CHAPTER-2

LITERATURE REVIEW

Customer expectations are the customer-defined attributes of your product or service. We cannot create satisfaction just by meeting customer’s requirements fully because these have to be met in any case. However, falling short is certain to create dissatisfaction. Major attributes of customer satisfaction can be summarized as:

- Product quality
- Product packaging
- Keeping delivery commitments
- Price
- Responsiveness and ability to resolve complaints and reject reports
- Overall communication, accessibility and attitudes

There are many factors that influence buying decision of a consumer. The factor that can be majorly affecting the buying decision would be:

- Price
- Income of the consumer
- Marital status/ Family single
- Features in the car
- Safety standard
- Warranty scheme
- Finance facility

(Fishbein and Ajzen, 1975)¹, “An attitude represents a person’s general feeling of favorableness or un favorableness toward some stimulus object, and as a person forms beliefs about an object, he automatically and simultaneously acquires an attitude toward that object.”

Attitudes are learnt and not instinctive, which means that a customer develops his/her attitudes from experience. Blythe (1997)\(^2\) writes that the formation of attitude can be based either on direct experience with the product (e.g. driving a car), or indirect experience - where `the consumer forms his/her attitudes from other’s recommendations and communicated experiences. It is difficult to imagine a psychological world without attitudes. Our environment would make little sense to us; the world would be a cacophony of meaningless blessings and curses. Existence would be truly chaotic and probably quite short.

(Fazio and Olson, 2003)\(^3\) Using dramatic words, the authors paint the picture of how the world would look if mankind were spared of its attitudes towards everything. This makes it easy to see the importance of understanding how and why people feel and act in a certain manner to a situation, object or anything that surrounds them.\(^3\) (Schlenker, 1978)\(^4\) A consistent number of authors expand and define attitudes as learned tendencies when responding to an object in a consistently favorable or unfavorable manner. A fairly easy to understand definition is that attitudes represent what one likes and dislikes or the amount of positive and negative feelings one has towards an object.

Attitude research has been popular beginning in the 1900s. One of the main reasons for this, as described by theorists have believed and have seen a real connection between attitudes and behavior. The idea is strengthened that attitude explains consumer behavior, even better than other factors. In fact, the term attitude was introduced in social psychology as an explanatory device in an attempt to understand human behavior.

Project that was funded by Era-Net transport with the name competitive electric town transport

The objective of this project was to decrease CO\(_2\) emissions by promoting the use of electric vehicles and this was supposed to be implemented through better technological knowhow of barriers immediate and that might come in future for electric vehicle that includes noise generated through road traffic. Complete electric vehicles and those with plugin hybrid electric


vehicles or hydrogen powered fuel cell driven vehicles and two wheelers with electric motor all have different purposes and different mode of travel so they may not face same kind of immediate and perspective barriers in future

Many countries including Norway Denmark and Austria have agreed to be the part of this project. This project will pave a new road for creation of sustainable and growing market for electric vehicles but defining the constructive role the government should play in the field of electric vehicles. the source from which electricity is getting generated is of paramount importance as in India the prime source of generating electricity is coal which produces lot of greenhouse gases when burnt to generate electricity So when we think of bringing electric vehicles it has to be coupled with low carbon electricity sources. Oliver D.J, Lee H.S, (2010) However, lot of countries lack electric energy from renewable sources is one of two significant points of view which is dragging electric vehicles into a debatable global warming dwindling achievement. The other squabble is the batteries as they are high-priced, huge and heavy which greatly increase the price of electric cars and increase the upfront cost to a large extent when compared to gasoline powered cars.

When car fleet will have to be changed into electric then this would require introduction of lot of different type of electric vehicles into the automobile segments. There are countries like Germany, Netherlands which have a Fair share of renewable electricity out of the total electricity generation so these countries will be able to reduce their carbon Footprints by lowering the emission of greenhouse gases. (Hagman et al. 2011)\(^5\).

The following questions have to be answered before we come to the conclusion that the beginning and increase of EVs will be a success or not:

a) To what extent can electric vehicles may be able to gratify the day to day travel needs of divergent groups of the populace?

b) What is the outlook toward possession and utilize of electric vehicles?

c) Does prospective buyer have adequate acquaintance of the diverse types of electric vehicles?

d) Do prospective buyers of electric vehicles ready to pay extra amount of money that electric vehicles command in terms of incremental upfront cost?

On the foundation of the existing literature, this report clarifies these questions and future scope of study. Given that electric vehicles comprise a very minute share of the total cars around 0.5 percent in Norway, study on their use, on the prospective buyers and on approach have been conceded out using different techniques and standpoints, thus comparison is different among different countries given the different socio economic condition. Although electric vehicles had come into existence for some decades ago but they are still labelled as new technology. So it makes all the more sense to explore theories of new technology dissemination before we conclude the result from this review of literature

There are quite a lot of theories about how new technology and innovations are prevalent and disseminated in society and adopted by consumers (e.g. Rogers 1995, Schelling 1978, Glad well 2000). To provide a small prologue to the different perceptions, they presented a paper that discussed the different ways in which electric vehicles can be made more adaptable.

Axsen and Kurani (2012)\(^6\) have searched the procedures of interpersonal manipulations implicit in the question of what societal benefits new vehicles offers to consumers.

Following point of views that can be helpful when examine adaption of electric vehicles:

Infectivity: Point-to-point flow of information for example dissemination of innovations (DOI) (the procedure in which an innovation is corresponds through certain channels over time among the associates of social arrangements). This viewpoint has been condemned as being inappropriate for forecast because of lack of focus on emblematic attributes and fundamental inspiration.

Traditionalism: An individual’s insight of the opinion and behaviour of others. It may best be useful to symbolic remuneration. Traditionalism includes structural similarity, threshold models, and physical propinquity.

Diffusion: dissemination focussed and managed by a planned group (the rider of societal benefits). Communal deed approaches look for the manifestation of a critical mass (Schelling 1978, Granovetter 1978).

Translation: consider novelty as vibrant, socially constructed relic. A newly introduced relic has an elevated degree of interpretive suppleness diverse social groups may have contradictory interpretations of its connotation and content, this further influences technological expansion.

Based on the experimental material (that was found in a study done on a plug-in hybrid electric vehicle (PHEV) the results demonstrates: infectivity, conventionality and diffusion are useful notions in regard to interpersonal procedures that engage practical, representative and communal plug-in hybrid electric vehicle paybacks. Infectivity presumes a single direction flow of information between clusters; conventionality portrays only the current norms and pressures of a given social organization; allocation is focus on a core group of pro community way of life practitioners. These terms recognize the in progress value, lifestyle, negotiations and expansion of interpretations with an innovation evaluation.

Following factors are responsible for expansion of the novel societal understanding of vehicle technology:

a) A fundamental consideration of practical aspects of Plug-In Hybrid Electric Vehicles technology has been accomplished
b) Way of life practices in an intermediary state
c) Pro communal values maintained within a social system

For incarcerate value alter, performance models describe the discernment of functional and representative compensation, as well as individuality and way of life practices. Since this plug-in hybrid electric vehicles technology is comparatively new in use, the respondents in the different researches will not correspond to the population as a whole and generalization of alteration and attitudes will consequently be easier said than done.

2.1 Behaviour of owners and usage

2.1.1 Profile of users
Assessments of the premature adopters of EVs specify a large degree of common socio-demographic description across countries. They are relatively young, a majority are men, and majority of them are having higher education and belong to the category of higher income group having more than one car. Ona E, Suzanna L, (2012) Numerous surveys of Norwegian electric vehicles holders were conducted in the last decade. Econ (2006)7 conceded out a study in Norway in 2006. This was a combination of postal survey and internet survey with personal electric vehicles holders as respondents.

A sample of 803 respondents was taken from the entire populace of electric vehicle possessors with a response rate of 72% and 104 corporations with a response rate of 52%. The study suggested that the archetypal holler is a man 66%, between 35 and 65 years of age, wedded or living together, higher educated and higher revenue, and living in or around the neighbourhood of a big city. The results demonstrate that only 7%t have an electric vehicle as their single car. A major population of electric vehicle owners, 78%, stay in Akershus, Oslo, Hordaland, which are regions within travelling distance of the three largest cities of Norway.

Rodseth, J. (2009)8 conducted a study in towns of Norway in 2009 meeting factions of respondents by phone 700 holders of an electric vehicle and 700 arbitrarily sampled driving licence possessors in Oslo, Bergen and Trondheim. The study demonstrates that possessors of electric vehicles are at variance from the random sample in the subsequent ways: Majority are male 69%t male V/s 33% ladies, the age groups between 25 and 55 years represent 60% in the electric vehicle sample in contrast with 35% in the random sample.

85% of the electric vehicle sample has had university level education in contrast with 65% in the random sample. In the electric vehicle sample, 73% stays in a family with greater than 2 persons compared with 44% in the random sample. Almost 94% electric vehicle possessors also own a car with ignition engine. 22% of the random sample owns 2 cars. Majority of the respondents in the electric vehicle sample are full time worker in comparison to the random sample (72% Vs 61%).

7Econ, Elbileiernes reisevaner (Travel behaviour of EV owners) Rapport 2006-040. Oslo.
Transport for London (2010) conducted a research with a variation of qualitative and quantitative techniques of electric vehicle possessor and electric vehicle drivers in SME (small and medium-sized enterprise), in-depth interviews were taken. It was established that present users were wealthy and they were dependent on their cars, so they had an electric vehicle in addition to ignition engine car to help driving in central part of London and reap advantage of no congestion charge.

Ozaki R, Sevastyanova K, (2011) In diverse worldwide studies, it is found that early adopters of electric vehicles are young, and have greater income and higher education. The number of respondents was 891 and the response rate 61%. The survey showed that the owners of electric vehicles are men (72%); 55% are over 60 years. They have at minimum 6 years of higher education and reside in the eastern parts of Norway.

Ozaki and Sevastyanova (2011) also conducted study in collaboration with Toyota (GB), but concerning a survey of possessors of the Toyota Prius. Akin to the Norwegian research, they found that the maximum of Toyota Prius possessors were male 52 years old or more who had comparatively high earnings and possessed more than one car.

2.1.2 Use of EVs and the intentions for buying

The Norwegian national voyage assessment established that travelling comprises about 20% of every day trips Vagane. A Norwegian study of the voyage conduct of EV possessors in 2006 established that travelling was the most recurrent reason of electric vehicle use (Econ analyse 2006), with 92% having one repeated trip per day (96%travelling).

The study established that commuting time with electric vehicle was far lower than ignition engine cars while travelling the same distance because electric cars were allowed to drive in public transport lanes. It is already established that when commuters use public transport it takes very less time to reach the destination. Additional benefit that were offered to electric vehicles are free driving on toll roads, free parking, no value added tax, decreased annual vehicle tax, with such benefits it had a great influence on buying decision of electric cars

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The study from Oslo, Bergen and Trondheim with 2 groups of respondents out of which 600 possessors of electric vehicles and 600 random sampled licence holders in the three cities also established that travelling was an important travel purpose of the electric vehicles. On trips to work, 83% of the electric vehicles possessors went by car 16% ordinary car and 67% EV V/s 47% in the random sample. Electric vehicle possessor segmented their car-use after they had purchased the electric vehicles. In this case there had been a modification from public transport to use of the electric vehicles. 41% of the electric vehicles possessors passed a toll road every day compared to 14% of the random sample.

The most significant factors of purchasing electric vehicles told by electric vehicles possessors were:

a) They were allowed to use bus lanes,

b) Sense of satisfaction that they are driving an environment friendly car.

c) Reduced total cost of ownership.

For the random sample, range of the battery, access to charging stations, the range of the battery and lesser operating costs were the main significant motivating factors for purchasing an electric vehicle.

Hybrid Electric Vehicles are used contrarily from EVs. The Norwegian learning of Toyota Prius holders found that the annual space of the Hybrid Electric Vehicles was a slight further than the average for cars in general. The Hybrid Electric Vehicles was used frequently for travelling and relaxation activities and for different sorts of service trips. Ecological explanations were the most important thoughts when purchasing a Hybrid Electric Vehicles, and too the little use of oil.

These are too said to be the most significant benefits of the Hybrid Electric Vehicles. Subsequent spell the respondents were to buy a car, 60 out of a hundred said they would need a Hybrid Electric Vehicles (35 percent plug-in Hybrid Electric Vehicles). The defendants in this study were also requested about purchasing an Electronic Vehicles, with 40 out of a hundred saying they could admit a distance of 120 km among each battery charge.
To determine out more about how customers adapt to the first-hand car technology, some in-deepness studies and demonstration projects have been supported out to find out it was quizzed 30 EV owners/users in 2006 and 10 in 2008 to attempt to trace the dissimilar stages in adjustment of the use of an electric car (awareness, procurement, first steps, daily practice, failures, repairs, etc.) The holders/customers in this learning lived in or close to big town or in medium-sized towns and categorized as middle class, with kids. All had a conventional vehicle which they mostly run. The Electric Vehicles was used mainly for daily travelling and was matching to other ways of transport. Several of the customers functioned in area where they had been prepared to such revolutions – even as electricians or in a municipality using a flotilla of Electric Vehicles – and where they could get knowledge to drive the vehicle. Among owners of Electric Vehicles, there is both the exclusive motorist (only the electric or the petrol car) and the multimodal customer (who run their car in combination with remaining modes of transport).

Customers are multimodal rather than convinced environmentalists, nonetheless they also expressed their attentiveness in cutting-edge technologies. Customers who owned the Electric Vehicles on a regular basis appraise its comfort and smoothness – less maintenance charges are also feature. Driving range is not revealed very often; mainly because of the travelling distance from home to work is a precondition to buying an electric car. The car can generally be recharged at the end of the cycle. People with both a conservative car and an Electric Vehicles run the vehicles selectively conditional on the journey they are about to set out on.

There are two main points of driving way of drivers of Electric Vehicles in the French learning:

a) Their expectation of the drive ahead due to revitalizing, which is mostly done at home or at work (scheduling, which is often not essential when there is access to a predictable car). The Electric Vehicles is less used for leisure activities as of the recharging of the battery.

b) Their espousal of a charming driving style in order to save battery power

Electric Vehicles customers say they use free charging stations rarely. They find them untrustworthy, problematic to locate, sometimes kept for professional task force, and poorly sustained. The reliability of free charging stations is fundamental if they are to become recognized use. An in-depth study of Electric Vehicles users in Norway found that two detail
modifications, matching to the French study, occurred when changing from an old-fashioned car to an Electric Vehicles, i.e. more preparation of the day-to-day travel and more green driving (less acceleration/braking and non-erratic/slower driving) (Gjoen, Hard 2002).  

Turpentine et al. (2011) studied 60 customers of MINI E (BMW converted MINI Coopers into high performance battery electric vehicles with about 110 miles of driving range) in the United States. As approaches they employed talks, focus groups, studies and driving diaries. The MINI E learning process as follows:

Would not ask consent to recharge at the households of friends or family as they were uncertain whether or not this would be suitable. Those who unspoken that the utmost advantages were realized by maximizing the use of the battery were recharging almost nighttime.

a) Changing driving conduct – seeing the miles per gallon (MPG) on the energy demonstration made some of the contributors change their driving behavior, but most females continual to drive as before

b) Pay back – the contributors had trouble finding out the prices and profits of the vehicle.

Derived themes – saving money? Prior outlooks and the upcoming plug-in hybrid electric vehicles- a car for the future, not for today?

Williams et al. (2011) expended a year following up on 15 households in northern California that used an initial (nickel metal battery) Toyota Plug-In HV (one of the initial producer provided plug-in hybrids obtainable), mainly to study recharging behavior. All homes could charge at home and at office their average trip lasted 14 min (about 7 miles). Trips ranged up to 2.4 hours and were 133 miles long. Entire distance was travelled 35 miles/day on weekdays and 21 miles/day at weekends. Compared to the national travel survey, the study contributors had a higher proportion of travel days beyond key distances (10–50 miles). Charging procedures lasted on average 2.5 hours, climaxing between 7 p.m. and 11 p.m. and 8 a.m. and 10 a.m.

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a) Early buyer of electrical vehicles (EVs) is comparatively young, a mainstream is male, and they have high education and salary, and fit to households with more than one car. The common also living in, or in the vicinity of, larger cities.

b) Travelling is the most often cited cause for using Electric Vehicles in most countries.

c) Modifications drivers have to do when driving an Electric Vehicles include improved planning of journeys – due to battery boundaries – and acceptance of a smooth (non-inconsistent) driving style.

d) Intentions behind the buying are the special regulatory recompenses (such as in Norway), ecological considerations, lower running costs and simply the suitability and fun it is to drive these vehicles

2.2 Prospective owners and enticements for purchasing

Because the electric vehicles in its present form is relatively new technology, continuously under development and, simultaneously, appropriate for reducing GHG emissions, several studies have been carried out to evaluate the potential of title and initiatives that would lead to improved demand. The approaches and data used are very dissimilar. The examination in this section delivers information about potential data foundations and supports in the choice of methods for this type of examination

Campbell et al. (2012)\textsuperscript{13} used survey data from Birmingham in 2001 to discover prospective EV owners in a metropolitan area. They working ranked cluster study – a technique by which to cluster a set of substances in such a way that elements in the same group (called cluster) are further like each other (in some sense or another) than those in other groups (clusters) – to categorize geo-demographic groups that fit the profile of a predicted extra fuel vehicle driver (input variables to the cluster study were based on an analysis of the literature on Electric Vehicles customers)

The outcomes of the cluster examination show that the early adopter cluster constitutes 8 out of a hundred of the (geographical) output areas. Within the areas of this cluster there are 42000 households and 86 000 inhabitants. They were focused in 4 areas. Early adopters have a large quantity owning two or more cars and show high car-use.

A consumer investigation team in Germany has carried out an E-investigation of four different user groups with regard to possible adoption of Electric Vehicles 1) consumers of Electric Vehicles 2) customers aiming to adopt Electric Vehicles in the upcoming 3) customers attentive but with no real intent to buying and 4) patrons not well knowledgeable about/not interested in Electric Vehicles.

These clusters differed in age, sex, type of household and number of cars. Group 1: average time of life 45 years, low female rate 5.4 out of a hundred, household with kids, 2.2 cars; group 2: average age 43 years, 9.4 out of a hundred female, fewer kids, 1.4 cars; group 3: average age 39 years, 18 out of a hundred female, fewer kids, 1.3 cars; and group 4: average age 39.5 years, fewer children, 32 out of a hundred female, 1.4 cars.

A regression examination of the total trial displays that compatibility with own values, involvements and needs is the most significant variable forecasting intention to buying and use of an Electric Vehicles. In addition, significant effects are experiential for relative gains with regard to operational costs of Electric Vehicles and driving features. In the examination of the four customer groups, compatibility was a vital variable display that the more interested respondents are in Electric Vehicles, and the more skill they have, the more they assess the various sizes in their interest.

Investigative the required series for a day’s driving, 14 monitored 484 vehicles (liquid fuel) with Global Positioning system for up to three years; 470 were supervised for more than 50 days. The choice of vehicles (households) was unsystematic (in the USA, Atlanta, Georgia greater metropolitan area). Every time the explosion of the instrumented vehicles was turned on, a Global Positioning system data logger would record the location, time and several action variables once per second until the vehicle was swapped off.
Everyday driving distance: During one year, the everyday range of a vast majority is whatsoever up to 50 miles, excluding times of zero driving; the mean 44.7 miles, the average 29.9 miles. When days deprived of driving are included, the mean is 32.6 miles and the average 18 miles. One hundred miles or extra occurs on average 23 days in the year and 150 miles less than nine times a year. This data can be utilized when talking questions about the figure of days per year the average driver would have to familiarize his behavior by, for instance

a) Swapping to a petrol-engine car.
b) Battery charging throughout the day.
c) Preparation the day’s trip to cover less total distance.

- Days of vehicle use and mileage: There is little connection amongst number of days in routine and travel distance, 0.18.

- Maximum day-to-day travel distance: 50 out of a hundred of the fleet have one day of 313 miles.

- Days needs adaptation: significance

a) Usage additional car in the household or rental a petrol-driven car.
b) Restore throughout the day or en route.
c) Delay part of the tour until the next day.
d) Select a diverse style of transport.

If motorists are eager to adjust two days a year, the 100-mile Electric Vehicles would encounter the needs of 17 out of a hundred of drivers, or if keen to adapt 6 days a year, the same 100-mile Electric Vehicles would meet the requirements of 32 out of a hundred of drivers.

Segmenting by average daily driving distance: 4 clusters of motorists: to content 95 out of a hundred of the lowest quarter of the days of driving needs only a 56-mile range, an 86-mile range for the second quarter, a 116-mile range for the 3rd quarter and a 171-mile range for the highest quarter.

For the lowest group, an Electric Vehicles with 100-mile range would be sufficient for 32 out of a hundred of motorists, without necessitating any adaptation. If a period of 2 days/year of
adaptations is bearable, this vehicle could please 56 out of a hundred of these drivers – with 6 days’ adaptations, 83 out of a hundred of the lower mileage vehicles could be replaced with 100-mile range Electric Vehicles.

Time-of-the-day driving forms: On a normal weekday at 5 p.m., only 15 out of a hundred of the cars in the sample are on the road. 85 out of a hundred are parked at any given 60 minutes of the average day, and in a year never less than 75 out of a hundred of the cars are parked. “Also, since the return trip home is widely feast in time, even if all cars plug in and begin charging instantly when they reach home and park, the improved demand on the electric system is less tricky than prior studies have suggested”.

Erdem et al. (2010)\textsuperscript{14} conducted an online examination in different areas in Turkey about readiness to pay for fuel-efficient vehicles. They found that customers who have high salary, high educational level, and are worried about global heating are more likely to be willing to pay for hybrids.

In accumulation to surveying the customers of Electric Vehicles Transport for London inspected the interest in procurement of an Electric Vehicles among all motorists

Nearly 3 of 4 motorists would consider an Electric Vehicles, and 21 out of a hundred would consider buying an Electric Vehicles in the next two years. Those most attentive had high car dependence, were regular drivers in city Centre zones, multiple car holders, new car holders, had higher salary, were early adopters of the technology, fairly ecologically conscious, ready to pay a premium, and had a hunger for cars. Motorists of attention were: saving money, valued convenience over public transport, and valued ecological benefits as a bonus, but not a sole motorist.

Axsen and Kurani (2012b)\textsuperscript{15} studied the part of families where a plug-in electronic vehicle could be revitalized at home in the United States as a total and in San Diego, California. About partial of families in which a new car was bought in the United States had the possible to recharge their


car at home with a minimum Level 1 service (the opportunity to park their vehicle within 25m of a 110/120V outlet at their household at some point throughout their diary day). About $\frac{1}{3}$ of new car purchasers in San Diego have access to Level 2 (220/240 V), and about 20 out of a hundred are keen to pay the cost of setting Level 2 recharging at residence.

Bandhold et al. (2009)\textsuperscript{16} carried out an operational study in the age group 25–65 years to detect the possible for Electric Cars in Sweden. This group had admission to a car or had deliberated to purchase one within the next 5 years. The consequences showed that 78 out of a hundred measured changing the car within 3–4 years, and 14 out of a hundred of those well-thought-out an electric car (type not defined). About 37 out of a hundred know what electronic vehicle and hybrid cars are, but only 16 out of a hundred know what a plug-in hybrid is. Men have more understanding than women Interest in purchasing an electric car increases with level of awareness about this car and promising conditions for its use. Those interested in purchasing an electronic vehicle or PHEV are men who work in the private sector, have a high income and education and live in urban zones. Lack of curiosity in purchasing an EV is usually because of doubt about charges and cynicism of mysterious technology.

Hanappi et al. (2012)\textsuperscript{17} did an online study in the area of Vienna to scrutinize factors in the decision to buying alternative fueled vehicles. The total sample was 714 defendants aged between 17 and 85 years. The study demonstrates that with increasing age the chance of car purchasers choosing a substitute powered vehicle drops.

Elder people are most skeptical of Compressed Natural Gas vehicles, followed by ethanol and electronic vehicle. Young males with high salary, kids, high education and a essential to use the car on a regular basis were the cluster most likely to buying otherwise fueled vehicles. Furthermore, the income consequence is highest for PHEVs. Peripheral variables such as high fuel rates, higher ranges of electric vehicle and rises in coverage of the charging substructure will have key impacts on the market share of electric vehicle. High fuel rates have the extreme effect

on the market share of electric vehicle in rural areas, whereas in areas with medium thickness it is the increase in the range of electronic vehicle that has the greatest effect.

Sentio Research Norway (2012)\textsuperscript{18} carried out an online study with a haphazard sample of 1000 Norwegians 18 years and older about whether they think an electric vehicle could satisfy their conveyance needs. The features of those who answered “to a large degree” were 30 years and younger, did not live in families with kids, were single without kids, lived in towns with more than 50 000 inhabitants, not in sparsely populated zones, and students.

Those who careful an electronic vehicle as car number one were 30 years and fresher, active in Oslo/Akershus (the metropolitan area), singles with or without kids, had low family income, were students. Persons in the age group 31–39 years and families with kid’s careful electronic vehicle as car number two.

The consequences of an online study by Halos et al. (2010) among 1400 members of Tekna (Norwegian Society of Graduate Technical and Scientific Professionals) express that 37 out of a hundred would consider an electronic vehicle as their next car – the following clusters in the majority: female, 30–49 years, families with two or more cars, families with kids (and more than one car), high pay, living in Rogaland (county including the fourth largest city of Norway) and Akershus (the county surrounding Oslo). In total, 67 out of a hundred would reflect a plug-in hybrid in the upcoming. The mainstream lived in the larger towns and among persons younger than 50 years. Vital factors regarding buying of car number one were road traffic safety (females. kids in the family), price and size (children in the household). For car number two, the significant factors were price, traffic security and ecological impact (women).

Musti and Kockelman (2001)\textsuperscript{19} emerging vehicle practice model for forestalling fleet composition, PHEV version and GHG release in Austin, Texas. They developed 4 situations, finding that 63 out of a hundred backing a feebate\textsuperscript{1} policy to favour more fuel-efficient vehicles.

\textsuperscript{18}Sentio Research Norge AS (2012) Online survey for Profero AS.
Under a fee bate situation, Hybrid Electric Vehicles, PHEV and (Mercedes) Smart car are likely will represent 25 out of a hundred of the fleet’s VMT by the imitation year 2025. 2 and 3-vehicle families are simulated to be the maximum adopters of Hybrid Electric Vehicles and PHEVs throughout all scenarios.

Windish (2011) used data from a National Transport Survey when learning the potential for confidentially owned electric cars in the Paris region. In addition, she used a model of total cost of ownership (TCO) for the designated region. A mixture of these two data sources collective with constraints regarding Electric Vehicles ownership (e.g. recharging at home) indicated that 10 out of a hundred of households in the area conform with the criteria; 0.03 out of a hundred in Paris (due to the parking criteria), 2.7 out of a hundred in Petite Couronne and 20.2 in Grande Couronne. Two situations were. Two situations were developed screening the rise in likely Electrical Vehicles ownership by changing policies.

Based on data from the Danish National Travel Survey and data from Global Positioning System loggers connected in 350 cars, examined the possible travel conduct of Electric Vehicles and the necessity for a accusing infrastructure.

Her summary is of the cars with a 150 km travel range fit in to families with two or more motorists, only a little less than 10 out of a hundred of the cars driven on the actual day will need to charge outside the home. If the travel range in practice is only 120 km, around 15 out of a hundred of the cars driven on the actual day will need to charge outside the home. For singles this is only 11 out of a hundred.

In Sweden did an online survey that included information to respondents about Hybrid Electric Vehicles, Electronic Vehicles and PHEVs, i.e. vehicle range, battery revitalizing time, etc. The results showed that 80 out of a hundred of the respondents drive less than 50 km daily; 53 out of a hundred make weekly or monthly long curved trips of 100–500 km, and 38 out of a hundred round trips of 500–1000 km; 90 percent were aware of Hybrid Electric Vehicles and Electric Vehicles but only 56 percent of PHEVs. Disregarding rate evidence – 40 percent are willing to

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buy a Hybrid Electric Vehicles 13 percent an Electric Vehicles, 25 percent a PHEV. With evidence about fuel being 2–3 times economical, the deliberation of buying an EV was 67 percent and of a plug-in hybrid electric vehicles 57 percent.

As many as 70 out of a hundred would want to recharge at home. Car possessors who drive less than the Electric Vehicles range (100 km) show a much higher possibility of buying these cars than those driving longer. Potential buyers of Electric Vehicles and PHEVs are sensitive to fuel rates/electricity prices – if running these cars is two to three times economical, the possibility of buying more than twice.

Accenture (2011)\(^{21}\) carried out an online survey in 13 countries (Australia, Canada, China, France, Germany, Italy, Japan, Netherlands, South Korea, Spain, Sweden, UK, US; N=7003) about the opinions and preferences of consumers toward PEVs. The results show that 30 percent understand enough about Electric Vehicles to buy one, in China 44 out of a hundred (highest) and in Japan 20 out of a hundred (lowest). 58 out of a hundred are in favour of electronic vehicles (PHEVs or Electric Vehicles) replacing conventional cars over time, China 86 out of a hundred, Netherlands 41 out of a hundred, Sweden 64 out of a hundred

60 out of a hundred would consider an Electric Vehicles or a PHEV as an option for their next car purchase, China 95 out of a hundred, Netherlands 41 out of a hundred.

The following factors are vital in the motivation to buy an Electronic Vehicles: Charging point available at home 63 \% 65 \% prefer to charge the battery at home. Battery range equivalent to a full tank of petrol in a conventional car 53 out of a hundred. Total cost of purchasing and running the car that are lower that for conservative petrol/diesel cars 51 out of a hundred. Top 3 incentives were: no tax on car, 86 out of a hundred. Free parking, 65 out of a hundred; toll discount, 44 \%. 71\% prefer a plug-in hybrid Electronic Vehicles, 29 percent a full Electronic Vehicles (the reasons for not choosing an EV are related to insufficient battery range, lacking

obtainability of charging points and too long charging time). Reasons for favoring full Electronic Vehicles were lower running charges, major effect on dipping carbon emission.

A Danish study about probable buyer of Electronic Vehicles found that rate, range and ready accessibility of charging places were the most vital aspects.

The approaches and data used to compute or evaluate the possible of possession and use are very unlike, and so the results cannot be compared directly, even though in Paris and Birmingham a possible of about 10 out of a hundred has been projected. In the USA (California), the share of owners who could recharge at home has been projected at about one-third.

Reduced taxes, other assistances (parking), appreciated suitability over public transport and ecological aids were areas of interest.

Facts of the technology and real-world experience of driving of an Electronic Vehicles are likely to raise one’s interest in purchasing.

2.3 Positive and negative attitudes

Positive and negative assertiveness to and perceptions of Electronic Vehicles, both positive and negative, vary with experience, information and the daily context. In many reviews and studies about people’s sentiments of different aspects of Electronic Vehicles, there is little or no evidence about the respondent’s level of knowledge and experience. The answers given can therefore be problematic to compare. The queries also vary, as can be seen in the evaluation in this section. However, two aspects of the Electronic Vehicles are mentioned time and time again, namely range and accusing of batteries. “Range anxiety” – the fear of being stuck due to a depleted battery is not uncommon (Boulanger et al. 2011)22.

Information about the technology and practical knowledge of the vehicle increase the attention in buying an Electronic Vehicles (Hagman and Assum 2012).

In a Norwegian research conceded out for Volvo Norway (2012), the responses to the query: “How important are the following urgings for not buying an electronic vehicle or a hybrid car next time?” were (percentages answering very vital):

<table>
<thead>
<tr>
<th>Statement</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>I cannot charge the battery where I live</td>
<td>63 percent</td>
</tr>
<tr>
<td>I cannot reach my weekend cottage or other out-of-the-way places with an electric vehicle</td>
<td>58 percent</td>
</tr>
<tr>
<td>The car is too small</td>
<td>57 percent</td>
</tr>
<tr>
<td>The car is too expensive</td>
<td>49 percent</td>
</tr>
<tr>
<td>The car is not safe enough</td>
<td>40 percent</td>
</tr>
<tr>
<td>I don’t trust the technology</td>
<td>21 percent</td>
</tr>
</tbody>
</table>

**Figure 2.1 Research conceded out for Volvo**

The three most repeatedly mentioned advantages of an EV stated by the owners were that:

- It was environmentally friendly,
- Driving in the bus lanes was permissible, and
- It was cheap to run.

Difficulties of the electronic vehicle according to the owners were:

- The variety of the car,
- Time-use for incriminating the battery and security,
- The drive range of the car,
- The minor size and
- Difficulties when charging the battery.

For the random sample, the conforming factors were: it was ecologically friendly, economical to run and parking was free. Approximately 70 percent of electronic vehicle holders said that it is likely they will purchase an electronic vehicle next time also.

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As per the research of Transportation for London (2010)\textsuperscript{24}, a huge majority of the electronic vehicle holders (80 percent) intended to swap their electronic vehicle with another electric vehicle. Blockades to uptake of electronic vehicle related to battery concerns, infrastructure and parking/charging. The current customers are anxious about whether the monetary incentives would be taken away in the future, and about variances in parking strategies across London boroughs.

Part of the learning from London focused on small and medium-sized enterprises and their reactions to electronic vehicle. It was found that enterprises might unevenly be divided into two clusters conditional on their main acuity of the electronic vehicle, i.e. Brand Focus and Cost Competence Focus. The first was categorized by: Initial adopter status, image of the company, in a protuberant position along main roads, and green permits.

Company persona was entrepreneurial and advanced, extra flat structure, open to fresh ideas. The industries were: innovative technology, great profile, media, and positioned in inner London. The Cost Competence Focus of the electronic vehicle was about price savings and image of cost saving. Company personality: Single industry dedicated industries with services, engineering, supply chain, and position in both. Extraordinary studies about range have been supported out

Franke et al. (2012)\textsuperscript{25} studied psychosomatic barriers related to the understanding of range among 40 electronic car operators. Control beliefs, uncertainty patience and coping skills played widespread role in the knowledge of comfy range.

The result shows that seeming range barriers can be overcome with the assistance of psychological interferences such as evidence, training and interface design. The in-depth learning from France of 30 electronic vehicle holders in 2006 and 10 in 2008 displayed that among holders of electronic vehicle there is both the limited driver (only the electric or petrol car) and the multimodal customer, who syndicates use of the car with use of other modes. The use of an electric car inspires a more balanced use of the car and sometimes multimodal performance. Users are multi-modal rather than persuaded environmentalists.


Possessors who practice the car on a regular basis gain its comfort and peace – less maintenance charges are also stated. Driving range is stated less and mainly because the distance from home to office is a condition for buying a media electric car. The car can generally be recharged at the end of the cycle. Two significant features of drivers of electronic vehicle were:

Forestalling the ride ahead due to recharging, which most do at home or at office (planning – which is often not essential when having contact to a car) – not so much used for relaxation events caused by the doubt about recharging of the battery

Espousal of comfortable driving in order to conserve battery power. Power electronic vehicle holders say they use free charging workstations very rarely because they are hard to locate, sometimes reserved for special fleets and poorly sustained. The consistency of free charging terminals is important if their use is to be properly established.

Liven et al. (2011)²⁶ did a stated inclination research in Germany, verdict that cost and range were most significant features of all sorts of cars. Range was more significant if the vehicle was the initial car. They also found a possible of electronic vehicle purchasers of 6 out of a hundred for the second car as opposed to 4.2 out of a hundred for first.

Interviews of 40 users of battery electric cars (BEV) (20 participants) and a plug-in hybrid car (PHEV) (20 participants), 20 males, 20 females 24–70 years from Berkshire, Hampshire and Surrey, UK were carried out by. Their purpose was to discover views about, and attitudes concerning, plug-in electronic vehicles articulated after psychosomatic distance was reduced by their undergoing the usage of a battery electric cars or plug-in hybrid car over a 7-day period

The findings of study identified six groups of attitudes:

a) Price minimization, some motorists unsatisfied that they did not get reaction (savings) on their driving style.

b) Car assurance – some motorists not persuaded of the range

c) Car adaptation demand.

d) Ecological views – few motorists skeptical of the net ecological welfares of electronic vehicle.

e) Impress management – dull design – ‘soulless’;

f) Insight presently a ‘work in progress’ – some motorists waiting for new progresses

Commendable aspects of the electronic vehicle originated in some of the studies are that it is ecological, easy to park, low on sound pollution - is well viewed and economically beneficial. Undesirable parts of the electronic vehicle stated in many lessons are: variety and battery charging, range anxiety, i.e. the distress of being stuck due to a dwindling battery, is not unusual dimension. Value of money, safety and disbelieve of the knowledge are also mentioned as negative features.

**Conclusion**

The review of different studies cited above have indicated both a great multiplicity of methods and topics related to ownership, use and attitudes to EVs and also a lack of analogous studies across countries and period. The study shows that primary reason to which the technology in transition and also to most of the dissimilarity in policy reimbursements among nations.

The re-evaluation suggests that there is a requirement for further studies investigating the expansion in possession utilisation and checking the impact of different policy dimensions of EVs. This reassessment also indicates the dearth of knowledge on the diverse types of EVs is a noteworthy feature in their possible possession and usage.