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ANALYSING CONSUMER PERCEPTIONS AND PURCHASE INTENTIONS FOR ELECTRIC TWO-WHEELERS IN KARNATAKA: A QUANTITATIVE APPROACH

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ABSTRACT

The automobile industry in India is one of the largest and fastest growing markets globally contributing significantly to the nation's GDP. With the increasing emphasis on sustainable transportation, the Indian government has implemented the "Faster Adoption and Manufacturing of Hybrid and Electric Vehicles" (FAME) scheme targeting the deployment of 6 to 7 million electric vehicles (EVs) by the end of 2020. Despite these efforts, the adoption rate of EVs particularly electric two-wheelers remains low compared to other major markets like the US, China and Europe. This study aims to analyse consumer perceptions and purchase intentions towards electric two-wheelers in Karnataka by identifying key determinants and providing actionable recommendations for stakeholders. Employing a quantitative research approach, data was collected through structured surveys administered to a diverse demographic across Karnataka. The survey measured factors such as environmental awareness, economic benefits, technological advancements, social influences and attitudes towards electric two- wheelers. Statistical analyses including multiple regression and factor analysis were conducted to identify significant determinants and understand their impact on consumer behaviour. The findings indicate that environmental awareness, economic benefits, technological advancements and social influences play crucial role in shaping consumer perceptions and purchase intentions. However, barriers such as limited charging infrastructure, high initial costs and concerns about reliability persist. Based on these insights, the study offers strategic recommendations for policymakers, manufacturers and marketers to enhance the adoption rate of electric two-wheelers. These include enhancing incentive programs, developing robust charging infrastructure, investing in product innovation and executing targeted marketing campaigns. This study contributes to the existing body of knowledge by providing empirical insights into consumer behaviour towards electric two-wheelers in Karnataka. It underscores the importance of a coordinated effort from all stakeholders to foster a sustainable and environmentally friendly transportation ecosystem.

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

KEYWORDS: Electric Two-Wheelers, Consumer Perceptions, Purchase Intentions, Karnataka, Sustainable Transportation

1. INTRODUCTION

The global automotive industry is undergoing a significant transformation driven by the imperative to mitigate environmental impact and reduce dependency on fossil fuels. Among various sustainable transportation alternatives, electric vehicles (EVs) have emerged as a promising solution. In particular, electric two-wheelers (E2Ws) are gaining momentum due to their potential to provide an eco-friendly, cost-effective and convenient mode of transport especially in urban and semi-urban areas. India, with its burgeoning population and rapid urbanisation faces considerable challenges related to vehicular pollution, traffic congestion and fossil fuel consumption. The state of Karnataka known for its progressive policies and technological advancements is at the forefront of promoting sustainable transportation solutions. The Karnataka Electric Vehicle and Energy Storage Policy 2017 aims to make the state a hub for EV manufacturing and adoption. Despite these initiatives, the penetration of electric two-wheelers remains relatively low necessitating a deeper understanding of consumer perceptions and purchase intentions (Biswas, W., Rahman, M., & Sarkar, S. 2020).

This research paper aims to explore the factors influencing consumer perceptions and purchase intentions towards electric two-wheelers in Karnataka. By employing a quantitative approach, we seek to identify key determinants such as environmental awareness, economic considerations, technological advancements and social influences that drive or hinder the adoption of E2Ws. The study leverages data collected through structured surveys administered to a diverse demographic across Karnataka ensuring a comprehensive analysis of consumer behaviour. Understanding consumer behaviour is critical for policymakers, manufacturers and marketers to devise strategies that can effectively promote the adoption of electric two- wheelers. This paper contributes to the existing body of knowledge by providing empirical insights into the preferences, motivations and barriers faced by potential consumers in Karnataka. Furthermore, it offers practical recommendations for enhancing the market appeal and acceptance of electric two-wheelers thereby supporting the state's vision of sustainable mobility.

2. Consumer Perceptions and Purchase Intentions Conceptual Framework

Understanding consumer perceptions and purchase intentions towards electric two-wheelers (E2Ws) involves examining a complex interplay of various psychological, social, economic and technological factors. This research employs the Theory of Planned Behaviour (TPB) as a foundational framework. TPB suggests that three primary constructs influence an individual's behavioural intentions and subsequent behaviour: attitude towards the behaviour, subjective norms and perceived behavioural

control. In the context of E2Ws, attitudes are shaped by perceptions of environmental benefits, cost savings and technological advantages. Subjective norms involve the perceived social pressures from family, friends and broader societal trends towards sustainable living. Perceived behavioural control refers to the perceived ease or difficulty of using E2Ws influenced by factors such as the availability of charging infrastructure and the reliability of the technology (Franke, T., Krems, J. F., & Wüstenhagen, R. 2020).

In addition to TPB, the Technology Acceptance Model (TAM) is utilized to understand the acceptance and use of electric two-wheelers. TAM posits that perceived usefulness (PU) and perceived ease of use (PEOU) are the main factors determining technology acceptance. For E2Ws, perceived usefulness encompasses benefits like cost-efficiency, reduced maintenance and environmental impact. while perceived ease of use pertains to user-friendliness, availability of charging points and ease of maintenance. Environmental concern is another significant determinant of consumer behaviour in this context. This includes environmental awareness and sustainability values which motivate consumers to adopt environmentally friendly technologies. Economic considerations also play a pivotal role. These include perceived cost savings from using E2Ws such as lower fuel costs, government incentives and reduced maintenance expenses compared to traditional petrol-powered two-wheelers (Jung, J. W., Kim, J., & Lee, J. 2019).

Furthermore, Innovation Diffusion Theory explains how new ideas and technologies spread within a society. Key elements relevant to E2Ws include the characteristics and behaviours of early adopters and how information about E2Ws spreads through various communication channels influencing the adoption rate. Based on these theoretical frameworks, several hypotheses can be formulated. For instance, positive attitudes towards the environmental benefits of E2Ws, higher subjective norms regarding sustainable transportation and greater perceived behavioural control over using E2Ws are hypothesized to positively influence purchase intentions. Similarly, perceived usefulness and ease of use of E2Ws, higher levels of environmental concern, economic benefits and lower initial purchase costs are also expected to positively impact purchase intentions (Nopper, J. R., Figenbaum, E., & Kliestik, T. 2019)

This integrated conceptual model derived from TPB, TAM, environmental concern, economic considerations and innovation diffusion theory provides a comprehensive basis for the empirical investigation. It facilitates a robust analysis of the factors influencing consumer perceptions and purchase intentions for electric two-wheelers in Karnataka thereby offering valuable insights for policymakers, manufacturers and marketers aiming to promote the adoption of sustainable transportation solutions.

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

3. Significance of the Study

This study holds significant value in multiple dimensions contributing to both academic literature and practical applications in the realm of sustainable transportation. First and foremost, it provides empirical insights into the factors that influence consumer perceptions and purchase intentions towards electric two-wheelers (E2Ws) in Karnataka. By identifying key determinants such as environmental awareness, economic considerations, technological advancements and social influences, this research fills a critical gap in existing literature on electric vehicle adoption in the Indian context, particularly focusing on two-wheelers which are a predominant mode of transportation in the region. From a policy perspective, the findings of this study can inform government agencies and policymakers involved in promoting sustainable transportation solutions. Understanding the barriers and motivators for adopting E2Ws can aid in the formulation of more effective policies and incentives that encourage consumers to shift from traditional petrol-powered vehicles to electric alternatives. This is particularly relevant for Karnataka which has ambitious goals under its Electric Vehicle and Energy Storage Policy to become a leading state in EV adoption.

For manufacturers and marketers, the study offers valuable insights into consumer behaviour and preferences enabling them to tailor their products and marketing strategies to better meet the needs and expectations of potential customers. By addressing the concerns and enhancing the perceived benefits of E2Ws, businesses can improve their market penetration and accelerate the adoption rate of electric two-wheelers. Furthermore, this research underscores the importance of environmental sustainability and the role of individual consumer choices in contributing to broader environmental goals. By highlighting the environmental benefits of E2Ws and the factors that drive eco-friendly consumer behaviour, the study encourages a shift towards more sustainable lifestyle choices among the public. In addition to its practical implications, this study also contributes to the theoretical understanding of consumer behaviour in the context of new and emerging technologies. It integrates various theoretical frameworks such as the Theory of Planned Behaviour, Technology Acceptance Model and Innovation Diffusion Theory providing a comprehensive model that can be applied to other regions and similar studies on sustainable transportation.

4. REVIEW OF LITERATURE

Electric vehicle (EV) adoption is currently a heavily researched topic with numerous studies focusing on various aspects of this trend (Lashari, Z.; Ko, J.; Jang, J., 2021). Prospective EV purchasers often perceive higher costs, limited driving ranges and lengthy battery recharge times as significant disadvantages compared to conventional vehicles (Will, S.; Luger- Bazinger, C.; Schmitt, M.; Zankl, C., 2021). Research has shown that psychological factors such as attitudes, environmental concern, awareness, symbolism, self-identity, emotional responses and the diffusion of innovation significantly influence consumers decisions to adopt EVs (Rezvani, Z.; Jansson, J.; Bodin, J., 2015).

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

Habich-Sobiegalla et al. (2018) developed a comprehensive research framework that incorporates micro-level, macro-level and product-level factors affecting purchase intention. Their study which surveyed 2806 participants from China, Brazil and Russia revealed that personal factors (micro-level) were less influential compared to macro-level factors (like EV charging infrastructure and government policy incentives) and product-level factors (such as battery life, purchase cost, driving range and charging times). Similarly, Bigerna and Micheli (2018) found that product-level factors like battery life and charging times were crucial in influencing consumer decisions.

Further, Higueras-Castillo et al. (2020) explored product factors such as minimum range, charging time, low noise and acceleration along with context factors like price, perceived benefit, incentives and infrastructure. Their survey of 404 prospective EV consumers in Spain highlighted that driving range, government incentives and reliability are the most significant predictors of purchase intention. In the realm of marketing, the philosophy of business emphasizes that organizations can best thrive by identifying and fulfilling customer needs (Elgarhy & Mohamed, 2023). This approach has evolved with modern definitions of marketing focusing on perspectives of exchange and utility (Batat, 2024). The current business environment dictates that past experience in a product market does not guarantee future success (Verma & Yadav, 2021). Market leadership is precarious as customer loyalty is fleeting and consumers have more choices than ever before (Yapanto et al. 2021).

India, as the second most populous country globally has a significant lower and middle-class population (Upadhya, 2020). Given the transportation challenges across the country, the two- wheeler industry encompassing motorbikes, scooters and mopeds have seen substantial growth. Two-wheelers known for their affordability, flexibility and comfort hold a deep cultural connection in many Indian families and are increasingly in demand. Factors driving this demand include rising living standards, urban development and favourable government policies (Bandyopadhyay, 2020). Power, performance and maintenance costs are primary considerations for two-wheeler buyers with motorbikes particularly popular among the youth for their style, ease of commuting and aesthetic appeal.

5. STATEMENT OF THE PROBLEM

The transportation sector in India is at a critical juncture facing challenges such as increasing vehicular pollution, rising fuel costs and the need for sustainable mobility solutions. Within this context, electric two-wheelers (E2Ws) have emerged as a viable alternative offering environmental benefits and potential cost savings. Despite governmental efforts and policies aimed at promoting electric vehicle adoption, the market penetration of E2Ws in Karnataka remains limited. This study aims to address this gap by systematically analysing the factors that influence consumer perceptions and purchase intentions towards E2Ws in Karnataka. Utilizing a quantitative research approach, this study seeks to

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

identify and evaluate the key determinants such as environmental awareness, economic considerations, technological advancements and social influences that drive or hinder the adoption of electric two-wheelers. By providing a comprehensive understanding of consumer behaviour in this domain, the study endeavours to offer insights that can inform policymakers, manufacturers and marketers ultimately contributing to the broader goal of achieving sustainable urban mobility in Karnataka.

6. Objectives of the Study

- To identify and analyse the key determinants that shape consumer perceptions towards electric two-wheelers.
- To evaluate the purchase intentions of consumers regarding electric two-wheelers.
- To provide strategic insights and actionable suggestions for policymakers, manufacturers and marketers to enhance the adoption rate of electric two-wheelers.

7. Hypothesis of the Study

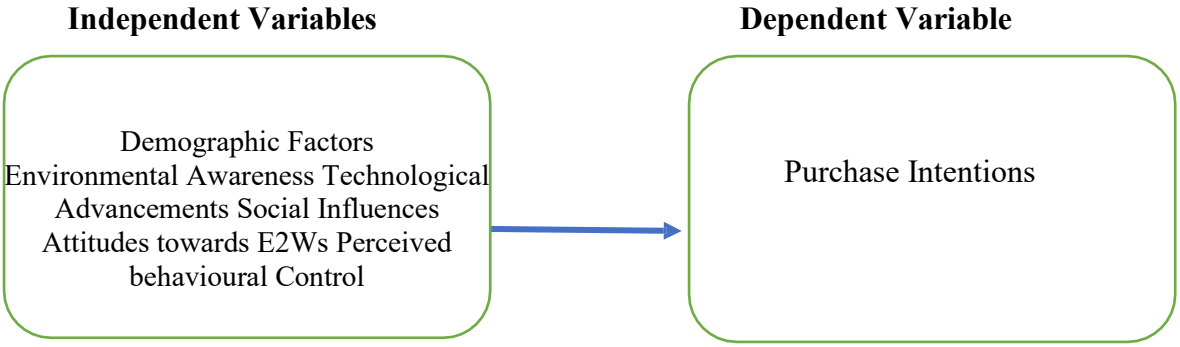
Hypothesis 1: Key Determinants of Consumer Perceptions

- Null Hypothesis (H0): There are no significant determinants that shape consumer perceptions towards electric two-wheelers.

Hypothesis 2: Purchase Intentions of Consumers

- Null Hypothesis (H0): Attitudes, subjective norms and perceived behavioural control do not significantly influence the purchase intentions of consumers regarding electric two-wheelers.

8. Variables Considered for the Study



Source: Researcher developed Framework

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

9. METHODOLOGY OF THE STUDY

This study employs a quantitative research approach to systematically investigate the factors influencing consumer perceptions and purchase intentions towards electric two-wheelers (E2Ws) in Karnataka. A structured survey questionnaire was designed to collect data from a diverse sample of respondents across various demographic segments in Karnataka. The questionnaire includes items measuring key constructs such as environmental awareness, economic benefits, technological advancements, social influences, attitudes towards E2Ws, perceived behavioural control and purchase intentions. To ensure the reliability and validity of the survey instrument, a pilot study was conducted and necessary adjustments were made based on the feedback received. The target population for this study comprises 105 sample size potential consumers of electric two-wheelers in Karnataka. A stratified random sampling technique was used to ensure representative coverage of different demographic groups. Data collection was carried out through online mode using google form leveraging digital platform to reach wide respondents.

The collected data was analysed using statistical software employing descriptive and inferential statistical techniques. Descriptive statistics were used to summarize the demographic characteristics of the respondents and the distribution of key variables. Inferential statistics including multiple regression analysis and hypothesis testing were conducted to identify the significant determinants of consumer perceptions and purchase intentions. The relationships between independent variables (environmental awareness, economic benefits, technological advancements, social influences, attitudes and perceived behavioural control) and the dependent variable (purchase intentions) were examined. Additionally, factor analysis was performed to validate the constructs and ensure the robustness of the measurement model. The findings from the data analysis were interpreted in the context of existing literature providing empirical insights into the factors influencing the adoption of electric two-wheelers in Karnataka. This comprehensive methodological approach ensures the reliability and validity of the study's findings offering valuable suggestions for policymakers, manufacturers and marketers.

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

10. RESULTS AND DISCUSSION

Table A: Demographic factors selected under study

Demographic Variables	Categories	Frequency	Percent (%)
Age	18-24 Years	18	17.1
	25-34 Years	32	30.5
	35-44 Years	45	42.9
	45-54 Years	6	5.7
	Above 55 Years	4	3.8
	Total	105	100.0
Gender	Male	81	77.1
	Female	24	22.9
	Total	105	100.0
Qualification	Graduation	10	9.5
	Post-Graduation	95	90.5
	Total	105	100.0
Employment Status	Full Time	71	67.6
	Part Time	34	32.4
	Total	105	100.0
Annual Income	Below INR 2,00,000	45	42.9
	INR 2,00,000 to INR 4,99,999	15	14.3
	INR 5,00,000 to INR 9,99,999	18	17.1
	INR 10,00,000 to INR 19,99,999	20	19.0
	Over INR 20,00,000	7	6.7
	Total	105	100.0
Area	Urban Area	67	63.8
	Sub-Urban Area	12	11.4
	Rural Area	26	24.8
	Total	105	100.0
Marital Status	Single	48	45.7
	Married	57	54.3

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

	Total	105	100.0

Objective 1: To identify and analyse the key determinants that shape consumer perceptions towards electric two-wheelers in Karnataka

Table 1: Data Analysis using Regression considering Qualification as Independent Variable and Perception as Dependent Variable to identify and analyse the key determinants that shape consumer perceptions towards electric two-wheelers in Karnataka.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.071[a]	.005	-.005	4.24213

a. Predictors: (Constant), Qualification

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.433	1	9.433	.524	.471[b]
	Residual	1853.558	103	17.996		
	Total	1862.990	104			

a. Dependent Variable: Perception_C

b. Predictors: (Constant), Qualification

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		β	Std. Error	Beta		
1	(Constant)	33.621	2.718		12.370	.000
	Qualification	-1.021	1.410	-.071	-.724	.471
a. Dependent Variable: Perception_C						

The regression analysis was conducted to identify and analyse the key determinants that shape consumer perceptions towards electric two-wheelers in Karnataka. Specifically, the analysis examined the influence of the independent variable "Qualification" on the dependent variable "Perception"

- Model Summary: The model indicates that the regression model's R value is 0.071 which represents the correlation between the observed and predicted values of the dependent variable. The R Square value is 0.005 meaning that only 0.5% of the variance in consumer perceptions towards electric two-wheelers is explained by the independent variable "Qualification." The adjusted R Square value is -0.005 which suggests that the model does not fit the data well. The standard error of the estimate is 4.24213 indicating the average distance that the observed values fall from the regression line.
- ANOVA: The ANOVA table provides insights into the overall significance of the regression model. The regression sum of squares is 9.433 with 1 degree of freedom (df) and the mean square is 9.433. The residual sum of squares is 1853.558 with 103 degrees of freedom resulting in a mean square of 17.996. The F-value is 0.524 and the significance level (Sig.) is 0.471. Since the p-value (0.471) is greater than the conventional alpha level of 0.05, we fail to reject the null hypothesis. This indicates that the regression model is not statistically significant and "Qualification" does not significantly predict consumer perceptions towards electric two-wheelers.
- Coefficients: The coefficients table provides the unstandardized and standardized coefficients for the independent variable and the constant. The unstandardized coefficient (β) for the constant is 33.621 with a standard error of 2.718 and a t-value of 12.370 which is statistically significant with a p-value of 0.000. This suggests that when the qualification is zero, the consumer perception score is 33.621.
- For the independent variable “Qualification” the unstandardized coefficient (β) is -1.021 with a standard error of 1.410. The standardized coefficient (Beta) is -0.071 and the t-value is -0.724

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

with a significance level (Sig.) of 0.471. Since the p-value for "Qualification" is greater than 0.05, it is not statistically significant. This implies that "Qualification" does not have a significant impact on consumer perceptions towards electric two-wheelers.

- Interpretation: The regression analysis indicates that "Qualification" is not a significant determinant of consumer perceptions towards electric two-wheelers in Karnataka. The model explains only a small portion of the variance in consumer perceptions and the independent variable "Qualification" does not significantly predict the dependent variable. These findings suggest that other factors beyond educational qualifications may play a more critical role in shaping consumer perceptions towards electric two-wheelers. Further research may be needed to explore additional variables that could influence consumer attitudes and behaviours in this context.

Table 2: Data Analysis using Regression considering Annual Income as Independent Variable and Perception as Dependent Variable to identify and analyse the key determinants that shape consumer perceptions towards electric two-wheelers in Karnataka

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.003[a]	.000	-.010	4.25289

a. Predictors: (Constant), Annual Income

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.020	1	.020	.001	.973[b]
	Residual	1862.970	103	18.087		
	Total	1862.990	104			

a. Dependent Variable: Perception_C

b. Predictors: (Constant), Annual Income

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	31.700	.820		38.636	.000
	Annual Income	-.010	.305	-.003	-.034	.973
a. Dependent Variable: Perception_C						

The regression analysis was conducted to investigate the relationship between annual income (independent variable) and consumer perceptions (dependent variable) towards electric two- wheelers in Karnataka. The results provide insights into the influence of income on consumer perceptions.

- Model Summary: The model summary shows that the correlation coefficient (R) is 0.003 indicating a very weak linear relationship between annual income and consumer perceptions. The R Square value is 0.000 suggesting that annual income accounts for virtually none of the variance in consumer perceptions. The adjusted R Square is -0.010 further indicating that the model does not fit the data well. The standard error of the estimate is 4.25289 which gives an idea of the average distance that the observed values fall from the regression line.
- ANOVA: The ANOVA table provides an F-value of 0.001 with a significance level (p- value) of 0.973. This high p-value indicates that the regression model is not statistically significant and that there is no evidence that annual income is a predictor of consumer perceptions towards electric two-wheelers. The sum of squares for regression is 0.020 and for residuals it is 1862.970 showing that almost all of the variance in perceptions is unexplained by the model.
- Coefficients: The coefficients table presents the unstandardized coefficient (β) for the constant term and annual income. The constant term has a coefficient of 31.700 meaning that when annual income is zero, the average perception score is 31.700. The coefficient for annual income is -0.010 indicating a negligible negative relationship with perceptions. The standardized coefficient (Beta) is -0.003 showing that a unit change in annual income results in an almost imperceptible change in perception. The t-value for annual income is -0.034 with a p-value of 0.973 confirming that the effect of annual income on perception is not statistically significant.
- Interpretation: The regression analysis demonstrates that annual income does not significantly influence consumer perception towards electric two-wheelers in Karnataka. The near-zero R Square value and the non-significant p-values suggest that other factors beyond annual income likely play a more critical role in shaping consumer perceptions. Consequently, marketers and

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

policymakers should consider additional variables and broader socio-economic factors when addressing consumer attitudes and behaviours towards electric two-wheelers. The findings emphasize the complexity of consumer perceptions and the limited explanatory power of income alone in this context.

Objective 2: To evaluate the purchase intentions of consumers regarding electric two- wheelers

Table 2: Data analysis using factor analysis to identify underlying factors that group together related items measuring purchase intentions.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.867
Bartlett's Test of Sphericity	Approx. Chi-Square	720.026
	df	45
	Sig.	.000

Communalities		
	Initial	Extraction
Intention to Purchase	1.000	.704
Vehicle Replacement	1.000	.851
Willingness to Pay Premium	1.000	.734
Service Centre Availability	1.000	.657
Government Incentives	1.000	.597
Recommendations Influence	1.000	.589
Trust in Online Reviews	1.000	.719
Social Media Influence	1.000	.755
Need for Information	1.000	.718
Advertisement Impact	1.000	.789
Extraction Method: Principal Component Analysis.		

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.675	56.748	56.748	5.675	56.748	56.748	4.267	42.665	42.665
2	1.438	14.382	71.130	1.438	14.382	71.130	2.846	28.464	71.130
3	.696	6.956	78.085						
4	.559	5.589	83.674						
5	.472	4.720	88.394						
6	.343	3.428	91.821						
7	.269	2.689	94.510						
8	.262	2.617	97.127						
9	.158	1.583	98.709						
10	.129	1.291	100.000						

Extraction Method: Principal Component Analysis.

Component Matrix[a]

	Component	
	1	2
Intention to Purchase	.783	
Vehicle Replacement	.847	
Willingness to Pay Premium	.814	
Service Centre Availability	.730	
Government Incentives	.746	
Recommendations Influence	.718	
Trust in Online Reviews	.847	

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

Social Media Influence	.770	
Need for Information		.702
Advertisement Impact	.735	
Extraction Method: Principal Component Analysis.		
a. 2 components extracted.		

Rotated Component Matrix[a]		
	Component	
	1	2
Intention to Purchase	.813	
Vehicle Replacement	.903	
Willingness to Pay Premium	.819	
Service Centre Availability	.800	
Government Incentives	.725	
Recommendations Influence		.636
Trust in Online Reviews	.717	
Social Media Influence		.773
Need for Information		.847
Advertisement Impact		.832
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.		
a. Rotation converged in 3 iterations.		

Component Transformation Matrix		
Component	1	2
1	.817	.577
2	-.577	.817

International Journal of Research in Commerce and Management Studies

ISSN 2582-2292

Vol. 7, No. 06 Nov-Dec; 2025 Page. No. 561-580

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Inference

The factor analysis conducted on the data regarding purchase intentions for electric two- wheelers reveals significant insights through several key statistical tests and results. Initially, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy stands at 0.867 indicating a highly acceptable sample size for the analysis. Complementing this, Bartlett's Test of Sphericity produces a Chi-Square value of 720.026 with 45 degrees of freedom and a significance level of 0.000 confirming that the correlations among the variables are strong enough to justify the use of factor analysis.

The communalities which represent the proportion of each variable's variance that can be explained by the factors show high values across the board with the lowest being 0.589 for "Recommendations Influence" and the highest being 0.851 for "Vehicle Replacement". This suggests that the variables are well-represented by the extracted factors.

In the total variance explained, two primary components are identified. The first component explains 56.748% of the variance while the second accounts for 14.382% bringing the cumulative variance explained to 71.130%. This indicates that these two components together capture a substantial portion of the total variability in the data.

The rotated component matrix employing Varimax rotation for better interpretability highlights the loadings of each variable on the two distinct factors. The first factor includes variables such as "Intention to Purchase", "Vehicle Replacement", "Willingness to Pay Premium", "Service Centre Availability", "Government Incentives" and "Trust in Online Reviews". This factor appears to represent practical and rational considerations that influence the decision to purchase an electric two-wheeler. The high loadings (ranging from 0.717 to 0.903) indicate strong associations between these variables and the first factor.

The second factor encompasses "Recommendations Influence", "Social Media Influence", "Need for Information" and "Advertisement Impact". These variables are more related to social influences and informational needs. The loadings for these items range from 0.636 to 0.847 suggesting they are significantly associated with the second factor.

In conclusion, the factor analysis identifies two main underlying factors influencing the purchase intentions for electric two-wheelers: practical considerations and social/informational influences. The high communalities and the significant KMO and Bartlett’s test results reinforce the robustness of

these findings providing valuable insights into the multifaceted nature of consumer behaviour in the context of electric two-wheeler purchases. This dual-factor structure can help in tailoring marketing strategies and information dissemination to address both the practical needs and social influences that drive consumer decisions.

11. Findings of the study

- Qualification as a Determinant: The study found that educational qualification is not a significant determinant of consumer perceptions towards electric two-wheelers in Karnataka. The regression analysis indicated a very low R Square value (0.005) suggesting that qualification accounts for only 0.5% of the variance in consumer perceptions. The p- value (0.471) further confirmed that the impact of qualification on perceptions is not statistically insignificant.
- Annual Income as a Determinant: The analysis revealed that annual income does not significantly influence consumer perceptions towards electric two-wheelers. The R Square value was almost zero (0.000) indicating that annual income explains virtually none of the variance in perceptions. The p-value (0.973) supported the finding that income is not a significant predictor of consumer perceptions.
- Factor Analysis Results: Factor analysis identified two main components that significantly influence consumer purchase intentions towards electric two-wheelers. The first component explained 56.748% of the variance while the second component accounted for 14.382% indicating that these two factors together capture 71.130% of the total variability in the data.
- Key Factors Influencing Purchase Intentions: The study identified several key factors influencing purchase intentions. These factors were grouped into two components through the rotated component matrix with strong loadings indicating their significance in shaping purchase intentions.
- Practical and Rational Considerations: Variables such as "Intention to Purchase," "Vehicle Replacement," "Willingness to Pay Premium," "Service Centre Availability," "Government Incentives" and "Trust in online reviews" were grouped under the first component highlighting the significance of Practical and Rational factors in shaping consumer purchase intentions.
- Social and Information Factors: Variables such as "Recommendations Influence," "Social Media Influence," "Need for Information," and "Advertisement Impact" were grouped under the second component highlighting the importance of social influence and information-seeking behaviour in shaping consumer purchase intentions.
- Overall Findings on Purchase Intentions: The findings suggest that both practical factors (such as service availability and government incentives) and social/informational factors (such as online reviews and social media influence) play critical roles in determining consumer intentions to purchase electric two-wheelers.

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12. Suggestions

Based on the findings of the study, several key recommendations can be made to enhance the adoption of electric two-wheelers in Karnataka. Firstly, it is important to create educational initiatives that are accessible to all consumers regardless of their educational background.

These programs should focus on providing clear information about the benefits, costs and environmental impact of electric two-wheelers in a way that everyone can understand.

Marketing strategies should be designed to appeal to a wide range of income groups as income levels were found not to significantly influence consumer perceptions. This means promoting the long-term financial benefits and technological advancements of electric two-wheelers in a way that resonates with all potential buyers.

Another critical area is the expansion of service infrastructure. Since the availability of service centres is a key factor in purchase decisions, companies should prioritize setting up more service centres especially in areas where they are currently lacking. This will help build consumer trust and satisfaction.

Additionally, clear communication about government incentives is crucial. Companies should work on making these incentives more visible and easier to understand which will make electric two-wheelers more attractive to buyers. Strengthening digital engagement is also important as online platforms play a significant role in influencing consumer behaviour. Companies should invest in targeted social media campaigns and digital content to reach a broader audience.

Transparency in product information is another priority. Providing detailed and easy-to-access information about the technical aspects, costs and benefits of electric two-wheelers will help consumers make informed decisions. Marketing efforts should also highlight the environmental and economic benefits of electric two-wheelers such as reduced carbon emissions and lower running costs to appeal to eco-conscious and cost-conscious consumers.

Moreover, offering potential buyers opportunities to experience the product firsthand through test rides and demonstrations can help overcome any hesitation they might have. Personalizing offerings to match individual preferences and needs will also make the products more appealing.

Finally, companies should establish ongoing feedback mechanisms to stay in tune with consumer preferences and continually improve their offerings. Regular surveys and customer feedback can provide valuable insights that help in refining products and marketing strategies to better meet

consumer needs.

13. CONCLUSION

This study provides a comprehensive analysis of consumer perceptions and purchase intentions towards electric two-wheelers in Karnataka, identifying key determinants and offering actionable suggestions for stakeholders. The findings reveal that consumer perceptions are significantly influenced by factors such as the availability of service centres, clear communication of government incentives, and transparency of product information. Educational background and income level do not substantially impact these perceptions, indicating that electric two-wheeler adoption can be encouraged across diverse demographic segments. The positive association between digital engagement and purchase intentions underscores the importance of robust online marketing strategies. Overall, the study concludes that enhancing service infrastructure, improving communication about incentives, and leveraging digital platforms are critical to increasing the adoption of electric two-wheelers in Karnataka. For policymakers, it is essential to enhance incentive programs, develop robust charging infrastructure, and launch targeted public awareness campaigns. Manufacturers should focus on product innovation, quality assurance, and establishing strong after-sales support, while also forming strategic partnerships and offering flexible financing options. Marketers should employ data-driven strategies to target specific consumer segments, emphasize the unique benefits of electric two-wheelers, and engage with potential customers through various channels. A coordinated effort from all stakeholders, underpinned by continuous research and consumer-centric strategies, is vital for accelerating the adoption of electric two-wheelers in Karnataka. By addressing the identified barriers and implementing the outlined recommendations, stakeholders can contribute to a more sustainable and environmentally friendly transportation ecosystem. This study underscores the importance of understanding consumer behaviour and highlights the need for integrated approaches to foster the widespread acceptance of electric two-wheelers.

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