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An Overview of Artificial Intelligence in Automobile Industry – A Case Study on Tesla Cars

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ABSTRACT: The counterfeit of human intelligence in machine that are lined up to think like human and mock their actions. Therefore, the word used in the present technological advance world is artificial intelligence. The term defined by human skills and allude to be used in the future. It is applied in various field and industries. In the Indian market artificial intelligence is blooming like budding flower, whereas in the global Market the penetration of artificial intelligence started in 20th century. The structural usage of artificial intelligence makes the company perform better and produce high end result. The present advancement of technology is witnessing devices which are providing superior experience in internet on things. Mobile Applications are finding a substantial space in the market and are becoming the high choice of customers today.

Keywords: AI, automobile, self-start cars, high performance, Chabot, virtual assistant

Objective:

1. To study the overview of tesla car manufacturing company
2. To study the concept of introducing AI in tesla automobile company.
3. To study the NLP's (natural language processing) success for high performance in tesla cars.

Methodology

The paper is study from the secondary data sources using the official website, paper publication in the international journal, newspaper articles and a few other sources.

Limitation:

This study is limited for case study on tesla cars and use of AI.

I. INTRODUCTION

1.1 How we understand artificial intelligence

The counterfeit of human intelligence in machine that are lined up to think like human and mock their actions. Therefore, the word used in the present technological advance world is artificial intelligence. The term defined by human skills and allude to be used in the future.

1.2 Why is AI used in the fast-growing world of technology?

Today in the fast-growing world, where computer is playing an essential role for data storage. This artificial intelligence forms the basis for all computer learning and its use. The future for all types of complex decision-making is on artificial intelligence usage. Chess playing application in smart phones today is the biggest example of AI today. It allows the user to play with a fully automated chess game. The present world of automobile is seeing the version of self-driving cars or driverless cars which use AI as the major source of satisfying the customer.

1.3 What are the Types of AI

There are three sorts of basic division of Artificial Intelligence (AI) namely:

1. Narrow or Weak AI,
2. General or Strong AI,
3. Artificial super Intelligence.

1.4 How do we understand NLP

Being a characteristic part of artificial intelligence, Natural Language Processing (NLP) enables computers peruse, decipher and comprehend human language. The objective of NLP's for machines to hold out dreary and high volume undertaking that may rather be finished by people.

1.5 How we connect NLP and AI in the technology world

NLP (natural language processing) is a part of AI. It is viable for humans to interact with machines. The part of AI enhances personal computers grasp and handle non-machine language.

By utilizing this, technology can help build up speech reading, document description, machine translation, spam detection, recognition of named entities, answer questions, predictive typing.

NLP Modelling is the method of perfection in recreating. By understanding the principles, the psychology, and the basic thought process (that is the strategies) that underlie the ability or actions, we can model any human behavior.

1.6 Where is AI used to solve the human endeavors in today's digital world

In today's global world of high computer usage where is NLP not used can be a question but, still to list out the areas such as business, sports, art, health, marketing, education for creating student friendly robots and politics. The advancement of AI will help solve human endeavor. NLP is widely used in business. It has instituted its way separately into many training course applications and add on in chrome for new and start up business, sales promotion activities, presentations for online teaching and webinars, planning and team building.

In the field of human resource management, natural language processing helps in solving the grievance using the human resource information system portal. It helps companies to solve employee's issues without any human error or biased data.

II. INTRODUCTION TO TESLA COMPANY

Vision: Quicken the world's progress from carbon creating fuel-controlled vehicles to vitality effective electric vehicles. **Mission:** To contribute affordable and reformed electric vehicles to push the worlds reformation to electric diversity.

Tesla, Inc. (formerly Tesla Motors, Inc.) an American company formed in 2003 which manufactures electric vehicles at Palo Alto in California. Model S, E, X and Y are latest inventions of tesla electric cars. Allied products, services and various titles are manufactured. The co-founders of the company are Ian Wright, Elon Musk, and J.B. Straubel, who were the former employees of the company Tesla motors which was instituted by Martin Eberhard and Marc Tarpenning in July 2003. The name is a tribute to the inventor and Engineers.

Elon Musk, is currently serving as a CEO and was formerly the chairman.

He said that the overall objective of the company is to aid speed up the move from a economy which was basically hydro carbon into a solar electric company. This will help in manufacturing a high variety of electrical vehicles and economical family cars. In 2016 tesla obtained solar city.

In 2019 tesla ranked after 11years in the market due to its world's best-selling plugin and battery electric coach manufacturer and a share in market of 17% in plugin segment and 23% in battery electric segment. There was a 50% increase in sales of tesla global vehicle from 2018 to 2019(2,45,40 units to 367,849 units) the company crossed 1000000 electrically cars produced in 2020.

500000 model E worlds all-time bestselling plugin electric cars were produced and delivered. It achieved a rank within the half of 2020 among the battery electric vehicles sold tesla cars accounted for 81%. To make it eligible for including within the S&P500 index. Tesla had four profitable quarters recorded in a row for the first time from July 2019 to June 2020. To deal with selling, adjusting and charging electric vehicles, tesla planning is based on three pronged way.

The biggest customer market for tesla cars is china and the Europe market. It also has a largest target market share in United States. At present Dutch customers are also contributories to the tesla sale of self -driving cars

2.1 What kind of technology does Tesla use for being the successful manufactures of cars

Tesla claims that the cameras on the vehicles, joined with radar and sonar, are sufficient to permit its vehicles to drive all alone. These trick y things are called Lidar scanners and Tesla vehicles don't have them by any stretch of the imagination. Lidar resembles radar yet utilizes laser light rather than radio waves.

The ranking of tesla cars on a published platform proxies the good usage of technology. Tesla is no:1 in Luxury Cars in USA market , ranked no: 4 in Luxury Vehicles, For the period of November 2019, the Tesla Model 3 drifted at the head of its group once more as it has been most demanded car, Tesla firmly took the no: I spot for deals of extravagance vehicles in the

United States, as per Clean Technical assessments . In 30minutes, the tesla cars can be charged as the company produced its own networking super charger station. This service at the super charging station is provided free of cost.The models of 2020 calendar year is the top-rated vehicles in the category of grand hybrid electric cars, because of its fast acceleration to lighting and distance driving.

2.2 How self-driving cars will change the economy

As quoted by the researcher Mr. Morgan Stanley (MS), according to his research on self-driving cars, he mentioned that they will be saving the economy of \$488 billion in the economy in the yearly saving by reduction in accidents and \$158billions by reduction in fuel cost

2.3 What kind of jobs will self-driving cars create with the advancement of technology?

According to the report given by Boston Consulting Group (BCG) and Detroit Mobility Lab (DM L) in 2019, the increase in self-driving and electric cars will produce more than 100,000US mobility jobs in the next 10years, which will include the field of engineers with computer science related graduation and Artificial intelligence specialization.

2.4 When did tesla implement the practice AI or NPL in the manufacturing of cars

In the month of October ,2014 tesla inc extended their customers anew sedan model as on tech package for an extra cost of \$4250. They included cameras and sensors which was included in this new package which warned the self-driving drivers about the accidents in advance. These sensors and cameras worked as better security control measure for tesla cars. it also helps the company to collect primary and direct data about the sensor's usage by the drivers.

Product name	Launch date	Details
Model S	October, 2010	-
Model S	June, 2012	Second car, luxury sedan
	June 22, 2012	In the year 2015 and 2016 , was the best-selling plug-in electric car globally.
Model X	September,2015	In this year the first SUV was launched.
Model Y	March, 2020	Started to deliver crossover cars.
Model E	July,2017	A third-generation car was launched with a four-door sedan.

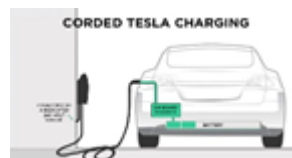
Which company makes technology for self-driving cars ‘?’

The advance technology of tesla cars is structured and developed by the top rated technological advanced company such as GM motors, Wayo and Yandex.

2.5 Comparison performance data tesla model cars

Tesla Model S Performance	Tesla Model 3 Performance	Tesla Model X Performance	Tesla Model Y Performance
			
0-60 mph 2.4 s	0-60 mph 3.2 s	0-60 mph 2.7 s	0-60 mph 3.5 s
163 mph	162 mph	163 mph	155 mph
348 mi	299 mi	305 mi	280 mi
100 kWh	74 kWh	100 kWh	74 kWh
785 hp	450 hp	785 hp	450 hp
60 cu ft	46 cu ft	88 cu ft	68 cu ft
5	5	5	5
200 kW max	250 kW max	200 kW max	250 kW max
\$99,990	\$56,990	\$104,990	\$60,990

From the comparison chart of the different car model of the tesla inc, we have interpreted that the model have been enhanced with the technology as per time. It was quoted by Elon Musk in an interview that price “will continue to rise” as its technology improves. Elon Musk decided models to spell "SEX", but company Ford owned the trademark already registered with name "Model E", so he selected "SEXY" adding the Model Y. The factors that are taken into consideration for High-performance cars are vehicles that suggestion with great speed and power. So in tesla model cars the speed has been moderate increased whereas the 0-60mph has increased rapidly from 2.4s to 3.5s for the previous 7years of launch of cars in the market. This leads to tesla cars been on the top choice of self-driving cars. The present and latest competition of electric cars is lucid air company which is planning to implement the speed to be 3.1, which when compared to tesla model Y is less.

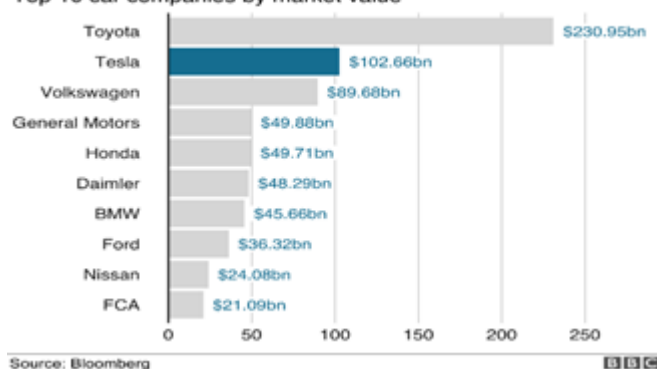


The capacity of seats in the models remain same over the years and the charging power has increased from 200kw max to 250kw max. The charging point utilizing the recharge at your convenience while away from home, with helpful charging areas at lodgings, eateries and malls. Screen and control charging and get warnings when accusing is finished of the Tesla application. The Tesla Model S utilizes the Type 2 charging standard, which is utilized for both AC and DC charging. The Type 2 channel is utilized while charging at home or at public moderate and quick AC focuses. It is likewise used to convey high force during fast DC charging from a Type 2 connector.

2.6 Performance impact of cars

Tesla's market valuation soars

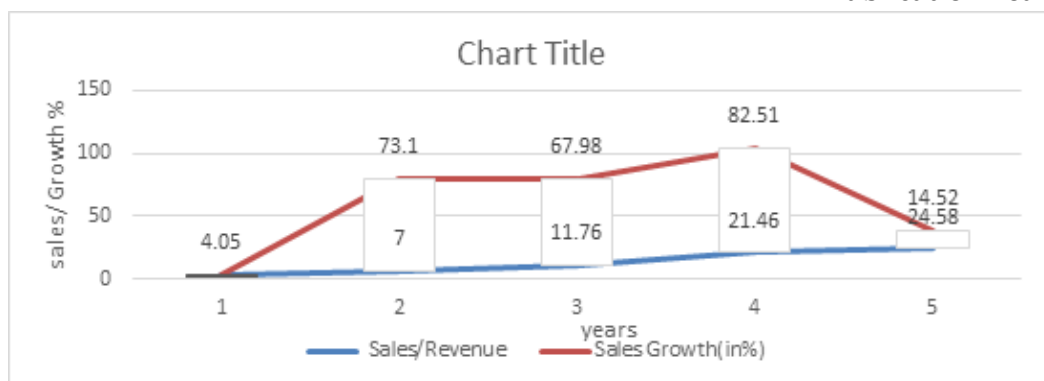
Top 10 car companies by market value



Company Name	Market value in bn \$
Toyota	230.95
Tesla	102.66
Volkswagen	89.68
General Motors	49.88
Honda	49.71
Daimler	48.29
BMW	45.66
Ford	36.32
Nissan	24.08
FCA	21.09

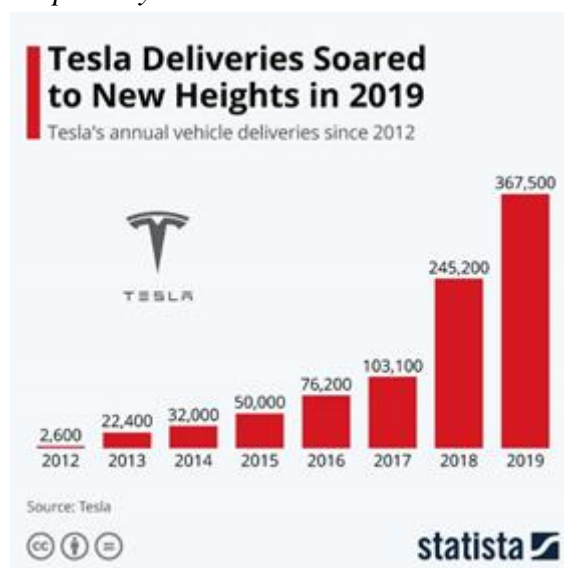
From the following table the market share of tesla cars in comparison to other cars is higher ie 102.66bn\$ for the financial year 2019. The other car manufactures who give a tough competition to tesla cars are Toyota and Volkswagen.

Financial year January to December	Sales/revenue	Sales growth
2015	4.05	
2016		73.1
2017	11.76	67.95
2018	21.46	52.51
2019	24.55	14.52



From the above table for the financial years the percentage of sale/revenue has increased from 7million USD to 24.55million USD. This increase has been profitable for tesla motors from the year 2015 to 2019. It has a moderate market share in case of luxury and self driving cars.

2.7 Customer satisfaction report 5 years



The table shows the data from 2012 to 2019 but for the case study in the paper we have taken only from 2015 to 2019 to draw interpretations and conclusions.

Year	Deliveries
2015	50000
2016	76200
2017	103100
2018	245200
2019	367500

As shown in the above table tesla has increased its deliveries since 2012, the table shown the data for 5 financial year. As it is evident from the table that the deliveries have increased from 2600 cars to 367500 cars from the year 2015 to 2019. This is also achieved because of the feedback given from the customers, it is the real time feedback (as Quoted below)

Parameters	Real Time Customers	Feedback Mentioned by the Customers
Acceleration and Power the Tesla Model S	Mr. Kelley Blue Book - customer 1	60Mph in 3.7 seconds is the long-range speed, while the performance impacts to that equivalent speed in and out meagre 2.4 seconds. That makes the Model S quicker than pretty much any other vehicle out and about. The disgusting push in either form of the vehicle, a Model S is a genuine roller coaster.
Acceleration and Power the Tesla Model S	Mr. Kelley Blue Book - customer 1	He mentioned in the feedback that acceleration is smart and prompt. The speedup push feels very intense, and with no solid nor develop of force, the experience is practically frightful. In any case, drivers will feel stuck to their seat and have a best driving experience of tesla cars.
Handling of the car	Edmunds (2019) - customer 2	Edmunds (2019), mentioned in the feedback that since the sharp guiding and fantastically clingy summer execution tires, to hold accessible with the vehicle is amazing. Corner-cutting is additionally supported by quick pedal reaction. Undoubtably more fun than any other hefty vehicle ought to be. In the Model S test vehicle with 21-inch haggles air suspension it stays on the firm side. It is not a genuine grumbling since it's rarely coarse, but rather a long-way comfortable.
Brakes of the cars	customer 3	Model S is amusing to drive despite the fact that it is wide

		and hefty. feels dug in, tight, and deft. Riding on the vehicle's standard 19-inch wheels, and with the standard air suspension, the Model S conveys a rigid consistent ride.
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Model -S has standard two electric motors and a lithium ion battery of 100kilowatt hour included. The tesla car model(SEXY) is deadly quick with acceleration. It has a great road grip with good steering feel factor.

2.8 Future of AI in tesla cars

Elon Musk mentioned that latest model will be acquainted with scope of 620 miles ie (1000 km) on the 200 kwh (720 MJ) battery and accomplish 0-60 mph in 1.9 seconds. Likewise it will accomplish 0-100mph in 4.2 seconds, and maximum velocity of more than 250 mph (400 kmph). Therefore, company tesla announced the new product for 2020 named as roadster and an electric vehicle. In April 2015, a semi trailer vehicle was announced.

LITERATURE REVIEW

1. In an article, published in the year 2020, the study includes its views on the latest innovations and up gradation methods done by tesla incl. The article also mentioned that tesla cars are better than other competitive automakers in the recent times. The reason for the recent breakout at market is the performance and also proving some its critics and doubters wrong. The article quoted about the usage of Tesla firmware tracker.
2. In a research study, the author emphasized on how is Tesla Company a master of building and using innovations. Investment capital on research and development to achieve the highest order ideas. Its strategies relate to introducing new hardware and software architecture. Tesla innovation strategies focuses on transforming into auto industry. Offers lessons for any innovators especially in terms of winning support for an idea and to bring new technology in the market.
3. From a published research paper, we have studied a case on marketing plan of Tesla. According to which it has profound marketing management implications.

III. CONCLUSION

From the above case study on Tesla Inc, we conclude as, yes Tesla is the highest rated car manufacturing company for self-driving cars today. The high performance of the self-driving cars or also called as autonomous Tesla cars has proven to be good and high on standards by the customer's feedback. The case study also mentions that Tesla cars has been the choice of customers when it comes to self-driving cars. The driving experience of tesla cars model SEXY is terrific and once you drive the car then no other type of car gives that satisfaction. The models on a given day gives an experience of two in one excitement like racetrack and

spa. The plan of Elon Musk was to do a direct marketing sale but build a relatively high-speed autonomous car market with a mass production. He could make the car affordable and could concentrate on the compelling market rather than mass production with high technology.

SUGGESTIONS

From the case study made on tesla autonomous cars, referring the data for 5years. The case study has a few suggestions.

1. The questions that make the customer think twice before buying an autonomous car is, it can be hacked. So company has to make vehicles with security code to be safe from cyber security problems.
As quoted by an Author named Paul Ausick, he mentioned as any computer device can be hacked even the advancement of technology in tesla cars can be hacked.
2. The Tesla cars are Expensive and although Self-driving vehicles are so empowering since they are full to the edge with space age advancement, yet this development is by and by enormously exorbitant. So the vehicles ought to be reasonable for high working class too.
3. The charging station should be more in number and the time should be indicated after the charging of the vehicle is done.
4. The technology been so advance in Tesla cars might go wrong if not handled by the person correctly, so improvement should be made for simple instructions manual.
5. Tesla cars are more expensive to insure, so company has to make a full insurance coverage not upto a limit of driven kilometers.

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