AN EXPLORATORY STUDY ON

HOW FEELING INTELLIGENCE WILL IMPACT CUSTOMER SERVICE JOB DESIGN IN ELECTRIC VEHICLE INDUSTRY

A dissertation submitted in partial fulfilment of the requirements for the degree of Executive Fellow Programme in Management (EEPM)

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Abstract

The Indian automotive sector is moving towards electric vehicles (EVs), which are fostering economic expansion and opening job prospects. Sustainable development objectives and environmental concerns are what are driving this change. The government has started initiatives to develop a skilled labour force and assist the electric vehicle sector. AI-driven "feeling economy" is changing the nature of service workers' jobs from "thinking" to "feeling." Businesses are being impacted by this change as decision-making and consumer satisfaction are heavily influenced by emotions. In the upcoming years, growth and economic resilience are anticipated to be propelled by the feeling economy. But the sector also must contend with issues like autonomous vehicles, automated manufacturing, ridesharing, COVID-19, and supply chain interruptions. To solve health and sustainable living issues and improve quality of life, the "feeling/sharing economy" is essential. High-performing, fuel-efficient, and low-emission cars are driving the electric vehicle industry; yet issues with performance and user experience persist. The diffusion of innovation model draws attention to the differences in adoption between the early majority and early adopters. The early majority consists of youthful, well-off people who believe that electric automobiles are clean and beneficial to the environment. Infrastructure, societal acceptability, technology improvements, environmental challenges, affordability, and trust are some of the factors that affect customer adoption. By creating environmental regulations, constructing infrastructure, providing auto subsidies, or cutting bank lending rates, governments need to take the initiative in encouraging the sale of electric vehicles. High net worth individuals embracing the emotion economy has a big impact on customer perception. Sustainable business models consider the interests of stakeholders and support the Sustainable Development Goals of the United Nations. To lessen range anxiety and encourage sustainability in the electric car market, improvements in battery technology and the transition to renewable energy sources are essential. It highlights how crucial it is to develop a feeling intelligence culture in the customer service division by emphasising empathy, active listening, and dispute resolution.

1. INTRODUCTION

With the shift in the Indian automotive industry towards electric vehicles (EVs), several job opportunities are being created across all industries. This change addresses environmental issues and promotes economic growth in line with the nation's sustainable development goals. The government's goal of encouraging wider EV use is supported by the enormous job opportunities provided by India's EV manufacturing boom. Making electric motors, battery packs, and vehicle assemblies are just a few of the specialised manufacturing and assembly processes that employees in the EV industry are involved in. For producers of battery cells, charging apparatus, and other EV-related items, the supply chain for EV components offers more employment opportunities. Innovating, promoting growth, and bolstering India's knowledge economy are all made possible by research and development (R&D) ***(Bhattacharya, 2011[1])[1].***

Sales and marketing experts, marketing strategists, and customer service representatives are vital in promoting the advantages of electric vehicles (EVs), educating consumers, and accelerating sales. There are more career prospects as showrooms and specialised internet platforms for electric automobiles grow. For EVs to be widely adopted, a strong charging infrastructure must be developed, which means that jobs in the installation, management, and upkeep of charging stations are required. A smooth charging environment requires the expertise of network experts, infrastructure planners, and skilled electricians. To support the EV industry's expansion and address the need for a trained labour force, the Indian government has launched several programmes. To close the skills gap and guarantee long-term success, skill development courses and initiatives for vocational training centred on electric vehicle technologies are essential.

[1] *Bhattacharya, S. (2011, March 17). Innovation in India: A Path to Knowledge Economy. Journal of the Knowledge Economy, 2(3), 419–431. https://doi.org/10.1007/s13132-011-0035-x*

1.1 The Main Drivers of Economic Growth

The word economy has largely been driven by numbers, rational factors such as supply and demand. According to the University of Sunderland, the main drivers of economic growth include:

- **Human capital:** Highly skilled, educated and well-trained workforce directly translates into higher economic impact because the well-trained and focused workforce will lead to better results, in a more efficient manner.
- **Physical capital:** Infrastructure such as factories, transport links and machinery directly impact the economy as it boosts manufacturing, encourages international trade, provides employment to the human capital mentioned above, and improves productivity and efficiency in most cases. As a result, the economy grows faster, and the standard of people living a particular area also rises.
- **Natural resources:** Oil, Gas, and Cobalt China had foresight. It understood that the technology of tomorrow would require extensive amounts of natural resources. So, as it is well known, they invested in the African country of Congo way before electronic vehicles even rose to the prominence that they have today. Currently, Chinese corporations own or fund 80 percent of the cobalt mines in the Democratic Republic of the Congo. It is no doubt that China's foresight gave it distinct foresight in the Electric Vehicle revolution (EV).

1.2 Technological Evolution to boost economy

Mining natural resources requires technology and human capital. Furthermore, transporting it will require physical capital. Technology makes humans more efficient, automates the mundane tasks and at the same time, allows for humans to focus on the more intellectually stimulating tasks ***(Chandler, 2020)[1][27].***

The impact of technological change and advancement on economic growth is quite significant. In recent times, though, an all-new economy is emerging. It is termed as the

[1] *Chandler, M. (2020, April 2). The Tech behind Electric Cars*

feeling economy. The feeling economy is a term used to describe the growing importance of emotions in the economy. In the past, the economy was largely driven by rational factors such as supply and demand. However, in recent years, there has been a growing recognition that emotions play a significant role in economic decisions.

For instance, when chatbot first came into the picture, no one really used them for solving complex problems. Human beings wanted interactions, someone to listen to their challenges, and then provide a solution. The evolution of AI is boosting this space with the addition of empathetic factors in chatbot algorithms. While statements like 'Is there anything else that I may assist you with today?' provide the customer with a notion of a human being at the other end, there are companies that take the AI game to a whole new level. They learn from human interactions and create a deeply personal response that makes humans want to use the tool. Empathy and technology, not so surprisingly, are more deeply connected now than ever before.

1.3 Feeling Economy and Sustainability

The feeling economy is directly impacted by the mindset and the perception of users. The initial adopters tend to be high net worth individuals, who have disposable income and tend to be more in tune with the demands of the climate on planet Earth. They feel that they are being nice to the environment by purchasing electric vehicles, without maybe understanding the implications of over mining of the elements that go into the battery of an electric vehicle. However, core to the feeling economy is the feeling that you are doing well for the environment and your actions directly impact the climate in a positive way. Currently, the globe needs the equivalent of 1.5 planets to support human activity on Earth, according to the WWF.

Therefore, by using a sustainable business model creation method, we may consider the interests of many different stakeholders, such as people, companies, the environment, and society. This kind of company plan will significantly contribute to the integration of innovation concerning sustainable matters. The Sustainable Development Goals of the UN will also be accomplished with the aid of this.

Such a business model will need to be assessed from three angles, according to the literature study on sustainable business models titled "A literature and practise review to develop sustainable business model archetypes." Organisational, social, and technical advancements are the three cornerstones of a sustainable company strategy. According to the report, the technical grouping comprises archetypes that include a significant element of technical innovation (such as manufacturing process and product redesign).

The technological pillar comprises of three archetypes of:

- Optimise energy and material efficiency.
- Utilise waste to create value.
- Replace with natural and renewable methods.

In the electric vehicle space, at least two of the three archetypes can be a potential match. With the emphasis on innovation in battery technology, there is a continuous demand for cheaper batteries which are more efficient. In the feeling economy sense, consumers want a car with a battery that is efficient so that their range anxiety is lessened. Once more, switching from non-renewable to renewable energy sources is part of replacing with renewable processes. As discussed in the paper above, there in innovation in the electric vehicle space where the shift is from power grids and using fossil fuel-based electricity to more renewable energy sources for charging batteries including solar and wind power.

Similarly, the social pillar has three archetypes as defined below:

- Providing functioning as opposed to ownership.
- Taking on a stewardship role.
- Promoting sufficiency.

Delivering functionality has a component of extended warranty and maintenance. While this paper has established from various sources that the electric vehicle maintenance cost is much lesser than an ICE or internal combustion power vehicle due to lesser moving components, there is still a fact that batteries will be at the forefront of any electric vehicle purchasing decision. Thus, batteries with extended warranties, options for rental, leased and even shared batteries may go a long way in influencing a purchase decision that is biased towards electric vehicles instead of internal combustion engine vehicles.

A component of this archetype is promoting consumer care including the health benefits. This is directly related to electric vehicles, as one of the most important selling points of the electric vehicle is the fact that it reduces carbon emissions and because of the positive impact on the environment, gives the consumer a direct control over their health. The number of people dying of lung cancer, and other environment related diseases is on a record high and the consumer mindset that electric vehicles will help control air pollution will go a long way in making purchase decision in favour the electric vehicle.

Consumer education is another pillar of this archetype. In the paper, it was mentioned that Stockholm failed to lead the electric vehicle brigade simply because there was a lack of consumer awareness. The government policies both of Sweden and of the European Union only went so far in making the consumer understand their personal benefits when they purchased an electric vehicle.

Additionally, one effort that helped gain awareness of the increasing number of electric vehicles on the road is the green number plates. This idea, although not meant to be a marketing idea to promote awareness, has indirectly led to many consumers being aware of the increasing number of electric vehicles plying the roads. The third pillar of the sustainable business model is the organizational pillar. The archetypes of this pillar are below:

- Repurpose for society / environment.
- Develop scalable solutions.

Electric vehicles, over time will lead to a mountain of battery waste. There needs to technology that can repurpose this battery waste into something that helps take away the waste from our landfills. Scalable solutions are in high demand in the electric vehicle manufacturing space. What happens when China refuses to part with Cobalt, which is essential for battery manufacturing? What happens when the elements that are needed to build a battery become unavailable or scarce? Do we have an innovation that can allow electric vehicles to scale despite their growing dependence on certain core elements? Battery makers are encouraged to explore more ways to power a battery including hydrogen-based fuels.

1.4 Artificial intelligence for EV adoption

According to a paper published by Science Direct, titled "The role of artificial intelligence in the mass adoption of electric vehicles," the reason behind the massive push towards renewable energy is the fact that fossil fuels, in addition to being wildly dangerous for human health and the environment, are depleting at a high rate. By adding geo-political tensions to the mix, we have an even more volatile cocktail of highly combustible fuel that can be cause serious damage to planet Earth at large.

As such there is a huge upfront push towards reducing the dependence on these fossil fuel-based technologies, including fostering the growth of electric vehicles. But as this article has already covered several times, one important issue impeding the widespread use of electric vehicles is the cost of the battery pack. According to experts, machine learning has the potential to offer a quick and inexpensive way to identify high-performing battery materials and potentially boost the productivity of battery production. After all, these battery production facilities rely on fossil fuels.

At the same time, artificial intelligence algorithms will help curb range anxiety in consumers because they provide realistic driving range estimation, and the more accurate these algorithms are the more trust they inspire in the minds of the consumers. These artificial intelligence-based algorithms can also aid in optimizing energy conservation, thereby adding extra driving range to the vehicles. Similarly, the usage of these algorithms in the smart grid can go a long way in figuring out which stations have a power load and the patterns of overloads in these grids. Thereby, consumers could use the electricity more efficiently, if the artificial intelligence-based system can redirect energy from the grid with the maximum surplus.

The concept of vehicle-to-grid (V2G) technology plays a significant role in the smart grid ecosystem that powers charging stations for electric vehicles. This technology operates bidirectional, enabling not only the efficient transfer of surplus energy between electric vehicle charging stations and power grids but also empowering consumers to generate revenue by supplying power back to the grid. In addition to its many applications, V2G technology also helps to manage energy distribution inside the V2G framework, reduce

congestion at charging facilities, and identify the best locations and resources for charging stations.

Artificial intelligence (AI) refers to the utilization of algorithms and models that aim to replicate natural thinking, perception, and action. In recent years, AI has evolved from a theoretical concept to practical applications in various domains, including the electric vehicle industry and its associated infrastructures. Examples of AI applications in this context encompass EV battery design and management, charging stations optimization, and even the intelligent management of the overall smart grid system. Diving deep into the technicalities of artificial intelligence, the paper states that the techniques mainly used in the electric vehicle space are divided into machine learning and computational intelligence.

Machine learning created models that effectively find relationships between inputs and outputs and they also are adept at finding trends. The machine learning models require training on an initial dataset. The paper goes deeper and states that machine learning can be both supervised and unsupervised. The supervised and unsupervised learning is done based on huge datasets that may be readily available or are artificially created. As such they are useful in figuring out the best materials to be used for Electric Vehicles. There are also models of machine learning that learn through trial and error.

1.5 Impact of Artificial intelligence on Electric Vehicles

Artificial intelligence in electric vehicles can be best used in route optimization and battery development. It can be hard to understand how machine learning can impact battery development. Electric vehicle battery packs still face performance related issues, and their battery design can be helped and made more efficient with the use of machine learning algorithms.

According to the paper, machine learning can lead help with higher battery energy efficiency, safety and most importantly, the consumer perception that the vehicle will not be stranded in the middle of nowhere can be reduce. For machine learning to facilitate this, the first aspect is needed to be understood is that there are limitations in the current lithium-ion battery design. Even manufacturing these batteries comes with its own set of limitation.

This all can lead to lower energy density in the battery. Machine learning techniques can be used to overcome the barriers mentioned above, and these have gained commercial and academic traction in the recent years. Machine learning algorithms directly facilitate battery-material discovery and have the potential to improve battery manufacturing efficiency.

1.6 AI in the charging stations for electric vehicles

Experts concluded that one of the most effective ways of reducing range anxiety is by the deployment of electric vehicle charging stations at optimal intervals along any given driving route. This is also called the optimization of charging locations. Optimally placed charging stations will give consumers more confidence that they will not be left stranded in the middle of the road in case the power in their battery-operated vehicle runs out.

Tesla realized that this option is a great one for gaining consumer confidence, and therefore it laid emphasis on installing the Electric vehicle charging stations globally and has around two thousands of them installed already.

An example of another company that uses artificial intelligence to optimize the placing of electric vehicle charging station is Elaad NL, which operates out of Netherlands and is one of the largest Dutch EV-Infrastructure providers. They make not make cars, but electric vehicles have given birth to a whole new industry which provides infrastructure for electric vehicles. Back to the feeling of range anxiety, this Dutch company placed the charging spots optimally throughout the Netherlands, and the optimum locations are determined based on artificial intelligence models that take traffic density and driving distance into account.

Artificial intelligence algorithms consider road network and other infrastructure, operational economics, power-grid security, local charging demand, construction feasibility, and other criteria while determining the best location for electric car charging stations. Additionally, the aspect of minimizing costs and maximizing of the net present value are also there. Based on inputs from these variables, artificial intelligence can map out the exact locations where electric vehicle charging stations should be placed.

1.7 Using artificial intelligence to connect electric vehicles to the smart grid

A crucial aspect of electric vehicle (EV) adoption involves efficiently obtaining sufficient power without disrupting the functionality of the charging grid. Smart grids offer advantages over traditional electric power distribution systems by facilitating bidirectional energy flow and enabling secure, dynamic optimization of energy distribution. They also allow for price optimization based on supply and demand dynamics.

Smart networks that support bidirectional energy flow allow energy to go both from the vehicle to the grid (V2G) and from the grid to the vehicle (G2V). This method allows for peak shaving and load levelling while ensuring effective energy generation and distribution through frequency management. Battery-powered electric vehicles may be used to generate electricity when demand is low and to charge the batteries when demand is high.

Electric cars offer a dynamic load, as opposed to a fixed one; hence the bidirectional energy flow also helps with load control. When needs from fixed loads are either fulfilled or decline, charging electric cars can be recommended, but it should not be done during high demand periods. Spinning reserve is another benefit of bi-directional energy flow. If the grid relies partially or fully on intermittent sustainable energy sources like solar and wind, power outages may occur. In such cases, the spinning reserve comes into play, and reducing the load from electric vehicles can help alleviate the overall demand. Machine learning models consider various factors to prevent overburdening the grids with the additional load from charging electric vehicles alongside fixed loads.

While artificial intelligence (AI) technology is being applied to practical commercial aspects of electric vehicles, it is still in its early stages and not fully matured. Ongoing innovation in AI holds the potential for discovering additional applications that will make electric vehicles a more viable choice for consumers worldwide in the future.

1.8 Challenges with EV and AI

A model of energy supply and demand is necessary for many artificial intelligence applications covered above, such as determining the ideal placement for EVCS and optimising energy management. Creating this model is a difficult task. This model is complex because it deals with high number of uncertainties. The charging patterns of electric vehicle users will not be the same tomorrow as it is today. This will be changing factor will change the dataset required for machine learning modelling. At the same time, the lack of sufficient EV user charging data will prove to be a challenge for machine learning algorithms, as they rely on data sets to train. Additionally, the artificial intelligence-based models can only inform but building the actual electric vehicle charging stations requires government permissions and needs to cross over legal and political barriers as well, in the real world.

Additionally, if the number of electric vehicles being driven for business grows, it's possible that the databases may become out of date. In addition to the infrastructure for electric car charging having to keep up with the demand for electric vehicles, machine learning models also need to be regularly updated with the most recent data. EVCS congestion management and demand-dependent pricing will benefit from an ideal machine learning model. It will assist in calculating the EVCS's electric consumption.

Although machine learning and artificial intelligence play a vital role in making the electric vehicle industry more efficient, the role of humans in the electric vehicle space cannot be ruled out. A paper titled “An Exploring Human Resource Development in Small and Medium Enterprises in Response to Electric Vehicle Industry Development” explores the roles human beings play in the electric vehicle industry.

1.9 New jobs in the electric vehicle industry

As countries worldwide encourage the development of electric vehicles (EVs) in the automotive industry, a new challenge has emerged—the need to up skill the workforce to meet the labour requirements and automation systems associated with EV production. This

transition from internal combustion engines (ICE) to EVs necessitates a whole new skill set that the labour force must be trained on to ensure the success of electric vehicle ambitions.

The report highlights that technological advancements and associated skills have presented challenges for the workforce, with a potential 10% growth in engineering demand contrasted by a projected 70% decline in low-skilled labour demand. The automotive industry workforce must acquire the necessary skills aligned with the new production processes. The new workforce will need to have strong technical abilities to support battery management systems because batteries are an essential part of electric vehicles (EVs). Ability to repair electrical and electronic components as well as abilities related to quality assurance will be emphasised.

Conversely, there may be a decrease in the need for low-skilled labour in the electric vehicle industry because EV power trains only need 20 components, compared to the 2000 components found in internal combustion engine power trains. The impact on the job market due to the rise of EVs is expected to be substantial. To incentivize the workforce, efforts have been made to persuade them to up skill in line with the needs of the electric vehicle industry. Studies conducted in China, Russia, and various other regions have found that the workforce's ability to re skill or up skill is influenced by their perceptions, attitudes towards career choices, capabilities, and anticipated technological advancements.

Research conducted in China by Fleisher and Wang during a transitioning economy revealed that the willingness of the workforce to pursue further education was driven by the correlation between education and higher salaries. Less educated workers were motivated by the higher earning potential of their more educated counterparts, leading them to seek higher education if it was economically feasible. Similar findings were observed by Sabirianova Peter in Russia, where the wage ratio adjustment significantly affected skill development and labour productivity in the skill-biased transition of the Russian economy.

In a developing nation like India, which is experiencing substantial investments in up skilling the workforce specific to the needs of the automotive industry, researchers have emphasized the need for continuous education processes in an industry that relies on innovation for sustained growth. Therefore, according to Ayyakkannu, A, who wrote a

paper called “Technical and soft skill competencies mapping at the entry level of diploma holders in mechanical and automobile engineering for auto and auto components industries” relevant skills were identified for the Indian automotive industry, and a curricula was developed in collaboration with agencies, institutions and authorities to ensure that the Indian workforce is educated about the latest developments in the automotive industry, and is skilled enough to handle any issues.

According to the paper "An Exploring Human Resource Development in Small and Medium Enterprises in Response to Electric Vehicle Industry Development," the introduction of electric vehicles would likely force SMEs to reorganise their labour forces, which would disrupt the automotive sector both directly and indirectly. With the decline in the production of internal combustion engine-based vehicles, the number of automotive parts that go into production will be reduced. This disruption may directly affect the livelihoods of the workforce. Indirect disruption will be demand based, and in reaction to the new technology. Therefore, it is imperative that the workforce of today be skilled with the demands of tomorrow ***(Osatis & Asavanirandorn, 2022)[1][79].***

This also requires some study on the impact on the professions and skills so that the affected workforce may be able to transition towards skills that will be in demand in the automotive industry in the future. According to the study, there are three skill levels which will be impacted by the transition to the electric vehicles. The initial group impacted by the transition to electric vehicles consists of highly skilled engineers. These engineers are typically employed in roles related to quality assurance, quality management, and diverse fields such as design, energy storage, and product development.

These jobs will be affected by the transition to electric vehicles directly because electric vehicle requires a highly skilled engineer to be able to design a hybrid engine, or a

[1] *Osatis, C., & Asavanirandorn, C. (2022, June 6). An Exploring Human Resource Development in Small and Medium Enterprises in Response to Electric Vehicle Industry Development. World Electric Vehicle Journal, 13(6), 98. https://doi.org/10.3390/wevj13060098*

lightweight battery, lightweight suspension or even battery management systems. These skills are not of much use in the current internal combustion-based vehicles.

These engineers may also require having knowledge of machine learning and artificial intelligence so that they can build datasets and machine learning models that will successfully emulate real world conditions for optimizing electric vehicle charging stations along a particular route, or in a particular area. Additionally, previously relatively unknown fields like mechatronic programming and coding will come into play with the advent of electric vehicles.

As such, for the highly skilled engineers, the paper predicts that employment will be increasing 10 to 20 percent in these and related expertise. However, training in these fields is not as easy as it sounds. The technologies mentioned above are still developing and there is a lack of trainers in these fields. The limited pool of professional trainers will serve as a bottleneck for up skilling the workforce. Furthermore, additional challenges arise from restrictions on intellectual property rights due to proprietary rights and intense competition within the industry.

Two categories are identified in the article for technicians. There is a twenty to fifty percent surge in demand for one category. Nonetheless, there is a need for a workforce with a variety of skills who can use cutting-edge technology. Information technology, supply chain management, warehousing, and logistics are examples of skilled non-manual jobs. Programmable logic control (PLC), enterprise resource planning (ERP), material requirement planning (MRP), and supply chain management (SCM) are necessary competencies for these roles. These abilities might not align with the conventional responsibilities of technicians in the internal combustion engine (ICE) sector, underscoring the necessity of backing from pertinent stakeholders to enhance the workforce's skill set in this area.

Supervisors, manufacturing workers, maintenance personnel, parts assemblers, and machine operators are among the other skilled manual labourers. These jobs may not demand as much technical know-how, but they nevertheless call for a foundational understanding of digital and IT abilities in addition to essential soft skills like communication, industrial discipline, problem-solving, mind management, and safety.

The category of operators is the last one. It is anticipated that employment for this sector of the workforce would shrink, necessitating either migration or up skilling to the job categories. The International Labour Organisation conducted a study titled "The Future of Work in the Automotive Industry: The Need to Invest in People's Capabilities and Decent and Sustainable Work." The study highlights the importance of investing in people's capabilities and decent and sustainable work considering the evolving paradigm in the automotive industry. As anticipated, a reassessment of the abilities and consequent vocational education and training required of workers in the automobile sector is necessary.

The report references well discussed research by Frey and Osborne that raised a lot of discussion and attention over the threat that digitization poses to jobs. According to this analysis, 47% of all jobs are potentially vulnerable. Workforce up skilling becomes more important than previously thought, since almost half of all jobs are at danger. The influence of four technologies—automotive electrification, lightweight material advancements, autonomous driving, and robotic automation—on the electric vehicle industry was the subject of a 2016 research by the International Labour Organisation. The study's focus was on how these four factors affected the workforce in the Member States' automotive and auto parts industries, especially small and medium-sized businesses.

The fire-fighters will also need to determine whether the electric vehicle is disengaged or not by viewing the dash display, if possible, and the position of the key in the ignition. Additionally, they need to look at the power button to see if the indicator light has been lit. Some new electric vehicles operate with something called a proximity key. If the proximity key is within range of the vehicle, then the vehicle can be powered on with a start button on the dashboard. In such cases, the power button needs to be turned off and the proximity key needs to be placed away from the vehicle.

The differences between an ICE and an EV in terms of fire protection do not just end there. There are two batteries that typically go in an electric vehicle. The high voltage power battery that powers the motor, and additionally, there is a conventional 12-volt battery. Both batteries have elements in them which could prove inflammable, and the slightest spark may give rise to a bigger fire. This battery can be placed at different places in different vehicle models and fire-fighters, if they have the time, can refer to emergency

field guides to locate this 12-volt battery and the fuses that fuse that can be pulled to disable the high voltage system. After that the extrication of the driver and the passenger can be done, and the fire can be extinguished.

Thus, safety becomes paramount as more and more electric vehicles including cars and trucks ply on the roads. The workforce up skilling that was discussed earlier in the paper, should now include the related professions which will be impacted due to the advent and rise of electric vehicles. As is evident from the paper published for safety, the roles of fire-fighters and other emergency responders becomes considerably more complex and technical as they respond to safety calls related to electric vehicles. With the increasing importance of optimally placed public charging infrastructure, and electric vehicles being manufactured from various companies, there arises another challenge. Tesla cars are charged at Tesla charging stations, and different manufacturers might be tempted to create their brand specific charging stations to boost their sales.

For the public, however, this strategy is cumbersome. The study "Interoperability of Public Electric Vehicle Charging Infrastructure" claims that there is a lack of communication across various networks and those electric vehicle service providers, or ESVPs, are often network specific. There is an interoperability model that makes it easier for users of electric vehicles to access charge points from different owners and operators using a single platform. Usually, this calls just a single network subscription agreement.

"Interoperability" in the context of charging electric vehicles simply refers to the ability of crucial system components to communicate and function as a unit. To establish a cohesive charging system, this compatibility guarantees efficient communication and smooth integration between cars, charging stations, charging networks, and the grid. There are many overarching goals of interoperability. Interoperability has a strong state interest as it relates to the entire chain of infrastructure, from the vehicle to the public charging stations, to payment options and ensuring that monopoly does not play out in the market, as it democratizes the access to these charging stations. This was mentioned in a paper published by Northeast States for Co-ordinated Air Use Management titled ‘Electric Vehicle Charging Interoperability recommendations for state policy makers”

Behind the scenes, this is a typical B2B model, where several electric vehicle services providers have signed bilateral agreements or even multilateral agreements to implement roaming partnerships. These agreements are vital to increasing the access to public charging spaces across a network. There is also an agreement between the network charging station owner and the network service providers. These agreements allow that the charging station can plug in to different networks to provide charging services to the consumers without having to create separate charging stations for individual manufacturers.

According to the study, Open Charge Point Protocol (OCPP) is an open networking standard that is becoming more and more popular in the United States and widely utilised in Europe. According to Wikipedia, the Open Charge Point Protocol (OCPP) is an application protocol that, like cell phones and mobile phone networks, enables communication between electric vehicle (EV) charging stations and a central management system. OCPP's first iteration was created by Joury de Reuver and Franc Buve.

While working with mobile phones and laptops, the world is increasingly moving towards standardization, which means that consumers can charge their mobile phones and their laptops with a common charger. The convenience of this interoperability of chargers encourages consumers to invest in a good mobile phone or laptop, because they will not have to pay extra for charger. Most laptops and mobile phones, except for i-Phones, and laptops from Apple can be charged by chargers from other manufacturers.

In terms of electric vehicles, the fundamental issue is the same. Not all electric vehicles have the same physical charging points. According to the report, there are currently three distinct DC charge ports in use, even though there is a single standard for common AC charging that is generally recognised in the US (Tesla vehicles need an adapter). Through the adoption of the SAE J-1772 standard, the automakers and the electric vehicle service providers have common system architecture. Since there are three different DC charging ports in use today, there are increased challenges of manufacturing adapters, and this directly leads to increased complexity and cost in the electric vehicle space.

According to the research paper titled "Interoperability of Public Electric Vehicle Charging Infrastructure" by the Electric Power Research Institute, achieving vehicle-grid integration

(VGI) technologies in the electric vehicle industry will require collaborative efforts among charging station manufacturers, network operators, site hosts, and electric vehicle companies. The integration of vehicles with the grid, known as vehicle-to-grid integration, offers benefits for both vehicle owners and electricity grids. Currently, grid operators prioritize the provision of secure, cost-effective, and reliable public charging stations. However, there is limited engagement between electric vehicle companies and grid operators.

To advance VGI technologies and realize the potential benefits, increased cooperation and collaboration among the stakeholders are necessary. Customers are generally positively impacted by the interoperability trend as this means access to a higher number of charging stations across the country. As stated above, the customers find it more convenient to drive into the nearest charging station and charge their vehicle battery. However, this aspect is highly dominated by e-roaming arrangements. Customers who are roaming between networks need to set up accounts and carry credentials that allow them to access the network of another vendor. Now, if each vendor issues a separate credential, it just means that a customer will need to carry credentials for all networks they have subscribed to in case of a need for refuel at a station where other forms of payments are not available.

There is also the issue of increased charges. Bank ATMs in India, at one point used to charge consumers if they used a debit card of another bank to withdraw cash. The fate of electric vehicle owners is similar. If you use the network of another provider, then you will have to pay extra. Customers who would like to use a new network will have to go through the hassle of signing up for a subscription on the spot. This, coupled with the fact that electric vehicles take quite some time to charge fully, takes a toll on the time spent at charging stations by consumers. The problem is exaggerated when the users do not have the required charging infrastructure at home. In such cases, the network infrastructure is their only hope of charging, and long wait and queue times add a challenge to already busy lives.

A paper titled “Research on DC Charger Interoperability Test for Electric Vehicles” China recognized that limited charging infrastructure availability will impact the sales of electric vehicles. To top it all the lack of standardization when it comes to charging, also leads to

inconvenience for the consumer. The structure of the device to plug in to the charging port is an issue discussed above, but the DC chargers also need to be tested for handling abnormal charges, communication interruption, and vehicle interface disconnect when done abruptly. DC chargers are complicated, in the sense that they could adjust the output voltage – fluctuations in voltage are a very real scenario that needs to be tested, and the DC chargers could also adjust the current in real time. When it is time to stop the charging, the switches need to be disconnected and a charging stop message needs to be sent indicating the end of the charging. Thus, to facilitate all this, the need is that DC plug in chargers need to be physically adapted to the charging points, if not already so. Then the behind-the-scenes action between the DC charger, the vehicle, and the network needs to be seamless. This problem goes beyond the point of securing the correct physical charger compatible with the vehicle ***(Li & Wang, 2021)[1][80].***

A paper was published by Northeast States for Co-ordinated Air Use Management titled 'Electric Vehicle Charging Interoperability recommendations for state policy makers." This paper provides state policy makers with recommendations to promote the entire system-wider interoperability. To maximize system utilization and reliability, open access is important. Open access refers to open access – that is, the ability of an EV driver to initiate and conveniently pay for a charging session at any public charging station. This will also directly impact the consumer mindset with the confidence in the charging network. The convenience will tap into the emotion of reliability and will further fuel electric vehicle adoption.

As discussed above subscription services while allowing consumers to access any public charging station, are inconvenient for more users, as they may need to pay extra fees, and in case they do not have a subscription for a particular service, they will need to sign up. This is time consuming and does not play well with the consumer mindset. The recommendations in the paper mentioned above include a single credential that the driver

[1] *Li, Y., & Wang, G. (2021, February 1). Research on DC Charger Interoperability Test for Electric Vehicles. Journal of Physics: Conference Series, 1754(1), 012061. https://doi.org/10.1088/1742-6596/1754/1/012061*

already has be used to access any public charger thereby foregoing the need to carry all subscription documents electronically or physically.

The widespread use of credit or debit cards as a convenient and universal payment method for charging services will further contribute to the economic growth of electric vehicles. In accordance with regulations in California, all public networked chargers will be mandated to be equipped with credit card chip readers by 2022. This will allow EV users to pay for charging services using one of the three major credit cards, promoting ease of access and streamlining the charging process across different networks.

Another policy measure that can facilitate the widespread adoption of electric vehicles is the implementation of universal roaming. This concept enables charging networks to securely and seamlessly share billing information with one another, like how ATMs operate. Just as consumers can withdraw cash safely from any ATM, regardless of their account affiliation, universal roaming would enable electric vehicle drivers to access and pay for charging at any public EV charger using their own network's interface, even if they are a member of a different charging network. This approach promotes convenience and interoperability, making it easier for EV drivers to utilize public charging infrastructure regardless of their network membership.

Open ADR 2.0 is a common response platform that can be used to facilitate vehicle- grid integration. The state policy can require all publicly funded EVSE to be compliant with Open ADR 2.0. This could also be beneficial to the consumer in terms of financial incentives. Improved EV charging infrastructure end-to-end interoperability facilitates more efficient communication, which may immediately result in the development of smart charging-related applications. The financial incentives for example could be special reduced rates during high load times on the smart grid.

With the electric vehicle market growing rapidly, battery life has become a significant concern. The issue of waste associated with battery disposal has brought attention to the need for recycling efforts. In their paper on the recyclability of electric vehicle battery packs, Evan Leon and Shellie Miller highlight the presence of valuable minerals such as cobalt, copper, lithium, manganese, and nickel in these battery packs. To harness these

minerals when the batteries run out of power, effective recycling initiatives must be established.

Currently, the recycling infrastructure is limited to strategic metals like lithium and cobalt. However, the recycling rate for lithium-ion batteries remains low, despite the expected surge in the number of electric vehicles entering the market. Most of the lithium-ion battery recycling occurs through other electronic devices rather than electric vehicles themselves. Governments, recognizing the strategic importance of precious minerals like lithium and cobalt, have labelled them as such due to their extensive use in emerging green technologies. Geopolitical tensions also pose the risk of supply chain disruptions.

The study's conclusions show that, in comparison to their respective ores, lithium, cobalt, copper, and nickel concentrations in EV battery packs are much greater. Since the cathode active elements of an electric battery include components of cobalt, lithium, and nickel, disassembling the battery at the cellular level further increases the concentration of metals. There are two types of recycling: mechanical recycling, which produces a greater maximum recoverable material, and thermal recycling, which takes less processing time but has an impact on recycling economics.

The study concludes that significant amounts of priceless minerals including cobalt, copper, lithium, and nickel are present in battery packs for electric vehicles. The favourable metal concentrations in these packs are sometimes five times greater than those in ores. To remove these minerals from the battery packs, a pre-treatment procedure is required. During this procedure, variables like product purity, energy use, cost, and maximum recoverable metal value are balanced. The cost of recycling is also influenced by the labour workforce. Estimates suggest that two high voltage technicians working for two hours on disassembly would cost around $100 per battery pack. Labour workforce costs contribute significantly to the total variable costs, ranging from 40 to 50% and sometimes exceeding 70%.

1.11 Key Challenges and Opportunities

As noted in the report "Key Challenges and Opportunities for Recycling Electric Vehicle Battery Materials," there are technical as well as economic difficulties in recycling electric

vehicle (EV) battery packs. Other approaches to extending the life of battery materials must be considered to solve these issues.

Utilising used battery packs for uses that don't need as much power as electric cars is one such strategy. According to estimates, EV batteries may hold between 75 and 80 percent of their initial capacity towards the end of their life, which qualifies them for applications that are not as demanding ***("EV Batteries: Driving Improvements," 2020)[1][81].*** These batteries can have a longer lifespan and contribute to lower lifecycle emissions and less demand for crucial components by being used in other applications. There are several applications for which this strategy has promise.

Going by the idea of the feeling economy, a consumer would much rather pay a marginally higher price for a new item rather than go for a refurbished item at a slightly lower cost. As discussed, there are economic implications of collecting, processing, and recycling large batteries. To achieve this feat, some factors need to be taken into consideration:

In an ideal scenario, recycling battery materials would result in the restoration of their original high purity, enabling them to be used again in the manufacturing of new batteries. This closed loop approach would ensure the continual utilization of the same materials. However, in practice, the situation is different. Many recyclers recognize that the recycling process does not fully restore the materials to their original battery-grade quality. As a result, they are often compelled to down cycle or sell the recycled product to other industries where the strict purity requirements of battery materials may not be as crucial.

Essentially, while the goal is to achieve a closed loop system, the reality is that current recycling processes often result in a lower grade of material that may be more suitable for alternative applications outside of the battery manufacturing sector. This choice may also be made due to the economic implications of maximizing revenue obtained from high value materials. In any case, this choice is preferable to dumping used battery packs in landfills, thereby exaggerating the climate crisis with the rise in the battery pack usage. However,

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[1] *EV Batteries: Driving Improvements. (2020, November). Eureka! 40(11), 21–22. https://doi.org/10.12968/s0261-2097(22)60855-4*

this choice fails to eliminate pressure on the supply chain when it comes to manufacturing battery packs for electric vehicles.

The recycling industry operates under the assumption that there will be profits generated from the sale of recycled materials, and that the raw materials can be obtained at low or negligible costs. This suggests that the costs incurred by competitive collection and recycling procedures should be adequately covered by the market price of recovered materials. Investments in recycling should ideally be motivated by the possibility of making money from the sales of recycled materials. Because of this, it is necessary for the market price of recycled materials to provide a sufficient return on investment for the recycling operator in addition to covering the expenses associated with gathering, transporting, storing, and processing spent battery packs. But customer perceptions also matter a lot when it comes to recycled goods sales. The price must be attractive enough for consumers to consider a second-hand purchase. This can conflict with the costs borne by recyclers in obtaining the supply. The costs involved in recycling can often exceed the costs of extracting minerals from their original ores. For instance, it has been estimated that the cost of recycling lithium is three times higher than that of mining new lithium, discouraging recyclers from investing valuable time, resources, and capital in a potentially unprofitable endeavour ***(Sgroi, 2022)[1][82].***

Furthermore, the market environment for recyclers is highly volatile. Shifts in supply and demand, as well as geopolitical tensions, can significantly impact the availability and cost of raw materials. There are rumours that the decreased cobalt concentration in lithium-ion batteries may eventually make recycling less profitable. Overall, the financial viability of recycling is influenced by various factors, including the ability to cover costs, consumer preferences, and the unpredictable nature of the market for recycled materials.

Reducing the harm caused by battery packs ending up in trash dumps is one of the main goals of recycling. They also aim to reuse the batteries in one way or another or ideally, to

[1] *Sgroi, M. F. (2022, November 1). Lithium-Ion Batteries Aging Mechanisms, Batteries, 8(11), 205. https://doi.org/10.3390/batteries8110205*

derive the virgin Material for a closed loop reuse. This process consumes quite an amount of energy, and such energy emissions secondarily will generate toxic emissions both in the gaseous and the liquid forms.

Moreover, the cost and environmental implications of collecting, transporting and then selling the recycled products back in the market will require considerable amounts of energy which may nullify the effects of recycling. The author does not have proof of the extent to which recycling efforts are nullified, but it is a direct implication of recycling.

In conclusion, a fine line exists between these multiple challenges in terms of environmental and financial challenges which reduce the lucrative proposition of recycling. Recycling walks on this fine line where it balances safety with environmental concerns, and product quality with cost of operations. The entire recycling ecosystem also needs a push from governments and policymaker to ensure that the system is profitable and beneficial for all involved parties.

2. LITERATURE REVIEW

The reason artificial intelligence is changing the duty of a service worker from "thinking" to "feeling" is explained by Professors Roland T. Rust and Ming-Hui Huang. However, before moving on to the aspect of role shift, the essence of the feeling economy needs to be established. According to these professors, the essence of feeling economy employs the soft aspects of a human, which is traditionally not considered to be important in the traditional economy.

In their own words: "An economy known as the 'Feeling Economy' places a greater emphasis on human employment and compensation related to emotional chores and jobs. The 'soft' components of a work include interpersonal communication, building and sustaining relationships, and exerting influence over others. These are examples of feeling/empathetic tasks and one such example is customer service."

The future of the emotional economy will be significantly impacted by AI, they continue. A "Feeling Economy" is supposedly forming, where AI handles a lot of the cognitive and analytical labour, while human workers are more drawn to dealing with people and showing empathy. It says that humans may concentrate on more interpersonal duties like interacting with others, building and sustaining connections, and influencing others, while AI thinks for them by analysing data and making predictions ***(Patel et al., 2020)[1][28].***

There are multiple, numerous reasons behind the rise of the feeling economy. It's a cyclical process where people are increasingly making decisions based on their emotions rather than their rational minds. At the same time, businesses understand the importance of emotions in the economy and are increasingly using emotions to sell their products and services. There is a growing recognition of the fact that emotions are a critical factor influencing consumer behaviour and subsequently businesses are capitalizing on this

[1] *Patel, N., Bhoi, A. K., Padmanaban, S., & Holm-Nielsen, J. B. (2020, November 25). Electric Vehicles. Springer Nature.*

insight and making a very evident shift towards emotional engagement strategies in the marketplace. This has become a key competitive advantage in the marketplace.

Several factors are behind this dramatic shift in affairs. In an interlinked world, the economy is not solely dependent on key industries like manufacturing and retail. The rise of social media makes it easy for people connect, to post the best versions of themselves online, has allowed businesses to reap into their insecurities and many businesses including the wedding, beauty, skincare businesses are now reaping the benefits of the inspirational nature of human beings.

Similarly, on the other hand, brands are now becoming more and more obvious that the audience that will use their products may or may not be the same as the audience that pays for the product. Thus, they use a variety of techniques, such as using emotional appeals in advertising, creating products that evoke positive emotions. Use a diaper, and your child will sleep better, put a spoonful of our healthy mixture in your child's milk and the child will grow stronger, taller, more intelligent, and more confident. The enormous number of brands that play on an individual's emotion to give their children a better life is an example of making a connection to sell the product, thereby giving a boost to the business ***(Sabouret, 2020)[1][83].***

An increasing number of brands are investing in customer care. There is a growing emphasis on the need for the customer to go forward with a 'good feel' in their interactions with any business. This is because the world we live in today is hyper connected and fast-paced, and emotions are seen to have a big impact on how consumers behave and make decisions.

The current research explores the impact of the feeling economy on the sunshine EV Industry which is gaining momentum and how the feeling economy impacts the customer service Jobs and the impact of AI combined with the feeling intelligence. Since EV is a sunshine Industry and we are still in the early adoption of the technology globally the data points would be very limited in terms of the customer service Jobs and feeling economy

[1] *Sabouret, N. (2020, December 9). Understanding Artificial Intelligence, CRC Press*

with Augmented Artificial Intelligence promising driverless cars. One can only have certain assumptions backed by studies conducted in the past followed by Hypothesis framed and being explored for certain correlations.

MacCrory et al., (2014)[1] has looked at the shifts in 673 jobs' skill sets between 2006 and 2014 to better understand how technology development affects the demand for various skill sets. The results will be helpful for future research on skill-based technological improvements. The study employed principal component analysis to discover the obvious and latent dimensions of various talents. The study's results about the degree to which various occupational skill sets have changed since 2006 are said to foretell even significant shifts in the labour force and the composition of businesses in the years to come. Numerous processes of fine-tuning and adjustment in occupational skill sets have been established because of the numerous ways that technology has affected abilities. The disruption of technology in the labour market is predicted to have both good and bad effects on the need for certain abilities, including initiative, teamwork, supervision, and awareness, which may temporarily rise.[84]

Grace et al., (2018)[2] tried to forecast the time when artificial intelligence (AI) would outperform human performance and have provided data from AI professionals to back up their forecast. Experts in AI and ML were surveyed extensively and over an extended period to find out how they felt about the direction AI was taking. According to the research, in the ensuing decades, artificial intelligence (AI) will surpass humans at a wide range of tasks, including operating a truck, writing essays, interpreting languages, working in retail, penning a best-selling book, performing surgery, and more. Within the next 45 years, artificial intelligence is predicted to surpass humans in every Endeavour by 50%, and in almost 120 years, all human employment will likely be automated. Regarding the

[1] *Frank MacCrory, et.al – "Racing with and against the machine: Changes in occupational skill composition in an Era of rapid technological advance"- Thirty Fifth International Conference on Information Systems, Auckland, 2014*

[2] *Grace, Katja & Salvatier, John & Dafoe, Allan & Zhang, Baobao & Evans, Owain. (2017). When Will AI Exceed Human Performance? Evidence from AI Experts.*

Asian participants, it is Compared to North Americans, Asian respondents are likely to have these years considerably sooner and faster.[85]

2.1 What is the Feeling Economy?

The feeling economy banks on not increasing productivity, rather increasing emphasis on the emotional aspects of products, services, and experiences. The concept of the feeling economy has wide implications for businesses, and there are multiple strategies they employ to harness the power of emotions, create meaningful connections, enhance brand loyalty, and drive business success ***(Rust & Huang, 2021[1])[24].***

Emotions tend to play an extremely significant role in decision-making, both for individuals and businesses. Since technology is universal, the deciding factor between giving the contract to company A versus company B often boils down to the level of customer service that a company is willing to offer. The experience behind a business-consumer connect is important in determining whether a business works with a service provider or not. Studies have also shown that emotions tend to override rational decision making when it comes to purchasing choices. Customers that have an emotional bond with a brand or product are more inclined to buy from it. A car can transport you from point A to point B, but the experience of sitting in a Porsche or other high-end vehicle as opposed to a mass-market vehicle is truly remarkable.

Moreover, emotions are contagious, and can lead to increased customer satisfaction and advocacy. Businesses can tap into these emotional triggers and create more resonant experiences for their customers, by understanding emotional intelligence and empathy. Another implication of the feeling economy is that large scale impact can be made through a feeling. For instance, every time a country goes to war, the feeling of patriotism and the willingness to sacrifice for the cause is a deep-rooted phenomenon that erupts into the minds of the public. During the India-China war, this feeling led to mass donations from

[1] *Rust, R. T., & Huang, M. H. (2021, January 19). The Feeling Economy. Springer Nature.*

individuals so that the soldier going off to war may have adequate weapons, food supply, warm clothes etc. This was a time of the traditional economy, but still the feeling economy gave a boost to the various industries whose output was needed to fight the war ***(Stevens, 2019)[1][18].***

2.1.1 Perspective of Feeling Economy

According to a University of Maryland study team, the "Thinking Economy," which rewards cognitive talents, is giving way to the "Feeling Economy" According to the report, employment in 2016 demanded a deeper level of empathy and emotional intelligence than in the past, and financial analysts are now highly regarded for their capacity to provide genuine emotional support. 'Feeling tasks' related to financial advice services were valued 20.5% higher in 2016 than they were in 2006, according to the researchers, but the perceived worth of 'thinking tasks' decreased somewhat during the same period.

In 2006, emotional intelligence was almost an afterthought in job descriptions for fields like chemists and biophysicists, according to similar findings the researchers found. But ten years later, their importance increased dramatically because businesses started to value employing personnel who were exceptional in leading, inspiring, and guiding others in addition to training and educating others. According to the researchers, thinking activities will become less important to computer scientists as AI continues to develop thinking capabilities and undertake more thinking duties. Consequently, artificial intelligence will handle more and more of the technical aspects of computer science, freeing up computing professionals to concentrate on interpersonal communication and leadership.

2.1.2 How Feeling Economy is going to influence the customer jobs

With its fast advancement, artificial intelligence (AI) is changing the nature of work from physical to cognitive. Human workers increasingly place a higher priority on interpersonal interactions, emotional intelligence, feeling abilities, and empathy as AI takes on cognitive duties. For instance, financial analysts increasingly use AI to do computations, freeing up

[1] *Stevens, R. (2019, June 11). Emotional Intelligence in Business. Independently Published.*

more time for customer interactions. Artificial intelligence (AI)-based umpiring technologies are being used in sports like baseball, highlighting the significance of human interaction in building trust. Patients continue to have faith in human interactions even if AI diagnoses are frequently more accurate than those made by human doctors. All organisations will be impacted by the growing Feeling Economy, which will highlight the value of empathy and people skills ***(Hughes-Cromwick, 2021)[1][25].***

The feeling economy is a complex and evolving phenomenon. However, emotions are playing an increasingly important role in the economy. Businesses need to be aware of this trend and take steps to adapt to it. Here are some examples of how emotions are being used in the economy:

Advertising: As has already been mentioned earlier, advertisers often use emotional appeals to sell their products and services. For example, a vehicle commercial might show a man driving at 100+ kilometres per hour on an empty road. Despite the rational implications of these commercial, consumers in India, still tend to be influenced by such advertising.

Product design: Product designers are increasingly using emotions to create products that people will love, for example, I-Phone. Apple designed a sleek and stylish look to evoke feelings of luxury and sophistication, and in the end, tapped into the luxury Smartphone market.

Customer service: Businesses are increasingly using customer service to make people feel valued. This is a strategy used by multiple business-to-consumers as well as business-to-business companies to differentiate themselves from their customers.

The impact of feeling economy on various industries:

[1] *Hughes-Cromwick, E. (2021, January 1). Mapping Jobs and the Transition to Electric Vehicle Assembly in the US.*

Industries are changing dramatically due to the rise of the feeling economy. In an increasingly competitive landscape, there is no escaping the reality that emotions and empathy leads to more revenue dollars.

According to professors, Ming-Hui Huang, Roland Rust, and Vojislav Maksimovic, the prediction is that the feeling economy will become more dominant. This prediction is based on the US government's figures. They go further on the impact of feeling economy by mentioning, “The Feeling Economy is an economy in which the total employment and wages attributable to feeling tasks exceed the total employment and wages attributable to thinking or mechanical tasks.” A direct link with the revenue ensures that consumer feeling, and feedback holds a high resonance factor with businesses. The feeling economy is a powerful force that is shaping the way we live and work. Businesses and governments need to be aware of this trend and take steps to adapt to it.

The following table 1 provides the comparison of feeling tasks against mechanical and thinking tasks to give a perspective on the feeling economy and what it can constitute.

Table 1.1 Comparison of Feeling tasks against Mechanical and Thinking descriptive analysis of comparative [1](Rust & Huang, 2021)

Mechanical	Thinking	Feeling
1. Getting information	1. Monitor processes, materials, or surroundings	1. Communicating with supervisors, peers, or subordinates
2. Inspecting equipment, structures, or material	2. Identifying objects, actions, and events	2. Communicating with persons outside organization
3. Scheduling work and activities	3. Estimating the quantifiable characteristics of products, events, or information	3. Establishing and maintaining interpersonal relationships
4. Performing general physical activities	4. Processing information	4. Assisting and caring for others
5. Handling and moving objects	5. Evaluating information to determine compliance with standards	5. Selling or influencing others
6. Controlling machines and processes	6. Analyzing data or information	6. Resolving conflicts and negotiating with others
7. Operating vehicles, mechanized devices, or equipment	7. Organizing, planning, and prioritizing work	7. Performing for or working directly with the public
8. Repairing and maintaining mechanical equipment	8. Interacting with computers	8. Coordinating the work and activities of others
9. Repairing and maintaining electronic equipment	9. Drafting, laying out, and specifying technical devices, parts, and equipment	9. Developing and building teams
10. Documenting/recording information	10. Monitoring and controlling resources	10. Training and teaching others
11. Performing administrative activities	11. Judging the qualities of things, services, or people	11. Guiding, directing, and motivating subordinates
	12. Making decisions and solving problems	12. Coaching and developing others
	13. Thinking creatively	13. Staffing organizational units
	14. Updating and using relevant knowledge	
	15. Developing objectives and strategies	
	16. Interpreting the meaning of information for others	
	17. Provide consultation and advice to others	

[1] *Rust, R. T., & Huang, M. H. (2021, January 19). The Feeling Economy, Springer Nature*

2.1.3 Learning from trigger paper

Research defines the following four traits as a feeling economy that is sensing its pulse:

- Assembling and forming groups
- Managing, supervising, and inspiring subordinates
- Forming and preserving connections with others
- Helping and tending to others

2.1.4 How it is different or similar from other economy

Second-generation AI is expected to upend the demand for analytical labour and usher in a feeling economy that is compassionate, sharing, cooperative, and caring. Four major factors depersonalization, saturation, acceleration, and fragmentation have an impact on this change. By 2036, collaborating with co-workers and fostering professional connections will be more important in most occupations than "thinking tasks." The phrase "feeling economy" describes a software ecosystem and set of gadgets that are emotionally aware and will transform the way humans interact with machines. All economy reflected in the above table including mechanical, thinking, and feeling will be impacted by the feeling economy. It should emphasise positive attention, which includes both warm and friendly expressions as well as praise for desirable behaviour, to prepare for this future. To get ready for the future of AI and human connection, we should cultivate emotional wellness and empathy.

2.1.5 Skills needed to develop for the EV industry

The electric vehicle (EV) market is expanding quickly; in 2023, sales of EVs will exceed 14 million worldwide, a 35% rise from the year before. Government subsidies, technology breakthroughs, and customer demand for eco-friendly products drive this market. By 2028, the EV market is predicted to grow by 10.7% to reach US$906.7 billion. Designing and producing electric cars, EV batteries, charging networks, and stations are important employment possibilities. Both technical and non-technical talents are in great demand; examples include interdisciplinary technology design, embedded product development, equipment testing, electrical power line installation and maintenance, and installation. For

those who are interested in technology and sustainability, the EV industry has a bright future ***(Graham, 2021)[1][30].***

2.2 Impact of the feeling economy on various industries

One of the industries that have taken steps to adapt to the consumer feeling trend is the automotive industry. Henry Ford once famously said 'You can buy any colour as long as it is black.' From then to now, where car customizations have become a mini-industry of its own, customized cars are a premium luxury which few consumers can afford.

Feeling economy, before the term became famous, was a very real thing. It corresponded to service. The famous Taj hotel chain is famous, even today, for its exceptional customer service. There are multiple hotel chains prevalent across India, but Taj brings forward the feelings of luxury, of being taken care of like a king or queen, and thus evokes different emotions than any other luxury brand of hotels. Many other, low service hotels have come up. However, Taj became inspirational; experience consumers like to go back to repeatedly ***(Mlodinow, 2022)[2][20].***

Coming back to the automotive industry, this is on the brink of change. On one hand, sustainability and the reduction in the consumption of fossil fuels is an issue that is raging across the world. Climate activists, across the globe are searching for ways to live, that because the least amount of damage to the environment.

On the other hand, it is at a brink of change. According to a paper published by the International Labour Office, titled 'Automotive Industry Trends and Reflections,' the numbers are staggering to say the least. The paper shares that "approximately 5 percent of global labour force is directly or indirectly employed in this industry. The total turnover of

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[1] Graham, J. D. (2021, April 30). *The Global Rise of the Modern Plug-In Electric Vehicle*. Edward Elgar Publishing.

[2] Mlodinow, L. (2022, January 4). *Emotional*. Penguin UK.

the automotive industry is greater than the gross domestic product of France." However, economic data reveals that Toyota has posted the first loss in 70 years. The paper also claims that vehicle manufacturers are product obsessed. There is a firm belief that the more variety of vehicles a company provides, it will gain more economical resilience and market share ***(Boranova et al., 2022[1])[23].***

According to McKinsey and company, billions of dollars could be lost due the disruptions in the automotive industry. This industry is at a brink of disruption almost every day, with driverless cars, automated factories, ridesharing, COVID-19 and of course, the disruption of supply chain with the Russia Ukraine war. The automotive industry is experiencing a fair share of reduced car sales and massive layoffs. However, there is a silver lining to the cloud. According to McKinsey, the companies that are radically focusing online are experiencing a major shift. The article mentioned mentions the following case:

"Within the automotive industry, the benefits of adopting a digital strategy surfaced early in the COVID-19 crisis. In February 2020, China experienced an 80 percent decline in overall automotive sales. One US electric-vehicle (EV) maker increased its sales in China by over 10 percent, however. The company had already established online sales offerings, including a clearly structured online shop, contactless test-drives, and car home deliveries, that proved effective during the nationwide shutdown."

Even electronic vehicles (EVs) are not out of the picture. In June 2022, Elon Musk had sent out strong warnings of about the automotive industry's "canary in a coal mine" moment. Tesla's stock fell 9%. Although the fears were alleviated, there was much to be said about the gaining popularity of electric vehicles. Consumers tend to buy electric vehicles, as a response to their inner voice of controlling climate change, maybe even as an inspirational vehicle, but in the real world, Tesla, the giant in the electric vehicle space, has seen maximum sales concentrated around the California area where information technology

[1] *Boranova, V., Huidrom, R., Ozturk, E., Stepanyan, A., Topalova, P., & Zhang, S. (2022, January 14). Cars in Europe: Supply Chains and Spillovers During COVID-19 Times. International Monetary Fund.*

companies are concentrated. At the same time, where Information Technology companies are luring human capital with rich stock dividends, which may or may not be redeemable after the position in the companies has been downsized. With massive layoffs, start-ups do find it harder to get funding. As such, it is still a far cry from being the default preference for consumers worldwide ***(Katsenelson, 2020)[1][22].***

So, where will the electric vehicle ecosystem look towards to future proof their industry? Electric vehicles are a great starting point for multiple reasons:

Driverless cars are all the rage of the future. Multiple companies, including Google are testing out driverless cars. The electric vehicle technology is easily merged with sensors in driverless cars to assure that vehicles of the future do not require consumption of fossil fuels and will not be driven out of range when driverless cars take over the scene in major countries ***(Wadhwa & Salkever, 2019)[2][21].***

2.3 How AI is ushering in the Age of Empathy: The Feeling Economy

According to Roland Rust and Ming-Hui Huang's book, "The Feeling Economy: How Artificial Intelligence Is Creating the Era of Empathy," artificial intelligence (AI) is changing the workforce and elevating emotional intelligence and empathy above intellectual prowess. The book outlines the phases of artificial intelligence's evolution and offers methods for workers, educators, and corporate executives to get ready for a world where artificial intelligence and human intelligence operate together in the workplace and in organisations. The Feeling Economy predicts that feeling intelligence will rule the economy and those women will play a larger role in both business and society. There's also a shift in politics towards empathising more and placing less value on reason. STEM

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[1] *Katsenelson, V. (2020, October 7). Tesla, Elon Musk, and the EV Revolution: An In-depth Analysis of What's in Store for the Company, the Man, and the Industry by a Value Investor and Ne. Shabbos Goy Productions.*

[2] *Wadhwa, V., & Salkever, A. (2019, June 4). The Driver in the Driverless Car. Berrett-Koehler Publishers.*

education is probably going to become less significant in the future, having maybe already peaked. The study used in the book was examined in the California Management Review, where data from the US Department of Labour on job tasks and their employees were examined. People skills, empathy, creativity, intuition, emotion, and people management are just a few of the non-intelligent qualities that humans will need to reassess and leverage as AI progresses to manage a large portion of the thinking involved in industries like manufacturing, retail, and healthcare.

2.4 Stimulation of Feeling Economy

Numerous studies indicate that in the future, artificial intelligence (AI) may do tasks like problem-solving and analytical thinking that are now performed by many individuals on a regular basis. This has been suggested as a potential catalyst for the shift from the "thinking economy" we currently operate in to a "feeling economy" of the future. According to the study, it will be more difficult to reproduce emotional intelligence and the capacity to shape social attitudes and behaviours through artificial intelligence. Hence, emotional intelligence can emerge as the key factor in effectively overseeing interactions and operations in the workplace. According to a recent study, emotional intelligence already contributes to the rise in compensation. However, the need for emotional intelligence and adjustment to the "feeling economy" is what drives the disparity in compensation.

2.5 Importance of feeling/sharing economy

India is a country that has had substantial economic growth and human development, having a GDP of $2.6 trillion in 2017. Nonetheless, the nation confronts difficulties with infrastructure development, employment, and skill development. More than half of Indian workers will require to re-skill by 2022, and the nation will see a yearly increase of 10–12 million working-age citizens, creating a "working age majority." To re-skill and right-skill the present and future labour force, public-private partnerships and interventions at the federal, state, and municipal levels are required. With 50,000 developed rural communities and over 5,000 small urban cities, 40% of Indians will live in urban areas by 2030. Financial inclusion, a lack of digital connectivity, and restricted physical connectedness are some of

the obstacles to accessing rural communities. Improving quality of life requires addressing health and sustainable living challenges, such as non-communicable illnesses and air and water pollution.

2.6 Environmental benefits of EV

Electric vehicles produce zero emissions, which in addition to being climate friendly, directly impacts human health. The state of California, with its climate getting deteriorated and the frequent wildfires will benefit immensely with improved air quality and reduced greenhouse gas emissions. This is a major selling point for many consumers, who are increasingly concerned about the environmental impact of transportation.

2.7 Technological improvements of EV

Electric vehicles have been popular forever now and are not a new concept. However, the technology behind electric vehicles was never as good as the petrol or diesel vehicles, and therefore, their popularity did not gain as much momentum as the more fossil fuel-based vehicles. But in recent years, the technology underlying these cars has advanced dramatically, particularly with the introduction of Tesla and the enthusiasm for producing superior electric automobiles. As a result, customers now find them to be a more appealing alternative, which has enhanced the market for electric vehicles.

Air pollution has serious consequences, even in the Indian economy. Several writers gave a work at the 7th International Conference on "New Frontier in Energy, Engineering, and Science (NFEES)". In a literature review titled "Electric Vehicles in India: A Literature Review," it was mentioned that the transportation sector is responsible for 27% of air pollution and the industrial sector for 51%. Every year, two million Indians die before their time due to air pollution.” According to this same paper, electric vehicles can significantly help reduce GHG or greenhouse emissions.

The Russia Ukraine war, in addition to President Joe Biden pushing for reduced fossil fuel consumption through various means has resulted in significant increases in the price of gas

in US alone. The chart below shows historical 5-year data on the considerable increase in gas prices in the United States in the past 5 years. (Source: Y Charts, Linked to the graph)

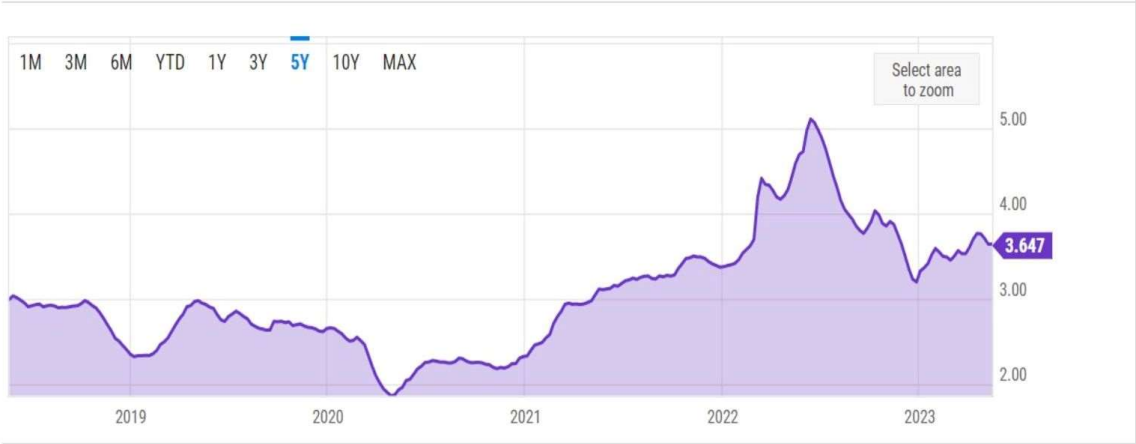

Fig 2.1: Increase in gas prices in the United States (Saad, 2023)[1][17]

The changing fuel prices coupled with the ever-increasing prices of food and basic amenities has forced consumers to look at alternative medium of transportation. While public transportation is a very viable option, there is still a considerable demand for private transportation. The electric-vehicle market is trying to take over the market by showcasing itself as a viable alternative to the gas-fuelled vehicles in the market.

2.8 Government incentives

The rise of electric vehicles has largely seen a huge shift lately because governments across the world are rolling out policies and initiatives that have been instrumental in businesses and consumers adopting electric vehicles as their ride into the future. The tax credits, subsidies and grants coupled with the investment of time and money required into the infrastructure required for electric vehicles is a huge boost to the electric vehicle sector. To encourage the use of electric vehicles (EVs), the Indian government has introduced a few programmes. These include the FAME India Scheme, lower GST on EVs, waivers for

[1] *Saad, G. (2023, May 16). The impact of the Russia–Ukraine war on the United States natural gas futures prices. Kybernetes. https://doi.org/10.1108/k-01-2023-0138*

battery-operated vehicles, exemptions for methanol-fuelled vehicles, and waivers for transport vehicles. In addition, the government intends to subsidise 15.62 lakh electric vehicles with the goal of having all-electric cars in India by 2050 and having 40 percent of all fleets run on electricity by 2030. Still, switching from internal combustion engines to electric cars can save oil import costs and enhance air quality. India may potentially take the lead in producing compact and shared electric cars.

2.9 Global goals – including the United Nations

The United Nations has developed 17 sustainable development goals, one of which focuses on Industry, Innovation, and Infrastructure (Sustainable Goal 9). Another one focuses on Sustainable Cities and Communities (Sustainable Development Goal 11). There are of course other goals in the list including goals on Climate Action (Sustainable Development Goal 13) and Affordable and Clean Energy (Sustainable Goal 7).

All these goals point to the fact that one of the ways of healthy living is possible when we start using sustainable, clean sources of energy. While no goals points specifically towards electric vehicles, the idea behind all the goals mentioned above is to reduce the human carbon footprint and lead a healthier lifestyle. Both directly and indirectly, electric vehicles help humans achieve these goals. While electric vehicles might not use renewable energy yet, they do play a role in the reduction of fossil fuel-based energy consumption.

2.10 Changing consumer preferences

Due to the reasons mentioned above and generally increasing consumer awareness on the issues of climate change, and the realization that fossil fuel-based vehicles are harming their own health, consumers are slowly and gradually shifting towards electric vehicles. In India itself, the number of electric vehicles that are seen on the road, even though they are of a particular brand, has seen a rise in the recent times. As support for electric vehicles from the Government grows, more charging stations are set up, more incentives are

provided to the consumers, the demand for electric vehicles will grow as they will, as many predict, surpass the consumer preference of a fossil fuel-based vehicle[1][16].

Ankita Nagpal further tries to learn how Indian consumers see electric automobiles. The study, which is now available in the International Management Review Vol. 18 attempts to identify the factors that affect consumers' intentions to make purchases. It states that reduced maintenance expenses, low carbon emissions, and government initiatives to encourage purchases all lead to increased purchasing intent. Advertisements, better after-sales service and information available on the internet, also deeply impact the consumer sentiment.

All this, combined with an increased disposable income per consumer, accounts for a heightened perception of the electric vehicles in the consumer mind space. In their paper, Making Electric Vehicles Profitable, McKinsey claimed that there is a desire of consumers to shift towards electric vehicles. The numbers of consumers willing to shift to electric vehicles for their next vehicle purchase are on the rise. A survey conducted in Europe claimed that the preference of purchasing electric vehicles is higher in Europe and China than in the United States.

In Europe, reportedly 40 to 60 percent of consumers were considering purchasing electric vehicles, while in China, the number climbed to 70 percent. However, the Chinese government and their strong incentives to adopt these vehicles but in United States the number of consumers who indicated their preference towards buying an electric vehicle was lower in comparison to these two geographies and was seen to be 10 to 30 percent. Not so surprisingly, this trend is seen more with the younger demographic living in urban areas as compared to the people who are more than 50 years old.

[1] *Acknowledgment to Reviewers of World Electric Vehicle Journal in 2021. (2022, January 27). World Electric Vehicle Journal, 13(2), 28. https://doi.org/10.3390/wevj13020028*

2.11 Why has the world not shifted to electric vehicles yet?

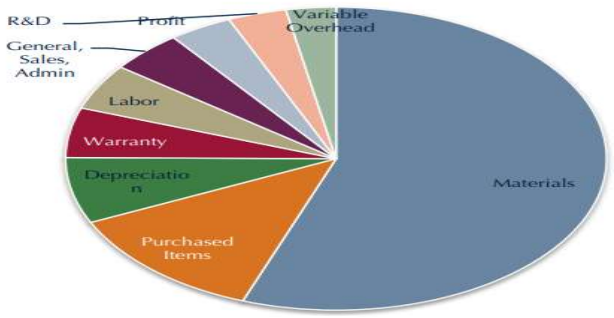

Fig 2.2: Different Variables of Electric Vehicles

Even though electrifying the fleet of light-duty cars is supposed to have favourable environmental effects, the percentage of EVs sold overall is still very low, according to the paper Advances in Consumer Electric Vehicle Adoption Research: A Review and Research Agenda. The European Commission (2012) reports that of the 51.1 million light-duty cars sold in the EU, US, and major Asian countries in 2011, the EV market share was just 0.06%. The widespread adoption of electric vehicles (EVs) is mostly dependent on how customers view them, according to one interpretation of these low adoption rates. The figure below shows the division of the components of the unit cost of a battery pack by Nelson, Gallagher and Bloom as of 2011. ***("Acknowledgment to Reviewers of World Electric Vehicle Journal in 2020,"2021)***[1]

According to India, a paper was published in 2018 by the Department of Electrical and Electronics Engineering at Panimalar College, Chennai. This paper stated that there has been a decline in battery prices in the recent years. In 2012, the price was $600, which decreased to $250 in 2012. The prices are further expected to fall to $100 by the year 2024.

There is a Catch 22 situation here though. There are multiple elements being used including lithium, graphite, aluminium and cobalt for batteries. However, all these elements are

[1] *Acknowledgment to Reviewers of World Electric Vehicle Journal in 2020, (2021, March 11). World Electric Vehicle Journal, 12(1), 40, https://doi.org/10.3390/wevj12010040*

scarce. As the demand for these electric vehicles rises, the availability of these materials will prove to be a bottleneck. However, in recent years there has been a significant technological shift in battery technology that has resulted in improved performance of the more recent cars. As we see stabilization in the battery technology, the depreciation rates of battery-operated vehicles will slow down and the hope for the future is that someday they will match that of internal combustion vehicles. This will also be aided by the fact that there is significantly lesser number of moving parts in a battery-operated vehicle, so maintenance costs will be lesser as well.

The papers, how expensive are electric cars? A total cost of ownership analysis derives the annual depreciation rate of vehicles based on their technology. The paper was published in 2013 and shows that the depreciation for internal combustion vehicles is higher than those of electric vehicles. Optimists are now claiming that the resale value of internal combustion engine-based cars will reduce further, since there is growing awareness about climate change, and carbon taxes will be raised even higher in Canada in future. The paper Comparing Fuel and Maintenance Costs of Electric and Gas-Powered Vehicles by the 2-degree Institute also did a study and came up with the 10-year average saving of driving battery electric vehicles or BEVs per household ***(Lebeau et al., 2013)***[1]**.** The savings are significant and can be seen in the chart below.

[1] *Lebeau, K., Lebeau, P., Macharis, C., & Van Mierlo, J. (2013, December 27). How expensive are electric vehicles? A total cost of ownership analysis. World Electric Vehicle Journal, 6(4), 996–1007, https://doi.org/10.3390/wevj6040996*

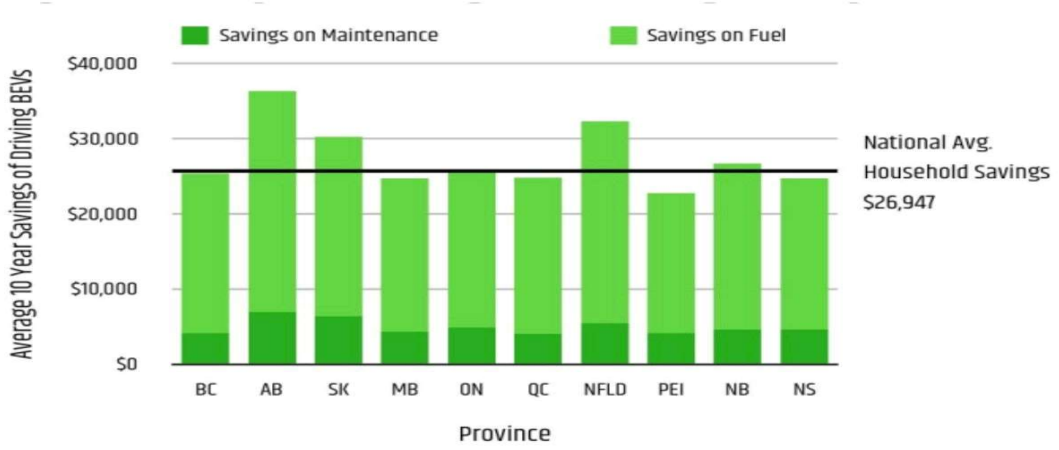

Fig 2.3: Average 10 years saving of Battery Electric Vehicles (Lebeau et al., 2013) [86]

The paper states that they took data from a third-party source and the data revealed a 47% average cost savings in maintenance of operating a BEV battery operated vehicle over an ICEV internal combustion engine vehicle. The lack of charging infrastructure ability at regular intervals causes range anxiety in many people, and rightly so. Rakesh Kumar and Dr. Sanjeev Kumar came to this conclusion when they investigated the problems of electric vehicles in India. Their theory was published in International Management Review Vol. 18. Fall Special Issue 2022.

It is quite evident that consumers will first choose the Hybrid Electric vehicles because they will be assured that petrol / diesel / any other fossil fuel-based pump will be available at a short range of driving distance. However, there is another theory developing with an increasing number of people. An increased disposable income, and with most families owning two cars, one of the cars tends to be used to drive around town, whereas the other car is more for long-range driving. Thus, to be on the safer side, the consumers are also opting for two cars so that they may avail the benefits of the electric vehicles for short distances while the gas / petrol / diesel-based fuel cars are used for long distances including family vacations.

Additionally, according to the publication, Advances in consumer electric vehicle adoption research: A review and research agenda, there are different types of electric vehicles in the

market today. One of the most common electric vehicles is the hybrid electric vehicle or the HEV. The power to run the Hybrid Electric Vehicle originates from the internal combustion engine, or the ICE. So, essentially, it is more of a fuel-efficient car. There is also advancement in the electric vehicle market with the PHEV, or the plug-in hybrid electric vehicle. This is essentially a hybrid electric vehicle with improved battery capacity and a plug-in charger, so it may run on electric power or ICE (internal combustion engine). This allows the driver to have a larger driving range.

Then of course, comes the BEV, or the battery-operated electric vehicle, with a larger battery and drives purely on electricity alone. The range of driving, apparently, is higher than that of the other two variants of Hybrid Electric Vehicle or HEV and the PHEV, plug-in hybrid electric vehicles. The following figure is from the Centre for Climate and Energy Solutions' publication Plug-In Electric Vehicles: It shows how electricity moves via various kinds of vehicles. In plug-in hybrid electric cars (PHEVs), external electricity may be used to power the battery; in hybrid electric vehicles (HEVs), however, it cannot be utilised. An electric vehicle that is hybrid and plug-in is called an EREV.

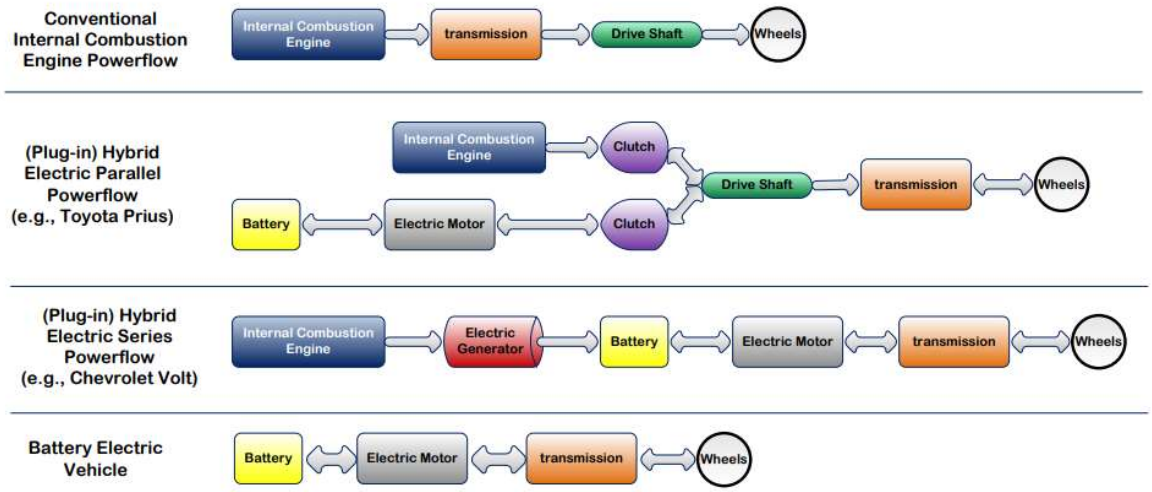

Fig 2.4: How electricity moves via various kinds of Electricity Vehicles (Husain, 2021)[1][87]

[1] *Husain, I. (2021, February 22). Electric and Hybrid Vehicles, CRC Press.*

2.11.1 Charging infrastructure availability

An increasing capacity to charge infrastructure and better batteries are closely correlated with range anxiety. One of the main worries of consumers is range anxiety, as is stated in the Plug in Electric Vehicles Literature Review study produced by the Centre for Climate and Energy Solutions. This concern is a direct result of the worry that there won't be enough battery life remaining in the car to get the driver where they need to go, leaving them stuck. It is truly impossible to bring back a can of gasoline for the automobile. Even though the average daily driving range in the US is 33 miles, many buyers are worried about the short range of BEVs, according to the article ***(Accenture 2011, Kintner Meyer, Schneider and Pratt 2007).***

Ninety percent of American respondents to a recent Deloitte Global Services poll said they travel 75 miles or fewer a day, which is the predicted range of the 2011 Nissan LEAF. The electric cars still require charging even if they can be driven shorter distances in some fashion. The same study claims that the primary distinction between BEVs and PHEVs (plug-in hybrid electric cars) is how long they take to charge.

The BEV may require a charging time of 17 hours, which is inconvenient in most cases of public charging stations. In such cases, consumers would have to fit the charging point in their own homes to avoid waiting for 17 hours at a public charging space. BEV owners will require installing a Level 2 charger in their own home for this purpose. This also limits the charging in instances like apartments, or houses where a garage is not available. Although at a higher voltage station the charging can be done much faster than at home. However, this technology is much more expensive than the Level 1 or Level 2 charging stations, and the cost to consumer can rise dramatically in a capitalistic economy ***(Alam et al., 2021)[1][88].***

The proposed solution is battery-switching stations, which could provide an alternative to longer wait times and even help with the cost, because the batteries with lower power could

[1] *Alam, M. S., Pillai, R. K., & Murugesan, N. (2021, December 31), Developing Charging Infrastructure and Technologies for Electric Vehicles, IGI Global*

be charged at non-peak hours, and therefore the cost of charging them is reduced. Innovations such as these are helping reduce the stress of range anxiety in consumer minds, however, the infrastructure still needs to go a long way before we see the anxiety vanish completely.

2.11.2 Uncertain battery span and durability

According to the paper Plug in Electric Vehicles Literature Review, developed by the Centre for Climate and Energy Solutions, in the real world, the confidence in the battery span and its durability will directly influence consumer preferences.

The paper cites that battery lifespan can be divided into two aspects:

The first aspect of battery lifespan is battery age in years. This is also counted as the number of charge-and-discharge cycles until the battery is no long fit for use and cannot power the vehicle. This number is not easily calculated as the charge and discharge cycles are not easy to determine and depend on several variables. Original Equipment Manufacturers (OEMs) would like to make batteries that will meet the energy storage needs of a vehicle for a full lifetime. To be able to do that, they must make batteries that last around 10 years. This is a mammoth task since it has already been discussed that battery lifespan is tough to calculate ***(Vangala & Casagranda, 2023)[1][11].***

In a bid to overcompensate for the battery life, Original Equipment manufacturers are trying to create batteries with a capacity that is larger than originally necessary. The thought behind this is that as the batteries start to degrade, they will still have the capacity to function normally, and therefore, the consumer will not have replaced the batteries as frequently as earlier. This seems like a viable option; however, it has its downsides. This increases the weight of the battery, increases the size of the battery, and thus we come to a Catch 22 situation where the price of the battery becomes an issue again.

[1] *Vangala, S., & Casagranda, B. (2023, March 10). Bolstering the Battery Storage Supply Chain for Battery Electric Vehicles and Grid Storage. Climate and Energy, 39(9), 19–27. https://doi.org/10.1002/gas.22340*

According to the paper published by Advances in Automobile Engineering, titled Electric Vehicles and Driving Range Extension, storage technology has been improving drastically in the past few years. Lithium-ion batteries are apparently the rage because they possess a high capacity and are light in weight. Many materials are being used in the making of batteries, but Lithium iron phosphate is deemed to have a high current capacity with very good thermal performance and is also low on the aging factor. Many technologies are being deployed to make more efficient and long-lasting batteries. Innovation in this space is multi-fold. Different storage materials can be added on top of the batteries to increase the driving range. Additionally, there is also an option of using super capacitors or ultra capacitors in parallel with batteries. In a purely theoretical world, ultra capacitors can store energy for a short period of time; however, they have infinite number of charge and discharge cycles. Fuel cells are another storage option being considered for electric vehicles as they have a high energy density. However, they have a poor response time ***(Chandran & Joshi, 2016)[1][89].***

There are pros and cons to every innovation in the electric vehicle space, and speed of innovation is providing optimism in the future of electric vehicles and their increased usage. In the technological space, many more advanced technologies are being considered as well. The use of photovoltaic panels is one such innovation. The photovoltaic panels have multiple uses in an electric vehicle. Not only do they charge batteries but also act as an AC to DC converter.

According to the paper published by Advances in automobiles in Engineering, titled Electric Vehicles and Driving Range Extension, even wind and solar energies are being tapped to increase the driving range of electric vehicles. Electric vehicle technology, at the end of the day, is complex, and continuous innovation in the space will soon be leading to a decrease in cost and increase in efficiency for the common consumer. The demand will soon follow the supply curve of low -cost efficient engines.

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[1] *Chandran, D., & Joshi, M. (2016). Electric Vehicles and Driving Range Extension – A Literature Review. Advances in Automobile Engineering, 05(02). https://doi.org/10.4172/2167-7670.1000154*

2.11.3 Driving experience and performance

India's car sector is the fifth biggest in the world, according to the article Market potential for electric vehicles - a literature assessment. It is responsible for around 22% of India's overall industrial output and has been expanding quickly. Additionally, the statistical data from the EV volumes in this study indicates that over a million EVs were sold in the first half of 2019, representing a 46% increase from 2018. Furthermore, after surpassing 1 million EVs sold globally in 2016 and 2 million in 2017, the worldwide EV stock reached over 500 million in 2019, indicating a 46% increase from 2018. Market for vehicles that are high-performing, low-emission, and fuel-efficient is what drives the market for electric vehicles (EVs) ***(Earl & Fell, 2019)[1][9].***

However, a small percentage of the Indian and the assumption is the global population, are concerned about driving performance and experience. The rev of the fossil-fuel based vehicle, in the psychological sense of the word, does not charm them like the ICV does. This market will be a tough one to crack, because in addition to the environmental concern, the driving experience and performance and the entire driving experience of the engine drumming away is a major attraction.

2.11.4 Integration on EVs into the smart grid

According to the paper, Integration of EVs into the smart grid: a systematic literature review, the one major component that has considerable interest by government authorities, private sector companies as well as researchers, is integration of the electric vehicle charging infrastructure into the smart grid. This integration, if not done properly, can lead to instability, as it can overload the profile of the grid significantly. This can lead to less than favourable consequences if not managed properly. According to the paper, it is vital to understand the enormity of the challenge. It requires a thorough evaluation of the

[1] *Earl, J., & Fell, M. J. (2019, June). Electric vehicle manufacturers' perceptions of the market potential for demand-side flexibility using electric vehicles in the United Kingdom. Energy Policy, 129, 646–652. https://doi.org/10.1016/j.enpol.2019.02.040*

economic impact of such integration at large scale, the operational impact needs to be examined, and the control benefits at ideal circumstances. The power utilization is largely driven by consumer demands, and therefore, not in the control of grid operators and the electricity companies. This leads to variable demands at various points. Grid overload is a risk in such situations, and this may lead to a degradation of the grid performance. It may additionally, also lead to bad power quality with voltage deviations, which will increase the chances of consumers facing issues with their other appliances. Also, in extreme circumstances, if the electric vehicle charging is not managed properly, there is a huge risk of blackout of the whole power system entirely ***(Sultan et al., 2022)[1][8].***

The report also makes the following suggestion: "Oscillations in the provided voltage, phase angle, and frequency can result from mismatches between the power supply and demand. The sensitive electronic equipment of utility consumers may be harmed by these oscillations, which lower power quality. To assist reduce intra- and inter-area power fluctuations, EVs can both produce and absorb power and energy." Alternatively, there are multiple benefits in the integration of electric vehicle charging points into the smart grid. It can help with the peak charging grid patterns and help offload the electricity from grids that have an excess. The concept of smart grids is on the rise with the integration of electric vehicle charging points into the electrical grid. Additionally, the smart grids can prove to be beneficial for the consumers as well. According to the paper mentioned above, the vehicle owners can potentially be compensated for providing electric services when the vehicle is not in use.

According to the Literature review on EV in India, electric vehicles will play a major role in the upheaval of the transportation economy and may lead to economic impact in the oil and gas industry as well. The electricity demand will raise, which especially in a power-strapped country like India, will put extra pressure on the power grids. However, there is little choice in the matter. In September 2018, Niti Aayog published a paper citing that

[1] *Sultan, V., Aryal, A., Chang, H., & Kral, J. (2022, December 15). Integration of EVs into the smart grid: a systematic literature review. Energy Informatics, 5(1). https://doi.org/10.1186/s42162-022-00251-2*

ICVs are a major polluter in the Indian aspect and the switch to Electric Vehicles will go a long way in improving air quality. With the assumption that ICV vehicles use approximately half to one litre of petrol per day, this comes out to about 200 litres per year. The numbers are approximate, but the paper shows the enormity of scale, when only half a litre of petrol is being used by ICVs in India. 200 litres of petrol per year translates into Rs. 2.4 Lakh Crores, at the cost of Rs. 70 per litre. With the price of petrol crossing a Rs. 100 per litre across India, the number becomes even higher ***(Hema & Venkatarangan, 2022)[1][7].***

The study goes deeper in linking the price of petrol to the cash reserves in India. It assumes that 50% of the price of petrol is the price of crude oil, and then India as a country can successfully save 1.2 lakh crores in cash reserves yearly with the switch to electric vehicles.

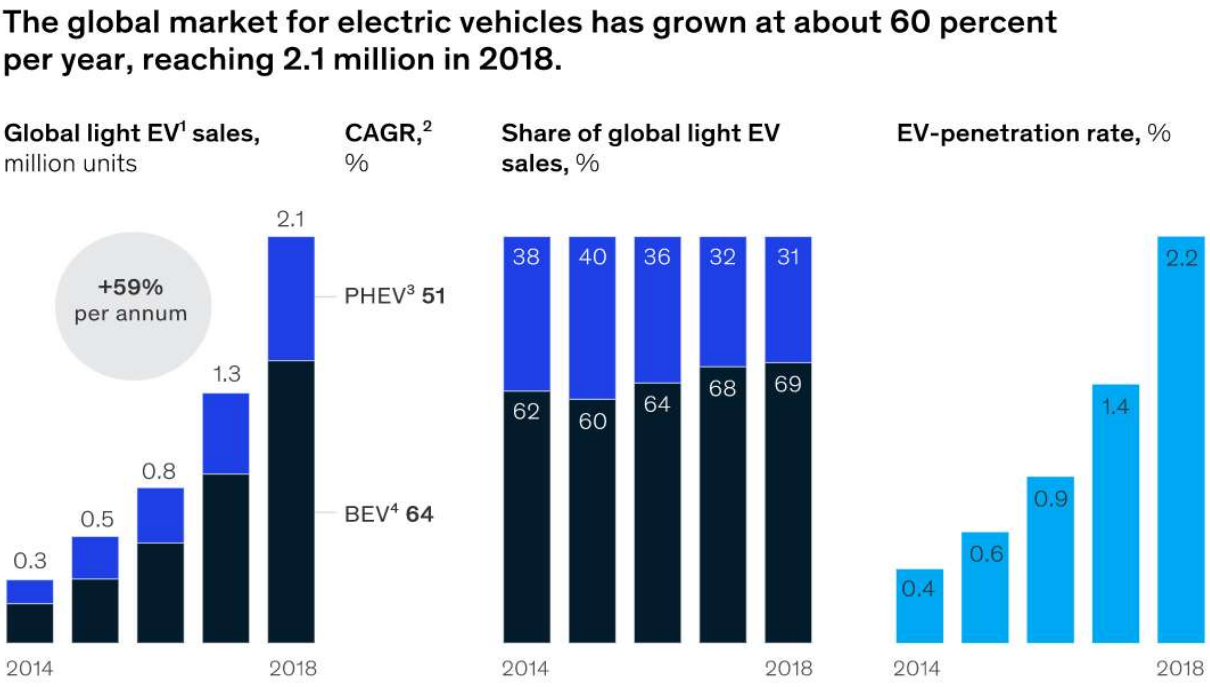


Fig 2.5: Global sales of Electricity Vehicles ("A Study on Rising Petrol Price in India and Effect on Common People," 2020)

[1] *Hema, R., & Venkatarangan, M. (2022, December). Adoption of EV: Landscape of EV and opportunities for India. Measurement: Sensors, 24, 100596. https://doi.org/10.1016/j.measen.2022.100596*

In their paper, Making Electric Vehicles Profitable, McKinsey claims that sales figures of 2018 only showcase a partial view. Electric vehicles accounted for less than 5 percent of the total vehicle sales in most markets. They however compare that to the pace of change. While the sheer volume of vehicles sold is lesser for electric vehicles, the grow rates of the vehicle sales is in the brackets of 100 percent or more. The top electric vehicles in the market are from Tesla, they are the most widely known brand of electric vehicles globally. This is followed by the Chinese companies called BYD and BAIC Motors. There are other players in the market like Toyota and Nissan, however, they too must make a big mark like Tesla globally. This paper also predicts that Original Equipment Manufacturers were predicted to launch multiple electric vehicle models. The numbers mentioned in the paper might have been derailed due to COVID 19, but the idea is that vehicle launches will happen across all segments of electric vehicles ***("Acknowledgment to Reviewers of World Electric Vehicle Journal in 2020," 2021)[1].***The graph below shows their predictions for the same.

[1] *Acknowledgment to Reviewers of World Electric Vehicle Journal in 2020, (2021, March 11). World Electric Vehicle Journal, 12(1), 40, https://doi.org/10.3390/wevj12010040*

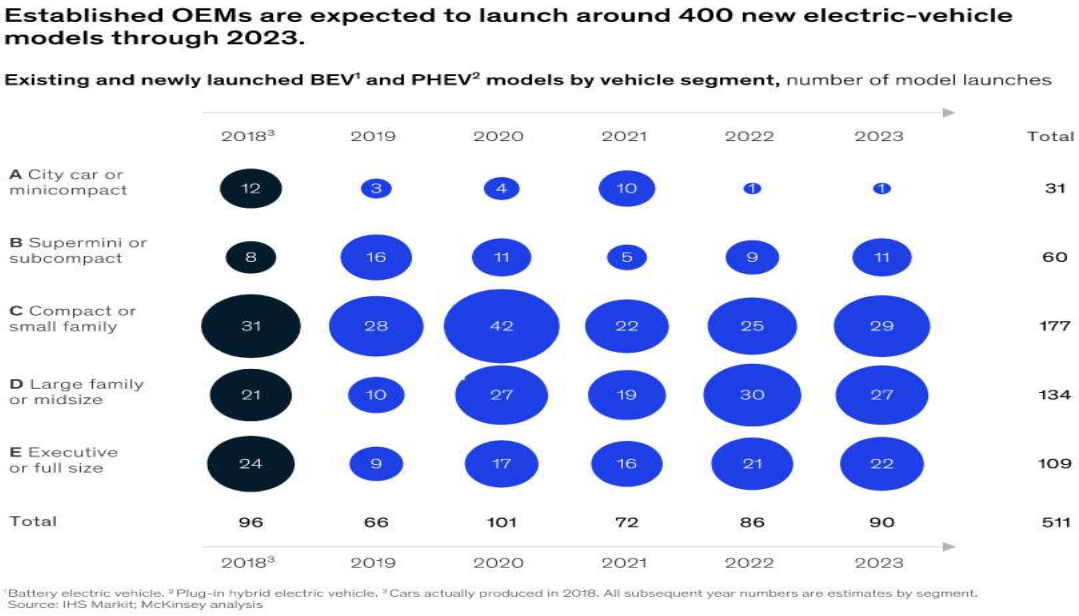


Fig 2.6: Upcoming Electricity Vehicles Models (Cui et al., 2023)[1][90]

While innovation is no stranger to the electric vehicle space, scale is a challenge. This paper also claims that most electric vehicles sold in 2018 had a negative margin because of the ever-increasing investment in electric vehicle technology. The same players have suggested redesigning EVs with new strategies for content trade-offs, growing alliances with mobility players, and taking more daring steps to collaborate with rival OEMs on platform development and manufacturing to boost the margin for electric vehicles in the near run.

In their paper, Making Electric Vehicles Profitable, McKinsey claims that most OEMs do not earn a profit on selling electric vehicles. They state that electric vehicles have consistently registered a 50 to 60 percent growth rate in the recent years. As mentioned above the original equipment manufacturers are high on the innovation mode and in 2018 alone, about 100 new models were launched and two million units were sold globally. Additionally, they must pander to strict regulations in the major car markets as well. A few

[1] *Cui, D., He, J., Cheng, X., & Liu, Z. (2023, July 21). Electric Vehicle Charging Transaction Model Based on Alliance Blockchain. World Electric Vehicle Journal, 14(7), 192, https://doi.org/10.3390/wevj14070192*

of the countries with strict regulations include China, the European Union and the United States. While the governments of these countries are pushing original equipment manufacturers to increase their supply of electric vehicles, they are also encouraging consumers to buy them with their regulatory policies ***("Electric & Hybrid Vehicle Technology International," 2021)[1][4].***

McKinsey further details this fact with the figure below:

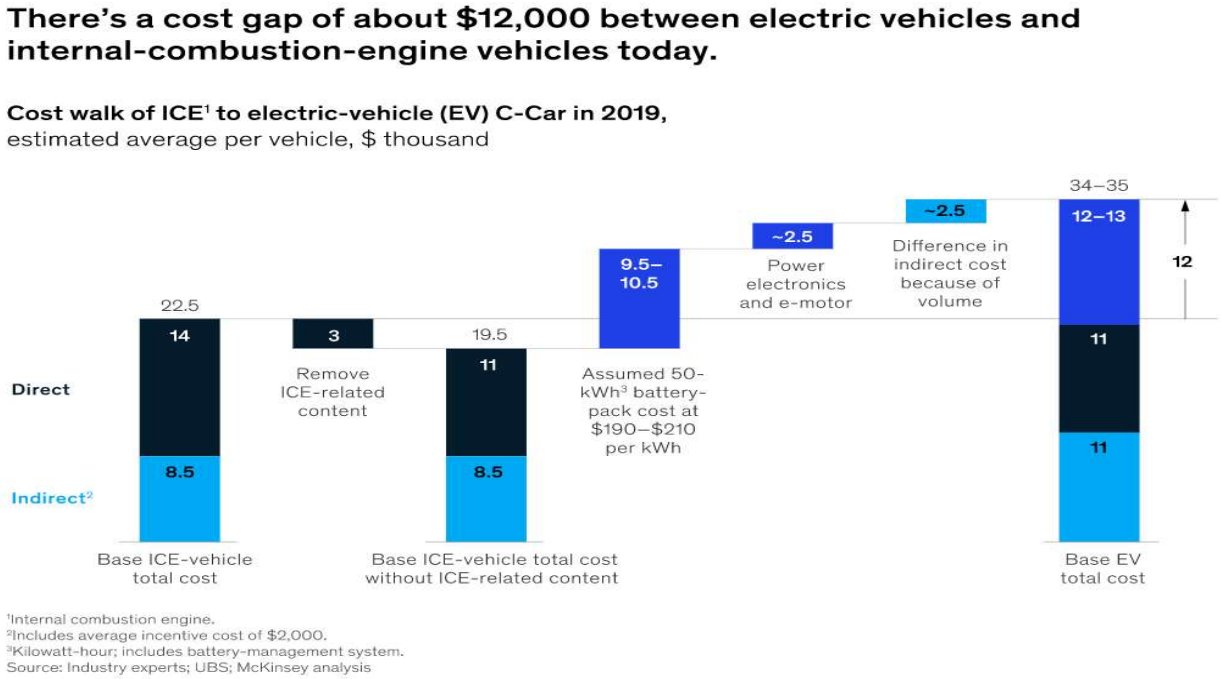


Fig 2.7: Cost gap between ICE & Electricity Vehicles ("Electric & Hybrid Vehicle Technology International," 2021)

But as McKinsey says, there's still hope. They point out that the sector may move more quickly towards profitability through a variety of approaches. One of the alternatives, according to them, is to "aggressively reduce cost through discontent, optimise range for urban mobility, partner with other automakers to reduce capital expenditures and R&D, target specific customer segments, and investigate battery leasing." These options,

[1] *Electric & Hybrid Vehicle Technology International. (2021, March). Electric and Hybrid Vehicle Technology International, 2021(1), 144–144. https://doi.org/10.12968/s1467-5560(23)60040-5*

according to McKinsey will help reduce the loss that original equipment manufacturers face in making electric vehicles. The rise of electric vehicles will help global economies scale as one country alone will not be able to manufacture and sell them all by itself.

2.12 Tying electric vehicles to the feeling economy

The feeling economy is influenced greatly by the psychological needs of human beings. The way the consumers feel about the environment, is directly related to their feeling to the electric vehicle.

According to the paper titled "Electric Vehicles and Psychology" published in the Collection Electric Vehicles: New Challenges and Opportunities for Sustainability, psychological factors have little to do with driving itself. The electric vehicle market is not bound by the actual reality of the scarce minerals being mined, or the amount of power the charging grid supports, rather, on the other hand it speaks about the mindset of the people, qualities that have little to do with the driving experience itself for consumers. The psychology behind the mindset is that it is rooted in the past. The public perception of electric cars can stall at any time leaving the passengers stranded because of limited battery capacity and charging infrastructure. This is even though some cars now claim to have a range of around 100 kilometres. Electricity is also, in some cases very widely available, and battery charging infrastructure has been developed for individual homes as well ***(Viola, 2021)[1][91].***

Again, the psychology that the battery will need to be replaced plays a huge factor in the mind of individuals as batteries comprise of approximately forty to fifty percent of the cost of the vehicle. Once the battery dies, it cannot be repaired. It needs to be replaced. Thus, the consumer mindset often thinks about replacing half the cost of the electric vehicle every few years. Battery swapping is another possibility in charging stations however that is a

[1] *Viola, F. (2021, January 13). Electric Vehicles and Psychology, Sustainability, 13(2), 719, https://doi.org/10.3390/su13020719*

very limited proposition, and it remains to be seen whether it is possible to swap out an old battery for a new one in such spaces.

If the idea is to buy an electric vehicle with a greater battery capacity, then the cost increases proportionately and thereby the cost-conscious consumer will not be able to afford or even think about affording a more expensive car in favour of the low initial cost internal combustion engine vehicle that we commonly see on the roads today. The paper suggests that two fundamental tools need to be used to break the rules of the game, which strangely, they consider to be pop culture and irony. There is always the aspect of the 'feeling' of the car while driving internal combustion engine vehicles. They give the sound of being in control, of roaring down the road, giving the psychological effect of power and in a sense of owning the road and your freedom.

This is a bigger problem than one imagines initially. To address the challenge, BMW, the renowned German manufacturer of high-performance vehicles, sought the expertise of Hans Florian Zimmer, one of the most celebrated contemporary composers specializing in movie soundtracks. Their objective was to craft an electric car sound that would match the distinguished reputation of their internal combustion engine counterparts.

There is also something called a noise device called the 'Audible Vehicle Alert System' commissioned by the European Parliament. It is meant to solve the silent issue in electric vehicles, so that pedestrians are forewarned of its arrival. Apparently, it has already triggered a "war on noise." While petrol and diesel cars were fighting to be silent, the electric vehicles are on the road to an opposite direction.

According to a recent paper, Maserati, the luxurious brand under the Fiat Chrysler Automobiles (FCA) group, plans to introduce its first electric car, the Granturismo, in 2021. Maserati aims to explore the unique "soundtrack of the Trident" for its electric vehicle and is actively developing a distinctive and iconic sound at its Innovation Lab in Modena. Taking a similar approach, renowned luxury car manufacturer Porsche has also embraced this concept with its Taycan luxury electric sports car model. However, this feature is not included as a default or complimentary option. Buyers interested in adding the electric sport sound to their vehicles, both inside and outside, will need to pay an additional EUR 500.

Likewise, Jaguar Land Rover has also joined the sound game, albeit opting for a more conventional sound for its I-Pace sports utility vehicle. While the impact of sound and the sensation of driving a powerful vehicle on electric vehicle adoption is still a subject of debate, electric vehicle manufacturers are currently striving to provide a comparable experience to that of internal combustion engine vehicles, particularly in terms of sound.

- **Innovators:** This small group of individuals is always on the hunt for new ideas and technologies. They get bored of technology easily and are always looking out for new ways to stimulate their need to be the first movers. This group includes the "gadget fetishists." In the context of mobile phones, they are the ones looking to buy the latest mobile phones, with the latest features, and price is not a big consideration for them. The inherent need to be at the top of technology trumps the price game.
- **Early Adopters:** These group of individuals are thought to be 'Opinion Leaders' and in a social media context can be said to be the "influencers" when it comes to technology. Again, in the context of mobile phones, these individuals buy the latest mobile phones, and have the power to influence the next set of people called the early majority in their purchasing decisions.
- **Early Majority:** They are not as big risk takers as compared to the early adopters. This is quite like people who let reviews of a movie come out before they spend money on purchasing a ticket and spending time on going to the theatre and catching the movie. They listen to critics, they listen to online and offline reviews, and maybe watch videos on social media channels before they make a purchasing decision.
- **Later Majority:** The individuals are essentially sceptical about new technologies. They eventually come around to buying a new technology, but not until after they are convinced that the new technology will be beneficial for them. In case they do not find the case to be true, they may avoid the purchase altogether. They are not enthusiastic about technology, but if they feel a price benefit from the purchase, or even a benefit from utilizing the technology, they will make the switch. This trend was seen when the older generation was making the switch from push button phones to smart phones. They did not believe that they needed it till their children

or the younger generation started to get smart phones, and soon the previous generation found that it made communication with others very simple with video calls and text messages.

- **Laggards:** Certain individuals tend to resist investing in new technologies until it becomes necessary for them to do so. When it comes to electric vehicles, these individuals are inclined to prefer traditional internal combustion engine vehicles until there are no other viable alternatives available. Referred to as "laggards," they harbour scepticism towards advancements and often rely on pseudo-scientific reasoning to support their viewpoints.

Within the framework of the diffusion of innovation model, there exists a concept known as the "chasm." This represents a significant barrier between early adopters and the early majority. Bridging this chasm is crucial as it can greatly reduce the gap between these two groups of adopters. Economically, government policies have been put in place to reduce the barrier between early adopters and early majority. However, that is not enough. The chasm is wide enough not just with monetary concerns, but with psychological concerns as well.

To understand this deeper, a greater understanding of the psychological profile of early adopters needs to be understood. This has been done via multiple surveys and an analysis of the answers was done using clustering algorithms. To find people who are most interested in the novel technology that is still used in electric vehicles, multiple investigations were carried out. Some investigations cut across entire nations, whereas other investigations were limited to a geographical entity.

In the realm of electric vehicles, the Roger's model of innovation diffusion suggests that early adopters are driven by a strong desire to be the first to own alternative fuel vehicles (AFVs). They seek to position themselves as pioneers in the electric vehicle space, embracing the forefront of innovation. As highlighted in the mentioned paper, a nationwide survey conducted in the United States identified early adopters as young, affluent individuals who own homes and perceive electric vehicles as environmentally friendly and

clean. They typically own their own car and drive approximately 100 miles per week ***("Electric Cars or Fuel Cell Vehicles," 2020)[1][92].***

On the other hand, the early majority adopts a more cautious approach. They observe and learn from the experiences of early adopters, using this information to make informed decisions about whether to transition to electric vehicles and which specific model best suits their needs. Another nationwide survey conducted in the United States defined early adopters as individuals in the younger to middle-aged range who possess a bachelor's degree or higher. They are motivated to switch to electric vehicles due to their awareness of global fuel price trends and the anticipation of rising fuel costs in the future. To be financially prudent and environmentally conscious, they choose to invest in electric vehicles. This demographic often resides in homes with garages, making the charging process more convenient for them.

The late majority and laggards are sceptical, and laggards tend to do things the way they have always done with internal combustion vehicles that they feel they have more control over. The hesitation in buying the initially expensive electric vehicle may stem from the fact that they do not have the financial resources to purchase an electric vehicle that may require them to take out a loan or put up a higher denomination up front.

The psychological factors are directly related to the feeling economy in multiple ways. Consumer satisfaction needs to be high up on the index of priorities for electric vehicle markets. This emphasis on customer satisfaction and retention will differentiate them not only from the competition of internal combustion engine vehicles but also from fellow electric vehicle manufacturers themselves.

Government policies can only go so far in convincing users to buy electric vehicles. The case in point is Stockholm. Stockholm apparently had the most favourable conditions in terms of incentives for the adoption of electric vehicles. The European Commission's Innovation Scoreboard placed Sweden as the first among EU member states in 2013 and

[1] *Electric cars or fuel cell vehicles, (2020), Auto Gas Filling Complex + Alternative Fuel, https://doi.org/10.36652/2073-8323-2020-19-12-563-564*

2020. However, Stockholm was still not at the front of European cities leading the electric vehicle brigade. It lagged Oslo and Copenhagen. Why did Norway and Denmark beat Sweden to the game? Various theories have been postulated regarding this, however there are a couple worth pointing out:

Incomplete awareness: While the EU and government policies were incentivizing the purchase of electric vehicles initiatives related spreading awareness were far from the required. This resulted in incomplete awareness and knowledge of battery-operated electric vehicles. No demonstrations were performed by local stores.

Another issue, again related to the feeling economy was the fact that there was a complete non-understanding of policies in various scenarios. A lack of vision confused users who did not know if private vehicles or collective ones would be supported soon. Thus, consumer awareness directly impacted the sales and adoption of electric vehicles in a country that was touted to be near perfect for the initiative.

The feeling economy impacts the minds of the consumer when it comes to battery constraints as well. A few years ago, the battery in a particular brand of mobile phones exploded. The model was deemed highly dangerous. Even airlines have restricted batteries from being placed in the luggage meant for the cargo hold of airplanes. Moreover, there is constant alarm because some users reported that their mobile phone battery exploded while charging. Worse yet, they were talking on the phone while charging their battery and the explosion caused damage to their ear and face.

Electric vehicles are essentially battery-operated vehicles. When one thinks about them from the feeling economy point of view, a fear sets in, because the public perception is that batteries are one small step away from exploding. There is also word of mouth, which spread fear and panic over this issue, and thereby justifies the fact that electric vehicles are dangerous and should not be purchased. There is literature related to fires in electric vehicles, however, in a feeling economy, manufacturers need to be aware that consumer perception will go a long way in determining whether a mode of transport is safe or not.

2.13 Effect of EV adoption in Customer Engagement Lifecycle

Modern environmental concerns are driving the development of electric car technology and sales. The convergence of a technologically advanced and semiskilled Indian workforce, a vast client base, and comparatively lower labour and manufacturing costs, has encouraging nearly all international suppliers of parts for electric vehicles and vehicle manufacturers, including Bosch, AVL, and Cummins, to launch facilities in India. It is necessary to research the elements influencing customer acceptability of these cars to understand the commercial success and purchase intention of electric vehicles among Indian consumers ***(Fauziyah et al., 2023)[1][93].*** Car purchasers' decisions are influenced by several elements, including their own perceptions of things like cost, trust, environmental difficulties, technological advancements, infrastructure, and societal acceptance. The findings indicate that perceptions regarding the purchase of electric vehicles are influenced by environmental concerns and customer faith in technology, and that cost, infrastructure, and social acceptance are the variables that hinder adoption. Therefore, the government must take the lead in promoting the sale of electric vehicles by developing environmental policies, building infrastructure, and offering car subsidies or lowering bank loan rates.

2.14 Feeling Intelligence Vis a Via Customer Centricity in EV Industry

The paper titled "AI-Powered Customer Service: Does it Optimize Customer Experience?" presents a qualitative study that examines the influence of AI applications in customer service. The study explores the advantages of AI while also acknowledging the challenges associated with AI-driven customer service that significantly affect the Customer Experience (CX). The findings suggest that digitalized customer services face difficulties in replicating human interaction, leading consumers to perceive that organizations struggle to create effective digital pathways for customer interaction. The best possible combination would therefore be to provide a balance where AI and feeling intelligence that is a part a

[1] *Fauziyah, H., Iskandar, I., & Wachjuni, W. (2023, June 26). The Effect of Customer Engagement on Customer Loyalty through Customer Satisfaction at Shopee, Indonesian Journal of Business and Economics, 6(1), https://doi.org/10.25134/ijbe.v6i1.8366*

parcel of the human element works in tandem to bring a unique, and seamless customer experience ***(Valeri & Pietila, 2020)[1][78].***

With EV becoming a sunshine industry in the world, the role of customer centricity will play a dominant role. All the players associated with the EV Industry be it charging point operators, distribution companies, OEMs in the space both hardware and software providers need to tie all the loose ends to provide a unified customer experience.

To provide a unified and seamless customer experience the customer service will evolve into a whole new level where mundane, data intensive, computing tasks can still be delegated to the AI realm, but the human element part is going to be dominated by the felling intelligence to provide customer centric experience right from customer reach and acquisition to customer advocacy in the entire value chain. To elaborate a little further on the same while data mining activities in terms of a particular customer data base to analyze customer preferences in terms of type of charging location, time, particular payment method used, promptness of customer payments and feedback, promotion of new launches will all be machine dominated. The customer care roles will go a sea change in terms of not only understanding the customer preferences and technology side of things but under which circumstances technology or feeling intelligence or a combination of both be deployed to provide support, assistance from a customer centric perspective would become the key to a delightful customer.

[1] *Valeri, F., & Pietila, G. (2020, April 14). Improved Customer Experience through Electric Vehicle Sound Enhancement. SAE International Journal of Advances and Current Practices in Mobility, 2(4), 2411–2417. https://doi.org/10.4271/2020-01-1361*

3. GAPS IDENTIFIED

What exactly helped you identify the gap in the paper?

Here in this paper, we are only dealing with the circumstances and scenarios of service job and EV industry and how feeling Economy will impact this all but on a large scale we avoid Technical, Market, Infrastructure and Policy which are crucial in defining what are the things which makes the gap in this study.

Gaps Identified:

- Feeling economy in the upcoming Automotive EV Industry and its impact overall on the economy for a nation.
- How Augmented AI and Feeling economy can play a pivotal role in the EV Customer life cycle?
- What skills of technology and customer focus needs to be developed in the service industry to bring in a unique value proposition for the end customer?
- Can AI replace the feeling economy, or a delicate balance can be attained within the EV Industry as it moves from its sunshine status to a mature status?
- Can Health, Regulatory and Safety aspects in the automotive EV industry combine the scope of AI and feeling Intelligence?

What exactly in the paper intrigued so much?

Right now, this paper mainly focuses on a "Feeling Economy" is beginning to emerge, where human workers are drawn increasingly towards interpersonal and sympathetic jobs and AI handles many analytical and cognitive duties. Even though these interpersonal duties have always been crucial to professions, their significance is currently growing to an unprecedented extent. This means that human workers need to emphasise the emotional and empathetic aspects of their work more to manage more successfully. AI approaches have reached a sufficient level of technological maturity for real-world application. To address issues such as data scalability, in situ computations, and high-throughput data creation, future directions are offered to support the advancement of AI methods in electric vehicles and associated infrastructure.

4. HYPOTHESIS

- Customers would seek services that are driven by the feeling economy.
- Feeling economy job design will result in better customer experience.

Feeling Economy driven by Customer

Null Hypothesis (H0): Positive emotional experiences connected to a brand have no discernible impact on consumer loyalty.

Alternative Hypothesis (H1): Consumer brand loyalty is greatly enhanced by positive emotional experiences.

The null hypothesis (H0) states that customers' intentions to make a purchase are unaffected by their emotional attachment to a goods or service.

Alternative Hypothesis (H1): Customers' intentions to buy a goods or service are positively influenced by a strong emotional connection.

Customer Experience in Feeling Economy

Null Hypothesis (H0): Positive customer interactions and workers' emotional intelligence as impacted by job design do not significantly correlate.

Alternative Hypothesis (H1): Customer interactions are positively impacted by higher degrees of emotional intelligence that arise from feeling economy job design.

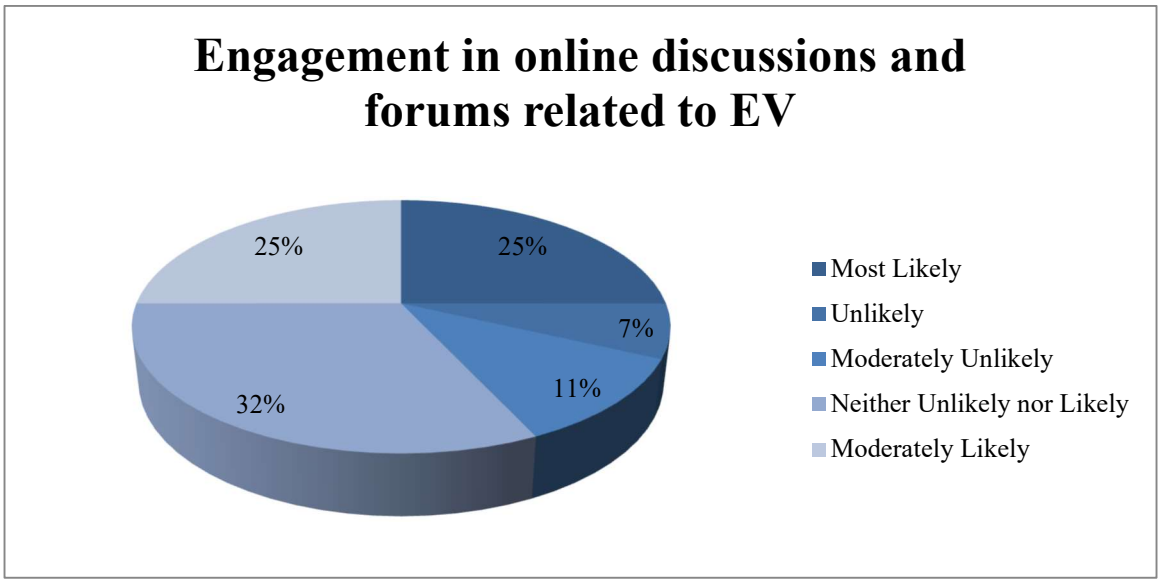
Null Hypothesis (H0): Customer satisfaction is not significantly impacted by employee well-being as determined by job design in the feeling economy.

Hypothesis Alternative (H1): Customer satisfaction levels are positively impacted by job designs that support staff well-being.

5. SURVEY & STATISTICAL ANALYSIS

- **Engagement in Online discussions and forums related to EV.**

Here we can see in below chart and graph that engagement in online discussions and forums related to EV are around in same number when we talk about concerns with likely and Unlikely and their subcategories. A good amount of people is engaged in discussions over EV on online forums but still a majority holds are still to achieve.



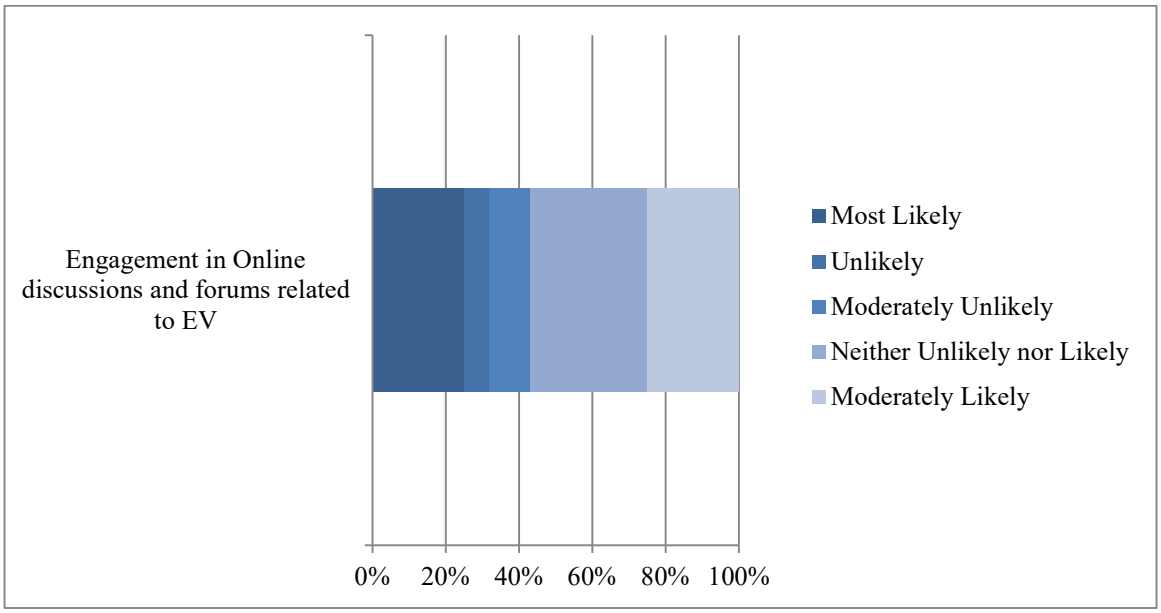


Fig 5.1: Graphical representation of Engagement in Online discussions and forums related to EV

- **Overall Support and Assistance received from manufacturers and dealers**

When we have responses over support and assistance received from manufacturers and dealers' respondents don't have good amount of numbers who said that they received it most likely. Support and Assistance is the key for success of any field where EV lacks this in listed chart.

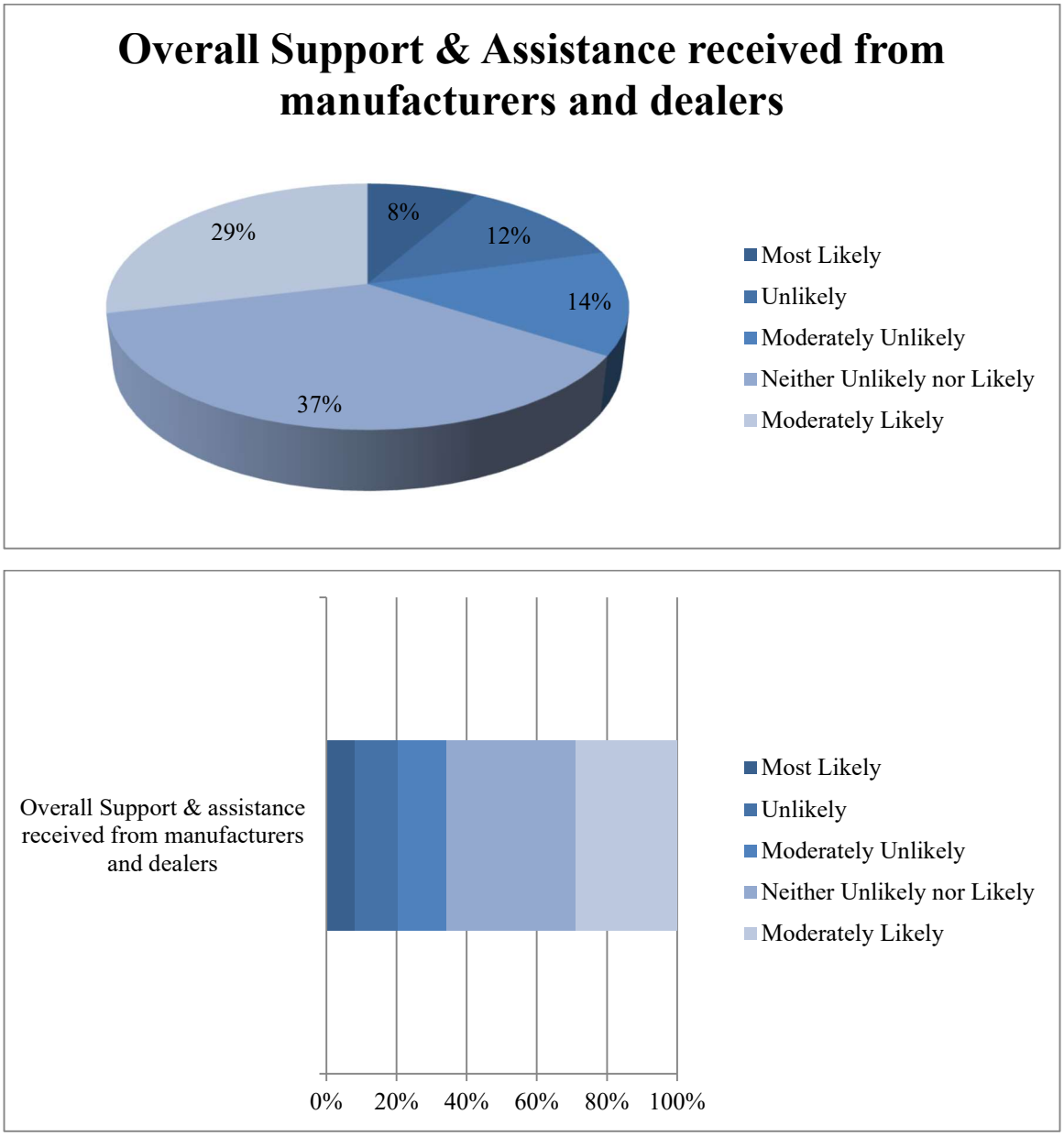


Fig 5.2: Graphical representation of Overall Support and Assistance received from manufacturers and dealers

- **Participation in events to promote EV**

Promotion of EV also holds 50:50 ratios in likely and unlikely responses altogether as we have seen in chart. If we must see progress of any field like EV industry and if we must sell a large number of EV in the coming future promotion is the key task in which much progress is still needed as per speculations coming from respondent.

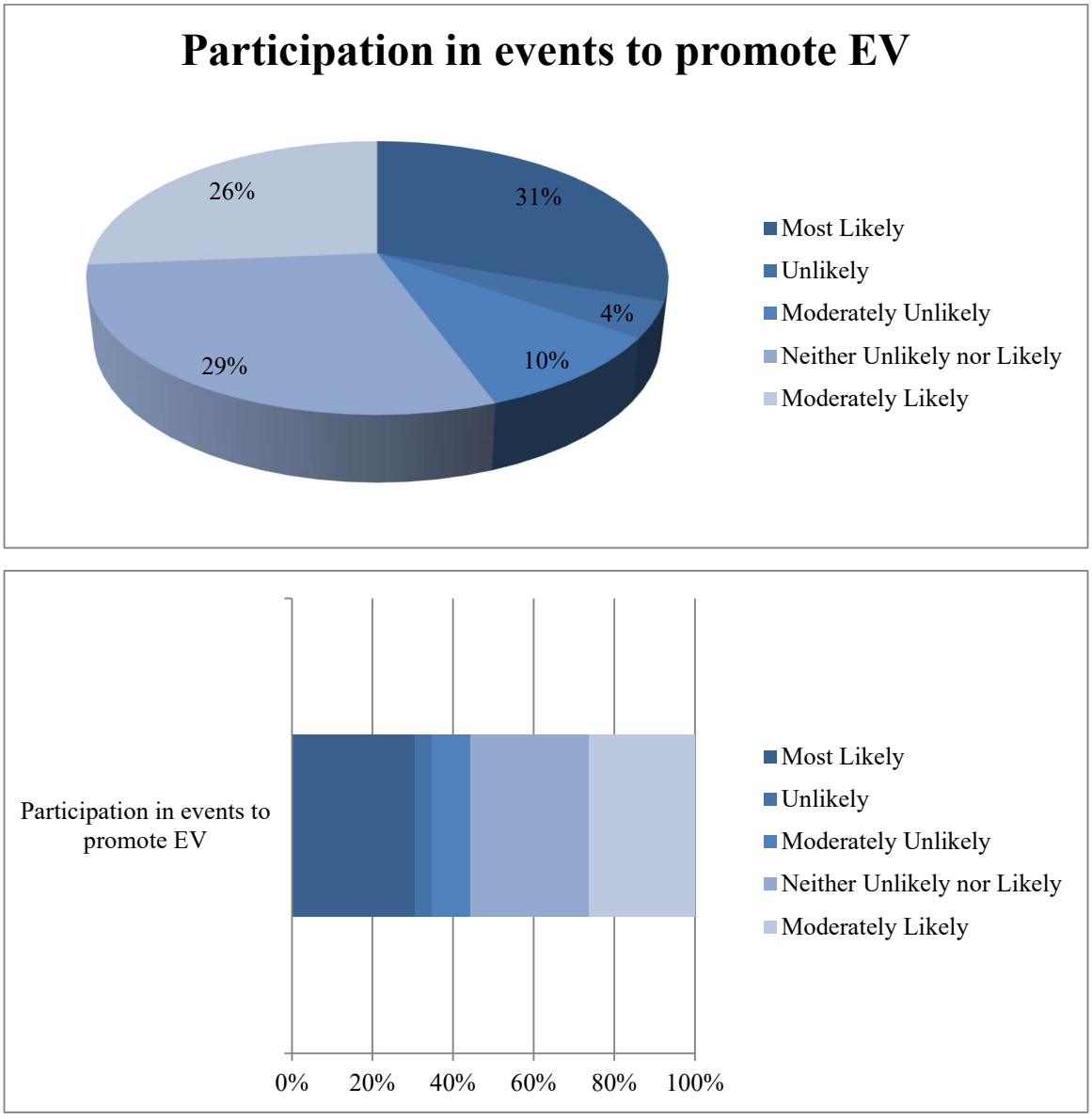


Fig 5.3: Graphical representation of Participation in events to promote EV

- **Suggestions & Opinions while purchasing an Electric Vehicle**

The chart below shows that a respectable number of people needed opinions and suggestions before purchasing an EV. As people are not aware of many things when it comes to EV, they are dependent on the views of the people who have already purchased EV.

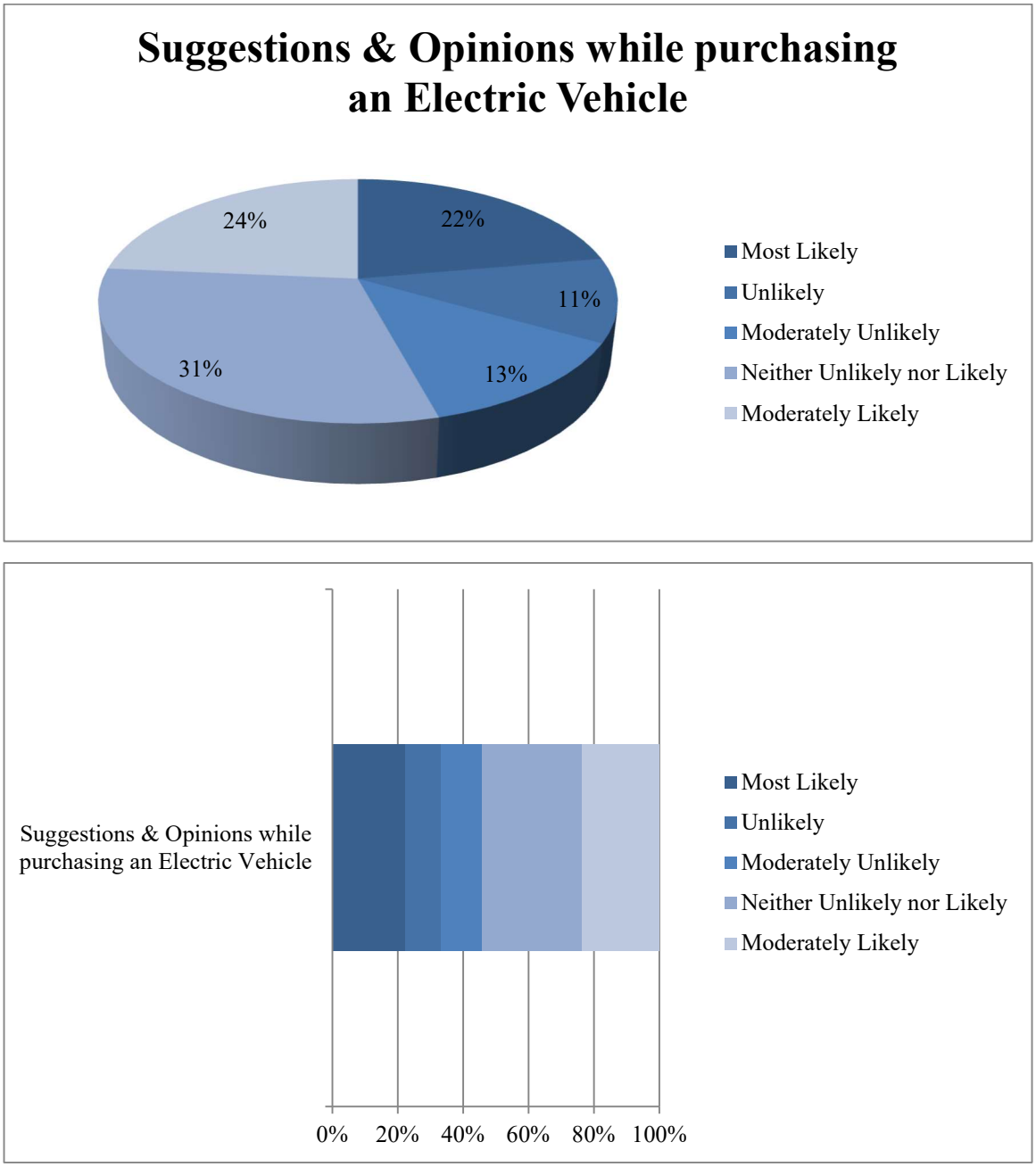


***Fig 5.4: Graphical representation of* Suggestions & Opinions while purchasing an Electric Vehicle**

- **Test drive before purchasing an EV**

Most people looking for test drive before purchasing an EV is shown below in the chart. Everyone wanted to know the technical knowledge, the performance, driving experience before purchasing EV.

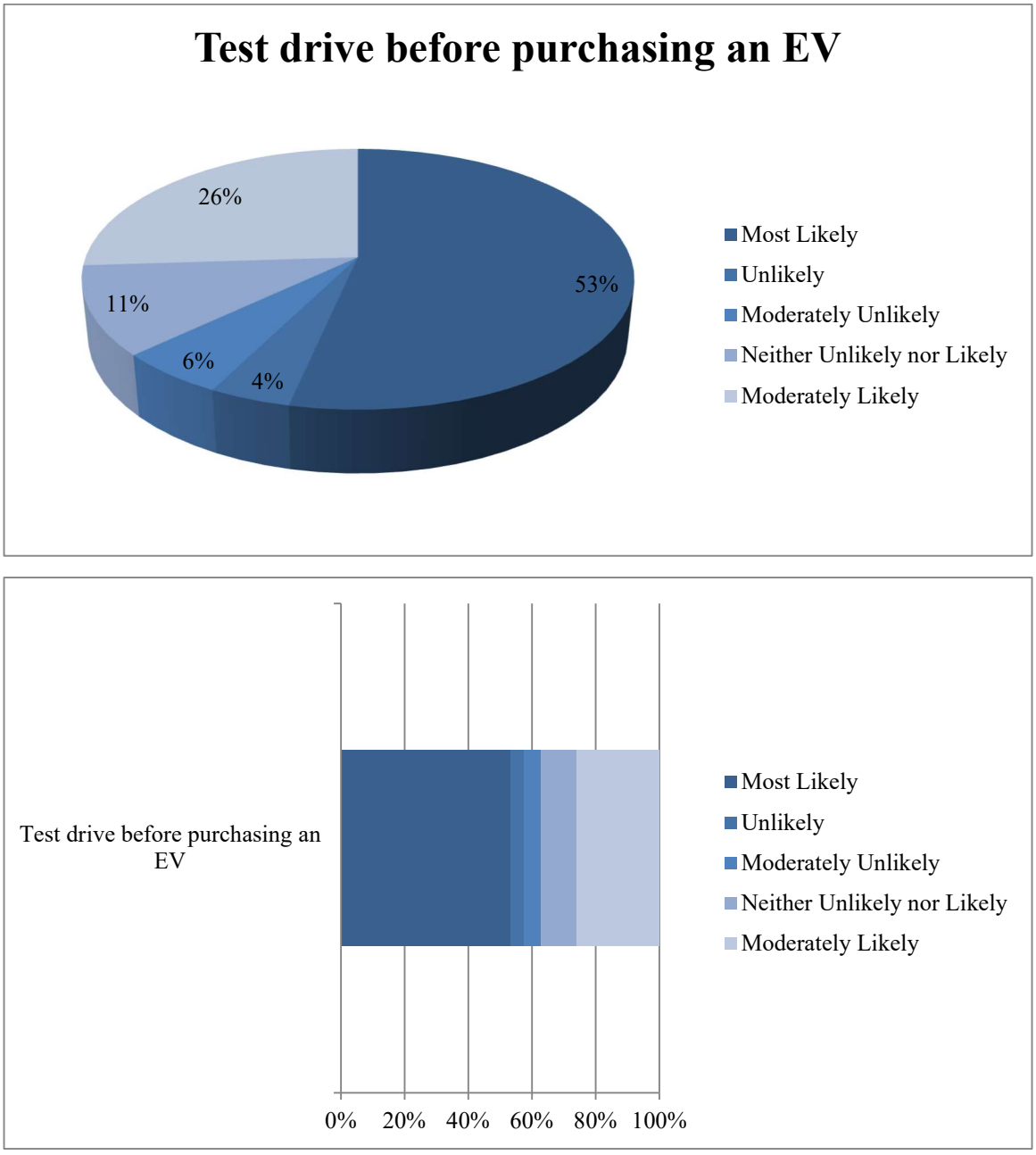


Fig 5.5: Graphical representation of Test drive before purchasing an EV

- **Incentives to switch from Conventional Vehicle to EV**

People in most numbers in the chart below wanted to switch to EV from their conventional vehicles. Government incentives, Petrol prices, next generation technology etcP are factors which boost things to switch to EV.

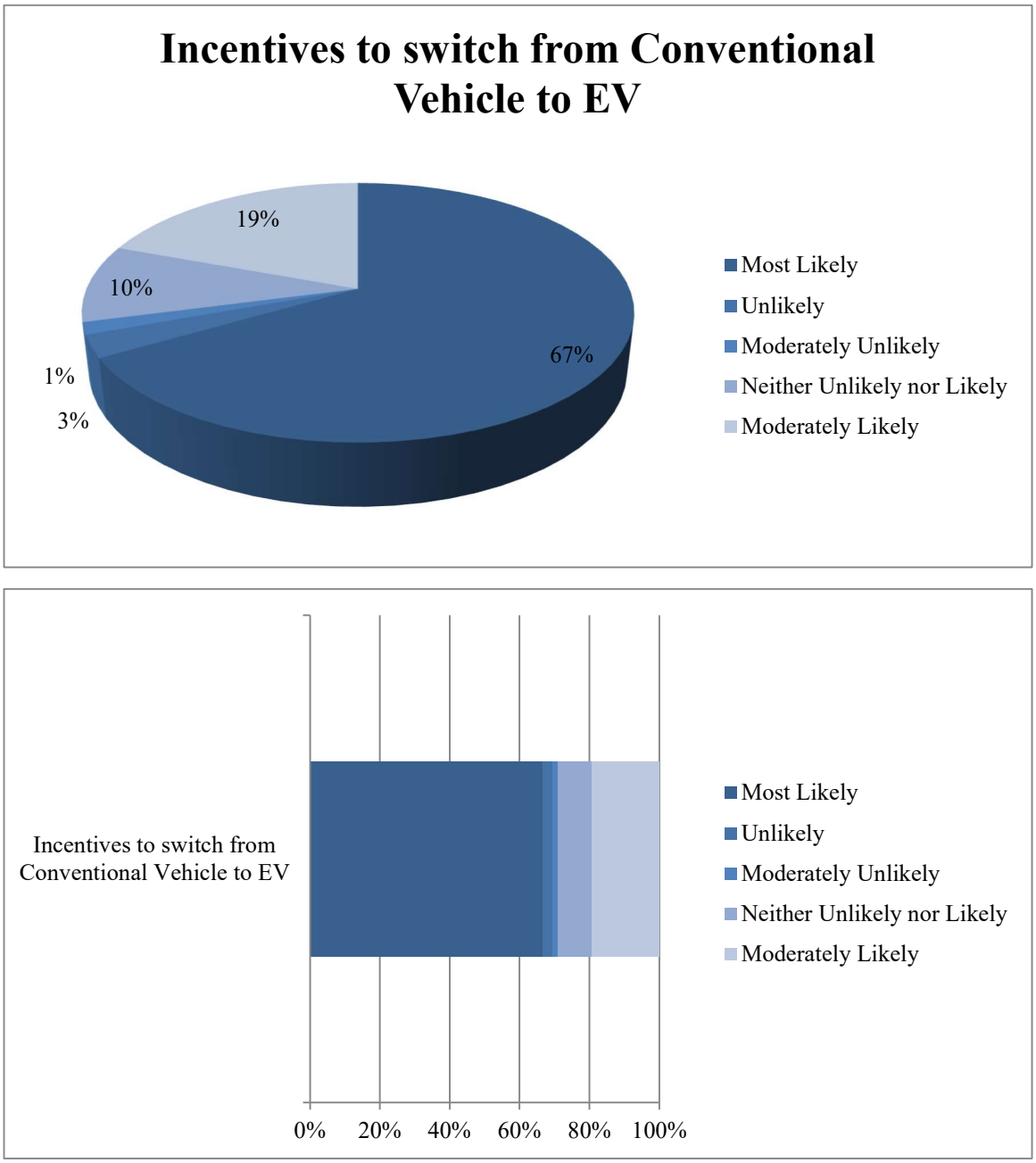


Fig 5.6: Graphical representation of Incentives to switch from Conventional Vehicle to EV

- **Pre Sale & Post Sale Support**

When we are talking over pre- sale and post-sale support coming from EV sector again customer dissatisfaction can be seen in the listed table. Support staff have made credibility to boom any sector where EV lacks.

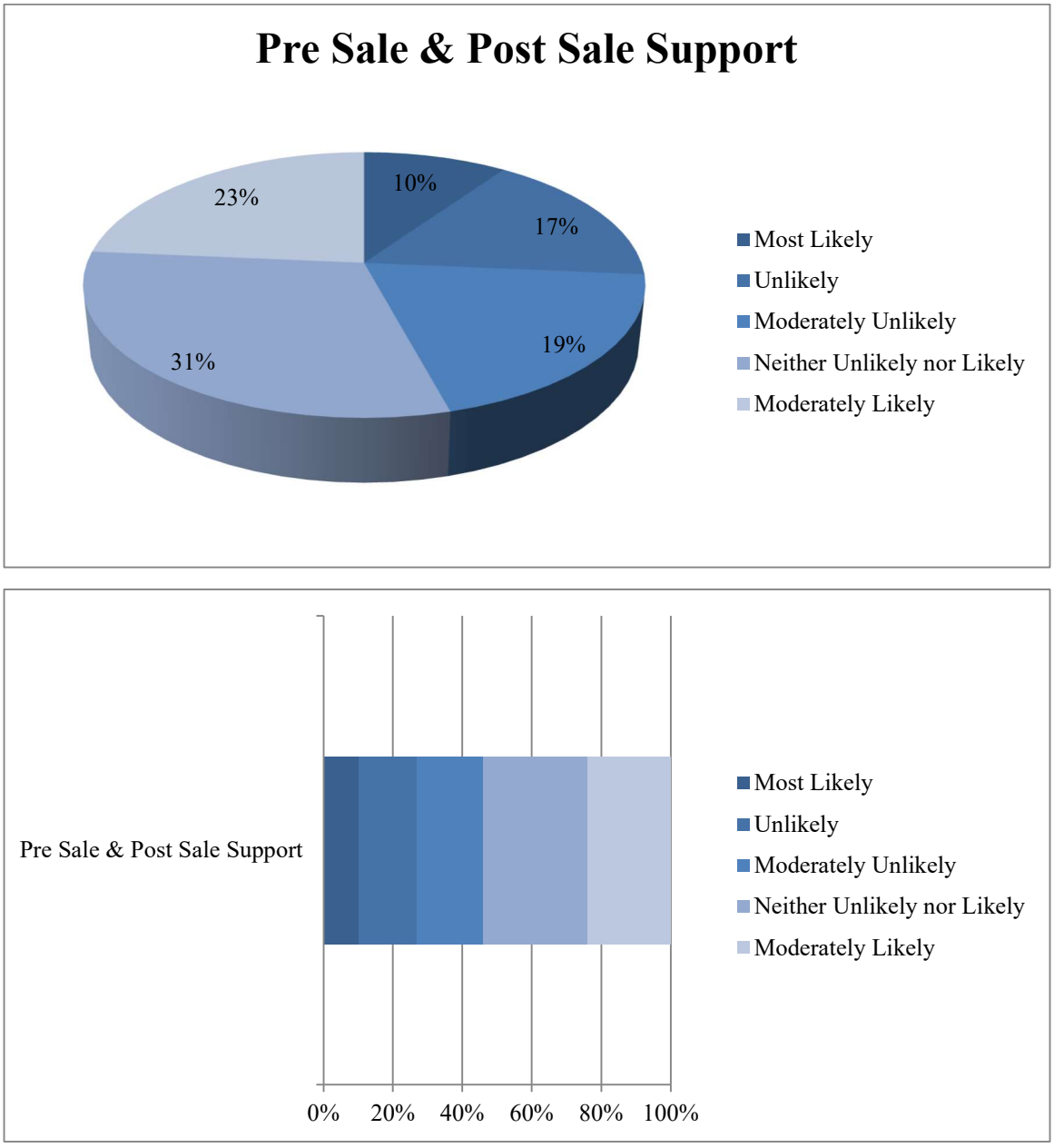


Fig 5.7: Graphical representation of Pre Sale & Post Sale Support

- **Renewal, Warranty and Service plans for EV**

Most characteristics of feeling economy
people are aware of renewal, warranty and service plans for EV, but they might be confused as support staffs are not helping in majority of cases. The EV sector is new technology where service plans are crucial for customer support.

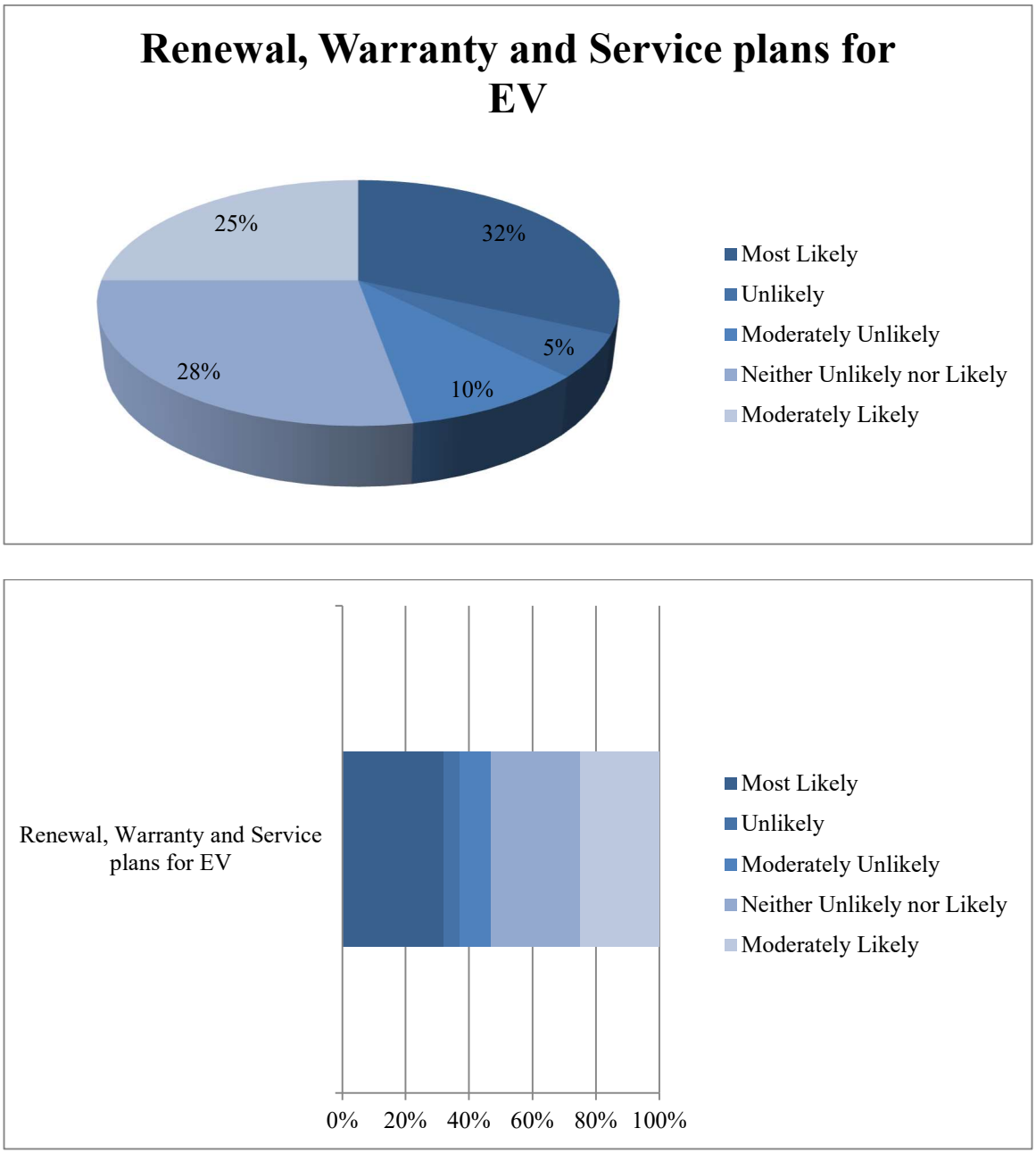
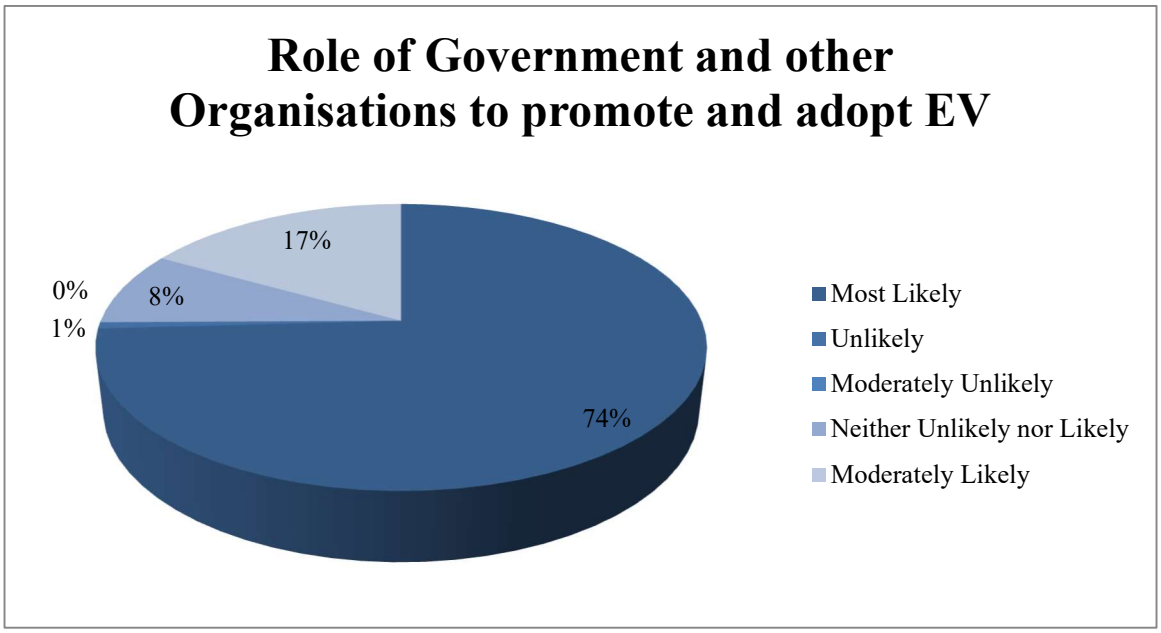


Fig 5.8: Graphical representation of Renewal, Warranty and Service plans for EV

- **Role of Government and other Organisations to promote and adopt EV**

Without government support no new technology makes their market. Listed chart and graphs clearly said that promotion and adoption of EV without government support is impossible. The factors for which governments are ready to promote EV are eco-friendly technology, cutting fossil fuel imports from foreign, reducing carbon emission etc.



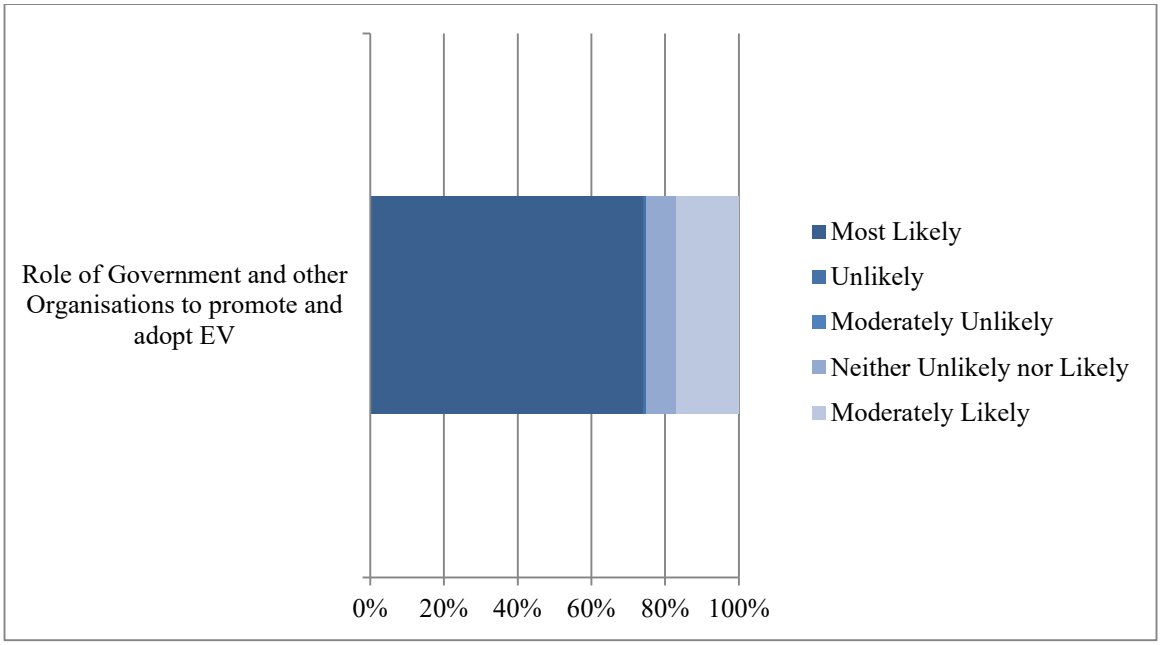


Fig 5.9: Graphical representation of Role of Government and other Organisations to promote and adopt EV

- **Reliable EV charging Infrastructure**

Technology to automate the EV charging infrastructures are most likely influences the customers. They majority says that reliable stations must be deployed in large numbers to grow EV sector and to enhance customer-oriented support system it must be needed.

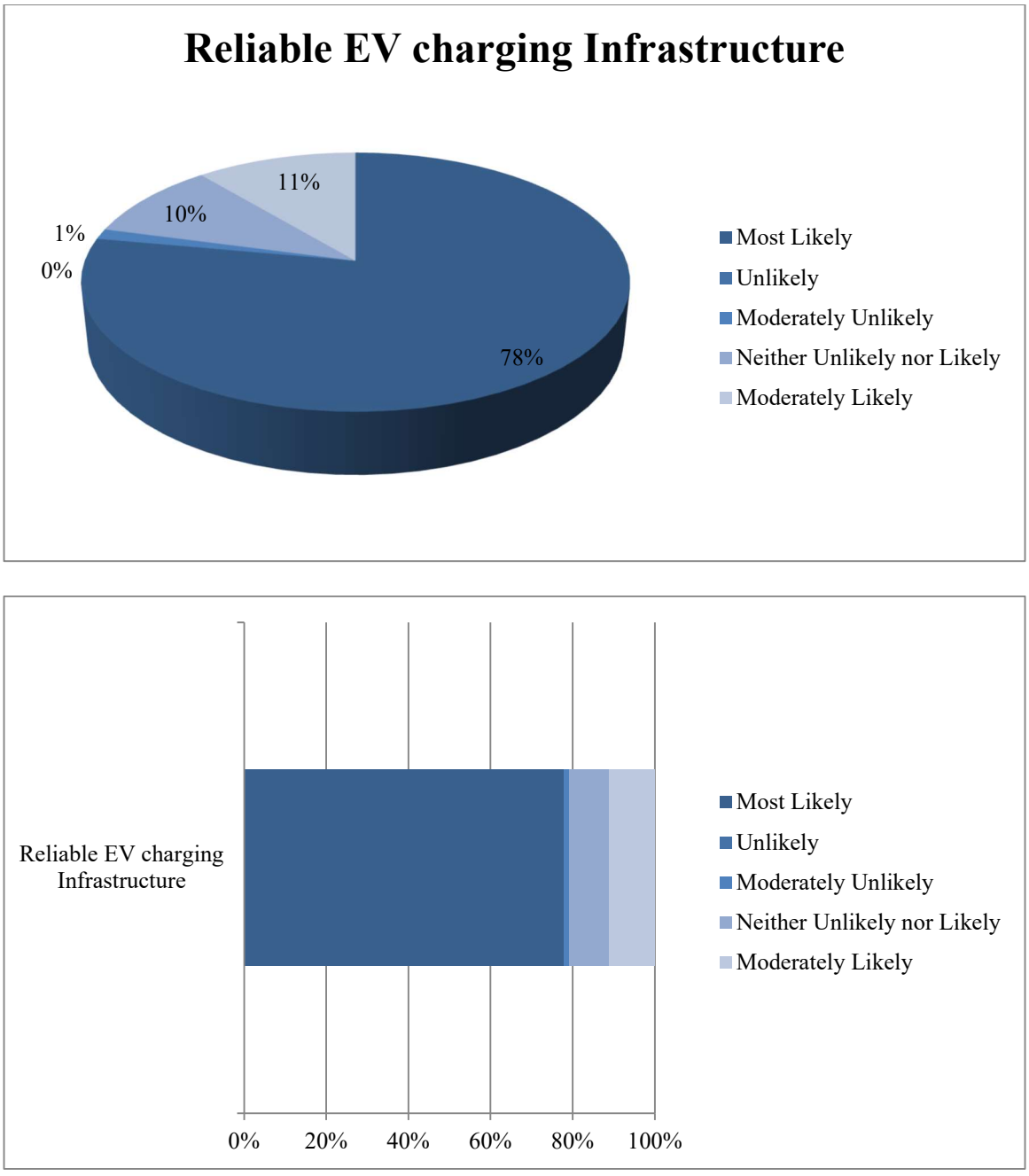


Fig 5.10: Graphical representation of Reliable EV charging Infrastructure

- **Advancements or Improvements in Future Electric Vehicle**

Almost everyone in majority wants to overcome limitations of lithium-ion batteries, lower cost production, fast charging etc. Such advancement is looking for those also who still not buying EV but still having a hope to buy in future.

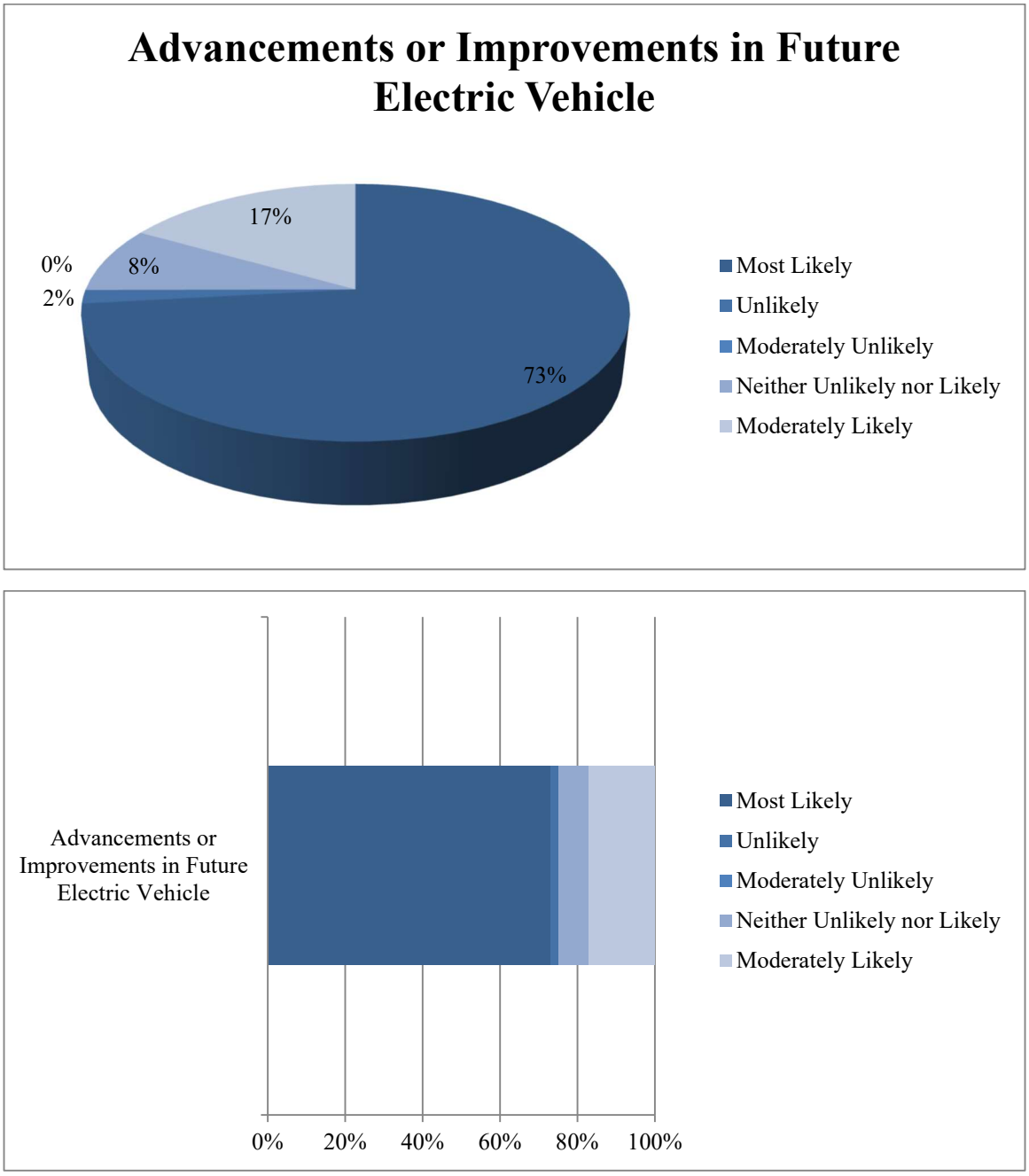


Fig 5.11: Graphical representation of Advancements or Improvements in Future Electric Vehicle

- **Recommended EV to others based on your experience, knowledge and benefits**

People are ready to share all their experience, knowledge and benefits to others when it comes to recommended EV to others. The main things to share with others are maintenance, cost, drive experience, battery etc.

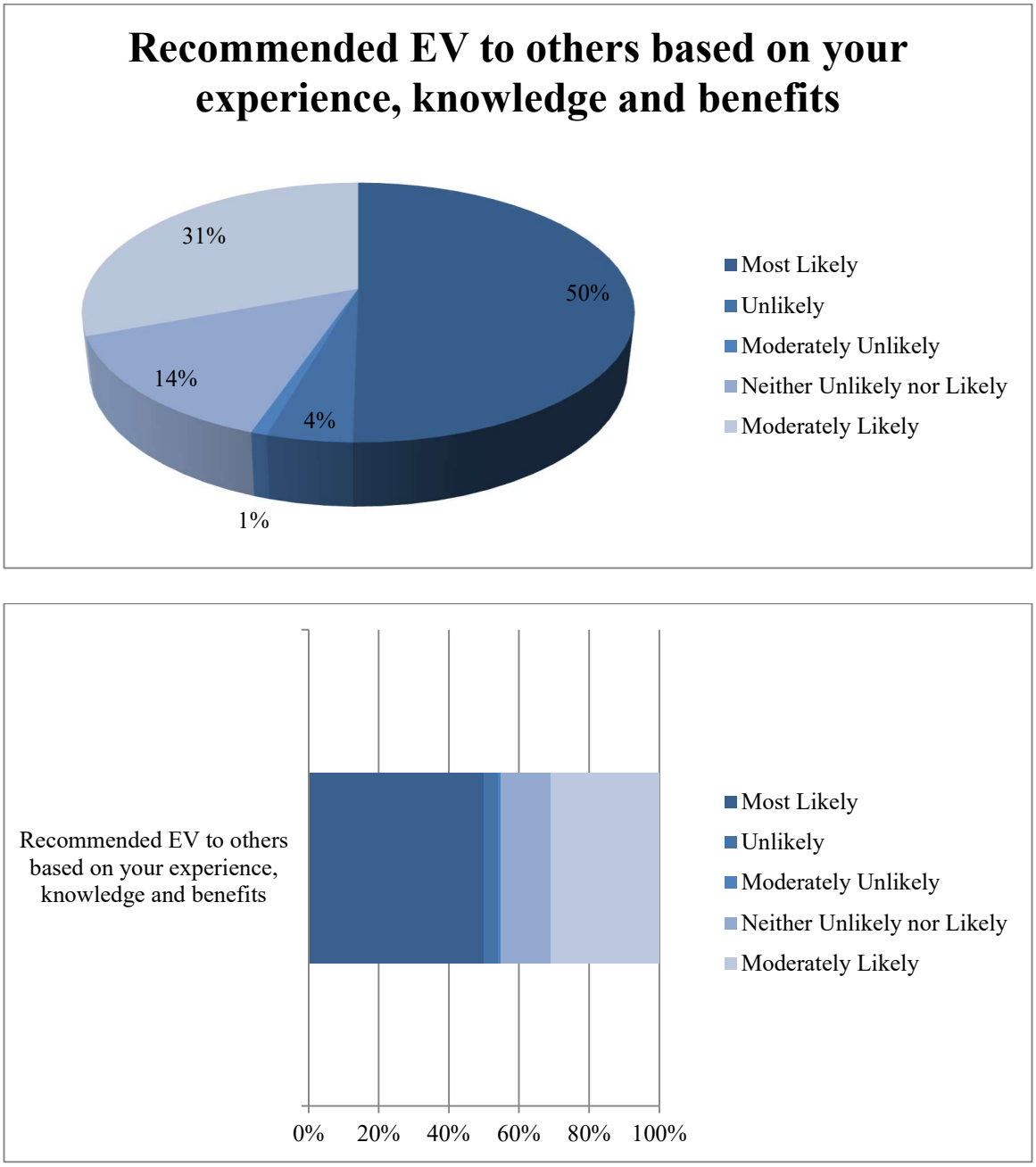


Fig 5.12: Graphical representation of Recommended EV to others based on your experience, knowledge and benefits

- **Active participation in EV campaigns, forums and events**

When it comes to development and execution of EV an ample amount to mix numbers in likely and unlikely people who have participated in forums and campaigns related to EV. Government events to promote all such campaigns are relevant and people are participated in large amount.

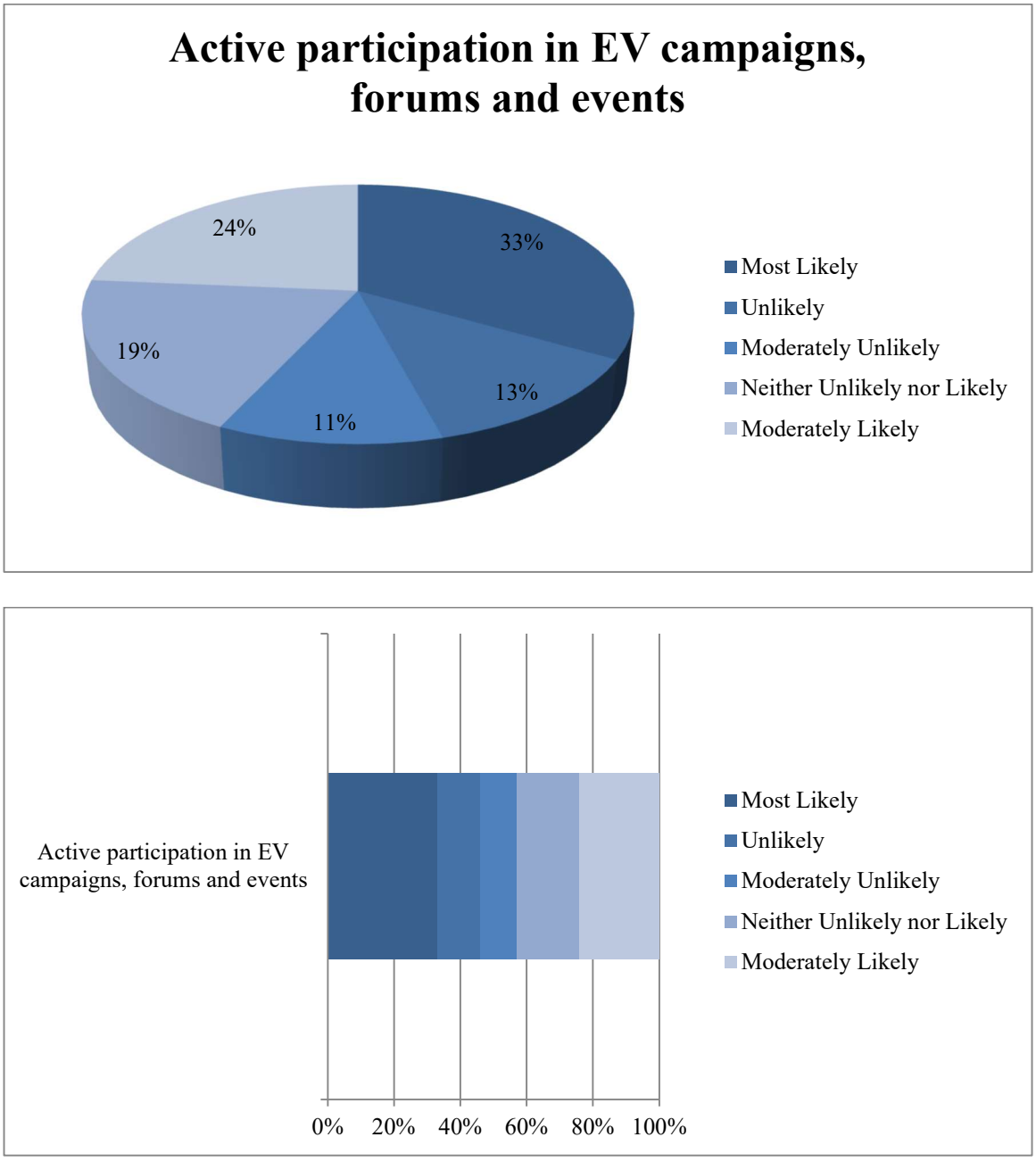


Fig 5.13: Graphical representation of Active participation in EV campaigns, forums and events

- **Participation in EV loyalty programs**

Loyalty programs allow EV charging providers to collect valuable data about their customers charging preference, habits and behaviours. Here most people allow participating to access the loyalty programs to collect data to upgrade services and infrastructure planning.

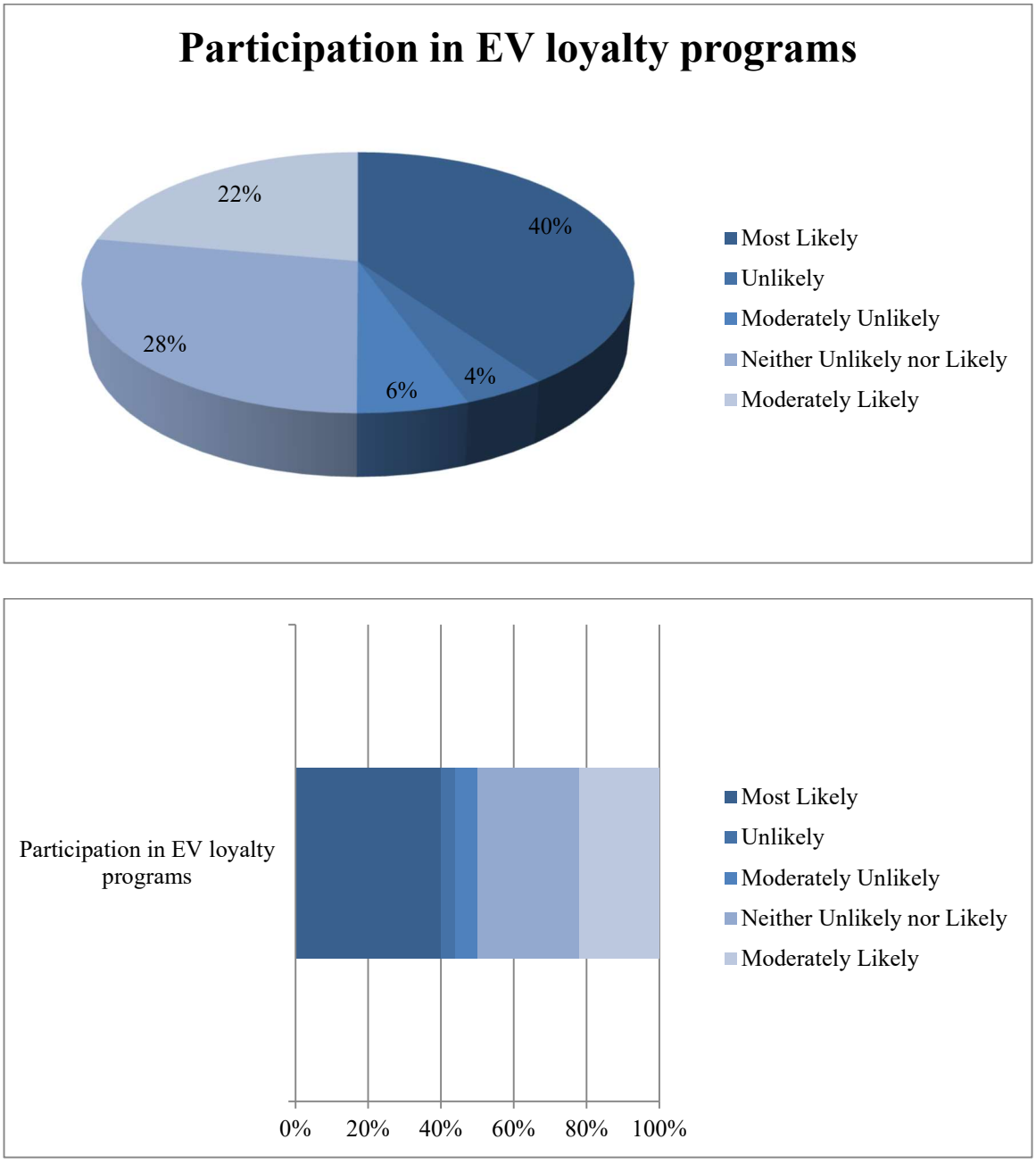


Fig 5.14: Graphical representation of Participation in EV loyalty programs

- **Overall Electric Vehicle Experience**

Here also moderately likely experience and most likely experience gained momentum. The overall electric vehicle experience of people is seamless, personalized and flexible and on the other hand battery charging, mileage, fast charging etc are the drawbacks faced by them.

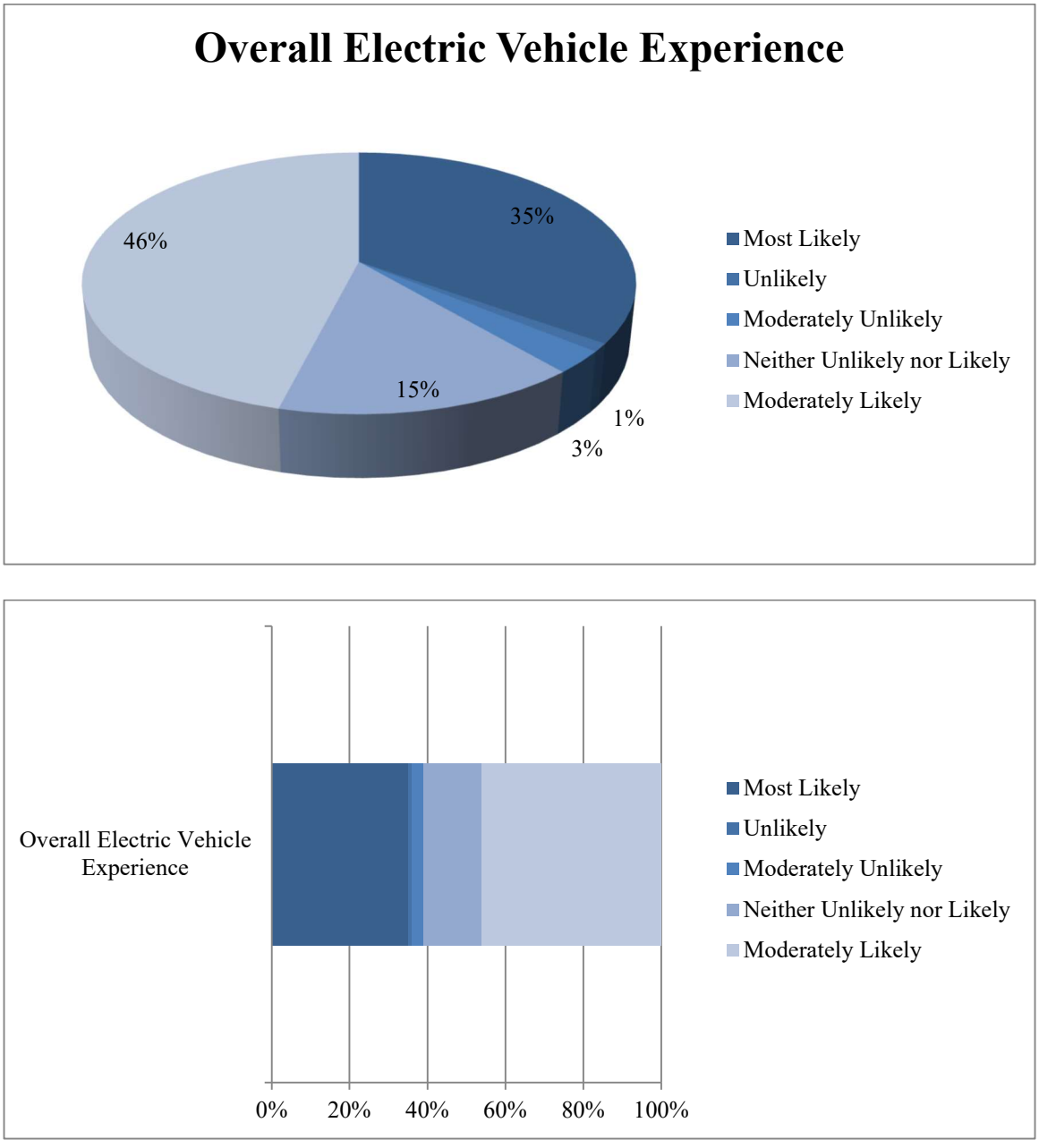


Fig 5.15: Graphical representation of Overall Electric Vehicle Experience

5.1 Customer Advocacy

Promotion of EV, recommending others and satisfaction are the things which majority of people here advocated to others.

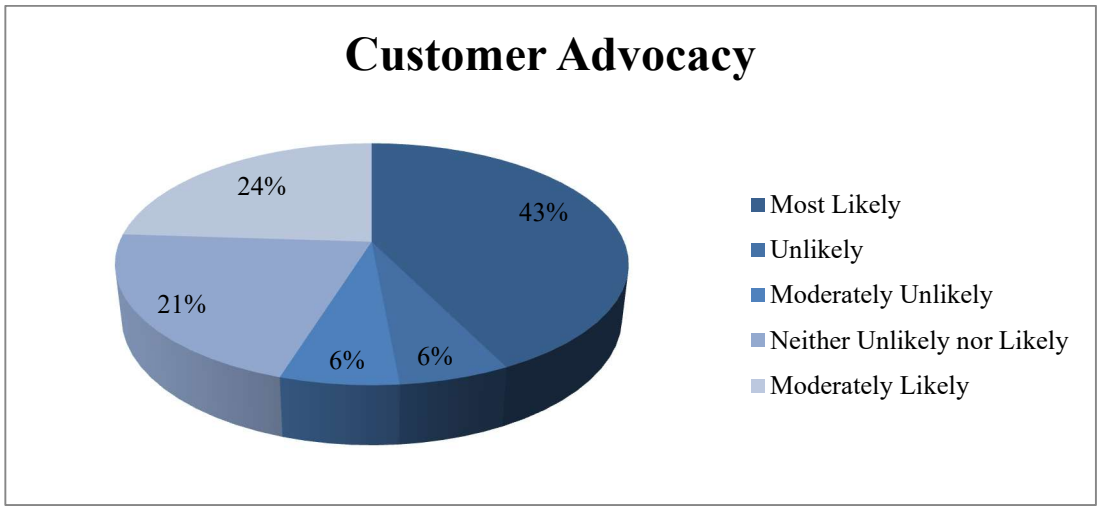


Fig 5.16: Graphical representation of Customer Advocacy

5.2 Customer Acquisition

Here majority of people looking for strategies and tactics a business uses to attract new clients. It may increase revenue, win over new clients, and keep your current client by implementing an effective customer acquisition plan.

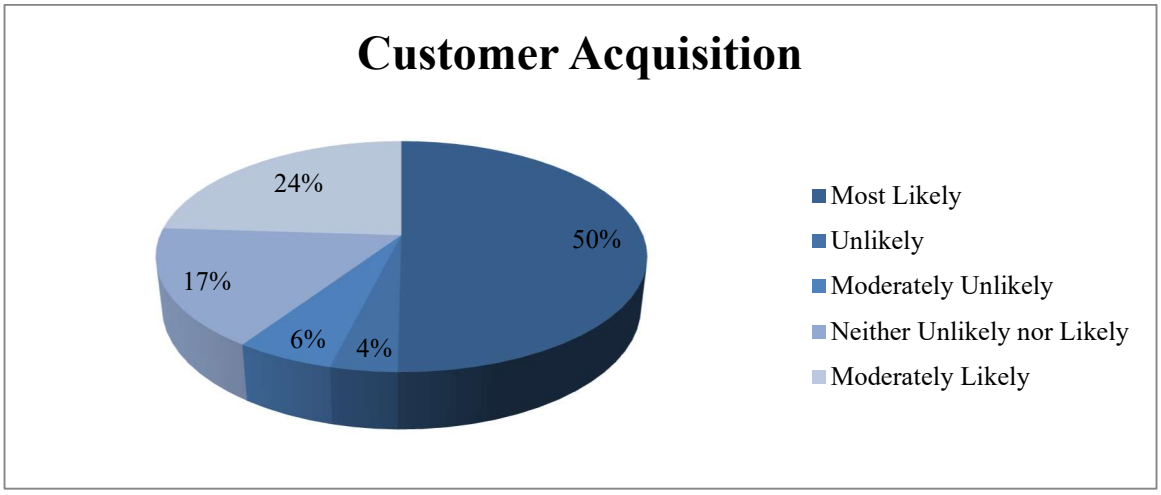


Fig 5.17: Graphical representation of Customer Acquisition

5.3 Customer Nurture

Meeting customer needs are in majority to nurturing customer. Almost majority of customers will give an electric vehicle (EV) some thought, and they will seek to dealerships that specialise in selling EVs to allay their worries and provide answers to their queries.

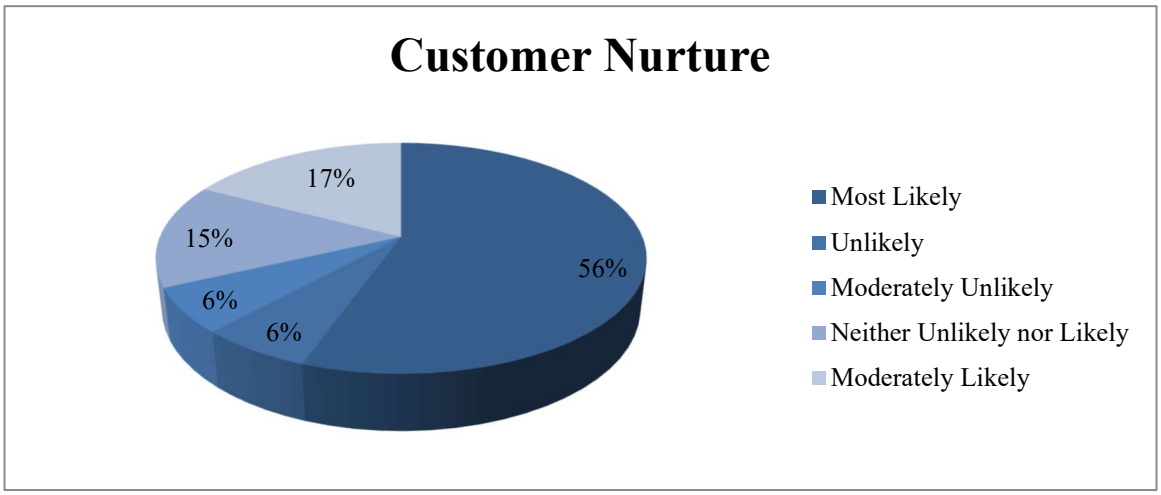


Fig 5.18: Graphical representation of Customer Nurture

5.4 Customer Development

Here again a good number of positive replies coming when to take the customer development. To promote more EV adoption, a customer development model must be resolved.

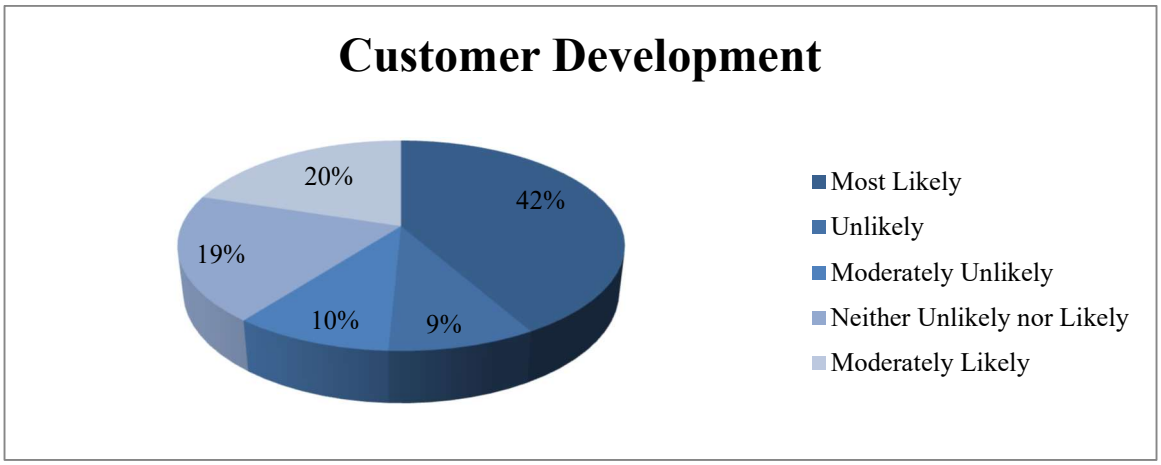


Fig 5.19: Graphical representation of Customer Development

5.5 Customer Retention

In the market for electric vehicles, client retention depends on providing consistent EV charging customer service. Regular maintenance, remote monitoring, and round-the-clock help are among strategies that improve customer happiness and company image. Here graph shows that not much positive roles when it comes to retaining customers.

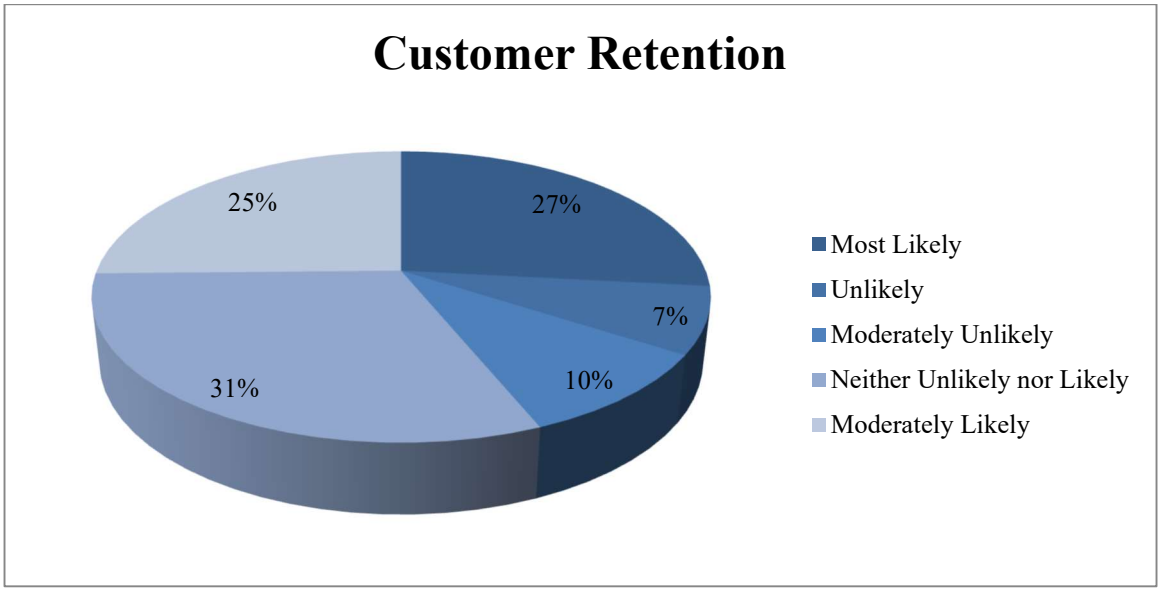


Fig 5.20: Graphical representation of Customer Retention

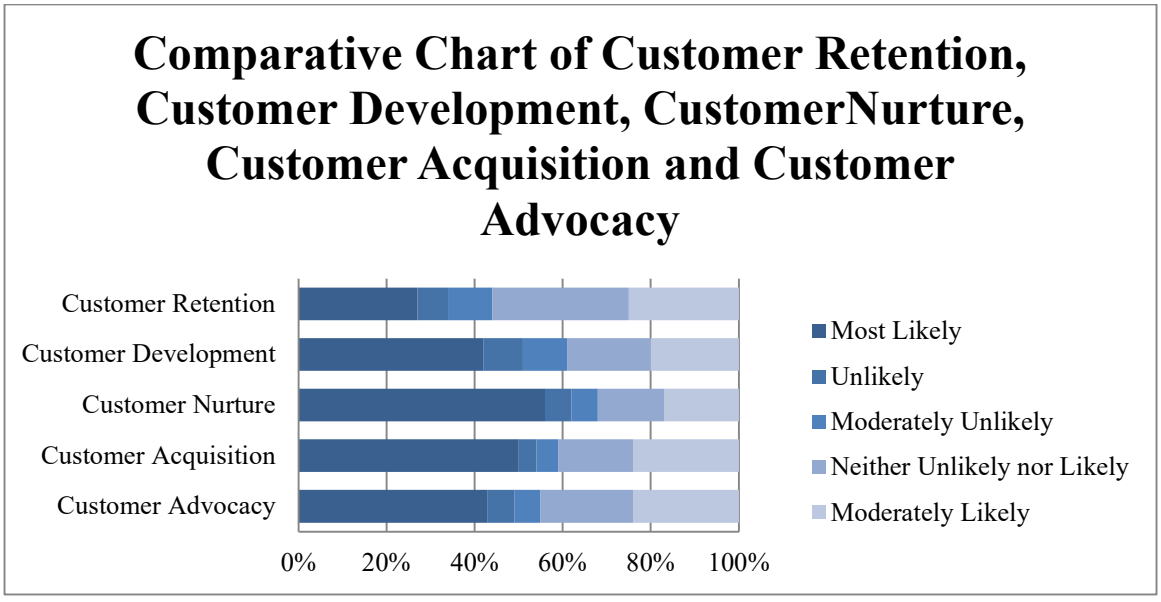


Fig 5.21: Graphical representation of Comparative Chart of Customer Retention, Customer Development, Customer Nurture, Customer Acquisition and Customer Advocacy

5.6 Descriptive

Descriptives

	Satisfaction	Customer Retention	Customer Development	Customer Nurture	Customer Acquisition	B	Customer Advocacy
N	72	94	93	93	93	0	93
Missing	22	0	1	1	1	94	1
Mean	4.10	3.46	3.81	3.96	4.11	NaN	3.87
Median	4.00	3.33	4.00	4.00	4.33	NaN	4.00
Standard deviation	0.858	0.841	0.722	0.803	0.738	NaN	0.698
Minimum	1	0.00	1.00	2.00	2.33	NaN	2.00
Maximum	5	5.00	5.00	5.00	5.00	NaN	5.00

Table 5.1: Descriptive Analysis of Comparative Chart of Customer Retention, Customer Development, Customer Nurture, Customer Acquisition and Customer Advocacy

5.7 Correlation

Correlation Matrix

		Customer Advocacy	Customer Acquisition	Customer Nurture	Customer Development	Customer Retention
Customer Advocacy	Pearson's r	—				
	df	—				
	p-value	—				
Customer Acquisition	Pearson's r	0.492	—			
	df	91	—			
	p-value	<.001	—			
Customer Nurture	Pearson's r	0.434	0.293	—		
	df	91	91	—		
	p-value	<.001	0.004	—		
Customer Development	Pearson's r	0.307	0.116	0.281	—	
	df	91	91	91	—	
	p-value	0.003	0.270	0.006	—	
Customer Retention	Pearson's r	0.433	0.345	0.460	0.536	—
	df	91	91	91	91	—
	p-value	<.001	<.001	<.001	<.001	—

Table 5.2: Co relational Analysis of Comparative Chart of Customer Retention, Customer Development, Customer Nurture, Customer Acquisition and Customer Advocacy

5.8 Customer Acquisition

With 91 degrees of freedom and a p-value less than 0.001, the Pearson r correlation of 0.492 suggests a statistically significant positive correlation between the two variables. The correlation's strength is modest. When two variables have a positive correlation, the values of the other variable likewise tend to rise when the values of the first variable do. Although there is still considerable fluctuation in the data, a moderate correlation indicates that there is a moderate link between the two variables. If there is no correlation between the two variables, there is less than a 0.1% probability of achieving a Pearson r correlation of 0.492 or higher, according to the p-value of less than 0.001. This is compelling proof that the two variables have a link.

5.9 Customer Nurture

The Pearson correlation coefficients of 0.434 and 0.293, both with p-values less than 0.001, indicate that there are statistically significant, positive correlations between the two variables in both cases. However, the correlation of 0.434 is stronger than the correlation of 0.293.

A Pearson correlation coefficient of 0.434 is a moderate correlation, while a Pearson correlation coefficient of 0.293 is a weak correlation. This means that there is a stronger relationship between the two variables in the first case than in the second case. The distinction between correlation and causation must be made. The mere presence of correlation between two variables does not imply causation.

Here are some possible explanations for the statistically significant correlations:

The two variables may be causally related. The two variables may be correlated because they are both influenced by a third variable. There may be an outlier in the data that is affecting the correlation.

5.10 Customer Development

The degree and direction of the linear link between two variables are measured in correlation analysis using the Pearson correlation coefficient (r). Its values range from -1 to 1, where a perfect negative correlation is represented by a value of -1, a perfect positive correlation by a value of 1, and no correlation is represented by a value of 0. If there is no correlation between the two variables, the p-value is the likelihood of finding a correlation coefficient that is either bigger or equal to the observed value. A statistically significant association is one that is unlikely to be the result of chance when the p-value is less than 0.05. Based on the information you provided, the following interpretations can be made:

$r = 0.307$, $df = 91$, $p < 0.003$: This indicates a statistically significant, positive correlation of moderate strength between the two variables.

$r = 0.116$, $df = 91$, $p < 0.270$: This indicates a statistically significant, positive correlation of weak strength between the two variables. However, the p-value is close to 0.05, so the significance of this correlation should be interpreted with caution.

$r = 0.281$, $df = 91$, $p < 0.006$: This indicates a statistically significant, positive correlation of weak strength between the two variables. The correlation between the two variables is positive overall, according to the findings of these correlation studies, albeit the strength of the association differs depending on the dataset. Keep in mind that correlation does not imply causality. Two factors do not always cause the other just because they are connected. The possibility exists that a third variable is influencing the changes in the other two variables.

5.11 Customer Retention

All four Pearson correlation coefficients (r) are positive and statistically significant, with p-values less than 0.001. This indicates that there is a positive relationship between the two variables in all four cases. The strength of the correlations is moderate in all cases. A moderate correlation means that there is a relationship between the two variables, but there is still some variability in the data.

5.12 Chi Square Method

Proportions - Satisfaction

Level		Count	Proportion
1	Observed	1	0.0139
	Expected	14.4	0.200
2	Observed	2	0.0278
	Expected	14.4	0.200
3	Observed	11	0.1528
	Expected	14.4	0.200
4	Observed	33	0.4583
	Expected	14.4	0.200
5	Observed	25	0.3472
	Expected	14.4	0.200

χ^2 Goodness of Fit

χ^2	df	p
55.8	4	<.001

Table 5.3: Chi Square Method of Satisfaction Count

A chi-square test demonstrating a chi-squared statistic of 55.8, four degrees of freedom, and a p-value less than 0.001 suggests that the observed and predicted data are statistically significantly correlated. This indicates that the null hypothesis, which holds that the variables do not correlate, is disproved.

If the null hypothesis is correct, there is less than a 0.1% probability of attaining a chi-squared statistic as big as 55.8, as indicated by the p-value of 0.001. This provides compelling evidence for the validity of the relationship between the variables.

6. INSIGHTS

The confluence of the Feeling Economy with electric vehicles (EVs) offers a distinctive terrain in which feelings have a central role in moulding customer attitudes, acceptance, and support. This insight explores the emotional aspects of driving an electric vehicle (EV) and highlights important observations and factors to consider when pursuing sustainable transportation. Since feeling intelligence improves human experience and attends to emotional demands, it is essential to the electric vehicle (EV) sector. It facilitates better range anxiety management, transition management, and human-machine interactions. It also helps to identify and treat the emotional bonds that EV owners have with their cars. In addition, it aids in user education, brand loyalty development, and customer service. An important component of the electric vehicle (EV) business, emotional intelligence may result in long-term consumer satisfaction and loyalty when included into client interactions.

- **Environmental Awareness as a Motivational Emotion**

Environmental sensitivity is intricately linked to the Feeling Economy within the electric vehicle industry. In addition to pragmatic considerations, consumers frequently select electric vehicles because of a deliberate and emotional desire to lessen their environmental impact.

- **Technological Innovation and Elegant Design**

Two important factors in the adoption of EVs are technological innovation and emotional design. The appeal of electric cars is heightened by their futuristic looks, sleek designs, and state-of-the-art electronics.

- **Charging Experience and Range Anxiety**

It's critical to address range anxiety, an emotional issue that many prospective EV buyers have. Companies in the electric vehicle (EV) industry should concentrate on improving the charging experience, offering convenience, and easing customers' concerns about the limited range of EVs.

- **Performance and Driving Experience**

One important emotional touch point is driving. Manufacturers of electric vehicles (EVs) may capitalise on the emotional attraction of driving an EV by highlighting performance, acceleration, and a pleasant driving experience.

- **Authenticity and Values of the Brand**

In the Feeling Economy, customers are drawn to companies that share their values and strive for authenticity. By stressing sustainability, openness, and moral behaviour, EV producers may emotionally connect with eco-aware customers.

- **Social and Community Sharing**

The EV environment is heavily influenced by social sharing and community development. Social media users post about their travels, road excursions and charging adventures, building a sense of community and encouraging good feelings related to owning an electric car.

- **Emotional Intelligence and Education**

Emotional intelligence is needed to inform consumers about the advantages of electric vehicles. It is essential to have efficient communication that allays worries, gives precise information, and fosters the sense of accomplishment that comes from making a positive impact on the environment.

- **Emotional Triggers and Government Incentives**

Policies and incentives from the government may serve as psychological catalysts for EV adoption. When consumers sense financial rewards, tax incentives, or government activities that assist them, they may be emotionally driven to select electric automobiles.

- **Convenience and Infrastructure for Charging**

The infrastructure for charging EVs is a critical factor in determining how owners feel about owning one. Making investments in widening charging networks and guaranteeing accessibility enhances the emotional experience in its entirety.

- **Choosing a Sustainable Lifestyle**

Adopting EVs is becoming more and more recognised as a sustainable lifestyle option. The thought of helping to create a cleaner, greener future strikes an emotional chord with consumers, who view owning an electric vehicle as a conscientious lifestyle choice.

In conclusion, the Feeling Economy emphasises emotional ties, values, and experiences, which has an influence on the electric car industry that goes beyond rational concerns. Businesses that are successful in the electric vehicle (EV) market recognise and capitalise on these emotional aspects to give customers a more engaging and fulfilling experience as they adopt sustainable transportation. Future sustainable transportation may be shaped by EV makers and others telling emotionally compelling stories as the Feeling Economy continues to shape consumer decisions.

7. FRAMEWORK

The following is the framework that is currently being proposed via this paper to provide a mix balance of AI technology and feeling intelligence that is the core of customer service mingled with entire value chain stakeholders that provides a unique customer experience for the EV consumers.

In addition to using AI technology, it is also important to foster a culture of feeling intelligence in the customer service department. This can be done by providing training on feeling intelligence skills, such as active listening, empathy, and conflict resolution. It is also important to create a supportive work environment where customer service representatives feel comfortable asking for help and sharing their ideas.

The increasing digital knowledge of customers presents a huge growth potential for businesses. With the help of automation, personalisation, future prediction, and suggestion, artificial intelligence and feeling intelligence is being utilised to improve consumer experiences. But just 15% of businesses have plans for AI. The personalization-privacy conundrum, system redesigns, privacy compromises, and profitability problems resulting from consumers switching between brands and customers are just a few of the difficulties that feeling intelligence brings along with its competitive benefits. With AI-driven customer journeys, this thesis gives a framework for organisational reforms and introduces new technologies. It seeks to address the conflict between personalisation and privacy and offers a methodology for lowering customer attrition with AI-powered customer journey mapping analytics.

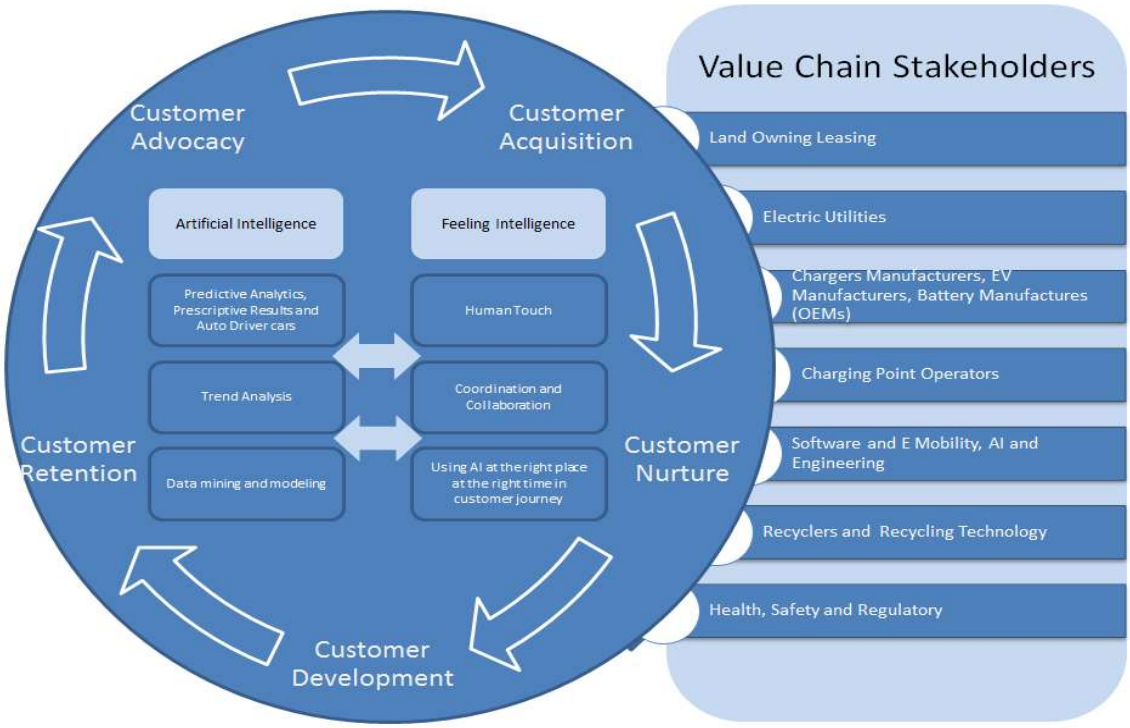


Fig 7.1: Graphical representation of Value Chain Stakeholders

Current & Future Implications:

- Net Carbon Zero Opportunity for Value Chain Stakeholders
- Carbon Emission Reductions for Policy Makers
- Unique Customer Experience across Customer Life Cycle
- EV Reliability for Customer Adoption
- New Age Technology for Battery Recyclability, Reliability and Scalability.
- New Age and cost-Effective technology to make EV a viable proposition for grass root adoption.
- Augmented AI combined and customer focus with human touch.
- Unique and Enhanced Machine and Human Interactions to give multifold productivity gains for the business, community and nations.
- Customer Preferences and services being personalized with a human touch.
- Coordination and Collaboration among the stakeholders in the entire customer life cycle for customer advocacy and EV adoption and EV Retention.

Challenges

To increase the dependability and efficiency of electric vehicles (EVs), artificial intelligence (AI) is being employed more and more in electronic vehicle. This involves creating new material compositions with improved properties, including interface attachment materials with varying elastic modulus and coefficient of thermal expansion. To control the condition of the electric vehicles a monitoring system may be created, increasing system dependability and lowering maintenance expenses. By predicting the time-resolved cooling needed for certain local electrical disturbances, machine learning techniques can reduce the size of cooling systems and save mass and money for electric vehicles. In electronic vehicle, the four V's of data - volume, variety, veracity, and velocity deserve consideration. In certain fields, gathering data might be difficult, yet utilising the least amount of data possible is encouraged. ML applications in this domain can be stimulated by an open-source database dedicated to power electronics component and system failures, which is led by collaboration.

Governmental organisations and business alliances may take the lead in formulating an AI roadmap for electronic vehicle, establishing research initiatives, and educating the labour force to propel and maintain advancements in this field ***("Acknowledgment to Reviewers of World Electric Vehicle Journal in 2020," 2021)[1].*** The pricey battery technology utilised in electric cars (EVs) is the main cause of their high initial cost in India. For electric vehicle owners, the charging infrastructure is cumbersome because it is still in its infancy and is mostly located in large cities. The worry of running out of battery power, or range anxiety, is a major barrier to the adoption of electric vehicles. EVs' range is impacted by the deterioration of their batteries over time. The manufacture of batteries in India is heavily dependent on imports, which presents supply chain difficulties. EVs' lengthier charging times have an impact on their utility and convenience as well. Finally, there aren't many EV models available in India, thus more choices are needed to meet the varying needs and tastes of customers.

[1] Acknowledgment to Reviewers of World Electric Vehicle Journal in 2020. (2021, March 11). *World Electric Vehicle Journal*, *12*(1), 40. https://doi.org/10.3390/wevj12010040

8. CONCLUSION & FUTURE SCOPE

Understanding and controlling your own emotions as well as those of others is referred to as emotional intelligence or feeling intelligence. As it enables you to establish a rapport with consumers, comprehend their wants, and address any challenges they may be having, it is a crucial ability for customer-facing professions.

Feeling intelligence is crucial in the EV sector since customers frequently invest a lot of money in new products. They can be worried about the EV's range, charging, and other features. These worries can be allayed, and the customer's trust can be increased by a staff member who interacts with customers and has good emotional intelligence.

Here are some examples of how emotional intelligence might affect how jobs for customer-facing occupations are designed in the EV.

Training: Workers in positions that interact with consumers should receive training in emotional intelligence abilities, such as how to recognize and control their own emotions, how to read and react to others' emotions, and how to establish rapport with clients.

Job descriptions: It is important to stress the value of emotional intelligence in job descriptions for customer-facing positions. This will make it possible for companies to select candidates with the appropriate abilities and for candidates to understand the value of acting intelligently in their position.

Reviews of performance: Reviews of performance for employees that interact with customers should evaluate their capacity for emotional intelligence. This will make sure that workers are improving their abilities to use feeling intelligence and that the assessment of their work is fair.

Feeling intelligence has a broader influence on an organization's culture and values in addition to these more targeted strategies to affect job design. An organization that places a high emphasis on emotional intelligence is probably more customer-centric and committed to giving customers a good experience. Numerous advantages may result from this, including elevated client contentment, patronage, and advocacy.

Here are some instances of how using feeling intelligence in customer-facing positions in the EV business can be done:

- An employee who interacts with customers may utilize feeling intelligence to recognize and address the emotions of a client who is concerned about the range of an EV. The employee may outline the formula used to determine an EV's range and give illustrations of how far an EV can go on a single charge. A test drive of the EV may also be offered by the staff members.
- A customer facing employee may use feeling intelligence to build rapport with a customer who is excited about purchasing their first EV. The employee may ask the customer about their needs and expectations for an EV. The employee may also share their own personal experiences with owning an EV.
- A customer facing employee may use feeling intelligence to resolve an issue with a customer who is having problems with their EV. The employee may listen to the customer's concerns and empathize with their frustration. The employee may then work with the customer to find a solution to the problem.

Overall, feeling intelligence is an important skill for customer facing roles in the EV industry. It can help to build rapport with customers, understand their needs, and resolve any issues they may have. Organizations that value feeling intelligence are likely to be more customer-centric and more focused on providing a positive customer experience.

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