IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

An Analysis Of Charging Station Availability Of E Vehicle With Special Reference To Coimbatore City

Dr. Piradeep S, Assistant Professor, School of Management, Sri Krishna College of Technology, Coimbatore – 641042

Sanjeevi.G Final Year Student, School of Management, Sri Krishna College of Technology, Coimbatore – 641042

ABSTRACT

Coimbatore, a major industrial and commercial centre in India, is experiencing a surge in electric vehicle (EV) interest. This shift is driven by environmental concerns, rising fuel costs, and government initiatives promoting EVs. However, a significant barrier to widespread EV adoption remains: the limited availability of conveniently located charging stations. This study tackles this challenge by proposing a strategic plan for expanding Coimbatore's EV charging network. The main objective is to find out the the Current Distribution of EV Charging Stations. and another one is to evaluate charging needs, analyse travel patterns, identify frequented locations, and understand preferences for charging speeds and payment methods, to evaluate infrastructure quality and charging efficiency and to forecast future charging infrastructure needs .The data was analyzed by using appropriate statistical tools by SPSS and conclusions drawn. The data's are collected from the respondents are converted into readable form to the process of classification and arrangements. The sample size is 150. The data was tabulated and analyzed using simple statistical method like simple Percentage analysis, Chi-square test and weighted average with ranking are used as the statistical tool for analysis.

INTRODUCTION

Coimbatore is witnessing a growing interest in electric vehicles (EVs) due to environmental concerns, rising fuel costs, and government initiatives. However, the limited availability of charging stations remains a key obstacle to widespread adoption. This study aims to assess the current EV charging infrastructure, analyzing the number, types, and distribution of stations while considering factors like EV ownership trends, traffic patterns, and residential clusters. It will identify optimal locations for new stations, focusing on accessibility near major roads, commercial hubs, and residential areas. Different charger types, including slow, fast, and

opportunity chargers, will be evaluated to meet Coimbatore's specific needs. A cost-benefit analysis will examine investment costs, operational expenses, and potential economic and environmental advantages, such as job creation and lower emissions. Finally, the study will propose strategic recommendations, including public-private partnerships, government incentives, and regulatory frameworks, to support sustainable EV infrastructure development. These findings will contribute to Coimbatore's transformation into a cleaner and more EV-friendly city.

OBJECTIVES OF THE STUDY

- To Assess Public Awareness and usage gauge public knowledge of existing stations, satisfaction with availability and preferred station features.
- To assess user needs and charging demand patterns
- To explore EV adoption considerations assess interest in purchasing EVs, concerns about air pollution, and the influence of charging stations on buying decisions.
- To Forecast Future Charging Infrastructure Needs

SCOPE OF THE STUDY

This cross-sectional study, limited to a single data collection, cannot fully capture changing consumer intentions. Rapid technological advancements and consumer hesitancy in expressing views further constrain the findings. Expanding the study to compare consumers across districts, beyond Coimbatore, could enhance insights. In India, coal remains the dominant source of electricity, contributing significantly to emissions. Thus, exploring eco-friendly and low or zero-carbon energy sources is crucial.

REVIEW OF LITERATURE

Nazem Ali et al. (2021) developed the Norm Activation Model to explain how social environments and preferences influence EV adoption.

Van Wee et al. (2014) highlighted that EV adoption reduces externalities, providing societal benefits. They examined how financial incentives and socioeconomic factors affect EV acceptance, analyzing market shares of 30 manufacturers in 2012.

Banos et al. (2011) explored factors influencing Russians' openness to EVs, shared vehicles, and autonomous transport, emphasizing socioeconomic aspects, perception, and innovation attitudes. Their study identified social groups supporting new transportation technologies.

Chen et al. (2021) stressed that urban e-mobility under the EGD program requires public conviction and communal commitment. Their research used machine learning to predict EV adoption based on survey data, especially relevant for "EV preparedness stragglers" like Poland.

RESEARCH METHODOLOGY

The study follows a descriptive research design to assess consumer satisfaction, expectations, and brand preferences using structured questionnaires through personal interviews. A non-probability convenience sampling method was adopted, selecting 150 employees to ensure key population characteristics are represented. Data collection involves both primary and secondary sources, with primary data gathered firsthand using a questionnaire.

DATA ANALYSIS AND INTERPRETATION

OBJECTIVE :TO FIND THE MEAN DIFFERENCE BETWEEN AGE OF THE RESPONDENTS ON THEIR EV PURCHASE CONSIDERATION

		Sum of squares	Df	Mean square	F	Sig.
Opinion about ever considered purchasing an electric vehicle	Between groups	2.197	3	.732	1.692	.171
	Within groups	63.196	146	.433		
	Total	65.393	149			
Concerned about air pollution in Coimbatore	Between groups	4.770	3	1.590	1.138	.336
	Within groups	203.904	146	1.397		
	Total	208.673	149			
Opinion about they believe, using electric vehicles reduces air pollution	Between groups	1.163	3	.388	1.709	.168
	Within groups	33.110	146	.227		
	Total	34.273	149			
Satisfied with the pollution reduction as a result of using of electric vehicles	Between groups	15.097	3	5.032	8.722	.000
	Within groups	84.237	146	.577		
	Total	99.333	149			

INTREPRETATION

The study analyzes the relationship between respondents' age and their opinions on EVs and air pollution. Since the significance values for purchasing EVs (0.171) and concern about air pollution (0.336) are greater than 0.05, there is a mean difference between age groups and these opinions. For believing EVs reduce pollution (0.168), the significance is less than 0.05, indicating a mean difference. However, for satisfaction with pollution reduction (0.000), the null hypothesis is accepted, showing no mean difference among age groups.

2.OBJECTIVE: . To find the significant difference between gender of the respondents and Primary use of vehicle type

H0 = There is no significant difference between gender of the respondents and Primary use of vehicle type
H1 = There is significant difference gender of the respondents and overall Primary use of vehicle type

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3.977[a]	3	.264
Likelihood Ratio	4.045	3	.257
Linear-by-Linear Association	3.802	1	.051
N of Valid Cases	150		

INTREPRETATION

Since the calculated value is 4.045 which are greater than table value 3.977 at 3 degrees of freedom and 5% level of significance, we accept the alternative hypothesis. Hence there is significant association between gender of the respondents and overall Primary use of vehicle type

H0 = There is no significant difference between Concerned about air pollution in Coimbatore and Satisfied with the availability of EV charging stations influence their decision to purchase an electric vehicle
H1 = There is significant difference Concerned about air pollution in Coimbatore and Satisfied with the availability of EV charging stations influence their decision to purchase an electric vehicle

Chi-Square Tests	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	11.635[a]	16	.769
Likelihood Ratio	15.029	16	.523
Linear-by-Linear Association	2.328	1	.127

INTREPRETATION

Since the calculated value is 15.029 which are greater than table value 11.635 at 16 degrees of freedom and 5% level of significance, we accept the alternative hypothesis. Hence there is significant association between Concerned about air pollution in Coimbatore and Satisfied with the availability of EV charging stations influence their decision to purchase an electric vehicle.

H0: There is no relationship between satisfied with the availability of EV charging stations and EV charging station awareness and usage

H1: There is a relationship between satisfied with the availability of EV charging stations and EV charging station awareness and usage

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.751[a]	.764	.549	.912

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	155.096	5	31.019	37.272	.000[b]
	Residual	119.844	144	.832		
	Total	274.940	149			

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		
(Constant)	5.586	.433		12.915	.000
Type of place visited frequently	-.166	.078	-.175	-2.136	.034
Aware of EV charging stations current locations	-.048	.186	-.017	-.258	.797
Type of charging station would they prefer to use	-.762	.089	-.550	-8.529	.010

Opinion about comfortable using public charging station	-.508	.135	-.296	-3.750	.020
Most useful features of the EV charging stations	-.065	.065	-.060	-1.003	.318

INTERPRETATION

Based on the table, since the p-values (0.034, 0.797, 0.010, 0.020, and 0.318) exceed the 0.05 significance level, the null hypothesis is rejected in favor of the alternative, indicating that all the considered variables play a significant role in explaining satisfaction with the availability of EV charging stations. The least squares model, Y = 5.586 + 0.166X1 + 0.048X2 + 0.762X3 + 0.508X4 + 0.065X5, shows that while the type of place visited frequently (X1) and awareness of current charging station locations (X2) contribute positively to satisfaction, the preferred type of charging station (X3) and the opinion on the comfort of using public charging stations (X4) have a more pronounced effect, with the most useful features (X5) providing a slight additional impact.

FINDINGS

ANOVA TEST ANALYSIS

- There is mean difference between the age group of the respondents and Opinion about ever considered purchasing an electric vehicle
- There is mean difference between age of the respondents and Concerned about air pollution in Coimbatore
- There is mean difference between age of the respondents and Opinion about they believe, using electric vehicles reduces air pollution
- There is no mean difference between age of the respondents Satisfied with the pollution reduction as a result of using of electric vehicles

CHISQUARE TEST ANALYSIS

- There is significant association between gender of the respondents and overall Primary use of vehicle type

- There is significant association between Concerned about air pollution in Coimbatore and Satisfied with the availability of EV charging stations influence their decision to purchase an electric vehicle

REGRESSION ANALYSIS :There is a relationship between satisfied with the availability of EV charging stations and EV charging station awareness and usage

SUGGESTION

1. Local authorities should try to conduct some awareness events and knowledge enhancement programs for both private and commercial potential EV users.
2. Provide sufficient charging stations to create reliability and convenience for the users.
3. Governments need to understand the needs of organizations, and the infrastructure required to support EV adoption and try to eliminate barriers to implementing it.
4. Provide proper logistic facilities for the private and public sectors and make some testbeds such as ports, optimize prime etc.
5. Concern authorities need to target events such as car shows so that people can come to know more about the benefits of EVs and through this way, manufacturers can generate a need in the market for EVs.
6. With the joint event, local and central governments can take better action to capture the EV market. Such as
7. This is another suggestion for concerned authorities to do more open data, data ethics and standard charging infrastructure to save users time and money. Though a sufficient charging station is not enough; well-maintained and easy-to-use charging infrastructure will be needed.

CONCLUSION

The project title “An analysis of charging station availability of E vehicle with special reference to Coimbatore city”. The sample size of the study is 150. Most of the respondents said they would prefer fast charging (30 minutes to 1 hour) and providing offering discounts or rewards to encourage more visitors to use EV charging stations.

Most of the respondents said there are specific incentives or rewards that would motivate them to use EV charging stations more frequently. The customer would prefer to use fast charger (DC charging) station. Most of the respondents concerned about air pollution in Coimbatore and Satisfied with the availability of EV charging stations influence their decision to purchase an electric vehicle.

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