PES UNIVERSITY, BENGALURU

FINAL SEMESTER ASSESSMENT (FSA) – B.TECH. (CSE) – VI SEM

SESSION: JANUARY – MAY, 2020

KNOWLEDGE MANAGEMENT

Project Report

on

"Case Study on Tesla"

Submitted by

Jnanesh D	PES1201701822
Mayur RB	PES1201700714
Sujay Gad	PES1201700177
Sachin S	PES1201701725
Yalipi Revanth	PES1201700201

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

PES UNIVERSITY

(ESTABLISHED UNDER KARNATAKA ACT NO. 16 OF 2013)

100 FEET RING ROAD, BENGALURU – 560 085, KARNATAKA, INDIA

Tesla

Introduction

Tesla, Inc. (formerly Tesla Motors, Inc.), is an American electric vehicle and clean energy company based in Palo Alto, California. The company specializes in electric vehicle manufacturing, battery energy storage from home to grid scale and, through its acquisition of SolarCity, solar panel and solar roof tile manufacturing.

Tesla Motors was founded in July 2003 by engineers Martin Eberhard and Marc Tarpenning. The company's name is a tribute to inventor and electrical engineer Nikola Tesla. Elon Musk was responsible for 98% of the initial funding, and served as chairman of the board. He appointed Martin Eberhard to be the first CEO. In its 2004[1] Series A funding, Tesla Motors was joined by Elon Musk, J. B. Straubel and Ian Wright, all of whom are retroactively allowed to call themselves co-founders of the company. Musk, who formerly served as chairman and is the current CEO, said that he envisioned Tesla Motors as a technology company and independent automaker, aimed at eventually offering electric cars at prices affordable to the average consumer. In February 2017, Tesla Motors shortened its name to Tesla.

After 11 years in the market, Tesla ranked as the world's best-selling plug-in as well as best-selling battery electric passenger car manufacturer by cars sold in 2019, both as a brand and by automotive group, with a market share of 17% of the plug-in segment and 23% of

the battery electric segment. Tesla global vehicle sales increased 50% from 245,240 units in 2018 to 367,849 units in 2019.

History:

Tesla Motors was incorporated in July 2003 by Martin Eberhard and Marc Tarpenning with 98% of the initial funds being provided by Chairman of the Board Elon Musk, who appointed Eberhard to be the first CEO. The founders were influenced to start the company after GM recalled all its EV1 electric cars in 2003 and then destroyed them,[1] and seeing the higher efficiency of battery-electric cars as an opportunity to break the usual correlation between high performance and low mileage.

Elon Musk led the Series A round of investment in February 2004, joining Tesla's board of directors as its chairman. Tesla's primary goal was to commercialize electric vehicles, starting with a premium sports car aimed at early adopters and then moving into more mainstream vehicles, including sedans and affordable compacts.

Musk took an active role within the company and oversaw Roadster product design at a detailed level. In addition to his daily operational roles, Musk was the controlling investor in Tesla from the first financing round, funding $6.5 million of the Series A round of US$7.5 million with personal funds. Musk later led Tesla Motors' Series B, $9 million of US$13 million, and co-led the third, US$12 million of US$40 million round in May 2006.

Tesla's third round included investment from prominent entrepreneurs including Google co-founders Sergey Brin and Larry Page, former eBay President Jeff Skoll, Hyatt heir Nick Pritzker and added the VC firms Draper Fisher Jurvetson, Capricorn Management and The Bay Area Equity Fund managed by JPMorgan Chase. The fourth round in May 2007 added another US$45 million and brought the total investments to over US$105 million through private financing.

Tesla had been reporting net losses most quarters for many years, but for the quarter ending September 2019, Tesla surprised analysts, who had been anticipating a quarterly loss of approximately 40 cents per share, with adjusted earnings of US$1.61 per share, on total quarterly revenue of US$6.3 billion. For the quarter ending December 2019,

Tesla posted adjusted earnings of US$2.14 per share on total quarterly revenue of US$7.38 billion.

Need of KM

1. **Speed up access to information and knowledge**

In his famous quote, Lew Platt, former CEO of Hewlett-Packard, once said: “If HP knew what HP knows, we would be three times more productive.”

In other words, knowledge management makes it easier to find the information or the people who hold the information you need. It increases efficiency and productivity and allows you to work better, reducing the tendency to “reinvent the wheel.”

2. **Improve decision-making processes**

Employees can improve the quality and speed of decision-making by accessing the knowledge of the entire organization when they need it. When making decisions, enterprise collaboration tools facilitate the access to opinions and experiences of different people, which may contribute additional perspectives to the choices made.

3. **Promote innovation and cultural change**

Enable and encourage the sharing of ideas, collaboration and access to the latest information. Knowledge management enables individuals to stimulate innovation and the cultural changes needed to evolve the organization and meet changing business needs.

4.**Improve the efficiency of an organization’s operating units and business processes**

With faster access to information and resources across the organization, knowledge workers can act quickly.

5. **Increase customer satisfaction**

The sharing of knowledge and cross-collaboration help to increase the value offered to customers. The company can give faster answers or shorten the time it takes to improve the service.

6.**Aid the employers**

The only way for employers to get to each of their performances is an improved technology in delivering to them proper knowledge management. Create the need for them to rely on the system so the industry attains an increase in profit and production. It provides employers and business owners to widen their understanding when it comes to managing their employees. It does not only mean the mere understanding of what they have to do for the company but it's more about providing them with the proper technology and help them enhance skills and become more of an asset to the company than a liability

Knowledge Management at Tesla Motors

Knowledge management (KM) has been a process of capturing, sharing, developing and effectively using the organizational knowledge. It is referred to as a term that helps in achieving the organizational objectives by making the best use of knowledge provided. Some of the concepts that have been used by the firm are as follows.

Understand key drivers of business:

The first step of successful KM in a firm is to understand the key drivers of the business In case of Tesla Motors, the key drivers for the company are the electronic car that has been the major source of revenue generation; therefore it has to be well presented in the market.

Analyse knowledge

This is one major step in KM. The reason is simple, sometimes the firms over rely on KM attribute and overlook other major or the breakthrough innovations. In such a situation, it is rather necessary that a certain group of employees are working towards achieving other objectives of the firm also.

Implement in phases

The final phase of KM is the implementation phase. This is the place where the firm has to execute the strategies it plans to integrate in the firm. The management has to ensure that the company and all its departments are aligned with the Km objectives and initiates.

Knowledge Management tools used by Tesla

Customer Relationship Systems

- Competitors know that customer ownership is a much bigger hill to climb than power density. Tesla is gradually converting that hill into an impenetrable wall as it prepares for a 2017 launch of the Model 3.
- Constant improvement, customer ownership, data collection and analysis are all hallmarks of the not-so-secret weapon of vehicle

connectivity deployed by Tesla. Whether or not Tesla can build, sell and maintain cars profitably remains to be seen, but Tesla has mastered the customer relationship fundamentals.

Content repositories: Tesla doesn't keep any of its technology as classified info, in fact they have made it open source so that open source tech developers can use their creativity to improve the company's image.This leads to newer innovations being added. Tesla has an open source github repository for the developers to work upon.

DESIGN PERSPECTIVE - KM

In order to increase the impact of academic research, it is important that we develop and strengthen national and international networks for knowledge transfer and translation.There is a dynamic interplay between knowledge creation, product development and market adoption; each co-evolves within an interconnected system of actors. TESLA will apply approaches from Design Thinking to support concurrent rather than sequential research, development and commercialisation activities, thereby accelerating the selection and the increasing the fitness of emerging technologies, products and services.Research creates new knowledge and new technologies, which often lead to innovation with commercial and societal impact. TESLA will explore ways to accelerate innovation and amplify impact, through using design-led interdisciplinary approaches to innovation.Knowledge transfer is not just one way, however; by collaborating with industrial and commercial partners, we are able to maintain the professional relevance of the undergraduate and postgraduate curriculum, which is crucial to the employability of our graduates.Increasingly open innovation-networks, processes and communication technologies promise to further accelerate the development and adoption of new technologies, products and services. TESLA will strengthen interdisciplinary collaboration within a diverse, adaptive and sustainable ecology of academic, industrial and commercial partners.

Knowledge Management Tesla Motors SWOT analysis

The acronym Knowledge Management SWOT stands for strength, weakness, threats and opportunities. This SWOT analysis shows that the company has the strengths needed to maintain profitability in the long term.

In this company analysis case of Tesla, the following strengths shape the capabilities of the business as a competitive player in the automotive industry:

- Highly innovative processes
- Strong brand
- Strong control on production processes

- Tesla's Weaknesses (Internal Strategic Factors)
  - Limited market presence
  - Limited supply chain
  - High prices

Strategy

Tesla's business strategy is to emulate typical technological-product life cycles and initially target affluent buyers, and then move into larger markets at lower price points. The battery and electric drivetrain technology for each model would be developed and partially paid for through the sales of earlier models. The Roadster was low-volume and priced at US$109,000. Model S and Model X target the broader luxury market. Model 3 and the Model Y are aimed at a higher-volume segment. This business strategy is common in the technology industry. According to a Musk blog post, "New technology in any field takes a few versions to optimize

before reaching the mass market, and in this case, it is competing with 150 years and trillions of dollars spent on gasoline cars."
Tesla's production strategy includes a high degree of vertical integration (80% in 2016), which includes component production and proprietary charging infrastructure. The company operates large factories to capture economies of scale. Vertical integration is rare in the automotive industry, where companies typically outsource 80% of components to suppliers, and focus on engine manufacturing and final assembly.

The Tesla Patent Wall at its headquarters was removed after the company announced its patents are part of the open source movement.
Tesla's sales strategy is to sell its vehicles online and in company-owned showrooms rather than through a conventional dealer network. Moving towards an e-commerce strategy, customers are able to customize and order their vehicles online. (Tesla has built electric powertrain components for vehicles from other automakers, including the Smart ED2 For Two electric drive (the lowest-priced car from Daimler AG), the Toyota RAV4 EV, and Freightliner's Custom Chassis Electric Van.)
Tesla's technology strategy focuses on pure-electric propulsion technology, and transferring other approaches from the technology industry to transportation, such as online software updates. Tesla allows its technology patents to be used by anyone in good

faith. Licensing agreements include provisions whereby the recipient agrees not to file patent suits against Tesla, or to copy its designs directly. Tesla retained control of its other intellectual property, such as trademarks and trade secrets to prevent direct copying of its technology.
Tesla Human Resources VP Arnnon Geshuri committed to bringing manufacturing jobs "back to California". In 2015, Geshuri led a hiring surge about which he said: "In the last 14 months we've had 1.5 million applications from around the world. People want to work here." Geshuri emphasizes hiring veterans, saying "Veterans are a great source of talent for Tesla, and we're going after it.

KM Roles at Tesla:

1)Knowledge manager-

Roles and responsibilities include working cross-functionally with Product Managers, Training Program Managers and technical writers to develop effective, interesting, and engaging knowledge management solutions for the Energy products at Tesla. Standardize content across each Product informational repository for consistent and relevant information for all functional teams. Gather usability feedback from end-users for continual format and delivery improvements.

2)Knowledge management administrator-
The Knowledge Management Administrator is responsible for actively collaborating with IT counterparts to continue development and completion of a high quality, user-friendly sales and service knowledge management system (called TRT) that can be leveraged by Retail Development, as well as its internal business partners and external vendors.

How Tesla has taken advantage of KM-

> **"[Musk] shared part of Tesla's intellectual property to drive innovation. He's following a knowledge-based strategy."**
>
> –Martin Ihrig

Tesla took a gamble by sharing patents that covered its revolutionary electric vehicles for free. Sharing of patents could have resulted in competitors catching up but the pro was that sharing of patents was a claim of authenticity which resulted in brand enhancement. Thus, the best engineers would flock to Tesla, attracted by its spirit of openness, innovation and dedication to a social mission. In this way knowledge assets (patents) were used by Tesla in the growth of the company.

Technologies of the company

1. Batteries

Unlike other automakers, Tesla does not use individual large battery cells, but thousands of small, cylindrical, lithium-ion commodity cells like those used in consumer electronics. Tesla's batteries are manufactured in Gigafactories, the name Gigafactory comes from the word 'Giga,' the unit of measurement representing "billions." It uses a version of these cells that is designed to be cheaper to manufacture and lighter than standard cells by removing some safety features. According to Tesla, these features are redundant because of the advanced thermal management system and an intumescent chemical in

the battery to prevent fires. Panasonic is the sole supplier of the cells for Model S, Model X, and Model 3 and cooperates with Tesla in the Giga Nevada's '21–70' cells.

In February 2016, Tesla battery cell costs were estimated at US$200 per kWh. Tesla indicated later in 2016 that their battery cells cost less than $190/kWh. Still later that year Argonne Labs estimated $163/kWh at a production rate of 500,000 packs per year. In the 2018 Tesla Shareholder meeting, Elon Musk stated battery cell cost could be $100/kWh in 2018. 2020 would bring $100/kWh Tesla battery packs (as opposed to battery cell).

The batteries are placed under the vehicle floor. This saves interior and trunk (boot) space but increases the risk of battery damage by debris or impact. The Model S has 0.25 in (6.4 mm) aluminium-alloy armour plate. CTO Straubel expected batteries to last 10–15 years, and discounts using electric cars to charge the grid (V2G) because the related battery wear outweighs economic benefit. He also prefers recycling over re-use for grid once they reach the end of their useful life for vehicles. Since 2008, Tesla has worked with ToxCo/Kinsbursky to recycle worn out RoHS batteries, which will be an integral part of all Gigafactories.

Tesla has ongoing battery research and development work at Dalhousie University in Nova Scotia, Canada, featuring lead researcher Jeff Dahn. Tesla acquired two battery companies in 2019, Hibar Systems and Maxwell Technologies, all expected to play an important role in Tesla's battery strategy.

2. Motors

Tesla makes two kinds of electric motors. Their oldest currently-produced design is a three-phase four-pole AC induction motor with a copper rotor (which inspired the Tesla logo), which is used as the rear motor in the Model S and Model X. Newer, higher-efficiency motors are used in the Model 3, Model Y, Semi, and the front motor of 2019-onward versions of the Model S and X. The permanent magnet motors increased efficiency, especially in stop-start driving

3. Autopilot

In September 2014, Tesla Autopilot started providing semi-autonomous driver assist. Tesla upgraded its sensors and software in
October 2016 (hardware version 2, or "HW2"); all Tesla cars built since then come standard with Autopilot hardware. As of 2017, Autopilot included adaptive cruise control, lane departure warning, emergency braking, Autosteer (semi-automated steering), Auto park (parallel and perpendicular parking) and Summon (recalling the vehicle from a parking place). HW2 includes eight cameras and twelve ultrasonic sensors, in addition to forward-facing radar. HW2.5 was released in mid-2017 that upgraded HW2 with a second GPU and, for the Model 3 only, a driver-facing camera. HW3 were first installed in the Model S and X in Q1 2019 and shortly thereafter in Model 3.
At the end of 2016, Tesla expected to demonstrate full autonomy by the end of 2017, which was later expected by the end of 2019. In April 2017, Musk predicted that in around two years drivers would be able to sleep in their vehicle while it drives itself.
In April 2019, Tesla announced that all of its cars will include Autopilot (defined as just Traffic-Aware Cruise Control and Autosteer) as a standard feature moving forward. Full self-driving (Navigate on Autopilot (Beta), Auto Lane Change, Auto park, Summon, Smart Summon and future abilities) is an extra cost software option.

---

4. Glass

In November 2016, the company announced the Tesla glass technology group. The group produced the roof glass for the Tesla Model 3 and for use in SolarCity roof

tiles announced in October 2016. The tiles contain an embedded solar collector, and are one-third lighter than standard roof tiles.

Vehicle Models

As of January 2020, Tesla offers four car models: The Model S, Model 3, Model X and Model Y.

Production

1. Model *S*

The Model S is a five-door lift back sedan. Deliveries began on June 22, 2012. The first delivery in Europe took place in August 2013.Deliveries in China began in April 2014.[200] First deliveries of the right-hand-drive model destined for the UK, Australia, Hong Kong and Japan came in 2014.[201] As of February 2020, the Model S has two configurations: the Model S Long Range Plus, and the Model S Performance with EPA ranges of 390 miles (630 km), and 345 miles (555 km) respectively.

Norway is the Model S' largest European market due to the country's incentives for the adoption of pure electric cars.

With an estimated 50,931 units sold in 2016, the Model S ranked was the world's best-selling plug-in car for the second year in a row. As of September 2018, the Model S, with global sales of 250,000 units, ranks as the world's second bestselling plug-in electric car in history after the Nissan Leaf (over 350,000 units).

The United States is the world's leading Model S market with an estimated 136,542 units sold through September 2018 Norway ranked as the Model S' largest overseas market as of November 2016, with 11,802 new units registered. The Tesla Model S became the first electric car to top the monthly sales ranking in any country, when the electric car achieved first place in the Norwegian new car sales list in September 2013.

In May 2010 Tesla purchased what would become the Tesla Factory in Fremont, California, for US$42 million, and opened the facility in October 2010 where

Model S would be produced. For the European market, final assembly and European Distribution occur at the Tesla facilities in Tilburg, Netherlands. Cars are built and tested in Fremont; then the battery pack, the electric motor and parts are disassembled and shipped separately to Tilburg, where they are reassembled.
Among other awards, the Model S won the 2019 Motor Trend "Ultimate Car of the Year",2013 "Motor Trend Car of the Year", the 2013 "World Green Car", Automobile magazine's 2013 "Car of the Year", and Time magazine's Best 25 Inventions of the Year 2012 award.
In February 2020, it was reported that the Model S had a range of 390 miles before needing to be recharged; an improvement of 17 miles.

2. Model 3

Main article: Tesla Model 3
Tesla Model 3 production model.
The Model 3 (originally stylized as "☰"), a four-door sedan, is Tesla's third-generation car. The car was originally intended to be called the Model E, but after a lawsuit from Ford that holds the trademark on "Model E", Musk announced on July 16, 2014 that the car would be called "Model 3" instead. In July 2017, the standard Model 3 was expected to deliver an EPA-rated all-electric range of 220 miles (350 km), while the long-range model was estimated to deliver 325 miles (523 km).

On March 31, 2016, Tesla unveiled the car. Potential customers began to reserve spots on March 31 with a refundable deposit. Tens of thousands were reported waiting to reserve their spot As of April 7, 2016, one week after the unveiling, Tesla reported over 325,000 reservations, representing sales of over US$14 billion. As of July 2017, Tesla reported about 500,000 reservations. Bloomberg News claimed "the Model 3's unveiling was unique in the 100-year history of the mass-market automobile." Bloomberg compared it to the 1955 Citroën DS that took in 80,000 deposits over 10-days at the Paris Auto Show.

First production Tesla Model 3 cars ready for the delivery event on July 28, 2017. Tesla expected to invest between US$2 billion and US$2.5 billion in capital expenditures to support Model 3 production. Limited vehicle production began in July 2017, with the first 30 units delivered at a special event on July 28. Customer deliveries totalled 1,764 units in the U.S. in 2017. In June 2018 production reached 5,000 per week. In January 2019, Tesla announced it would cut its full-time

workforce by 7% – equal to about 3,150 employees – in order to reduce the cost of the Model 3 from $44,000 to $35,000. Musk explained that while the company had "made great progress, our products are still too expensive for most people … There isn't any other way."

The Model 3 topped plug-in electric car sales in the U.S. in 2018, with an estimated all-time record of 139,782 units delivered, after being the top-selling plug-in car in the country for 12 consecutive months since January 2018, and marking the first time a plug-in car sold more than 100,000 units in a single year. In addition, it was listed as the bestselling plug-in car in California in 2018 with 51,293 units. The Tesla Model 3 also topped global sales of plug-in electric passenger cars in 2018 with 146,055 units delivered. Global sales since inception totalled 198,719 units through March 2019.

On February 28, 2019, Tesla announced that they would begin to roll out the Standard Range base model starting at $35,000. In January 2019, the Model 3 passed the Model S to become the top selling all-electric car in the U.S. ever, and, the next month, also passed the Chevrolet Volt to become the all-time best-selling plug-in electric car in the U.S. Since inception, about 164,000 Model 3 cars were delivered in the U.S. by March 2019.

The Tesla Model 3 in 4 trims: Standard Range Plus RWD, Dual Motor AWD Long Range, Performance and the off-the-menu $35,000 standard range. In 2019, Tesla Model 3 was the 9th bestselling car in the United States.

3. Model X

Elon Musk delivering one of the first six Model X Founders Series models
The Tesla Model X is a mid-size crossover SUV with a lightweight aluminium body. Model X deliveries started in September 2015. It is offered in 5-, 6- and 7-passenger configurations. The passenger doors are articulating "falcon-wing" designs that open vertically.
Production was rescheduled several times, from 2013 to late 2014, to the second quarter of 2015, to the third quarter of 2015. In August 2015, user groups estimated around 30,000 X pre-orders, compared to 12,000 for the S.

Deliveries of the Model X Signature series began on September 29, 2015. Model X sales totalled 2,400 units during the first quarter of 2016, rising to 4,638 in the second quarter of 2016. Global deliveries totaled 25,312 units in 2016, and 46,535 in 2017.
In September 2016, the Model X ranked as the top selling plug-in electric car in Norway. Previously, the Model S had been the top selling new car four times. Cumulative sales since inception totaled 106,689 units through September 2018. United States is its main market with an estimated 57,327 units sold through September 2018.

4. Tesla Model Y

In August 2013, Tesla trademarked the name "Model Y". In October 2015, Musk described a future "Model Y". In August 2017, Tesla announced that the Model Y would use the Model 3 platform.
In February 2018, Tesla announced that they would unveil Model Y production plans within the next 3–6 months and posted open positions for Model Y production and design. In May 2018, Musk said that the Model Y will be built on a platform that shares many components with the Model 3, and that the Model Y will be in production at the earliest in early 2020. In July 2018, Musk rescheduled the Model Y unveiling to be March 2019.[261] In March 2019, Musk tweeted, "Model Y unveil event on March 14 at LA Design Studio" also adding that "the Model Y would be 10% bigger than the Model 3 so would cost 10% more".
The Model Y unveiling occurred on March 14, 2019. The car will have up to three rows of seats (up to 7 people), 66 cu ft (2 m3) of cargo space with the second and third rows folded, and will have a range of up to 300 miles (480 km).
As of January 2020, The Tesla Model Y is being manufactured at Tesla Factory in Fremont, CA. In the future, the Model Y is also planned to be built at the yet-to-be-built Giga Berlin, newly announced in November 2019.

Table 1. Range and prices of Model 3, Model X, and Model S

Model and Version	Range	Base Price	Fully Loaded
Model 3 Standard Range Plus	250 miles	$39,900	$51,490
Model 3 Long Range	322 miles	$48,990	$60,490
Model 3 Performance	322 miles	$56,990	$66,990

Model S Long Range	373 miles	$79,990	$95,490
Model S Performance	348 miles	$99,990	$115,990
Model X Long Range	328 miles	$84,990	$106,490
Model X Performance	305 miles	$104,990	$128,490

Upcoming models: Tesla Cybertruck price, Tesla Model Y price, and Tesla Roadster price

Model	Base price	Max price	Expected launch
Cybertruck	**$39,900**	**$76,900**	**Late 2022**
Model Y	**$48,000**	**$74,000**	**Early 2021**
Roadster 2020	**$200,000**	**$250,000**	**Unclear**

Factories & Markets

Tesla's first assembly plant occupies the former NUMMI plant in Fremont, California. It is known as the Tesla Factory. As of 2016, the plant was not highly automated—it was expected to produce some 80,000 cars with 6,000 workers compared to a "typical" plant that might produce 250,000 cars with 3,000 workers. The 370-acre (1,500,000 m2) site includes a 5,500,000-square-foot (510,000 m2) building complex.

In 2015, Tesla acquired Riviera Tool & Die (with 100 employees in Michigan), one of its suppliers of stamping items. In 2017, Tesla acquired Perbix Machine Company, a manufacturer of automated manufacturing equipment, that had been an equipment supplier for over three years.

Tesla occupies a second factory in Fremont. The building is more than 500,000 sq. ft (46,500 m2). The location is next to a SolarCity facility, a few miles from the original Fremont plant.

Giga Nevada is located outside Reno, Nevada. As of January 2017, it occupied 1.9 million square feet (180,000 m2) with 4.9 million square feet (460,000 m2) of usable area across several floors. It produces Power walls and Powerpacks as well as battery cells in partnership with Panasonic. It also produces Model 3 battery packs and drivetrains. The factory received substantial subsidies from the local and state governments.

Giga New York is located in Buffalo, New York on the site of a former Republic Steel plant. It is operated by Tesla's SolarCity unit. The factory is a $750 million, 1.2-million-square-foot (0.11 km2) facility that directly employs 500 workers. Tesla partnered with Panasonic to assemble photovoltaic panel modules. Tesla received incentives to locate the factory in Buffalo through the Buffalo Billion program. As of August 2017, the factory added production of solar tiles for the Tesla Solar Roof. In January 2018, Tesla announced, after testing on employees' roofs, that it would begin installing the Tesla Solar Roof on customers' homes "within the next few months". Version 3 of the Tesla Solar Roof was announced in October 2019, with this version achieving economic viability to be cost competitive for installations where a new roof is needed and residential solar power is desired. Production ramp up is expected to occur into 2020 as Tesla works through anticipated ramp-up issues with the new mass manufactured and mass installed product.

In Canada

Tesla's first "new design" store opened on November 16, 2012 in the Yorkdale Shopping Centre in Toronto, Ontario. As of May 2017, eight Tesla stores/galleries operated in Montreal, Quebec City, Calgary, Toronto and Vancouver.

In Europe

Tesla opened its first European store in June 2009 in London. Tesla's European headquarters are in Amsterdam. A 62,000 sq. ft (5,800 m2) European service centre operates in Tilburg, Netherlands, along with a 77,650 m2 (835,800 sq ft) assembly facility that adds drivetrain, battery and software to the (imported) car body to reduce EU import tax.

In late 2016, Tesla acquired German engineering firm Grohman Engineering in Prüm as a new division dedicated to helping Tesla increase the automation and effectiveness of its manufacturing process. After winding down existing contracts with other auto manufacturers, Grohman works exclusively on Tesla projects.[363] As

of February 2018, Tesla is building a small research and development office in Athens, Greece.

In June 2014 Tesla announced, and again confirmed in November 2016, its long-term plans to build a car and battery Gigafactory in Europe. Several countries have campaigned to host. and in July 2018, it was reported that Tesla was exploring locating Gigafactory 4 in either Germany or the Netherlands. A location and plans to begin construction near Berlin were announced in November 2019. In 2020, after anti-Tesla protests and environmentalists' victory in the court, the car-maker has been forced to temporarily stop preparations for the launch of a factory in Germany.

In Asia

Tesla Motor's Japanese showroom in Aoyama, Tokyo, which was the first showroom opened in the country

Showrooms and service centres operate in Hong Kong, Beijing and Shanghai. Tesla opened its first Japanese showroom in Tokyo, Japan, in October 2010. In South Korea, it opened two showrooms in March 2017 and a service centre in late 2017. In August, 2017, Taiwan opened its first service centre and showroom.

Giga Shanghai

In July 2018, Tesla signed an agreement with Chinese authorities to build a factory in Shanghai, China, which is Tesla's first Gigafactory outside of the United States. The ground-breaking ceremony was held on January 7, 2019. The factory building was finished in August 2019, and the initial Tesla Model 3s were in production from Giga Shanghai in October 2019.

In Middle East

Tesla opened a showroom and a service centre in Dubai, United Arab Emirates, in 2017 as the first expansion of Tesla in the Middle East. Five ultra-fast superchargers were also built between cities with a planned 50 destination chargers in the United Arab Emirates by the end of 2017. The Dubai Department of Economic Development stated that it will assist Tesla expansion across the United Arab Emirates as well as neighbouring countries in the Middle East. One of the first Tesla customers was Dubai's Roads and Transport Authority which ordered 200 Tesla Model S and Model X vehicles that were added to Dubai Taxi Corporation's fleet. In May 2017 the service centre and store in Amman Jordan was opened. In January 2020 a "pop-up" store in Tel Aviv Israel was opened and an R&D centre.

In Australia

Tesla opened a showroom in Sydney's Martin Place in 2010, followed by a showroom and service centre in Melbourne in 2015. By 2019, Tesla had opened 4 service centres in Australia.

In South America

In February 2020, several news sites reported that Tesla was negotiating with the Brazilian Minister of Science, Technology and Innovation, Marcos Pontes to build a Gigafactory in the state of Santa Catarina, Brazil. The rumours were later confirmed by the Brazilian government. Brazil wants to have Tesla in the country, not only selling its cars but also producing them there. Tesla vehicles could then be exported to other nearby markets, such as Argentina, Chile, Paraguay, Uruguay, Colombia, the Caribbean region, and even Mexico, a country with which Brazil has a free trade agreement. Brazilian president Jair Bolsonaro stated on his Twitter

account that he will be going to the United States in March to visit one of Tesla's facilities, hoping to finalize the deal

---

How Tesla changed the auto industry

Tesla is forcing the auto industry to rapidly change. Large, established automakers now are making fully electric and hybrid electric cars. Automakers are starting to explore and include artificial intelligence (AI) in their cars, and now major automakers and U.S. Congressmen are discussing autonomous vehicles (AVs) and how best to innovate and regulate them.

Not only that, but Tesla's software design is state-of-the-art: the fact that Tesla can update vehicle software over-the-air (OTA) as if it were Apple updating an iPhone is unprecedented. As cars become more tech-savvy, Tesla is in the lead. But Tesla struggles to meet deadlines and frequently delivers flawed vehicles, and profitability remains elusive. Many use Tesla's failings to argue that the company shouldn't be followed as an innovator or even as a true automaker.

Tesla is forcing the auto industry to change rapidly:
Tesla didn't invent the electric car (Scottish inventor Robert Anderson did, in 1832), but it was Tesla who popularized, pioneered and promoted the electric car ever since the company's founding in 2003. None of the major automotive manufacturers were making electric cars until Tesla made it cool in 2008 with its bombastic announcement of the first luxury electric car: The Tesla Roadster. Since then, big automakers with lots of capital, solid supplier bases and seasoned supply chains went to work in rapidly developing and churning out their own electric cars, as consumers and governments pursue eco-friendly, low-emissions transit options. The next electric car, released in 2010, was made by Mitsubishi Motors. According to the Bureau of Transportation Statistics data, the number of hybrids EVs sold in the U.S. didn't break 100,000 until 2005. The bureau doesn't have data on the number of EVs sold until 2011, which was 9,750. Since then, the EV market has exploded. By 2015, 71,044 EVs were sold in the U.S., and 384,404 hybrid EVs.

Between January and September 2017, Tesla led the pack by selling 73,227 EVs, followed by Chinese automaker BYD, selling 69,094.Brian Loh, a partner at McKinsey&Company;, said innovation is at an "all-time high" in the auto industry right now, which is significant because historically, the auto industry is very slow to evolve.

Problems faced by Tesla

Tesla's supply chain is it's Achilles' Heel

Tesla doesn't meet deadlines. Tesla doesn't meet market expectations. Tesla delivers cars riddled with defects. Last fall, Tesla missed Model 3 production goals in Q3 2017 due to supplier issues, and ended up having to redesign a key part of the Model 3. What CEO Elon Musk called "production bottlenecks" continued through Q4 2017, although by then Tesla was no longer blaming suppliers, and told investors in February that the company would produce 5,000 Model 3s a week by the end of Q2 2018. Almost all of these problems can be attributed to lack of funding and the fact that Tesla is still a small company, compared to the rest of the auto industry, and so ramping up production for a new car is much harder for Tesla than it is for landed companies like Ford or General Motors. Tesla's supply chain is still in the development phase, and right now Tesla doesn't have the capital and supplier relationships that other big automakers have. “For better or worse, Tesla makes its own batteries, so it's heavily dependent on its own sources," said Michelle Anderson, a partner with Boston Consulting Group. "If that went down, batteries are heavily commoditized, so there wouldn’t be too much of a hiccup, but there would be some down time. “Because Tesla's supply chain often relies on single source suppliers, one can quickly fit the puzzle pieces together to see how and why Tesla has struggled. According to a Tesla statement provided by CSIMarket, the electric car manufacturer does have more supply chain volatility than other automakers. “While we obtain components from multiple sources whenever possible, similar to other automobile manufacturers, many of the components used in our vehicles are purchased by us from a single source," the statement reads. "To date, we have not qualified alternative sources for most of the single sourced components used in our vehicles and we generally do not maintain long-term agreements with our suppliers. While we believe that we may be able to

establish alternate supply relationships and can obtain or engineer replacement components for our single source components, we may be unable to do so in the short term or at all at prices or costs that are favourable to us. “That’s essentially the story of the company's struggle: Tesla tries to scale high and fast, but gets bogged down by a faulty supply chain.

Tesla suffers from a lack of funding and narrow supplier base

Supply chains are critical to an automaker's success, but the most critical part of the automaker's supply chain is its relationship with suppliers — and that might be where Tesla is weakest. Loh told Supply Chain Dive that in general, the auto industry doesn't single source, and described the average auto supply chain as being far more efficient and effective than Tesla's. “Typically, an OEM will have a

supplier panel or a collection of a few suppliers, anywhere from 2-5 suppliers they source from for that commodity," Loh said. "Oftentimes for a particular vehicle, they might be single sourced on that vehicle, like one supplier would have all of a certain part for a Honda Accord or something like that, but it’s extremely rare for a supplier to be single sourced across an entire commodity for all their vehicles." Then there's the funding problem. Tesla is technically still in the red — the company isn't profitable yet, and many critics use that fact as their main reason for arguing that Tesla isn't worth investment or even worth paying attention to. But when it comes to suppliers, Tesla's lack of funding is a huge issue. For example, Tesla is trying to ramp up production of the Model 3, necessitating a high volume of parts and components from its suppliers. Because of that capital outlay, Tesla might hold off on paying upfront costs for the parts and wait until the car starts selling before paying suppliers. "An OEM may get the best pricing if it uses all the capacity of a supplier," Anderson said. "If an OEM only uses 20% of a supplier’s capacity, it’ll likely cost them more. (The question is) are they willing to use that as a hedge?" That compounds the problem; now Tesla has to produce and sell as many cars as possible in order to pay suppliers and maintain strong supplier relationships. But because Tesla is still learning how to mass produce electric cars — relatively speaking, Tesla is still new to the auto industry — production problems still arise, making it increasingly difficult to sell and deliver quality cars at an efficient rate. "In some cases, a vehicle program might be really big and the

OEM might say, I'm not going to pay the supplier any upfront funding, you need to handle that cost yourself because you'll get a big volume down the road," Loh said. "The other extreme is low volume with very little return (for the supplier) down the road, and the OEM might need to pay for more of the engineering upfront. "While that paints a bleak picture for any start up trying to break into the auto industry, there's some silver lining: if you've got a solid vision and can sell that vision — like Tesla — suppliers just might take a risk on you. "If you have a combination of small budget and low volumes, then it's trickier to get enough interest from a supplier, especially if it's an OEM with cutting edge technology and known for leading the market," Loh said. "Even though the pure economics of the program isn't normal, a supplier might say, the technology might be worth it."

Tesla Deliver's on its promises, just not always on time

For all of the problems Tesla is now experiencing with the Model 3, the company already experienced with the Model S. At this point, most of the wrinkles in Model S production have been ironed out. That may instil some hope in investors, but the fact remains that Tesla still has inroads to make as a trusted automaker. "Tesla is struggling to get to scale and get its model to pay off," Anderson said. "It's a tight margin business. We need innovation, but where tend to see the innovation happening is in the traditional OEMs who have the supplier base to leverage. "What Tesla has proved is that it takes a tremendous amount of funding, grit and hard work, star power and a strong vision in order to succeed in the auto industry and launch a radical new product — especially if you're trying to do both those things at the same time. The fact that Tesla is still around 15 years after its commencement is impressive all by itself. "On one hand, ramping up a car company from scratch is really hard," said Greg Keffer, vice president of marketing at GT Nexus. "There's a lot of basic tackling. An assembly line that produces 10,000 cars a week? That's really hard." Tesla shows how crucial it is for an automaker — or any company, really — to have all the kinks worked out of its supply chain before pursuing such big goals, like skipping the prototype stage and rushing to produce 5,000 cars a week right away, which is how Tesla approached the Model 3. While Tesla can be seen as an inspiration to the industry, it also serves as an example of what happens when you lack capital, sufficient cash flow and an unstable supply chain. But if Tesla can keep investors hooked on its vision of a future filled with electric cars, it may just be a matter of time before it

becomes an industry bedrock. "Once they work out the supply chain issues, watch out," Keffer said. "The big three better be looking over their shoulder."

Conclusion

Although Tesla scores top points in terms of marketing and features, where it lags behind is in terms of delivery. The major reason behind this failure is due to the supply chain problems that tesla faces due to its parts suppliers. To avoid retail delays and problems associated with dealerships, Tesla is moving online, Tesla has started selling its products online in select regions, to make the life of an average consumer easy. Tesla has given other “potential” EV manufacturers are run for its money.

With the future automobile market turning electric, Tesla is 3 steps ahead of every potential EV company. Tesla has set new standards for future electric vehicles, which are yet to arrive in the market. Tesla hires the best experts for its development, there is no shortage of creativity. Tesla has broken beyond the realms of the conventional automobile industry, with new ways of marketing, creating lots of hype even before being released, Tesla would be the No 1 company when the world shifts completely to EVs.

References:

Case study: How Tesla changed the auto industry | Supply Chain Dive

https://caserighted.com/knowledge-management-tesla-motors/

https://www.thecasesolutions.com/knowledge-management-tesla-motors-42960

http://panmore.com/tesla-motors-inc-organizational-structure-characteristics-analysis