



Tesla Inc.

Data Strategy for Autonomous Vehicles

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Data Strategy



Table of Contents

P3 – Company Introduction

P4 – Autopilot System

P5 – Data Strategy

P6 – Insights

P7 – Recommendations and Conclusion

P8 – Appendix

P9 – Sources



Tesla Inc. : Autonomous Revolution

Tesla Inc. is a company founded by Elon Musk in 2003 with the goal to prove that people did not have to have to financially compromise in order to purchase an electric vehicle. They believe that the quicker the world ceases to utilize outdated fossil fuel technologies and transitions to zero-emission possibilities, the better and greener it will become.

In 2008, Tesla unveiled their very first model car, the Tesla Roadster. An electric 2-door sedan with state-of-the-art battery and electric powertrain capabilities. The Roadster was a complete sensation from the start, delivering roughly 2500 units between 2008-2012. The Tesla Roadster was also the vehicle used during the Space-X launch of 2018.

With the Roadster's success, Tesla continued to design the first fully electronic premium sedan, the Model S. By incorporating cutting edge technology in performance, safety, and efficiency, the Model S has become one of the best in its class, completely redefining and modernizing expectations for vehicles in the modern era. The most popular feature of the time was the "Launch System" which propelled the car from 0 to 60 MPH in a record 2.28 seconds. Many testers and influencers called it a revolution.

Following continuous successes, Tesla diversified its product line by adding new models including the Model X, Model Y, and a future "Cyber Truck" in order to fit the needs of various clientele.

Vehicles are not the only products developed by Tesla. In order to stay true to their mission, the company produces various unique sets of merchandise for sustainable home energy. Their items range from solar panels and "SolarRoofs", to "PowerWalls", which permit homeowners and businesses to manage their renewable energy emission and consumption.

In figure 1 of the Appendix, the Tesla business model is made easily understandable for how they develop their vehicles, all the way to the different methods a client may purchase a Tesla vehicle.

Despite its young age, Tesla Inc. has managed to make itself a major player in the vehicular and transportation markets, however, they are just starting. Their aim is the continuous innovation of their vehicles as well as making them more affordable in order to create a greener and more environmentally stable future.



Autopilot System:

In 2013, Tesla began the conceptualization of an autonomous piloting system for all vehicle models in their product lines. Elon Musk rationalized that “Autopilot is a good thing to have in planes, and we should have it in cars”, and wished for full autonomy by the end of 2018. The autopilot system currently is used in tandem with driver operation, meaning it can accelerate, steer, and slow-down within its lane. Data collected is later used with machine learning algorithms to create and develop highly advanced artificial intelligence systems capable of operating vehicles with full autonomy without driver inputs or interventions.

All Tesla automobiles manufactured between 2014 and 2016 came with a software which supported autopiloting functions and customers could begin pre-ordering these vehicles as part of a “Tech Package” Option. This package included a semi-autonomous drive function, which required a driver to continue making decisions but with less workload, as well as a self-parking function.

In 2016, Tesla began incorporating more cameras and added LIDAR technology to accurately navigate in low visibility environments and to generate more accurate data for their fleet. This provided the company with millions of miles of data for further development of the feature.

Between 2017 and 2019, more cameras and nodes were added to increase reliability and safety. A new feature named “Autosteer+” was introduced where vehicles could change lanes and maneuver in tighter more complex roads with a driver’s hands still on the steering wheel. Moreover, a “Smart Summon” feature was introduced in which a Tesla vehicle would start itself on its own and would be able to navigate through obstacles to come find its summoner.

As of 2020/2021, Tesla has entered its testing stage where drivers can use the autopilot systems in their vehicles to send data to the company for further analysis. So far it has not fared particularly well as it often makes mistakes requiring drivers to intervene in order to avoid accidental collisions.

According to an article by Mack Hogan (RoadandTrack), “The Tesla's software is defeated by cars stopped in the roadway and an intersection where it clearly has the right of way.”

Full autonomy has not been achieved at the time of writing, as the technology is still too immature and requires considerably more improvements.

Based on figure 2 in the Appendix, it is estimated that starting in 2025, there will be roughly \$5 Million worth of registered autonomous vehicles operating on roads with that number steadily increasing over time.



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The autonomous revolution has only just begun.

Data Strategy:

For its autopilot system, Tesla utilizes a variety of different systems to develop the Ai required to operate properly. Machine learning algorithms are the main methods in terms of such an endeavor and fleet education.

The following are used by Tesla in conjunction to have the most optimal algorithms possible for their fleet.

Voluntary Data Submissions:

In order to acquire real time and diverse data, Tesla decided to use test drivers. A Tesla car owner can sign up on the Tesla Website to become registered as a tester and their vehicle is outfitted with the necessary components to begin testing. The entire process is completely voluntary, and testers can upload data at their discretion.

The data is a combination of cameras obtaining real time road traffic encounters and interactions while sensors and nodes register driver inputs and reactions based on certain scenarios and environments.

The data is later uploaded to Tesla servers for further analysis and Ai incorporation.

AI Education:

Tesla analyses its acquired data by using machine learning software to educate its fleet based on locations. The data analyzed is recycled to generate highly dense and accurate maps containing traffic scenarios, hazards, and available alternate routes. The machine learning components also enable Tesla vehicles to effectively communicate with each other, forming a network capable to share real time information.

In a not-so-distant future, this networking feature will also be likely to interface itself not only with other Tesla models, but with traffic cameras, other autonomous vehicle brands, and even mobile phones.

To many, this seems like an amazing feat to accomplish, to others, it will surely be the precursor to the Terminator Franchise.



Insights: The Way of the Future

Tesla's ambitious autopiloting system is undeniably an endeavor of mammoth proportions. It requires enormous amounts of data to create a foundation capable of handling and operating such a vast network of inter communicating vehicles. However, if Tesla can appropriately create such an AI, it will be a massive step towards a more technologically advance environment. Practically gone will be the days of driving oneself from point A to point B.

Moreover, transportation will not be the only altered field. If made publicly available, how will this new technology affect public transportation? How will it affect the job market? How will competitors react? Will governments allow these vehicles to be street legal and will they pass certain laws to limit and regulate how autonomous vehicles operate?

As of now, in the United States, only 28 States have passed legislations concerning autonomous vehicles, despite it being likely many years before widespread availability for the mass populace.

A major concern would be for insurance companies in the event of a collision. Who would be responsible? Would it be the people involved? The car manufacturer? Or would it be the companies providing the servers the vehicles rely on in order to navigate?

According to David Carlson from Marsh and McLennan Advantage, auto liability might be shifted to a more hybrid system. If a vehicle is under a driver's control during a collision, personal coverage will come into effect, however if the autopilot system was engaged, then a product liability coverage will be used by the manufacturer.

Another major concern is how will autonomous vehicles be utilized in relation to public transportation employment in the future. Many commuters use busses, metros, taxis, and ride share apps, such as Uber and Lyft, for transport. How will their jobs be affected by the introduction of AVs?

It is very similar to the situation in the mid-2010s when fast food companies began incorporating an automatic ordering booth for customers, effectively lowering the number of employees required to operate a locale. It may be far away, but if AV technology becomes readily available and safety is assured, some cities may begin incorporating these vehicles to the chagrin and detriment of those who are employed in these industries.



Recommendations

1. Safety Guarantees

Many who believe in Tesla Inc's. vision have been overjoyed by the possibility of using the self-drive and autopiloting systems despite its relative immaturity. There have been many instances where drivers had to intervene in order to avoid a collision or to make corrections. In one instance, a Tesla Model S' autopilot system caused a collision and resulted in two unfortunate deaths.

The first recommendation is for Tesla to make sure that their autopilot system is ready to be released for public use. Despite beta testers signing up to assist the company's project, their safety must be assured to avoid unnecessary disasters.

2. Cyber Security:

It may seem silly currently, however the threat of hackers gaining control of an autonomous vehicle with malicious intent may become an all to real threat in the not-so-distant future. With data cyber security attacks happening frequently, what is to prevent them from doing the same to self-driving vehicles?

As of now, the SELF-DRIVE Act passed by Congress in 2017 requires companies to "develop written cybersecurity and privacy plans for such vehicles prior to offering them for sale."

The second recommendation is for Tesla to ensure that their vehicles are safe from cyber attacks while continuously updating their cyber security measures to prevent such disasters.

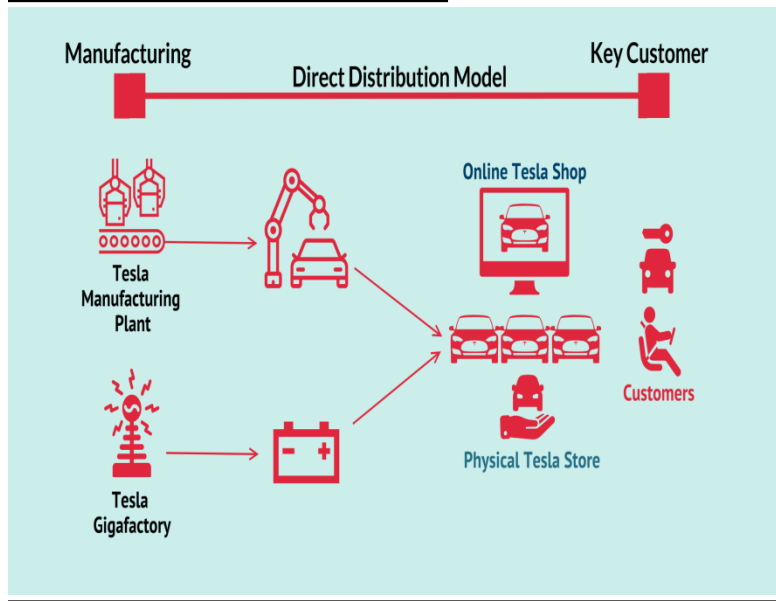
3. Cyber Transparency:

Currently, Tesla collects data from their customers in order to develop their AV AI and network. Some of the information collected includes vehicle usage information, autopilot system information, camera recordings, and various more. It is crucial for Tesla to remain transparent on how the acquired data is used in order to maintain public trust. If customers lose faith, their status as a top company will be ruined and effectively, Tesla will become a relic of the past.

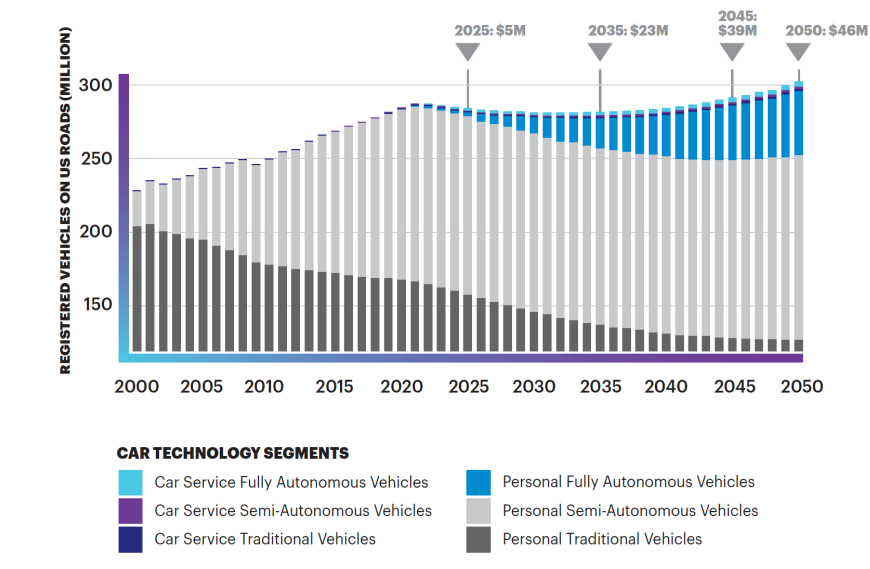


Appendix:

1. Tesla Business Model



2. AV Adoption Forecast



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Frisch, Loic

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