

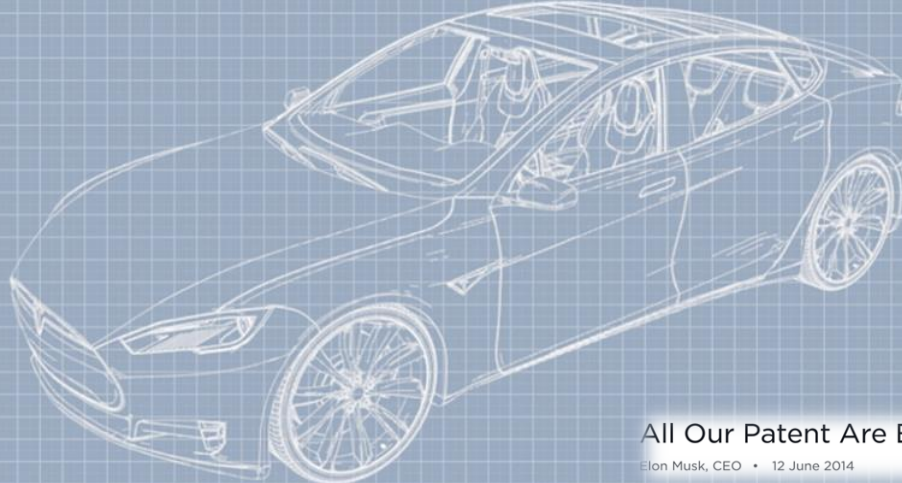
Tesla Model S 2013

Manufacturer Tesla Motors
Production 2012–present
Assembly Tesla Factory
Fremont, California, United States
Class Full-size sports sedan
Body style 4-door fastback
Layout Rear-motor, rear-wheel drive

Electric motor

Three-phase AC induction motor

85 kW·h (Performance)
310 kW (420 hp), 443 ft·lb (600 N·m)
85 kW·h
270 kW (360 hp), 325 ft·lb (440 N·m)
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225 kW (302 hp), 317 ft·lb (430 N·m)



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UNIVERSITY OF KENT KENT BUSINESS SCHOOL

2021/2022

Module: Operations Management and Digital Transformation (BUSN9320)

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Student declaration: I confirm that: This is an original assessment and is entirely my own work. Where I have used ideas, tables, figures of other authors, I have acknowledged the source in every case. This assignment was not submitted previously as assessed work for any other academic course.

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Title: ***The Digital DNA of Tesla***

Word count: 2196 (within the allowance of 10% deviation)

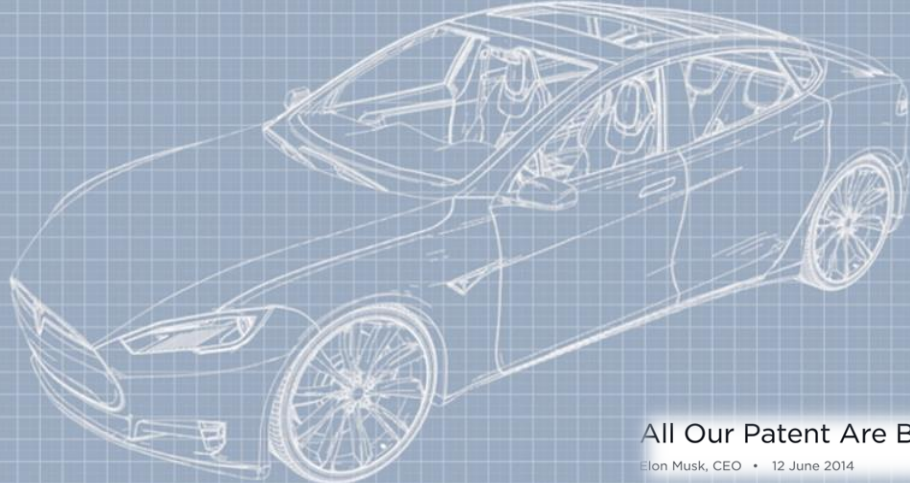
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The Digital DNA of Tesla

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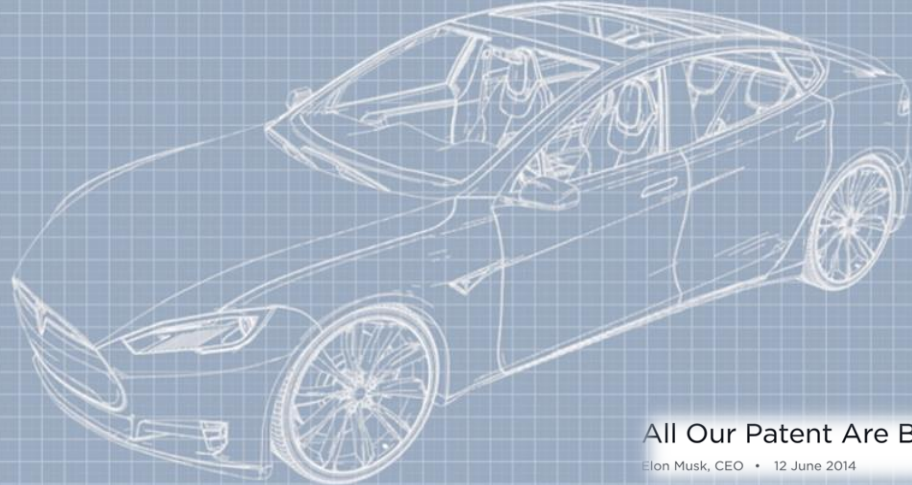
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1. Executive Summary

The title of this study foreshadows that the company in scope does indeed have Digital DNA (Cordon, 2016). Technology, Innovation, R&D, strategy, and operations are all connected and digitalised. Each Tesla vehicle that are on the road is an IoT itself. They are constantly communicating and sending data to its users and to Tesla for performance tracking and/or to receive over-the-air upgrades.

The purpose of this analysis is to see through the sometimes overly complicated and complex processes and forces (Figure 1. shows the wider context) which drive and accelerate Tesla's performance in connection with its digital strategy and - transformation.

Through the value chain analysis it can be concluded that Tesla greatest advantage is its continuous technology advancement, but also that it has some challenges on its supply chain that needs to keep up with the pace of the company's growth.

The performance and 4Vs analyses made it clear that cost-effectiveness is a major influence of the operations, it inspires new and innovative solutions to achieve a more sustainable global environment.

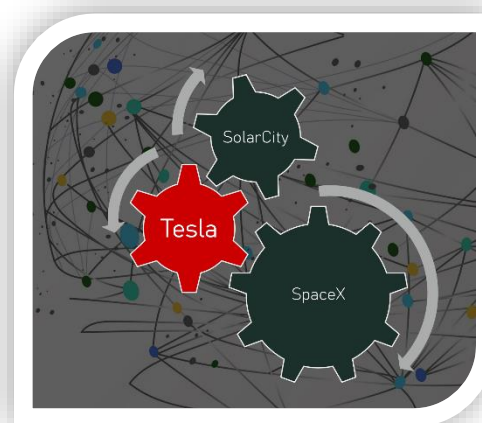


Figure 1. The gear wheels of the company

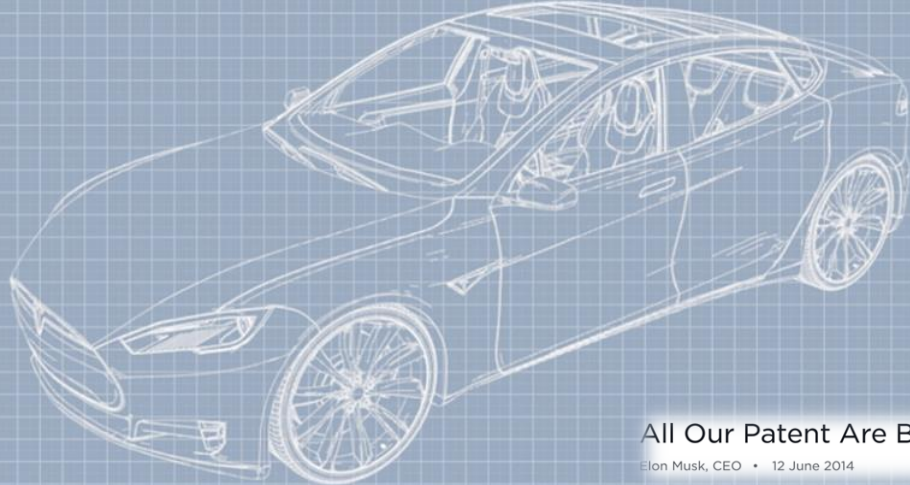
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2. Introduction

Tesla's Business Model is not just vertically integrated, but Smart and Connected (Ustundag et al. 2018). It is clearly different from any other traditional car manufacturing company; the products and solutions they offer let it be vehicles or energy storage systems have the capability to transfer and receive data in real time. Innovation, technology, and the high value proposition led the company to its market leading position in the Electric Vehicle (EV) market.

Since the company's driving force is Sustainability, and summarised its mission (Impact Report, 2020) as,

“to accelerate the world's transition to sustainable energy”

Tesla addresses its competitors, not solely of the EV market, but of all cars. They want to build the best cars (and not just best electric cars). Their aim is to have more EV on the roads for a more sustainable future (et al Impact Report 2020).

They have changed the preconception that a sustainable product will perform worse or cost more than a regular one. Model 3 SR+ is the first EV that has the same starting price as ICE (internal combustion engine: refers to gasoline or diesel engines) vehicles of the same range. Tesla reached record sales in 2021, as Figure 2. and Figure 3. demonstrate.

2021

	Production	Deliveries
Model S/X	24,390	24,964
Model 3/Y	906,032	911,208
Total	930,422	936,172

Figure 2. Production and Deliveries in 2021.
Source: Tesla Q4 2021 Report

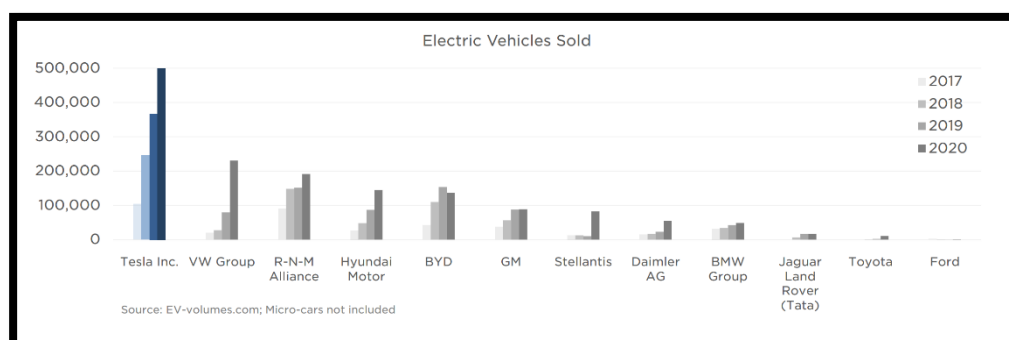


Figure 3. Source: Tesla Impact Report 2020

As the header of this report anticipates, Tesla open sourced all their patent since 2014 and with that strategic move changed the way forever of how patents fulfil their purposes. It offers competitors an easier way to enter or expand in the EV market therefore aid the global sustainable goals, but by signing Tesla's Patent Pledge they agree that any development they would achieve based on these patents are free to use for Tesla.

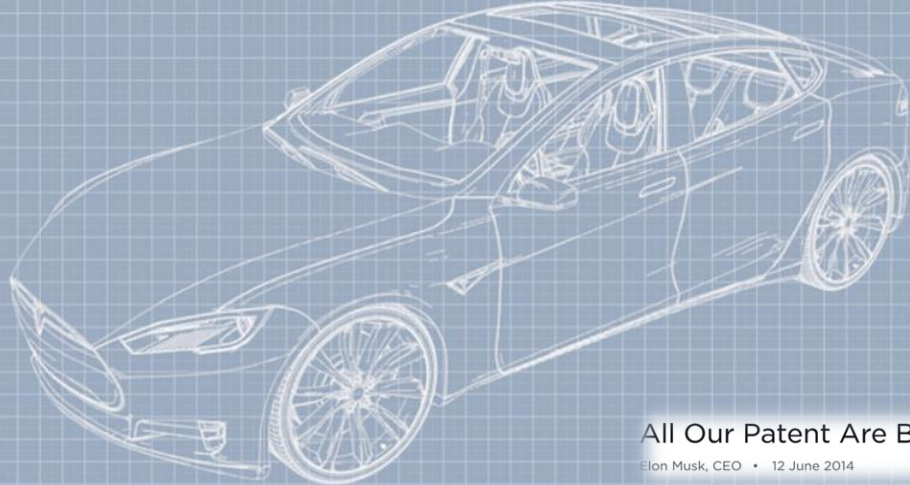
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To understand Tesla's strategy especially its digital strategy it is necessary to see the big picture. Three companies – SpaceX, Tesla and SolarCity. Figure 4. below introducing their joint ecosystem, demonstrates their connectivity and gives ground for Tesla's vertically integrated Business Model.

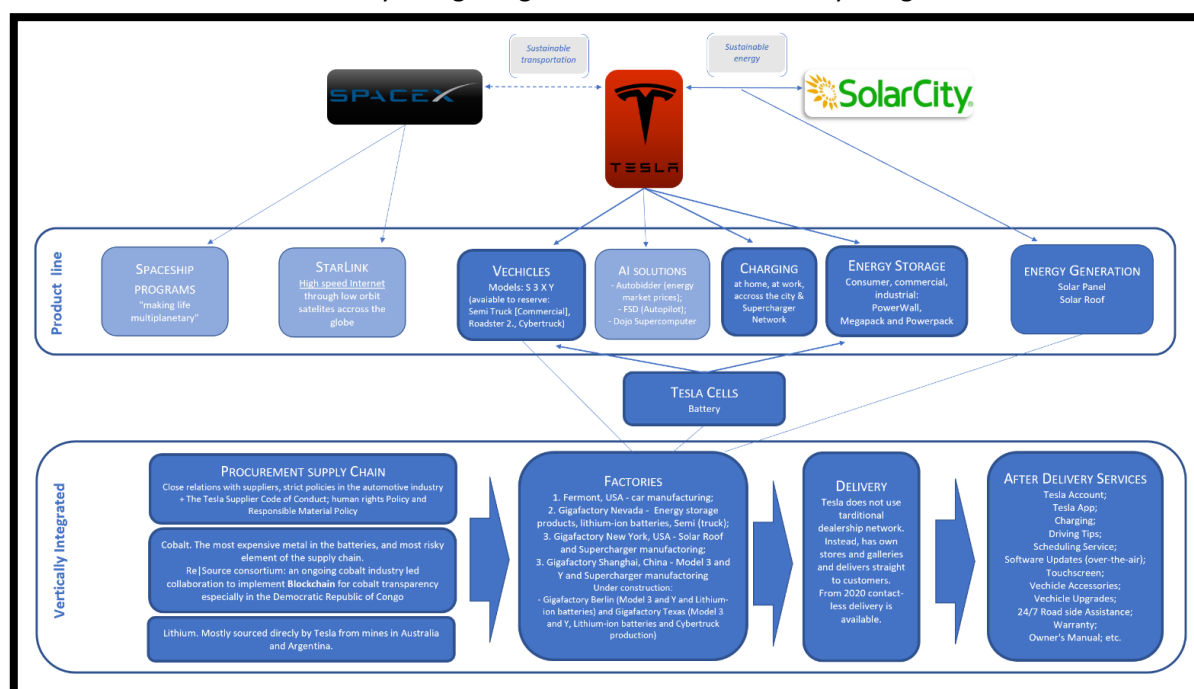


Figure 4. Tesla's joint ecosystem, Business Model outline

Tesla with the acquisition of SolarCity in 2016 - although there was unease around this acquisition both in the minority shareholders and in the press (Song, 2019) -, nevertheless it was an important strategic move to add value to their business and satisfy the customers energy need for their vehicles with a competitive price. With the Solar power generation and its storage with PowerWall, they gave an option to customers to not just find a more economical way to charge their cars, but also cut cost of their overall energy bill.

This leads to sum up their core motivators in a "Golden Circle" (Figure 5.) what was introduced by Simon Sinek and Cordon further explained (Cordon, 2016).



Figure 5. Simon Sinek's "Golden Circle" Source: Cordon, 2016

WHY? – Tesla wants “to accelerate the world’s transition to sustainable energy” (Impact Report, 2020).

HOW? – With highly sophisticated technology they enhance performance, safety and attractive styling. (Annual Report, 2020).

WHAT? – Tesla “designs, develops, manufacture, sell and lease high-performance fully electric vehicles and energy generation and storage systems, and offer services related to their sustainable energy products” (Annual Report, 2020).

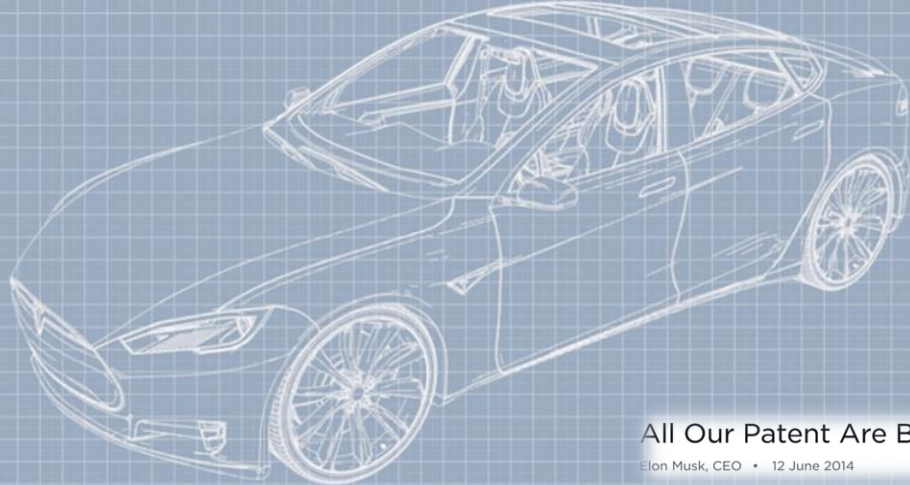
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3. The Digital DNA of Tesla

As the *Introduction* revealed Tesla's sustainability goals are sought all through the value chain and is in fact the main force for all their innovative products through high tech solutions. In this section the analysis intends to explore how Tesla's digital strategies affect the operations of the company.

3.1 Transformation Process at Tesla

The main, but simplified transformation process can be drawn as Figure 6. indicates, the way Tesla generates value to its customers.

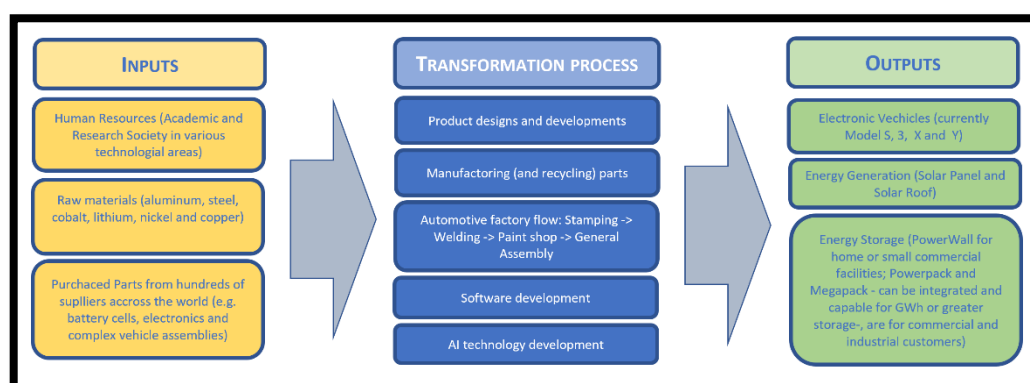


Figure 6. Transformation Process at Tesla

In Figure 7. Gigafactory 1. Nevada (Battery Production) process flow can be observed. The whole process is highly automated for cost reduction and efficiency purposes. Automated Guided Vehicles (AGVs) or simply put mobile robots transfer the parts within the factory.

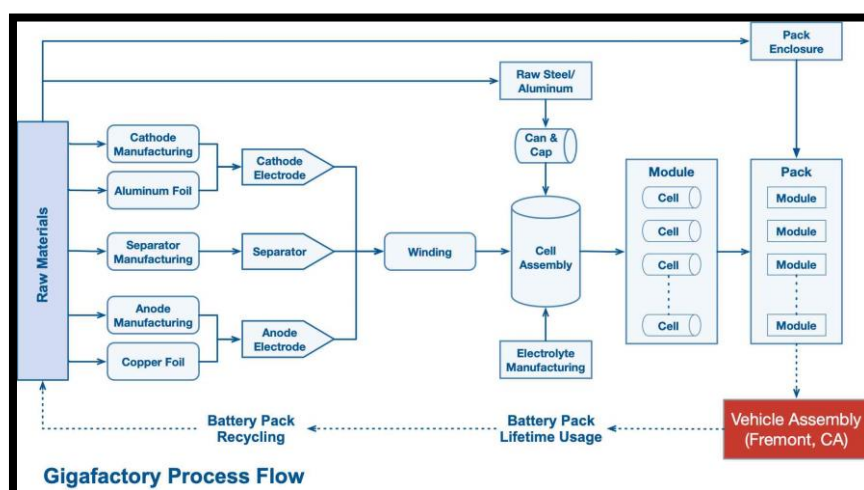


Figure 7. Tesla's Cell Production for Batteries Process Flow. Source: strategyforexecs.com

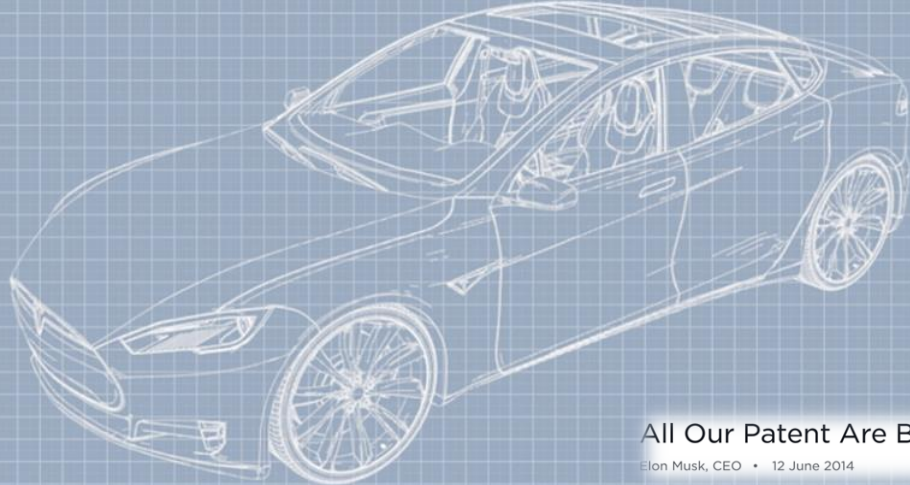
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Batteries in Tesla's Gigafactories are designed to outlast the car (with 1,000,000 miles lifetime), compared to the 2-5 years of battery changes required by other non-electric cars is very significant.

Since the end of 2020 Nevada Gigafactory started recycling batteries, which means it is possible to recover 95% of the raw materials from the end-of-lifetime batteries. This technology will enable Tesla in the future to significantly reduce new raw material sourcing. The company plans that all its Gigafactories will have the capacity to do battery recycling.

3.2 Value Chain Analysis

One of the best tools to obtain a detailed picture of a company's value chain is by the application of Michael Porter's Value Chain model. Figure 8. shows its architecture and this part of the analysis will mainly concentrate on some of the key elements in each.

Primary Activities

Inbound Logistics:

Tesla had and still has considerable risks and challenges through its inbound supply chain. It has 1000s of parts delivered from 100s of suppliers (et al Annual Report, 2020) in addition to the raw material sourcing. Tesla has close relations with key components suppliers and there are signs of synchronous manufacturing (et al. Doran 2002) for example with the local suppliers near Fermont Factory, but there is surely room for improvement to reduce time between customer order and delivery of the vehicle. Where multiple supplier are available Tesla tend to qualify them to reduce risk of production disruption on either side. Cobalt sourcing is a very sensitive area, since the metal is rare and therefore a bottleneck of its battery and ultimately vehicle production. The main source is in the Democratic Republic of Congo (DRC). Because of its historical problems due to illegal mining practices, Tesla has joined the Re|Source Consortium (founded by the 3 main cobalt producer of DRC) and there is an ongoing implementation of Blockchain technology to ensure the origin and transparency of cobalt all through the supply chain. The other strategy to reduce its risk on production, is to develop new technologies to reduce the cobalt component in the batteries as well as develop further the lithium-based batteries to perform better just like the cobalt-based ones.

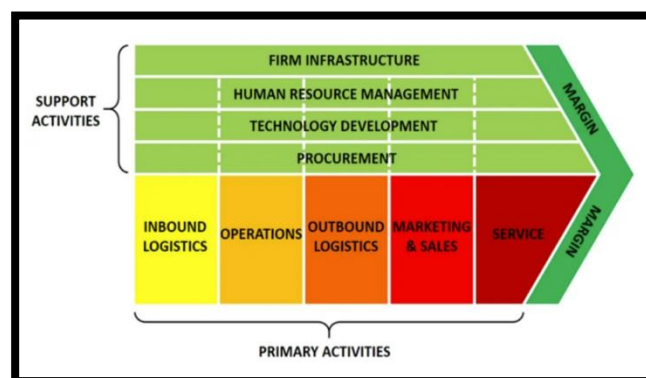


Figure 8. Porter's Value Chain (source: Module materials)

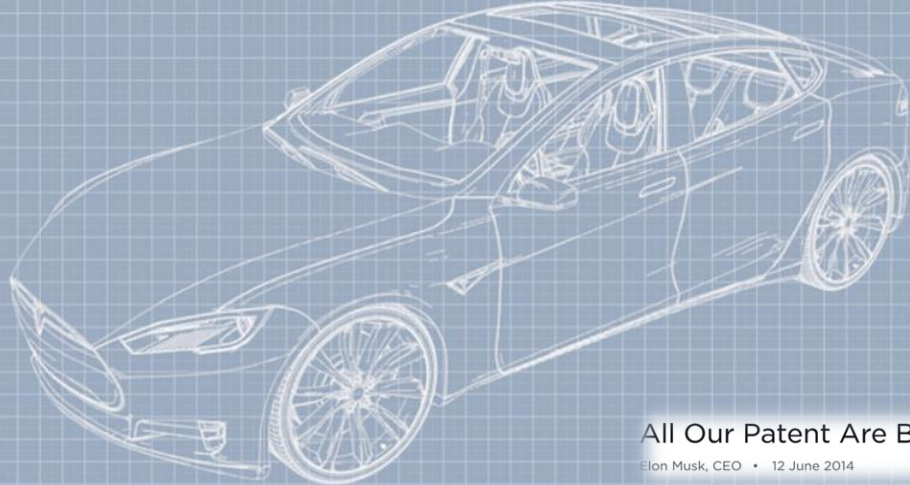
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Operations:

In addition to previously shown processes, factory optimization of raw materials and workforces are continuously improving based on the performance data of each stages.

Tesla Semi (Electric Truck) is about to enter the road freight market (a 324.5 billion euros market in Europe alone in 2020 – Statista 2021). It is available to reserve through Tesla's website with the option of 300 or 500 miles range. These options are in line with the U.S. average daily miles driven, about 285-430 miles per day (Free Freight Search Blog, 2019).

Outbound Logistics:

It takes a high sophisticated system with minimal to none stocks being kept, production is Made To Order, direct delivery to customers. In 2020 due to the Pandemic contact-less delivery method was introduced.

Marketing and Sales:

Tesla has a unique and cost-effective marketing strategy: word of mouth and generally wide media coverage. The company image and values are perceived through its charismatic CEO and Tesla's products itself. The sleek style of the company webpage, the Tesla App, the Supercharger Network are all indirectly penetrating the attention of the prospective customers.

Tesla does not have the traditional dealership network, instead it has its own stores and show galleries. It accommodates direct sales mainly through their website. Tesla Account and Tesla App offer a wide range of services, from purchasing upgrades for the car, through monitoring energy generation and usage, to finding available Superchargers on the way (there are 3000+ Supercharging stations with 30,000+ Superchargers globally, where in 15 minutes one could charge 200 miles range).

Service:

There is a wide range of services Tesla offers its customers both pre- and after sales. E.g. financial services, insurance, vehicle service centres and Mobile Service technician network.

Support Activities

Firm Infrastructure:

'Tesla aspires to be a "do the right thing" company' (Tesla impact Report 2020)

Governance: Board of Directors (encompasses four Committees)

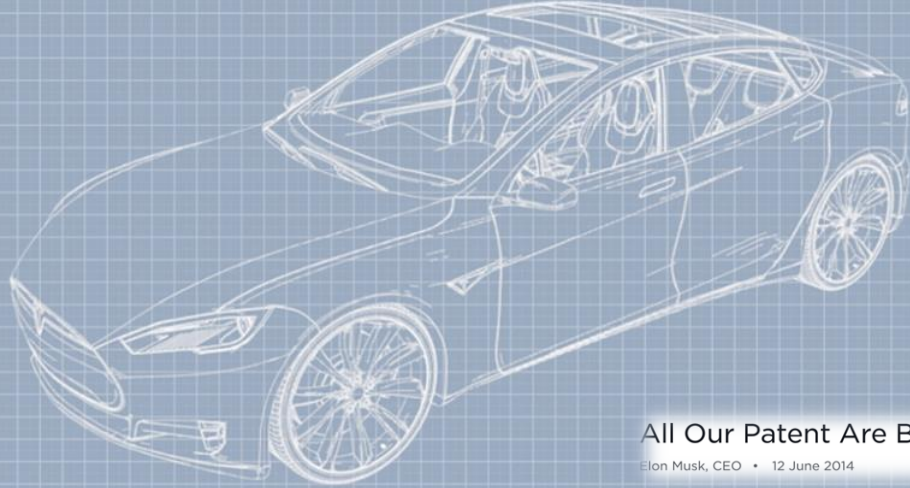
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High priority on overall Safety and open communication environment (through employee's App or by anonymously)

Human Resource Management:

Tesla is focused to have talented and engaged (e.g. owners of company shares) workforce with clear pathway for development. Competitive compensation (higher than industry average). DEI principles.

Technology Development:

FSD (Full Self-Drive) is a currently ongoing training of AI neural networks to prepare for full functionality when regulations will allow these systems on the roads. Additionally, a Supercomputer ("Dojo") is being developed, to be able to process the big data coming from the vehicles in real time and to train the neural network. Figure 9. glimpses into the

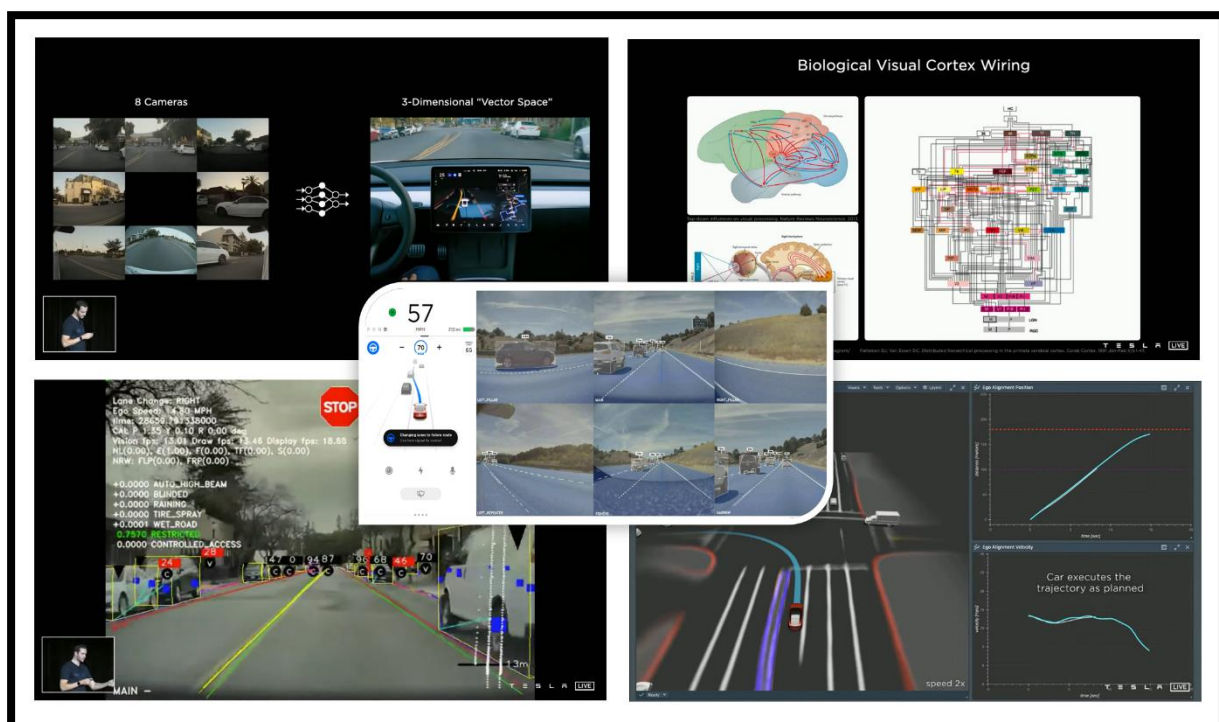


Figure 9. AI Neural Network training for FSD. source: tesla.com

presentation of this technology. The background pictures demonstrate that from the 8 cameras around the vehicle process the pictures into a vector space similarly to the biological

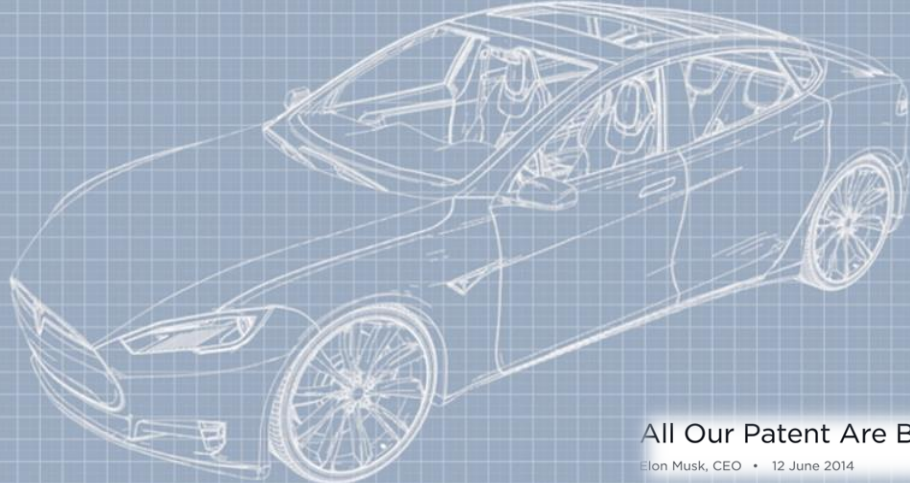
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eyesight, and by learning all objects and real-time road conditions, the resulting middle picture is similar to the user perception.

The FSD will enable Tesla to expand their service line of transportation via *Robotaxis*. It would function as a Full Self-Driving taxi, using the Tesla owners' vehicles while they are not in use (and generate profit), if they wish to participate.

Tesla plans to move the user Account from vehicle to cloud via StarLink, and this could mean an unimaginable user experience. It is something like when someone transfers their contents from their phone to the cloud and to a new phone, but in the case of the Taxi they occupied.

The energy storage systems are capable to send and receive data for optimization or even in emergency situations could make precautions steps (e.g. StormWatch).

Procurement:

All the qualified suppliers have to except Tesla's Supply Chain related policies as Figure 4. in the *Introduction* section shows. According to these documents RFTET (Right For The First Time Every Time) is expected. Additionally, Tesla performs ad-hoc audits at their sites.

3.3 The 5 Performance Objectives (POs)

The study now focuses on the five POs (Figure 10.) and its remarks at Tesla.

1. Quality

Automotive industry is well known for its high standardisation primary to ensure safety of the products and the manufacturing processes itself. Six sigma and high precision technologies, such as robotics, are being implemented too for high quality and waste reduction.

2. Speed

This is something that have room for improvement. Currently, based on the company's website, if a customer places an order today in the UK for a new Tesla Model 3 with basic configuration, the estimated delivery is 2 months. The opening of two Gigafactory in 2022 is set to fulfil the global demands more quickly.

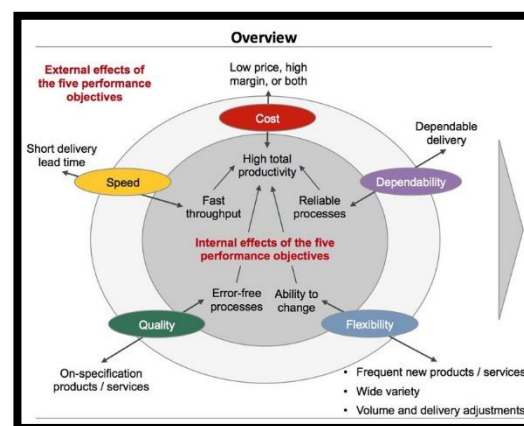


Figure 10. Five Performance Objectives (source: Module materials)

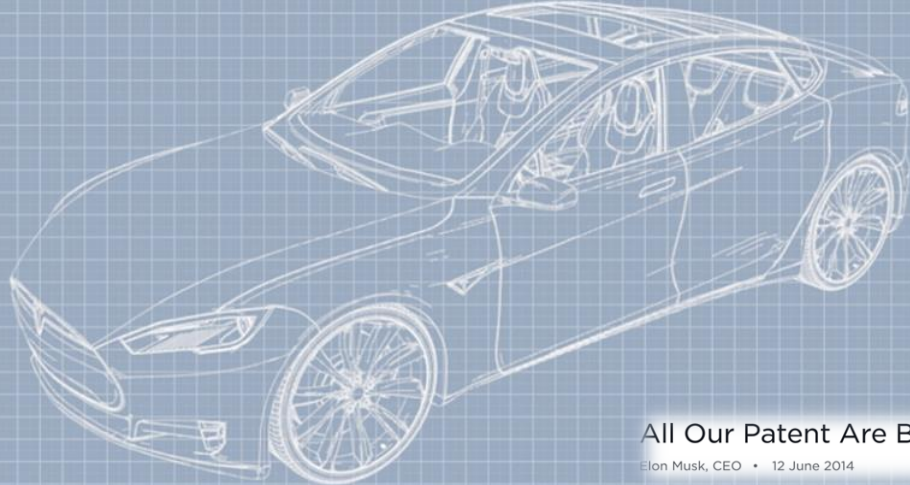
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3. Dependability

Historically there were and are currently delays of product launches.

4. Flexibility

Currently there are not much of variety for customer preferences (for Model 3, there are three base Models, 5 colour option, 2 different wheels, and possible to add 2 extra features (Enhanced Autopilot and Full Self-Driving Capability).

5. Cost

Cost effective manufacturing processes are one of the driving forces for Tesla's R&D. With Model 3 they reached the target to fix its market price of those ICE vehicles equivalents, resulting high demand and substantial growth.

3.4 The 4Vs at Tesla

Figure 10. is to summarize visually the impact of Tesla's current technology development. Low unit cost shall be understood as the efforts to make the vehicles affordable and therefore have great impact on the market share.

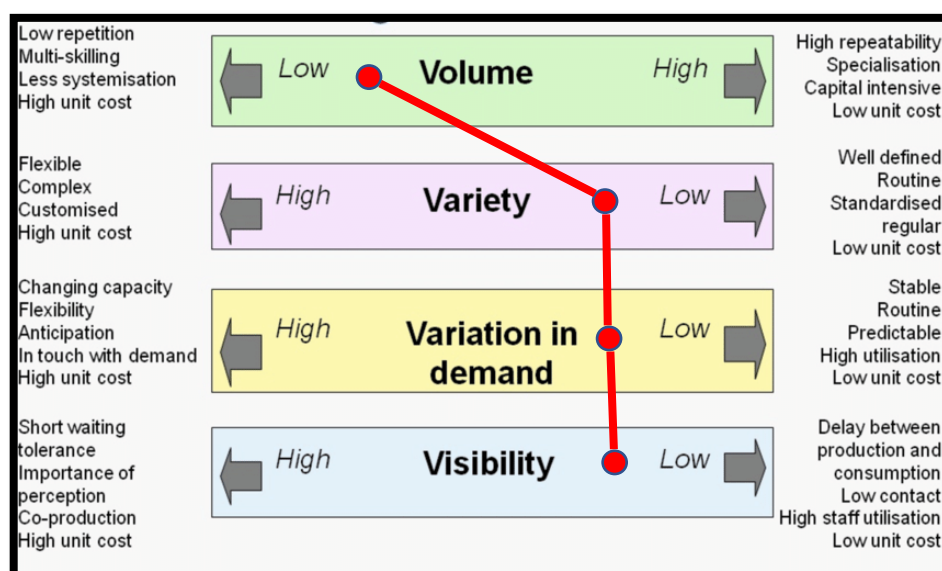


Figure 11. The 4Vs of Operations Management at Tesla. Source: Module materials

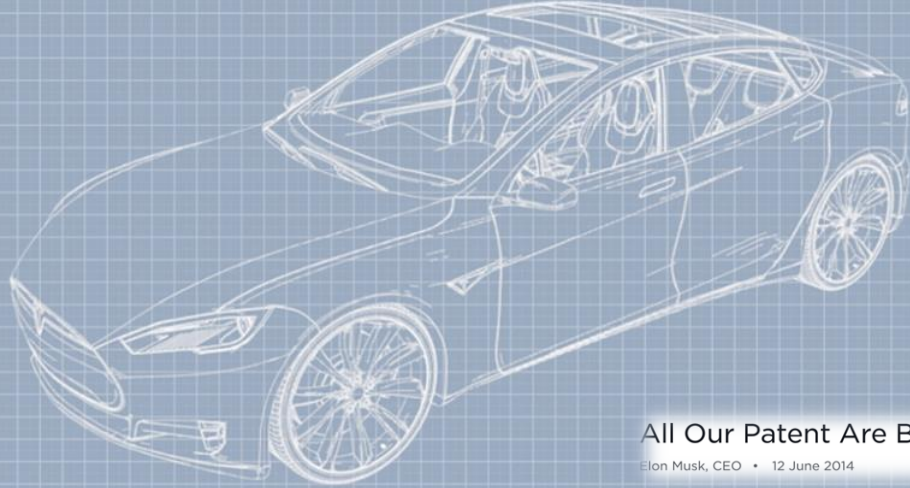
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4. Summary of Key Observations

Big Data has an impact on every area of the company, but especially influential on new technology developments.

The all connectiveness aspires solutions as could never have been imagined before.

The Full Self-Drive is one example of live data flow between vehicles and the AI neural network, others are the over-the air upgrades mentioned earlier.

Not just the vehicles, the energy storage systems are also communicating and receiving optimization remotely.

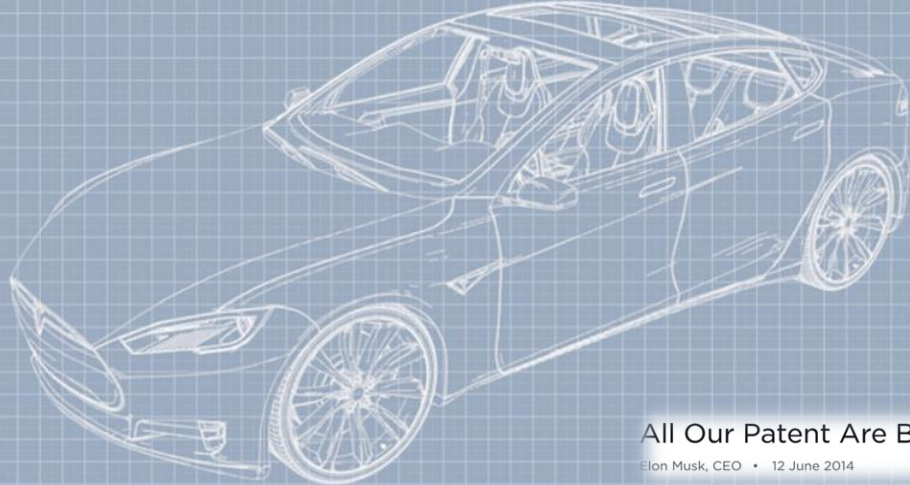
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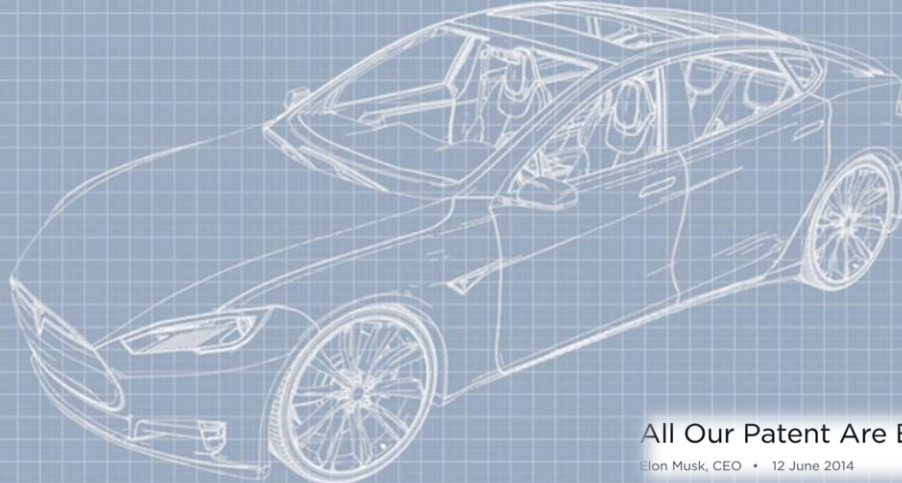
Tesla Model S 2013

Manufacturer	Tesla Motors
Production	2012–present
Assembly	Tesla Factory
Fremont, California, United States	
Class	Full-size sports sedan
Body style	4-door fastback
Layout	Rear motor, rear-wheel drive

Electric motor

Three-phase AC induction motor

85 kW·h (Performance)
310 kW (420 hp), 443 ft·lb (600 N·m)
85 kW·h
270 kW (360 hp), 325 ft·lb (440 N·m)
60 kW·h
225 kW (302 hp), 317 ft·lb (430 N·m)



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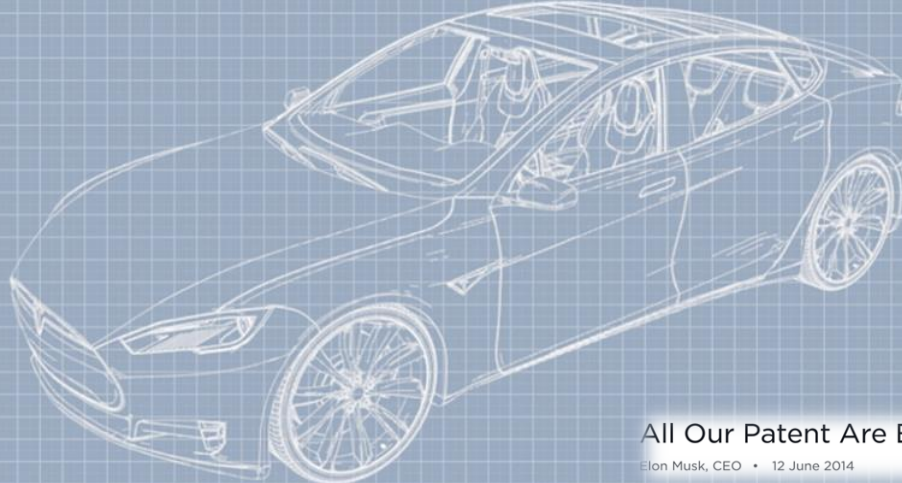
Tesla Model S 2013

Manufacturer Tesla Motors
Production 2012–present
Assembly Tesla Factory
Fremont, California, United States
Class Full-size sports sedan
Body style 4-door fastback
Layout Rear motor, rear-wheel drive

Electric motor

Three-phase AC induction motor

85 kW·h (Performance)
310 kW (420 hp), 443 ft·lb (600 N·m)
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270 kW (360 hp), 325 ft·lb (440 N·m)
60 kW·h
225 kW (302 hp), 317 ft·lb (430 N·m)



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