ISSN: 2347-4440 (Print)

JOURNAL PRESS INDIA

MANTHAN
JOURNAL OF COMMERCE and MANAGEMENT

Volume | 5

Special Issue | 2018

JK LAKSHMIPAT UNIVERSITY
ज्ञानम् अमृतम्

SPECIAL ISSUE

In collaboration with

JK Lakshmipat University

Jaipur, Rajasthan, India

6th INTERNATIONAL CONFERENCE

GREEN, GROWTH, GLOBALIZATION, GOVERNANCE & GST: CHALLENGES & OPPURTUNITIES

February 2-4, 2018

12230

MANTHAN
MANTHAN

6th INTERNATIONAL CONFERENCE

on

GREEN, GROWTH, GLOBALIZATION, GOVERNANCE & GST: CHALLENGES & OPPURTUNITIES

February 2-4, 2018

SPECIAL ISSUE
EDITORIAL ADVISORY BOARD

Dr. R. L. Raina
Vice- Chancellor, JKLU Jaipur

Dr. Manoj Bhatia
Associate Dean, IM, JKLU Jaipur

Dr. Ben Baliga
Professor, St. Cloud State University, USA

GUEST EDITOR

Dr. Ganesh Dash
Assistant Professor
IM, JKLU

ASSOCIATE EDITORS

Dr. Kapil Arora
Associate Professor, IM, JKLU

Dr. Upasana Singh
Assistant Professor, IM, JKLU

Dr. Rakhi Arora
Assistant Professor, IM, JKLU

Dr. Richa Mishra
Assistant Professor, IM, JKLU

Dr. Punam Mishra
Assistant Professor, IM, JKLU

Dr. Vaibhav Kaushik
Assistant Professor, IM, JKLU

CONTENTS

RESEARCH PAPERS

Consumers' Reaction after Purchasing Mobile Services Provided by Various Mobile Network Operators
Debarun Chakraborty 1

Online Buying Behaviour and Risk Perception: An Empirical Study
Shilpi Saxena and Roopam Kothari 20

Influence of Demographic Variables towards Purchase of Organic Personal-Care Products
Vishal Kumar Laheri, Anupama Vohra and Hamendra Kumar Dangi
.....36

Quality in Health Care Services: A Contradictory Statement from the state of Odisha
Ansuman Samal and Bibhuti Bhusan Pradhan 47

A Study on Employee Perceptions on Green HRM Practices and its Impacts on Organizations Environmental Performance
P. K Haridas, R. Chitra Sivasubramanian and Ganesh Dash 63

Governance Issues in Road Freight Transportation (Trucking) Industry in India: An Overview
Mahendra Parihar and Akanksha Singh 79

Transmuting Revolution of Digital Payments after Demonetization with Reference to Paytm
Rakhi Arora 93

Impact of Basel Accord on Performance of Indian Banks: An Empirical Analysis of Selected Public and Private Sector Banks
Swati Lodha 107

A Study on Investment Preferences and Risk Return Perceptions of Millennial Investors
Lokanath Mishra 123

Is India Ready for all Electric Vehicles Fleet by 2030: A Study of Consumer Preference and Consumer Acceptance towards Electric Cars
Punam Mishra, Ajay Chandel and Rohit Vij 138

Digital and Social Media Marketing: Potential to Leverage Healthcare Communication
Ajay Kumar Khatua, Jyoti Ranjan Das and Ganesh Dash 157

Investigating Consumer Motivation towards the Purchase of Green Products: A Demographic Study
Minal Uprety 166

Determinants of Herding Behavior of Investors in Indian Stock Market
Sarfaraz Ansari 178

A Study on Internet Banking Portal Service Quality of Indian Public and Private Sector Banks in Gujarat State
Nirav B. Halvadia and Mahendra Sharma 188

Analyzing the Factors Influencing Career Choice of Students for Higher Education
Kirti Jainani 210

The Development of Energy Derivative on MCX and Challenges for Further Development
Rashmi Sharma 224

CASE STUDY

A Study of Stock Price Dynamics around Merger & Acquisition: A Case Study of Mahindra & Mahindra Acquisition of Ssangyong Motor Co. Ltd.
Kapil Arora and Ajay Kumar Pandey 244

MANTHAN: Journal of Commerce and Management
Volume 5, Spl. Issue, pp. 138-156

Is India Ready for all Electric Vehicles Fleet by 2030: A Study of Consumer Preference and Consumer Acceptance towards Electric Cars.

Punam Mishra, Ajay Chandel** and Rohit Vij****

ABSTRACT

This study examines the perception and consumer acceptance of electric vehicles by 2030. A sample including 200 respondents was collected on the streets and malls of Jalandhar (Punjab Region). The results demonstrate that consumer acceptance and perception of fully electric vehicles. Factors like perception of economic benefit, performance, Government aid and Environmental concerns were identified as the key factors influencing the adoption of full electric vehicles. Potential electric vehicle users look for numerous benefits from purchasing an electric car including economic benefits from long-term fuel savings, high energy efficiency, more service and charging stations, longer battery backup and affordable electricity with green benefits of using electric vehicles as an additional benefit. Thus, Government's efforts to promote low carbon transportation, needs scaling up of efforts to improve residents' environmental apprehensions and to establish proper pro-environmental policy as well as to provide long term economic and strategic support for electric vehicles. The study tries to peep into if India is ready for all electric vehicles fleet by 2030?

Keywords: *Electric vehicles; India; All electric fleet by 2030; Pollution; Government aid, Infrastructure; Perception of economic benefit; Performance.*

1.0 Introduction

"The mobility model we have today will not work tomorrow"-Bill Ford (Great grandson of Henry Ford and Executive Chairman of the Ford Motor Company). Transportation is a major catalyst of economic growth and social development.

**Corresponding author: Dr. Punam Mishra, Assistant Professor, Institute of Management, JK Lakshmipat University, Jaipur, Rajasthan, India, (e-mail id: punammishra@jklu.edu.in)*
***Assistant Professor, Mittal School of Business, Lovely Professional University, Punjab, India, (e-mail id: ajay.chandel@lpu.co.in)*
****Assistant Professor, Mittal School of Business, Lovely Professional University, Punjab, India, (e-mail id: rohit.14627@lpu.co.in)*

A large share of transportation depends upon passenger's car use, which is expected to endure to increase in future, especially in developing and emerging countries. India's population is expected to exceed population of china by 2024, making it the most populated country in the world (Economic Times, 2017). High Economic growth along with globalization has increased the prosperity in Urban India resulting in auto mobilization. This is the reason that within 15 years, the population living in urban India is expected to double to over 7oo million due to distressed rural to urban migration and other factors. This will place added burden on urban set-up, which is already overloaded. Projections indicate that by 2021, India will have largest concentration of megacities in the world with a population, which might exceed 10 million (McKinsey, 2010, Padam & Singh, 2017). Out of a total of 88 cities, with a population of more than half a million in 2011, only 28 have any formal public transportation system in India. As the demand for public transport services surpasses supply, both qualitatively and quantitatively, the existing public transport systems are aged and strained beyond capacity in India (Yes Bank, 2013).

With rise in disposable income because of economic growth, middle class is able to afford and prefer personal vehicles. It is also because having a vehicle is a symbol of upward social mobility, and offers greater ease and flexibility (Steg et al., 2001)

Transportation ranks second after electricity power as the largest source of carbon emissions in the world. Over the past few decades, research has been conducted to investigate various aspects of the development of sustainable low carbon transportation technologies to reduce carbon emissions. As a result, there are already a number of potential alternatives to the conventional diesel/petrol combustions engine. A significant change that can improve fuel efficiency and reduce emissions can be the introduction of fully Electric vehicles, which has a zero-emission potential when electricity is produced with the use of renewable energy sources. Powering electric vehicles using solar charging stations could decrease the emission of greenhouse gases (GHG) by up to 34%. Although full electric vehicles have been available since the dawn of motoring, they were not popular. Due to current environmental worries, fully electric vehicles have been seen making a comeback in the 21st century.

1.1 Energy security

The 2011-12 budget stimulated CNG, LPG and other hybrid and alternative fuel cars adoption in the country. A variety of incentives for EVs and hybrids were also declared.

To promote EV mobility, the then Finance Minister, Mr. Pranab Mukherjee, led to the formation of "National Mission for Hybrid and Electric Vehicles" (NMHEV). This initiative was designed to act as a focal point for all the industry's needs on infrastructure, R&D and new incentives. The mission is headed by the Ministry of Heavy Industry & Public Enterprises and stakeholders including Ministries like Urban Development, New and Renewable Energy, and Power along with industry. (Joint Report on Electric Vehicles, YES Bank and TERI 2013)

1.2 Initiatives of ministry of heavy industries and public enterprises

The Ministry of Heavy Industries is planning to approve a INR 20,000 - 23,000 Cr (USD 3.7 billion –USD 4.25 billion) plan under the National Electric Vehicle Mission policy to promote EV mobility over the next 8 years. The Government has planned to invest around INR 12,250 - 13,850 Cr (USD 2.26bn –USD 2.56bn) while the rest of the investment will be made by the industry. The funds for this initiative are to be made by pooling allocations given to all the other Ministries, like the JNNURM related funds of Ministry of Urban Development and the Climate Change Fund of the Ministry of Environment. The funds are to be allocated for incentivizing private players, giving tax benefits and setting up R&D centers apart from various other activities. The NMHEV will provide incentives and subsidies to customers through manufacturers, based on many parameters such as fuel efficiency and carbon emission standards. (Yes Bank, 2013)

1.3 A bold decision

As the country's economy has boomed, new industries and commuters have spewed pollutants in the air at staggering rates with its 1.3 billion residents now suffering. According to one estimate, India's polluted air causes 1.2 million deaths per year. As per doctors, breathing in New Delhi, is equivalent to smoking 10 cigarettes a day (CNN, 2017)

India's vision is to have all-electric car fleet by 2030 (. This means no petrol or diesel car would be sold in the country. Ministry of Heavy Industries and the NITI Aayog are already in the process of framing a policy for the promotion of electric vehicles. India is therefore looking to have an all-electric car fleet by 2030 with a clear objective of lowering the current pollution level, country's fuel import bill and running cost of vehicles. The government's National Electric Mobility Mission Plan is expecting an annual sales of electric and hybrid cars to reach 6 million to 7 million by 2020. (Times of India, 2017)

2.0 Review of Literature

2.1 Environmental concern

Consumer adoption of Hybrid electric vehicles in the USA was studied by Gallagher and Muchlegger (2011). It was found that groups with strong pro-environmental and energy security attitude prefer hybrid or electric vehicles. Results indicated environmentally conscious behaviors that motivate green consumers to purchase such vehicles. The results also indicated that people recognize the environmental benefits of electric cars more than the economic and social benefits.

Attributes that are important for the acceptance of electric vehicles were studied by Schuitema et al. (2013). It was concluded that people's pro environmental self-identity has a positive effect on the perception and adoption of electric vehicles. Bockarjova and Steg (2014) found out most important barriers for electric vehicles adoption. These barriers were found to be high monetary and non-monetary costs of electric vehicles and environmental benefits associated with the use of a conventional vehicle. However, use of batteries in fully electric cars would affect environment less and be eco-friendlier but discharging and recycling of such batteries can pose a challenge. Hacker et al (2009) conducted a study that indicated that an environmental assessment of electric vehicles must be considered from a long-term perspective, as it will put additional demand of energy and resources. It was also proposed that mining of lithium, which is the key element of battery in electric vehicles, would put a negative impact on environment, so it remains a controversial issue.

2.2 Government aid

Salle (2007) summarized that tax reduction and change in gasoline prices were the influencing factors for purchasing behavior of alternate fuel vehicles. Robinson *et al,* 2014 concluded that the government should provide a network of charging stations in the city after the launch of electric vehicles. The study also threw light on one of the problems with electric vehicles i.e. infrastructure designers are unwilling to invest in this area until they believe there will be a sizeable population of electric vehicles on the roads. Vehicle manufacturers are also reluctant to launch their models in specific countries owing to the lack of charging stations. The study thus summarized that involvement of government appears to be necessary at least in the early stages of implementation. Chandra et al. (2010) concluded that tax rebates and tax reduction subsidies and incentives to the OEMs (Original Equipment Manufacturers) are some crucial factors that influence the consumer buying behavior towards fully electric

vehicles. The paper also determined that the need of the hour is for Government initiatives in this regard so as to mobilize, the diverse set of stakeholders ranging from research institutes, renewable energy suppliers, financial institutions, Electric Vehicle manufacturers, power companies, policy makers and consumers only if all these parties are on board can electric vehicles then hope to move beyond a niche market. Beresteanu and Li (2011) shows that gasoline prices and Government support (tax incentives, tax reductions) are the main factors in deciding the purchasing behavior of full electric vehicles. This study also showed the need of producing business models which would emerge around managing charging infrastructure aided by the government, for example models which would propose providing of charging points in public parking spaces, personal residential or private sites and also to provide end to end value added services. Gallagher and Muchleggar (2011) also found that factors such as Government initiatives (tax incentives, tax deductions) and changes in gasoline prices affect the acceptance of fully electric cars by the consumers by 2030. The study also concluded that the significant step towards reducing the barriers to electric cars adoption revolves around coming up, with an integrated effective business model, one that links together the interests of car makers, owners, infrastructure developers and policy makers.

2.3 Perception of economic benefit

Diamond (2009) and Jenson et al. (2013) found that perception of economic benefits could be a big motivational factor for consumers' adoption of electric cars. In addition, higher price of fully electric vehicles as compared to conventional cars could demotivate consumers. However, as per Vliet et al. (2011), these shortcomings could be taken care of as it is expected that in future Li-ion and Zebra batteries could provide sufficient power at a comparatively lower cost, which can make fully electric vehicles more competitive than vehicles running on gasoline. Thomas, Becker and Ikhlaq Sidhu, (2009) concluded that adoption of electric vehicles could be driven by the lower price and operating costs of electric cars with battery ownership or battery leasing. Graham-Row et al. (2012), and Lipman, & Delucchi (2006) strongly focused on economic benefits along with vehicle confidence and environmental beliefs, perception of electric vehicles as critical factors that influence the acceptance and buying behavior of electric cars by the consumers.

2.4 Performance

Peters & Dütschke (2014) and Klöckner et al. (2013) concluded that consumer expectation like ease, dependability, strength, power, safety, economy and fair prices of auto parts are the major factors that determine consumers' acceptance of fully electric

vehicles. This study also concluded that consumers' evaluation of perceived risks like running out of power, meeting an accident, a mechanical breakdown and being stuck in a traffic might dissuade consumers to accept electric cars. Chiu and Tzeng (1999) proposed that dependability, speed, emissions level, style and design, safety, cruise distance were some of the factors that can be the antecedents of consumer buying behavior of fully electric vehicles. The study also depicted that cars having a higher efficiency would require comparatively less fuel to travel a particular distance that reduces fuel consumption and running costs. The study proved the fact that when energy prices are constant, cost effective efficiency improvements will increase economy wide energy consumption above or in nutshell "greater the efficiency of a process, the grater is the energy use. Skippon (2014) concluded that dynamic performance and cruising performance of the electric cars on streets and other factors such as severity, vulnerability, self-efficiency, car type class, brand loyalty are some of the factors that would affect the buying behavior of consumer of fully electric vehicles. The study also proposed that aesthetics, availability of charging stations, vehicle range, vehicle price, charging time, pro-environmentalism and innovation etc. were some of the performance factors which might influence or put a positive impact on buying and consumer preference of fully electric cars.

3.0 Research Gap

The review of literature helped identify under mentioned gap:

3.1 Launch of an all-electric car fleet by 2030 has raised many eyebrows on the implementation of this new policy matter. This is a relatively under researched area in India and thus calls for an in-depth study to give a deeper understanding of underlying dimensions and their relative contribution towards the consumer adoption towards electric cars.

3.2 India has already seen a slow growth in hybrid cars that is a transactional shift from cars running on oil and gas. Launch of electric vehicles is a very current phenomenon in developing country like India. Studies on this discipline are majorly confined to developed economies of the world. Such studies are particularly scarce in developing countries like India and calls for an investigation from consumer behavior perspective.

4.0 Objectives of the Research

The study strives to accomplish below mentioned objectives:

1. To explore and investigate the factors related to consumer acceptance of electric cars

2. To identify the factors that are better predictor of electric cars adoption behavior

5.0 Research Methodology

The study has deployed an exploratory as well as a descriptive approach to accomplish the stated objectives. An in-depth review of literature was conducted to unearth the underlying themes of consumer perception and acceptance of Electric Cars 2030 in India. The themes were converted into items for questionnaire development. The questionnaire was vetted by 10 experts having an academic experience of more than 5 years. The items were deleted and modified as per the suggestions of the experts. The final questionnaire was circulated amongst 250 respondents outside the shopping malls and quick service restaurants of Jalandhar, (Profile attached in annexure) on the basis of judgmental sampling where the respondents agreed to express their concern and preference towards Electric Cars. A total of 217 questionnaires were collected back of which 17 questionnaires were found to be incomplete and hence were not found suitable for the study. A total of 200 filled questionnaires were found to qualify for the analysis after data cleaning process.

6.0 Results and Discussions

Objective 1: To explore and investigate the factors related to consumer acceptance of electric cars

The questionnaire was developed using the four major constructs as explored in review of literature and themes generated in qualitative research. The questionnaire containing 20 statements representing each construct was presented to 16 experts for vetting. Academicians having rich experience of teaching and research in marketing and branding were selected for the vetting. Experts from industry were selected from various managerial levels handling core marketing and branding domains. The experts were presented the items in an excel sheet electronically with each statement having three options for Modification, Deletion or Keeping.

6.1 Exploratory factor analysis

In order to achieve the objectives of exploring and investigating the antecedents of consumer perception and acceptance of electric vehicles by 2030, Exploratory Factor Analysis was used which curtailed a large set of items into small set of factors.

The conceptual model showed the presence of four constructs that add up to a consumer's perception and acceptance of electric cars by 2030. Before applying EFA on

all the items of the questionnaire, each construct was explored using EFA. Items having low factor loadings were removed to further refine the construct.

From the construct related to experiential reasons of brand avoidance each statement/item was retained as each item had a high factor loading.

6.2 Reliability statistics

To identify the internal consistency of the items retained in the questionnaire after initial EFA, the reliability statistics were checked. This helped understanding if the items that suggest measuring the same general concept produce similar scores. Reliability Statistics (Table 1) provides the actual value for 'Cronbach's alpha' is shown below.

Table 1: Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	N of Items
.932	20

Source: *Primary data*

Cronbach's alpha was found to be 0.934. This indicated a high degree of internal consistency for the scale with this specific sample. The Item-Total Statistics table that presents the "Cronbach's Alpha if Item Deleted" was studied to estimate the value that Cronbach's alpha would have if a particular item was deleted. None of the item was found to improve the Cronbach's Alpha score considerably. Hence, all items were retained for further analysis.

Appropriateness of factor analysis

Table 2: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.735
Bartlett's Test of Sphericity	Approx. Chi-Square	1.038E3
	Df	190
	Sig.	.000

Source: *Primary data*

The KMO score indicates the sampling adequacy. It should be close than 0.5 for a satisfactory factor analysis to proceed. However, Kaiser (1974) recommended 0.5 (value for KMO) as minimum (barely accepted), values between 0.7-0.8 acceptable, and

values above 0.9 as excellent. This was well supported by KMO (Kaiser-Meyer-Olkin) value of 0.735. This indicated that reducing variables into fewer factors was appropriate. Bartlett test of Sphericity was found to be significant at value 0.000, which suggested that correlations in the data set was appropriate for conducting EFA.

6.3 Factor extraction and total variance explained

SPSS Output as listed in table 3, shows the eigenvalues related with each linear component (factor) before extraction, after extraction and after rotation. The eigenvalues related with each factor denotes the variance described by that particular linear component and it also shows the eigen value in terms of the percentage of variance explained as in this case factor one explains 23.349% of total variance. SPSS extracts all factors that have eigen values m than 1 leading to the extraction of four factors. In the final part of the table (labeled as-Rotation Sums of Squared Loadings), the eigenvalues of the factors after rotation are shown. Rotation optimizes the factor structure and one consequence of this is that the relative importance of the four factors is equalized. It can be seen that before rotation, factor 1 accounted for significantly more variance than the remaining four (23.349% compared to 9.312, 7.197 and 6.869%) factors. However, after extraction it accounted for only 13.186% of variance (compared to 26.154, 37.288 and 46.726% respectively).

Table 3: Factor extraction and 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	4.670	23.349	23.349	4.670	23.349	23.349	2.637	13.186	13.186
2	1.862	9.312	32.661	1.862	9.312	32.661	2.594	12.968	26.154
3	1.439	7.197	39.858	1.439	7.197	39.858	2.227	11.134	37.288
4	1.374	6.869	46.726	1.374	6.869	46.726	1.888	9.438	46.726

Source: *Primary data*

As explained in total variance explained, 20 statements, are used to conduct exploratory factor analysis rearranged themselves in to four factors which were capable of explaining approximately 46% of all the variable variance.

6.4 Pattern matrix

Statements with high factor loadings on factor one corresponded to Environmental factors behind consumer preference and consumer acceptance of electric cars by 2030. Statements with high factor loadings on factor two corresponded to Governmental Aid factors and hence were named as Governmental aid factors responsible for the acceptance and perception of electric vehicles. Statements with high factor loadings on factor three corresponded to perception and economic based reasons behind acceptance of electric vehicles and hence were named as Perception of Economic Benefit. Statements with high factor loadings on factor four corresponded to Performance and Infrastructure related reasons behind perception and consumer acceptance of electric cars and hence were named as Performance and Infrastructure Framework. The factors found have been shown below in a pattern matrix.

Table 4: Pattern matrix

	1	2	3	4
I will shift to electric cars because it can help solve the problem of pollution in India	.851			
I will shift to electric cars because it's a clean fuel	.943			
I believe use of electric cars is a long-term step towards a sustainable future	.895			
I believe that use of electric cars will help reduce risk of respiratory diseases caused by harmful emission by cars running on oil and gas	.935			
I believe electric cars will help reduce ozone layer depletion	.736			
I will shift to electric vehicles if Government of India helps promote convenient purchase options (Easy loans, Lower interest rates etc.)		.567		
I will shift to electric cars if the Government of India will devise electric cars friendly policies		.780		
I will shift to electric cars if Government of India will subsidize the usage of charging station		.749		
I will shift to electric cars if Government of India ensures enough availability of service stations		.748		
I will shift to electric cars if Government of India will work towards building an infrastructure (roads, enough charging stations) facilitating the use of electric cars		.830		

I believe electric cars will help lower down the cost of electricity			.704	
I will shift to electric cars if they are priced appropriately			.810	
I will shift to electric cars if maintenance cost of such cars is low as compared to existing vehicles.			.836	
I will shift to electric cars if they provide relatively cheaper means of private transport			.861	
I will shift to electric cars if sales tax on initial purchase of electric vehicles can be waived off			.698	
I will shift to electric cars if the speed is not compromised				.725
I will shift to electric cars if recharging such cars doesn't cost much time				.614
I will shift to electric cars if their efficiency exceeds or at least matches to that of existing vehicles				.870
I will shift to electric cars if the battery back-up is performance oriented				.631
I will shift to electric cars if the chances of engine breakdown are lowered				.636

Source: *Primary data*

Factor 1: First factor identified comprises of 5 items related to main theme of **'Environmental Concern'**. Various items comprising Environmental concern were mapped against various subthemes identified and explored in review of literature. A tabular representation is given below.

Table 5: Factor 1 Environmental Concern

Sr. No	Statements/Variable/Item	Factor Loading	Subtheme
1	I will shift to electric cars because it can help solve the problem of pollution in India.	.851	Environmental Concern
2	I will shift to electric cars because it is a clean fuel	.943	Environmental Concern
3	I believe use of electric cars is a long-term step towards a sustainable future	.895	Environmental Concern
4	I believe that use of electric cars will help reduce risk of respiratory diseases caused by harmful emission by cars running on oil and gas	.935	Environmental Concern
5	I believe electric cars will help reduce ozone layer depletion	.736	Environmental Concern

Source: *Primary data*

Factor 2: Second factor comprises of 5 items related to **"Government Aid and Infrastructure Support"**. Various items comprising Governmental Aids were mapped against various subthemes identified and explored in review of literature. A tabular representation is given below.

Table 6: Factor 2 Government Aid and Infrastructure Support

Sr. No	Statements/Variable/Item	Factor Loading	Subtheme
1	I will shift to electric vehicles if Government of India helps promote convenient purchase options (Easy loans, Lower interest rates etc.)	.567	Government Aid
2	I will shift to electric cars if the Government of India will devise electric cars friendly policies	.780	Government Aid
3	I will shift to electric cars if Government of India will subsidize the usage of charging station	.749	Government Aid
4	I will shift to electric cars if Government of India ensures enough availability of service stations	.748	Government Aid
5	I will shift to electric cars if Government of India will work towards building an infrastructure (roads, enough charging stations) facilitating the use of electric cars	.830	Government Aid

Source: *Primary data*

Factor 3: Third Factor is the collection of 5 items related to **'Perception of Economic Benefit'**. Various items comprising perception of economic benefits were mapped against various subthemes identified and explored in review of literature. A tabular representation is given below.

Table 7: Factor 3 Perception of Economic Benefit

Sr. No	Statements/Variable/Item	Factor Loading	Subtheme
1	I believe electric cars will help lower down the cost of electricity	.704	Perception of Economic Benefit
2	I will shift to electric cars if they are priced appropriately	.810	Perception of Economic Benefit
3	I will shift to electric cars if maintenance cost of such cars is low as compared to existing vehicles.	.836	Perception of Economic Benefit

4	I will shift to electric cars if they provide relatively cheaper means of private transport	.861	Perception of Economic Benefit
5	I will shift to electric cars if sales tax on initial purchase of electric vehicles can be waived off	.698	Perception of Economic Benefit

Source: *Primary data*

Factor 4: Fourth Factor comprises of 5 items related to **'Performance'**. A tabular representation is given below.

Table 8: Factor 4 Performance

Sr. No	Statements/Variable/Item	Factor Loading	Subtheme
1	I will shift to electric cars if the speed is not compromised	.725	Performance and Infrastructure Framework Support
2	I will shift to electric cars if recharging such cars doesn't cost much time	.614	Performance and Infrastructure Framework Support
3	I will shift to electric cars if their efficiency exceeds or at least matches to that of existing vehicles	.870	Performance and Infrastructure Framework Support
4	I will shift to electric cars if the battery back-up is performance oriented	.631	Performance and Infrastructure Framework Support
5	I will shift to electric cars if the chances of engine breakdown are lowered	.636	Performance and Infrastructure Framework Support

Source*: Primary data*

Objective 2: To identify the factors that are better predictor of electric cars adoption behavior, multiple regression was applied. The results are mentioned below (Table 9).

Model summary

Table 9: Model Summary

R	R Square	Adjusted R Square	Std. Error of the Estimate
.792[a]	.627	.619	.1123

Source: *Primary data*

The "R" column of Model summary represents the value of R, which represents the multiple correlation coefficients. R is a measure of the quality of the prediction of the dependent variable (Consumer Perception & Acceptance). A value of 0.792 indicates a

good level of prediction. This is a measure of overall strength of association but does not reflect the degree to which any independent variable is associated with the dependent variable. Model summary statistics also showed value of R square (coefficient of determination) as .627 which indicates independent variables are capable of explaining/predicting 62.7% of variance in dependent variable. The adjusted R-squared is an adapted form of R-squared. It is adjusted for the number of predictors in the model (four in this case). Adjusted R square value of .619 (almost same to R Square) again signals towards the predictive power of independent variables.

Anova table

Table 10: ANOVA

Sum of Squares	df	Mean Square	F	Sig.
38.175	4	9.544	81.964	.000[a]
22.705	195	.116		
60.880	199			

Source: *Primary data*

The F-ratio in the ANOVA table examines whether the overall regression model is a good fit for the data. The table displays that the independent variables statistically significantly predict the dependent variable with $F(4, 195) = .116$, $p < .0005$. This means that regression model is a good fit of the data. Std. Error of Estimate (SEE; standard deviation of the residual SEE) is .1123. This means on average estimate of consumer perception and acceptance will get wrong by .1123 that is negligible in context of brand avoidance. As R square is close to 1 it reduces the SEE. Higher R Square indicates better fit that leads to lesser estimation error.

Table 11: Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	-1.204	.323		-3.722	.000	-1.842	-.566
	Environment	.280	.044	.301	6.369	.000	.193	.367
	Government	.167	.044	.177	3.790	.000	.080	.254
	Economic benefit	.336	.042	.368	7.966	.000	.253	.419
	Performance	.494	.072	.331	6.859	.000	.352	.637

Source: *Primary data*

Consumer Perception and Acceptance = -1.204 + .301*Environmental Concern + .177* Government Aid + .368* Perception of Economic Benefit + .331*Performance & Infrastructure Frame work

In order to find out the most predictive antecedents of brand avoidance, regression model was applied by taking "Factor 1 to Factor 4" as independent variables & "Consumer Perception & Acceptance of Electric cars" as dependent variable. The regression model produced

R Square= 0.627

F= 81.964

P< .000

Value of all the factors (Independent variable) & (Dependent Variable) was 0.000 which indicates all the factors contributes to the model and out of these factor, Factor 4 have the highest "Standard Coefficient Beta" & "Unstandardized Coefficient B" i.e. .331 & .494 respectively which made it the most predictive antecedents for consumer perception and acceptance of electric vehicles by 2030.

After that Factor 3 with Standard Coefficient Beta & Unstandardized Coefficient i.e. .368 & .336 respectively was the second most predictive antecedent. Factor 2 has the least coefficient out of 5 predictors which made it least predictive antecedent.

7.0 Conclusion

In today's scenario preservation and sustainability of scarce resources is very crucial and is the need of an hour. So, alternate eco-friendly energy sources should be the aim in order to minimize the damage and maintain the sustainability. As per review of literature, consumer perception and acceptance of electric vehicles mostly was found to be dependent on factors such as Performance and Economic Benefit which would largely affect the behavior of consumer in accepting Electric vehicles in future. It is really important to study the perception and acceptance of Indian consumers towards Electric Vehicles by 2030.

The aim of the research was to find out antecedents of consumer perception and acceptance of electric vehicle by 2030, for which data was collected from 200 respondents. Exploratory factor analysis resulted into unearthing four factors that impacted consumer perception and acceptance of electric cars. The factors were found to be Environmental concern, Government Aid and Infrastructure Support, Perception of Economic Benefit and Performance.

India has been ranked very high in the list of most polluted countries in the world with cities like Delhi topping the list itself. Environmental concerns were found to

be one of the most influential factor behind people's acceptance of electric cars. Since the data was collected from well to do respondents who were educated and were well travelled, the results can be due to respondents personally witnessing environmental depletion around the globe.

Respondents also expressed government to extend a helping hand in aiding the shift to electric cars financially as well as infrastructure wise. Tax rebates and other subsidies were found to be motivating factors behind acceptance of electric vehicles. Also, government's initiatives to develop infrastructural backbone to assist users to shift via improving the roads, regular energy, ample charging stations, reduction in electricity prices etc. were found to be inviting.

Consumers were also convinced with long term reduction in operating costs of the electric vehicles as one of the motivating factors. Performance of the vehicle as compared to its counterparts as also found to be influencing consumers' perception of adoption towards electric cars.

8.0 Future Scope of Study

Electric vehicles (EVs) acceptance is growing day by day. They are also considered to be cleaner and more efficient. Future studies can help use conjoint analysis to map consumers' utilities they derive from various combinations of features, price and performance related attributes to help managers decipher consumer mindset to boost consumer adoption of electric vehicles.

References

Becker, T. A., Sidhu, I., & Tenderich, B. (2009). Electric vehicles in the United States: a new model with forecasts to 2030. *Center for Entrepreneurship and Technology, University of California, Berkeley, 24.*

Beresteanu, A. & Shanjun, L. (2011). Gasoline prices, government support, and the demand for hybrid vehicles in the United States. *International Economic Review*, 52.1 (2011), 161-182.

Bockarjova, M., & Steg, L. (2014). Can Protection Motivation Theory predict pro-environmental behavior? Explaining the adoption of electric vehicles in the Netherlands. *Global environmental change*, *28*, 276-288.

Chandra, A., Gulati, S., & Kandlikar, M. (2010). Green drivers or free riders? An analysis of tax rebates for hybrid vehicles. *Journal of Environmental Economics and management*, 60(2), 78-93.

Chiu, Y. C., & Tzeng, G. H. (1999). The market acceptance of electric motorcycles in Taiwan experience through a stated preference analysis. *Transportation Research Part D: Transport and Environment*, *4*(2), 127-146.

Diamond, D. (2009). The impact of government incentives for hybrid-electric vehicles: Evidence from US states. *Energy Policy*, 37(3), 972-983.

Electric vehicles in India - Yes Bank (2013), Retrieved from https://www.yesbank.in/pdf/researchandinitiatives_awardsandrecognition_pdf10.

Gallagher, K. S., & Muehlegger, E. (2011). Giving green to get green? Incentives and consumer adoption of hybrid vehicle technology. *Journal of Environmental Economics and management*, 61(1), 1-15.

Graham-Rowe, E., Gardner, B., Abraham, C., Skippon, S., Dittmar, H., Hutchins, R., & Stannard, J. (2012). Mainstream consumers driving plug-in battery-electric and plug-in hybrid electric cars: A qualitative analysis of responses and evaluations. Transportation Research Part A: Policy and Practice, 46(1), 140-153.

Hacker, F., Harthan, R., Matthes, F., & Zimmer, W. (2009). Environmental impacts and impact on the electricity market of a large scale introduction of electric cars in Europe-Critical Review of Literature. *ETC/ACC technical paper*, *4*, 56-90.

India to sell only electric cars by 2030, Available on url: http://money.cnn.com/2017/06/03/technology/future/india-electric-cars/index.html, Retrieved on 10th of Sep,2017

India's population to surpass that of China's around 2024: UN, Available on url: https://economictimes.indiatimes.com/news/politics-and-nation/indias-population-to-surpass-that-of-chinas-around-2024-un/articleshow/59257232.cms, Retrieved on 20th of Sep,2017

India's urban awakening – McKinsey (2010). Available on url: https://www.mckinsey.com/~/media/McKinsey/Global%20Themes/Urbanization/Urban

%20awakening%20in%20India/MGI_Indias_urban_awakening_full_report.ashx, Retrieved on 10th of Sep,2017

Jensen, A. F., Cherchi, E., & Mabit, S. L. (2013). On the stability of preferences and attitudes before and after experiencing an electric vehicle. *Transportation Research Part D: Transport and Environment*, *25*, 24-32.

Klöckner, C. A., Nayum, A., & Mehmetoglu, M. (2013). Positive and negative spillover effects from electric car purchase to car use. *Transportation Research Part D: Transport and Environment*, *21*, 32-38.

Lipman, T. E., & Delucchi, M. A. (2006). A retail and lifecycle cost analysis of hybrid electric vehicles. *Transportation Research Part D: Transport and Environment*, *11*(2), 115-132.

Peters, A., & Dütschke, E. (2014). How do consumers perceive electric vehicles? A comparison of German consumer groups. *Journal of Environmental Policy & Planning*, *16*(3), 359-377.

Robinson, J., Brase, G., Griswold, W., Jackson, C., & Erickson, L. (2014). Business models for solar powered charging stations to develop infrastructure for electric vehicles. *Sustainability*, *6*(10), 7358-7387.

Salle, J. (2007). Tax credits and the market for hybrid vehicles; Working paper. University of Michigan: Ann Arbor, MI, USA, 2007.

Schuitema, G., Anable, J., Skippon, S., & Kinnear, N. (2013). The role of instrumental, hedonic and symbolic attributes in the intention to adopt electric vehicles. Transportation Research Part A: Policy and Practice, 48, 39-49.

Skippon, S. M. (2014). How consumer drivers construe vehicle performance: Implications for electric vehicles. *Transportation research part F: traffic psychology and behaviour*, *23*, 15-31.

Steg, L., Geurs, K., & Ras, M. (2001). The effects of motivational factors on car use: a multidisciplinary modelling approach. *Transportation Research Part A: Policy and Practice*, *35*(9), 789-806.

Urbanization and urban transport in India: the sketch for a policy, Available on url: https://www.seas.harvard.edu/TransportAsia/workshop_papers/Padam-Singh.pdf, Retrieved on 10th of Sep, 2017

Van Vliet, O., Brouwer, A. S., Kuramochi, T., van Den Broek, M., & Faaij, A. (2011). Energy use, cost and CO2 emissions of electric cars. *Journal of power sources*, *196*(4), 2298-2310.

YES Bank and TERI joint Report on Electric Vehicles by RushLane, Available on url: https://issuu.com/sagarpatel6/docs/final_electric_vehicles_report_24-1-13, Retrieved on 10th of Sep,2017