

**Project Dissertation Report on**

# **COMPOSITE STRATEGY FOR ENHANCING SALES OF ELECTRIC VEHICLES**

*Submitted By:*

**Jatin Achint**

2K18/MBA/047

*Under the Guidance of:*

**Prof. P. K. Suri**

Delhi School Of Management



**DELHI SCHOOL OF MANAGEMENT**

**Delhi Technological University**

**Bawana Road, Delhi 110042**

**Jan-May 2020**

# CERTIFICATE

This is to certify that the work titled '**COMPOSITE STRATEGY FOR ENHANCING SALES OF ELECTRIC VEHICLES**' as part of the final year Major Research Project submitted by Jatin Achint in the 4th Semester of MBA, Delhi School of Management, Delhi Technological University during January-May 2020 was conducted under my guidance and supervision.

This work is his original work to the best of my knowledge and has not been submitted anywhere else for the award of any credits/ degree whatsoever.

The project is submitted to Delhi School of Management, Delhi Technological University in partial fulfillment of the requirement for the award of the degree of Master of Business Administration.

Prof. Rajan Yadav  
Delhi School of Management  
Delhi Technological University

Prof. P.K. Suri  
Delhi School of Management  
Delhi Technological University

# DECLARATION

I hereby declare that the work titled '**COMPOSITE STRATEGY FOR ENHANCING SALES OF ELECTRIC VEHICLES**' as part of the final year Major Research Project submitted by me in the 4 th Semester in MBA, Delhi School of Management, Delhi Technological University, during January-May 2020 under the guidance of Prof. P.K. Suri is my original work and has not been submitted anywhere else.

The report has been written by me in my own words and not copied from elsewhere. Anything that appears in this report which is not my original work has been duly and appropriately referred/ cited/ acknowledged.

Jatin Achint  
2K18/MBA/047  
MBA (Marketing and HR)

# ACKNOWLEDGMENT

It is a great pleasure for me to acknowledge the kind of help and guidance received during the research work. I would like to thank my faculty advisor Prof. P.K. Suri, who helped me to take up the topic '**COMPOSITE STRATEGY FOR ENHANCING SALES OF ELECTRIC VEHICLES**' and guided me to complete this project properly. The project provided me with an excellent opportunity to explore the areas of Economics and Analytics.

I am highly indebted to Delhi School of Management, Delhi Technological University for giving me an opportunity to work on this project. Lastly, I would like to express my gratitude to all the honorable faculty members for sharing their experience and expertise on this Project. I have put all my efforts to ensure that the project is completed in the best possible manner and also ensured that the project is error-free.

Jatin Achint  
(Roll No. 2K18/MBA/047)

# ABSTRACT

Evs are significantly cleaner and more environmental friendly option instead of traditional gasoline cars. These cars are super quiet and super quiet cars are loved by the new generation buyers. There is criticism that metal parts of EVs are not totally environmental friendly but there will be no problem if there is a proper way of disposing them.

Research, innovation and technology helps in growth of economy in some way or other. The demand of a constant reliable energy source for electric vehicles will help in growth of renewable source of energy, like solar and wind.

With all this there will be need for proper marketing strategies to streamline the sales of EVs in the market. This research will help in modelling the proper strategies needed to penetrate the market as early possible. Because only having the qualities will not make the product sale in market, communicating these qualities are needed to be communicated to the people.

The ground for EVs is still needed to be created, which will require help from all the different authorities like marketers, manufacturers, government and obviously the people. The selling of EVs will not be an easy deal to crack because of the high initial cost which matters a lot to customers. Taking in account all the variables, benefactors and malefactors of EVs this research will try to bring out the best possible ways to help EVs sales in market.

# CONTENTS

	<i>Page No.</i>
<b>Certificate.....</b>	<b>i</b>
<b>Declaration.....</b>	<b>ii</b>
<b>Acknowledgement.....</b>	<b>iii</b>
<b>Abstract.....</b>	<b>iv</b>
<b>Table of Contents.....</b>	<b>v</b>
<b>Table of Figures.....</b>	<b>vi</b>
<b>Chapter 1 Introduction.....</b>	<b>1-8</b>
1.0 Background.....	3
1.1 Motivation.....	4
1.2 Need of the Study.....	5
1.3 Statement of Problem.....	6
1.4 Objectives of the Study.....	7
1.5 Scope of the study.....	8
1.6 Concluding Remarks.....	8
<b>Chapter 2 Review of Literature.....</b>	<b>9-14</b>
2.0 Introduction.....	9
2.1 Related Documents Analysis.....	9
2.2 Concluding Remarks.....	14
<b>Chapter 3 Research Methodology and Approaches.....</b>	<b>15-26</b>
3.0 Introduction.....	15
3.1 Factors influencing customers intuition.....	15
3.2 Types of Usable Strategies.....	18
3.3 Energy Storage Barriers in Emerging EV markets .....	24
3.4 Concluding Remarks.....	26
<b>Chapter 4 Data Analysis.....</b>	<b>27-33</b>
4.0 Introduction.....	27
4.1 Effect of GDP PER CAPITA on sales of EV.....	28
4.2 Analysis of Cost of Charging Infrastructure .....	32
4.3 Analysis of Attitude of people towards acceptability of EVs.....	33
4.4 Concluding Remarks.....	36
<b>Chapter 5 Conclusion and Recommendations.....</b>	<b>37-40</b>
5.0 Introduction.....	37
5.1 Conclusion & Recommendations.....	37
5.2 Limitations & Future Work.....	40
<b>References.....</b>	<b>41</b>

## Table Of Figures

<b>Fig.No.</b>	<b>Particulars</b>	<b>Page No.</b>
Fig. 1	CO2 emissions	18
Fig. 2	GDP Per Capita	24
Fig. 3	Tableau Sheet	25
Fig. 4	SPSS Sheet	26
Fig. 5	SPSS Results sheet	27
Fig. 6	Charger Cost Analysis Chart	28

# Chapter 1

## Introduction

The transition from Internal Combustion Engine Vehicles to Electric Vehicles can be the one prime transition of many which we have to take for our environment. Rising temperature, global warming are the only gifts which mankind has delivered to nature in its history of a thousands of years. Now, in 2020 this is evident and proven in various researches that these “gifts” are going to affect mankind the most in many ways. For instance, rising sea level and the revelations that it is going to affect coastal areas.

The electric vehicles can be seen as more of a mandatory development for mankind and nature now. EVs are the prime substitute for traditional one's which can help in reduction of local pollution and greenhouse emissions as well.

This is not a lesser known fact in 2020 that recent developments in the field of EV are a breakthrough and these vehicles will be the future. However, this benefit will come at a little bit higher costs to the owner in terms of price, loading capacity, speed and acceleration. Driving Range, Maintenance charges and availability of charging infrastructure are the other major challenges that are directly connected with EVs.

Charging Infrastructure can affect the usability of these vehicles which in turn leads to sales of the EVs which further can help in reduction of price of EVs as market gains Economies of scale. Every step in this mission is as important and mandatory.

Premium products are a hard sell but they still stand a chance with some skillful marketing. EVs can be also called in the category of premium products, but this time the product is backed with lenient government policies which provide an absolute advantage to the sellers and buyers.

Diffusion of EVs in the society will require marketing strategies, concern towards nature and environment, government policies all together in a composite form. This paper will try to outline this composite strategy for success of EV's sales in market of India and similar markets.



With all this there will be need for proper marketing strategies to streamline the sales of EVs in the market. This research will help in modelling the proper strategies needed to penetrate the market as early possible.

Only having the qualities will not make the product sale in market, communicating these qualities are needed to be communicated to the people. The ground for EVs is still needed to be created, which will require help from all the different authorities like marketers, manufacturers, government and obviously the people.

The selling of EVs will not be an easy deal to crack because of the high initial cost which matters a lot to customers. Taking in account all the variables, benefactors and malefactors of EVs this research will try to bring out the best possible ways to help EVs sales in market.

# 1.0 Background

The present Research on “**Composite Strategy for enhancing sales of EVs**”

is done as a part Major Research Project in the final semester (IV) of MBA.

Electric Vehicles will be the next disruptive force in market for all kinds of transportation, innovation & technology. EVs have enough potential to revolutionize the method of usage of energy in our daily lives. These are one stop solution to the conventional ICE vehicles and the negative environmental effects of those cars.

EVs have proven to be much more beneficial to the society. These vehicles have also created the need in the world to improve the methods of usage and generation of electricity. The need of the hour is to make a more sustained developmental model for our environment and society as a whole.

Evs are a mandatory development in the now because they come with loads of benefits. The efficiency of engines of these vehicles had been successfully made them stand out from all other groups of engines. EVs are 75% efficient in converting input energy into output energy, i.e, kinetic energy. On contrary ICE vehicle can only give 25% of efficiency which is significantly less as compared to EVs.

EVs have less parts to pass energy through, hence they undergo less energy conversion. The most interesting part is the brakes of electric car which do not function like the brakes of gasoline vehicles. EVs have regenerative braking systems installed within them which allow the battery to charge more while pulling the brakes.

“Instead of using a brake pad that converts friction into heat, electric cars run on a generator that helps to recover some wasted energy back into the battery.” The other important reason to bring electric cars in the market is the increased greenhouse gas emissions which furthermore influences global warming. To combat the situation this development was important and mandatory as also mentioned before. The urban areas will see greatest impact when carbon emissions will reduce because millions of cars are being drove in these areas. For future we must be focusing towards 100% renewable energy, because that’s how innovation works.

## 1.1 Motivation

EVs are seen as the future of automobile industry and there is no evidence needed for this now. This is a new product for the industry to sell, manufacturers to manufacture and marketers to market. There is need for important insights which can describe us what customers need and want. The knowledge of customer's requirement is the first step to marketing and we need more of it.

Indian market needs good strategies to make these vehicles sellable because of the high cost and less per capita income of population. We cannot rely on premium customers only because they are present in less number in India. Indian consumers rely on economical vehicles rather than quality made vehicles because of high costing.

We are in dire need of adapting EVs now or otherwise we will be left behind in innovation which will lead to long term losses. So, India needs a composite strategy to sell EVs where manufacturers, government and people will be working hand in hand.

The main reason behind composite strategy is the cost of EVs, EVs are costly attempt, and if manufacturers have to work alone, they will run out of cash which will result in failure of a whole system. If consumers themselves move to EVs, then they will not be able to incur the cost. Hence, the government must also work in conjunction to all of this. This marks the need for a strategy where all these 3 authorities work together and benefit each other which will in result benefit the environment and people both.

## **1.2 Need of the Study**

EVs which were introduced in the Global market a time ago. Now many countries are actively working towards changing their infrastructure. Now when most of the countries are setting goals for EV adoption and many of them are falling short now is the time government to step in and ease the norms for EVs so that people can go for the FAME incentives. We need improvements in EV's over the predecessors and electric driving range. Cost being the main game player in India. So what should the government come up with? This paper reviews important factors which will play a part in adoption of EVs in India. Several important gaps in knowledge are identified. First there is mixed evidence of the effectiveness of government incentives because still people are not ready to pay for so much instead moving towards ICE vehicles. Second, it is not that people are reluctant to wait they have showed good signs but the actual-to-action gap is there.

## **1.3 Problem Statement**

Automobile sector is undergoing a transition phase in the world and soon India will be on the same page. India is having sixth largest market of automobiles around the world and the rate with it is increasing is unstoppable. Many of the developed countries have successfully adopted EVs and the world is following the suite keeping in account the benefits. India will be meeting the same situation but with different challenges. So, we need strategies to tackle these challenges & to help and persuade Indian consumers to buy EVs and make EVs a success in India.

## **1.4 Objectives of the Study**

To study and discover factors that depict the positive behavior of consumers towards the EVs and, hence, to device best methods for the marketing of EVs in the market which will help in growth of sales in India.

To make recommendations for the government to help the customers, in adoption of EVs and manufacturers by taking in account the environmental benefits.

To carve a strategy out of these factors so that customer's intention towards buying of EVs increases and they see it as a mandatory development regardless of the negative factors.

To choose the target market and exploring the new markets.

## **1.5 Scope of the study**

Electric vehicles (EVs) were recently reintroduced to the global car market. Plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs), collectively referred to as EVs, reduce or entirely negate gasoline or diesel use in the vehicle itself through integration with the electric grid. EVs have re-emerged for a variety of reasons –

- Including improvements in battery technology and
- Heightened vehicle efficiency and
- air quality standards.

EVs are a potentially important technology to help reduce

- greenhouse gas emissions,
- local air pollution,
- and vehicular noise.

## **1.6 Concluding Remarks**

This study reviews literatures about the key factors which can help in increasing the acceptability of the EVs and how different authorities can play their part in building the environment for EVs. Buyers, manufacturers, marketers, influencers are the prime players who can affect the acceptance in apposite way.

The purpose of this is to summarise knowledge and identify gaps in understanding related to EV uptake with the purpose of informing policy-makers and researchers.

# Chapter 2

## Review of Literature

### 2.0 Introduction

This section discusses about the related work that has been done in the area of Electric Vehicles and attitude of consumers towards them. Many corporates has already devised the technique to determine the perception of customers towards the EVs and are successfully calculating it. This analysis will help us in getting the knowledge about the factors which are a major concern for our market. These factors will help to create a new strategy and improve the current situation by the help of indicators like the intuition level or positive attitude.

This analysis proves to be very useful for creating marketing strategy and in new product development. This analysis will also help in determining the steps and initiatives which are need ed to be taken up by government for helping the manufacturers, government and environment.

### 2.1 Related Documents Analyzed

#### 1. Internal factors affecting EV adoption

Author: Carley, Krause, Lane & Graham, 2013

The literature identifies the following vehicle properties as those that have the greatest effect on EV adoption: vehicle ownership costs, driving range, and charging time. The relatively high price of EVs, battery costs, limited driving range, and potentially long charging time requirements are major impediments to EV adoption.



## **2. Impact of relative fuel prices on EV ownership**

Author: Al-Alawi & Bradley, 2013

There is growing literature that looks at fuel prices on EV ownership costs but there is less study of its effect on actual uptake. Simulation studies show that higher gasoline and diesel prices results relatively higher fuel cost savings for EVs compared to ICEVs and HEVs show that in the U.S., where petroleum based fuel prices are relatively low, the comparative fuel cost advantage of any EV is going to be lower than in Germany, where petroleum based fuel prices tend to be relatively high. Yet even in regions with high petroleum fuel prices, the relative cost of electricity can still be a challenge. There is growing literature that looks at the impact of relative fuel prices on EV ownership costs though there is little study of its effect on actual uptake. Simulation studies show that higher gasoline and diesel prices render relatively higher fuel cost savings for EVs compared to ICEVs and HEVs.

## **3. Consumer characteristics of an EV oriented**

Author: Carley et al., 2013

Studies identify a number of consumer characteristics that potentially affect the likelihood that a person will purchase an EV, where common indicators include: education level, income, number of cars owned, type of cars owned, love towards environment, and technological love. The literature, however, is mixed on which of these characteristics matter most and sometimes even differs on the sign of the effect. Several studies found that having a higher level of education make persons more likely to purchase an EV or be “EV-oriented”.

## **4. Charging networks & EV adoption**

Author: Bakker, Maat, & Wee, 2014

Due to limited driving range, the presence of adequate charging infrastructure that is capable of meeting EV users' mobility needs is found to be critically important to EV adoption. This relationship is often referred to as the “chicken-and-egg” conundrum where limited infrastructure is a barrier to EV adoption yet investment in charging networks depends on the number of EVs on the road. Due to limited driving range, the presence of adequate

charging infrastructure that is capable of meeting EV users' mobility needs is found to be critically important to EV adoption.

### **5. Affects to uptake EVs**

Author: Eppstein, Grover, Marshall, & Rizzo, 2011

Public visibility of EVs, relating to peer and network effects, technology acceptance and comfort levels, affects the uptake of EVs. In a survey of new vehicle buyers in San Diego, California, that positive interest in HEVs and EVs is based on association of these vehicles with "intelligence, responsibility, and support of the environment and nation". The stereotype is, however, evolving from a more negative to positive view – where greater contact with EV drivers helps to reinforce this evolution. Public visibility of EVs, relating to peer and network effects, technology acceptance and comfort levels, affects the uptake of EVs.

### **6. Government Incentives for EVs**

Author: Langbroek, Franklin, & Susilo, 2016

The principal financial incentive employed by governments is tax incentives on the purchase of an EV. Nonfinancial incentives include benefits like access to high occupancy vehicle lanes, free or preferred parking. Understanding whether incentives create additional EV adoption is important to assess the effective use of public funds and resources. In this case, effectiveness is defined by whether the policy leads to EV uptake beyond what would have occurred without the intervention. If the policy does not lead to additional EV uptake, public incentives are solely a redistribution of wealth or benefits.

### **7. The importance of standardisation of charging infrastructure**

Author: Gass, Schidt, & Schmid, 2014

Studies suggest that it may be an appropriate role for government to support EV infrastructure buildup as a public good. Given finding that the number of charging stations (normalised per capita) is one of the few significant predictors of a country's EV market share in 2012, the

authors suggest that supporting charging infrastructure could be the most critical policy to support additional EV adoption.

## **8. Raising awareness**

Author: Lane and Potter

Survey work shows that consumers are often misinformed regarding vehicle purchases. Found in a study of U.K. consumers that people often lack knowledge regarding vehicle characteristics, particularly related to fuel usage. They found that consumers have economic concerns, and they do not know about actual car cost. While consumers may know more about fuel costs, taxes, and insurance, issues of depreciation and government incentives for cleaner cars are not well understood. Therefore, providing consumers with the correct information or educating them on the differences between EVs and ICEVs can increase consumers' willingness to purchase EVs.

## **9. Why people want to buy electric vehicle: An empirical study in first-tier cities of China**

Author: Boqiang Lin & Wei Wu

The research paper explores the major factors which hugely impact the purchasing intention of the EVs of the people with help of surveys. The model accounts the demographic characteristics, and attitude factor of consumers. The survey was conducted in Beijing, Shanghai, Guangzhou, Shenzhen as they are the largest cities of China. Based on the data, the paper explores the public's intention based on the many influencing factors. The results indicated that factors such as external network, price acceptance, subsidies by government, performance of vehicle and demographic factors such as gender, age and marital status have good significance & impact on customer's willingness to purchase electric vehicles.

## **10.The influence of financial incentives and other socioeconomic factors on electric vehicle adoption**

Author: William Sierzchula, Sjoerd Bakker, Kees Maat, Bertvan Wee

Evs are the innovation with huge potential to lower the emissions of greenhouse gas and they will help in decreasing and diminishing the causes of climate change.The countries with less GDP per capita income are failing as the cost of EVs is high. This papers estimates that main factor which can help the consumers is policies of the government. This paper seeks to address the relationship of one such policy instrument(financial incentives to consumers) to adoption of vehicles.

The researchers used the multiple regression analysis to examine the relationship between the variables and 30 countries and their national electric vehicle market share for the year 2012. The model indicated financial incentives, infrastructure ofcharging, and presence of local production facilities to have high significance and positive correlation to country's electric vehicle market share.

Results suggest that of those factors, charging infrastructure was most strongly related to electric vehicle adoption. However, descriptive analysis suggests that neither financial incentive s nor charging infrastructure ensure high electric vehicleadoption rates.

## **11. Marketing of the Premium Product**

Author: John A. Quelch

The paper highlights the methods which should be taken up to market premium products successfully. The products which use high quality parts can be the one having the best performance as well. The writer has mentioned different rules to be applied according to the products. The examples reflect the good marketing and the bad marketing both.

## **12.The Five Simple Rules of Green Marketing**

Author: Jacquelyn A. Ottman

The paper highlights the 5 major rules for making a new product which comes with a definition of environmental saver or ecofriendly. The paper describes sustainable design as a long living product in the market and non substitutable. This can be an opportunity to strength a brand as well. But the writer makes clear that the right message is evenly more important or their can be failure in the handsof manufacturers. The marketer must know what is important for customers, the product must make feel the customers empowered and that they are doing something important.

## **2.2 Concluding Remarks**

The major studies and researches done on the EVs are taken into consideration for performing a deep analysis and major developments in the field. Major factors studied are as follows:

- Environmental Impact
- Government Incentives
- Fuel Cost and comparison
- Marketing of premium products
- Performance of vehicle
- Charging Infrastructure, etc.

## **Chapter 3**

### **Research Discussion and Approaches**

#### **3.0 Introduction**

According to findings of Boqiang Lin & Wei Wu there could be a number of factors belonging to consumers attitude which can influence purchasing scenario of EV. These findings could provide recommendations for the policy makers and industry to plan strategies.

Environmental implications of ICE vehicles are a gigantic motivation for adopting EVs in small and big cities. There are cities in which air quality is in seriously worrying condition and residents in these cities are more intended towards purchase of an Electric Vehicle.

#### **3.1 Factors influencing customers Intuition**

For promotion of EVs the government can provide subsidies according to the pollution level of the cities, i.e. more polluted gets more subsidies. More resources of these subsidies are to be provided to higher polluted cities. The automakers must also consider these polluted cities as the prime market and must also look at penetrating these markets.

The price of EVs is now also in the range which can be accepted by the customers who want to buy mid segment cars. The acceptance rate can be much higher than before because the price has always been an important measure to motivate the people to buy purchasing EVs.

These all factors if kept constant can propose a conclusion that EV can perform in the market competition. But, the subsidies will play a decisive role in the future. They should last for long time otherwise the sales could decline as the issue of price is sensitive in this segment.

Government subsidies will play an essential role in increasing penetration rate of EVs. The major problem is the Government of China is providing subsidies and people still disagree that these are not enough.

Evs are the mandatory development for pollution problems thriving in the urban area. These subsidies have a positive correlation on attitude, acceptability & purchasing of EVs. Many experts have warned about ramifications on public finance. In this case positive outweighs the negative and these subsidies are worthif government wants to address this problem.

Feedback also certifies positive behaviour that more is the EVs share in market, more will be growth in sales of EVs. Government policy designed appropriately should consider EV License plate, EV priority in heavy traffic periods. All should be done to prioritize EVs and increase exposure.

Vehicle performance has a huge significance on the public's intuition to purchase EVs. According to the survey done public has a neutral thinking about the EVs performance, which clearly indicates that public opinion is still of sticking with gasoline vehicles in terms of performance. On the same lines, usage cost of EVs, which are lesser then gasoline vehicles, is not able to attract customers and has very little influence. According to evaluation of public the cost of EVs is equal to cost of gasoline vehicles.

On contrary EVs has better accelerate performance and usage cost (electricity is having less cost than gasoline). Less Experience of EVs may be the prime reason the public is undervaluing the overall performance because they do not know real performance.

Researchers has pointed out many times that consumers do not know how to calculate real usage cost of EVs. These results indicate that marketers and manufacturers must enhance the sales strategy by educating the customers and giving specialized knowledge of the sales.

For helping the charging infrastructure private underground garages can install battery chargers of low range. According to the survey done with different population groups female, married, younger people have showed high intuition to purchase EVs.

Marketers can focus on the particular population and create strategy accordingly because these groups have different wants and needs. For example, if the results showed that females show more interest in buying EVs, then the manufacturer canprovide a priority vehicle which is preferred for female.

William Sierchula and his coauthors in their research paper explored the significant relationship which can exist between financial incentives by government and other social and economic factors which help in EV adoption.

Significance of these factors are as signified below:

Presence of local EV manufacturing- Positive

Number of charging stations- Positive

Financial Incentives- Positive

This paper also suggests that these factors are highly significant in prediction of rate of adoption of Electric Vehicles in the countries they studied. Charging infrastructure is the best of the predictors in market share of EVs in the country.

The EVs according to their higher cost and good quality can be categorised as premium products. Buying this product for a low income and middle income group is much difficult. But if the government incentives are taken into account the consumers can change their choice.



## 3.2 Types of Strategies

Author John A. Quelch in his writing has given several recommendations to introduce the premium product in the market which can be applied in this case also. Prior to this Toyota has worked on the same strategy to define EVs as a premium product.

John A Quelch **firstly** recommended that introduction of a premium version of mainstream brand is always cheaper than launching a new brand. Premium entry can have implications and can make customers rethink about the quality as it is different franchise. These advantages come with a lot of disadvantages as well.

Some of the disadvantages are:

1. Increasing the periphery of brand can dissolve the clarity of its positioning in a huge market.
2. Higher price of the product must be advertised and justified or premium entry can distract from the quality of mainstream products. For example General Electrics had a faceoff with a similar problem during the introduction of PermaTuf tub liner.

**Second** recommendation of John A. Quelch is to Trade Up Loyal Customer Base Premium segment can also be penetrated by introducing this product to existing loyal customer base which are already satisfied with quality of products.

Harley Davidson wanted to defend its highpriced motorcycles. They did a mistake of considering premium market as a different market. However, HD got its lesson and discovered the size of premium segment expanded from consumers trading up from smaller motorcycles. Customers asked for similar features (like electric ignition rather than kick starting) that they used in their smaller bikes. In the HD case features and performance outperformed brand name and determined the controller of premium segment.

**Third** recommendation for the companies and policy makers is “Changing definition of “premium” for consumers” by upgradation in image of the mainstream brand can help in doing so. All the customers have certain criteria for measuring the “premiumness” of the products and brand, marketers can try to change this criteria by upgrade program.

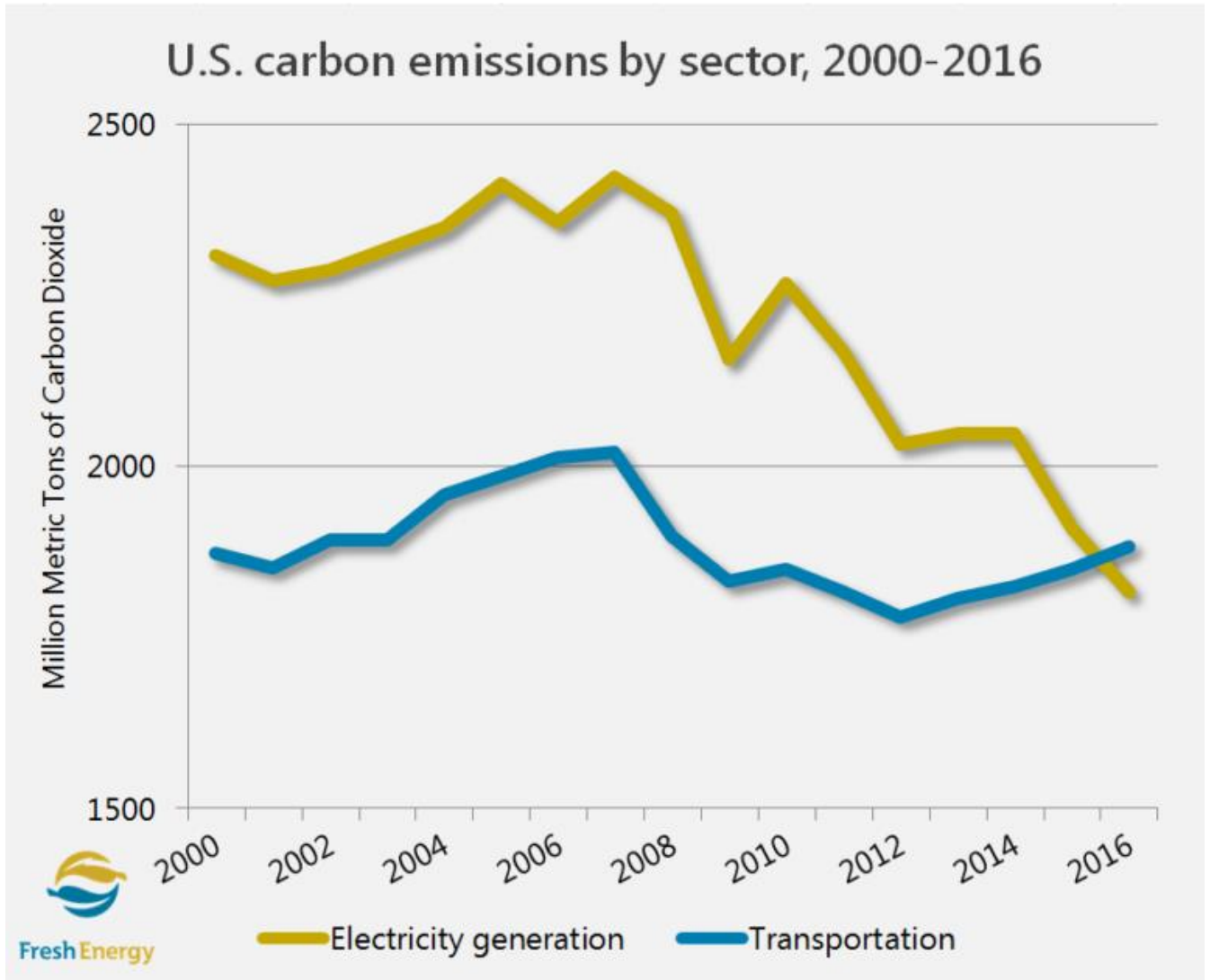
In his research paper **The Five Simple Rules of Green Marketing** author Jacquelyn A. Ottman mentions golden rules to market the products in different environments. Marketing refers to make the product more sellable by focusing on a particular population or group of people.

First rule which is relevant and significant for our study is, the consumer must be feeling empowered with a new technology. The buyer must feel that they are going to make a difference by buying the product. Empowerment of customers with a better product and with a product that can make a difference is the primary reason to buy green products.

The impact on the health of planet can be one of the main highlight for the buyer in this case. According to Andrew Twite from freshenergy.org the exhaust gases from don't just stink they can also kill. Pollution spread from cars, buses. Trucks has caused serious problems to public's health, animal's health most importantly to our climate. It is confirmed that transportation sector is emitting more CO<sub>2</sub> than electricity generation. These emissions are causing 53000 premature deaths every year.

Electric vehicles have fortunately no emissions or less emission's in case of hybrid vehicles. Economies are also having a priority shift towards clean electricity where carbon emissions are lower to generate electricity. When we will shift to electric cars the carbon emissions will get reduced. It will help in changing the quality of life for all which is right now saddled up and burdened with air pollution.

In 2016, for the first time, there were more carbon emissions from the transportation sector than from electricity generation nationally, as shown in the graph below (data source: [U.S. Energy Information Administration](#)).



**Fig. 1: CO2 Emissions**

*Source: Taken from own Twitter account*

Electric vehicles present a tremendous opportunity for carbon reduction. A recent study by Dane McFarlane of the Great Plains Institute compared the total lifecycle carbon emissions of gasoline and electric vehicles in Minnesota. The results were striking: for the average Minnesotan, switching to an electric vehicle reduces carbon emissions by over 50 percent. And if the electric car is powered by Xcel Energy—the nation leader in wind generation—carbon emissions fall by two-thirds. Further, an electric vehicle powered by renewable energy reduces carbon emissions by 95 percent!

Second rule is, the customer must have a highly positive feeling of quality of the product and the claims which are made by the company.

Third rule is to, Reassure the Buyer, every claim made by the seller must be believable and there should be proof available. Customer must believe that the product is performing the job as claimed by the company. Environmental implication is not enough motivation to forgo a quality product. And eventually there is a proven truth that bad performing products wind up in the trash bin only which is again worst for environment.

Fourth Rule is, Considerable pricing as per the product. The makers can charge more for a product due to economies of scale and use of higher quality material. According to the case, one must make sure that customers can pay for this premium product. Customers can pay premium for environment friendly product and they sometimes prefer these products but it should feel worth it. Development of a target audience and product specification is also important because many consumers cannot afford premiums.

Prime example, is Marketing appeal of Toyota Prius.

It is the most successful environment friendly product in the world.

#### Sedan and all featured

Attractive styling, higher fuel efficiency, hybrid engine which makes it possible to drive for long distance range

#### Quiet Ride

A featured dashboard which lets know which engine is working.

Introduction of car with advertisements focused on better superior performance, and supplemental advertisements focused on environmental benefits. It was reported that some customers bought the car to let everyone know that they are environmental astute. And some customers bought the car “because it makes a statement about me”.

Putting the rules to work for our electric vehicles:

To start capitalizing on the many market opportunities represented by sustainability, considering the following:

1. Think and act holistically. It is no longer enough to focus on functional benefits alone.

*Ask:* What are we making? Product or service? Green or not? How are we making it? Who are we working with?

2. Take advantage of the opportunities that green marketing represents to engage consumers on an emotional level and thus build brand equity.

*Ask:* How can we make our passion and vision relevant and engaging, our consumers into advocates? How can we empower consumers to make a difference by providing them with education, infrastructure, events, and experiences?

3. The way you communicate will be critical to success (and will help you avoid green washing).

*Ask:* How can we ensure that our approach is viewed as authentic? As transparent?

Are all stakeholders aware of our intentions and progress? Is our vision embedded into the fabric of our company?

4. Eco-innovation represents new ways to grow top-line sales.

*Ask:* How can we inspire consumers? What technology and partners do we need to gain access to?

5. Strive for an ideal goal of zero environmental impact. Strive to eco-innovate rather than simply eco-design.

*Ask:* What would it take to achieve zero environmental impact and still meet our consumers' needs? Can we make consumers more responsible?

It's one thing to design better products and technologies. But at some point, industry's efforts will only go so far. Achieving zero environmental impact will only come about if changes in consumer behavior can be made-  
thus the genius of Toyota's dashboard and websites that engage consumers in more responsible forms of behavior.

### 3.3 Energy storage barriers in emerging EV markets

The characteristics of energy storage technologies that require improvement to succeed in the areas of long-range transport, low-cost transport and high-utilization transport are:

**Longrange transport:** Inadequate driving range, or ‘range anxiety’, is frequently reported as a key technological barrier preventing consumers from purchasing EVs. Longer EV ranges are particularly desired in the United States and India perhaps because of longer potential travel distances and less reliance on public transit than other developed regions. Over half (54%) of US consumers in a 2016 survey required a range of at least 175 miles (282 km) to consider purchasing an EV, and over a quarter (29%) required a range of 375 miles(604 km). When considering an EV that could reduce fuel costs by onethird, 52% of respondents were unwilling to spend more than US\$5,000 above theprice of a petrol- (gasoline)-powered vehicle, and 29% would not spend above a premium of US\$1,000.

Recent forecasts predict that the cost of Li-ion battery packs will fall to near 70 US\$ kWh by 2030 or 2040 as manufacturing efficiency is further improved.

If 2017 EV prices are adjusted to reflect this value, three models (Chevrolet Bolt, Hyundai Ioniq electric and Tesla Model 3) appear to passthe 50% US consumer requirement threshold . However, EVs with these adjusted prices would remain far short of meeting the requisites of nearly 30% of US consumers, and probably many other consumers in highly automobile-dependent countries. Even if energy storage costs are removed from the vehicle prices, none of the current EV models would provide a driving range that 30% of US consumers would be willing to pay for. Therefore, substantially improving EVranges without increasing cost seems to be the only way to satisfy the long-range transportation market.

**Lowcost transport.** The cost of EVs, as opposed to their range, is likely to be the primary concern for a large and increasing percentage of future vehicle owners. US consumers were willing to pay an additional 21 US\$ per additional kilometre of range (21 US\$ km), whereas consumers in emerging countries (China, India, Brazil and Indonesia) were only willing to pay an average of 8.4 US\$ km. The negative coefficient for emerging countries was, on average, significantly higher than that of the United States. China was the one exception, with a negative value indicating that a higher price surprisingly increased the probability of a vehicle purchase. Nevertheless, high Chinese sales figures for cheaper and smaller low-speed EVs, including two wheelers and three wheelers, versus those for conventional EVs (over 200 million versus 0.6 million in total as of 2016) indicate the high market desire for lowcost transportation in China alongside India, Brazil and Indonesia. EVs available in emerging markets such as China have a similar price premium to the developed countries. The low cost transportation market, which is expected to grow quickly as emerging countries continue to industrialize, is thus underserved by current Li-ion-powered EVs.

**High-utilization transport.** Vehicles that experience higher utilization, that is, the percentage of time they are in operation than consumer vehicles are a considerable contributor to climate change and poor air quality. For instance, road freight vehicles accounted for about a third of carbon dioxide emissions from the global transportation industry in 2015, and this share is increasing in industrialized countries as passenger vehicles become more fuel efficient.

Therefore, the unique challenges of transitioning to high utilization EVs for public transportation and goods transportation must be addressed. High utilization has important implications for the requirements of the energy storage technology used in EVs. First, the capability for fast charging (for example, less than an hour) becomes a more important consideration, as the time required to charge the vehicle should not disrupt the operating schedule of the vehicle. Li-ion batteries are capable of fast charging and electric buses designed for quick partial recharging at bus stops have been deployed in several countries. However, this can cause increased cell degradation and safety issues. Simultaneous fast charging of several EVs can also put excessive stress on the components of power grids, thus necessitating expensive upgrades. Therefore, an important



aspect to consider for high utilization EVs is their ability to recharge quickly while smoothly integrating with power grids.

Another key characteristic of many high utilization vehicles such as trucks, buses and trains is their larger weight relative to personal transport vehicles. Li-ion battery packs must be proportionally scaled to larger sizes for these vehicles to travel an equivalent distance. But the lower surface-to-volume ratios of larger battery packs mean that heat dissipation is slower, often resulting in increased degradation and safety concerns, and the need for complex cooling techniques with expensive or toxic chemicals. Therefore, energy storage and conversion technologies that have higher specific energies and safer characteristics (for example, non-flammable materials) are particularly attractive for high-utilization EVs.

### **3.4 Concluding Remarks**

The study enlightens the factors which were responsible for acceptability in different countries like China, USA, Japan, etc. China showed positive behaviour of customers when the EVs were subsidised. Charging Infrastructure was the main reason for sale of EV. Driving Range has stood out as a main factor in countries like USA, People where people drive for a long range. For small countries like Norway, France, Japan where driving range is not a problem. Fuel cell cost and battery cost are also a major concern for the customers. On the contrary, the customers are not thinking about the maintenance cost and running cost. The customers need proper knowledge regarding that. Technology for EVs are evolving day by day making it a prime topic to study for researchers as a result of which new developments are taking place now.

# Chapter 4

## Data Analysis

### 4.0 Introduction

According to the above literatures there are some major reasons for growing market share of EV's. They are:

1. GDP per capita income
2. Cost & Features of Charging Infrastructure
3. Driving Range
4. Cost of Batteries & Battery Life
5. Government Incentives
6. Education about Environmental Implications
7. Demography
  - Women
  - Newly Married
  - Millenials
8. Awareness about the features
9. Presence of EVs in market
10. Manufacturing Locations
11. Positioning of the EVs
12. Power of communication

## 4.1 Effect of GDP Per Capita on sales of EVs

The correlation between GDP Per capita income and %age share of sales in 2018 is also positive.

The data is as in following diagrams:

- A. Data
- B. Visualized in Tableau
- C. Correlation Sheet
- D. Correlation Output on SPSS

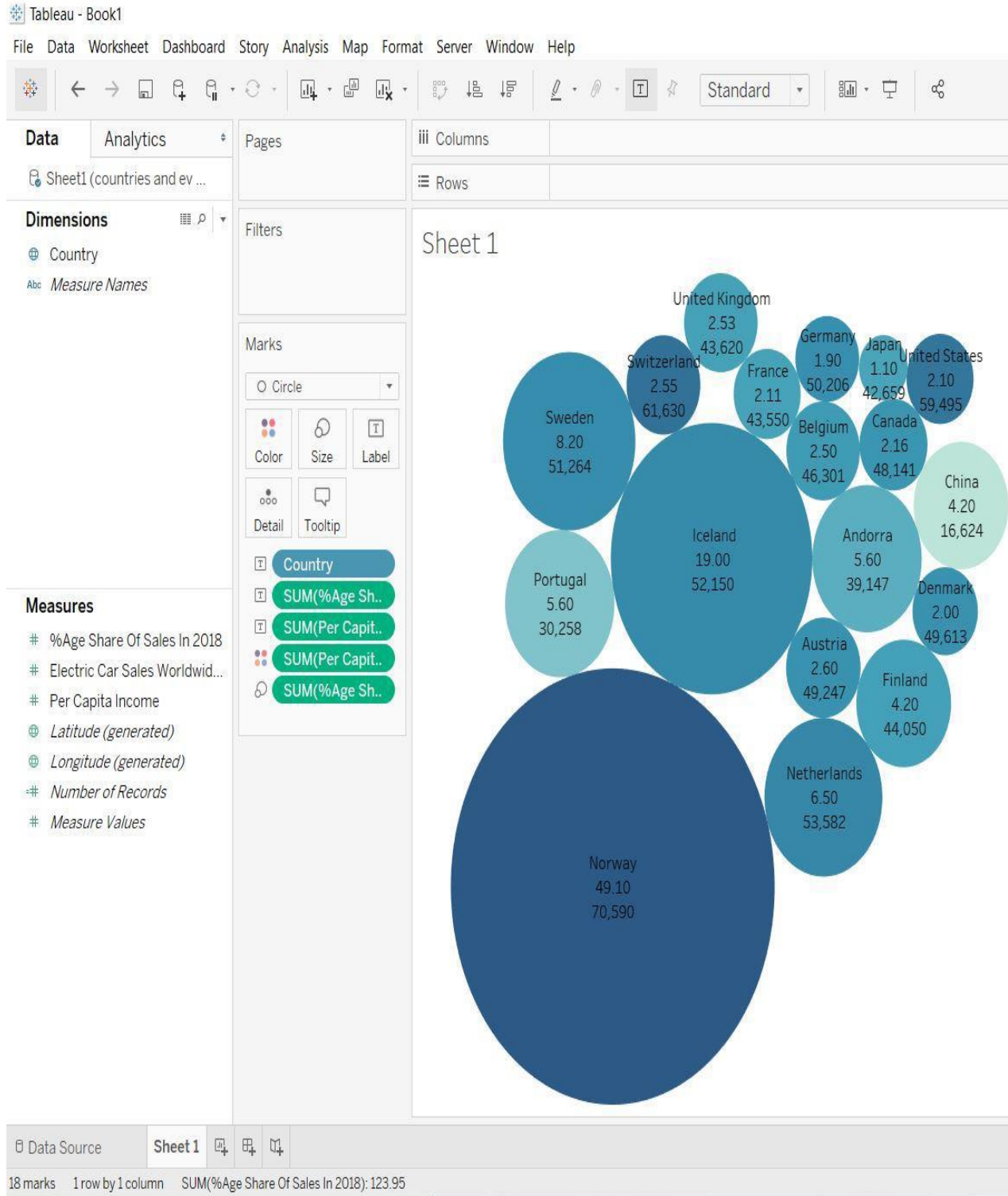
A. Data showing: Countries, GDP Per Capita, %age share of sales in 2018 in the countries.

Country	Per Capita Income	%age share of sales in 2018
<b>Japan</b>	<b>42659</b>	1.1
<b>Germany</b>	<b>50206</b>	1.9
<b>Denmark</b>	<b>49613</b>	2
<b>United States</b>	<b>59495</b>	2.1
<b>France</b>	<b>43550</b>	2.11
<b>Canada</b>	<b>48141</b>	2.16
<b>Belgium</b>	<b>46301</b>	2.5
<b>United Kingd</b>	<b>43620</b>	2.53
<b>Switzerland</b>	<b>61630</b>	2.55
<b>Austria</b>	<b>49247</b>	2.6
<b>China</b>	<b>16624</b>	4.2
<b>Finland</b>	<b>44050</b>	4.2
<b>Portugal</b>	<b>30258</b>	5.6
<b>Andorra</b>	<b>39147</b>	5.6
<b>Netherlands</b>	<b>53582</b>	6.5
<b>Sweden</b>	<b>51264</b>	8.2
<b>Iceland</b>	<b>52150</b>	19
<b>Norway</b>	<b>70590</b>	49.1

**Fig. 2:** GDP Per Capita income

*Source: statista.com*

## B. Visualized in Tableau



**Fig. 3:** Tableau sheet

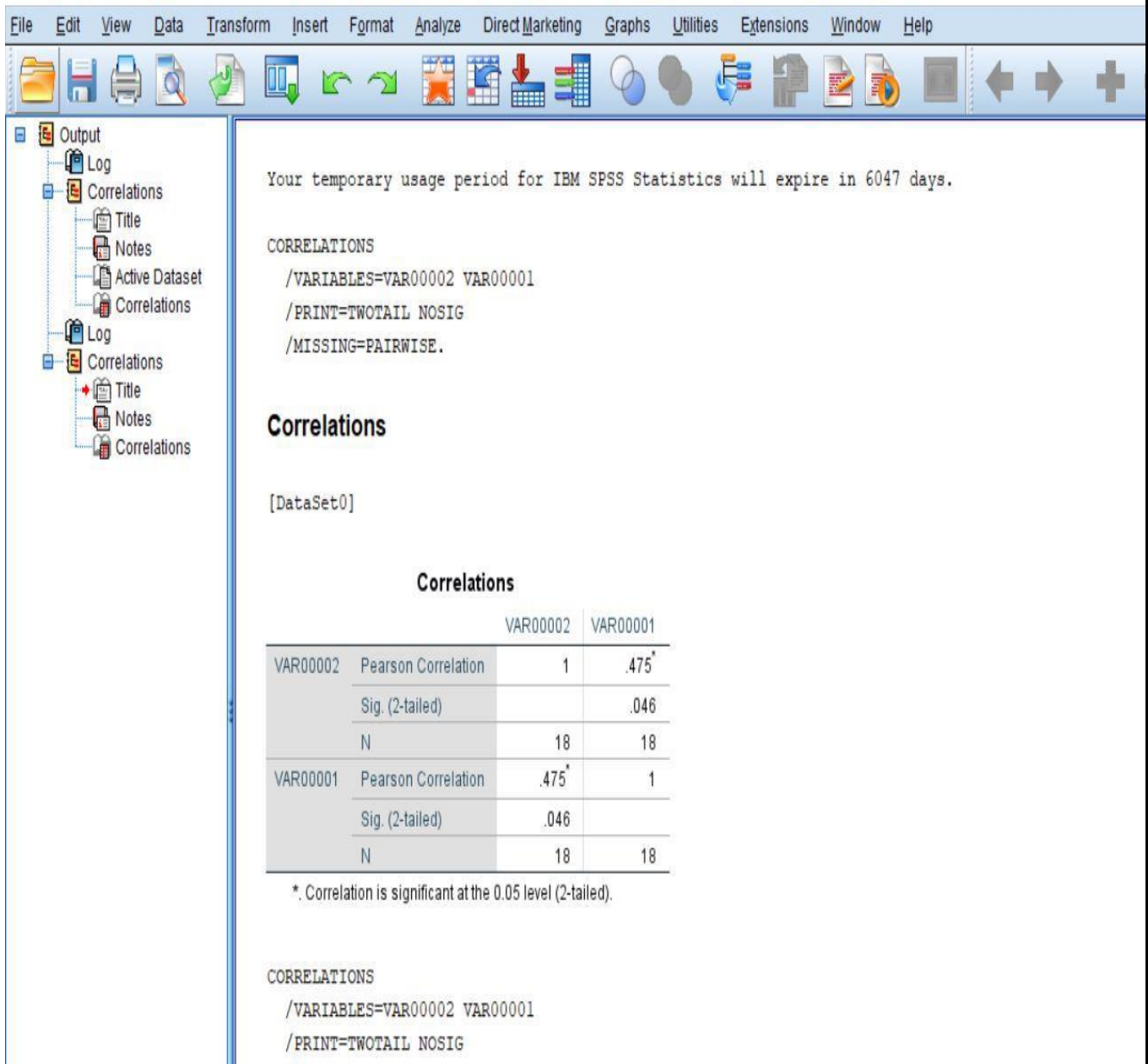
### C. Correlation Sheet

The image shows a screenshot of an SPSS spreadsheet. The menu bar includes File, Edit, View, Data, Transform, Analyze, Direct Marketing, Graphs, Utilities, Extensions, Window, and Help. The toolbar contains various icons for file operations, data manipulation, and analysis. The spreadsheet has a header row with the following columns: GDP, Percentage share of sales, and ten empty columns labeled 'var'. The data rows contain numerical values for GDP and Percentage share of sales, with the remaining columns being empty.

	GDP	Percentage share of sales	var	var	var	var	var	var	var	var	var	var
1	42659.00	1.10										
2	50206.00	1.90										
3	49613.00	2.00										
4	59495.00	2.10										
5	43550.00	2.11										
6	48141.00	2.16										
7	46301.00	2.50										
8	43620.00	2.53										
9	61630.00	2.55										
10	49247.00	2.60										
11	16624.00	4.20										
12	44050.00	4.20										
13	30258.00	5.60										
14	39147.00	5.60										
15	53582.00	6.50										
16	51264.00	8.20										
17	52150.00	19.00										
18	70590.00	49.00										
19												
20												
21												
22												
23												
24												
25												
26												

**Fig. 4: SPSS Sheet**

## D. Correlation Output on SPSS



**Fig. 5:** SPSS result sheet

According to the positive value of Pearson Correlation we get an idea that there is significant relation between GDP Per Capita and Car sales.



## 4.2 Analysis of Cost of Charging Infrastructure

Cost of Charging Infrastructure: According to GOI norms the price of 50KW charging station is estimated as (By: Nimesh Shah on [www.pluginindia.com](http://www.pluginindia.com))

Driving Range

### Cost Estimates for a Typical Public Charging Station (PCS):

The Capex and Opex of a PCS comprising of minimum infrastructure required as per the GoI notification are estimated below:

Type of Charger	Number of Chargers in PCS	Power Output	Approx Cost including GST @18%	Number of EVs that can be charged simultaneously	Maximum Power sold to EVs per day (20 hours/day assumed) kWh
<b>CAPEX</b>					
CCS	1	50 kW	14,50,000	1	1000
CHAdEMO	1	50 kW		1	1000
Type 2 AC	1	22 kW	1,25,000	1	440
Bharat DC-001	1	15 kW	2,40,000	1	300
Bharat AC-001	1	3 x 3.3 kW	70,000	3	200
Swap Station*	-	15 kW	-	-	300
New Electricity Connection (250 KVA), Transformer, Cabling (100 meters), Panels, Breakers, Energy Meter			7,50,000		
Civil Works (Flooring, Boards, Painting, Branding, Shed/Cover etc.)			2,50,000		
EVSE Management Software – Integration with Chargers and Payment Gateway			40,000		
CCTV Camera Setup			30,000		
<b>TOTAL CAPEX</b>			<b>29,55,000</b>		<b>3240</b>
<b>OPEX</b>					
Technicians (1 technician @25k/month considered for first 6 months)			1,50,000		
Site Maintenance Staff (1 personnel @15k/month throughout the year)			1,80,000		
Network Service Provider Fee			6,000		
EVSE Management Software Fee (considered as 10% of net margin on electricity charges)				Refer Table-2 on Revenue projections	
Payment Gateway Fee (1-2% of total money collected)				Pass through to customer is considered	
Land Lease Rental @50000/month**			6,00,000		
Advertising @3000/month			36,000		
<b>Total OPEX</b>			<b>9,72,000 + EVSE Software Fee in First Year</b>		
			<b>8,22,000 + EVSE Software Fee from Second Year</b>		

\*The cost of swap station is considered to be borne by the swap station technology proprietor. PCS provides space for a swap station in return of margin on sale of electricity.

\*\*Land lease rental is assumed to be low as per Delhi EV policy guidelines on providing land at bare minimum lease rentals to charging infrastructure providers.

Fig. 6: SPSS result sheet

## **4.3 Analysis of Attitude of people towards acceptability of EVs**

This questionnaire was made to understand the intention of the consumers in India and results are as following:

Consumers under age group 26-30 and 31-40 are biased towards buying the car because of technological advancement, environmental implications and good performance.

With the help of this survey we want to find out Intention of the customers towards purchasing an EV. Consumers are interested in long range vehicles and fast charging infrastructure for their vehicle as India has large area and people travel to long distances. Government incentives and price of EV has proved to be the biggest drivers of this force in India.

The questionnaire is as following:

### **1. What's your age group?**

- A.20-25
- B.26-30
- C.31-40
- D.40-50
- E.50 or above

### **2. Education Qualification**

- A. Diploma
- B. Graduation
- C. Post Graduate
- D. Professional Course

### **3. Do you think now this is the right time to act against pollution.**

- A. Yes
- B. No
- C. Maybe



**4. What can be your motivation in buying an electric vehicle?**

- A. Reduction in pollution.
- B. Technological Advancement
- C. Good Design

**5. India is the 4 highest emitter of carbon dioxide in the world, accounting for nearly 7% of Global emission in 2017. What do you think will be the situation in next 10 years? You will shift the interests of buying towards electric vehicles \_\_\_\_\_ .**

- A. Totally
- B. Partially
- C. not shift your interest

Other:

<https://docs.google.com/forms/d/1TskNqZKdspcI-YuTKdzbbWD34WOXafDDhgov8s-HEhM/edit> 2/3

**6. Driving Range: Distance covered by the car after one time full charging. There are three types of driving range options. Which one do you prefer :**

- A. 50 KM's
- B. 150 Km's
- C. 300 Km's
- D. More than 300

**7. Assume that you own an EV (Electric Vehicle) & Your Electric Vehicle is charging. How much time can you wait:**

- A. 10 Minutes
- B. 30 Minutes
- C. 2 Hours
- D. 4-6 Hours

**8. How much amount can you willing to pay for an EV (Assuming if you want to buy one)?**

- A. 5-8 Lakhs
- B. 8-11 Lakhs
- C. 11-15 Lakhs
- D. Above 15 Lakhs

**9. How many cars do you own?**

- A. 1
- B. 2
- C. 3
- D. 3 or more

**10. Will financial and nonfinancial incentives by the government can give you a reason to buy EV rather than combustion engine vehicle?**

- A. Yes
- B. No
- C. Maybe

**11. Are you willing to buy EV instead of Combustion Engine Vehicle only for the sake of ENVIRONMENT? .**

- A. Yes
- B. No
- C. Maybe

**12. Is it possible that seeing more EVs on the road may increase your awareness and interest?**

A. Yes

B. No

C. Maybe

## **4.4 Concluding Remarks**

The analysis revealed that income is directly related to the acceptability of EVs. The more is per capita income the more is the people's acceptance. The questionnaire analyzed behavior of consumers regarding different factors in India. The price of vehicle is the strongest factor which can lead to acceptability. And mostly the people who want to buy are those who already have 1 car. In totality, India can become a good market because of diverse customers which are present in high numbers.

# Chapter 5

## 5.1 Introduction

These findings could provide recommendations for the policy makers and industry to plan strategies. According to the researches and information studied, it is evident that there could be a number of factors belonging to consumer's attitude which can influence purchasing scenario of EV.

## 5.2 Conclusion & Recommendations

We reviewed literature on facts that affect EV adoption and identified several gaps in knowledge and areas for further inquiry. First, the literature on EV adoption suggests that high purchase price is a major reason EV uptake. Moreover, though many governments offer incentives to support EV uptake, there are mixed findings as to their thoughts and intentions. There is need for more studies focusing on issues like the optimal timing (for early adopters or to encourage mass adoption) and magnitude of benefits (related to the finding that small subsidies seem insignificant at the margin). EV driving range is identified as another major reason to EV adoption. Relatedly, studies suggest there is an appropriate role for government to support the development of charging infrastructure for EVs as a means of creating the public network. Though there are early findings that the presence of charging infrastructure significantly relates to rates of EV uptake, there is still an open question in regards to the direction of causality. In addition, the literature provides little guidance on how governments should best add the provision of infrastructure. For example, through public provision, public/private partnerships, financial incentives, or mandates. In addition, the literature has only begun to explore the kinds of public charging infrastructure that may be optimal and how that criteria may be developed per regional needs. The literature shows mixed evidence that consumer characteristics like income, education, and age can significantly determine whether a person will be interested in purchasing an EV. This is important because studies suggest that consumers often have misinformation regarding EVs. The survey data is the biggest limitation in interpreting the results of studies on EV uptake. The literature provides compelling evidence that there is a

substantial gap between people's stated likelihood of EV adoption and actual adoption trends. We suggest more study should be done regarding the magnitude of this "gap", with emphasis on different consumer characteristics. Now that there are several years of data on EV purchases, comparisons with survey work can start to be done.

Education about environmental implications of ICE vehicles and education about benefits of EVs to public should be one of the primary step which should be taken in this mission. The cities in which air quality is in seriously worrying condition and residents in these cities are more intended towards purchase of an Electric Vehicle.

For promotion of EVs the government can provide subsidies according to the pollution level of the cities, i.e. more polluted gets more subsidies. More resources of these subsidies are to be provided to higher polluted cities. They should last for long time otherwise the sales could decline as the issue of price is sensitive in this segment. Government policy designed appropriately should consider EV License plate, EV priority in heavy traffic periods.

The automakers must also consider these polluted cities as the prime market and must also look at penetrating these markets. Vehicle performance has a huge significance on the public's intuition to purchase EVs. EVs has better accelerate performance and usage cost (electricity is having less cost than gasoline). Less Experience of EVs may be the prime reason the public is undervaluing the overall performance because they do not know real performance.

Calculating the real usage cost of EVs is essential and communicating results to the public is important. This indicates that marketers and manufacturers must enhance the sales strategy by educating the customers and giving specialized knowledge of the sales.

Charging infrastructure plays major role sales of EVs. Presence of chargers is important for the car owner whether they are present at public stations or at home. Car manufacturers can also make home chargers for assisting the customers. Number of charging stations should be installed at priority and at the nearest places for people possible. Charging infrastructure is the best of the booster for market share growth of EVs in the country.

The EVs according to their higher cost and good quality can be categorized as premium products. Buying this product for a low income and middle income group is much difficult. But if the government incentives are taken into account the consumers can change their choice.

EVs should be introduced under the mainstream brand, this will keep clarity with positioning in market. High price should be made justified by company. The brands should look up to loyal customers for the sale. The brands must also look in upgrading their image in market as more technologically advanced and innovation driven.

As Jacquelyn A. Ottman mentioned the manufacturers should be able to make buyers feel empowered with a new technology. The effect on health of planet must be communicated to the customers and the change in quality of life (without air pollution) should also be mentioned. The manufacturers must work on building a trust in the mind of customer regarding the product.

## 5.2 Limitations & Future work

This study stated the work needed in total charging infrastructure, manufacturing capabilities, government incentives, charging infrastructure not taking into account how a heterogeneous distribution of all these factors (many in one city, few elsewhere) might influence EV adoption. Specifically because of the important role played in installing charging infrastructure, their allocation could have an important affect on a country's EV adoption rate. Therefore, suggestion is that future research must focus on the relationship between the distribution of charging infrastructure within a country and its EV adoption rate. In addition, this model found charging infrastructure and financial incentives to be powerful predictors of EV adoption rates for the countries in our sample. However, it is possible that the variables concealed other important factors. Therefore, further analysis is necessary to unpack the importance of charging infrastructure and financial incentives to determine whether they are on their own good predictors of EV adoption, or if there are other elements that also need to be present but were not included in the model. For instance, fuel price volatility may provide insight into EV adoption that is not captured through absolute fuel prices.

## REFERENCES

Zachary P. Cano, Dustin Banham, Siyu Ye, Andreas Hintennach, Jun Lu, Michael Fowler and Zhongwei Chen (2018).

*Batteries and fuel cells for emerging electric vehicle markets*

Till Gnann, Simon Funke, Niklas Jakobsson, Patrick Plötz, Frances Sprei, Anders Bennehag

*Fast charging infrastructure for electric vehicles: Today's situation and future needs*

John A. Quelch

*Marketing the premium product*

Andreas Schroeder, Thure Traber

*The economics of fast charging infrastructure for electric vehicles*

Jacquelyn A. Ottman

*The Five Simple Rules of Green Marketing*

David Diamond

*The impact of government incentives for hybrid-electric vehicles: Evidence from US states*

William Sierzchula, Sjoerd Bakker, Kees Maat, Bert van Wee

*The influence of financial incentives and other socio-economic factors on electric vehicle adoption*

Boqiang Lin, Wei Wu

*Why people want to buy electric vehicle: An empirical study in first-tier cities of China*

Michael K. Hidrue, George R. Parsons, Willett Kempton, Meryl P. Gardner

*Willingness to pay for electric vehicles and their attributes*