

ANALYSIS OF PERCEPTION, ATTITUDE AND BEHAVIORS TOWARD PURCHASE OF ELECTRIC VEHICLE IN DELHI NCR-INDIA

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ABSTRACT

To reduce the carbon footprints and trade deficits, India took several measures to push India's electric vehicle segment. However, in the entire discourse, the critical stakeholders, the consumers, were left behind. Therefore, this paper has used the theory of planned behaviour to analyse various constructs like consumers' perception behaviour; perceived behavioural control; environmental concern; moral norms and attitude towards purchasing electric vehicles with a sample consumer in the city of Delhi and Gurugram. The study used a partial least squares (PLS) method to predict the relationships. The study finds significant evidence of attitudinal and behavioural roles while considering electric vehicle purchases. The results suggest that personal moral norms affect green purchase intention, whereas subjective norm and environment concern positively affects perceived behavioural control. This study provides valuable insight for various stakeholders in developing a green attitude and behavioural intention to alter electric vehicle purchases.

Keywords: Electric Vehicles, Purchase Intention, Indian Consumers, Automotive industry, Environment

Introduction

The Automotive industry is a crucial component of the Indian manufacturing sector. Its deep linkages with the economy create a strong multiplier effect resulting in higher economic growth and employment. However, in recent years the increase in demand for vehicles can be attributed to the rise in per capita income. This surge in vehicle density resulted in a sudden surge in emission levels, excessive dependence on fossil fuel, road congestion and related health issues. To reduce carbon emission intensity, various stakeholders have committed to change the way netizens move. Their initiative is to replace conventional motors with electric vehicles (EV). To initiate the process, the Government of India (GoI) formulated FAME¹; however, these initiatives did not see much effect on the ground level both from the consumer's and manufacturer's end. Policy changes can undoubtedly alter the supply; however, such vehicles' demand depends on consumers' willingness. Therefore, a logical and pertinent question is how far our Indian consumers are ready to alter their preference to Green Vehicles, especially electric vehicles (EV)? This paper intends to understand consumer perception, behaviour, and attitude towards EV in the backdrop of the theory of planned behaviour (TPB), specifically among

the conventional car owners and new buyers in Gurgaon, India. Understanding the perception and attitudes can help the Government and Manufacturing Companies to know the EV's acceptability in the market. The paper is organized, starting by discussing the current status of the Indian Automotive sector and government initiatives. The second section details TPB and gives a conceptual model. The third section presents the data, models, and analysis and ends with a discussion, implications, and recommendations.

Automotive Industry in India: Issues and Background

Currently, the automobile sector's contribution to India's GDP stands to an average of 7 per cent per annum (National Auto Policy, 2018). Furthermore, between 2000 and 2019, the sector attracted foreign direct investment to the tune of US\$ 21.38 billion (DPIIT, 2019). Private car ownership in India witnessed a 40-fold increase between 1981 and 2015 (BCG, 2018). However, increasing vehicle density has resulted in road congestion, invariably reducing the average speed of vehicles. As per the report by NITI Aayog and BCG (2018), amongst Asian cities, Indian cities tops the peak-time congestion; where urban Indian spend almost six times more time in peak hours due to the average speed of just 17 km/h. Congestions and

burgeoning vehicle density have resulted in deteriorating air quality. According to the Economic Survey (2019), the vehicle sector is the second largest contributor to India's carbon. As per the WHO (2019) survey, about fourteen cities of India are listed as the world's most polluted cities. As a result, as per the World Bank estimates, the burden on health due to pollution can be pegged at 7.7 per cent of India's GDP (BCG, 2018).

Due to a deteriorating environment, growing concerns have raised the bar of environmental performance expectations from automobiles and policymakers alike. With multiple initiatives, the government has taken various policy measures to promote Electric Vehicle (EV) technology production. A comparative analysis of EV with the rest based on Energy and Emissions Per Mile Driven has proved that EV's are 41 per cent less energy-intensive and 49 per cent less emitting than conventional vehicles (Aguirre et al. 2012). Further, a study by Malmgren (2016) states that EV usage not only helps improve air quality and the environment but also promotes better health, economic growth, and grid resilience. Despite the benefits, the adoption of EV's is relatively less in India. Therefore, to know consumer insights into this complex buying behaviour, this study dwells deeper to understand consumers' perception of behaviour and attitude towards purchasing electric vehicles. This paper is situated in the planned behaviour theoretical framework.

Theory of Planned Behaviour (TPB): Theoretical and Conceptual Framework

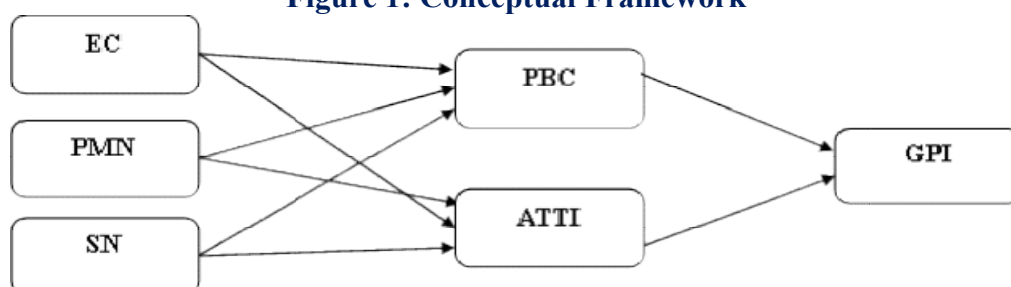
In order to explore the link within the dimensions like intentions, behaviour, and actions, Ajzen (1985) conceptualised the TPB framework (Ajzen 1988, 1991, 2002). According to Shankar and Kumari (2019),

TPB has its origin in reasoned action theory. The theory states that the determinants of behaviour are subjective norms, attitude and perceived behavioural control.

These constructs collectively determine an individual's intention, which provides a framework to shape an individual's action. Several studies (Armitage & Conner, 2001; Afroz et al., 2015) acceded that the TPB has a broader application to understand the individual behavioural intention, which leads to the formation of a specific action. Hence, this conceptual framework is applied in various contexts, viz., to understand food consumption (Vermeir & Verbeke, 2008), intention to utilise free bus service in Malaysia (Jayaraman et al., 2015), recycling behaviour (Terry et al., 1999; Tonglet et al., 2004; Oreg & Katz-Gerro, 2006; Davies et al., 2016), purchase intention of eco-friendly goods and services (Mancha & Yoder, 2015) pro-environmental behaviour (Bamberg & Moser 2007) intention to adopt sustainable energy (Srivastava & Mahendar, 2018). Studies on Intention to purchase Electric Vehicles and other environmentally friendly cars were done by Mohamed et al. (2016) in Canada; Hamilton and Smit (2018) in South Africa; Jayaraman et al. (2015) in Malaysia; Orlov and Kallbekken (2019) in Norway; Yan et al. (2019) in China etc.

The framework at its initial stage had only explored a few sets of constructs to explain the intentions. However, extensions and numerous dimensions were added to the theory's to understand the link between behaviour and intentions. (Huang and Ge, 2019; Klöckner et al., 2013; Shankar and Kumari, 2019; Simsekoglu and Nayum, 2019; Adnan et al., 2018). The conceptual framework adopted for the current research is given below in figure 1.

Figure 1: Conceptual Framework



Behaviour

EC: Environmental Concern; PMN: Perceived Moral Norm; SN: Subjective Norm; PBC: Perceived Behavioral Control; ATTI: Attitude; GPI: Green Purchase Intention

Variables and Measurement

Dependent Variable: *Purchase Intention:*

Researchers have given varied perspectives in defining Intention viz. relative strength to execute or implement specific behavior (Klöckner et al., 2013), probability, likelihood, and willingness to purchase (Rashid, 2009), or act of purchase with particular determination (Ramayah et al., 2010 as cited in Aman et al. 2012). However, Ajzen and Fishbein (1980) have stated that purchase intention is the probability of an individual's engagement and behaviour in a particular manner. Purchase intention towards green products has varied results over time (Khandelwal & Bajpai 2011; Lee, 2009; Rahbar& Wahid, 2011). In this study, to measure purchase intention for electric vehicle 5-point Likert scale is used.

Independent Variables

Subjective Norms (SN):

Subjective Norms have significant importance to an individual's life, and they expect that an individual should act with a specific approach. It can be a social pressure from peers, friends, and from family members as well (Ajzen 1991). Subjective norm, or the influence of others, has been found to impact consumers' willingness to adopt advanced technology (Taylor and Todd, 1995). The literature considers SN as a strong determinant for adoption intention (Kim & Han, 2010; Jeon et al. 2012; Yadav & Pathak, 2016; Sreen et al., 2018; Zhang et al., 2018; Shakar and Kumari, 2019). Researchers proposed that when subjective norms are higher it leads to higher consumer purchase intention for green vehicles. The studies also deliberated that increasing level of social pressure may influence the consumer to change their purchase intention in certain way. Ng et.al. (2017) research study conducted in Malaysia, showed a positive association exists between SN and GPI. The study also indicated that consumers weigh the opinions of family members and close friends who might

influence an individual's purchase decision for the green vehicle. Thus, the current study has developed a hypothesis to test the impact in the millennium city. To measure Subjective Norms, a 5-point Likert scale is used.

Environmental Concern (EC): Environment concern pertains to the consciousness about issues related to the environmental and willingness to resolve the same (Dunlap and Jones, 2002, Hu et al., 2010). Significantly, citizens realise that pollution is causing detrimental effects on the environment, and they are concerned about it. A study on electrical vehicles conducted by Jensen et al. (2013) emphasised that environmental concern positively influences electric cars both before and after purchase experience. Further, Peters and Dutschke (2014) also indicated that EC acts as a motivator while preferring the EVs. Bockarjova and Steg (2014) demonstrated that as consumers expect those electric vehicles to reduce detrimental effects on the environment, they will be more likely to prefer an electric car. In the Indian context, Paul et al. (2016) demonstrated EC has a positive impact on GPI.

Perceived Moral Norm: *It can be perceived as pro- environment behaviour or sense of moral obligation to protect environment.* Environmental protection is broadly recognized as a moral norm. It is observed that ,the guilt factor weighs on the consumer when their environmental responsibility is not met (Peloza, et al, 2013; Theotokis and Manganari, 2014).

Yadav and Pathak (2016) deliberated on the moral norms while predicting purchase intention of environment-friendly products. Lebeau discusses this aspect (2013) in a study conducted in Belgium where customer perceived certain advantages in electric vehicle like low fuel cost per kilometre and the capability to charge battery of electric vehicle at home. At the same time, initial high price, limited distance covered, inconvenient, and limited charging infrastructure are few disadvantages of EVs. Furthermore, Saleki and Seyedsaleki (2012) study in India indicated that environmental knowledge, pro-environmental behaviour has an influence on intention of purchase towards eco -friendly products.

Mediating Factors

Environmental Attitude: Literature looks at attitude as an individual's tendency to assess certain things favourably or unfavourably (Katz, 1960, p. 168); or to identify variables anterior of intentions (Dickinger & Kleijnen, 2008). Environmental attitudes are generally characterised as personal values and beliefs (Mei et al., 2012). Consumers with eco-friendly buying behaviours are not ready to compromise on the quality and value for money (Chang, 2011). Numerous studies have explored the association between environmental attitude and environment-friendly product purchase intention (Paladino and Ng, 2013; Yadav and Pathak, 2016; Varela-Candamio et al., 2018). Empowering on the social-psychological framework, studies have indicated that pro-environmental attitude has a positive influence on green products and purchase intention (Paul et al., 2016; Yadav and Pathak, 2017). In the Indian context, it is evident from the literature that environmental attitude has a positive linkage with eco-friendly products and intention to purchase the same. (Khare, 2015).

Perceived Behavior Control: It is an individual's perception of how easy or difficult it would be to carry out certain behaviour (Pavlou and Fygenon, (2006). To explore the perceived behavioural control, the TPB framework is useful. It is also applied to predict adolescents' purchase intentions to commute by bicycle or car (Sigurdardottir et al. 2013). A study conducted in Sweden indicated that higher monetary cost for green products might make people feel good and more prosperous. According to Mathias Zannakis et al. (2019), monetary value matters and psychological aspects determine the intention. In the Indian context, Paul et al. (2016) and Yadav and Pathak (2017) and Paul et al. (2016) explained the implication of perceived behavioural control to understand and predict consumers' purchase intentions and behaviours for environment-friendly products. In this research context, perceived behavioral control includes competitive price and performance of electric vehicles, advanced technology, Infrastructure, ecosystem, individual's knowledge about electric vehicles. Based on

the above literature, the following hypotheses are formulated for the study:

Hypothesis

- H1: Environmental concern has got a positive impact on the perceived behavioural control
- H2: Environmental concern has got a positive impact on the attitude
- H3: Perceived moral norms have got a positive impact on the perceived behavioural control
- H4: Perceived moral norms have got a positive impact on the attitudes of consumer
- H5: Subjective norms has got a positive impact on the perceived behavioural control
- H6: Subjective norms has got a positive impact on the attitudes of consumers
- H7: Perceived behavioural control has got a positive impact on the green purchase intention
- H8: Attitude has got a positive impact on the green purchase intentions of consumers

Sample and Methods

A structured questionnaire and interview schedule was adopted to collect primary data. An extensive pretesting and refinement were done in the questionnaire through a pilot testing of 30 respondents. After calculating Cronbach's alpha, a sample of 266 data points were collected from January 2019 to May 2019. Respondents were selected from various sectors of Gurgaon using a convenient sampling technique to ensure spread.

The response received was well distributed between genders i.e. about 52.7 per cent were female. About 43 per cent of the respondent belonged to a household with an average size of 4 members. About 46 and 36 per cent of the respondent were 18-29 and 30-44 of age, respectively. The study received more than half of the response from postgraduate or above respondents with an average family income and full-time employment benefits. 51 per cent of the respondent had an annual family income of 15 lakhs and above. About 60 per cent of the respondent were aware of the electric vehicle, whereas about 5 per cent had no idea of electric vehicles. Thirty-one per cent of the respondent never owned a car. Of all the respondent, 39 per cent never considered purchasing an EV, whereas about 44 per cent are ready to buy one soon. The main criteria for buying a car would be price, comfort and safety, power, design and capacity.

Data Analysis: For doing the data analysis, PLS or partial least squares regression has been used to perform the test. The PLS method is most suitable as it does not require data to belong from large sample size and normally distributed (Vinzi et al., 2010). Hence, PLS-SEM is considered as one of the best

alternatives to CB-SEM (Covariance based structural equation modeling) when certain situations are observed (Bacon, 1999; Wong, 2010): viz., small sample size, less theory availability, and foremost predictive accuracy, correct framework is not assured.

Figure 2: Results from PLS regression analysis

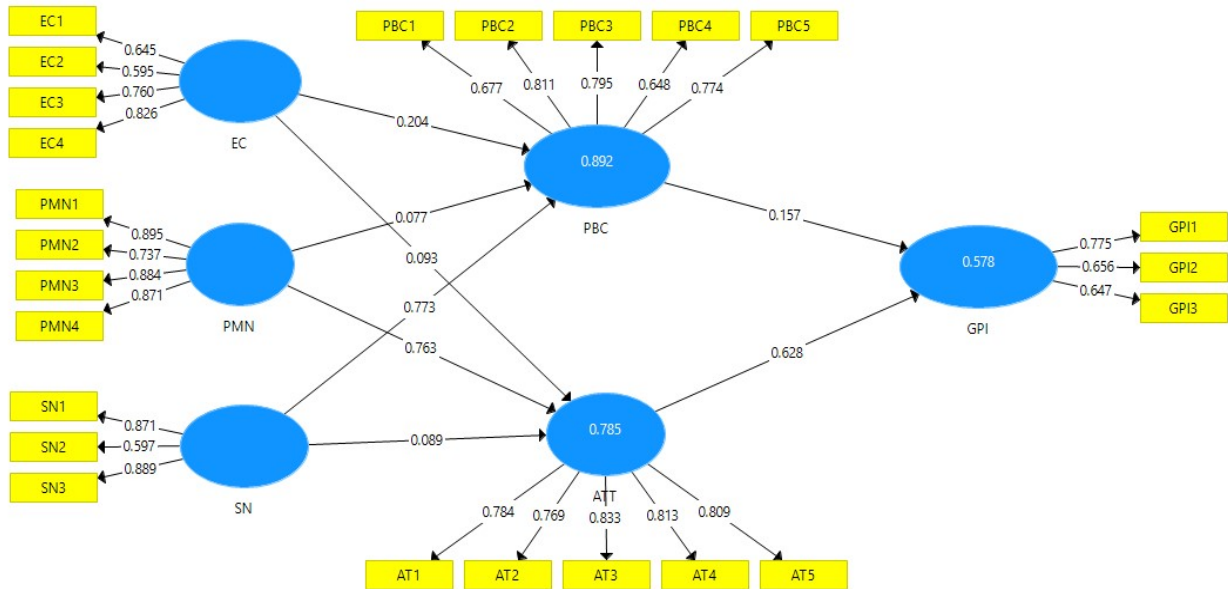


Table 1: The table displays Reliability Analysis and Convergent Validity

	Regression Beta Values		Reliability Analysis and Convergent Validity			
	R Square	R Square Adjusted	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
ATT	0.785	0.781	0.899	0.9	0.9	0.643
GPI	0.578	0.573	0.736	0.743	0.736	0.483
PBC	0.892	0.89	0.859	0.865	0.86	0.553
PMN			0.912	0.916	0.912	0.722
SN			0.827	0.863	0.835	0.635
EC			0.808	0.815	0.802	0.507

Table 1 indicates CR and Cronbach α value for all the constructs is superior than the acceptable value of 0.70 (Henseler et.al.)

2009). Thus, reliability of constructs was established at the items and constructs level.

Table 2: The table displays Discriminant Validity

		ATT	EC	GPI	PBC	PMN	SN
Fornell and Larcker	ATT	0.802					
	EC	0.49	0.712				
	GPI	0.755	0.698	0.695			
	PBC	0.812	0.565	0.667	0.744		
	PMN	0.88	0.472	0.715	0.813	0.849	
	SN	0.759	0.42	0.58	0.923	0.828	0.797
Heterotrait Monotrait Ratio	ATT						
	EC	0.482					
	GPI	0.756	0.698				
	PBC	0.814	0.563	0.659			
	PMN	0.878	0.468	0.714	0.808		
	SN	0.753	0.438	0.576	0.936	0.828	

as each construct is strongly related to its items rather than other constructs.

Discriminant validity, all constructs are dissimilar from one another as they are strongly related to its items rather than other constructs. Multicollinearity and common method bias (CMB) were also tested to confirm

the model estimation. The degree of Multicollinearity was examined by VIF or variance inflation factor. VIF must be lower than 3.3 according to Petter et al., (2007). The VIF values of all the variables in our model were lower than 3.3.

Table 3: Structural Path

Hypothesis	Hypothesis: Direct Path	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics (O/STDEV)	P Values	Results
H8	AT -> GPI	0.628	0.643	0.176	3.573	0.000	Sig
H2	EC -> AT	0.093	0.086	0.073	1.273	0.204	Non-Sig
H1	EC -> PBC	0.204	0.215	0.071	2.866	0.004	Sig
H7	PBC -> GPI	0.157	0.144	0.186	0.841	0.401	Non-Sig
H4	PMN -> AT	0.763	0.78	0.15	5.084	0.000	Sig
H3	PMN -> PBC	0.077	0.034	0.244	0.315	0.753	Non-Sig
H6	SN -> AT	0.089	0.081	0.15	0.592	0.554	Non-Sig
H5	SN -> PBC	0.773	0.811	0.221	3.496	0.001	Sig

Discussion

The study was designed to reveal the underlying determinants of purchase intentions for electric vehicles (EV) among consumers in Millennium City. The data analysis results reveal new dimensions of purchase intention, and indicate which factors are the most important for the purchase of EV.

As data analysis conducted provide nice jumping-off points for the final two areas of discussion, first -the relation of five constructs with purchase intention of EV among Indian consumers—second important factor considered by the customer while purchasing a new vehicle.

First, based on the Data analysis results, environment concern (EC) has got a positive impact on the perceived behavioural control, is consistent with related research such as, Prakash and Pathak (2017), Mathias Zannakis et al.(2019). This result reveals that citizens are concerned about the environment and know that air pollution caused by conventional cars will create adverse health effects. Customers are ready to purchase EV and expect EV performance in terms of power and mileage, adequate charging stations, government subsidies, tax incentives, and rebate to push their EV purchase decision.

Further data analysis results indicate that subjective norms have got a positive impact on perceived behavioural control. This result

suggests that while purchasing an electric vehicle, subjective norm such as an individual's friends, family, and influencer's opinion plays a vital role in EV's purchase decision. Hence marketers should focus on influencers of the target market by emphasising on digital media platforms content, reviews and chatbot assistance to promote EV. Moreover, the Government of India's encouragement to shift towards sustainable practices is an essential determinant of the subjective norm for EV purchase intention.

The study also observed that personal moral norms have positively influence on purchase intention through the mediator environmental attitude. These results resonates with earlier research studies conducted by Pelozo, White & Shang, 2013; Theotokis & Manganari, 2014. Yadav and Pathak 2016. The analysis indicates the customer has perceived moral norms like moral values and principles and feels an obligation towards society to use EV in order to reduce carbon footprints in the environment. As PMN and green purchase intention has positive relationship it indicates environmental attitude plays a vital role of moderator and indicate green purchase intention. Hence customers will become a change agent and ready to modify their travel patterns to own an EV. Also, they have a very positive environment attitude and agree to buy EV, even though they might have to compromise on

performance and comfort, which might be little less than conventional car. People also feel EV has less detrimental effect on the environment and as a change agent they have a responsibility to protect the environment.

Secondly study also attempt to identify important factors in buying a new vehicle and found that the price of the car, fuel/ charging stations, driving comfort and safety these are very extremely important while new vehicle purchase decision. Followed by that fuel consumption, power/performance of vehicle, after sales service and maintenance expenses are also extremely important while purchasing new vehicle. EV manufacturing companies certainly consider these inputs while designing new vehicles and positioning strategy for the target market.. Companies may get an advantage by taking the eco-friendly initiative to meet changing customers need (Chan et al., 2006). The recession has made an impact to the automobile Industry in India (BCG 2019). Adapting to electric vehicles may emerge as a competitive advantage to automobile companies in India. Marketers should understand the significance related to the constructs like Environment concern, subjective norms, attitude, perceived behavioral control and EV purchase intention and foster to build an image of the EV in the minds of the Indian customers.

Conclusion and Recommendation

The rising price of crude oil in the international market, adverse impact of carbon emission on human lives, decreasing conventional fuel reserves, and increasing environmental concerns have led to inclination towards eco-friendly vehicles and the electric vehicle market's growth. This growth and awareness are intense in developed nations and eventually and gradually disseminating to developing countries. In India rise in young population and middle-class income may foster the growth of automobile industry, it also predicted that by 2030, providing an opportunity to EV, India

may become a leader in shared mobility. Many leading global market players have already entered India to tap the potential market and plan to launch electric vehicles in Indian market and hence it becomes necessary to measure the purchase intention of EV. This study would be extremely beneficial for automobile manufacturers and marketers to get deeper consumer insights about EV.

Limitations

Study has been conducted in India's particular city; hence, while generalising the results, it cannot be considered the perception of overall Indian consumers. Hence, the study offers limited scope. The sample size taken in our study can be considered another limitation. With time limitations, it was impossible to target more respondents, which can be considered further in our research.

Implications of the Study

Theoretical and Practical implications

The study gives an insight with an extension to the past theories by creating the usage of newer mediating latent constructs to predict purchase intentions of green electric vehicles. This research gives an extension to TPB model with addition of new construct EC, PMN and SN. hence the study gives an extension to existing concepts like green marketing mix, ecofriendly products, green consumerism with different predictor variables to predict purchase intention towards electric vehicle.

The paper suggests to adopt consumer-centric approach. Moral norms, perceived behavioral control, environment concern, intention to purchase the eco friendly products, which have less detrimental impact on environment could be explored more within different consumer groups in Indian cities. The results of the study provide an insight on perception, attitude and behaviors toward purchase of electric vehicle which can create huge opportunities for auto industry players in developing electric vehicles preferred by the Indian customers.

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