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Electric Vehicles: Opportunities and Challenges: With special reference to Alwar city

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Abstract
Global warming, environmental pollution, exploitation of natural resources is one the major issues world is facing today. Many important steps is been taken to address the problem worldwide and invention of electric vehicle is one of the step ahead in the path. This paper gives a general review of trends in electric vehicle history of EV, market share of EV worldwide, key advancement in the field, opportunities scope and challenges for EV. Electrification of power train set the main trend and act as driven force in the path of small electric vehicle manufacturing. The developing risk of an Earth-wide temperature boost, over the top petroleum reliance, ever expands costs in fuel; what's more, driving patterns are only a choice of reasons which have quickened the improvement of Electric Vehicles likewise. The increasing danger of global warming, dependence on fuels like petrol and diesel on gulf countries, increase in greenhouse gases, and more cost expansion on fuels and several health issues are the problem which encouraged us to think of an alternative other than traditional fuel based vehicles. Transport division assessed the emissions of greenhouse gases by 84% by 2030. Scratch advances, for example, hydrogen power device, electric vehicles and bio fills are relied upon to add to emanation decrease over the long haul. The main aim of this research is to analyse the perception of people towards E- vehicles, various challenges and opportunities for E- vehicle manufacturing companies and their role in addressing environmental issues. This work gives a point by point outline of the different advances and suitable choices as far as power quality control electronic converter topologies and vitality the board choices ideally plausible in India. Ongoing arrangements and activities taken by the Government are additionally exhibited in this paper. In this research we have used simple graphical method and factor analysis methods is used on the data collected through a self-made questionnaire.

Keywords: trends in electric vehicle, government support for EV, challenges

Introduction
Expanding dimension of air contamination in Indian urban areas has been a reason for worry for strategy producers. In excess of 25 Indian urban areas are inside the 100 most contaminated urban communities in the World. The reason of developing air contamination in urban areas is identified with an assortment of sources anyway transport division makes noteworthy commitment. It is essential the discharges from transport part are limited. The unfriendly impacts of air contamination on human wellbeing and to the economy are well known and accordingly to limit the effect on the earth, strategy producers are thinking about a few choices. Electric vehicles have been viewed as a promising innovation choice what's more, a few national governments have effectively actualized strategies to advance the innovation. Indian government is quick to advance electric vehicles as a green portability choices furthermore, is additionally considering it as a feasible answer for lessen air contamination in urban communities. All inclusive there are a few examples of overcoming adversity and best practices. For instance, China has taken to electric vehicles bigly for bikes and transports. In the UK, urban communities like London are giving motivations, for example, awards to buy new electric vehicles, exceptions from clog charges and free or diminished leaving charges for electric vehicles in numerous districts. In India, electric 3 wheelers have been incompletely effective, anyway very little dispersion of electric vehicles has occurred inside 2 wheelers, 4 wheelers and city transport armadas. Techno-monetary evaluations anyway demonstrate that electric bikes can turn out to be economically reasonable by 2020 itself and electric four wheelers can be a noteworthy innovation choice by 2030, if government gives impetuses and frameworks to charging are accessible. A solid atmosphere approach moreover propels the reason for electric vehicles. The administration is excited about advancing electric vehicles furthermore, the Minister of Power has even put a yearning objective of getting to be 100% electric by 2030. Alternate services, especially Minister of Road Transport and Highways, made a solid explanation at Society of Indian Automobile Manufactures (SIAM) yearly tradition, that has frightened the car business.. With the rapid growth in the ownership of the vehicles and the fast development of the automobile industry, exhaustion of the resources, and issues arising regarding the effects on the environment due to pollution, more attention is being started given to protect the environment and to secure our needs. The global demand for the petroleum has increased rapidly over the years which has resulted in the high oil prices and uncertainty in the market. Some new technological advancement with new sources of power is needed to confront these issues.

One of the answers to these problems the electric vehicles or EV's. An electric vehicle (EV) is a vehicle powered by an electric motor, instead of an internal combustion engine (ICE), and the motor is run using the power stored in the batteries. EV has a much longer history than most people realize. EVs were seen soon after Joseph Henry introduced the first DC-powered motor in 1830. The first known electric vehicles were a small model built by Professor Stratingh in

the Dutch town of Groningen in 1835. The first EV was built by in 1834 by Thomas Davenport in the U.S., followed by Moses Farmer, who built the first two-passenger EV in 1847. There were no rechargeable electric cells (batteries) at that time. An EV did not become a viable option until the Frenchmen Gaston Plante and Camille Faure respectively invented (1865) and improved (1881) the storage battery.

EVs are known as zero emissions vehicles (ZEVs) and are much environment friendly than gasoline- or LPG-powered vehicles. As EVs have fewer moving parts, maintenance is also minimal. With no engine there are no oil changes, tune-ups, or timing and there is no exhaust. EVs are also far more energy efficient than gasoline engines and they are very quiet in operation.

The current state of the global EV market

As more and more governments across the world are aggressively looking for ways to benefit from the ongoing EV revolution, the market opportunity in the space has grown dramatically over the years. Thanks to the push from local governments and corporates, the sector is expected to grow at a CAGR of 28.3% between 2017 and 2026, as per BIS Research.

Trends in electric Vehicle

Electric Vehicles (EVs) have been on the radar of the administration and all inclusive. As per the 2015 Global Automotive Executive Survey done by KPMG International, by 2020, short of what one of every 20 vehicles is relied upon to be furnished with charged powertrains. The module mixture and battery EVs are relied upon to catch a littler bit of the pie, trailed by energy unit electric autos that have the slightest offer. By 2020, just 0.01 percent of vehicles are required to be outfitted with power modules for example around 16,000 units for each annum.

The quantity of electric vehicles sold every year all around is developing quickly from 45,000 units in 2011 to in excess of 300,000 units in 2014. The worldwide electric vehicle total enlistments developed at a CAGR of 92 percent to achieve a sum of 665,000 electric autos on street, by 2014. The United States of America held the biggest offer, with the world's greatest armada of e-vehicles, trailed by Japan and China. Comprehensively, 320,000 electric vehicles were enrolled a year ago, of which 117,000 autos were enlisted in the United States pursued by China at 54,000. China is one of the quickest developing business sector for EVs, with 230 million e-bicycles, 83,000 electric autos, and 36,500 e-transports on street by 2014.

Indian government scope for EV

The electric and half and half vehicle industry in India, which is at an incipient stage, is gradually making open doors for car unique gear makers (OEMs), as per Frost and Sullivan. The appropriations from the Government has bolstered electric vehicle (EV) industry up until now, anyway the equivalent could have been increasingly reliable for the general market development. Be that as it may, the Indian government's arrangement to re-present motivations for electric vehicle purchasers is required to rejuvenate the market. The attack of increasingly car producers into the Indian electric and half and half vehicle industry also will finance charging foundation and enliven showcase extension. As indicated by Frost and Sullivan's new examination, 'Key evaluation of electric and mixture vehicle advertise in India', the all out electric and half and half vehicles showcase is relied upon to develop from 1,25,257 units in 2013 to 1.1 million units by 2021 at a compound yearly development rate of 31.6%. Residential and universal vehicle producers are required to dispatch in excess of 25 EV models by 2021.

This new move by the Government can be depicted as the greatest push to support offers of electric and mixture vehicles in India. Under a one of a kind and creative plan named as FAME, Government will give motivators up to Rs 1.38 lakh for each electric vehicle sold.

Association Minister of Heavy Industries and Public Enterprises, Anant Geete, propelled Faster Adoption and Manufacturing of (Hybrid and) Electric Vehicles in India (FAME) going for advancing and empowering clearance of electric and half breed vehicles.

The dispatch program of this plan was sorted out by The Department of Heavy Industry (DHI) under the Government of India, alongside the Society of Indian Automobile Manufacturers (SIAM). It was declared that the Government intends to bring 6-7 million (60-70 lakh) electric and half and half vehicles on street by 2020. For the following 5 years, the service has assessed that Rs 14,000 crore would be required to effectively execute the plan. Starting at now, Rs 795 crore has been apportioned which will be used under Phase 1, which has been again separated into two 1-year time frame: 2015-16 and 2016-17. Out of Rs 795 crore spending plan, Rs 500 crore would be used for giving motivations alone.

- Government will set up the Governing Council for Electric Vehicles
- Operate under the Ministry of Heavy Industries and Public Enterprises
- It will develop infrastructure for electric mobility - charging stations
- Council to have representatives from various Ministries – includes Road Transport and Highways, New and Renewable Energy and Power and also industry representatives.
- Promote Joint Ventures, esp. in EV battery manufacturing & technology transfers.

Electric vehicle component manufacturers

Few EV component manufacturers who are involved in the manufacture of chargers and controllers for electric vehicles were interviewed. They are also working on developing specialized battery packs and storage solutions based on the end usage of the vehicle. For instance they have separate battery recommendations for passenger rickshaws and small load autos, cabs vs private cars etc.

They mentioned that today almost all the electrical modules, motors, controllers and batteries are imported from China, while the structural components connected to the chassis such as steering, brakes, suspension, air conditioning are generally sourced locally by the auto makers.

The primary reason for this is because there is an indigenous supply chain of conventional auto component makers who can supply structural components for EV at competitive prices. On the other hand technical competency is lacking among Indian manufacturers for production of Lithium ion batteries and other electronic and electrical components in India. Chinese suppliers are at least 5 years ahead in technology, and offer products at a predatory price. Further they are incentivised by the Chinese government with tax breaks and subsidies on exports. Unless there is a huge demand, new entrants cannot achieve the economies of scale

that would be required to compete against the more established Chinese players. Further, there are no major entry barriers on import and trading of these components, so it is cheaper to import from China than to manufacture them in India. All these factors make it unattractive for the Indian auto component manufacturers to invest in domestic manufacturing, when they can actually import goods at a reasonable cost to meet the current market demand.

Take for instance the specific case of energy storage batteries used in EVs. The transition to EVs would require a battery capacity of about 400 GWh (gigawatt hours) each year, which, as per research conducted by Council on Energy, Environment and Water (CEEW), is equivalent to increasing the current global EV battery production by a factor of four, just to cater to the Indian EV market. Currently China is in the lead position followed by the US with installed capacities of 125 GWh and 35 GWh respectively. Germany is leading the EU nations and plans to have 34 GWh capacity by 2019. Currently 100% of Li-ion batteries are imported. It was for the first time in 2016 that Central Electrochemical Research Institute (CECRI), Karaikudi in Tamil Nadu, set up the first indigenous Li-ion fabrication facility that has applications in defence, solar powered devices, railways and other high end usages. EVs will create a huge demand for Li-ion batteries, and this is an ideal opportunity for the domestic auto component manufacturing industry to transition into.

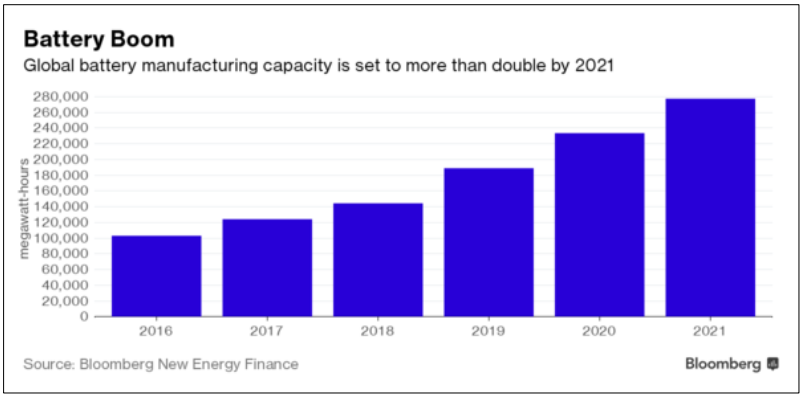

Fig 1

Manufacture of lithium-ion batteries, which are the primary source of energy used to propel electric vehicles require critical minerals such as lithium, cobalt, graphite and phosphate. The resource endowment of the most critical component i.e. Lithium, is limited to only nine countries and 95% of global lithium production comes from Argentina, Australia, Chile and China. The recent demand surge in the electric mobility market has already resulted in a two fold increase in lithium prices from $4,390 per tonne (in 2013) to $9,100 per tonne currently. It is estimated that India would require about 40,000 tonnes of lithium to manufacture EV batteries in 2030, considerably higher than the current annual global lithium production of 32,000 tonnes. To meet India's demands amid a global surge in electric vehicle demand, the entire mineral supply chain needs to be overhauled and expanded.

However, India has missed many such opportunities to be integrated in the global value chain in the past. During the early waxing phase of solar PV and electronics industries, there was a lack of suitable policy support by the government for solar cells and wafers and electronics manufacturing. This led to an ever-increasing import bill for electronics products, currently the highest after oil and gold. The annual EV battery market is expected to be around $30-55 billion and India cannot afford to fulfil the demand solely through imports. Hence there is a need to formulate policies incentivising domestic manufacturing companies to create a vibrant battery manufacturing, research and development ecosystem, and mining companies to simultaneously invest in overseas lithium mining assets.

The same view was also reflected in a recent article published in Auto News magazine, by the president of Automotive Component Manufacturers Association of India (ACMA), Mr. Rattan Kapur. He expressed cautious optimism over the government's plans to switch over from ICE vehicles to EV by 2030. Unless government policies and regulations create a conducive environment, it would be difficult for the component manufacturers to face the dual challenges of graduating from B-IV to B-VI and gear up for supporting the electric mobility wave in India. Component manufacturers also highlighted that lack of industrial standards was also compromising public safety and leading to poorly built and unstable / unfit vehicles plying the road. Last year, the GOI exempted E-rickshaws and E-carts from the regulatory process governing other motor vehicles, thereby allowing them to ply on roads anywhere in the nation.

Lack of standards leads to poor construction quality and substandard vehicles which are cheap, but at the same time is a safety hazard. According to a recent news article there were 380 deaths due to e-rickshaws, with maximum 71 deaths reported from Telangana, followed by 66 in UP, 56 in Haryana, 47 in Maharashtra and 20 in Delhi.

NITI Aayog- vision paper on mobility transformation

Indian think tank, NITI Aayog along with Rocky Mountain Institute, USA has come up with a mobility transformation concept in May 2017, wherein India intends to leapfrog from private ownership and fuel based mobility to a new mobility paradigm which is shared, connected and electric. The roadmap of such transformation from ownership based approach to user ship based approach is proposed through a three phase activities of system integration achieved through mobility as a service and interoperable transport data, scaled manufacturing achieved through new products and technology and Electric Vehicle deployment and shared infrastructure development through Mobility oriented development an vehicle grid integration.

The details are shown in Table. Further such transformation is expected to be achieved in three phases spread over a period of 15 years from 2017 to 2032.

Table 1: Road map proposed by NITI Aayog for transitioning from ownership based approach to user ship based approach

Governance	Infrastructure	Policy and incentive	Business Model	Data accessibility
To achieve Coordination among stake holders	To achieve shared infrastructure development	To achieve accelerated adoption of new mobility paradigm	To achieve cost reduction for manufacturers	To achieve system integration
Steps proposed				
a. Metropolitan Planning Authority b. Incubation centres	a. Integrated Transport Hub b. Vehicle Grid Integration c. Electric Vehicle charging stations	a. Free bates b. Zero emission vehicle credits. Mobility as a service encouragement. Fiscal and non-fiscal incentives	a. Manufacturing consortium for procurement b. Development of standards c. Bulk procurement of assembly /sub assembly level parts	a. Interoperable transport data b. Standards for sharing such data

Table 2: Phase wise implementation details

Phase I- 2017-19	Phase II- 2020-2024	Phase III- 2025-2032`
▪ Implementing phase for Solutions which are already economic and scalable and cultivating solutions for phase II which are nearly economic. ▪ Lighthouse (test) cases to be taken up	▪ Implementing solutions cultivated in Phase I ▪ Ground work by private and ▪ public sector for future and complete mobility ▪ Lighthouse (test) cases to be taken up	▪ All spectrum of mobility implemented based on learning from previous phases and lighthouse cases
Focus: on Projects and States	**Focus:** on States and region	**Focus:** on entire nation as Whole
Major Activities		
▪ Compile and share data ▪ Refine existing policies and incentives and suggest new policies ▪ Create Infra to support EV Mobility oriented development and Modal Integration	▪ Develop more policies and create shift from Government led to market led development Integrate Modes and region ▪ Increase domestic supply and improve supply chain management	▪ Phase out subsidy

Review of the Literature

"You have to match the convenience of the gasoline car in order for people to buy an electric car." – Elon Musk.

Jager, Marco & Marija (pg. 259-270) poses that the problem with internal combustion engines is not so much in their efficiency but that they burn fossil fuels whose by-products in the form of carbon monoxide and carbon dioxide are slowly destroying the ozone layer and trapping heat in the atmosphere which leads to global warming. Electric vehicles do not use fuel. Instead, they are run by an electric motor that draws its energy from batteries and fuel cells (Rasouli & Harry pg. 99-130). Since electric vehicles do not use fuel that means that they do not emit ozone altering gases and thus they help in protecting the planet. Jager, Marco & Marija (pg. 259-270) have claimed that electric vehicles tend to be very quiet as compared to gasoline or diesel-powered vehicles and thus there is reduced pollution Electric vehicles are considered to be friendlier to the environment as compared to the diesel vehicles. Many governments are even encouraging people to adopt electric vehicles (Wilson).

Need for EVs

It is a well-known fact that India ranks 3rd in the global greenhouse emissions after US and China. Hence, the air pollution level in India is also reaching an alarming state. It won't be long when Indians would fear walking on streets because of smog and the impure air full of NOx and Sulphur. The recent event in New Delhi emphasizes more on this.

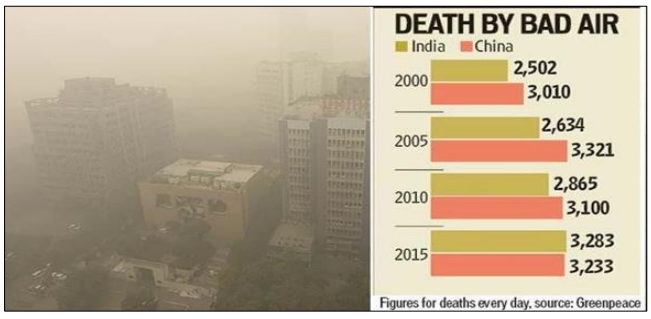

Fig 1

Thus it is quite clear that a solution to negate the dangerous AQI needs to be found. If India successfully turns 100% electric by 2030, it could save about 1 Giga Tonne of emissions. Elon Musk's revolution in the west has motivated and pumped in ideas for the Indian government to tackle the situation by switching to e-mobility.

The second argument is dependent on crude oil. India imports nearly $100 Billion of crude oil yearly. That accounts for about ₹ 700,000 Crores. That gives out an average of $330 Million per day on oil and gas. This costs India a lot and since ICE is not very efficient, a considerable amount of money is wasted due to losses in energy. Comparing this to 80% efficient traction motors looks like a sweet deal. The government is still happy with hybrid motors as it would at least initiate a paradigm shift in the automobile sector which would then be taken over by BEVs(7) in the years to come. The total imports in 2017–2030 would amount to $670 Billion if we still run on ICE till 2030.

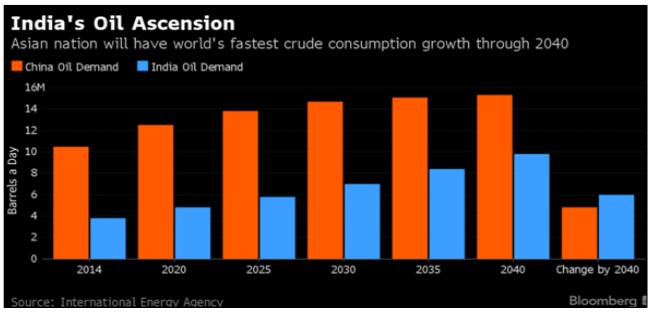

Fig 2

EVs are required in the country also because of the fact that India can help transform EV culture in countries like Iran, Afghanistan, Nepal etc, and that means cash flow for India. These states are not as potent as India to work on indigenous EV production, and this can be a plot twist.

Advantages

No Fuel, Cheaper To Maintain

Because electric cars are powered by electricity and not

gasoline, it drastically reduces the monthly spendings of car owners. According to Bloomberg, the consumption of fossil fuels by automobiles currently stands at 23 Mn barrels per day. However, with the increased popularity of EVs, the global gasoline consumption in the passenger vehicle segment will drop significantly within the next five years, as per a report by the International Energy Agency.

Although the initial cost of electric cars is quite higher than that of conventional vehicles, in the long-run, it is actually cheaper to own and maintain EVs. Ergon Energy states that the electricity needed to charge an EV is, on an average, around a third of the price of petrol per kilometre, especially in developed countries.

Similarly, a battery electric vehicle (BEV) contains fewer components than a conventional petrol/diesel car, making servicing and maintenance a lot cheaper than petrol and diesel-powered vehicles.

More Eco-Friendly, Lower Carbon Footprint

Given that the number of air pollution-related deaths have been on the rise lately, switching to electric cars, especially when it comes to public transport, could potentially reduce carbon emissions, thus slowing down climate change and global warming.

In fact, electric cars are 100% emission free as they run on electrically powered engines. Consequently, they do not emit any toxic gases or smoke that could adversely affect the environment. In this count, all-electric cars – particularly the ones powered by renewable energy – are much better than hybrid cars.

However, in this regard, it should be noted that the source of electricity is also of importance in case of EVs. If the electricity is produced through environmentally-damaging means like coal power plants, which is often the case in developing countries, the environmental benefits of electric cars ultimately get negated.

Less Noise Pollution, Smoother Ride

Since they are devoid of internal combustion engines and, in general, have less number of components, electric vehicles tend to be more silent than conventional vehicles. This, in turn, helps in curbing noise pollution, especially in crowded urban areas.

As an added advantage, electric motors, being lighter, offer a smoother drive with higher acceleration over longer distances than cars running on fossil fuels.

Now, let's look at some of the disadvantages of EVs:
Range Anxiety, Lack of Charging Infrastructure

Despite the massive technological advancements, EV charging infrastructure remains inadequate in most parts of the world. Furthermore, most electric cars have a range that falls between 150 to 175 km on a single charge. This, inevitably, gives rise to range anxiety among car owners.

In the absence of charging points, especially during low-distance drives, there is the risk of being stranded, which albeit can be avoided through battery swapping. However, for widespread adoption of EVs, governments around the world need to be more proactive in building a robust and well-connected charging infrastructure.

Long charging times

As mentioned above, the charging process of EVs can take anywhere from 30 minutes (in case of fast charging) up to 24 hours, depending on the capacity of the battery and motors. Most, however, take around four to six hours to be fully charged, which is several times longer than the time it takes to refuel a petrol/diesel car.

Lower battery life, high battery costs

The batteries currently used in electric vehicles have a lifespan of only around three to 10 years, depending on the make and model. The lower battery life often serves as a hindrance that affects the performance of electric cars. The higher costs of batteries, which are caused by the insufficient supply of raw materials, add to this problem.

Objective of the research

1. To analyse the growth of e- vehicle market
2. To seek the opportunities and challenges for E-vehicle in the market with special reference to Alwar city

Research Methodology

This research is based on primary data collected from the questionnaire, filled by the 38 people. The data is collected in the month of October in 2018. The other information about the electric vehicle is gathered from various articles online. The various tests have been performed on the raw data based on the data collected through the questionnaire.

Analysis

Q1 Factor Analysis

Table 3

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.615
Bartlett's Test of Sphericity	Approx. Chi-Square	57.951
	Df	36
	Sig.	.012

From the above table, we can interpret that there is no error in 61.5% of the sample and in the remaining 29.9%, there may occur some sort of error

Table 4

Communalities		
	Initial	Extraction
Familiarity	1.000	.509
Owned	1.000	.469
Plan To Buy	1.000	.731
Pay For EV	1.000	.739
Pay For Non EV	1.000	.708
Environment Conscious	1.000	.492
EV Good Return	1.000	.425
Type	1.000	.375
Prefer Hybrid	1.000	.748

Extraction Method: Principal Component Analysis.

Communality of each statement refers to the variance being shared or common by other statements. With reference to the first statement, the extraction is .509 which indicates that 50.9% of the variance is being shared or common to other statements

Table 5

Total Variance Explained

Component	Initial Eigenvalues Total	% of Variance	Cumulative %	Extraction Sums of Squared Loadings Total	% of Variance	Cumulative %
1	2.480	27.559	27.559	2.480	27.559	27.559
2	1.622	18.019	45.578	1.622	18.019	45.578
3	1.094	12.150	57.728	1.094	12.150	57.728
4	.989	10.993	68.721			
5	.901	10.009	78.731			
6	.632	7.019	85.750			
7	.573	6.364	92.114			
8	.411	4.561	96.675			
9	.299	3.325	100.000			

Table 6

Component 1	**Explain a variance of 2.480, which is 27.559 % of the total variance of 9**	**27.559**
Component 2	Explain a variance of 1.622, which is 18.019 % of the total variance of 9	45.578
Component 3	Explain a variance of 1.094, which is 12.150% of the total variance of 9	57.728

Table 7

Component Matrix[a]

	Component 1	2	3
Familarity	-.343	-.621	-.078
Owned	.052	.644	-.228
PlanToBuy	-.487	.517	.475
PayForEv	.781	.298	.201
PayForNonEV	.820	.077	-.174
EnvironmentConcious	-.384	.545	-.219
EVGoodReturn	-.555	.301	.163
Type	.572	.217	.020
PreferHybrid	.243	-.157	.815

Frequencies

Table 8

Statistics

		Familarity	Owned	PlanToBuy	PayForEv	PayForNonEV	Environment Concious
N	Valid	38	38	38	38	38	38
	Missing	0	0	0	0	0	0
Std. Deviation		.36954	.22629	.86705	1.73595	1.47043	.72351
Variance		.137	.051	.752	3.014	2.162	.523

Table 9

Statistics

		EVGoodReturn	Type	PreferHybrid
N	Valid	38	38	38
	Missing	0	0	0
Std. Deviation		.80891	1.91869	.47107
Variance		.654	3.681	.222

Frequency Table

Table 10

PayForEv

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 3,00,000	16	42.1	42.1	42.1
	3,00,000 to 6,00,000	6	15.8	15.8	57.9
	6,00,000 to 9,00,000	8	21.1	21.1	78.9
	9,00,000 to 12,00,000	2	5.3	5.3	84.2
	12,00,000 to 15,00,000	1	2.6	2.6	86.8
	more than 15,00,000	5	13.2	13.2	100.0
	Total	38	100.0	100.0	

Table 11

PayForNonEV

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Less than 3,00,000	21	55.3	55.3	55.3
	3,00,000 to 6,00,000	8	21.1	21.1	76.3
	6,00,000 to 9,00,000	2	5.3	5.3	81.6
	9,00,000 to 12,00,000	4	10.5	10.5	92.1
	12,00,000 to 15,00,000	1	2.6	2.6	94.7
	more than 15,00,000	2	5.3	5.3	100.0
	Total	38	100.0	100.0	

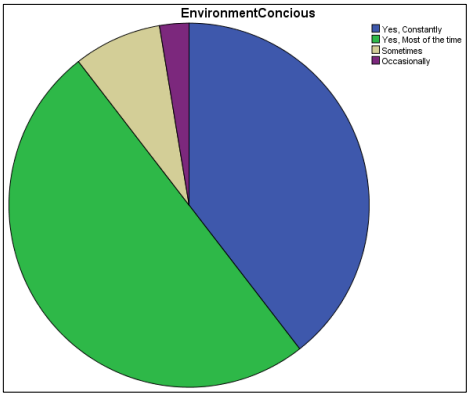

Fig 3

Table 12

EnvironmentConcious

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes, Constantly	15	39.5	39.5	39.5
	Yes, Most of the time	19	50.0	50.0	89.5
	Sometimes	3	7.9	7.9	97.4
	Occasionally	1	2.6	2.6	100.0
	Total	38	100.0	100.0	

Table 13

Type

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Sports Vehicles	2	5.3	5.3	5.3
	City vehicle	7	18.4	18.4	23.7
	Motorcycle	5	13.2	13.2	36.8
	gearless scooter	7	18.4	18.4	55.3
	SUV	3	7.9	7.9	63.2
	Mini vehicle	8	21.1	21.1	84.2
	Sedan	6	15.8	15.8	100.0
	Total	38	100.0	100.0	

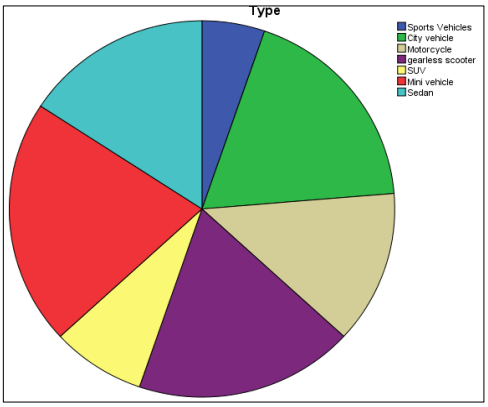

Fig 4

Table 14

PreferHybrid		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	26	68.4	68.4	68.4
	No	12	31.6	31.6	100.0
	Total	38	100.0	100.0	

Analysis of Multiple Response Questions Q8 and Q9

Table 15

Case Summary	Cases Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
$Benefits[a]	38	100.0%	0	0.0%	38	100.0%
$Drawbacks[a]	38	100.0%	0	0.0%	38	100.0%

Table 16

		Percent of Cases Percent	
Benefits[a]	Fueleconomy	19.3%	60.5%
	LessEmission	7.6%	23.7%
	LowDep.FossilFuel	15.1%	47.4%
	InexpensiveRun	10.9%	34.2%
	LessMaintenance	8.4%	26.3%
	EasyDrive	13.4%	42.1%
	LessNoisePollution	25.2%	78.9%
Total		100.0%	313.2%

Table 17

		Percent of Cases Percent	
Drawbacks[a]	TakeTimeRecharge	27.8%	84.2%
	RechargingInconvenient	13.0%	39.5%
	IntialCostPurchace	5.2%	15.8%
	Design	4.3%	13.2%
	LimitedChoice	15.7%	47.4%
	PowerDelivery	7.8%	23.7%
	LowPowerStations	20.9%	63.2%
	DontKnow	5.2%	15.8%
Total		100.0%	302.6%

Challenges

The issues are the difficulties of the electric vehicle

- Battery life is less (3-4.5 years): For this test the battery ought to be structured so the battery will work viably, effectively and any condition.
- Frequent reviving of battery: For this the battery limit is to be expanded with less space devouring battery ought to be execute.
- Recharging time is high (6-8hr): Existing electric vehicle ought to be kept 6-8 hr for finish reviving for this test the distinctive techniques need to acquire for quick charging of battery.
- Access for energize isn't actually accessible outside the home for this test the legislature and producer need to give the charging station like petroleum station.

For the previously mentioned difficulties, looks into are persistently going in the business, many research on the quick charging of battery ex: Mahindra Reva are utilizing the quick charging procedure accessible in Kemp gouda International airplane terminal Bengaluru. Like this the business and the administration is taking a shot at the difficulties to build electric vehicles.

Conclusion

Electric Vehicles are likewise a standout amongst other alternative for transportation. By this report Trends in electric vehicle need to increment in Indian market for decrease of contamination in nation. By this we became more acquainted with about current key improvements, Trends of Electric vehicles in worldwide market. In this U.S. has most extreme Percent of Electric vehicle contrast with other nation specially country like India is lacking in this field, although from the principal electric vehicle created in 1837 till the present occasions, we have seen monstrous progressions, outstandingly as far as innovation yet in addition in the general population's disposition towards the natural effect of autos and other versatility arrangements. While the electric vehicles advertise is right now a rewarding goal for corporates and new businesses in India, there are still a significant number difficulties that should be defeated to make EVs prepared for mass reception. Assembling electric vehicles locally, for example, accompanies the obstacle of surprising expenses. Also, generation of batteries is to a great extent a costly undertaking. To have the capacity to transcend these difficulties, the Indian government should concentrate its endeavors on encouraging mechanical disturbance. For quicker appropriation of EVs, the administration will likewise bring to the table more prominent assessment refunds and sponsorships to planned vehicle proprietors and producers. In the event that fruitful, the move to electric vehicles could conceivably enable India to set aside to $300 Bn (INR 20 Lakh Cr) in oil imports and about 1 gigatonne of carbon dioxide discharges by 2030, according to an ongoing report by FICCI and Rocky Mountain Institute! Besides, EVs will be a venturing stone towards structuring a clever, modern transport framework in India that is equipped for obliging the portability needs of the nation's immense populace. From the research it was found that E-vehicle has several benefits in terms of low carbon emission, depletion of natural resources and fossil fuels also it was found that people think that E-vehicle are comparatively economical, easy to drive and create less noise pollution. While if we think about it drawbacks the major challenge is, to recharge vehicles is an time taken activity, and availability of power station in the country like India is very low and limited choice in terms of brands is also a major constraint

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