



Need Of Electrical Vehicles In Indian Secenario With Special Reference To Indian Light Motor Vehicle Sector And Tata Nano Electrical Version

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Abstract- Electrical vehicles are much better and greener than gasoline vehicles. Electrical vehicles can be charged from electricity and the electricity may be generated from domestic sources like solar, wind, hydro, nuclear sources, natural gas, renewable sources etc. These vehicles have lower fuel and low maintenance costs and also environment friendly. Due to this reason many of the Indian automotive industry has turned into the electrical powered vehicle. The Indian automobile industry is one of the largest industry in the world. Currently in India, the Tata automobile company launched a new car named Tata Neo (Jayem Neo). That electric car is powered by electricity. It is totally modified by old NANO car. This Electric NANO Car has very important feature. In this paper the author(s) firstly, explain the importance of electrical vehicles in Indian secenario, how the EVs works, how to charge these vehicles, which type of sources are available to charge these vehicles. Secondly, we will discuss about the Tata nano electric car and their importance in Indian market. In this paper, for doing survey we will also design the set of questionnaire to find out the need of electric vehicle whether the customer wants to purchase these vehicles in future like Tata Nano electric vehicles.

KEYWORDS: Indian automobile sector, need of electric car, Tata Nano electric vehicle, Previous Tata Nano Car, questionnaire, surveyresult

I. INTRODUCTION

At present time, Indian manufacturing industries growing very rapidly. The automobile industry in India is expected to be the world's third largest by 2016. Production of passenger vehicles, commercial vehicles, three wheelers and two wheelers grew at 11.27 per cent year-on-year between April-December 2017 to 21,415,719 vehicles. The sales of passenger vehicles and two wheelers grew by 5.22 per cent and 40.31 per cent year-on-year respectively, in December 2017.

The auto industry is set to witness major changes in the form of electric vehicles (EVs), shared mobility, Bharat Stage-VI emission and safety norms [1].

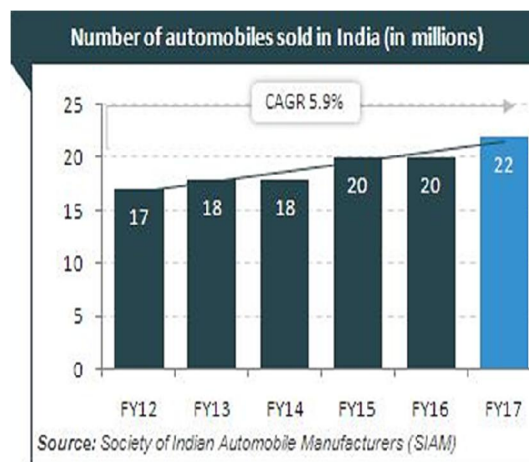


Fig.1: Graph shows the no. of automobiles sold in India
Source: <https://www.ibef.org/industry/india-automobiles.aspx>

According to the graph 25 million automobiles produced in the year 2017.

All type of vehicles are basically depends on fuel and gas. Most of the vehicle are powered by fuel which is very harmful for leaving things and environment. A very high percentage of pollution increases by fuel vehicles because of every day everyplace so many vehicles are running on the road that is powered by fuel and some gas vehicles are also included in it. Therefore, it is the necessary need to replace old vehicles by electric vehicles because of electric vehicles are much better than other and the brought advantage is that electric vehicles are eco friendly and good for environment. In compare to fuel car electric car is much better, it is charged by electricity from natural source like wind, solar etc. and we can generate the electricity using these sources to power the electric car.

II. AUTOMOBILE COMPANIES ENTERING INTO HYBRID AND ELECTRIC VEHICLES

Currently many of the Automobile companies has turned into electric cars and hybrid cars. Electric car is powered by electricity while hybrid car is partially electric means hybrid car is the combination of two types of vehicles such as



electric cars and traditional gasoline powered cars. Both types of cars are ecofriendly and designed to lower the use of gasoline.

The Government of India also thinks that electric vehicles are the future and recently revealed its aim to have an all-electric car fleet in the country by 2030. Therefore many of the car manufacturers entering into the hybrid and electric vehicle's sector. Some of the list of hybrid and electric vehicles available in India are as follows [2].



Figure2; showing the picture of Mahindra e2oPlus model of Mahindra

Source: <https://auto.ndtv.com/news/top-5-hybrid-electric-cars-in-india-757164>

Mahindra e2oPlus model of Mahindra

Recently in India Mahindra was launched an electric car named e2oPlus. It is powered by a 72V lithium-ion battery that has increases the driving range to 140km. The powertrain makes about 40 bhp and 91 Nm of peak torque has a top speed of 85 kmph. The price range of this car is approx. (5.46 lakh - 8.46 lakh) [2].

2. Mahindra eVerito

This car is also launched by Mahindra. This is the passenger car powered by the same electric motor with a 72V battery pack. The powertrain and torque is about 40 bhp and 91 Nm respectively. Having said that, the range on the eVerito is limited to 110 km on a full charge [2].



Figure3. Showing the picture of Mahindra eVerito

It uses lithium-ion battery that takes 1 hour and 45 minutes to be fully charged through fast charging technology and will take over 8 hours on regular mode. The eVerito's top speed is rated at 86 km/h. Mahindra says that the running cost on the EV comes down to 1.15 per km. The price range of this car is 9.50 lakh - 10 lakh (ex-showroom, Delhi)[2].

3. Toyota Camry Hybrid

This is the hybrid car. It is available in both petrol and hybrid models. Among hybrid cars, the top player in India is clearly the Toyota Camry. The car comes in both petrol and hybrid models. It is powered by the company's DOHC VVT-i 2.5-litre petrol unit paired to an electric motor. The output tally of the hybrid system stands at 202bhp; 158bhp from the petrol motor, and 44bhp from the electric motor [2].



Figure4. showing the picture of Toyota Camry Hybrid

The engine comes mated to the e-CVT (electronically continuously variable transmission) and the car comes with three driving modes to choose from - EV, Eco and Normal. Toyota claims that the Camry Hybrid delivers 19.6Km/l. The price of this car is 31.98 lakh [2].

4. Honda Accord Hybrid

The Japanese carmaker brought back the Accord nameplate to India with the launch of the 2016 Honda Accord Hybrid. This car is the hybrid car [2].



Figure5. Showing the picture of Honda Accord Hybrid



Powering the Honda Accord Hybrid is a 2.0-litre, 4-cylinder petrol engine mated to an electric motor powered by a 1.3 Kilowatt/h lithium-ion battery pack. While the petrol engine churns out a maximum of 145 bhp and 175 Nm of peak torque, the electric motor puts out 184 bhp and a peak torque of 315 Nm. The Honda Accord hybrid's combined power output is rated at 212bhp. It comes mated to a CVT gearbox. Incidentally, the car is over Rs, 6 lakh more expensive than its closest competitor - the Toyota Camry Hybrid [2].

Maruti Suzuki, which plans to drive in an electric car in 2020, also showcased a clean-car concept — e-Survivor, something which combines connected mobility with an electric drivetrain. Company MD Kenichi Ayukawa said making affordable electric vehicles is one of the “biggest challenges” that carmakers are facing.

“Affordability is a concern, and we can't seem to find answers,” Ayukawa said, adding that it seems “practically impossible” to think of electric vehicles at a price range of Rs 5-6 lakh, which is the heart of the Indian car market.

5. Volvo XC90 T8 Plug-In Hybrid



Figure6; showing the picture of new Volvo XC90 T8 Plug-In Hybrid

Charging infrastructure is one of the main concerns. “Look at the long queue outside CNG gas stations today. If after so many years, the government cannot even provide adequate stations for CNG, how can we expect them to roll out an adequate infrastructure for charging electric cars, two-wheelers and commercial vehicles,” a CEO of a top company said at the Expo, but requesting anonymity.

But the industry is confused, and so are buyers. “There are so many issues that need answers. The government needs to be clear on its roadmap if it wants affordable vehicles,” Sumit Sawhney, MD of Renault India, said. The company has showcased its Zoe mini electric car at the Expo and this is a successful vehicle in Europe, but Renault is not clear on its India debut.

This is the hybrid car. The AWD Volvo XC90 Excellence derives power from the company's T8 Twin-Engine Plug-in Hybrid Electric powertrain (2.0-litre supercharged and turbocharged petrol engine + 9.2kWh Lithium-ion battery). Mated to an 8-speed automatic transmission, the SUV offers a combined power output of nearly 402bhp and develops a maximum torque of 640Nm. The price range is 1.25 crore [2].

“What is the support for R&D that companies are going to get, and what is the scale of electric fleet that the government wants to put in place? Until we are clear on these aspects, it is difficult to work out costing and supplier agreements,” Sawhney said.

Auto Expo – 2018

New Delhi: Electric is the flavour at the Auto Expo, but is India really prepared to roll out clean cars in a large way? Affordability and lack of onground charging infrastructure remain the biggest concerns for companies, which say pushing sales may be difficult in absence of ‘green incentives’ and a coherent government policy.

However, companies say that despite higher price tag, running cost of an electric car will be much lower. “The operating costs may still prompt many customers to opt for electric cars. For example, the per kilometre running cost of Kwid petrol could be Rs 4.7, while on electric, it will be Rs 1.2. Apart from this, the service costs will be very low. So, there is a clear benefit of around Rs 3.5 per kilometre,” Sawhney added.

On average, electric cars may cost “at least double and even more” compared to their petrol or diesel variants, and companies are worried.

कंसैप्ट कारों में भी सुरक्षा का ध्यान, वजन कम और मजबूती ज्यादा रखी



नौरो प्लग-इन हाइब्रिड कार : किआ कंपनी ने बीजे को लॉन्च किया। इसका फंटेड लुक टाइगर नेज (बाक) जैसा है। हेड लाइट में एलईडी का इस्तेमाल हुआ है। यह पेट्रोल और इलेक्ट्रिक दोनों से चलेगी। 2018 में भारतीय मार्केट में आएगी। इसकी अधिकतम स्पीड 172 किमी होगी। सेक्रेट के लिए इसमें 6 एयर बैग हैं।

Renault, for example, is preparing to launch an electric version of Kwid mini in China and it may cost around \$10,000 (around Rs 6.5 lakh) there. Even if it is made in India, the same will cost at least Rs 7.5 lakh, nearly double the cost of its petrol version.

“Affordability is a big concern. We are waiting for a roadmap from the government on the front of support infrastructure and other incentives,” Y K Koo, MD and CEO of Hyundai India, told TOI. The company is showcasing two electric cars at the Expo — Ioniq sedan and Kona SUV. The company plans to launch Kona next year, while feasibility study is on for the other one.



एक ही कार में तीन टेक्नोलॉजी



: हंडई आयनिक में हाइब्रिड, प्लग-इन हाइब्रिड और इलेक्ट्रिक तीनों टेक्नोलॉजी है। फ्यूरोडायनेमिक्स और क्लोन लार्ड्स के जरिए इसका शैप और लुक अकर्षक बन गया है। इसका 63% हिस्सा एडवेंस हार्ड स्ट्रेंथ स्टील से बनाया गया है। इससे बॉडी हल्की होने के साथ मजबूत भी है।

Figure7. Showing the picture of concept of car's

III. WORKING OF ELECTRIC CAR

EVs first came into existence in the mid-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 [3]. Due to the rapid increment of gasoline cars, the environment pollution increases day by day throughout the world. To reduce the environment pollution, the electric vehicles will be act as a giant for the upcoming future. Therefore electric vehicles is needed to save the environment.

The electric car is the combination of electric motor, controller and battery. The motor's controller takes DC power from the battery and convert it into an AC power, then send this AC power to the motor. The batteries are made up of lead acid, lithium ion and nickel-metal hydride. Here a very large transistors are used that turns the battery voltage "on" and "off". Finally the motor is rotate the wheel which is work by power supply. Here the variable resistor is also used i.e. connected between accelerator pedal and controller. It provides the signal to the controller that how much power is used to deliver.

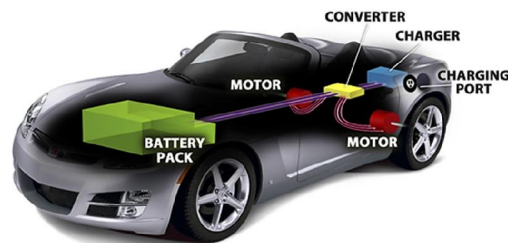


Figure8. Shows the functions used in electric car
Source: <http://ww1.prweb.com/prfiles/2008/05/23/463434/crosssection.jpg>

IV. HOW TO CHARGE THE BATTERY FROM OTHER SOURCES

Energy can neither be generated, created and even nor be destroyed, it can transferred from one source to another energy source. Using this concept we can charge the electrical vehicles from renewable energy sources like wind , solar, hydro etc. These energy sources finally converted the energy into the form of electricity. Because these sources are naturally available , therefore we can charge the battery of EVs with the help of these sources. This concept will be save the money and environment friendly.



Figure9. Showing of this picture is solar panel on the top of the car
source: <https://www.bing.com/images/search?q=solar+light+on+vehicles&FORM=HDRSC2>

V. ELECTRIC TATA NANO CAR

Ratan Tata recently launched a new electric TATA NANO car with some new features and specialty from previous car. This car is powered by electricity and its have automatic manual gear and front set is manual set according to us TATA NANO is the most affordable car commercially available in Indian market.

Tata Motors will supply the body shells of the Nano to Coimbatore-based engineering company Jayem Automotive.



Tata has entered a joint venture with Jayem for the Neo EV. Jayem will source the electric motor for the Neo from another company called Electra EV and assemble the final electric car, which will then be supplied to Ola. The Neo EV will not feature any Tata branding.

The Jayem Neo electric car will feature a 48V battery pack, putting out about 23 Hp. The EV is said to weigh about 800 kilograms, which makes it significantly heavier than the 636 kilo Nano Petrol. The weight of batteries is said to be reason for the additional weight.

This much power could be adequate for the Neo EV to function as a city cab though. Autocar's sources add that the car will be able to do nearly 200 kilometers per full-charge of its batteries. With 4 people aboard and the AC functioning, effective range per charge is said to dip to 140 kilometers [4].



Figure10. Showing the picture of new TATA NANO electric car

Source: https://www.bing.com/images/search?view=detailV2&ccid=PXGVs52S&id=440FFB1083CF4614D26AA8712ECAFE03CFB93C11&thid=OIP.PXGVs52S0k9JJNs9Wq_uwHaFL&q=latest+new+tata+nano+electric+car&simid=608025194877028037&selectindex=2&mode=overlay&first=1

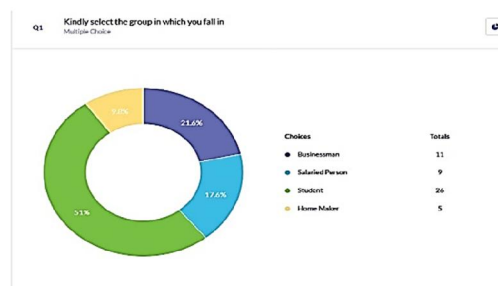
First phase cars will be sold to OLA. OLA will purchase four hundred of these nano electric vehicle and launch them in Delhi. The Tata motor are manufacturing new electric car which is launched in 2018 with specific qualities

1. Fuel type= electricity
2. No. of gears = 5 automatic manual
3. Body type = hatchback
4. Manufacturer warranty = 2 year
5. Total length = 3090mm
6. Total width = 1487mm
7. Overall height = 1585mm
8. Wheels base = 2230.0mm
9. Ground clearance = 180.00mm
10. Engine description = 12kw/h
11. Maximum / high power = 54bhp

To find out the interest of people about electrical vehicles. We have design a set of questionnaire. In this questionnaire the respondents are included of all the age groups. The main aim of this survey to aware the people about electric vehicle so that in future the people prefer to purchase the electric vehicle and save the environment.

VII. SURVEY RESULT AND ANALYSIS

In this paper the online survey was conducted for seeking the awareness about electric vehicles and newly launched car named Tata Nano electric vehicle. The survey results shows that the maximum respondents are youngsters of the age group less than 25 years and the next one age group is from 36-40.

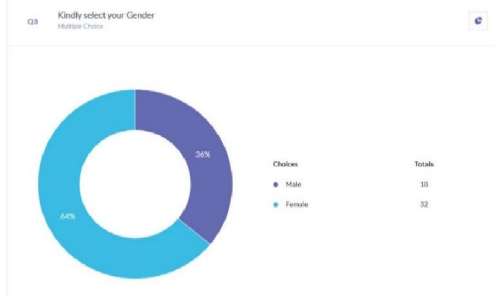


The respondent are for the above question select the age group in which you fall in, are maximum from the students category as they are important part of the society and at later stage the students will become businessman or as a salaried person. Other than students there are businessman and salaried person who have responded the questionnaire. This question gives us the picture of young generation as well as mature people views.



As per the age group is concern, maximum population is from less than 25 years and the next one is from 36-40 age group. Regarding the topic of electrical vehicle the younger generation is quite ambitious in responding the questionnaire and the mature people who are already using LMV or two wheeler with gear are also responding.

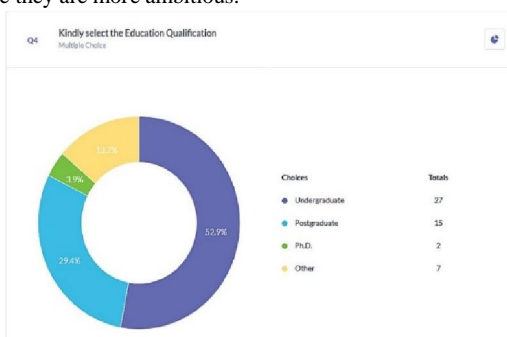
VI. SURVEY DONE BY AUTHOR TO KNOW THE INTEREST OF THE RESPONDENT



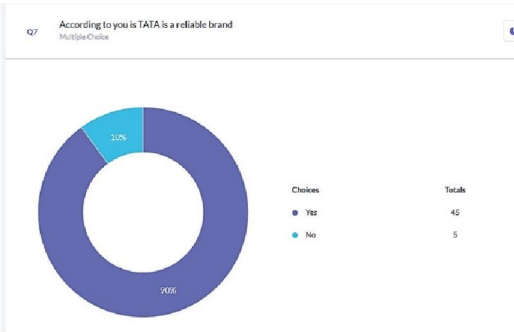
In the case of gender selection there are more female candidates who had responded to the questionnaire as the female drivers are increasing and they are the new potential drivers in the car segment. In the case of Electrical vehicle drive they are more ambitious.



This question clarify that, due to more than 4 members in a family they are also having two wheelers with gear and without gear along with car. Most of the vehicles are petrol driven like two wheelers.



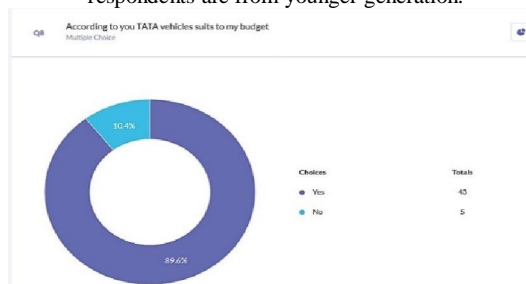
If we compare the educational qualification of the respondents, most of them are undergraduates and post graduates. This implies that the respondent group are well educated and must be understanding the future of electrical vehicles in coming future. It is a good sign that well educated respondents are making their choice for the forthcoming future vehicles.



Tata, is India's most reliable brand as it marks its presence in various sectors like power, Telecom, chemicals, passenger vehicles, commercial vehicles etc. It is one of the oldest and trusted brand available in India. The important fact can be driven from this question is that it is yet popular in the younger generation in terms of trust, as the respondents are from younger generation.



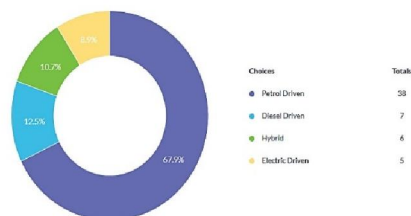
As per the above question, the respondents are having 4 and more than 4 family members and for this kind of family a car is a must in today's scenario.



Budget, is not a problem in today's scenario as many banking and non-banking financiers are available to provide vehicle loans to cope up the market situation. The younger generation, business man and salaried persons are the prime target for the loan purpose. Younger generation is the upcoming potential market for the banking sector and business man and the salaried persons are the regular customers for car loans.

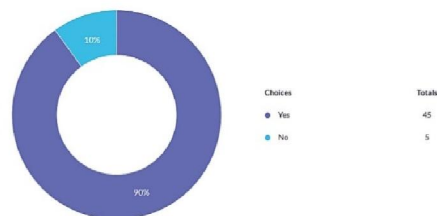


Q9 Kindly select the vehicle which you are Currently using/ or being owned by family member
Multiple Choice



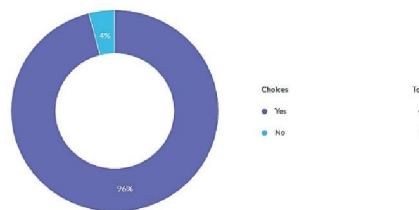
This question gives us the view about the passenger vehicles available currently with the respondent whether owned or in family. Maximum are petrol driven vehicles whether it may be cars or two wheelers are we already seen that due to more than 4 family members and they are having their different needs there is a combination of two wheeler and four wheels.

Q12 According to you TATA NANO Electric vehicle, is Electrical driven car will it get suitable acceptance in comparison to the Hybrid cars available in the market?
Multiple Choice



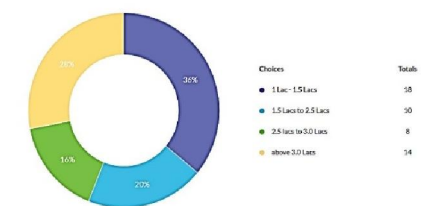
In terms of acceptance, the electrical vehicles are accepted against petro, diesel and hybrid vehicles as they are fuel free, non- polluting vehicles. This question indicates the acceptance towards the electrical vehicles, TATA NOAO EV.

Q10 Due to continuous decrease in availability of Fuel, do you believe that the future Vehicles is in the form of hybrid / Electric driven vehicles.
Multiple Choice



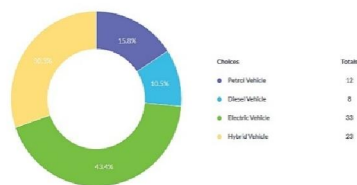
This is the one of the most important questionnaire for the respondents as well as the researcher, as we all know that the fuel is going down day by day and the prices are booming. There is an acute need of alternative solution and that could be the electrical driven vehicles. Things are started in the form of hybrid vehicles but there is a time lag to be covered for the complete conversion from fuel to electrical or some better way. The other problem is environmental pollution due to emission from fuel driven vehicles, this is a positive point in the case of electrical vehicle as they are non – polluting vehicles in comparison to the fuel driven vehicles. This is an indication for the car makers to make the way for non – polluting electrical driven vehicles.

Q13 According to you the estimated price range for TATA NANO EV is:
Multiple Choice



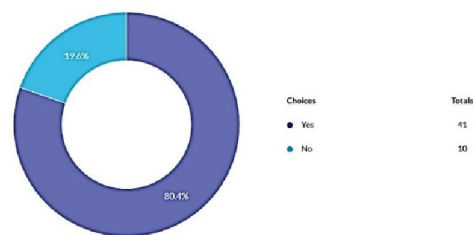
The price is not yet out in the market, but people have different opinion for the price content, many people are in the old framework of price that is between 1 – 1.5 lacks some of them are opting more than 3 lacks. But the price is yet to be decided for the market, let's hope that it will be well suited in the pocket of maximum people.

Q11 According to you which type of vehicle would you like to purchase in future.
Multiple Choice



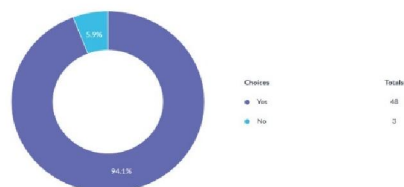
The question gives the clear indication that people have used petrol and diesel driven cars and they want to shift to the hybrid and electrical driven vehicles. One of the reason is fuel prices and other can be the new and latest non – polluting technology.

Q14 According to you would you like to purchase future ready TATA NANO EV as your next car?
Multiple Choice



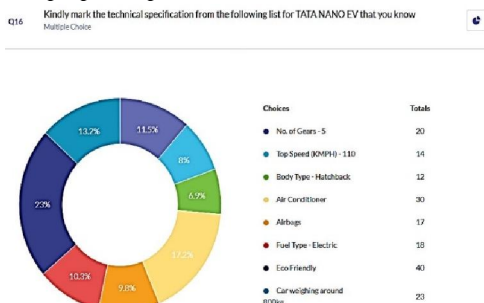
This question gives us the picture that people are eagerly waiting for the new technology, they want to feel the TATA NANO EV as their next car. It may be due to its brand value, old usage of Tata vehicle anything could be work as supporting factor.

Q15 According to the facts gathered that TATA NANO EV is first delivered to OIA (a Intra-city cab service) it will be well suited for my requirements too
Multiple Choice

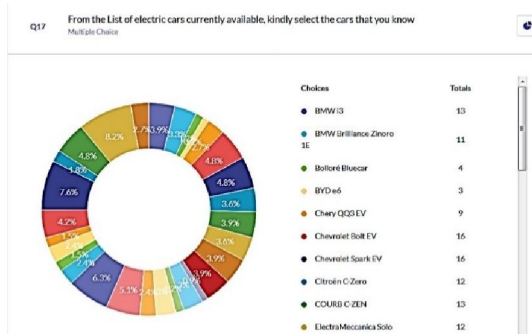




This question gives the picture of a market trial run by Tata, before launching it to the market. As OLA is a well-established name in intra city cab service and if TATA is banking on them for the testing the market and people are readily accepted the OLA cabs for their need in Intra city movement according to the response gathered for this question people are positive about the electrical vehicle.



This question, gives is the picture about the general knowledge of the TATA EV, many of them are having clear perception about the ecofriendly feature as it runs on electrical fuel. People are having quite a good idea about its other features like air conditioner system, air bags, number of gears etc. it is a typical question about the specification of unlaunched electrical vehicle as the respondents are from younger generation and they are more techno savvy and future oriented this is a good indication for the researchers to have good general knowledge about the electrical vehicles.



Well, after analyzing the above question's responses this what assumed by the researcher, the younger generation is more aware of electrical vehicles not only for Tata Nano EV but also other brand available in the market internationally, BMW, Mercedes, Chery, Chevrolet, Tesla, Nissan etc. they are big giants in the automotive market globally. They are

putting their efforts in the electrical driven automotive segments to make them future ready for the upcoming market of passenger vehicles. The respondents are made their choices at almost all the available car makers who have their international presence.

CONCLUSION

In this paper the survey was online filled by the respondent, After successfully survey filled by the respondent including all age groups it concluded that they are more interested to purchase the electric vehicles in future and they wants to purchase these type of vehicles with latest features like air conditioner system, air bags, number of gears etc. The young generation are more interested for purchase these vehicles in future specially women category as per survey result. We concluded after doing the survey that the Tata nano electric vehicle is the next favorite car of the people. They are eagerly waiting to drive these types of vehicle as well as other brands also in the form of hybrid and electric vehicles. This is the good sign for car makers those who are working for making hybrid and electric vehicles.

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