CONSUMER ADOPTION & BUYING BEHAVIOUR FOR ELECTRIC VEHICLES IN INDIA

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I.INTRODUCTION

Electric cars are now regarded as the most cutting-edge vehicles in the automotive sector. In terms of greenhouse gas emissions, light-duty vehicles—cars and vans (commonly referred to as passenger cars)—are responsible for around 15% of the total emissions (European commission 2012). A hybrid electric vehicle (HEV) is a vehicle that uses both a battery and a diesel/petrol engine (Rahman et al., 2016). Furthermore, HEVs, a hybrid form of EVs, are now emerging as a solution to the problem of dependency on conventional fuels and increasing CO2 emissions (Dijk, Orsato, 2013). Given the severity of the threat posed by climate change, several governments have begun initiatives to reduce carbon dioxide emissions via electric vehicles (EVs) (Adnan et al., 2016). An electric vehicle's technology is well-established and on the rise, allowing it to travel long distances while maintaining high efficiency and a high level of comfort (Class, Winter, et al. 2010). Research on the possibilities of electric mobility has been conducted from a technological (Werther, Frischknecht, lab eye et al. 2011), economic (Kley et al., 2011), logistical (Ehrler et al. 2012), and environmental (Sourlounis et al. 2011) perspective. On the other hand, research suggests that electric cars face an uphill battle in creating a viable market. Propagation and trust-building in the Electric vehicle market are necessary to shift public opinion away from gasoline-powered vehicles (Hiffman, 2014).

EV has the potential to permeate not just B2B but also institutional purchasing. Regarding EV adoption, preferences and priorities might vary amongst players in an organization. These variances are linked to these actors' professional responsibilities in their business (Kaplan et al., 2016).

The role of people who serve as "innovation champions" or "early adopters," as the marketing phrase goes, is well established in ideas about how organizations acquire new technologies. Similarly, (Rogers, 2003:414) describes an innovation champion as a "... Charismatic individual who throws his/her weight behind an innovation, thus overcoming indifference or resistance that the new idea may provoke in an organization" and refers to (Schon 1963:84) who states that a ".....new idea either finds an advocate or dies."

An organization's adoption of electric vehicles (EVs) is critical to its long-term success since there are generally no immediate demands for EVs (Nesbit, 1996). Patronage is essential to electric vehicle (EV) adoption success since it will not take care of itself.

Future electric vehicles can travel long distances with excellent efficiency and comfort because of well-established and up-trending technology (Class, Winter, et al. 2010). The potential for electric mobility has been examined from various angles in recent research. This includes a technological, economic, logistical, and environmental perspective. However, research has shown that electric vehicles have a significant challenge in establishing viable markets. To shift the public's perception of electric vehicles from skepticism to acceptance, the electric vehicle industry must do much outreach and establish consumer confidence. There is, however, an overwhelming amount of skepticism about the EV, which is predicated on a perceptual barrier (Hiffman, 2014). For the commercial success of electric vehicles, social considerations must be considered. According to (Ozaki & Sevastyanova 2011), customer approval is vital for sustainable transportation to succeed. According to Diamond (2009), some typical barriers to technology adoption include the lack of understanding among prospective adopters, high initial costs, and a low-risk tolerance. (Hidrue et al., 2011) found that consumers with higher education, affluence, and environmental consciousness were more likely to embrace EY. The price of gasoline has been cited as an essential factor in adopting alternative-fuel vehicles (Soltani-Sobh et al., 2016, Eppstein et al., 2011). The bulk of EV running costs are accounted for by the cost of gasoline and the cost of electricity, and both of these variables are associated with an increased chance of EV adoption (Zubaryeva et al., 2012). Consumers' adoption of alternative fuel cars depends on the availability of charging infrastructure in various research (e.g., Ghamami et al., 2014: Yeh, 2007; Struben & Sterman, 2008; Egbue & Long, 2012).

Different governments have set up a variety of consumer incentives to encourage people to buy electric vehicles. Contradictory findings have been reported in a literature study on the influence of incentives on EV adoption (Sierzchula et al., 2014).

According to market share data (Zhang et al., 2014), financial incentives and individual inclination to purchase electric vehicles have little association.

There are two main goals for this study. An excellent place to start is learning about the factors that influence and obstruct the widespread use of electric cars, particularly plug-in hybrids. The second step is to identify the gaps and limits in current research and propose a few research agendas for the future... As a result of reviewing several empirical investigations and theoretical frameworks, this research has indicated potential future research areas.

II. LITERATURE REVIEW

"This section reviews the existing academic and practitioner literature and attempts to establish logical linkage in past research and research gaps." We have divided the literature review into three sections, **Section 1** – Electric vehicle categories and their significance, **Section 2** – Relevant literature study consumer adoption, and **Section 3** – theoretical underpinning for the study.

Section 1: Type of electric vehicles

hybrid electric cars are well-known EVs (such as the Toyota Prius). In addition to an internal combustion engine (ICE) and an electric motor operated by a battery, an HEV features a secondary electric powertrain. Breaking energy may be recovered and used to re-charge the battery, or an electric motor and a battery can directly power the battery. As a result, the HEV is considered a more fuel-efficient vehicle since its full power is derived from liquid fuel (Schuitema et al., 2013; Proff & Kilian, 2012). It is possible to recharge the battery of the plug-in hybrid electric vehicle (PHEV) by using an electrical grid plug-in charger (Sovacool & Hirsh, 2009; Egbue & Long, 2012). ALTHOUGH THE ALL-ELECTRIC RANGE IS USUALLY LIMITED, a PHEV may operate on either electricity or ICE. Extended-range electric vehicles (E-REVs), like PHEVs, include a battery that can be charged from an electric outlet and a petrol tank that extends the driving range. An all-electric powertrain driven by a powerful capacity battery (relative to PHEV and E-REV) that is recharged from the energy grid in a battery electric vehicle (BEV) (Proff & Kilian, 2012). BEVs typically have a more excellent range of electric power than PHEVs since electricity is the primary power source.

In the broadest sense, any automobiles that may run entirely or partially on alternative fuels are alternative fuel vehicles (AFVs) (Jansson et al., 2011). Electric vehicles include several types of cars, such as PHEVs (plugging-in hybrid vehicles), extended range battery electric vehicles (E-Revs), and Hybrid electric vehicles (Hybrids) (HEVs). In the early years of the 21st century, HEVs became more widely accepted worldwide. In addition to the internal combustion engine (ICE), a battery-powered electric type motor is used in the HEV. HEVs are fuel-efficient automobiles since all of their energy originates from liquid fuels (Schuitema et al., 2013; Prof & Kilian, 2012). It is possible to recharge the battery of a plug-in hybrid vehicle (PHEV) by plugging it into a power source, such as a wall outlet or a battery pack (Sovacool & Hirsh, 2009; Egbue & Long, 2012). Plugin hybrid cars are frequently termed extended-range EVs (E-REVs) (E-REVs). The electric powertrain is the only component in a battery electric vehicle (BEV). Bulk volume batteries are used to power the system instead of E-REV and PEV. BEVs often have a more extended driving range because of their use of electric power.

This evaluation does not concentrate on fuel-efficient vehicles that do not need significant changes in customer behavior but rather on those that have been classified as electric vehicles (EVs) in the past, such as hybrid electric vehicles (HEVs), similar to Schuitema et al. (2013). Our definition of an electric vehicle includes a battery pack that can be recharged using an electric outlet. Furthermore, we use the phrase "rechargeable automobiles" to refer to electric vehicles that can be recharged, and we include research on customer reactions to BEVs, PHEVs, and E-REVs. PHEVs, E-REVS, and BEVs (Proff & Kilian, 2012) are more disruptive breakthroughs in transportation technology (Proost & Van Dender, 2010; Schuitema et al., 2013), place new behavioral demands on customers, and academics and practitioners must grasp this. Plugging in the vehicle to the grid and charging the battery when it is not in use is a necessary part of driving a PHEV, E-REVS, or BEV, for example, so that drivers can anticipate their next trip (Axsen et al., 2012). Range anxiety is another example of a driver's worry. There is a perception that electric batteries have a restricted range compared to what is required for everyday driving and a lack of infrastructure for charging stations compared to gas stations (Sovacool & Hirsh, 2009). Our findings from 2007 onwards show that future investigations into consumer EV adoption behavior will be more fruitful when they concentrate on BEVs. However, they should also look at PHEVs and E-REVs.

Section 2 – Past literature studies

Various research papers on electric vehicles have been searched on databases like Emerald, Jaster, Science Direct, Springer, Wiley, and Google Scholar. Various keywords are used as Electric Vehicles, Consumer Adoption on Electric Vehicles, Cleaner Vehicles, and Consumer buying behavior. Among various papers found, Few studies have related various theoretical models for EV-based behavioral variables and financial motivation and benefit ((Musti & Kockelman, 2011). A list of empirical papers has been added below table No 1

e	Authors	Sample Details	Method	Consumer Behaviour attribute	Business attributes	Theatrical Underpinning

1	Peters & Dutchske(2014)	drivers of Europe (mostly Germany)	Online Survey	Subjective social norms, experience & needs, risk apetite and experince with EV	Policy measure which can reduce purchase cost	Diffusion of Innovation
2	Mabit & Fosgerau (2011)	Potential car buyers of Denmark	Quantitative, online survey	consumer psychology, diffussion of choice	Technology upgradation, power of choice	Mixed Logit Model
3	Carley et al (2013)	Individuals with driving license in USA	Quantitative, online survey	Gender, Age, experince wth HEVs,	Charging station, Range anxiety	Rational Choice Theory
4	Valeri and Danielis (2015)	Car owners from USA/China/Italy	Quantitative, online survey	Age, social norms, past experience , propensity of adoption	vehicle technology, acquisition price	Mixed Logit Model , Theory of planned behaviour
5	Zhang et al (2011)	Respondents from various driving schools in China	Quantitative, survey	Opnion leadership, number of cars and driving license in the family	Safety, Performance, Purchase & maintenance cost	Rational Choice Theory
6	Noopers et Al (2014)	Dutch residents	Quantitative, survey	Age, Social norms	Environmental and technological attribute of the vehicle	Self congruency, costly signaling theory
7	Hornne, Jaccard and Tiedemann (2005)	Drivers from Canada	Quantitative, survey	Value, past experiences	Acquisition and maintenance cost , ease of usage	Multinominal Logit model
8	Brown, Pyke et al (2010)	Potential buyers Sweden	Quantitative, online survey	Age, gender, new product adoption, travel requirement	Range anxiety, charging infrasture	Theory of planned behaviour
9	Axsen et al (2012)	Households in california	Quantitative, online survey	Opennnes to change, pro environmental concer, technology adoption	Purchase cost, running cost	Lifestyle practice theory
10	Egbue and Long (2012)	Stuents, Staffs and teachers of a technical university	Quantitative, online survey	Opinion leadership , social influence	Safety, performance, decreased use of oil	Theory of planned behaviour
11	Graham -Rowe et al (2012)	UK non commercial and ICE vehicle drivers	Quantitative, online survey	Feel good factor, age , gender , adoption of new technology	Battery material and electricity source	Grounded theory
12	Mau, Eizaguirre, Jaccard, Collins-Dodd and Tiedemann (2008)	Canada	Quantitative, online survey	Openness to change, social norms	Battery life, charging points	Nested logic model

13	Jensen et al (2013)	Drivers of Denmark	Quantitative, survey	Hands on experience with EV	Charging station in public places	Rational choice theory
14	Skippon and Garwood (2011)	UK Car owners	Qualitative and quantitative interviews	Purchase cost, saving of fuel cost	performance related to acceleration, less noise, smoothness , lower range and logn charging time	Signaling theory
15	Shin, Hong, Jeong & Lee (2012)	Car owners in South Korea	Quantitative, online survey	Acquisition cost, serviceability	Battery life, Battery charging station availability	Multiple discreate continuous extreme value choice model
16	Chorus, Koetse and Hoen(2013)	Drivers in Netherlands	Quantitative, online survey	handing the vehicle, driving experience, peace of mind	Charging infrastructure, Recommendation from Influencers	Regret Model
17	Schuitema et al(2013)	Driving license holders in UK	Quantitative, online survey	Purchase cost	Performance, perception pf PHEV attributes	Self congruency theory
18	Lane & Potter (2007)	Car owners in UK	Qualitative and Quantitative Interviews	Pro Environmental Identity and Lifestyle	Purchase Cost, payback time	Theory of planned behaviour
19	Tanaka, Ida, Murakami and Friedman (2014)	Car drivers and owners in USA and Japan	Quantitative, online survey	Environmental consciousness , technology upgradation	Performance , Charging Infrastructure	Mixed Logit Model
20	Ziegler (2012)	Driving license holders in Germany	Quantitative, online survey	Vehicle handing , Self image	Acquisition and running cost	Probit Model
21	Moons and De Pelsmacker (2012)	Drivers in Belgium	Quantitative, online survey	Range, performance	Purchase Price	Theory of planned behaviour
22	Daziano and Bolduc (2013)	Car owners in Canada	Quantitative, online survey	Openness to change, pro environmental concern, technology adoption	Purchase cost, running cost	Hybrid Choice Model
23	Jensen, Cherchi, and Mabit (2013)	Car owners in Denmark	Quantitative, online survey	Risk taking ability , Adaptability	Vehicle performance,	Hybrid Choice Model
24	Krupa and all (2014)	Residents in USA	Quantitative, online survey	Performance, Ease of use, safety, reliability	Purchase Cost, long payback time	Rational Choice Theory
25	Hirdrue, Parsons, Kempton, and Gardner (2011)	Drivers in USA	Quantitative, online survey	handing the vehicle, driving experience, peace of mind	Charging infrastructure, Recommendation from Influencers	Latent class model

Section 2.1 –Range Anxiety

Various studies on electric vehicle drivers and owners show that the potential buyers of EVs often face "range Anxiety" (Scott parker et al) . The range anxiety results from perceived and actual inadequate range required in everyday usage. To improve EV adoption, charging infrastructure will play a critical role (Krupa JS et al, 2014). However, various studies have been conducted to determine the correct category of EV, whether it is only BEV, PHEVs or E-REVs. Schuitema et al , 2013) suggested that HEVs can be kept outside the electric vehicle category as they are merely fuel-efficient vehicles. Studies has happened to understand different consumer behaviour toward PHEVs. Every segment is a disruption in technology innovation and transportation space (Proost and Van Dender, 2010; Schuitema et al, 2013) and it reflects different consumer behaviour in other category. The range anxiety and lack of charging infrastructure that accompanies various technological revolutions has led to varying levels of customer adoption (Sovacool and Hirsh, 2009). Research articles from 2008 have been analysed in order to get a better understanding of the changing patterns and our analysis has focused more on BEVs, but the consumer adoption elements of E-REVs and PHEVs have also been included. According to (Morton, 2016), research in this topic will likely be defined by the issue of converting the transportation industry onto a low-carbon trajectory in the next decade. Transport accounts for 40% of ultimate energy use, making this a severe problem.

Section 2.2 – Environmental Consciousness

According to a recent study, "Attitudes toward Electric Vehicles," (Bigerna & Micheli, 2018), steps are required to adapt to a more sustainable development model as our world confronts the consequences of climate change. An international leader in climate action, the EU is putting together measures to boost funding for green technology. The term "green technologies" refers to those that aim to reduce pollution and save energy and resources in order to benefit the environment. It was found that many countries around the world have begun to attach greater importance to an electric vehicle, or EV, and that there has been a relentless attempt to replace a car that uses fuel oil as its primary energy source with an EV in order to reduce energy and air pollution problems. (Montian, 2018) studied "Factors Influencing Purchase Intention Toward Electric Vehicles in Bangkok Metropolis." A study on consumer perception and intention to purchase electric cars (Bhalla, 2018) found that environmental concerns are driving electric vehicle production and sales today (Bhalla, 2018). A paradigm shift in the Indian manufacturer's thinking towards electric vehicles has occurred in 2018. In India, for example, Tata Motors, Mahindra & Mahindra, TVS Motors, and Bajaj Auto are attempting to harness the high growth phase of electric cars into their strategic competitive advantages in the market by producing 20 new models of EVs. "Incentives for promoting Battery Electric Vehicle (BEV) adoption in Norway" found that as an answer to greenhouse gas emissions, and to some extent local pollution and national energy security, we are currently witnessing a new wave of interest in electromobility – understood as a road transport system with vehicles using electricity for propulsion. (Ystmark, 2016). In order to achieve electromobility, considerable technological and societal transformation difficulties must be overcome. Battery Electric Vehicles (BEVs), plug-in hybrid vehicles (PHEVs), and range-extended electric cars (EVs) are all types of electric cars. "Key Factors Influencing Consumer Purchase of Electric Vehicles" (Tu & Yang, 2019) study found that fast worldwide economic and technological advancement has aided human civilization, but it has also harmed the planet's ecosystem. As a result, humanity is taking the environment and sustainable development very seriously.

Section 2.3 – Technology adoption

(Dhawan, 2017) studied "The future of mobility in India: Hurdles & opportunities for the autocomponent industry" and observed that The pace of innovation is on the verge of disruption due to the outcomes of four key technology driven patterns, shared mobility, connectivity, and, autonomous driving. Stricter pollution standards, reduced battery prices, more widely accessible fast-charging infrastructure, rising customer acceptability and improved total cost of ownership (TCO) will provide fresh and significant impetus for the adoption of EVs in the near future. (Motwani, 2019) I studied "Customer Buying Intention towards Electric Car in India" and discovered that an electric vehicle, unlike a regular car, is highly versatile. This is due to the reduced amount of moving components that are crucial in operating of a classic car. In an electric vehicle, the number of moving parts is restricted to one, the motor. "(Deng, 2018) explored "factors impacting consumer intention To electric vehicle sharing programme In china" and remarked that Time-shared rental has been established as an emerging model in the domain of sharing economy in recent years in China". "Since the technology of Internet of Things (IoT) and new energy automobile advanced, there are more and more people paying attention to innovative transportation such as eco-car sharing. (Wolff, 2019) investigated "EV-Ready India" and discovered that India is charged to become a worldwide hub for electric transportation". "Over the last several years, the national government has built momentum via many laws that support the use of electric transportation. Following suit, 10 states and union territories (UT) have published draught electric vehicle (EV) policies or announced final policies specifying fiscal, non-fiscal and other incentives to advance a value chain of electric mobility operations. (Ghate, 2017) researched "India's electric transportation transition" The Government of India has announced the beginning of a new age of mobility for India". Global technological trends and India's fast rising economy have led to concentrate on electrification of transportation as the primary technical avenue to accomplish this change.

“Ghate (2017) studied "EV deployment targets" and observed that A growing number of governments are setting objectives for EV deployment, providing increasingly clear signals to manufacturers and other industrial stakeholders, building confidence on the future policy framework and enabling the mobilisation of investment”.

Section 2.4 – Government policies in India

As of 2019, (Devendranath An EV policy is likely to be announced by the government of India in the first quarter of 2018, according to "India EV Story Emerging Opportunities." Many policymakers in India have shown significant support for EVs and other low-carbon solutions like Methanol, CNG, etc. To put it another way: In the previous decade, India has been climbing the

motorization curve swiftly. Both urban traffic congestion and air pollution have worsened in all significant metropolitan areas. Around 18 percent of the country's CO2 emissions were generated by the transportation sector. The majority of vehicles in India are powered by fossil fuels. Nykvist, 2015) (Nykvist) The study "Rapidly declining prices of battery packs for electric cars" found that precise data on present and expected costs of battery packs is required to adequately assess the chances for commercially viable battery electric vehicles (BEV). According to research, the dominant Li-ion battery technology's costs have decreased in the past, present, and the future. (Menon, Yang, & Bandivadekar, n.d.) (Menon, Yang, & Bandivadekar, n.d.) It was determined that state governments play an essential role in the development of the electric car industry by supplementing national measures with laws that match local situations. As a bridge between the federal and local administrations, states also play an essential role. "Propelling Electric Vehicles in India" was studied by (Sharma et al. 2019) and it was found that an EV with a partially charged/discharged battery visits a Charging Station where it is provided parking space and a service of charging the battery by electricity via EVSE (Electric Vehicle Supply Equipment). It is during the charging process at Charging Station that the electrical power is converted into chemical energy in the battery.

Section 3 : EV Adoption by Consumers: Theoretical Framework

Multiple review literature study shows that majority of the studies focused on intention of EV adoption by consumers compared to actual purchase studies. Consumer mind set on adoption of innovation play a critical role (Jansson et al , 2011) . Various types of metrics like readiness, willingness to buy and willingness to pay are considered as a variable in adoption behaviour (Arts et al, 2011). Summarising multiple research studies , it has found researches has used nine categories of theoretical frameworks (Barbarissa et al , 2015) in significant consumer adoption researches

Normative Theories and Environmental attitude

Several studies have shown that environmental concerns are a significant factor in the uptake of electric vehicles (Bamberg & Moser , 2007). Value-belief norm theory and other normative theories (Stern,2000). EV adoption behaviour has been characterised as environmentally friendly, and characteristics linked with this are commonly defined and explored when evaluating EV adoption behaviour (Schuitema et al 2013). Pro-environmental behaviour, including values, beliefs, norms, and attitudes, is typically the focus of consumer EV literature aimed towards the adoption of electric vehicles. Ideas about the environment and the consequences of human activity influence personal norms. A new ecological paradigm scale is used to examine beliefs about human conduct and the environmental problems it causes (Dunlap et al 2000). Another study indicated that the impression of EVs' beneficial environmental impacts influenced adoption intentions for EVs as well. / (Schneidereit T et al 2015). A study by Graham Row et al reveals that green power and electric vehicles (EVs) will inspire prospective consumers to embrace electric vehicles (EVs) sooner. In areas where renewable and non-renewable sources of electricity are available, little attention has been paid to the environmental impacts of electric cars. Concern for environmental issues has been explored in previous studies and is regarded as one of the most significant impacts.

Diffusion of innovation and consumer innovativeness

When it comes to the dissemination of new ideas or technologies, there is a notion known as diffusion on innovation. As a professor in the field of communication studies, Rogers' book "diffusion of innovation" helped make the idea more well known in the United States. Many studies have relied on the diffusion of innovation (DOI) paradigm to get a better understanding of how users and prospective users perceive new products and technology. Compatibility, complexity, trialability, observability, and relative benefit (Peter & Dutschke 2014) are five categories of criteria that impact the adoption choice. Consistency in innovation and values is shown through compatibility. Complexity is a term used to describe how difficult it is for customers to understand and make use of an invention. When it comes to trial and modification, trialability, observability, and relative advantage all play a role. Trialability determines how much innovation can be seen by others and how much the present product or solution beats out the competition. A study by Schuitema et al. (2013) found that people prefer to acquire or accept new technologies rather than older ones. Rezvani et al, 2015, defines three types of consumer innovation: symbolic, contributory, and hedonic. For buyers, symbolism demonstrates the innovativeness of upcoming automobiles. The rationale and function of a vehicle are at the heart of contributory advances. It's the innovation that comes from feeling a car that is seen in hedonic creations. Researchers in the past haven't taken into account the feelings that come up while discussing the adoption of new technologies and innovation. Perceived pace of innovation is a topic of research in which Shih and Schau (2011) looked at how prospective customers' perceptions of the market's changing technical circumstances might lead to regret and delay in the purchase of technological innovation. A consumer's choice to acquire a product is influenced by their expectations about the intricacy of technological advancement, according to researchers. As numerous hypotheses were clarified, we came to the conclusion that consumer emotion is essential for EV technology to be absorbed.

Theory of planned behaviour and rational choice

Consumers make informed decisions based on logical evaluations of inputs and the probable consequences of their choices, according to the theory of planned behaviour (Ajhen 1991). Bamberg & Moser, 2007, demonstrated that intentions, the total of probable positive and negative consequences of a behaviour, are directly predictive of behaviour. According to Moons and De Pelsmacker (2012), EVs can only be used in urban areas where people can buy them and where they can be practical in terms of daily commutes and a limited driving range. Consumer perceptions of peer beliefs about EVs are evaluated to see whether they regard EV adoption as a societal norm or not. There have been many studies looking at how rational consumers' EV adoption behaviour is, and numerous dimensions have been used to gauge how consumers feel about EVs (Carley et al 2013, Ebogue & Long 2012, Jensen et al 2013).

Social networks/influences/norms

According to He et al. (2014), a social network is a grouping of people who are linked together because of an unusual or extraordinary example in a diagram. It's probable that social networks will have a considerable impact on the uptake of electric vehicles, given that people tend to define themselves as individuals rather than part of a group (Barth et al., 2016). On the one hand, those who are part of the same network may adjust their behaviour to become more consistent with the behaviour of others with whom they are connected (Wang, Chen, and Conzelmann, 2014). Individuals' behaviour and mentality may be shaped by their existing social network connections, according to Friedkin et al (2006), who defined this process as social impact. When it comes to purchasing an electric car, consumers' choices are often influenced by the choices of others with whom they are connected in the network (He et al., 2014). According to Klöckner (2014), the pre-decisional process might affect an individual's objective goals due to societal norms. The conventional instructions for behaviour in meetings and social hierarchies are described as "social standards" (Zalta, 2014). According to Noppers et al (2014), the more people believe that driving an electric car would elevate their social standing, the more likely they are to do so. Even in the Netherlands, where Rasouli and Timmermans (2016) conducted a nationwide analysis, they found that social networks had no influence on consumer uptake of electric automobiles (Rasouli and Timmermans, 2016). "(Jansson, 2017) Studying "Examining determinants of sustainable consumption: The role of norms and opinion leadership on electric vehicle uptake in Sweden," researchers discovered that fossil fuel combustion accounts for about 80 percent of anthropogenic greenhouse gas emissions such as carbon dioxide (CO2). These emissions have more than doubled since 1970, and have risen at a higher pace than any other energy end-use industry, including transportation.

Many previous research have been conducted to determine the environmental awareness of prospective electric car purchasers. Research reveals that EV uptake is not only driven by environmental awareness. A combination of other factors is required for it to operate.

Other Literature reading summary

According to a study conducted by Lai (2015), "Factors Influencing the Behavioural Intention towards Full Electric Vehicles: An Empirical Study in Macau," transportation is the second-largest source of carbon emissions in the world. Many facets of the development of low-carbon, sustainable transportation systems have been studied throughout the last few decades in an effort to minimise emissions of greenhouse gases.

in the United Kingdom (UK) in 2011, with a growth of 52% from 1980. in the UK

According to Sang (2015, p.), An empirical study in Malaysia concluded that the rise in economic status and consumer buying power throughout the globe has increased the mobility of the world's population, which has resulted in a considerable increase in carbon emissions from transport.

Climate change programmes throughout the world are significantly depending on the electrification of transportation, notably private battery-electric cars and plug-in hybrids ('EVs'). This is a new field of technology with which the general public has little familiarity, and as a result they are emotionally removed from it.

According to (Masurali & Surya, 2018), the Indian car sector is the sixth biggest in the world and contributes for 22% of India's overall industrial output. (Masurali & Surya, 2018) In the recent decade, India's motorization rate has accelerated.

the "Global EV Outlook 2019" was analysed by (2019) and it was found that The Global EV Outlook annually publishes an article outlining the most current advancements in electric mobility throughout the world. An electric vehicle is being developed with help from the Electric Vehicles Initiative (EVI) (EVI).

To assist the adoption of electric cars with plug-in electric vehicles, many governments and local authorities throughout the globe have introduced Government incentives for plug-in electric vehicles. (Cobb, 2018)

Studies on "Environmental Concern and Purchase Intention of Electric Vehicles in Eastern China" (Moyo, 2018) found that environmental concerns affected people's decision to buy an electric car in that region (Moyo). A qualitative technique was used to collect data from 86 Beijing-based participants. For this group, stratified random sampling was utilised as the method of selection. According to the conclusions of the study, environmental concern has a significant effect in the purchase of electric cars.

Adopting Pure Electric Vehicles: Key Policy Enablers was the subject of a study by Polar (2017), which found that understanding customers' expectations and concerns is critical to understanding why the electric car industry has grown slowly. Compared to conventional cars, electric vehicles now have a number of shortcomings that are briefly discussed in the following sections. The exorbitant cost of EVs, which is around two to five times that of a similar conventional car, is the primary reason for their delayed uptake.

Studies on "Advances in consumer electric vehicle adoption research" (By-nc-nd, Rezvani, Janson, and Bodin, 2015) found that EVs are being presented as a solution to the problem of fossil fuel reliance, growing CO2 emissions, and other environmental challenges. Almost a fifth of the EU's CO2 emissions may be attributed to the usage of automobiles. "(European Commission)" (2012, EU).

III. BUSINESS PROBLEM

Low adoption by consumers despite of various promotions, environmental awareness, improved technology and driving range, Govt subsidies and introduction of new models

1. The electric car business has a number of challenges, the most pressing of which is the issue of market penetration. The Tesla Model 3 is one of the most popular vehicles in the United Kingdom. Even if it is a huge success, just 1.1% of new vehicles sold in the UK in 2019 will be electric. EVs' commercial viability will be hampered if social problems aren't taken into account. It has been shown that customer acceptability is essential to the long-term viability of sustainable transportation (Ozaki & Sevastyanova, 2011). Indian electric vehicle sales fell 5.5% in Fiscal Year 2019-20 mainly because of the absence of large-scale purchases of electric automobiles by government agencies. Additionally, SMEV stated that Mahindra E-Verito, India's most popular electric vehicle, had been discontinued, which contributed to the drop in sales. Mckinsey Report, September 2017)
2. As a result, EV sales are far lower than they might be due to a lack of client information and a lack of risk tolerance (Hidrue et al, 2011). Changing the public's acceptance of gasoline-powered vehicles to electric vehicles demands a large proclamation and trust-building campaign. Still, there remains a lot of scepticism about EV adoption. Hiffman, (2014).
3. Lack of adequate charging infrastructure, is a cause of consumer concern and may have an adverse impact on adequate electric vehicle penetration. Relevant infrastructure plays a major role for consumer adoption , on the other hand absence of adequate infrastructure may have opposite effect (Bhalla, Ali, et al, 2018)
4. 4. Anxiety about range - In India, Hyundai & TATA MOTORS give the greatest range for electric automobiles, which is roughly 300 km. The model's price, on the other hand, is prohibitive for the majority of potential buyers. Because electric vehicles may not have enough power to get them to their destination, users experience range anxiety (Skippon & Garwood, 2011). The absence of charging infrastructure in the nation has a significant impact on this. Range anxiety is a major issue for potential purchasers and users of electric vehicles, according to a recent survey (Giridhar et al 2015).

A. Current Research Gap in Electric Vehicle Adoption

RG-1: Several theoretical frameworks have been used to examine consumer uptake of electric cars. Adoption by consumers has been described as a combination of intentional, emotional, and symbolic behaviour in certain research (Moons & De Pelsmacker, 2012,). Clearly, Giridhar et al 2015 said that there is a study gap in the electric car consumer adoption research on the selection of sample populations. According to Jansson J (2017), there is a research hole in the area of electric car adoption since no one from the industry has been included as a responder. A number of studies (Moyo N., 2018, Tu. J. Yang., 2019) show that previous studies on the adoption of electric vehicles (EVs) have methodological flaws that need more study and other techniques. Many studies have incorporated responses from people who have no direct experience or financial interest in electric vehicles (Axsen et al 2012, Krupa et al 2014). The validity of conclusions was severely hampered in such cases since the respondents were mentally removed from EVs (Adnan et al 2016). Many previous studies include sample biases, the most prevalent of which being the use of early adopter samples. These samples are not typical of the majority of customers. A critical component of studying actual EV adoption behaviour rather than just intentions is becoming increasingly important as the market for electric vehicles (EVs) grows.

There is research need with measure EV adoption behaviour with potential buyer of the vehicles who have considered buying EV at some points of time, but have not completed purchase process due to various factors. At the same time a sample survey from existing EV users are also required to understand how they are influencing purchase of other potential buyers

RG-2: The existing literature predominantly focused on analyzing EV adoption behaviour as a complete segments (Schuitema et al 2013. However the industry preference is constantly changing and different kind of models are emerging as trend leaders. Ziegler (2012) mentioned that there are multiple preferences co exist among potential electric vehicle users and research gap exist on that space. Moons de Pelsmacker (2012) mentioned that there are difference of preference exist on battery range and performance attributes of electric vehicles, therefore future researches should be directed towards category of electric vehicles. Model and category based study like whether EV in hatchback, Sedan or SUV category will have the maximum propensity to be successful is missing in past literature study. Similar way , no past researches clearly indicate that whether electric vehicle in power bike segment or economy segment will have better propensity for adoption. The recent trend in passenger vehicle sales shows increased preference of SUV (Sports Utility vehicles) globally. While electric vehicle journey started with smaller cars (example – Mahindra REVA), gradually many global players brought bigger vehicles in electric options , which can be a strong contributor on electric vehicle consumer adoption . There is a clear need to understand the preferred features and attributes of electrics vehicles which will ensure better consumer adoption and will work as input in OEMs. Future researches may guide and may find correlation on changing preference on consumers on passengers and correlation on electric vehicles to identify effective model mix for electric vehicle

There is a need to study the consumer preference among various vehicle category, segments and sub segments and which segments of consumers are having higher propensity of adoption of electric vehicles

RG-3: Range Anxiety is a key determinant of consumer adoption of electric vehicles (Brown, Pyke et al (2010) and automotive OEMs are constantly working to improve range anxiety and charging infrastructure. According to Scott-Parket et al. (2018), 'Range-Anxiety' is the fear that a vehicle's plug-in battery range would fall short of the range necessary for normal driving. The range anxiety phenomenon are perceived (Krupa et al 2014), as most of the users survey was based on potential EV user. However many researches (Hirdrue, parsons et al 2011) shows that there the gap present on existing researches on actual usage of electric vehicles and range requirement accordingly. Briggs, Webb et al (2015) studied that there are different potential user group exists for EV and exact usage pattern to be identified to make existing solutions more usable and sustainable for environment. Bonges, Lusk (2016) shared that the range anxiety sometime can be perceived as actual user pattern of electric vehicle owners and potential owners are not known yet. Choi, Shin et al (2018) mentioned that user requirements are yet to be identified to determine maximum required battery range for widespread EV adoption.

Research gap exists in identifying actual usage requirement of EV across various segment of customers which can become a key element to understand and drive consumer adoption of EVs.

There is a need to study and establish the usage pattern of electric vehicles among various users and to derive the actual range of better which will optimize EV adoption among various segments

Discussion and Review Agenda :

B. Research Problem

Research Problem-1: Lack of research data availability on various factors affecting the adoption of EV among high potential buyers, who enquired for electric vehicle at some point of time and later dropped the purchase plan

Current Scenario: Majority of the earlier researches have conducted survey on various groups who are not directly linked with EV. There are a prominent research need among the potential consumers who have enquired for EV on various platform, both online and offline and later has not made the purchase decision. Research can show the show the factors actually impacting the purchase decision of potential buyers. Research can also distinguish the factors which are favouring to make purchase decision and which are restricting consumers to buy.

Research Problem-2: Lack of research data exist on category and model type of electric vehicles which consumers prefers to adopt. Lack of research data available on various features and attributes of preferred models which will improve consumer adoption

Current Scenario: In India, though the penetration of electric vehicle have been very moderate in recent years, it has gone through various life cycle as new product emerges. Reva was first electric vehicle which was essentially a mini hatchback. It was acquired by automotive leader Mahindra & Mahindra later and big investments were made by Mahindra to ramp up its production and sales. However that product had its own life cycle and it production was stopped by Mahindra as sale declined. In the mean time, newer electric vehicles were launched by other manufacturer in different categories like sedan, mini SUVs which experienced a decent acceptance by consumers. However, there are less research data available on preferred category and type of vehicles among various segment of users

Research Problem-3: Lack of research data on current usage pattern and usage requirement of potential buyers. Most of the constraints of electric vehicles usage and perceived constraints

Current Scenario: Range anxiety and other parameters have been highlighted as a constraint of electric vehicle adoption in past researches. However none of the researches have documented actual usage need of consumers and then evaluated whether current electrics vehicle can fulfil it or not. Evaluating exact usage requirement is very critical to improve consumer adoption. It will also greatly help manufacturing OEMs to line up EV products which suits consumer requirements and ensure maximum adoption.

C. Research Questions

RQ-1: What are the key attributes which are impacting final purchase decision among a potential EV buyer?

RQ-2: Which is most preferred category of electric vehicles for potential consumers?

RQ-3: Identifying the detailed usage requirements of EV among potential consumers

IV. PROPOSED CONTRIBUTION & MANAGERIAL IMPLICATIONS OF THE STUDY

- The proposed study will determine the key attributes and factors which determine EV purchase decision among potential buyers. There outcome will be specific for EV category for the sample population. Also it will provide some fundamental inputs on any new product and technology adoption by new buyers
- The proposed study will find out the most important category of vehicles which will have high propensity for adoption. It will also determine the key features and specifications which are desired in electrics vehicles and will propel adoption
- The proposed study will evaluate the current usage pattern of EVs among various segment of potential buyers. This empirical data and analysis will help to determine and possibility of enhancing adoption with the existing EV range available in market

A. Business/Managerial implications of the proposed study are:

From industry perspective, the outcome of the proposed research will be immensely valuable in following perspective

1. The proposed study outcome will help to understand EV manufacturer on key factors and attributes which impact potential buyers to make final decision. The outcome will be helpful to create strategy and action plan for EV manufacturer to improve their sales conversion
2. The proposed study will determine vehicle category which will have high propensity of adoption by consumers. This will help various EV manufacturers to determine their upcoming product strategy
3. The proposed study will critically evaluate actual usage pattern of electric vehicle by various segment of consumers. This will help industry players to revaluate their marketing strategy among various segment of potential consumers to enhance EV penetration

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