude formation.

This study attempts, at least to some degree, to address a core, yet mostly missing puzzle piece-the electric and solar vehicle purchase behavior of Generation X (Gen X), Generation Y (Gen Y), and Generation Z (Gen Z). The research attempts to discover generational perception of sustainable transport, test for the influence of environmental concern on the willingness to buy electric vehicles, and also test for the mediating effects of environmental concern on the relationship between generational identity and consumer behavior. By interpreting the overall behavior of EV adoption by age groups, the study attempts to provide evidence-based suggestions to the policymakers, industrialists, and marketers on clean, inclusive, and sustainable mobility for the country.

1.4 ***Environmental Concern as a Mediator***

Environmental concern plays an important mediating role in the transition from purchase intention to purchase behavior, and this mediation factor is generational attitudes toward adopting electric vehicles. While awareness and positive regard for the environment and sustainability are important, they do not carry behavior in and of themselves. Environmental concern stands for deeply held emotional and moral considerations about environmental protection, activating feelings of personal responsibility and urgency. Hence, those Gen X and Y who act on their eco-conscious intentions truly believe environmental concern to be a social obligation alongside a long-term value of motivation to act. On the other hand, the environmental consciousness characteristic of Generation Z is counterbalanced by youthful innovation influences, the paramount importance of peers, and lifestyle appeal; thus, their awareness might end up not really benefiting their decision-making unless it is supported strongly by an environmental concern. By choosing to set environmental concern as a mediating variable, this study will find the psyche mechanism that makes possible the translation of values and attitudes into behavior. This distinction bears utmost significance for policymakers and marketers seeking to institute interventions that lead to the engagement and

mobilization of generational cohorts toward sustainable transport alternatives rather than just educating them.

2. LITERATURE REVIEW

Purchase Behavior. Purchase behavior lies at the center of this study, and it is operationalized according to the AIDA model- Attention, Interest, Desire, and Action, signifying the stepwise psychological consumer journey from awareness to the actual act of purchase. Generation X showed responses high in action, where there was a stronger conversion of interest into purchasing behavior. This indicates that older consumers act on purchasing utility and sustainability once convinced of the product, thereby supporting Kotler and Keller (2016) in saying that trust must be built and value ensured for a consumer to take action. Generation Z, meanwhile, evidenced an intention-behavior gap (higher interest and desire but lower action), which is often seen with younger cohorts, possibly due to factors such as affordability, infrastructure, or perceived risk (Lee et al., 2020). Generation Y lay somewhere in the middle, showing moderate scores across all stages. Knowing these differences points toward the necessity for generational segmentation. For instance, Gen Z might be more receptive to novel approaches to messaging and social influence, whereas Gen X might look more into protracted durability and savings. Furthermore, there would be need to factor in marketing strategies ensuring that there are no circumstantial or personal impediments preventing inclination toward a purchase. This, indeed, confirmed prior studies where behavioral intention is moderated by cost, product familiarity, and social norms (Amoako et al., 2020). In this way, through the lens of the AIDA model, this framework sheds light on the generational cohort interaction with EV-related messaging and how those interactions translate into tangible consumer action, thereby drawing insights further necessitating policy and marketing interventions for sustainable transportation.

Quality. Quality is considered very important in the ability of the electric and solar-powered vehicles to get to final acceptance by a consumer. Quality here refers to perceived reliability, battery performance, charging efficiency, acceleration, or even general build durability. Generation X and Y have scored very high on quality-related issues, thus emphasizing long-term value and performance assurance. This is in consonance with the findings of Bhattacharyya and Thakre (2021) that product reliability and the consumer perceived technical soundness promote consumer trust and reduce indecisiveness. Generation Z conversely places almost less emphasis on quality, implying a generational shift toward aesthetics, innovation, or social status more than functional performance (Rahimi & Jin, 2020). Tsala and Adam (2023), as per their study, have found that product performance post-awareness impacts behavior more than initial appeal. Marketing messages that stress warranty coverage, technical features, and cost-efficient operation would, therefore, appeal well to Gen X and Y. Quality messages for Gen Z can, however, be strengthened when coupled with themes of smart design and tech innovation, hence quality assurance has got to go hand in hand with other value propositions that appeal cross-generationally.

Environmentally Conscious. Environmental consciousness is described as an awareness, knowledge, and moral concern relative to environmental sustainability, which greatly influences green buying behavior. This study found environmental consciousness to be a strong predictor of positive attitudes toward electric and solar-powered vehicles. Both members of Generation X and

Generation Y agreed more strongly with such statements as willingness to reduce emissions, committing to environmental sustainability, and social considerations of EVs. According to Barbu et al. (2022) and Barbarossa et al. (2015), environmental values impact behavioral intentions directly, especially with more mature consumers. Flores and Jansson (2021) also, however, argued that while Gen Z may be environmentally conscious, their behavior is more often swayed by trendiness, innovation, and peer pressure versus strictly ecological obligation. These understandings mean that while Gen Z holds sustainability in esteem, they need environmental messaging to be wrapped within lifestyle appeal or technological innovation talk.

Price. Price remains a universal factor in establishing purchase decisions, and the study confirmed the role of price as a deterrent in electric and solar-powered vehicle adoption amongst all generational cohorts. Turretine and Kurani (2007) stated that older consumers consider economic value and product life span as considerations when making sustainability choices. Their various respondents agreed to some extent that affordability of EVs, existence of financial incentives, and long-term cost savings had the greatest influence on their choice. Generation X mostly considered total cost of ownership, indicating a more pragmatic and investment-based view of green transportation. Yue et al. (2020) considered Generation Y and Z more responsive to financial incentives and upfront costs. Casalegno et al. (2022) consider price sensitivity paramount amongst younger consumers, especially when environmental benefits are not so clear-cut. While both cohorts indeed indicate high levels of environmental consciousness, the financial practicality of EVs acts as a determinant in converting intention to action.

Availability. Availability refers to the presence and access to EV models, charging infrastructure, spare parts, or technical support services. It is a fundamental parameter that more acutely affects people's decision when buying, more particularly generations X and Y. These generations expressed profound concern regarding whether charging stations existed, whether part for the car existed, and whether someone with skills to service such cars existed. Their somewhat wary stance actually reflects the view from Heeraman et al. (2024) and Egbue and Long (2012), who identified that infrastructure deficiency is a major barrier to green vehicle adoption, especially in the developing countries. While Generation Z has also acknowledged availability, they slightly toned down their concerns regarding it. This could be the upsides of their adaptability and trust in technological change even without a fully-fledged support ecosystem (Rahimi & Jin, 2020). Meanwhile, they still contract themselves by making decisions based on ease and reliability of purchase and therefore, infrastructure cannot just be ruled out even by younger consumers.

Environmental Concern. Environmental concern acts as a mediating variable, making the connection between quality, environmental consciousness, price, availability, and purchasing behavior. It is a mental attachment and willingness to take responsibility for environmental protection on the part of the consumer. In the study, the mediating effect of environmental concern between environmental consciousness and buying behavior was found to be significant: this confirms the findings by Yue et al. (2020) and Chua et al. (2022). Motivation by practical considerations such as price or quality enhances respect for the environment, turning awareness into behavior within consumers who have concern for environmental issues. Generation X and Y showed stronger mediation effects with more decisive buying behavior due to their heightened concern with the environment. On the other hand, Gen X appeared willing to compromise performance for benefit, particularly in consideration of environmental impact, in a very value-driven manner of consumption. Gen Z, by contrast, exhibited weaker mediation mechanisms,

giving some indication that concern in itself may not be enough to inspire action unless conjoined with lifestyle alignment or technological appeal (Flores & Jansson, 2021).

The theoretical synthesis of this study is primarily based on Rogers' Diffusion of Innovation (DoI) Theory and Social Identity Theory, offering a comprehensive lens to understand the generational differences in the adoption of electric vehicles. DoI theorizes how innovations such as EVs get adopted over time, with adopters being classified by some characteristics into groups of innovators, early adopters, majority, and laggards-openness to change and perceived risk are such characteristics. The theory is lined with the findings regarding differences in readiness and motivation for EV adoption among Gen Z, Gen Y, and Gen X. The complementary SIT offers a framework for considering how an individual's behaviors are driven by the norms and values of their generational group and thus reinforces the peer-based motivation (especially in Gen Z) and duty-based consumption (observed in Gen X). By combining these theories with previous literature on environmental concern, affordability, and infrastructure, the adoption of EVs emerges as something beyond just in technology-based decision. It is a social-identity-driven process shaped by generational norms.

3. METHODOLOGY

Participants of the Study

This study's research design is descriptive-correlational research. The study participants were the owners and those who intend to buy electronic vehicles such as e-bikes and hybrid cars in the Philippines. Purposive nonprobability sampling was be employed in this study. According to the Department of Transportation and Land Transportation Office motor vehicle registration, in 2021, the number of EVs will be 9000. Using the Raosoft sampling size calculator, with a 95% level of confidence, the estimated sample size is 385. However, since the survey was done electronically, 740 was the actual number of respondents. This study strictly adhered to ethical research guidelines involving EV owners in the Philippines. Participants were fully informed of the study's purpose, procedures, risks, and benefits, and were assured of their right to withdraw at any time without consequence. Informed consent was obtained before data collection. To ensure confidentiality, coding procedures were implemented, safeguarding respondents' identities and securing personal data. Participants were also informed about how to raise concerns if they experienced discomfort. The research involved no physical or psychological risks and included only non-vulnerable groups. All data were gathered fairly, and the study maintained transparency, objectivity, and participant safety throughout. The following table is the demographic profile of the respondents:

Table 1. Sample's Socio-Demographic Profile

Respondent's Characteristics	Frequency	Percentage
Gender		
Male	449	60.7
Female	291	39.3
Age (Generation)		
X	106	14.3
Y	217	29.3
Z	417	56.4
Family Income		
5000-10000	286	38.6
11000-25000	235	31.8
26000-45000	111	15
46000 pesos and more	108	14.6
Highest Educational Attainment		
Highschool Graduate	399	53.9
Bachelor's Degree Holder	319	43.1
Post-Graduate	22	3

The socio-demographic picture would look like males making up the majority with 60.7%. Meanwhile, the largest generational group would be Gen Z at 56.4%, followed by Gen Y at 29.3% and finally Gen X at 14.3%. The Final Draft RRL indicates Gen Z increased awareness in sustainable products, much interest in innovation, but tend to lag in actual purchasing due to financial constraints, which supports our findings (Flores & Jansson, 2021). This is further evidenced by the income data, showing that 70.4% earn less than or up to 25,000 pesos, indicating very limited purchasing power. Most respondents were high school graduates (53.9%), which may have to do with the younger age of Gen Z and still budding career paths. The RRL contrasts this by stating that Gen X and Y, being financially stable and better educated, emphasize quality and sustainability more. This is in line with the demographic information, which supports the generational buying patterns that literature reveals: Gen X is pragmatic, Gen Y is sustainability-minded, and Gen Z is tech appeal but economically challenged.

Research Instrument

The current study used a researcher-made questionnaire as the research instrument. The instrument contained the demographics of the respondents—gender, age, family income, educational attainment, and region—and the items (measured using a 4-point Likert scale) for the three (4) latent variables—factors affecting buyers' decision, purchasing behavior and environmental concern of respondents towards EVs. The questionnaire was subjected to reliability tests and discriminant validity. The reliability test was conducted in order to ascertain that the questionnaire administered under similar conditions would always produce the same results, hence making the answers reliable and not haphazard. On the contrary, discriminant validity was assessed in order to ascertain that each attribute measured via the survey was distinct from the rest and not overlapping. This is crucial for investigations where environmental attitude is a mediator since it ensures that each concept(for example, purchasing habits and environmental attitude) is measured separately and accurately, without unintentional interference. By ensuring reliability and discriminant validity, the researcher ensures that collected data accurately mirrors age disparities in electric vehicle purchasing and the exceptional role of environmental concern, thus adding weight and credibility to their comparative analysis.

Establishing the reliability and validity of the constructs influencing consumer behavior towards electric and solar-powered vehicles. These constructs include Quality, Environmental Consciousness, Price, Availability, AIDA: Attention, Interest, and Desire; and Environmental Concern. CA, CR, and AVE measures show internal consistency and convergent validity of constructs. For example, all the CA values are above 0.84, and all AVE values are above the required level of 0.50, with most constructs topping 0.65, which means the items explain a great deal of the variance. With an AVE of 0.616 and CR of 0.888, Quality is typical of factors such as the reliability of a vehicle, acceleration, and the efficiency of batteries being instrumental in making consumer decisions-this finding underscores the importance of perceived performance and product durability as critical factors in the adoption of electric vehicles (Rezvani et al., 2015).

Environmental Consciousness and Environmental Concern become the constructs with higher degrees of influences and higher loadings (from 0.839 to 0.896), in tune with burgeoning literature highlighting pro-environmental attitudes in green technology adoption. According to Barbarossa et al. (2015) and Xu et al. (2020), those with strong ecological values tend to embrace sustainable innovations. Another factor contributing to EV purchase decisions is price, indicating that consumers are very conscious of upfront investment costs against long-term savings (CR = 0.903, AVE = 0.711; loadings from 0.769 to 0.850). This finding supports Turretine and Kurani's (2007) argument that EV purchase choices are really governed by economic incentives and costs. The availability construct reflects infrastructure in the form of charging stations, spare parts, and local service accessibility in mediating purchase intent (CR = 0.925, AVE = 0.689). It is consistent with the literature circumference infrastructure gap as one of the barriers to adoption (Egbue & Long, 2012). In turn, the constructs of Attention, Interest, and Desire, based on the AIDA model, have high CR and AVE values, confirming that exposure to advertisements, influence of the media, and personal aspirations form the purchase decisions significantly. Such results align well with marketing-based studies (Kotler & Keller, 2016) that argue that brand visibility and emotional engagement empower consumer motivation. The above-given results verify that technical quality, cost concern, environmental values, market availability, and consumer engagement make up total adoption predictors. This set of conclusions simultaneously validates and strengthens previously conducted empirical works thus further supporting the multidimensional model of EV adoption behavior.

Data Analysis

ANOVA tests were conducted to analyze differences in attitudes, intentions, and behaviors toward sustainable transportation across Generations X, Y, and Z. To test the proposed structural model and examine the relationships among the independent variables, the mediating variable (environmental concern), and the dependent variable (purchasing behavior), a predictive-correlational approach was employed. Parameter estimates were measured using Structural Equation Modeling (SEM). The data analysis, including the SEM and mediation tests, was performed using **WARP-PLS Version 8**, a software specifically designed for Partial Least Squares SEM, ensuring robust and reliable results.

Ethical Considerations

This study maintained strict adherence to the accepted ethical guidelines governing research. Participants were fully informed about the aim and procedures of the study and about their rights to withdrawing from the study at any given point without any penalties. After giving due

consideration and understanding of all details regarding the study, the participants gave their informed consent freely, voluntarily, and in writing before the collection of data commenced. The respondents were assured of anonymity and confidentiality of all information provided; no personal information that could identify the respondents was asked from any of them. All the responses were coded to facilitate the study and to protect the respondents' privacy. The study inflicted no physical, psychological, or social harm, and respondents were basically healthy adults and comprised no vulnerable populations. The data gathered were stored in sealed records and used only for academic purposes. The process underwent ethical clearance according to institutional research standards; the core of all these was to ensure dignity, autonomy, and respect for the rights of all participants in the research.

4. RESULTS AND DISCUSSION

Table 2. Quality Affecting Purchase Behavior of E-Bikes

Factor	**Gen. X**			**Gen. Y**			**Gen Z**		
Quality	x̄	SD	VI	x̄	SD	VI	x̄	SD	VI
I consider the reliability of electric/solar-powered vehicles to be crucial in my purchasing decision.	3.36	.757	*SA*	3.29	.781	*SA*	3.19	.667	*A*
I believe electric/solar-powered vehicles are less likely to need repairs compared to gasoline vehicles.	3.08	.754	*A*	3.03	.842	*A*	3.06	.724	*A*
Acceleration and speed capabilities are important factors in my decision to buy an electric/solar-powered vehicle.	3.32	.735	*SA*	3.29	.809	*SA*	3.20	.735	*A*
The efficiency of the battery charging system is important to me when selecting an electric/solar-powered vehicle.	3.49	.664	*SA*	3.49	.760	*SA*	3.37	.715	*SA*
I prioritize high build quality and durability when considering the purchase of an electric/solar-powered vehicle.	3.59	.598	*SA*	3.50	.767	*SA*	3.41	.708	*SA*
Composite Mean	**3.37**	**.575**	***SA***	**3.32**	**.746**	***SA***	**3.24**	**.642**	***A***

LEGEND: 3.26-4.00 Strongly Agree
2.51-3.25 Agree
1.76-2.50 Disagree
1.00-1.75 Strongly Disagree

Table 2 reflects the quality-related differences affecting the purchase behavior of e-bikes for Generations X, Y, and Z. The results show both Gen Xs ($\bar{x}$=3.37) and Gen Ys ($\bar{x}$=3.32) strongly agreeing about the importance of quality, while Gen Zs ($\bar{x}$=3.24) somewhat agree, but less strongly. Interestingly, younger consumers assign somewhat lower importance to some quality elements and more specifically to features such as acceleration, fast charging, and durability than their older counterparts. This explains the review of related literature, which states that Generation X tends to follow the tenet of long-term value and technical functionality (Lee et al., 2020); Gen Z, however, views innovation and lifestyle implications more so than technical durability (Rahimi & Jin, 2020). From the RRL, quality considerations such as charging efficiency and reliability and lesser maintenance were identified as important technical and economic attributes that can influence consumer decisions (Tsala & Adam, 2023; Bhattacharyya & Thakre, 2021). These attributes mirror closely those found in Table 2, thus confirming the construct's validity. The item producing the highest means for all generations is build quality and durability, further cementing the conclusion from Heeraman et al. (2024) that concerns regarding the assurance of performance cut across the age divide. In summary, all generations acknowledge the importance of quality; however, the

generational barrier exists in the strength of preference. The results imply; therefore, that for the older generations, the marketer must focus on themes of durability and efficiency, whereas for Gen Z, these should be promoted alongside themes of innovation and eco-identity to create resonance.

Table 3 Environmental Consciousness Affecting Purchase Behavior of E-Bikes

Factor	**Gen. X**			**Gen. Y**			**Gen Z**		
Environmental Consciousness	$\bar{x}$	SD	VI	$\bar{x}$	SD	VI	$\bar{x}$	SD	VI
I am aware of the environmental benefits of electric and solar-powered vehicles compared to traditional gasoline vehicles.	3.49	.620	*SA*	3.51	.735	*SA*	3.40	.668	*SA*
I would choose an electric/solar-powered vehicle to contribute to lower emissions.	3.33	.762	*SA*	3.30	.818	*SA*	3.28	.707	*SA*
Choosing an electric/solar-powered vehicle is part of my commitment to environmental sustainability.	3.32	.735	*SA*	3.25	.866	*SA*	3.22	.694	*A*
I am willing to pay a premium for a vehicle if it has a lower environmental impact.	3.27	.664	*SA*	3.24	.760	*A*	3.10	.715	*A*
Buying an electric or solar-powered vehicle is an important act of social responsibility for me.	3.24	.763	*A*	3.20	.862	*A*	3.16	.718	*A*
Composite Mean	**3.33**		***SA***	**3.30**		***SA***	**3.23**		***A***

LEGEND: 3.26-4.00 Strongly Agree
2.51-3.25 Agree
1.76-2.50 Disagree
1.00-1.75 Strongly Disagree

Table 3 displays the effect of environmental consciousness on e-bike purchase behavior across Generations X, Y, and Z. An overall analysis indicates Gen X ($\bar{x}$ = 3.33) and Gen Y ($\bar{x}$ = 3.30) strongly agreeing that environmental consciousness affects their purchasing behavior, whereas Gen Z ($\bar{x}$ = 3.23) shows some level of agreement, albeit a bit less. The items scoring highest for all cohorts concern an awareness of the environmental benefits and a desire to reduce emissions, thus providing shared awareness of the ecological value of electric and solar-powered vehicles. Decreasing mean scores appear as the items ask for some personal give-away, such as paying a premium or considering it social responsibility. Gen Z, in particular, ranks lowest on these items. One finds local support for this insight in the literature reviewed that describes Gen Z as environmentally aware but more motivated by technology and innovation than by environmental obligation (Flores & Jansson, 2021; Rahimi & Jin, 2020). The literature also provided Barbu et al. (2022) and Bhattacharyya & Thakre (2021), citing that consumer behavior is influenced not only by environmental values but also by economic considerations and perceived personal utility. These nuances manifest in the ratings of Gen Y and Gen Z, particularly where variability is greatest (e.g., SD = 0.862 for Gen Y on social responsibility), signifying the presence of opposing views within age groups. Hence, environmental consciousness is stronger among the older generations, among whom its power weakens with the younger; this brings in the need for differentiated messaging: for older generations competitive market-conscious ethical appeals and for Gen Z-technology and lifestyle-oriented framing.

Table 4 Price Affecting Purchase Behavior of E-Bikes

Factor	Gen. X			Gen. Y			Gen Z		
Price	x̄	SD	VI	x̄	SD	VI	x̄	SD	VI
Electric and solar-powered vehicles are affordable for the average consumer.	3.17	.795	*A*	3.04	.831	*A*	3.01	.762	*A*
I am willing to pay a higher upfront cost for a vehicle if it is environmentally friendly.	3.12	.723	*A*	2.98	.831	*A*	2.97	.762	*A*
The availability of financial incentives would likely persuade me to choose an electric/solar-powered vehicle over a traditional one.	3.24	.775	*A*	3.09	.795	*A*	3.06	.699	*A*
I consider the total cost of ownership, including long-term savings, more important than the initial purchase price.	3.25	.741	*SA*	3.23	.768	*A*	3.19	.669	*A*
I constantly compare prices and seek the best value for money when selecting a vehicle.	3.49	.678	*SA*	3.41	.710	*SA*	3.29	.700	*SA*
Composite Mean	**3.25**	**.618**	***SA***	**3.15**	**.696**	***SA***	**3.23**	**.630**	***A***

LEGEND: 3.26-4.00 Strongly Agree
2.51-3.25 Agree
1.76-2.50 Disagree
1.00-1.75 Strongly Disagree

In this table, price-related factors concerning the purchasing behavior for an e-bike are discussed. The weighted means conclude that Gen X ($\bar{x}$ = 3.25) and Gen Y ($\bar{x}$ = 3.15) strongly agree, while Gen Z falls under the category of "agree" ($\bar{x}$ = 3.23). Hence, price continues to be considered an important consideration for all generations, but perhaps slightly less for Gen Z. All generations agree that e-bikes are affordable and that the buyer should be willing to pay more upfront for environmental benefits. The lower means of 2.98 and 2.97 for Gen Y and Gen Z, respectively, shows they hesitate when it comes to initial investment, which mirrors the literature. More particularly, the literature indicates that Gen Y cares about incentives, and Gen Z has a weak financial independence, curbing its initial investment, though with an increased ecological awareness (Casalegno et al., 2022; Yue et al., 2020). It was stated that Generation X compared prices for value among the highest-rated item across all generations ($\bar{x}$ = 3.49). This again supports the discussion in the RRL about economic pragmatism being especially pronounced in older consumers who often consider total cost of ownership over immediate affordability (Tsala & Adam, 2023). Price ultimately touches all generations but with subtle differences: Gen X is concerned with the long-term cost; Gen Y will generally respond to external incentives; and Gen Z may need to see a link between price and technology value to warrant a high initial cost. Such counterpoint suggest the need for differentiated pricing structures' and financing schemes' implementation for various age groups.

Table 5. Availability Affecting Purchase Behavior of E-Bikes

Factor	**Gen. X**			**Gen. Y**			**Gen Z**		
Availability	x̄	SD	VI	x̄	SD	VI	x̄	SD	VI
The availability of different models of electric and solar-powered vehicles in my area affects my willingness to purchase.	3.19	.689	*A*	3.15	.852	*A*	3.16	.698	*A*
The presence of charging stations in my area is a critical factor in my decision to purchase an electric vehicle.	3.25	.848	*SA*	3.24	.823	*A*	3.14	.747	*A*
The lack of specialized mechanics for electric and solar-powered vehicles in my area is a deterrent to purchasing one.	3.25	.754	*SA*	3.26	.795	*SA*	3.17	.715	*A*
Immediate availability or short delivery times are important to me when purchasing an electric or solar-powered vehicle.	3.36	.756	*SA*	3.24	.772	*A*	3.13	.687	*A*
I am concerned about the availability of spare parts for electric and solar-powered vehicles.	3.46	.691	*SA*	3.33	.841	*SA*	3.24	.705	*A*
Composite Mean	**3.33**	**.679**	***SA***	**3.30**	**.779**	***SA***	**3.23**	**.648**	***A***

LEGEND: 3.26-4.00 Strongly Agree
2.51-3.25 Agree
1.76-2.50 Disagree
1.00-1.75 Strongly Disagree

Table 5 shows that environmental factors influence e-bike purchase behavior across generations. The results indicate that Gen X ($\bar{x}$ = 3.33) and Gen Y ($\bar{x}$ = 3.30) strongly agree that availability makes a difference in their purchasing decision, while Gen Z agrees moderately ($\bar{x}$ = 3.23). In general, the highest score among all the different groups centers on concerns with regards to the availability of spare parts, with Gen X giving the highest level of concern of all ($\bar{x}$ = 3.46). This, therefore, may be in line with the literature, which highlights infrastructure as indeed an adoption-barrier, especially from the perspective of the older, more pragmatic purchasers (Heeraman et al., 2024). Charging stations and the availability of specialized mechanics gained strong agreement from Gen X and Gen Y members as well, further emphasizing the need for convenience and technical support as enabling factors. On the contrary, while still in agreement, Gen Z gave a slightly less enthusiastic response; perhaps this might suggest a more tech-go-with-the-flow attitude endemic to a younger generation, yet one somewhat influenced by logistics. Such remarks strengthen the literature's claim that infrastructure development should go hand in hand with EV promotion. While the youngsters (Gen Z) are innovation-driven, the above-average-aged generations require visible and accessible support so they can confidently put their money down for e-vehicle ownership.

Table 6 Buyer's Purchasing Behavior

Behavior	Gen. X			Gen. Y			Gen Z		
	x̄	SD	VI	x̄	SD	VI	x̄	SD	VI
Attention	3.21	.795	*A*	3.08	.831	*A*	3.08	.762	*A*
Interest	3.00	.723	*A*	2.98	.831	*A*	2.89	.762	*A*
Desire	3.09	.775	*A*	3.14	.795	*A*	3.04	.699	*A*
Action	2.80	.741	*A*	2.86	.768	*A*	2.71	.669	*A*

LEGEND: 3.26-4.00 Strongly Agree
2.51-3.25 Agree
1.76-2.50 Disagree
1.00-1.75 Strongly Disagree

Table 6 summarizes the in-buying stages: Attention, Interest, Desire, and Action (AIDA) across Generations X, Y, and Z. Averaged scores for each generation vary between 2.71 and 3.21 in the interval, therefore each generation agrees almost moderately to behaviors associated with electric-bike purchases. However, with Attention coming to the fore with an $\bar{x}$ of 3.21, Action having an $\bar{x}$ of 2.80, and Gen X being higher in both, these findings imply that when Gen X customers feel pressed about an interest, they act on it, which agrees with the literature notion whereby functionality and long-term value are of great concern to Gen X consumers." Gen Y, despite marking the lowest in attention and interest, had the highest mean in Desire ($\bar{x}$ = 3.14), thus supporting the literature assertion that this cohort is swayed by environmental ethics or financial incentives (Yue et al., 2020). Gen Z recorded the least in Action ($\bar{x}$ = 2.71), which shows there is more desire than actual purchase probably due to financial factors or legitimacy of ownership. Hence, with the data supporting the literature conclusion, in that while all generations are environmentally-conscious, turning that into environmentally-motivated consumer behavior—especially for Gen Z—requires an interventional approach that includes institutional financing, stronger brand engagement, and infrastructure readiness, among others, to see some actual conversion from intention to purchase.

Table 7. Level of Environmental Concerns

Factor	Gen. X			Gen. Y			Gen Z		
Environmental Concern	x̄	SD	VI	x̄	SD	VI	x̄	SD	VI
Preserving the environment is a responsibility that all individuals should take seriously.	3.51	.620	*SA*	3.44	.806	*SA*	3.43	.651	*SA*
Choosing an electric or solar-powered vehicle over a gasoline vehicle can significantly reduce environmental pollution.	3.38	.722	*SA*	3.34	.839	*SA*	3.34	.671	*SA*
Environmental benefits are a major factor in my vehicle purchase decisions.	3.43	.660	*SA*	3.29	.844	*SA*	3.28	.705	*SA*
I am willing to compromise on vehicle performance (e.g., speed, range) if the vehicle is more environmentally friendly.	3.25	.778	*SA*	3.18	.902	*A*	3.22	.733	*A*
I actively follow news and developments about the environmental impact of vehicles.	3.31	.732	*SA*	3.17	.865	*A*	3.14	.745	*A*
Composite Mean	**3.38**	**.639**	***SA***	**3.30**	**.813**	***SA***	**3.31**	**.641**	***A***

LEGEND: 3.26-4.00 Strongly Agree

2.51-3.25 Agree
1.76-2.50 Disagree
1.00-1.75 Strongly Disagree

Table 7 focused on the generational aspects of this environmental concern for car purchase intentions. According to means composite, Gen X strongly agrees ($\bar{x}$ = 3.38), Gen Y also strongly agrees ($\bar{x}$ = 3.30), and Gen Z agrees ($\bar{x}$ = 3.31). The greatest consensus throughout the years is maintaining that the preservation of the environment is a responsibility shared by all, with Gen X placing stronger agreement on it ($\bar{x}$ = 3.51), giving credence to the Final Draft's implication of the older generation as more constant in its commitment to the environment. Interestingly, when respondents were presented with the option of slowly compromising performance for environmental benefits, Gen X was the only one to keep its score within the "strongly agree" level ($\bar{x}$ = 3.25) but both Gen Y and Gen Z scored lower. This gives credence to the literature's statement that Gen Z is instead spurred ahead by innovation and design, not by sacrifice or compromise (Flores & Jansson, 2021). In addition, younger generations seem to be less interested in actively following environmental news, suggesting that even though they value an eco-friendly outlook, their seriousness is still somewhat inconsistent. The findings further commend differentiated communication approaches; while Gen X responds favorably to messaging centered on responsibility and sustainability, Gen Z might need messages rooted in innovation and emotional appeal to spur environmental behavior and close the intention-action gap.

Table 8 Mediation Results

Hypotheses	B	P-value	SE	f^2
Quality-Attention	.031	0.198	0.037	0.020
Quality-Interest	.099	0.003	0.036	0.042
Quality-Desire	.000	0.499	0.037	0.000
Quality-Action	.066	0.036	0.037	0.037
Quality- Envi. Concern	.179	<0.001	0.036	0.119
Envi. Conscious-Attention	.026	<0.001	0.036	0.163
Envi. Conscious-Interest	.038	.241	0.037	0.011
Envi. Conscious-Desire	.329	.148	0.037	0.021
Envi. Conscious-Action	.291	<0.001	0.036	0.125
Envi. Conscious-Envi. Concern	.186	<0.001	0.035	0.293
Price – Attention	.255	<0.001	0.036	0.179
Price – Interest	.329	<0.001	0.036	0.167
Price-Desire	.291	<0.001	0.036	0.174
Price-Action	.235	<0.001	0.036	0.155
Price- Envi. Concern	.186	<0.001	0.036	0.126
Avail-Attention	.137	<0.001	0.036	0.086
Avail-Interest	.010	.395	0.037	0.004
Avail-Desire	.098	.004	0.036	0.051
Avail-Action	.044	.113	0.037	0.025
Avail-Envi.Concern	.100	.003	0.036	0.062

The mediation analysis considers the direct effects of four independent variables—Quality, Environmental Consciousness, Price, and Availability—on the four stages of purchasing behavior (Attention, Interest, Desire, and Action) and their indirect effects through the mediator Environmental Concern (Table 9). The use of SEM has pointed out some pathways to be significant

while others were not, providing a very nuanced understanding of how these constructs drive the behavior of adoption of electrical and solar vehicles.

Quality has statistically significant effects on Interest ($\beta = 0.099$, $p = 0.003$) and Action ($\beta = 0.066$, $p = 0.036$), corroborating Bhattacharyya and Thakre (2021), who stated that product reliability is a chief concern for behavioral commitment. However, its non-significant effects on Desire ($\beta = 0.000$, $p = 0.499$) suggest that quality affects cognitive evaluations rather than emotional drive, which supports the view of Tsala and Adam (2023) that performance matters more after awareness than in the attraction phase. The mediation through Environmental Concern ($\beta = 0.179$, $p < 0.001$) further confirms quality as a more general ecological consideration in purchase intention.

Environmental Consciousness has a strong effect on Action ($\beta = 0.291$, $p < 0.001$) and through mediating Environmental Concern ($\beta = 0.186$, $p < 0.001$), as studies have previously established: ecological values encourage ethical consumption (Barbarossa et al., 2015; Xu et al., 2020). The weak effects on Interest and Desire, however, seem to suggest that environmental ideals alone do not suffice without practical or lifestyle reinforcement-lending support to Flores and Jansson (2021) regarding Gen Z's sustainability ideas that are more oriented toward the trend.

Price exerts a pronounced and consistent effect across all stages: Attention ($\beta = 0.255$), Interest ($\beta = 0.329$), Desire ($\beta = 0.291$), and Action ($\beta = 0.235$), all with $p < 0.001$. This echoes the findings of Yue et al. (2020) and Casalegno et al. (2022) that ultimately contend with price sensitivity, particularly among young consumers. Through Environmental Concern ($\beta = 0.186$, $p < 0.001$), however, price implied that affordability bolsters not just feasibility but also environmental justification.

Availability moderately influences Attention ($\beta = 0.137$, $p < 0.001$) and Desire ($\beta = 0.098$, $p = 0.004$) but has non-significant effects on Interest and Action, thus representing an initial stage but not a decisive one (Egbue and Long, 2012). However, its significant influence on Environmental Concern ($\beta = 0.100$, $p = 0.003$) underlines the fact that perceived infrastructure contributes to ecological awareness.

In sum, the model confirms that Environmental Concern serves as a vital mediator, especially for the price, quality, and environmental consciousness constructs, thus validating the theoretical and RRL findings related to sustainable consumption behavior.

Table 9. ANOVA - Purchasing Behavior

	Sum of Squares	df	Mean Square	F	p
Generation	0.953	2	0.476	1.27	0.283
Residuals	273.619	727	0.376		

Table 9 exhibits the result of a one-way ANOVA test assessing whether there are statistically significant differences across generations in purchasing behavior. Furthermore, the variation between groups assigned to generation received a sum of squares value of 0.953 with 2 degrees of freedom, resulting in a mean square of 0.476. The variation within groups (residual) is much higher, having a sum of squares of 273.619 with 727 degrees of freedom, thereby resulting in a mean

square of 0.376. Consequently, the F-ratio was almost equivalent to 1.27, and the p-value was 0.283. Since the p-value came to be above the conventional alpha level of 0.05, the test is insignificant. In contrast, the sample data showed that generational cohort-or Generation X, Y, or Z-does not largely affect purchasing behavior as a whole. This implicitly means that while generational disparity may exist in other constructs such as attitude and awareness, those differences do not surface into distinct purchasing patterns under this context. Another possible reason for the result is the disparity in sample sizes or overlapping of behavior traits across the generations.

5. CONCLUSION

The study's findings, when divided into generational cohorts, provide valuable insights into the purchasing behavior of consumers toward electric and solar-powered vehicles in the Philippines. Based on the research questions, it is found that purchasing behavior is affected by quality, price, availability, and environmental consciousness; environmental concern acts as a mediator among these factors, and consumer attitudes differ between Generations X, Y, and Z. Each of these themes was examined regarding the empirical evidence and what literature said, giving a more encompassing interpretation of the findings.

In general, all four consumer behavior variables—quality, price, availability, and environmental consciousness—exercised a noteworthy influence upon the consumers' intent to buy electric and solar vehicles. Quality possessed a really prominent influence on Generation X and Generation Y buyers. They looked for performance reliability, battery longevity, and structural rigidity to enter into their decision-making since this aligns with earlier findings of Bhattacharyya and Thakre (2021) that product reliability influences consumer trust. On the contrary, Generation Z developed somewhat less importance on quality, a statement supported by Rahimi and Jin (2020), who claimed that young consumers rarely consider mechanical soundness and rather value appearance and innovation. Price was also an important factor for all groups. Generation X respondents were most concerned with the total cost of ownership, assessing the long-term economic viability of acquiring an electric vehicle. Such a practical perception of the concept of price confirms earlier considerations made by Turretine and Kurani (2007). Generation Y and Z, despite also being concerned about price, were more concerned about initial costs together with government incentives. The two generations became more willing to adopt electric vehicles as soon as financial support started to become evident, therefore reinforcing the findings from Yue et al. (2020) and Casalegno et al. (2022) on the financial pragmatism of young consumers.

Availability was another critical factor, with Gen Xers and Yers emphasizing the need for sufficient charging infrastructure and proper technical support. The authors thereby corroborate arguments by Heeraman et al. (2024) and Egbue and Long (2012), who pointed to the role of infrastructure in determining green transportation choices in developing contexts. Generation Z, less overt about availability issues, still operated in a manner whose effects were indirectly altered by infrastructure presence: the indication that, while Gen Z remains hopeful about new technologies, their actions remain mired in the more pragmatic domain of access and service reliability. Another significant predictor of purchase intention is environmental consciousness. This again places higher value on intrinsic motivation toward environmental sustainability among Generations X and Y, with evidence from Barbu et al. (2022) and Barbarossa et al. (2015), who maintain that pro-

environmental values are more deeply internalized among older consumers. Generation Z, although outwardly concerned, often relate environmental concerns to lifestyle, social trends, and identity signalling, an observation supported by Flores and Jansson (2021) and Gaspar et al. (2023).

Another second major finding considered the mediating role of environmental concern on purchase intention given consumer characteristics. Structural equation modelling revealed that environmental concern unilaterally accentuated the purchase behavior effects of the major consumer behavior factors, especially for Generation Y. This would be in tune with the theory made by Amoako et al. (2020), which states that environmental attitudes strengthen the relationship between consumer awareness and behavior. Tareke (2024) found somewhat similar findings by stating that increased public awareness of global ecological risks as a result of the pandemic increased the willingness of consumers to consider any form of sustainable transport. This also outlined the fact that environmental concern indeed acted as an important mediator for all generations, showing the most significant influence for Gen Y respondents who would appear to somewhat weigh environmental concerns against a zest for technology and social accountability.

Generational analysis show great differences between behaviors of purchase. Generation X translates very high conversion rate from intention to action, reflecting their emphasis on proven value, longevity, and economic considerations. Contrary to Kotler and Keller (2016), who state that older consumers tend to act more on the basis of product reliability, Generation X seems to be the best example of this model. The Generation Y shows level engagement on all four AIDA stages of attention, interest, desire, and action, making them the most uniform-likely customer base for electric vehicles. Their behaviors are characterized by a blend of environmental concern, openness to innovation, and compatibility with sustainability values, in accordance with Agustini et al. (2021). Generation Z shows the highest levels of awareness, interest, and desire but ranks the lowest on actual behaviors of purchase, thereby indicating a strong intention-behavior gap, an often discussed occurrence in behavioral and sustainability research. According to Lee et al. (2020) and Flores and Jansson (2021), this population faces barriers concerning affordability, infrastructure, and lack of personal mobility despite their high-level intention toward green technologies.

The study findings very much agree with and complement Rogers' Diffusion of Innovation Theory, especially in the manner in which electric vehicle technologies are adopted by generations at different rates. Generation Z embodies characteristics of innovators and early adopters, although it stands very high on awareness and early interest-perhaps access, affordability, and infrastructural impediments. Generation Y embodies the early majority that wants innovation plus social acceptance, while Generation X well exemplifies the late majority, which wants proven performance, economic practicality, and reduced levels of uncertainty. Furthermore, Social Identity Theory explains how belonging to specific groups-namely generation-determines environmental attitudes and behavior toward purchases. Generational cohorts share values, experiences, and peer norms that influence their behavior. For instance, environmental awareness among Gen Z is more in the realm of identity signaling and/or peer alignment than actual internalized ecological consciousness. Whereas Gen X tends to lean more on a sense of stewardship and moral obligation. Combining DoI and SIT, the study contends that innovation adoption and identity-based group norms are two major factors in sustainable consumer behavior. Thus, understanding how social identity interweaves with the stages of innovation adoption can serve as the basis for marketing or policy interventions that give priority to the particular motivations of each generation.

In essence, the study points to the developing generational strategies to enhance numbers of electric vehicle adoptions. As far as Generation X is concerned, concrete infallible demonstrations of quality and cost-efficiency are the things that meet their standards. As opposed to that, Generation Y can be tempted by brand-building and eco-conscious incentives. Despite high levels of attitudinal engagement, policy, peer pressure, and financing instruments should assist Generation Z to translate their attitude into behavior. Policy makers and marketers should therefore consider segment-specific approaches, employing environmental arguments to link generational values to real behavioral engagements. This important distinction of generational behavior becomes key in expediting the technology uplift of clean transportation in the Philippines and other emerging markets.

Management Implications and Limitations

Essentially, this research cultivates actionable insights for a wide spectrum of parties involved in electric and solar power vehicle promotion, design, and regulation. The research has revealed that consumers' behavior is deeply influenced by generational identity, price consciousness, and environmental value systems; hence, these factors should dictate strategic decisions on both the policy and industry sides.

Due to the influence that environmental concern may exert as a mediator, policy has to consider creating awareness through its educational campaigns and other incentives. Governments should consider an expansion of subsidies, tax credits, and financing schemes targeted mostly toward younger generations, most notably Gen Z, who are highly interested but are financially constrained from moving to action. As well as incentivizing the wide-scale establishment of electric charging infrastructure and linking it with renewable energy supply schemes, policies would be instrumental in helping build consumer confidence, especially for Generation X and Y, who are thus more availability- and service-support sensitive.

In the context of manufacturers, differentiated marketing systems and production strategies are demanded by generational differences as factors that push consumers. Gen X wants reliability and after-sales service, Gen Y has responded to innovation, environmental labels, and social impact, while Gen Z, the most digitally involved and environmentally expressive generation, can be reached via gamified platforms, influencer marketing, and breaking the cookie-cutter payment schemes. The innovations should go hand by hand with allowing the possibility of introducing EV models and solar-related solutions at a cheaper price baseline. An equally crucial set of implications awaits the urban planners. Infrastructure matters proved to be paramount across all generational strata. Such a finding implies that urban transport policies must pay particular attention to electric vehicle infrastructure development across urban centers and their adjacent suburban realms. Allowing for EV-friendly features in city zoning plans, such as dedicated charging hubs, solar-powered micro-mobility lanes, and green parking spaces, will not just increase adoption but will interlock with bigger sustainability themes.

In a nutshell, while this study made its contribution to the body of knowledge, it also has certain limitations. The data are based on a cross-sectional survey studied in the Philippines, which could limit its generalizability to other geographic contexts. Behavioral outcomes were self-reported, leaving room for social desirability bias. The validation of stated intentions could also be well

served by longitudinal designs and tracking of actual market behavior. Also, while generational identity was used as a central variable, intersecting variables such as geographic location, household composition, or digital exposure could add further segmentation insights. Future research may want to look at the influence of employer incentives, education curricula, and peer pressure on EV adoption among youth. The importance of collaborative efforts among government, industry, and urban development sectors in creating a friendly platform to address both psychological and practical challenges to clean transportation adoption has been demonstrated in this research.

One limitation of this study is the unequal number of respondents across generations, which may have influenced comparative results and potentially limited the representativeness of findings for each age cohort.

Limitations

A major limitation of having this kind of study is that it does not control for variables such as income level and location, which might be major determinants of purchasing behaviors. Though generational differences have been at the very heart of the discourse, income differences could have been influencing the valuation of affordability among the Gen Z group. In a similar fashion, within these contexts, being geographically varied in lieu of urban versus rural setting could affect one's access to charging infrastructure or exposure to environmental campaign initiatives. Not including these variables might not allow the findings to truly capture the complexity of the factors driving the adoption of electric vehicles. These factors must be included in follow-up research so that the analysis will be further refined and the results generalized with contextually accurate conditions.

Recommendations

This study has revealed ground-breaking differences in variations in key drivers leading to the purchase of electric and solar-powered cars, especially via certain generations where environmental concern has been noted to play a significant role. Firstly, it should be noted that environmental consciousness levels tend to differ greatly among Generations X, Y and Z. This is illustrated more clearly in the case of Generation X, where there are higher rates of environmental responsibility, especially when it comes to investment into green cars. These people value sustainability because they regard owning eco-friendly cars as their social responsibility. On the side of Generation Y, this is achieved. However, it varies slightly from person to person, indicating that some attach more importance to developmental matters as compared solely to environmental factors, meaning that there can be extreme advocates of strong sustainability among them at the same time who are less motivated by such issues alone. Finally, yet importantly, when talking about Generation Z, it would be correct to mention that this is a generation that puts more emphasis on things other than sustainable means, especially motor vehicle technology design and innovation.

Regarding buying decisions, Generation X concentrates on EVs as they view them in terms of long-term savings that are more significant than what one incurs initially. While the focus on EV costs during ownership emphasizes a pragmatic outlook among Generation X, Millennials and Gen Z have a fair appetite for this investment but are more interested in offers like government subsidies. Conversely, Generation Y has the most varied answers regarding issues related to prices; hence, if given some financial backing, they can also consider using electric cars. In general, this factor has everything to do with price at each step: attracting attention, generating interest and desires, and

even influencing decisions for buying, thus forming the basis upon which people go for eco-friendly vehicles. By and large, people are very attentive to prices while buying things because the cost largely defines what one pays for an item and its quality as well.

Even though many other factors determine purchase decisions, the availability of EV infrastructure, such as charging stations and specialized vehicle support, matters most. Generation X considers infrastructure availability to be more important than the younger generations since it assumes that having accessible charging stations and spare parts is necessary for this. On the other hand, Generation Y agrees with Generation X in realizing the importance of having a well-developed support system for electric vehicles (EVs).In contrast, Generation Z seems okay with the lack of infrastructure. Their lower emphasis on support facilities may indicate their inclination towards novelty value instead of functionality, which could be associated with different mobility needs or lifestyle choices. This implies the necessity for individualized methods addressing peculiar motivations among these age groups and ensuring environmental or financial incentives should be provided alongside infrastructural assistance to promote a wider uptake for green cars over different generations.

To achieve acceleration in the adoption of electric vehicles (EV) across the generations, what is required is a complete strategy combining targeted marketing, extensive infrastructure development and financial incentives that are tailored. A point marketing ought to make is soundly talk about each and every one of these generations' priorities by highlighting long-term saving as well as positive environmental impact on Generation X, monetary incentives and corporate social responsibilities on Generation Y, and mobility appeal and lifestyle on Z. This problem should be solved through improving distribution of electric cars including building such places like charging stations or garages with repair services mostly in cities and other suburban zones hence alleviating their concerns on access to charging stations especially for Generation X and Y. Young people can also benefit from tax refunds so that EVs become cheaper for them. It is an overall strategy consistent with age characteristics that tear down obstacles while creating a stable consumer class loyal to EV, representing their societal improvement.

Future research is encouraged to perform longitudinal analyses tracking actual purchase behavior through time and the prospective sustained influence of environment concern on generational clusters. More emerging economies added to the study would improve generalization and thus allow for cross-cultural comparison. Other variables, such as digital literacy, employment nature, and residency in either urban or rural areas, need to be added, thereby cementing consumer segmentation. Experimental designs could assess causal effects of focused incentives or awareness campaigns. Finally, the role of peer influence and social media shaping Gen Z's consumption behavior for sustainability is another glaring area for further inquiry.

REFERENCES

Amoako, G. K., Dzogbenuku, R. K., & Abubakari, A. (2020). Do green knowledge and attitudes influence the youth's green purchasing? Theory of planned behavior. *International Journal of Productivity and Performance Management*, *69*(8), 1609-1626.

Agustini, M., Baloran, A., Bagano, A., Tan, A., Athanasius, S., & Retnawati, B. (2021). Green marketing practices and issues: A comparative study of selected firms in Indonesia and Philippines. *Journal of Asia-Pacific Business*, *22*(3), 164-181.

Barbu, A., Catană, Ș. A., Deselnicu, D. C., Cioca, L. I., & Ioanid, A. (2022). Factors influencing consumer behavior toward green products: a systematic literature review. *International journal of environmental research and public health*, *19*(24), 16568.

Bagdia, R., Keche, Y., Bagdia, K., & Agrawal, A. (2022). Road Transport Electrification And Renewables: Opportunities For Integration. *Electromobility And Renewable Electricity*, 11.

Bautista, R., Dui, R., Jeong, L. S., & Paredes, M. P. (2020). Does altruism affect the purchase intent of green products? *Asia-Pacific Social Science Review, 20*(1), 159–170.

Bhardwaj, A. K., Garg, A., Ram, S., Gajpal, Y., & Zheng, C. (2020). Research trends in green products for the environment: A bibliometric perspective. *International Journal of Environmental Research and Public Health, 17*(22), 8469. https://doi.org/10.3390/ijerph17228469

Bhattacharyya, S. S., & Thakre, S. (2021). Exploring the factors influencing electric vehicle adoption: an empirical investigation in the emerging economy context of India. *foresight*, *23*(3), 311-326.

Casalegno, C., Candelo, E., & Santoro, G. (2022). Exploring the antecedents of green and sustainable purchase behavior: A comparison among different generations. *Psychology & Marketing*, *39*(5), 1007-1021.

Flores, P. J., & Jansson, J. (2021). The role of consumer innovativeness and green perceptions on green innovation use: The case of shared e-bikes and e-scooters. *Journal of Consumer Behaviour*, *20*(6), 1466-1479.

Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobserved variables and measurement error. *Journal of Marketing Research, 18*(1), 39–50. https://doi.org/10.2307/3151312

Heeraman, J., Kalyani, R., & Amala, B. (2024). Towards a Sustainable Future: Design and Fabrication of a Solar-Powered Electric Vehicle. In *IOP Conference Series: Earth and Environmental Science* (Vol. 1285, No. 1, p. 012035). IOP Publishing.

Ho, T. K., & Loo, B. P. (2020). Generational change and travel. In M. Behrens (Ed.), *Handbook of sustainable transport* (pp. 357–367). Edward Elgar Publishing. https://doi.org/10.4337/9781789904997

Khan, S. J., Dhir, A., Parida, V., & Papa, A. (2021). Past, present, and future of green product innovation. *Business Strategy and the Environment, 30*(8), 4081–4106. https://doi.org/10.1002/bse.2858

Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal, 28*(1), 227–261. https://doi.org/10.1111/isj.12131

Lee, Y., Circella, G., Mokhtarian, P. L., & Guhathakurta, S. (2020). Are millennials more multimodal? A latent-class cluster analysis with attitudes and preferences among millennial and Generation X commuters in California. *Transportation*, *47*, 2505-2528.

Lizzio-Wilson, M., Mirnajafi, Z., & Louis, W. R. (2022). Who we are and who we choose to help (or not): An introduction to social identity theory. In M. Lizzio-Wilson, Z. Mirnajafi, & W. R. Louis (Eds.), *Solidarity and social justice in contemporary societies: An interdisciplinary approach to understanding inequalities* (pp. 17–28). Springer. https://doi.org/10.1007/978-3-030-91833-4_2

Nawaz, M. U., Umar, S., & Qureshi, M. S. (2024). Life cycle analysis of solar-powered electric vehicles: Environmental and economic perspectives. *International Journal of Advanced Engineering Technologies and Innovations, 1*(3), 96–115.

Nunnally, J. C., & Bernstein, I. H. (1994). *Psychometric theory* (3rd ed.). McGraw-Hill.

Rahimi, A., Azimi, G., & Jin, X. (2020). I am investigating generational disparities in attitudes toward automated vehicles and other mobility options. *Transportation research part C: Emerging Technologies*, *121*, 102836.

Sana, S. S. (2020). Price competition between green and non-green products under a corporate social responsible firm. *Journal of Retailing and Consumer Services, 55*, Article 102118. https://doi.org/10.1016/j.jretconser.2020.102118

Straub, D., Boudreau, M. C., & Gefen, D. (2004). Validation guidelines for IS positivist research. *Communications of the Association for Information Systems, 13*(1), 380–427. https://doi.org/10.17705/1CAIS.01324

Tezer, A., & Bodur, H. O. (2020). The green consumption effect: How using green products improves consumption experience. *Journal of Consumer Research, 47*(1), 25–39. https://doi.org/10.1093/jcr/ucz045

Tsala, A. A., & Adam, S. U. (2023). Assessment Of Tricycle Owners' Willingness To Adopt Solar Powered Motorized Tricycle In Maiduguri Metropolis, Borno State, Nigeria. *Journal Of Arid Zone Economy*, *1*(3), 103-115.

Vijayakumar, K. (2021). Solar charging infrastructure for E-vehicles-A Review. In *2021 International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE)* (pp. 586-588). IEEE.

Yue, B., Sheng, G., She, S., & Xu, J. (2020). Impact of consumer environmental responsibility on green consumption behavior in China: The role of environmental concern and price sensitivity. *Sustainability*, *12*(5), 2074.