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Determinants Of Electric Vehicle Adoption Among Young Adults: An Extended Technology Acceptance Model Approach using PLS-SEM

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Abstract: Electric vehicles (EVs) are emerging as a key innovation for sustainable mobility, offering reduced dependence on fossil fuels and lower greenhouse gas emissions. In India, the transportation sector contributes significantly to national emissions, and government initiatives such as subsidies and incentive schemes have accelerated the development of the EV market. Despite this progress, adoption remains uneven, particularly among young consumers who represent the future demand for sustainable transportation.

This study investigates the determinants of EV adoption among young adults in Bilaspur, Chhattisgarh, using data from 120 college students. The research model integrates the Technology Acceptance Model (TAM) with contextual factors such as awareness, environmental concern, social influence, charging infrastructure, and cost barriers. Data were collected through a structured questionnaire using a five-point Likert scale and analyzed using PLS-SEM.

The findings reveal that perceived ease of use and perceived usefulness significantly influence attitude toward EVs, which in turn positively affects purchase intention. Additionally, perceived usefulness directly impacts purchase intention. However, awareness, environmental concern, social influence, and cost barriers were not significant predictors of attitude, while charging infrastructure showed only marginal influence. These results suggest that young adults in Bilaspur prioritize practical usability and perceived benefits of EVs over environmental or social motivations. The study offers valuable insights for policymakers, educational institutions, and EV manufacturers to design targeted strategies that enhance usability, improve perceived benefits, and address infrastructure concerns to encourage EV adoption among youth in emerging urban contexts.

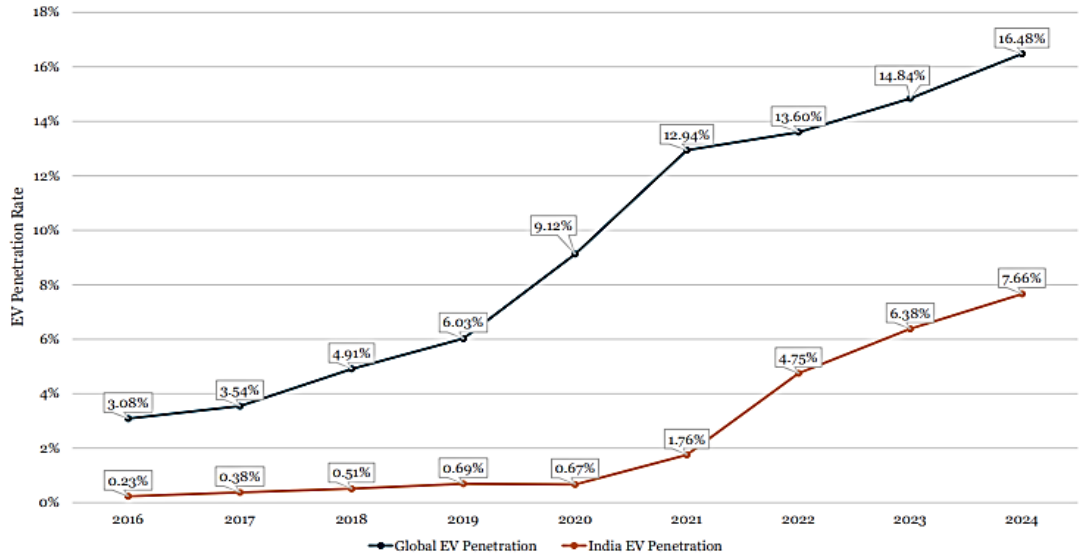
Keywords: Awareness, Charging Infrastructure, Cost Barrier, Environmental Concern, Perceived Ease of Use, Perceived Usefulness, Social Influence.

1. Introduction: The transport sector plays a critical role in shaping environmental sustainability and economic development, particularly in emerging economies such as India. According to the International Energy Agency, India's road transport sector accounts for nearly 12% of national carbon dioxide (CO_2) emissions, making it the third-largest contributor after energy and agriculture. Rising urbanization, increasing vehicle ownership, and dependence on fossil fuels have intensified concerns related to climate change, air pollution, and energy security. In response, the Government of India has undertaken sustained policy efforts over the past decade to accelerate the decarbonization of the transport sector, most notably through initiatives such as the Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles (FAME) scheme introduced in 2015 (Shankar, 2024).

Electric vehicles (EVs), which are powered wholly or partially by electric motors rather than internal combustion engines, have emerged as a promising alternative to conventional fuel-based vehicles. Although the concept of electric mobility is not new, EV adoption has gained substantial momentum in recent years due to heightened environmental awareness, technological advancements, and supportive policy frameworks. In India, the policy ecosystem for EVs has evolved gradually, beginning with limited fiscal incentives in 2010, followed by the National Electric Mobility Mission Plan (NEMMP) 2020, and later strengthened through the implementation of FAME and its expanded phase, FAME-II, which emphasized purchase subsidies and charging infrastructure development. Additional measures, such as the reduction of Goods and Services Tax (GST) on EVs and charging equipment, along with the proposal of a new Electric Vehicle Policy in 2024, reflect the government's continued commitment to promoting electric mobility (India's electric vehicle journey, n.d.).

Despite these policy interventions, EV adoption in India remains below targeted levels. Insights from NITI Aayog indicate that electric vehicles accounted for only about 7.6% of total vehicle sales in 2024, significantly short of the ambitious target of achieving a 30% market share by 2030. While adoption has progressed relatively well in electric two-wheelers and three-wheelers, penetration in electric cars, buses, and long-haul trucks remains limited. This gap highlights the need to understand not only infrastructural and policy constraints but also consumer-level behavioral factors influencing EV adoption, particularly among younger demographics who are likely to shape future mobility transitions (NITI Aayog, 2025).

Figure 01: EV Penetration Rate Global and India



Source: (NITI Aayog, 2025)In this context, the present study seeks to examine the factors influencing electric vehicle adoption intentions among young adults in Bilaspur, Chhattisgarh, using an extended Technology Acceptance Model approach with PLS-SEM. Young consumers represent a critical segment due to their openness to technological innovation, evolving mobility

preferences, and long-term influence on market diffusion. Drawing upon the Technology Acceptance Model (TAM), the study extends the framework by incorporating contextual variables such as awareness, environmental concern, social influence, charging infrastructure, and cost barriers. Using primary data collected from 120 college students and employing Partial Least Squares–Structural Equation Modeling (PLS-SEM), the research aims to provide empirical insights into the relative importance of perceived usefulness, perceived ease of use, and external factors in shaping attitudes and purchase intentions toward electric vehicles.

By focusing on a semi-urban Indian context and a youth-centric sample, the study contributes to the growing literature on sustainable mobility adoption in emerging economies. The findings are expected to offer practical implications for policymakers, educational institutions, and EV manufacturers in designing targeted interventions that enhance perceived benefits, improve usability, and address adoption barriers, thereby supporting India's broader transition toward sustainable and low-carbon transportation.

2. Review of Literature: Prior research on electric vehicle (EV) adoption in India indicates that consumer acceptance is shaped by a combination of awareness, environmental attitudes, perceived technological benefits, infrastructural readiness, and economic considerations. Awareness (AW) has been identified as a foundational factor influencing EV adoption, as limited knowledge about financial incentives, long-term cost savings, and operational benefits constrains consumers' willingness to consider EVs (Rao et al., 2024). Studies further highlight that public awareness campaigns and targeted information dissemination are critical in shaping favorable perceptions, particularly among young and first-time vehicle buyers. Environmental concern (EC) is frequently examined as a motivator for EV adoption; however, empirical evidence remains mixed. While EVs are associated with reduced tailpipe emissions and improved air quality, environmentally conscious consumers in India often express skepticism due to the coal-dominated electricity mix, weakening the direct impact of EC on adoption decisions (Dhankhar et al., 2024; Sharma et al., 2026).

From a Technology Acceptance Model (TAM) perspective, perceived usefulness (PU) and perceived ease of use (PEU) emerge as central determinants of attitude (ATT) toward EVs. PU—reflecting perceived economic savings, driving comfort, and technological advantages—has consistently shown a strong positive influence on both attitude and purchase intention (PI) (Saha & Mukherjee, 2024). In contrast, PEU demonstrates inconsistent effects across studies; while ease of operation and maintenance is acknowledged, it does not always translate into higher adoption intention, particularly among younger, technologically adept consumers who may already assume ease of use (Mehta et al., 2024). Social influence (SI) also plays a nuanced role, with peer opinions, media exposure, and societal norms shaping perceptions, though its impact varies across regions and demographic groups (Sharma et al., 2026).

Contextual and structural factors further moderate EV adoption behavior. Charging infrastructure availability significantly affects consumer confidence by alleviating range anxiety and enhancing perceived convenience, though its influence is sometimes marginal where daily travel distances are limited (Rao et al., 2024). Cost barrier (CB) remains one of the most persistent inhibitors, as high upfront prices, battery replacement costs, and perceived financial risk discourage adoption despite long-term savings (Dhankhar et al., 2024). Collectively, the literature suggests that attitude toward EVs serves as a critical mediating variable linking technological perceptions and contextual factors to purchase intention. However, existing studies often examine these constructs in isolation or using alternative behavioral frameworks. Addressing this gap, the present study integrates TAM with contextual variables—AW, EC, SI, charging infrastructure, and CB—to empirically examine their combined influence on attitude and purchase intention among young adults using PLS-SEM.

3. Research Gap and Research Objective: The study aims to examine the key determinants and barriers influencing electric vehicle (EV) adoption among college students in Bilaspur, Chhattisgarh, by analyzing the effects of perceived ease of use and perceived usefulness on attitudes toward EVs and their subsequent impact on purchase intention. It further assesses the direct

influence of perceived usefulness on purchase intention, while evaluating the roles of awareness, environmental concern, and social influence in shaping students' attitudes toward EVs, along with the impact of perceived barriers such as charging infrastructure and cost. Despite the growing body of EV adoption research, limited empirical evidence exists on young consumers in smaller and emerging urban regions of India, particularly using PLS-SEM to simultaneously examine both drivers and barriers. Accordingly, this study explores the interrelationships among these determinants and barriers using Partial Least Squares Structural Equation Modeling (PLS-SEM) to generate context-specific insights that can guide policymakers, educational institutions, and EV manufacturers in promoting EV adoption among young consumers in emerging urban regions.

4. Hypothesis Development and Conceptual Model: The present study develops a conceptual framework to examine electric vehicle (EV) adoption among young adults by extending the Technology Acceptance Model (TAM) with context-specific factors relevant to emerging urban regions in India. TAM posits that perceived ease of use (PEU) and perceived usefulness (PU) are fundamental determinants of users' attitudes toward a technology, which subsequently influence behavioral intention (Davis, 1989). Given the growing importance of sustainable transportation, this study adapts TAM to the EV context and integrates additional constructs such as awareness, environmental concern, social influence, charging infrastructure, and cost barriers to provide a comprehensive understanding of EV adoption behavior among college students.

a. Perceived Ease of Use and Perceived Usefulness

Perceived ease of use refers to the degree to which an individual believes that using an EV would be free of effort. In the context of EVs, ease of charging, maintenance, and operational simplicity are expected to enhance their perceived usefulness. Prior studies have consistently reported a positive relationship between PEU and PU, suggesting that technologies perceived as easy to use are also considered more beneficial. Moreover, PEU is expected to positively influence attitude toward EVs, as users tend to develop favorable evaluations toward technologies that are convenient and simple to operate. Accordingly, the following hypotheses are proposed:

H1: Perceived ease of use positively influences perceived usefulness of electric vehicles.
H2: Perceived ease of use positively influences attitude toward electric vehicles.

b. Perceived Usefulness, Attitude, and Purchase Intention

Perceived usefulness reflects the extent to which individuals believe that adopting EVs would enhance their commuting experience, reduce long-term costs, and meet their mobility needs. In line with TAM, PU is expected to positively influence attitude toward EVs, as individuals form favorable perceptions when a technology is perceived as advantageous. Additionally, PU may directly affect purchase intention, particularly in the EV context, where functional and economic benefits play a crucial role in adoption decisions. Attitude toward EVs is also expected to be a strong predictor of purchase intention, as favorable attitudes often translate into stronger behavioral intentions. Therefore, the following hypotheses are formulated:

H3: Perceived usefulness positively influences attitude toward electric vehicles.
H4: Perceived usefulness positively influences purchase intention toward electric vehicles.
H5: Attitude toward electric vehicles positively influences purchase intention.

c. Awareness, Environmental Concern, and Social Influence

Prior studies grounded in the Technology Acceptance Model (TAM) and its extensions suggest that awareness enhances perceived usefulness and perceived ease of use, thereby fostering favorable attitudes toward electric vehicles (EVs) (Davis, 1989; Egbue & Long, 2012). Environmental concern has been incorporated into extended TAM and UTAUT frameworks

as an external belief influencing attitude and behavioral intention toward sustainable technologies, including EVs (Jansson et al., 2011; Rezvani et al., 2015).

Similarly, social influence—conceptualized as subjective norm in TAM extensions and as a core determinant in UTAUT—has been shown to significantly affect attitudes and adoption intentions for EVs, particularly among younger and urban consumers (Ajzen, 1991; Venkatesh et al., 2003; Moons & De Pelsmacker, 2012). Collectively, these studies justify the inclusion of awareness, environmental concern, and social influence as antecedents of attitude toward EVs within an extended TAM/UTAUT framework.

In this study, these constructs are hypothesized to influence attitude toward EVs:

H6: Awareness of electric vehicles positively influences attitude toward electric vehicles.
H7: Environmental concern positively influences attitude toward electric vehicles.
H8: Social influence positively influences attitude toward electric vehicles.

d. Perceived Barriers: Charging Infrastructure and Cost

Despite the benefits of EVs, perceived barriers such as inadequate charging infrastructure and high costs remain critical challenges, particularly in non-metropolitan regions. Limited availability of charging stations, long charging times, and high upfront costs may discourage favorable attitudes toward EV adoption. Therefore, these barriers are expected to negatively influence attitude toward EVs:

H9: Perceived charging infrastructure barriers negatively influence attitude toward electric vehicles.
H10: Perceived cost barriers negatively influence attitude toward electric vehicles.

5. Materials and Methods

5.1. Questionnaire Design

This study adopts a quantitative, survey-based research design and focuses on young adults residing in Bilaspur City, Chhattisgarh. Data were collected from a total of 120 respondents through a structured questionnaire distributed online via Google Forms. The questionnaire comprised two sections: Section A captured the demographic characteristics of the respondents, while Section B assessed their perceptions and opinions regarding the adoption of electric vehicles (EVs). The instrument included 36 measurement items, adapted from established literature. All items were measured using a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

5.2. Variables Used for the Study

Table 01. Constructs and statements used.

Constructs	Meaning & Source	Statements Used
Awareness (AW)	Awareness refers to the extent to which young adults possess knowledge and understanding of electric vehicles, including their features, benefits, environmental impact, and available policy incentives related to EV adoption (Rogers, 2003).	AW1:I am familiar with the term “electric vehicle (EV)."
		AW2: I know the main differences between EVs and conventional petrol/diesel vehicles.
		AW3: I can identify major EV brands/models available in India.
		AW4: I am aware of government incentives and subsidies for EVs.
Environmental Concern (EC)	Environmental concern denotes the degree of concern expressed by young adults regarding environmental degradation and climate change, and the extent to which these concerns influence their inclination toward adopting electric vehicles.	EC1: I am concerned about air pollution caused by fuel vehicles.
		EC2:Reducing carbon emissions from transport is important to me.
		EC3: I consider environmental impact when choosing a vehicle.
		EC4: I would pay more for a vehicle if it significantly reduced pollution.
Perceived Usefulness (PU)	Perceived usefulness refers to the degree to which young adults believe that using an electric vehicle would enhance their mobility performance, reduce costs, and provide functional advantages over conventional vehicles (Davis, 1989).	PU1: EVs would be economically beneficial for me in the long run.
		PU2: Driving an EV would improve my daily commuting experience.
		PU3: EVs provide sufficient performance for my travel needs.
		PU4: EVs save money on fuel compared to petrol/diesel vehicles.
		PU5: Owning an EV would be a useful upgrade from my current vehicle.
Perceived Ease of Use (PEU)	Perceived ease of use represents the extent to which young adults believe that learning and using an electric vehicle would require minimal effort, including ease of driving, charging, and maintenance (Davis, 1989).	PEU1: Charging an EV would be easy for me.
		PEU2: Maintaining an EV would be simple and convenient.
		PEU3: Using EV charging apps or stations would be straightforward.

		PEU4: Learning to operate an EV would not be difficult.
Social Influence (SI)	Social influence refers to the degree to which young adults perceive that important others, such as family, friends, and peers, encourage or support the adoption of electric vehicles (Venkatesh et al., 2003).	SI1: People who are important to me think I should consider an EV.
		SI2: My friends/peers see EV ownership positively.
		Si3: Seeing influencers/celebrities with EVs makes me more interested in EVs.
		SI4: Social media discussions influence my thinking about EVs.
Charging Infrastructure (SI)	Charging infrastructure relates to the availability, accessibility, and adequacy of electric vehicle charging facilities, including public and private charging stations, which significantly influence EV adoption decisions among young adults (Rezvani et al., 2015).	CI1: There are not enough public charging stations in my city.
		CI2: Home charging facilities are difficult to arrange.
		CI4: Finding a charging station when needed would be challenging.
		CI4: Long charging times make EVs inconvenient
Cost Barrier (CB)	Cost barrier refers to the perceived financial constraints associated with electric vehicles, such as high purchase price, battery costs, and maintenance expenses, which may hinder adoption among young adults (Egbue & Long, 2012).	CB1: EVs are too expensive to purchase compared to regular vehicles.
		CB2: The high upfront price of EVs discourages me from buying one.
		CB3: Maintenance and battery replacement costs of EVs are a concern.
		CV4: EVs are not affordable for students like me.
Attitude (ATT)	Attitude toward electric vehicles reflects the overall positive or negative evaluation of EVs by young adults, based on their beliefs, feelings, and perceptions regarding EV technology and benefits (Ajzen, 1991).	ATT1: I have a favorable opinion about EVs.
		ATT2: I feel positive about using EVs in the future.
		ATT3: EVs are a smart alternative to conventional vehicles.
		ATT4: Buying an EV would be a wise choice.
Purchase Intention (PI)	Purchase intention refers to the extent to which young adults are willing and intend to purchase or use an electric vehicle in the future, representing their readiness to adopt EVs (Ajzen, 1991).	PI1: I intend to buy an EV in the future.
		PI2: I am likely to recommend EVs to others.
		PI3: I will consider an EV as my next vehicle.

5.3 Sample size determination

The study employed Partial Least Squares Structural Equation Modeling (PLS-SEM), which is suitable for prediction-oriented research and complex models with multiple constructs and indicators. The research model comprised nine latent constructs measured using 36 indicators. Data were collected from 120 respondents through an online Google Forms survey. This sample size is considered adequate for PLS-SEM analysis, as PLS-SEM is robust to relatively small sample sizes and performs well under such conditions. Moreover, the sample size satisfies the minimum requirements recommended by Hair et al. (2022) for estimating complex PLS-SEM models, thereby ensuring reliable path estimation and model validity.

Table 02: Demographic profile of the respondents (N = 120).

Demographic		**Frequency**	**%**
Gender	Female	51	42.5
	Male	69	57.5
Education	Other	7	5.8
	Pursuing PG	19	15.8
	Pursuing UG	94	78.3
Age	16-18	9	7.5
	18–20	87	72.5
	21–23	20	16.7
	24–26	2	1.7
	Above 26	2	1.7
Family Monthly Income	₹20,000–50,000	35	29.2
	₹50,001–1,00,000	32	26.7
	Above ₹1,00,000	15	12.5
	Below ₹20,000	38	31.7

Source: Primary Data

The demographic profile of the respondents indicates that the study sample for examining electric vehicle adoption among young adults in the Bilaspur district of Chhattisgarh was largely composed of individuals in early adulthood. The gender distribution shows a slightly higher representation of males (57.5%) compared to females (42.5%). With respect to educational attainment, the majority of respondents were pursuing undergraduate studies (78.3%), followed by postgraduate students (15.8%), while a small proportion (5.8%) belonged to other educational categories. The age composition reveals that most respondents were between 18 and 20 years (72.5%), followed by those aged 21–23 years (16.7%) and 16–18 years (7.5%), with only a negligible share in the 24–26 years and above 26 years categories (1.7% each), confirming the youthful nature of the sample. In terms of family monthly income, 31.7% of respondents reported income below ₹20,000, 29.2% fell within the ₹20,000–50,000 range, 26.7% reported ₹50,001–1,00,000, and 12.5% belonged to households earning above ₹1,00,000, indicating representation from diverse socio-economic backgrounds. Overall, the demographic characteristics suggest that the sample is predominantly composed of young, educated individuals from varied income groups, making it appropriate for analyzing factors influencing electric vehicle adoption among young adults in the study area.

5.4. Techniques and Tools Used

Descriptive statistics were computed using MS Excel, while partial least squares structural equation modeling (PLS-SEM) was employed to evaluate the measurement and structural models. PLS-SEM is a variance-based SEM technique well suited for analyzing complex models involving multiple latent and observed variables, particularly when sample sizes are

relatively small. Accordingly, the data were analyzed using SmartPLS 4.0, applying the PLS algorithm and bootstrapping procedures to test the hypothesized relationships.

6. Results

6.1 Measurement Model

The measurement model was evaluated using PLS-SEM with SmartPLS 4.0 to examine the reliability and validity of the constructs included in the study. Internal consistency reliability, convergent validity, and discriminant validity were assessed following established guidelines. As presented in Table 03, all indicator outer loadings exceed the recommended threshold of 0.70, with only a few marginal values that remain acceptable in exploratory research. The internal consistency reliability of the constructs is supported, as Cronbach's alpha values range from 0.831 to 0.927, exceeding the minimum acceptable limit of 0.70. Additionally, composite reliability values (ρa and ρc) for all constructs are above the recommended threshold of 0.70, confirming satisfactory reliability. Convergent validity is established, as the average variance extracted (AVE) values for all constructs exceed the threshold value of 0.50, indicating that each construct explains more than 50% of the variance in its indicators. Furthermore, multicollinearity was assessed using variance inflation factor (VIF) values, all of which fall below the critical threshold, indicating the absence of collinearity concerns. Discriminant validity was examined using the heterotrait–monotrait (HTMT) ratio of correlations, as shown in Table 04. All HTMT values are below the conservative threshold of 0.85, demonstrating that each construct is empirically distinct from the others. Collectively, these results confirm that the measurement model exhibits adequate reliability, convergent validity, and discriminant validity, thereby providing a sound basis for subsequent structural model analysis.

Table 03: Internal consistency reliability

Constructs	Variable Code	Variance Inflation Factor (VIF)	Outer Loading	Cronbach's Alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average Variance Extracted (AVE)
Attitude	ATT1	2.67	0.867	0.927	0.927	0.948	0.821
	ATT2	4.445	0.935				
	ATT3	3.257	0.896				
	ATT4	4.003	0.924				
Awareness	AW1	2.746	0.933	0.876	0.565	0.883	0.657
	AW2	3.041	0.882				
	AW3	2.549	0.659				
	AW4	1.98	0.738				
Cost Barrier	CB1	3.068	0.903	0.855	0.874	0.902	0.698
	CB2	2.129	0.827				
	CB3	2.415	0.874				
	CB4	1.572	0.727				
Charging Infrastructure	CI1	1.951	0.827	0.853	0.923	0.897	0.689
	CI2	1.501	0.654				
	CI3	2.591	0.911				
	CI4	2.618	0.902				
Environmental Concern	EC1	2.881	0.878	0.883	0.888	0.919	0.741
	EC2	3.649	0.875				

	EC3	2.963	0.885				
	EC4	1.762	0.801				
Perceived Ease of Use	PEU1	2.404	0.859	0.831	0.864	0.89	0.673
	PEU2	2.276	0.873				
	PEU3	3.025	0.907				
	PEU4	1.246	0.609				
Purchase Intention	PI1	3.922	0.941	0.921	0.921	0.95	0.863
	PI2	3.254	0.924				
	PI3	3.207	0.922				
Perceived usefulness	PU1	2.4	0.854	0.872	0.886	0.907	0.662
	PU2	2.239	0.822				
	PU3	2.084	0.809				
	PU4	1.639	0.715				
	PU5	2.444	0.86				
Social Influence	SI1	2.456	0.857	0.891	0.894	0.925	0.754
	SI2	2.998	0.89				
	SI3	2.961	0.903				
	SI4	2.061	0.822				

Source: Primary Data Analysed by Researcher

Table 04: Discriminant Validity (HTMT Criterion)

	ATT	AW	CB (-)	CI(-)	EC	PEU	PI	PU	SI
ATT									
AW	0.187								
CB (-)	0.285	0.351							
CI(-)	0.337	0.348	0.514						
EC	0.327	0.532	0.329	0.422					
PEU	0.758	0.344	0.445	0.302	0.398				
PI	0.724	0.252	0.366	0.159	0.411	0.534			
PU	0.684	0.397	0.408	0.264	0.493	0.713	0.706		
SI	0.635	0.464	0.278	0.282	0.413	0.723	0.567	0.685	

Source: Primary Data Analysed by Researcher

6.2 Structural Model

The structural model was assessed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with SmartPLS 4. Bootstrapping was performed to evaluate the significance of the hypothesized relationships, and the results are reported in terms of standardized path coefficients (β), t-values, and p-values, as presented in Table 05 and illustrated in Figure 02. Prior to hypothesis testing, overall model fit was examined using the standardized root mean square residual (SRMR). The SRMR values for the saturated model (0.075) and the estimated model (0.094) are within the recommended thresholds, indicating an acceptable model fit.

The results reveal that attitude toward electric vehicles has a positive and statistically significant effect on purchase intention ($\beta = 0.444$; $t = 2.935$; $p = 0.003$), supporting the hypothesized relationship and indicating that favorable attitudes increase young adults' intention to adopt electric vehicles. Perceived ease of use shows a significant positive effect on

attitude (β = 0.413; t = 3.285; p = 0.001), suggesting that electric vehicles perceived as easy to learn and operate contribute positively to attitude formation. In addition, perceived ease of use significantly influences perceived usefulness (β = 0.614; t = 8.388; p < 0.001), indicating that ease of use enhances perceptions of utility. Furthermore, perceived usefulness exerts a significant positive effect on both attitude (β = 0.300; t = 2.524; p = 0.012) and purchase intention (β = 0.362; t = 2.373; p = 0.018), confirming its central role in explaining adoption-related evaluations and behavioral intentions.

In contrast, several hypothesized relationships were not supported. Awareness (β = −0.075; t = 0.445; p = 0.656), environmental concern (β = −0.029; t = 0.266; p = 0.790), social influence (β = 0.162; t = 1.369; p = 0.171), and cost barrier (β = −0.095; t = 0.897; p = 0.370) do not have statistically significant effects on attitude toward electric vehicles. Charging infrastructure exhibits a positive but marginally insignificant relationship with attitude (β = 0.191; t = 1.888; p = 0.059), suggesting that its influence is present but not strong enough to reach conventional levels of statistical significance.

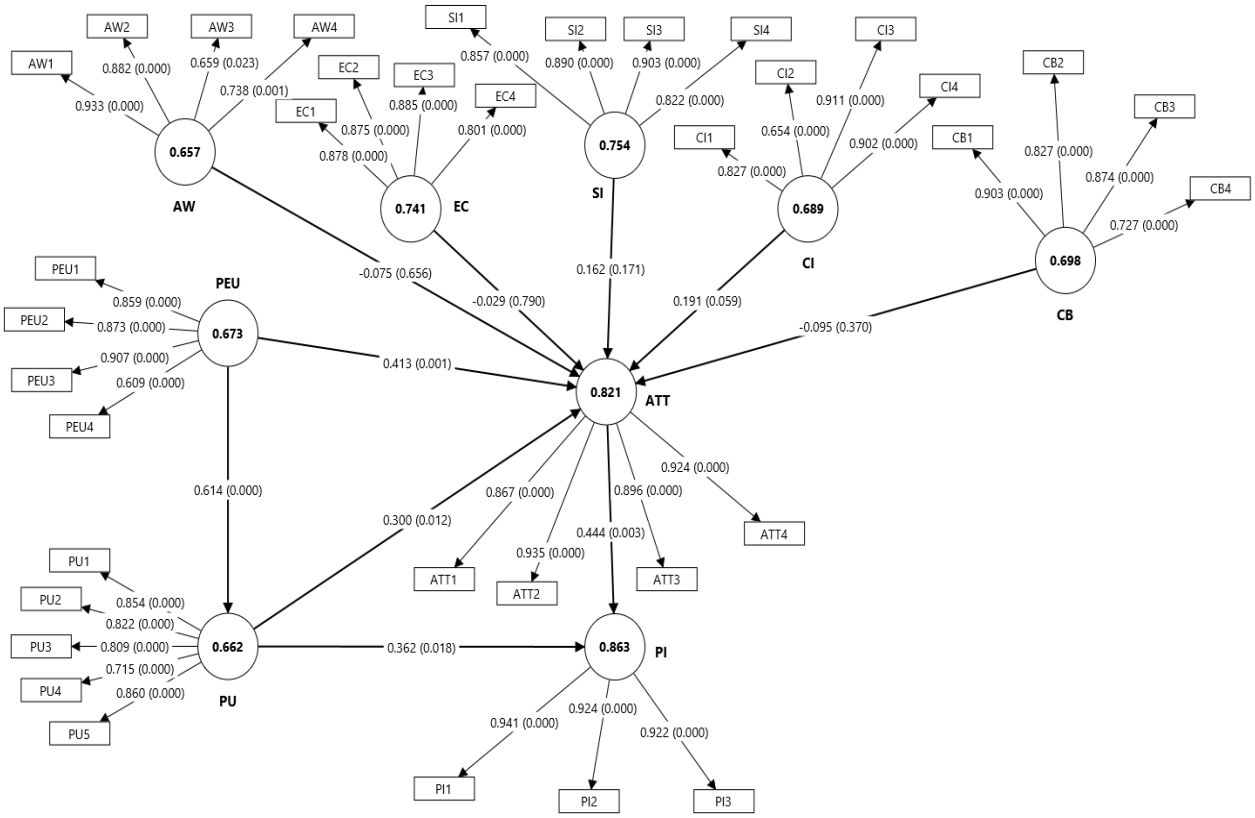
Overall, the structural model assessment indicates that technology-related perceptions, particularly perceived ease of use and perceived usefulness, are the most influential determinants of attitude and purchase intention toward electric vehicles among young adults, while awareness, social, environmental, and cost-related factors demonstrate limited explanatory power in the present study.

Table 05: Path coefficient analysis.

	Original sample (O)	**T statistics (|O/STDEV|)**	**P values**	**Inferences**	**Related Hypothesis**
ATT -> PI	0.444	2.935	0.003	Supported	H5
AW -> ATT	-0.075	0.445	0.656	Not Supported	H6
CB (-) -> ATT	-0.095	0.897	0.37	Not Supported	H10
CI (-)-> ATT	0.191	1.888	0.059	Not Supported (marginal)	H9
EC -> ATT	-0.029	0.266	0.79	Not Supported	H7
PEU -> ATT	0.413	3.285	0.001	Supported	H2
PEU -> PU	0.614	8.388	0	Supported	H1
PU -> ATT	0.3	2.524	0.012	Supported	H3
PU -> PI	0.362	2.373	0.018	Supported	H4
SI -> ATT	0.162	1.369	0.171	Not Supported	H8

Source: Primary Data Analysed by Researcher

Figure 02: Structural Model



Source: Drafted by Researcher using Smart-PLS 4 Canvas

7. Discussion, Managerial Impact & Conclusion

This study investigated the determinants and barriers influencing electric vehicle (EV) adoption among college students in Bilaspur, Chhattisgarh, by extending the Technology Acceptance Model (TAM) using PLS-SEM. The findings demonstrate that technology-related perceptions play a dominant role in shaping EV adoption intentions among young adults. Specifically, perceived ease of use (PEU) significantly enhances perceived usefulness (PU) and directly contributes to favorable attitudes toward EVs, while perceived usefulness positively influences both attitude and purchase intention. Attitude toward EVs emerges as a strong and significant predictor of purchase intention, underscoring its mediating role between cognitive evaluations and behavioral intentions. In contrast, awareness, environmental concern, social influence, charging infrastructure, and cost barriers do not exhibit statistically significant effects on attitude, although charging infrastructure shows a marginal influence. These results suggest that, within the context of a smaller and emerging urban region, young consumers prioritize functional ease and practical utility over broader social, environmental, or cost-related considerations when forming adoption intentions.

From a managerial and policy perspective, the findings highlight the importance of emphasizing ease of operation, low maintenance, and practical benefits of EVs in promotional and educational initiatives targeted at young consumers. EV manufacturers should focus on user-friendly designs, simplified charging solutions, and clear communication of long-term utility benefits to strengthen positive attitudes and purchase intentions. Policymakers and educational institutions can support EV adoption by incorporating experiential learning, demonstrations, and campus-level pilot programs that enhance students' perceptions of usability and usefulness, rather than relying solely on awareness campaigns or environmental messaging. Although perceived barriers were not statistically significant in this study, continued improvements in charging infrastructure and cost incentives remain important to prevent potential resistance as adoption scales up.

In conclusion, this study contributes to the EV adoption literature by providing empirical evidence and demonstrating the applicability of TAM-based extensions using PLS-SEM in an emerging urban context. The results confirm that perceived ease of use and perceived usefulness are the primary drivers of attitudes and purchase intentions toward EVs among college students, while external and barrier-related factors play a comparatively limited role. These insights offer valuable guidance for policymakers, educators, and industry stakeholders seeking to promote EV adoption among young consumers in similar emerging urban regions.

8. Limitations and Future Research Directions

This study has certain limitations that offer directions for future research. The sample comprised 120 college students from Bilaspur, Chhattisgarh, which, although adequate for PLS-SEM analysis, may limit the generalizability of the findings to other regions and populations. Future research should consider larger and more diverse samples across different cities and states to improve external validity. Additionally, the cross-sectional design captures perceptions at a single point in time; therefore, longitudinal studies could better explain how attitudes and purchase intentions evolve as EV technology and infrastructure develop. Further research may also incorporate additional constructs such as perceived risk, trust, government incentives, and policy awareness to gain a more comprehensive understanding of EV adoption among young adults. Moreover, the present framework can be extended to other age groups and professional segments to examine whether the determinants of EV adoption differ across demographics and occupational backgrounds.

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