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# A STUDY ON FACTORS INFLUENCING THE PURCHASE OF ELECTRIC VEHICLES IN INDIAN AUTO MOBILE MARKET

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## Abstract

The EV space has getting Hotter day by day with more and more legacy where all the Big Car manufacturing giants are making entry. Pollution has become a major source of concern for the majority of people at present. Everybody wants to live in a pollution-free society, Pollution is primarily caused by automobiles Nevertheless, and India's automobile registrations are growing at a rapid pace, Petrol and diesel process are also soring high As a result, and modes of transportation started becoming more sustainable and environmentally friendly. This made the electric vehicles to create a space but the adoption rate was not more in India, projections by many manufactures are expected in next 5-6 years, this study includes five independent variables: financial incentives, charging infrastructure, social reinforcement, environmental concern, and price, and one dependent variable, electrical vehicle adoption. The data for the present study was collected from 150 randomly selected respondents across India, Confirmatory Factor Analysis (CFA) were used to analyze the data. The study's findings demonstrate that pricing has a substantial impact on the adoption of electric vehicle.

**Key words:** Transportation, Pollution, Automobile market, Electrical vehicle, Social Reinforcement

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## Introduction

Indians are still Skeptical about Evs but environmental concerns are compelling both the government and consumers to consider alternative Sources of Energy or Fuel. The environment has been harmed significantly by the use of fuel powered automobiles, India's attitude about EV is changing Though the country is still concerned about EV, charging burning Evs, raising oil prices have forced many to consider electric cars. <sup>1</sup>The Indian government offers various financial and non-financial incentives to manufacturers and consumers. Manufacturers are rewarded financially for increasing their investment in the production of electric vehicles. Indian automakers such as, Bajaj Auto, Maruti Suzuki Tata Motors, tesla and Mahindra and Mahindra are planning to launch a variety of electric vehicle models to meet future demand<sup>2</sup>.

“EV Sales grew 257% year on year ...But in April sales Grew 300% “

Similarly, in line with industry, the potential of electrical vehicles and their mobility has been recognized and investigated by academicians with varying perspectives. Numerous researchers confirmed several aspects of electric mobility, including technical, economic, logistical and environmental. Many of legacy car makers are now focused on delivering new and innovative electric vehicles ,as the current Indian government has

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<sup>1</sup> <https://www.grandviewresearch.com/industry-analysis/india-electric-vehicle-market-report>

<sup>2</sup> <https://journals.sagepub.com/doi/full/10.1177/0972262919875548>

envisioned a pollution-free commercial and private transportation system in the country. Government of India has launched two major policy initiatives: Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME-I) and Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME-II). The main objective of FAME-I and FAME-II is to promote adoption of electric vehicles. However, favorable government policies are the focal point in making a decision about electric vehicle adoption. There are other factors that play an important role in adoption of electric vehicles.

But the ride towards a future of electric vehicle has so far been bumpy and with many road blocks. Where people are used to their reliable old oil run cars, with an over 60,000 petrol pumps in India. The chances of running out fuel on the road. But electricity is available everywhere to charge Evs (need Charging Infra structure to develop)<sup>3</sup>,EV Penetration in India 0.08% as compared to 13.4% in other countries<sup>4</sup> esp. in china. In India infrastructure has to be developed more for Evs with an option of Battery Swapping ,No more waiting for hours on the road ,you can swap the battery and be on your way,where this technology reduces range anxiety and cut down Ev investments.

Instance 1:- Bounce India Allows the customer to buy Ev Vehicle with battery and the cost of the scooter is Rs-68,999...But without battery it cost Rs-36,000.which will put Ev on Equal footing. Same can be leased of Rs849/Month .After that you can swap for Rs 35.<sup>5</sup>

Fuel type	BEV Okinawa iPraise+	BEV Ather 450X	Gasoline Honda Activa 6G
Gasoline fueling	N/A	N/A	INR 90 per liter
Residential overnight charging	INR 4.5 per kWh	INR 4.5 per kWh	N/A
Public charging	INR 4.7 per kWh	INR 4.7 per kWh	
Preferential tariff margin for public fast-charging	INR 9 per kWh	INR 9 per kWh	
Battery swapping	INR 34 per kWh	N/A	

6

Source- [www.business-standard.com](http://www.business-standard.com)

Purpose of this study is to categorize and list the factors that influence electric vehicle adoption. Objectives:

- (i) To identify the factors influencing the purchase of electric vehicles in India.
- (ii) To investigate the demographic factors influencing electric vehicle Purchase.

The study’s findings will add of knowledge about electric vehicles, allowing Manufacturers to concentrate on the most compelling factors. Additionally, it will pave the way for the formulation of government policies to address the gap identified in this study. Additionally, the study’s sample will become aware of and more knowledgeable about the vistas associated with electric vehicle adoption.

### Literature Review

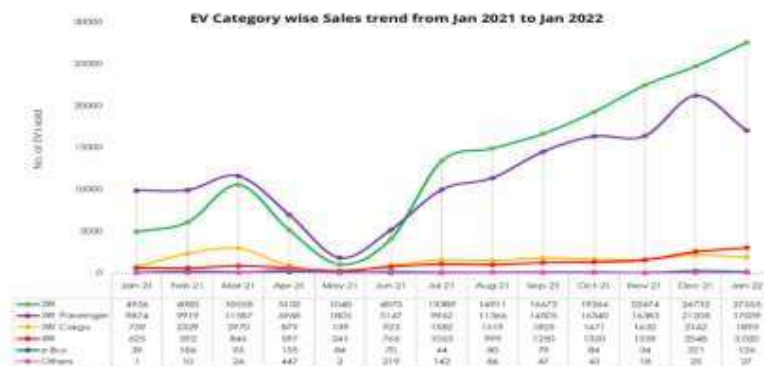
Electric vehicles are more environmentally friendly and save the environment, Government efforts to adopt electric vehicles is to save the environment. Adoption of electric vehicles can help us to improve the air quality.

<sup>3</sup> <https://www.financialexpress.com/auto/electric-vehicles/2462566/2462566/>

<sup>5</sup> <https://www.financialexpress.com/auto/electric-vehicles/2462566/2462566/>

<sup>6</sup> [https://www.business-standard.com/article/companies/bounce-to-set-up-300-charging-stations-for-greaves-in-10-indian-cities-122031500670\\_1.html](https://www.business-standard.com/article/companies/bounce-to-set-up-300-charging-stations-for-greaves-in-10-indian-cities-122031500670_1.html)

Determinants behind Purchase intentions of electric vehicles are government financial incentives, industry development, and pattern of demand in the market<sup>7</sup>. Motivating people to purchase electric vehicles by offering financial incentives and non-financial incentives is highly effective and successful. The government needs to formulate market and customer friendly policies such as a flexible regulatory framework, tax advantages and other financial incentives to encourage rapid adoption among potential customers<sup>8</sup>. Manufacturers are launching electric vehicles which will provide more Choice to the customers, which will motivate to adopt electric vehicles in near future. Electric vehicle manufacturers can easily achieve economies of scale which will pump companies to gain more profit and helps to reduce prices for the targeted customers. Major cost component for an electric vehicle is its battery, with the help of battery swapping has helped to reduce the cost of the battery which will help to reduce the overall cost of electric vehicles. The EV campaign was launched at the Eighth Clean Energy Ministerial in 2017, with the goal of increasing the market share of electric vehicles in all the member countries of EVI (Electric Vehicles Initiative) to 30% by 2030<sup>9</sup>. Higher social strata and in possession of modern values have a higher willingness to buy electric vehicles. “Travel demand, environmental awareness, living conditions and purchasing<sup>10</sup>. Since the electric vehicle is a new type of personal vehicle with green technology, the consumer behavior of buying electric vehicles is regarded as an innovative behavior. Previous theoretical studies on technology acceptance, purchase behavior, and innovation have usually adopted<sup>11</sup>



Source:- <https://evreporter.com/>

## Research Structure and Method

Electric vehicle demand is expected to grow significantly in India. Automobile manufacturers are heavily investing in manufacturing capacity for electric vehicles. The purpose of this research is to examine critical factors influencing the purchase intention of electric vehicles. The questionnaire is comprised of two sections. The first section of the questionnaire focuses on the respondents’ demographic characteristics, such as gender, age, marital status, income, education, and work experience. The second section of the questionnaire includes

<sup>7</sup> Müller, N.; Schenk, S.; Wu, T. The Global Electric-Vehicle Market Is Amped up and on the Rise; McKinsey & Company: New York, NY, USA, 2018.

<sup>8</sup> Lutsey, N. Evaluation of State-Level US Electric Vehicle Incentives; The International Council on Clean Transportation: Washington, DC, USA, 2014.

<sup>9</sup> Impact and Response of the International Electric Vehicle Boom on Energy Development, APEC International Energy Cooperation Website. 2017

<sup>10</sup> Impact of Vehicle Usage on Consumer Choice of Hybrid Electric Vehicles. Transp. Res. Part D **2012**, 17, 208–214

<sup>11</sup> Fishbein, M.; Ajzen, I. Beliefs, Attitude, Intention and Behavior: An Introduction to Theory and Research; Addison-Wesley: Reading, MA, USA, 1975.

questions about the study's constructs, including financial incentives, charging infrastructure, social reinforcement, and environmental concern, price, and purchase intention.

### Hypothesis

H<sub>1</sub>: There is a significant association between financial incentive and electric vehicle adoption.

H<sub>2</sub>: There is a significant association between charging infrastructure and electric Vehicle adoption.

H<sub>3</sub>: There is a significant association between social reinforcement and electric Vehicle adoption.

H<sub>4</sub>: There is significant association between environmental concern and electric Vehicle adoption.

H<sub>5</sub>: There is a significant association between price and electric vehicle adoption.

### Methodology

Electric vehicle demand is expected to grow significantly in India. Automobile manufacturers are heavily investing in manufacturing capacity for electric vehicles. The purpose of this research is to examine factors influencing the purchase of electric vehicles in Karnataka and the data was collected from May- July 2022 the questionnaire is comprised of two sections. The first section of the questionnaire focuses on the respondents' demographic characteristics, such as gender, age, marital status, income, education, and work experience. The second section of the questionnaire includes questions about the study's constructs, including financial incentives, charging infrastructure, social reinforcement, and environmental concern, price, and purchase Decisions. The questionnaire contains 21 items that assess respondents' interest to purchase electric vehicles.

### Data Analysis

IBM SPSS and IBM AMOS were used to analyze the data. Numerous statistical techniques, such as correlation analysis, exploratory factor analysis, and structural equation modeling, were employed. Validation of factor analysis results was made by use of a structural equation modeling tool. Structural equation modeling (SEM) is a two-step validation tool. The first step uses confirmatory factor analysis to validate the measurement model.

**Table 1.** Demographic Profile

Factors	Frequency	Percent
Gender		
Male	238	65.0
Female	128	35.0
Age		
18–30	138	37.7
31–40	118	32.2
41–50	86	23.5
51–60	24	6.6
Marital Status		
Single	229	62.6
Married	137	37.4
Income		
Less than 3 Lakh	205	56.0
3–5 Lakh	86	23.5

5–10 Lakh	32	8.7
More than 10 Lakh	43	11.7
Qualification		
Under Graduate	16	4.4
Graduate	93	25.4
Post Graduate	205	56.0
Any other	52	14.2
Experience		
Less than 5 Years	147	40.2
5–10 Years	106	29.0
10–15 Years	78	21.3
15–20 Years	35	9.6

**Table 2.** KMO and Bartlett’s Test.

<b>Sphericity Parameters</b>	Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.681	<b>Data Test Values</b>
	Bartlett’s Test of Sphericity	Approx. Chi-Square	2486.17	
		df	23	
			1	
		Sig.	0.000	

Reliability and validity are indicators of the instrument’s quality. The Average Variance Extracted (AVE) is used to validate the scale used to measure the constructs, A score of 0.5 or greater for Average Variance Extracted (AVE) indicates adequate convergence and validity.

Cronbach’s alpha must be greater than 0.6. When assessing scale reliability. Except for electric vehicle adoption, all constructs in Table 3 are greater than 0.6. This demonstrates the scale’s high degree of reliability. Additionally, all constructs in this study have an AVE value greater than 0.5, which indicates the scale’s validity. The loadings of all items are greater than 0.5

<b>Constructs</b>	<b>Item Code</b>	<b>Loadin g</b>	<b>AV E</b>	<b>C R</b>
	FI1	0.628		
Financial Incentive	FI3	0.770	0.54	0.748
	FI4	0.706		
	CI1	0.846		
Charging Infrastructure	CI2	0.741	0.52	0.668
	CI3	0.552		
	SR1	0.813		
Social Reinforcement	SR2	0.839		
	SR3	0.647 0.59		0.737
	SR4	0.748		
	EC1	0.828		
Environmental Concern	EC2	0.845		
	EC3	0.722	0.63 0.806	
	EC4	0.772		
	PR1	0.748		
Price	PR2	0.800	0.66	0.766
	PR3	0.887		
	EVA1	0.681		

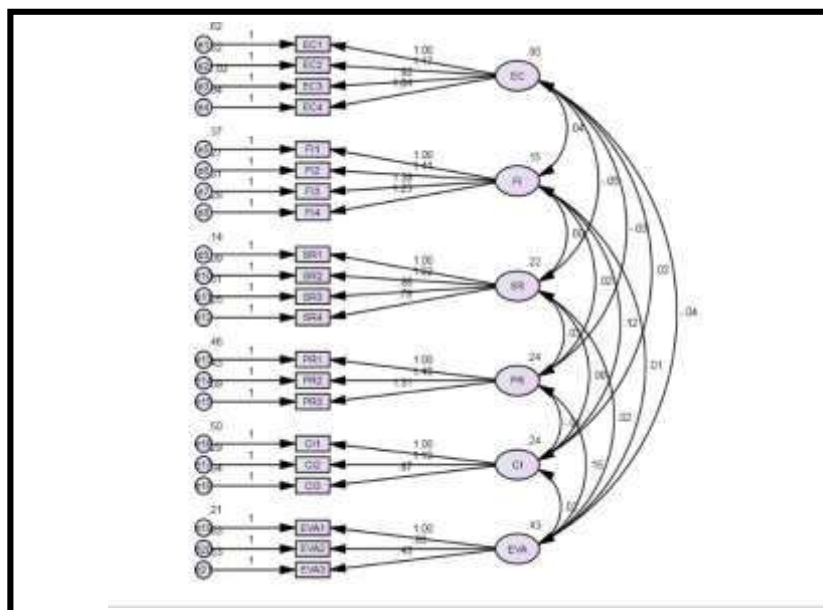
Electric Vehicle Adoption	EVA2 EVA 3	0.767 0.732	0.53	0.593
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### Confirmatory Factor Analysis

Fit Indices	Recommended Values	Observed Values	Result
CMIN/df	Less than 5	2.631	Acceptable
CFI (Comparative Fit Index)	0.8–0.9	0.874	Acceptable
GFI (Goodness of Fit Index)	≥0.9	0.9	Acceptable
AGFI (Adjusted Goodness of Fit Index)	≥0.80	0.866	Acceptable
PNFI (Parsimonious Normal Fit)	>0.5	0.663	Acceptable

### Hypothesis testing with Structural Model

SEM is extremely beneficial when the research model is complex and there are multiple dependent variables. As illustrated in Table 6, price has a significant effect on purchase intention ( $p = 0.5$ ). As a result, price has an effect on customers' adoption of electric vehicles.



Hypotheses Status		Path		Estimate	S. E.	C.R	p
H1 Rejected	EVA	←	EC	-0.034	0.046	-0.746	0.456
H2 Rejected	EVA	←	SR	0.017	0.087	0.191	0.848
H3 Rejected	EVA	←	FI	-0.029	0.109	-0.268	0.788
H4 Rejected	EVA	←	CI	0.089	0.081	1.105	0.269
H5 Accepted	EVA	←	Price	0.64	0.097	6.572	***

The current study is significant to investigate the demographic factors influencing electric vehicle adoption. Because electric vehicles (EVs) are dubbed “future vehicles.” Electric mobility is the way of the future. Thus, understanding what motivates people to purchase electric vehicles will aid companies and governments in shaping the automobile industry’s future. In this regard we had charging infrastructure, social reinforcement, environmental concern, and price. In the light of these independent variables, five hypotheses were set for testing. The model for the study was found to be significant on various statistical parameters. However, the results of the hypothesis are mixed, which indicates that price is the most significant factor for customers while making the decision to buy an electric vehicle. Indian consumers have lower purchasing power than those in other developed countries, which is presumed to significantly impact the buying decisions of customers. However, the current study contradicts previous trends. It is surprisingly insignificant, as people appear to be more concerned with their own resources than with public infrastructure. Customers are allegedly enticed to purchase electric vehicles by the availability of charging infrastructure.

### Conclusion

Key determinants of electric vehicle adoption are financial incentives, charging infrastructure, social reinforcement, environmental concerns, and price. This study confirms that price is the primary determinant of electric vehicle adoption. Other independent variables, on the other hand, such as financial and non-financial incentives, charging infrastructure, social reinforcement, and



environmental concerns, have little effect on adoption this study confirms that males have a more favorable attitude toward electric vehicles than females do. Males are more likely to adopt electric vehicles than females. In comparison to older customers, younger customers are more likely to adopt electric vehicles. Customers with a higher level of education are more aware of the benefits of electric vehicles rapid adoption of electric vehicles is greater among educated customers than among less educated customers.

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