iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 11 **Issue:** II **Month of publication:** February 2023

DOI: https://doi.org/10.22214/ijraset.2023.49091

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue II Feb 2023- Available at www.ijraset.com

Evolution and Impact of E-Mobility Aftermarket on Current Automotive Aftermarket

Dipak A Katti
Institute of Management studies, Parul University

Abstract: Electric Vehicles (EV) is the buzzword in today's day today life. EV volume has grown from 17000 in 2010 to 72 L during 2022 globally. Whereas in India the EV volume commenced from 1996 with a small numbers of 400 three wheelers and grown to more than 10L currently. In recent past 5 years the growth was rapid mainly due to Govt. of India initiative with many incentive for EV promotion. The aftermarket for EV has evolved and the volume is increasing. There is impact of EV aftermarket on current aftermarket with ICE vehicles as well.
In this paper, the attempt has been made to study the evolution of EV-aftermarket that is popularly known as e-mobility aftermarket. The study also details on the impact of the e-mobility aftermarket on current aftermarket with ICE vehicles.
Keywords: e-mobility, automotive aftermarket, EV aftermarket, e-mobility aftermarket, evolution, impact,

I. INTRODUCTION

An electric vehicle (EV) is a vehicle that uses one or more electric motors for propulsion. It can be powered by a collector system, with electricity from extravehicular sources, or it can be powered autonomously by a battery (sometimes charged by solar panels, or by converting fuel to electricity using fuel cells or a generator). EVs include, but are not limited to, road and rail vehicles, surface and underwater vessels, electric aircraft and electric spacecraft.

EVs first came into existence in the late 19th century, when electricity was among the preferred methods for motor vehicle propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. Internal combustion engines (ICE) were the dominant propulsion method for cars and trucks for about 100 years, but electric power remained commonplace in other vehicle types, such as trains and smaller vehicles of all types.

A. Electric Vehicle (EV) Overview

1) Global Scenario

In 2010, only 17000 electric cars were sold globally. By 2019, this number had soared to 7.2 million. Evidently, electric vehicles (EVs) are expanding significantly, more recently with a 40% year-on-year increase for electric cars in 2019.

China, Europe, and U.S. are the largest consumers of EVs, owing to favorable policy announcements that include zero-emission mandates and fuel economy standards, and fast technological progress in the electrification of two/three-wheelers, buses, and trucks.

In 2021, global electric vehicle sales surpassed 6.5 million units, an increase of 120% over that of 2020. Currently, Mainland China is leading the way with a market share of almost 50%. Car manufacturers are pushing to bring out new electric car models and have big plans for the future. The 2021 race for the highest market share was won by the Tesla Model 3 with 8%, followed by Wuling's Hong Guang MINI EV, and Tesla Model Y with 6% each, Volkswagen ID.4 and BYD Qin Plus PHEV with 2% each respectively.

Environmentally, EVs are making a favorable case, with only 51 million tons of carbon-dioxide emission globally in 2019 that too only because of the electricity generation required to supply the global electric vehicle fleet, as compared to 104 million ton that would have been emitted from an equivalent fleet of IC engine-based vehicles, and that includes on-road emissions.

And it's not just electric cars that are picking momentum, but also the electric non-car segment. With almost 25% of all two-wheelers on the roads being electric, micro-mobility via electric vehicles like electric scooters, electric-assist bicycles, and electric mopeds is also on the rise in many large cities across more than 50 countries worldwide. China is making significant inroads in electric transportation with the bus fleets in many cities being near-fully or fully electrified. Outside of China, Santiago in Chile has the largest electric urban bus fleet with significant reductions in operational costs as compared to conventional buses along with favorable customer ratings. More vehicle manufacturers are investing in this space – General Motors created a stir when they announced in January 2021 that they would not sell gas/petrol-powered vehicles after 2035. Volkswagen too has taken a strong stance to electrify its cars. This trend is bound to lead to a virtuous cycle – lower costs due to increased manufacturing, increased infrastructure such as charging ports, more awareness, and so on.

©IJRASET: All Rights are Reserved

2) Indian Scenario

In 1996, the first electric vehicle was a three-wheeler, invented by Scooter's India Pvt Ltd, and it was named VIKRAM SAFA. Approximately 400 vehicles were made and sold. In 2000, BHEL developed an eighteen-seater electric bus, which became popular too. Then approx. 200 electric vans were made and ran in Delhi. But it did not do that well in the market as it required a high cost for the battery and its low life.

Electric vehicles came into existence in the 19th century. Earlier, they did not do that well in the market because of its high cost, low speed, and short-range. So initially, the demand declined. However, they have been used for transportation and public transport, especially as rail vehicles.

As the concern for the environment increased in the 21st century, gas-powered vehicles emit a lot of smoke and are incredibly harmful to the atmosphere.

Therefore, the interest in electric vehicles increased too. Electric cars were popular among those who used them in the city where their short-range did not prove a disadvantage. Another reason that gave it a boom was that there was no requirement to change the gears, making it an easy option. It did not have vibration sounds or any sound. It did not require a manual start, which was also a plus point.

Due to a lack of power infrastructure, acceptance of electric vehicles was hampered. In a bid to overcome the limited operating range of electric vehicles and the lack of recharging infrastructure, an exchangeable battery service was first proposed in 1896.

In 2007, Hero cycles, in partnership with UK-based ULTRA Motor, launched a series of bikes. These electric bikes became popular, among other companies named Electrotherm India, TVS Motor, Hero electric, etc. They are also manufacturing and selling their products. Furthermore, in 2017 Etrio raised over 3 million in funds from HNIs and set out to transform existing fuel-powered commercial vehicles into electric variants, thus benchmarking efficient and eco-friendly transportation.

The significant popularity of electric rickshaws dominated the entire market. In 2016-17 about 500000 e-rickshaws were sold in India. It served as an excellent help for the population to commute daily. The primary use of these rickshaws is in Delhi NCR currently. The government is now rapidly targeting majorly polluted cities to increase the use of electric vehicles. A scheme called FAME, i.e., "Faster Adoption and Manufacturing of Electric and Hybrid Vehicles in India", is being launched where a subsidy is being given to 11 cities for launching electric buses, taxis, and e-rickshaws. The targeted cities include Ahmedabad, Delhi, Bangalore, Jaipur, Mumbai, Lucknow, Hyderabad, Indore, and Kolkata, plus two cities – Jammu and Guwahati under a particular category. (e-trio.in)

India is quickly catching up to electrification. Department of Heavy Industry, Government of India, implemented Phase-II of FAME India Scheme from 1st April 2019 in with an outlay of Rs 10,000

Crores. Under the FAME India Scheme (both FAME Phase-1 and Phase-2), more than 300,000 hybrid and electric vehicles have been supported (till July, 2020). In addition to this, various Indian States are also launching state EV policies to further accelerate EV adoption and inviting investments through local manufacturing of such vehicles and their critical components. One of the most recent electric vehicle policies, launched by Delhi, aims at having 25% share of BEVs in new vehicle registrations by 2024.

EV usage in India, can have positive macroeconomic and environmental impacts. The import burden per IC-engine car is 4.1 times higher for private vehicles and 5.7 times higher for commercial ones when compared to electric vehicles over their lifetimes, if we compare oil and battery cell imports by 2030.

India has taken initiatives in gearing up its EV initiatives such as the Faster Adoption and Manufacturing of Electric (FAME) vehicle policy and reduction of GST on EVs, but more may need to be done, especially from the private manufacturers' point of view.

II. THE EV AFTERMARKET - EVOLUTION

Aftermarket is nothing but, taking care of vehicles after these are sold to customers.

For ICE vehicles aftermarket include providing - service & repairs, replacement spare parts, denting & painting, lubricants, accessories, workshops, skilled mechanics etc

Whereas for EV vehicles these include providing support for limited spare parts, battery charging, charging stations, normal mechanics, general workshops etc

Prima facie, the numbers look bleak, but is not so. Deloitte, a consultancy, predicts that after sales-related revenue could shrink by as much as a half by 2035. In fact, Tesla explicitly mentions that their vehicles do not need annual maintenance! But where there is disruption, there is also an opportunity. This change is not going to happen overnight, so OEMs and other players have time to adapt.

The servicing needs of EVs, which have fewer parts, are fundamentally different from those of ICE-based vehicles. For example, engine oil changes and filter changes – two mainstays of after sales service for ICEs – do not apply for EVs. At the same time, the latter have their own set of requirements and even skills. Reilly Brennan, founding general partner of Trucks VC (an American transportation VC company) wrote that the future of an electric-dominated auto maintenance world belongs to tyre and glass, remarking that "Tesla's Model X panoramic glass costs $2,300 to replace — we're entering an era of big, beautiful and expensive visibility." The influx of EVs will pose all sorts of questions for incumbent players. New revenue streams, ownership models such as subscriptions, value-added services for customers, after sales relationships beyond the hygiene servicing, manufacturing and supply chain cost optimization, and so on. While the above might seem daunting, it also poses an opportunity for those with vision and quick to get off the blocks. Maintaining a relationship with the customer will be vital. Deloitte lays this out as one of the four key points for OEMs looking to adapt: "Increasing the digital experience will be a significant part of success and retention in an OEM's core business".

III.KEY DRIVERS TO EV-AFTERMARKET EVOLUTION

A. Retrofit kits

Retrofit kits will play a good role in EV aftermarket. The components of the kits need to be genuine and certified by the authorized body like ARAI. The RTO should be responsible to check the genuineness of the kit fitted in vehicles wile registering the newly fitted kit. The kit is manufactured by independent entity and is fitted in old ICE-EVs, by removing the ICEs and modifying the connections.

The kit is not fitted on old ICE vehicles by the OEMs who manufacture the new EVs. Hence, the after-market dealers & workshops will play important role for the fitment and maintenance of the retrofit kit. The kit price will be definitely lesser than the new vehicle price hence the market for converting ICE vehicles to electrical vehicles has a good market. Vehicle owner has an attachment to his vehicle and added to that the lesser cost of retro-kit, he prefers to retain the vehicle and converts to electric.

B. EV repair jobs

EV repair jobs seem to be simpler owing to its structure compared to ICE vehicles. Here the moving and rotating parts are much less as compared to ICE vehicles. The traditional engine, gearbox etc are not available which consume more repairs due to high number of moving spare parts.

The main components are motor, charger, controller and battery. Majority of parts are use and throw type. Hence repair jobs become simpler. We can expect requirement of initial repairs may be less or negligible. At later stage, as vehicle age increases, the repair cost increases owing the cost of spare parts. The prices of spare parts are likely to be costlier like battery, motors etc. The labor charges may also be higher due to monopolistic situation presently.

C. EV-specific workshops

Presently there are large number of workshops for traditional vehicles. There are EV workshops for the exclusive brands run by a specific brand channel. This work shop does not attend the repair jobs of another brand due to competition. Like traditional workshops the common workshop for all brands for the particular segment is likely to be evolved shortly. So we can expect the workshops for 2W EV, 3W EV, EV cars etc

D. EV- skilled manpower

Even though it looks simpler to attend the repair jobs for EV as compared with traditional vehicles, the training and understanding of technicality of spare parts is a must. One small mistake could result in very high cost.

The various institutes are coming up with the courses in EV repair at various levels like certificate courses, diploma etc. This will definitely give the better understanding to attend the EV jobs.

E. EV- battery charging stations

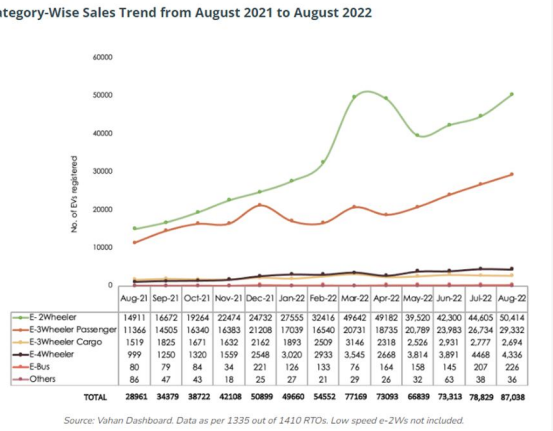
One of the major role is played by the charging stations, once vehicles are sold. The battery needs charging periodically. Hence the charging equipment are in picture. The charging could be public or private. The battery swapping stations are the ultimate for EV; as here the time taken is almost the same as filling the petrol or diesel. The infrastructure created for battery charging or swapping now, is going to pay high returns later.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 11 Issue II Feb 2023- Available at www.ijraset.com

IV. E-MOBILITY AFTERMARKET PRESENT SCENARIO

The e-mobility aftermarket has direct relationship with EV sales. The trend of EV- sales in various segment are depicted in the following graph.



	Aug-21	Sep-21	Oct-21	Nov-21	Dec-21	Jan-22	Feb-22	Mar-22	Apr-22	May-22	Jun-22	Jul-22	Aug-22
E-2Wheeler	14911	16672	19264	22474	24732	27555	32416	49642	49182	39,520	42,300	44,605	50,414
E-3Wheeler Passenger	11366	14505	16340	16383	21208	17039	16540	20731	18735	20,789	23,983	26,734	29,332
E-3Wheeler Cargo	1519	1825	1671	1632	2162	1893	2509	3146	2318	2,526	2,931	2,777	2,694
E-4Wheeler	999	1250	1320	1559	2548	3,020	2933	3,545	2668	3,814	3,891	4468	4,336
E-Bus	80	79	84	34	221	126	133	76	164	158	145	207	226
Others	86	47	43	18	25	27	21	29	26	32	63	38	36
TOTAL	28961	34379	38722	42108	50899	49660	54552	77169	73093	66839	73,313	78,829	87,038

Source: Vahan Dashboard. Data as per 1335 out of 1410 RTOs. Low speed e-2Ws not included.

Fig. 1 Category wise sales trend for EV; Source – Vahan portal

The E-mobility after market volume is negligible in terms of revenue from a total of aftermarket revenue of 72000CR. This is close to 4300CR.

The next pic gives details for the segment-wise current penetration.

V. E-MOBILITY AFTERMARKET EXPECTED SCENARIO

The electric vehicle components market in India is likely to register a healthy CAGR of close to 76% in revenue to Rs 72500 CR in FY 28, from Rs 4300 CR in FY 23.

With this the share of the EVs in overall automotive components market is set to rise to 9 – 11% from a negligible 1% currently.

As per CRISIL ratings analysis of 220 manufacturers, those account for one-third of the automotive components market, the transition to EVs will create both opportunities and challenges for domestic automotive component makers.

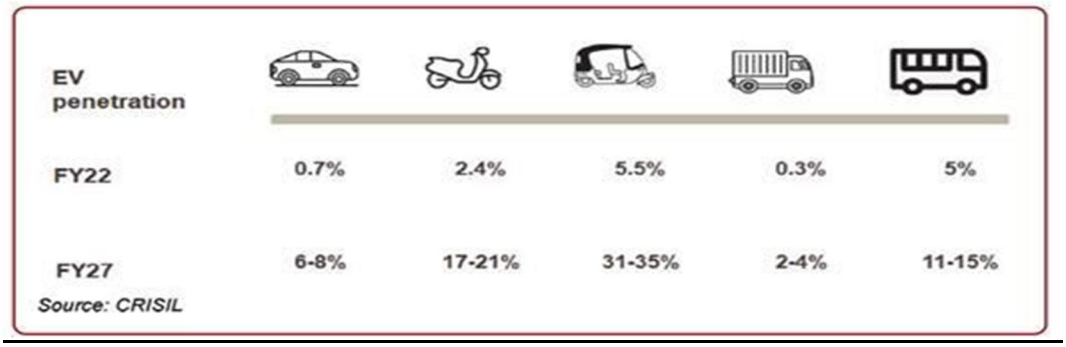


Fig.2 EV component penetration, Source: CRISIL

VI. IMPACT ON CURRENT AUTOMOTIVE AFTERMARKET

Amongst the key auto segments, the transition will be topped by two wheeler and passenger vehicles. EV penetration in two wheelers is likely to rise to 17 – 21% over next five years, from current close to 2.5% currently. For PVs the penetration will increase to 6-8% from less than 1% currently. The commercial vehicles will see far lower penetration at 2-4% *0.3%) currently, because of unfavorable economics. Three wheelers will see an estimated penetration of 31-35% (from 5.5% currently) by FY28. But in terms of revenue, this is smaller segment within the overall auto components market due to lower volume. This transition will have significant ramifications for the automotive component market.

EV batteries are likely to account for 60-65% of EV component revenue by FY28, drive trains 10-15%, electronics 10-15% and others 5-10%. This presents an opportunity for automotive components players to diversify their revenue base beyond supplies to ICE vehicles.

©IJRASET: All Rights are Reserved | SJ Impact Factor 7.538 | ISRA Journal Impact Factor 7.894 |

Out of total EV component market estimated at Rs 72500 CR by FY28, two wheelers will account for 64% followed by PVs at 28%. The balance is made up of commercial vehicles including 3 wheelers.

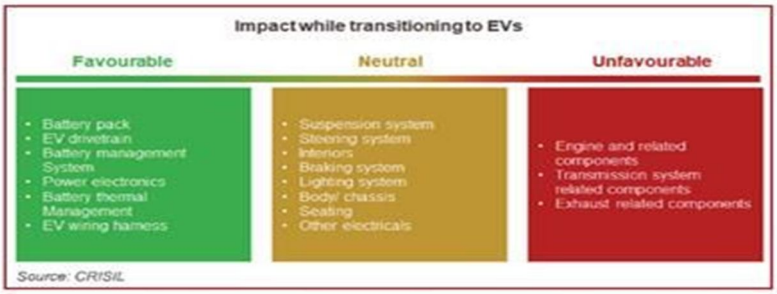


Fig.3. Impact of EV aftermarket on current automotive aftermarket, source: CRISIL

The suppliers, exclusive for engine and power train could face challenge due to EV transmission. These include parts such as alternators, fuel injection, radiators, gear box, clutch, pistons, liners, blocks, and exhaust system.
The transition is set to be faster in two wheelers, the components makers in this group will be at higher risk than those supplying to PVs and CVs. Engine and transmission component makers supplying majority to two wheelers account for 6% as rated by CRISIL.



Fig.4. Risk analysis for component manufacturers, source: CRISIL

Majority of component players close to 50% are diversified across multiple end segment. Players are also looking to de-risk by supplying EV parts and non-auto in their plan. So far component distributors, dealers, retailers are concerned they are already getting involved into EV parts. They are extending their portfolio by adding the EV parts. Thus there is a very good opportunity for them to increase business. The mechanics are trying to get additional information and knowledge of EV maintenance and up-skilling themselves. EV makers are also exploring means to train the mechanics. Institutes are coming up with courses for EV maintenance & repairs.

VII. CONCLUSION

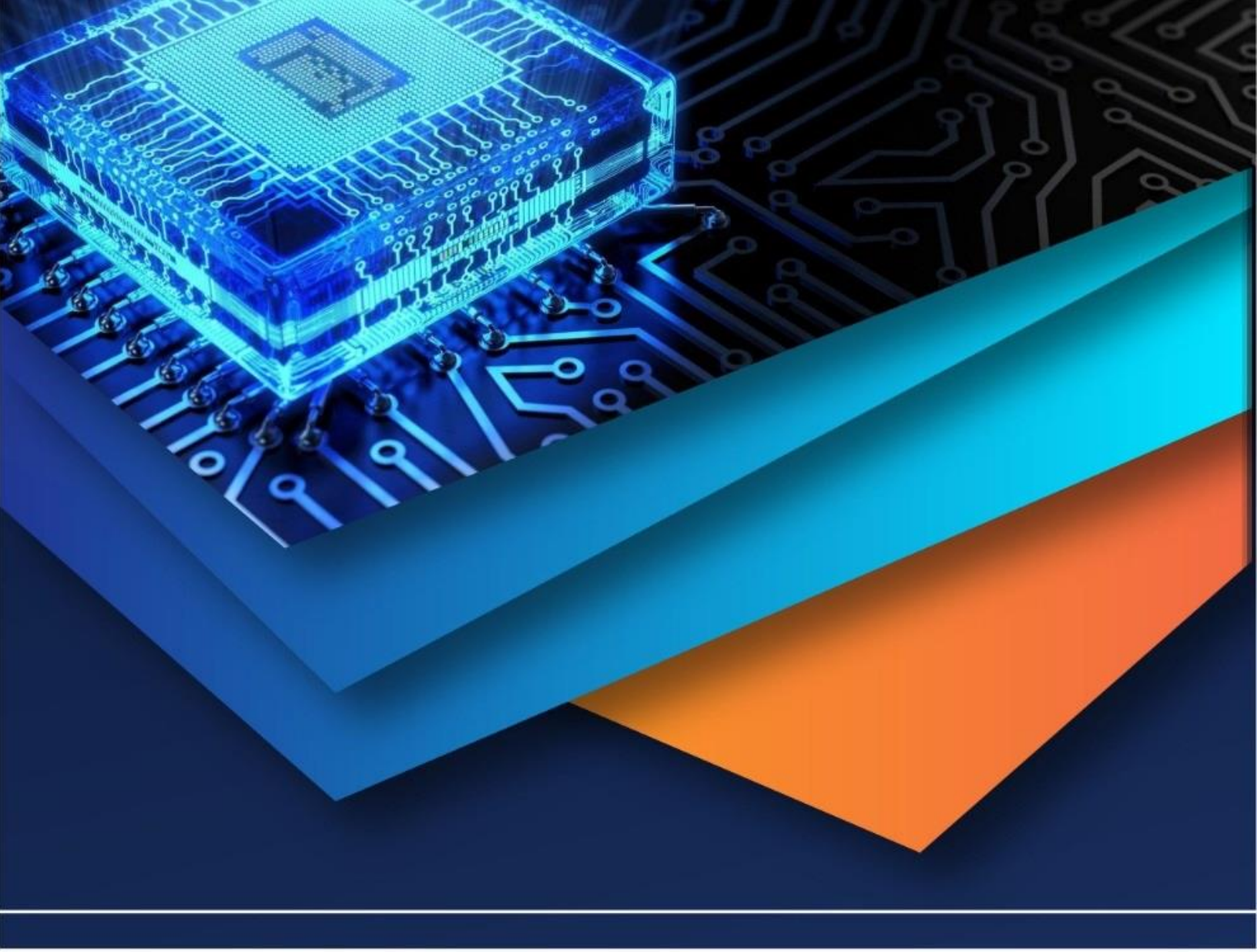
The aftermarket for EV is almost evolved and is in primary stage. However, the EV aftermarket is growing at much faster rate and the business opportunity seems to be amazing. The impact of EV aftermarket evolution is going to high. The components manufacturers and the channel partners are getting ready to the takeover. Already the majority of the component manufacturers have invested in the additional lines of EV component manufacturing. They also invested in the R&D for the expected change.
This has resulted in the more requirement of the manpower resulting in the availability of more job opportunities for the youth and all the concerned. The evolution and impact of the e-mobility aftermarket is thus quite positive and is encouraging.

VIII. ACKNOWLEDGMENT

I wish to acknowledge Dr. Hetal Thaker, my research guide for the inspiration and guidance for preparation of this paper.

REFERENCES

[1] Elect vehicle –Wikipedia
[2] SIAM report 22
[3] Is the vehicle aftermarket prepared for elect vehicle…available in…www.21north.world/blog-details?
[4] India needs to reskill its workforce for EV Available in…https://autofintechs.com
[5] EV related information available in…www.evreporter.com
[6] EV updates available in…www.e-vehicleinfo.com
[7] CRISIL report available in… http://emagazine.motorindiaonline.in/31650/18-08-2022#page/63



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089 (24*7 Support on Whatsapp)