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A Pivotal Study on Electric Vehicles' Purchase Intention in Delhi-NCR, India

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ABSTRACT
Governments everywhere are adopting policies that encourage the use of electric vehicles to reduce dependence on foreign oil, reduce greenhouse gas emissions and improve air quality. The Indian government, too, has placed several policies to encourage users across the country to use electric vehicles. However, the results have not been quite impressive. Therefore, the researchers wanted to understand the reasons for the same. After a thorough literature review, it became clear that people around the world are not very aware of the benefits of electric cars. So, the current study focused on two major objectives. First, to understand the level of awareness among Indian users regarding electric vehicles. Second, investigate the effect of awareness on customer purchase intention. The study's conclusions will add to the current discussion about the viability and uptake of electric automobiles in the Delhi-NCR area. These findings can be utilized by policymakers, automobile manufacturers, and interested parties to develop focused marketing strategies, implement appropriate incentives, and establish the necessary infrastructure to accelerate the change in Delhi-NCR's transportation system to one that is more sustainable and friendly to the environment.

Keyword: Electric Vehicle, Purchase Intention, Delhi-NCR, Awareness.

1. Introduction

Currently, the global automotive industry is trying to adopt alternative or less energy-intensive options, which is causing a paradigm shift. India is also making investments in this shift to electric mobility. As per recent data, it is evident that the Indian automated market is scheduled to be the third largest in terms of volume in 2030. Problems such as global warming, environmental pollution, oil dependencies, etc. will be reduced through the adoption of electric vehicles. As a result, many governments have seized the initiative and implemented regulations to encourage the development and use of electric vehicles (Sierzchula, Bakker, Maat, & Van Wee, 2014). Additionally, the Indian government has launched a number of programs to encourage the country's citizens to buy electric cars. Nevertheless, despite various initiatives, there is currently very little adoption of electric cars in India. As per the Indian Press Information Bureau (2023), a little more than 8 lakh electric vehicles were registered from June to December.

As decided upon in the 2015 Paris Agreement. Among the many actions governments around the world have taken in this direction, the adoption of EVs is proving to be very successful in reducing the severity of the present environmental catastrophe (Han et al., 2017). Transportation is becoming less dependent on fossil fuels, a source of energy that is not sustainable, thanks to EVs (Tran et al., 2013). Despite several benefits of using electric vehicles, the customer adoption rate is very low. According to Goel et al. (2021), there are several demand-side barriers that deter a consumer from purchasing electric vehicles: family support (Li et al., 2017); concerns related to batteries (Knez et al., 2019); safety concerns (Axsen et al., 2010); and price factors (Haider et al.,, 2019), to name a few. Lack of information, education, and sales of these cars are discouraged by knowledge of the benefits of EVs (Goel et al., 2021).

The goal of the current study is to ascertain how customer knowledge of electric vehicles affects their propensity to be purchased. To achieve this objective, an extensive literature review was done. The study focuses on understanding the difference in awareness levels of both males and females in India. It later works on getting insights into the relationship between awareness and purchase intention.

As the Indian government is working towards promoting electric vehicles in the nation, this study provides a brief insight into those initiatives in the later part of the literature review. Hence, this study is a pioneer in understanding customer awareness based on gender, which will help not only future researchers but also industry at large, as there is no doubt that electric vehicles are the need of the hour.

2. Literature Review

Findings were made by Gyimesi and Viswanathan (2011) in an IBM survey about consumers, which revealed that 45% of drivers questioned knew insignificantly about electric vehicles. Approximately two thirds of participants in a survey done across 21 American cities (Krause, 2013) misinterpreted the essential characteristics of plug-in electric cars, and about 95% of them were not aware of the available incentives.

It is anticipated that exposure to and knowledge of EVs (via test drives, trial periods, etc.) will influence preferences (Jason et. Al, 2013). A consumer who cares about the environment should favor car technology that is less harmful to the environment (Daziano and Laval, 2013). Increasing consumer awareness through action is essential to fostering the early electric vehicle market's expansion (Jin and Slowik, 2017)
This makes clear, that the consumers have less knowledge about the benefits of electric automobile. Hence, it is important to inculcate the perspective of Indian consumers on electric vehicles, in the era where the government wants to achieve its target of 2030 fleet electrification.
Exposure to electric vehicles increases the likelihood that consumers will value them more and think about buying them in the future (Kurani et al., 2016; Gyimesi & Viswanathan, 2011, and Larson, 2014). As per Jin and Slowik (2017), There is a strong correlation between consumer knowledge of electric vehicles and their intention to buy. As per CFA (2015), Awareness about electric vehicles does affect consumer interest.
All things considered, these studies show that consumers are not well-informed about electric vehicles. This includes misconceptions regarding the possible savings from lower maintenance and energy costs, unfamiliarity with new technology, and ignorance of models and available incentives. Consumers with greater knowledge or experience are generally more likely to think highly of electric vehicles, value them more, and be inclined to pay far more for the technology involved.

The study focuses on the following hypothesis:
Ha1: There is a significant difference in the level of awareness based on gender.
Ha2: There is a significant impact of awareness on the purchase intention of the customers.
To promote the use of electric cars, both the national and state governments of India have launched a number of initiatives and incentives. The National Electric Mobility Mission Plan (NEMMP) 2020 was unveiled by the Indian government with the goals of enhancing domestic manufacturing capabilities, reducing the harmful environmental effects of vehicles powered by fossil fuels, and enhancing the nation's energy security. (GoI, 2012). This plan, among other things, concentrated on the significance of government incentives for the promotion of electric vehicles. Furthermore, by 2022, the Indian government hopes to produce 100 GW of electricity using solar energy. The quicker acceptance and production of Electric Vehicles (FAME II) plan was introduced by the Indian government to expedite the widespread use of electric and hybrid vehicles. By establishing infrastructure for charging them and providing a number of incentives, this program also encourages the purchase of electric vehicles. In February 2019, the cabinet gave its approval for 10,000 crores to FAME II, allowing it to go into effect on April 1st, 2019 and last for three years. Similar to this, in response to the development of EV technology and the need to reduce energy demand in the automotive industry, NITI Aayog's 2017 Transformative Mobility Report developed a roadmap for the use of solely electric vehicles. The Society of Indian Automobiles (SIAM) and other automakers intend to sell only fuel cell and battery electric vehicles (EVs) that are 100% pure by 2030 for use in city fleets of public transportation.
Goel et al. (2021) state that in order to ensure the program's success, the government, companies, and other stakeholders should band together and make long-term investments in a plan to build a fleet of entirely electric vehicles.

3. Methods

3.1 Participants and Procedure

An online and offline survey was conducted in the Delhi-NCR region of India. The survey was closed when the No. of male and female respondents were approximately equal; because our first hypothesis is based on the demography of the respondents.
A total of 600 responses were collected but some responses were either incomplete or biased. So, after data cleaning we were left with 537 total responses and they were fit for further analysis. It was found that 262 (48.7%) were female participants and 275 (51.2%) were male participants. The target market consisted of consumers from the National Capital Region (NCR) due to their diverse mindset and the fact that people from many regions of India assimilate here for various reasons. Consequently, they accurately reflect the perception, awareness, attitude, and purchase intention of Indians. In addition, the respondents were selected via no-probability convenient and purposive sampling. Six regions in NCR were sampled for information: Ghaziabad, Faridabad, Gurugram, Noida, Delhi, and Manesar. In this study, we took universe samples.

3.2 Measures

Awareness about electric vehicles was measured using four statements on a 5-point scale.
Purchase Intention regarding electric vehicles was measured using three statements on a 5-point scale.

3.3 Reliability

Cronbach’s Alpha was used to measure the reliability of the questionnaire. The value came to be 0.908 for awareness and 0.907 for purchase intention. Cronbach's alpha had a higher value than 0.70 for all the variables hence, the

measurement scales were said to be reliable (Hair et.al, 2007). Therefore, now the research can proceed for further data analysis.

4. Results and Analysis

4.1 Normality of the data

Skewness and Kurtosis were checked for the normality analysis. We observed a fairly normal distribution of our latent variables. According to Kline (2010), the value of skewness and kurtosis must be below 3 and 10 respectively. In the current study, the highest value of skewness was 1.104 for one item of Awareness and the highest value of kurtosis was 1.123 for one item of Purchase Intention. But both the said values belonged to the range given by Kine (2010). Hence, the given data was found to be normal.

4.2 Testing Hypothesis

- *For hypothesis 1:*

We conducted independent sample t-test. The calculated p-value was 0.002 (as shown in the table 1 below) which is less than the standard p-value of 0.05. Therefore, we fail to accept null hypothesis and it can be said that the male and female does not have same level of awareness about the electric vehicle.

Table:1

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
AW	Equal variances assumed	10.101	.002	1.054	535	.292	.05525	.05242	-.04772	.15822
	Equal variances not assumed			1.050	512.69	.294	.05525	.05262	-.04814	.15863

The results of Sovacool et.al (2019) shows that as women are more knowledgeable about electric vehicle and they seem to have greater preferences when it comes to cars that are eco-friendly; which contradicts our results. As per the following table 2 the mean value of male is greater than those of female, hence, we can say that males are more aware about the electric vehicles than females.

Table: 2

	Gender	N	Mean	Std. Deviation	Std. Error Mean
AW	Male	275	3.9827	.55732	.03361
	Female	262	3.9275	.65543	.04049

- *For hypothesis 2*

We conducted Regression test (Table 3) where awareness was considered as an independent variable and purchase intention as dependent variable.

Table 3: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.644	.414	.413	.26409	.414	378.493	1	535	.000

As per the above table it is found that the value of R is 0.644 which is greater than .4, hence, it was clear that there is a correlation between awareness and purchase intention. Therefore, we can further look for the results. Also, R-squared

shows the total variation in purchase intention due to level of awareness. Here, the value is greater than 0.4 (0.414), hence, the model is effective to determine the relationship.

Table 4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	26.398	1	26.398	378.493	.000
	Residual	37.314	535	.070		
	Total	63.712	536			

As per the above ANOVA table-4, the significance value of 0.000 (<0.05). These results are good.

Table 5: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.451	.143		10.173	.000	1.171	1.732
	PI	.657	.034	.644	19.455	.000	.591	.723

Here, the significance value is again 0.000 (<0.05) as shown in the table 5. Hence, we can say that the results are satisfactory as we have sufficient data to rule out the null hypothesis, and it is reasonable to conclude that customers' intentions to make purchases are positively impacted by their level of awareness.

5. Discussion

Given the nascent nature of the topic and the low sales volume of electric vehicles in India, it proved imperative to ascertain the level of awareness among electric vehicle customers.

So, for our first hypothesis we conducted independent sample T-test and it was found that the males were more aware about the electric vehicles than the females. We also conducted a cross-tab to understand the future scope of electric vehicle. We asked the respondents, “How likely that your next car will be electric car? And gave them 4 option; option a: I want to buy an electric car as soon as possible, Option b: I want to buy electric car during next four years?, Option c: I want to buy electric car during next 10 years, Option d: I don’t want to buy electric car. And the results of the crosstab are as follows in the table 6:

Table 6

Gender	**Option a**	**Option b**	**Option c**	**Option d**	**Total**
Male	183 (66.5%)	58 (21.1%)	24 (8.7%)	10 (3.6%)	275 (100%)
Female	166 (63.4%)	56 (21.4%)	30 (11.5%)	10 (3.8%)	262 (100%)
Total	349 (65.0%)	114 (21.2%)	54 (10.1%)	20 (3.7%)	537 (100%)

It is clear from the table that as males are more aware about the electric vehicles and their merits, they are more inclined to buy an electric vehicle right away. Also, in general 65% of the diverse respondents wanted to purchase their next electric car as soon as possible.

It was discovered through linear regression that customers' buy intentions are positively impacted by their level of awareness. This result was similar to few past literature (Kurani et.al, 2016; Larson, 2014). Customer’s adoption of electric vehicles depends on the how much that consumer is aware about the benefits of the electric vehicles.

6. Conclusion and Suggestions

This study is the pioneering study in understanding the market of electric vehicles in India at a surface level. It focussed on the level of awareness and how that awareness is impacting the purchase intention of the customers. The results of this study can be used by future researchers, the government, and the industry in general.

Raising consumer awareness is essential to fostering the early electric car market's development. Most customers in many areas are not acquainted with electric car technology, are not aware of potential incentives, and are not aware of all the advantages that electric vehicles have to offer (Mcelgunn, 2018). A diverse array of stakeholders, including various governmental levels, non-profit organizations, enterprises, academic institutions, local communities, and people,

have undertaken measures to enhance education and awareness. Collaboration may provide several chances to enhance outreach effectiveness, particularly with the ongoing advancements in technology and related programs. A well-thought-out, the all-inclusive program would make use of a variety of strategies to increase the number of times that consumers see electric vehicles (such as fleet acquisitions, pilot programs, public awareness media campaigns, and signage), in addition to making it easier for prospective clients to get information that is user-friendly for them (such as test drives, one-stop shopping portals, and straightforward leasing or buying processes).

Given the gender-based differences in attitudes, it is advisable for marketing and outreach efforts to consider tailoring strategies to engage both male and female consumers effectively. Addressing the concerns and preferences of each gender can help promote electric vehicles more comprehensively. The government should invest in awareness campaigns to educate consumers about the benefits of electric vehicles. Increased awareness positively influences attitudes and, subsequently, purchase intentions.

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