Team 3

Capstone Project - Tesla

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Executive Summary

Company Analysis

Tesla was founded in 2003 by Martin Eberhard and Marc Tarpenning with the intention of building an all-electric sports car mostly from components sourced from other companies. Early investor Elon Musk has acted as a force to develop Tesla into a full-fledged automaker while at the same time turning himself into a household name as the CEO of both Tesla and SpaceX. With over 400,000 paid reservations taken, Tesla is on the brink of releasing the Model 3, their first electric vehicle that is affordable to the mass-market. In addition, as of April 2017, they have surpassed GM to have the highest market capitalization of any US automaker (Ferris, 2017).

On the surface, Tesla appears to be a technology company that is disrupting the entrenched auto industry with new technologies and designs. However, much of what they are attempting is akin to the more vertically integrated industries that were more common at the beginning half of the twentieth century. Many corporations have moved away from that level of integration, but as time has gone on, the popular view has been to outsource as many functions as possible. As the company evolved from the initial concept of depending on many outsourced functions to build an electric sports car to an automaker that performs more functions in-house than the established companies currently do.

While attempting to shift the entire auto industry into electric vehicles (EVs), they have reopened the Fremont, California auto plant that was previously run as a joint venture by GM and Toyota. Tesla has also partnered with Panasonic to build the Gigafactory in the desert of Nevada which will allow them to make as many lithium-ion battery cells and packs in a year as the rest of the world combined produced in all of 2013 (Tesla Motors, 2014). Tesla has also recently acquired SolarCity in a stock swap worth approximately $2 billion. According to Tesla "The acquisition of SolarCity will create the world's only integrated sustainable energy company, from energy generation to storage to transportation." Tesla has also made a great effort in building a network of charger stations to support their vehicles.

Now Tesla has direct control over the manufacture of the electric drive train components, the body stamping, and final assembly. Battery cells and packs are made in partnership with Panasonic, but

Tesla has significant control in the arrangement, and has designed their own custom battery chemistries. Once the car is delivered to the customer they have the potential to purchase a SolarCity electrical generation system, which could then charge their car. Since they are rapidly reducing the cost of batteries by having their own factory coming online, the power storage systems; Powerwall and Powerpack will drop in price, eventually coming to the point where a Tesla customer could totally leave the electric grid and depend on Tesla for power for their home as well as transportation. This is a potential arrangement that runs counter to the popular wisdom for many startups. Other recent technology companies such as Uber have succeeded by having as little direct physical interaction with customers as possible. All interactions are done through an app or email, and the drivers are not actually employees or in vehicles owned by the company. The level of direct manufacturing and physical interaction in customer's lives is unusual today.

Despite their popularity and the excitement they have generated in both the public and the financial sector, Tesla is not a company without serious challenges ahead. Other than a few scattered quarters under special circumstances, they have not been profitable throughout their 14-year history. Each of their four models have been released far later than originally promised, and have been produced slower than anticipated. New features and materials have been committed to before fully understanding how they would impact production. Despite having a high level of pride in the work they are performing, employees report being subjected to a difficult, high-pressure work environment. On top of these issues, there is the fact that the success so far has been highly tied to Musk acting as a driving force.

Problem

The main problem with Tesla is that they are so highly dependent on the personality and drive of Musk. He is a highly innovative and charismatic personality and is able to drive employees to pursue radically new ideas and designs. While this has propelled Tesla to the position they are in now, the company must be able to sustain this momentum for years to come. As time goes on, the company will be too large for one person to drive in this way. Many companies, such as Apple, have run into difficulty when their charismatic leader is no longer part of the business. On the other hand, many companies that have been started by similar type of leaders, they that have been able to integrate that creativity and drive into the structure and systems of the company itself. Over half of Tesla's outstanding shares are held by 13 individuals and three investment firms. Elon Musk himself owns 26.5% of the outstanding

shares. (Ausick, 2016). Because of this concentration of ownership, the corporate board has an unbalanced composition of members who were selected by Musk and have a financial background. This does not allow for a diversity of leadership for the company.

The company has a very flat horizontal organization structure that has a many individuals directly reporting to Musk. Although this is an ideal situation for a small company or a start-up, it is difficult to sustain for years, especially as Tesla grows. If something were to happen to Musk, it would have a serious detrimental effect on the company. Even without a mishap, with over 30,000 employees, Tesla is too complex to be driven by a single personality.

In addition to the organization being so dependent on Elon Musk, the entire concept of Tesla's value depends on people's trust in his ability to get the company from the state it is in today to a profitable company producing mass quantities of cars. By many metrics Musk has built a company that is doing the right things to be successful in the long-term. They have already succeeded in building the prestige of an EV from a niche environmental statement to a desirable high performance car. They have released four models and have recently announced the development of an electric pickup truck and semi-truck that will be forthcoming. The stage is set for them to be a large, successful automaker, but at the same time they have spent a lot of money setting up a lot of production capacity. If they are unable to shift to mass production to take advantage of that capacity, then they will be unable to keep up with the financial commitments they have made. In the past they have been known to have issues with being able to meet original release dates for new models. A large part of this is related to Elon Musk's desire to make improvements, even if it means repeating design and engineering work that has already been completed.

Solution

A solution proposed by this report is to add a president position under the CEO, which would allow Musk to primarily focus on Products and Innovation (P&I). In the long-term Tesla's innovation would then be spun off into its own separate company so the current business could focus on manufacturing. The president position could be filled in a relatively short period of time, at which time the business lines of manufacturing and supply chain management could be aligned to report directly to them. The product innovation business units would then be aligned to report directly to the CTO. Although the CTO reports to the president, a dotted line relationship would also have him and his group

reporting to Elon Musk. The CIO, CHRO, and CFO and their business units would all also report directly to the president, and the new business unit of Global Customer Support and Service would be added to the manufacturing division.

Once the president is in place and running most of the manufacturing functions, the process could begin to split the innovation segment of Tesla into its own company that would still directly report to Elon Musk. By separating the two segments of the business, the innovation company would be free to pursue technologies and designs that are on the cutting edge of the industry without risking disruption to the manufacturing operations of Tesla. Even if the company is spun off, since each would have Elon Musk as CEO there would still be extensive cooperation between them. This will be critical so that Tesla does not lose their advantage over the competition by losing their innovative spirit.

Impact of Solution

The impact of this solution, especially spinning off the innovation portion of Tesla would be significant to the future of the company. By adding a president position under the CEO, the operation of the manufacturing portion of the company should become more efficient. Since the president's main responsibilities would be related to manufacturing, they would be able to devote their full focus to that portion of the business. By having a top-level executive completely focused on that part of the business, adaptations to new manufacturing processes and designs will be more organized so that they will not unexpectedly delay new models. As the public comes to expect that Tesla release dates are accurate, they will be able to plan when considering a new vehicle. Possible missed sales due to customers buying another car because they are unwilling to wait for some undetermined future date will decrease. Investors will also take a more favorable view of Tesla if they can trust the commitments Tesla makes will be fulfilled on time. This should make the stock price rise, and make it easier to raise money in the future if needed. The morale of manufacturing employees will increase as well since they will not be the ones who are delaying the progress of the company, even if it was not only their fault.

Elon Musk is already involved with SpaceX, SolarCity, Hyperloop, as well as many other smaller projects. As time goes on, he will only become more spread out in his pursuits, so Tesla will not be able to depend on his personal drive to continue to succeed. When the solution is implemented, Musk and other innovative executives will be able to get involved with endeavors that may lead to increased synergies between the companies.

Finally, as Tesla becomes more established, the need to innovate radically will decrease over time. There is already a team of engineers and other employees who have been able to work together on making EVs that are unlike anything other automakers have been able to create. Once these individuals are no longer used to their full potential, there is a risk that they will begin to move on to other opportunities. By spinning off Tesla Innovation into its own company, they will be able to continue to make use of the people they have now in new ways. They may end up working on projects that don't involve cars at all, but the team's unique skills may be able to come up with the best solution for other problems.

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Company Background

Tesla was founded in 2003 by Martin Eberhard and Marc Tarpenning with the intention of building an all-electric sports car based on electric drivetrain technology from AC Propulsion and put into a Lotus Elise body. As time went on, the Tesla Roadster evolved by having more components and systems custom made by Tesla. At the same time, early investor Elon Musk's role grew gradually and he became Tesla's CEO. Today Elon Musk's role highly linked in the public's mind to the company. Although the company took orders from high-profile celebrities in 2006 to generate publicity for the new company, the company did not actually ship a car until 2008 (Baer, 2014). Tesla found the manufacturing process a much more difficult process than they originally believed, but this process had the result of pushing Tesla into becoming a full-fledged automaker. This process culminated into their first fully in-house model, the Model S, which was introduced in 2012. The Model X quickly followed in 2015. Tesla purchased SolarCity in 2016, another company Elon Musk is heavily invested in. Tesla is also building the Gigafactory, a very large battery cell and pack factory in Nevada along with their battery partner Panasonic. Through all of this, Tesla has only been profitable for a few scattered quarters under special circumstances. They now approach the release of the Model 3, another all-electric vehicle that is priced much lower than their previous models. The future success of Tesla hinges on their ability to make enough money with a mass-market car so that they can recoup the capital expenditure they incurred with dramatically increasing their manufacturing capacity.

Vision and Mission

According to the Tesla website, "Tesla's mission is to accelerate the world's transition to sustainable energy". Since the founding of the company, they have focused entirely on building fully-electric cars, rather than hybrids as an interim technology like other manufacturers have done. Tesla recently acquired SolarCity in a stock swap worth approximately $2 billion (The Tesla Team, 2016). According to Tesla "The acquisition of SolarCity will create the world's only integrated sustainable energy company, from energy generation to storage to transportation." Tesla has also made a great effort in building a network of charger stations to support their vehicles.

Tesla has not been shy about advertising their vision and mission. Tesla has published a Part 1 and a Part 2 of what they call their "Master Plan." (Musk, 2006). Combined, this plan states the following:

1. Create a low volume sportscar, which would necessarily be expensive
2. Use that money to develop a medium volume car at a lower price
3. Use *that* money to create an affordable, high volume car
4. Provide solar power
5. Create stunning solar roofs with seamlessly integrated battery storage
6. Expand the electric vehicle product line to address all major segments
7. Develop a self-driving capability that is 10x safer than manual via massive fleet learning
8. Enable your car to make money for you when you aren't using it

Goals, Objectives, and Strategies

The goals of Tesla have expanded greatly since 2003, when the company was founded. In the most recent quarterly report, Tesla stated that their goal is to produce 500,000 cars a year in their factory by 2018 (Tesla, Form 10-Q, 2016). In addition to this level of auto production, they are building what they call the Gigafactory in Nevada which will produce enough batteries to total 35 gigawatt-hours of storage capacity annually.

Business Model

New technologies are prohibitively expensive before production is optimized and efficiencies of scale can be taken advantage of. Tesla is purposely entering the market with high performance models so they can sell to early adopters who are willing to pay extra to have the newest technology When the EV technology is perfected in these models, then they can more effectively move to mass-market models. This strategy was outlined in Tesla's "Master Plan" as listed above.

By expanding their goals to include all forms of sustainable energy, Tesla has become a much more complex company. Tesla plans to enter the market of more affordable mass-market cars by ramping up Model 3 production in 2017. Approximately 400,000 Model 3 cars have been pre-ordered,

which represents an entire year's worth of production. To scale up production at Tesla's Fremont, California plant, they acquired the German automation company Grohmann Engineering to increase automation in their production process (Golson J. , 2016).

As a new market trend, Musk is also pushing Tesla's ventures into self-driving car technology. Current Tesla cars, include hardware that will enable them to be fully self-driving once the software exists to allow them to do so. Over-the-air software updates upgrade the car with this new software and increase the number of functions they can perform autonomously as the technology develops. There is a plan for a self-driving Tesla to drive itself from Los Angeles to New York City by the end of 2017 as a demonstration (Muoio, 2016).

Tesla said it expects SolarCity to increase their revenue by over $1 billion in 2017. This will net Tesla over 500 million in cash over the next three years. Tesla's first major solar product post-merger will be its solar roof. By printing the tiles using a process called hydrographic coloring, the solar panels will better match the appearance of a traditional roof. The Tesla division that is currently developing the solar roof is also developing glass that include heating elements to keep the panels clear of snow. It is also possible that future car models will feature a solar roof using the same technology which will allow the vehicles to recharge while they are away from a charger. A Tesla and Panasonic joint venture in Buffalo, New York will produce solar photovoltaic (PV) cells for SolarCity. These cells will be used for both the solar roof and traditional solar panels. Production of the PV modules is scheduled to start in summer 2017, and will increase to 1 Gigawatt of modules being manufactured by 2019 (Muoio, 2016).

Their new Powerwall 2 battery pack will cost $5,500 and stores 14 kWh of energy. This is double the capacity of the Powerwall 1 that came before it. The inverter is also included with the $5,500 price, which was not the true with the Powerwall 2. Tesla will sell Powerwall 2 in its vehicle showroom locations, allowing them to take advantage of the geographic coverage of their existing retail, and giving them the opportunity to sell the entire generation, charging, and mobility package at one time (Muoio, 2016). In addition, the Powerpack 2 is their battery pack offering to the commercial sector.

Engineering

Within the Tesla organization, engineering can be divided into the three main product lines; vehicles, energy storage, and solar energy systems.

1. Vehicles

"Tesla Motors' core competencies are powertrain engineering, vehicle engineering, innovative manufacturing and energy storage" (Tesla Motors, Inc., 2015). This is a far cry from when the company began. Then, vehicle engineering was a much simpler engineering task, with the chassis and body coming from Lotus and drivetrain technology from AC Propulsion. During the development of the Roadster, Tesla began its journey to a full-fledged automaker, with the engineering required to support this level of manufacturing.

Although the day-to-day workings of the engineering team are held secret, it is known that Tesla prefers to hire younger engineers who may be less experienced, but are more enthusiastic and less expensive. As a trade-off, they may have had a steeper learning curve compared to if they had enticed experienced automotive engineers from other companies. The leadership of Elon Musk pushing them to continue despite their setbacks was key to their success in completing the Roadster, as well as introducing the Model S and Model X.

2. Energy Storage

From an engineering standpoint, improving the electric vehicles (EV) battery pack is a clever solution to an EV's largest cost. In an EV, space and weight are at a premium, so batteries must be as energy dense as possible. In a home energy storage application, both of these restrictions are greatly eased. By developing stationary energy storage, the engineers have helped give older batteries that are too low in capacity for an EV another use

3. Solar Systems

When Tesla added the Powerwall to its portfolio it first did not seem like it matched with its main product. As time has passed, the business reason for this has been made apparent. Now in light of their acquisition of Solar City, their business is electric power from solar generation, to storage, to use in a vehicle. In addition, it is an additional market for the battery cells they are producing in partnership with Panasonic at the Gigafactory.

<u>Research and Development</u>

To differentiate itself from conventional automakers, Tesla Motors has successfully established an image as a leading, cutting-edge, innovative company. From its founding, Tesla has had engineers in key leadership positions, and is currently run by Elon Musk who has overarching goals of developing

technologies that will ensure the long-term survival of the human race. To sustain this industrial high mark, the main function of Tesla Motors Research and Development serves a central role in pioneering new products that increase buyer value.

Research and development (R&D) expenses as a percentage of a company's total revenue is a good metric to gain insight into a company's research and engineering strategy. R&D consists of items such as salaries of employees in engineering and research, supply chain, quality control, as well as manufacturing and engineering. In addition to salaries R&D includes the cost of prototypes, contracted services and equipment. Most of these areas do not directly add to the company's bottom line, and it may take several years before the benefits are realized. By this metric, Tesla is outperforming traditional automakers by a multiple of 2.7 – 4.6.

Figure 1 - Tesla's R&D Intensity vs. Other Automakers (Pressman, Culture of Innovation: Tesla has triple the R&D of traditional automakers, 2016)

In most traditional companies, intellectual property is carefully guarded and fiercely defended. Despite its large investments in new technology, Tesla has made some unique decisions to work with competitors, and to allow them to have access to their patents. One major initiative was to sell their electric drive powertrains to other automakers for them to use in their EVs. Examples of this include selling Daimler their Smart Fortwo and to Toyota for their RAV 4 EV. By cooperating, Tesla was able to sell powertrains that they had capacity to build beyond the number they needed for their own car

models. Since Tesla has not yet turned a profit, these additional sales would be a great benefit to keep their production busy while their own models increased in popularity.

On the supply side, Tesla has built partnerships with their vendors, most notably with Panasonic, the supplier of their Lithium Ion battery cells. While many companies are willing to make partnerships with their suppliers, this arrangement goes beyond normal pricing and supply terms. The two companies have worked together to develop new battery chemistries for the Li-Ion cells. They are also working together to make batteries at the new Gigafactory in Nevada. Many companies strive to reduce dependence on a specific supplier in order to not have their material supply disrupted due to circumstances beyond their control. This independence is often at the expense of having to settle for products and materials that are standard in the industry. By closely partnering with Panasonic, Tesla has made the choice to be dependent on them, but they are able to combine their R&D efforts with them in order to make battery chemistries that are unavailable to other EV makers.

Human Resources

Since Tesla is experiencing fast-paced growth, their human resource department must also be capable of filling positions quickly. Tesla must set its compensation at a level that is competitive with other companies in both the automotive and tech space so they can attract the best workers. This has been especially critical in the past years as the best technical workers have become scarce and companies are forced to compete on salary and benefits. Also, Tesla works to improve the quality and effectiveness of their workers by allowing them to undergo continued training, especially in leadership. For example, they have put into place internal leadership development programs that are meant to strengthen the structure as a whole. (Meyer, 2017)

As an important role to create and support the rapid growing innovation company, HR plays key roles to create and support Tesla's unique organizational culture. Generally speaking, its culture includes six main features:

Hire Problem Solvers: There aren't many employees at Tesla who have worked at other auto companies. They are selected for their ability to solve problems, especially when they don't have all the information at hand. Interviews include questioning what problems the applicant has already solved, and getting into specific detail on how they did it.

Reward Innovation: The Tesla bonus system and promotions are determined using a 1 – 5 scale. According to Elon Musk, "You don't get the two highest ratings, unless you have done something innovative. It has to be significant in the case of phenomenal, something that makes the company better or the product better."

Do the Impossible: Many components of the cars, plus systems in the company have been built from scratch by in-house teams where most other companies would not attempt to take on those types of projects themselves. When Musk hired Jay Vijayan as CIO, he was tasked with rebuilding all of the software used to run Tesla in three months with a budget a fraction of that normally needed for a company that size. Although he doubted if it was possible, he was able to complete the job in four months. It has needed improvements along the way, but it gives them a level of information and control that would not have been possible otherwise.

Stay Flexible: Tesla's cars are able to be updated over-the-air as the factory makes improvements. The internal organization is also set up so that mistakes can be learned from, and changes be made quickly. While other car makes are reluctant to change the setup of their factory floor, Tesla's production areas are in a constant state of change and improvement.

Move Fast: Employees are put into small teams that allow them to communicate and work quickly as they work through the challenges of building their cars. When different groups need to work together, they are put together rather than having to communicate through a large organizational structure. The Model S was designed with 3 designers rather than the traditional 10 – 12 who worked directly with the engineers. By eliminating the difficulties in communication they are able to not only work faster, but come up with a better finished product.

Complete Dedication: Although in many ways Tesla seems to be a good place to work because of the high quality of products they are building, and the reported sense that they are doing something significant. This comes at a cost of a required high dedication of time and energy to the job. Musk has been known to look down on employees complaints that they are not able to spend time with their families. It may be possible to keep up this pace while Tesla is growing and the work is exciting and new, but this may prove difficult to maintain as years go on. (Dyer, Gregersen, & Furr, 2015)

Organization

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Tesla Motors, has the persona of an innovative company in the Silicon Valley. Tesla operates with a horizontal organization structure. A horizontal organizational structure seems to be the preferred structure that most start-up companies choose. In this flat organization, there are few levels of middle management between staff and executives. This specific structure provides the large distribution of function units on the same level but it creates open talking relationship between the employees and the senior management level. That is also the reason that start-up companies can look forward to ideas bubbling of from baseline that could easily rise up to the executive level.

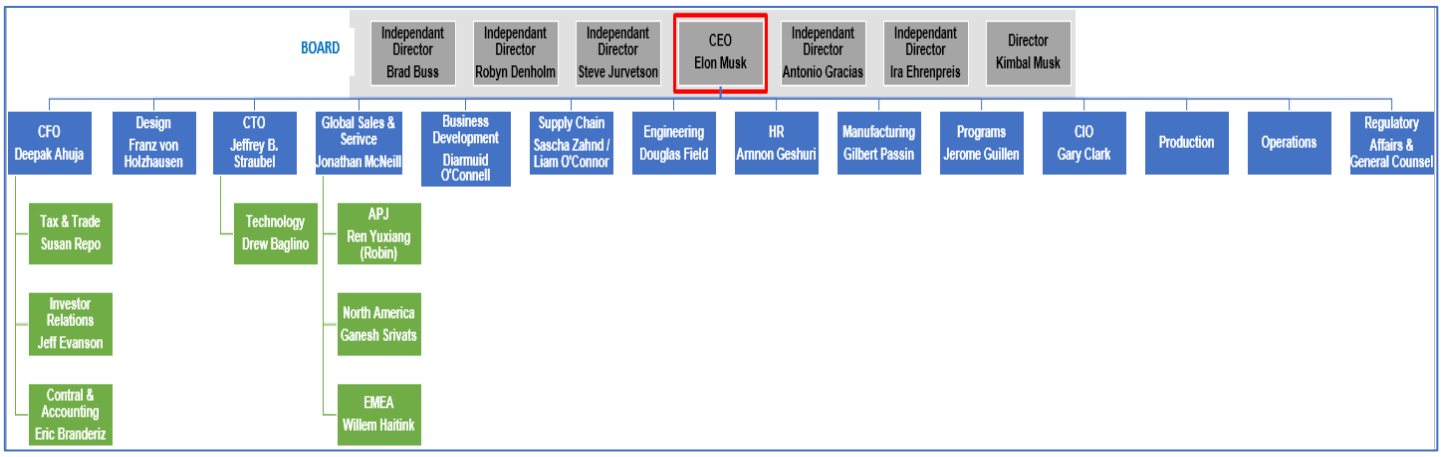


Figure 2 - Tesla Motors Organizational Chart

The company CEO, Elon Musk, directly leads all functional presidents and officers who are in charge of the domestic and international operations. As illustrated in Figure 2 above, Musk's direct reports consist of Chief Financial Officer Deepak Ahuja (Tesla announced on its earnings call that CFO Jason Wheeler decided to resign in April 2017), Chief Technology Officer JB Straubel, Global Sales and Services President Jon McNeill, Chief Designer Executive Franz von Holzhausen, Business Development Sr. Vice President Diarmuid O'Connell, Chief Information Officer Gary Clark, Engineering Sr. Vice President Douglas Field, Manufacturing Vice President Gilbert Passin, Programs Vice President Jarome Guillen, Global Supply Chain Management Vice Presidents Sascha Zahnd and Liam O'Connor, Human Resource Vice President Arnnon Geshuri, VP of Regulatory Affairs & General Counsel, VP of Productions, as well as VP of Operations. Below these tier 1 managers, Tesla has their own regional leads for each function group.

Therefore, the CEO of the company has a large group of direct reports, which is Tesla's most significant characteristic in its corporate structure. Global Hierarchy feature is typically observed in the

organizational structures, where the company aims to maintain strict control of their operations by the highest executive level. This means that Elon Musk has tremendous power and influence over all aspects of the company operations. With this global centralization hierarchy, the head of each office of the global hierarchy form Tesla's central headquarters, which directly controls all operations.

Marketing

The two methods to analyze Tesla's marketing strategy is to identify the customer segmentation and to review the marketing mix.

Customer segmentation is a concept that allows companies to categorize their customers into groups with similar characteristics such as geographic, demographic, behavioral, and psychographic. Tesla has segmented the market into several different groups. Based on how they wanted to grow the company, they specifically targeted each group with a different product offering. In fact, Elon Musk outlines their "Master Plan" on the Tesla website. (Musk, Master Plan, Part Deux, 2016)

1. Create a low volume sportscar, which would necessarily be expensive
2. Use that money to develop a medium volume car at a lower price
3. Use *that* money to create an affordable, high volume car
4. Provide solar power
5. Create stunning solar roofs with seamlessly integrated battery storage
6. Expand the electric vehicle product line to address all major segments
7. Develop a self-driving capability that is 10x safer than manual via massive fleet learning
8. Enable your car to make money for you when you aren't using it

Marketing Mix is typically defined through the use of the "4 P's of marketing: Price, Product, Promotion, and Place"(The Marketing Mix, n.d.). By utilizing marketing mix a company can ensure that they are introducing the correct product to the correct person at the right price and time. By defining the 4 P's a company can develop and execute an effective marketing campaign. The marketing mix "has been proven as a major factor in the success of a product once it is well understood and used." (The Marketing Mix, n.d.) The marketing mix is comprised of four interdependent components that must

work together and be aligned. The customer is the central focus of the marketing mix. It is important that the company builds the four components sot that they lead to a satisfied and loyal customer.

1. The **product** component means that Tesla should build an electric vehicle that meets their customer's demands or they should make their electric vehicles so compelling that their customers believe that they need it. This component defines what product is being sold and what differentiates Tesla's product from their competitors.

2. The **price** component is where Tesla determines what their customers will pay for an electric vehicle. The price will be dependent on the manufacturing costs, other indirect expenses, the perceived value by the customers, and the price of Tesla's competition. For the purposes of this analysis, the Model S, Model X and the unreleased Model 3 will be evaluated. The price for a Model S can vary quite a bit depending on which packages are chosen. The cost ranges from $83,200 to $163,100. The price for a Model X can also vary quite a bit depending on the vehicles configuration; with a base price of $101,250 to $165,000. The pricing information for the Model 3 has not been fully released. At this point Tesla has revealed that the pricing starts at $35,000.

3. The **promotion** component refers to the amount of effort Tesla puts into advertising, promotions, and public relations. This component helps provide the rationale for the price of electric vehicles to Tesla's customers. Tesla has a unique approach to the promotion component compared to other car manufacturers. Tesla does not rely on the common media advertising or the dealership business model. Instead, Tesla focuses on viral marketing, a strong online social media presence, and direct sales. Their primary target audience has an income greater than $100,000, is a car enthusiast, interested in technology, and environmentally concerned.

4. The **place** component defines where the electric vehicles are sold and how they are delivered to the market. Tesla does not use a dealership network like the other automobile manufacturers. Instead they utilize their own direct sales stores that are located in high traffic areas. By cutting out the middlemen in the sales process, Tesla believes it can reduce costs and control the quality of the sales process.

Like everything within their business, Tesla approaches their marketing strategy uniquely. One of the most interesting aspects of Tesla is their ability to innovate and create new technologies. This innovative concept permeates the entire company, including the marketing strategy. Tesla has very deliberately and accurately followed their Master Plan that they published with regards to market segmentation. Tesla has chosen their products very intentionally so that they can cover their specific target audience. Tesla has priced their early products to be relatively exclusive knowing that they would eventually be able to build a car that was more moderately priced. By focusing on direct sales and social medial viral marketing, Tesla appeals to the specific audience that they intend to target.

Tesla's engineering team is made up of many younger engineers who may be less experienced than other automakers, but have a level of enthusiasm that is higher than those at other companies. In addition to the engineering, the research and development group has made great strides in developing new battery technologies, and in building strategic partnerships with vendors as well as competitors. These efforts by the engineering and R&D teams have made Tesla a company that is known for careful and innovative designs. If Tesla decides to have a stronger emphasis on profits the R&D and engineering efforts would likely be reduced. However, engineering excellence should remain one of the defining aspects of the Tesla brand.

Tesla is operating with the global centralization hierarchy, the decision making is made from top to bottom, which is not in line with their flat organizational strategy. The company is also growing to a critical size, the simple flat organization structure does not work as efficiently as previously. Considering this factor, the executive team should consider altering the structure for further organizational growth. For the future, Tesla's strcutre can remain generally streamlined while still getting away from a completely flat organizational structure.

Tesla's innovative six point HR strategy has served the company well and should continue to help their employees to achieve their personal goals along with achieving Tesla's goals.

Tesla has bucked the popular concept of marketing their electric vehicles through the dealership model. Tesla has successfully figured out a way to sell directly to their customers and deliver their products through company owned stores. This allows Tesla to reduce costs and control the selling process by cutting out the middleman. However in order to capture a greater market share Tesla may need to reassess the use of conventional marketing practices.

Company Performance

The key financial data for Tesla Corporation includes the Liquidity Ratios, Operational Efficiency Ratios, Financial Leverage Ratios, Profitability Ratios, and Dividend Policy Ratios. Each of these ratios provide insight into the financial health of a company. The data used in this analysis was taken from the 2015 SEC filings for each of the companies, as well as nasdaq.com.

Liquidity Ratios

Liquidity Ratios provide an indication of company's ability to pay its short-term debts and the margin of safety under which the company operates with regard its financial obligations. The key liquidity metrics are the Current Ratio, Quick Ratio, and the Cash Ratio.

The table below provides a comparison of the Liquidity Ratios for Tesla and some of its competitors.

Table 1 – Key Liquidity Ratios

Key Liquidity Ratios	Ford	GM	Honda	TSLA	Toyota	Peer Median	Best in Class
Current Ratio	120%	89%	114%	107%	113%	113%	120%
Quick Ratio	110%	73%	90%	72%	100%	90%	110%
Cash Ratio	43%	29%	32%	60%	34%	34%	60%

It is informative to note that Tesla's ratios are within one standard deviation from the mean of the Current Ratio and the Quick Ratio and is in the strongest position for the Cash Ratio. This data shows that Tesla is solvent and is in a good position to quickly settle its financial obligations.

Operational Efficiency Ratios

The Operational Efficiency Ratios provide insight into the asset management at the company. These ratios are often referred to as "asset turnover or asset management ratios". (UK Essays, n.d.)

Table 2 - Operational Efficiency Ratios

Operational Efficiency Ratios	Ford	GM	Honda	TSLA	Toyota	Peer Median	Best in Class
Turnover	0.39	8.44	2.64	23.95	1.95	2.64	23.95
Debtor Days	929	43	138	15	187	138	15
Payables Turnover	1.757	7.801	11.434	0.021	27.303	6.119	27.303
Creditor Days	207.71	46.79	31.92	17376.53	13.37	59.65	13.37
Inventory Turnover	4.28213	11.06917	8.83534	3.16631	13.29099	8.83534	13.29099
Inventory Days	85.24	32.97	41.31	115.28	27.46	41.31	27.46

The creditor days ratio is skewed because Tesla has a very low (by comparison) cost of sales. Tesla also does well in collecting on debts owed to the company. Tesla has some problems with inventory turnover. Tesla is the slowest of all of its competitors and more than 2 standard deviations from the mean.

Financial Leverage Ratios

The Financial Leverage Ratios are used to examine a company's long term solvency. Each ratio offers insight into the ability of a company to pay its future debts. The table below shows a comparison of Tesla's Financial Leverage Ratios to it peers.

Table 3 - Financial Leverage Ratios

Financial Leverage Ratios	Ford	GM	Honda	TSLA	Toyota	Peer Median	Best in Class
Debt Ratio	0.602	0.251	0.625	0.428	0.386	0.428	0.251
Debt-to-Equity Ratio	4.724	0.485	0.533	3.179	1.092	1.092	0.485
Interest Coverage	4.18	60.75	679.36	69.29	24.53	60.75	679.36

The data in the table shows Tesla doing well in comparison with its peers in Financial Leverage Ratios. There are no apparent issues with Tesla and the amount of leverage it had accrued at the end of 2015.

Profitability Ratios

The Profitability Ratios provide an assessment of a company's ability to generate profit from its assets. (UK Essays, n.d.) Improvement in these ratios over a previous period or relative to the companies peers is an indication that a company is doing well. The following table shows a comparison of these Profitability Ratios between Tesla and its peers.

Table 4 - Profitability Ratios

Profitability Ratios	Ford	GM	Honda	TSLA	Toyota	Peer Median	Best in Class
Gross Profit Margin	-2.482	0.158	0.904	0.995	0.245	0.245	0.995
Net Profit Margin	0.207	0.063	0.000	-0.220	0.081	0.063	0.207
Return on Assets	0.033	0.123	0.000	-0.110	0.049	0.033	0.123
Return on Equity	0.257	0.238	0.000	-0.816	0.138	0.138	0.257

According to the data, it appears that Tesla has a serious problem generating a profit. Even though Tesla is generating a greater amount of money relative to the cost of its products; the cost of operations and taxes and other liabilities create a negative net profit. This is an area that Tesla needs to address. The negative profit of course leads to a negative ROA and ROE. One caveat is that even though Tesla has not shown a profit, the stock price has increased steadily which attracts equity holders and could allow them to realize earnings through stock sales.

Dividend Policy Ratios

The Dividend Policy Rations relate to the amount of dividends that are paid to stockholders. These ratios may not be indicative of the health of a company since the amount paid is sometimes thought to be irrelevant since some entities rely on dividends as a source of income and could move to different stocks if the dividends are not paid. Taken in conjunction with the other financial ratios, the dividend policy ratios can indicate the level of reinvestment the company is making. The table below shows a comparison of Dividend Policy Ratios between Tesla and its peers.

Table 5 - Dividend Policy Ratios

Dividend Policy Ratios	Ford	GM	Honda	TSLA	Toyota	Peer Median	Best in Class
Dividend Yield	0.037	0.037	0.023	0.000	0.013	0.023	0.037
Payout Ratio	0.323	0.226	0.313	0.000	1.500	0.313	1.500

Tesla has not given a dividend which does not negatively reflect on Tesla. Tesla is growing in a relatively new field and therefore it is somewhat expected that earnings would be reinvested back into the company.

Tesla was operating on a solid footing in 2015. The loses they incurred can be attributed to their growth and investment. Based on their financial ration, it appears that Tesla is improving in some areas. However, subsequent investments have taken their toll on the company's profitability. Telsa's future rests on their ability to produce and sell their Model 3 in a cost effective, and profitable manner.

Management Characteristics

The management style of Tesla is overwhelmingly dominated by the personality of Elon Musk. Although he was not involved with Tesla from the very start of the company, he has been a major investor from almost the beginning. He has also provided Tesla's strategic direction and has been the driving force for each critical decision. By including new features such as large touchscreens, autopilot, and over-the-air updates, a Tesla car is similar to a tech product such a smartphone.

Analysis of the Internal Environment - Strength Weaknesses Opportunities and Threats (SWOT)

A SWOT Analysis is divided into four components, Strengths, Weaknesses, Opportunities, and Threats. The SWOT Analysis allows a company to find opportunities that they should pursue and prepare for threats that they had not considered previously. A summary of the SWOT Analysis is shown below.

<u>Weaknesses</u>

- 70% of employees reported that their job is "fairly" or "extremely stressful" (Autoblog, 2016).
- Tesla has only had two profitable quarters in its history so far (Higgins, 2016).

- Workers at the Fremont plant have expressed a desire to join the UAW union recently (Hull, 2017).
- Tesla's longest range is still just over 300 miles on a full charge. This is less, but not dramatically less than a comparable car on a full tank of gas.

Opportunities

- Concern for environmental impact is high despite recent low oil prices, and customers are willing to consider purchasing an electric vehicle.
- Tesla's is positioned to develop the technologies to transition many power applications to sustainable energy through not only more affordable electric vehicles, but also to solar energy generation and on-site power storage. At its newly built and running Gigafactory, Tesla and Panasonic have begun mass production of lithium-ion battery cells, which will be used in Tesla's energy storage products and the Model 3.
- The acquisition of SolarCity, vertically integrates energy production using PV panels, and the EVs that will be charged from them.
- The price of oil is much more volatile than the price of electricity, so although oil is inexpensive now, it can potentially jump in price at any time.
- The market penetration of home solar panels was forecast to grow at a fast pace, with residential installations already at 1.1 million homes (Fischer & Mountz, 2016).

Threats

- Oil prices continue to be low, which diminishes the economic advantage of an electric vehicle.
- A significant threat is competition from other established automobile manufacturers such as Chevy and Nissan.
- The other threat would be potential disruptions in Tesla's supply chain.
- The Trump Administration has taken a notably anti-environment stance, and will likely work to eliminate incentives for electric vehicles and solar panels.

Strengths

- CEO, Elon Musk, who is ambitious about growing Tesla into a large player in the auto and clean energy industries.
- 89% of employees reported that they feel the work they do makes the world a better place (Autoblog, 2016).
- Tesla has the capability to do much of their production in-house, and they are adding additional capabilities to do more in the future.
- Within the past two years, Model S vehicle sales have grown about 50% annually. Meanwhile, Tesla successfully launched a dual motor all-wheel drive version of the Model S.

Analysis of the Internal Environment – Value Chain Analysis

A Value Chain Analysis is used to determine the ways in which Tesla creates value for their customers. Tesla is primarily a manufacturer since they take raw material and create a product. The value chain analysis looks at the various activities and processes that convert the inputs for a product into an output that has value. A summary of the value chain analysis is shown below. There are a couple steps involved in the Value Chain Analysis. The first step is to separate the activities between primary and secondary and then the second step is to identify the activities that are critical to customer satisfaction and market success

Primary Activities are the activities that are directly involved in the creation of a product. In Tesla's case, primary activities include (Mind Tools Editorial Team, n.d.):

a) Inbound logistics – this activity involves receiving, storing, and transporting the raw materials that Tesla needs to build their products.

b) Operations – this activity includes all of the activities that Tesla goes through to create their products, such as the assembly lines.

c) Outbound logistics – this activity includes the distribution methods and networks that Tesla utilizes to get their products to their customers.

d) Sales and Marketing – this activity includes the methods that Tesla uses to convince their customers to buy their products.

e) Service – this activity includes the systems that Tesla uses to maintain and support their products after the products have been purchased.

Support Activities are the activities that provide support to the primary activities. Support activities are not actively involved in the creation of value, but are the activities that allow the primary activities to work correctly. In Tesla's case, the support activities are (Mind Tools Editorial Team, n.d.):

a) Procurement – this activity includes the processes that Tesla goes through to purchase the raw materials it uses to create its products. This activity includes the actual purchasing process, vendor selection, and price negotiation.

b) Human Resource management – this activity involves the hiring, training, and retaining of personnel that Tesla needs to build their products.

c) Technological development – this activity includes maintaining Tesla's current technology as well as the research and development for improving their current products and developing new products.

d) Internal Systems – this activity includes all of the back office support that a corporation needs to function, such as accounting, safety, legal, and general management.

<u>Separate Tesla's Operations into Primary and Support Activities</u>

Tesla's core business is the manufacturing of their electric vehicles. Because of this, there is a relatively distinct delineation between their primary and support activities.

1. Primary Activities

a) Inbound Logistics: One thing that sets Tesla apart is that they manufacture and keep the key components in house. This allows them to control the delivery of the components and closely monitor the quality.

b) Operations: Tesla owns and operates their own manufacturing facility in Fremont, California. They purchased the facility in 2010 and have continued to improve it over the last 7 years, with major renovations in 2010 and 2014.

c) Outbound Logistics: Tesla distributes their electric cars directly to consumers rather than use the typical dealership model that other car companies use. This unique approach allows Tesla to regulate the process, ensure the quality, and avoid paying a "middle man."

d) Marketing & Sales: Tesla does not spend money on marketing and sales like a typical automobile manufacturer. In fact they spend $0 on marketing (Gray, 2016).

e) Service: In addition to owning their own showrooms, Tesla also owns their own service centers.

2. Support Activities

a) Procurement: Tesla manufactures key components in house which allows them to control the costs and quality as well as the schedule. For the outsourced components, Tesla forms strategic partnerships.

b) Human Resource Management: By certain metrics Tesla is not considered a great company to work for. Per PayScale, Tesla is known for providing a lot of meaning, a lot of stress, and not very much pay (Autoblog, 2016).

c) Elon Musk acknowledges that Tesla is challenging to work for. According to one of his Twitter posts, "SpaceX & Tesla comp[ensation] is same or better than other companies. Big diff[erence] is that we don't outsource manufacturing, retail sales, or service." (Musk, @elonmusk, 2016)

d) Technological Development: Technological development is one of Tesla's most important activities. Tesla is constantly innovating and creating which is one of the driving forces for what draws customers to Tesla.

e) Internal Systems: The organization chart for Tesla is extremely horizontal. Elon Musk is at the top of the org chart with a 10 managers reporting directly to him. These 10 managers are responsible for 20 departments (Tesla, 2017).

Identify the Activities Critical to Customer Satisfaction and Market Success

Tesla's most important activities are the technological development and the marketing and sales. These two activities are inter-related. Another aspect that is important to Tesla's success is their focus on keeping as many activities in-house as possible.

Industry Analysis

There are two different perspectives that can be utilized while analyzing a company, the external environment and the internal environment. The external environment refers to any forces that are outside the company's control. These forces include the economy, government, competitors, and more. The two methods of analysis of the external environment that this report utilizes are the PEST analysis and Porter's 5 Forces Model.

Analysis of the External Environment - Political, Economic, Social, and Technological (PEST)

A PEST analysis is used to evaluate the current and future Political, Economic, Social, and Technological factors, and to determine the possible consequences and impacts to a company or corporate entity. The PEST analyzes the various macro factors that a corporation should take into account when making strategic and corporate decisions. A summarized version of the PEST Analysis is included below.

Political factors

1. Taxation policy

Tesla's products have benefitted from a variety of government tax incentives both in the United States and abroad. This includes a $7,500 tax incentive in the US, along with incentives in Canada, and virtually all European nations.

2. Regulations

Electric vehicles (EV) are subject to all of the rules and regulations that other motor vehicles are subject to. Recent development in autonomous, or in the case of Tesla, auto-piloted vehicles have necessitated standards for vehicle-to-vehicle communications and security from cyber intrusions.

3. Governmental stability

Tesla operates and is manufactured in countries that have long-term stable governments.

4. Unemployment policy

In the United States, where Tesla has centered its manufacturing operations there are standard percentages for the employer's portion of unemployment insurance, the individual states set these rates.

5. Levels of corruption

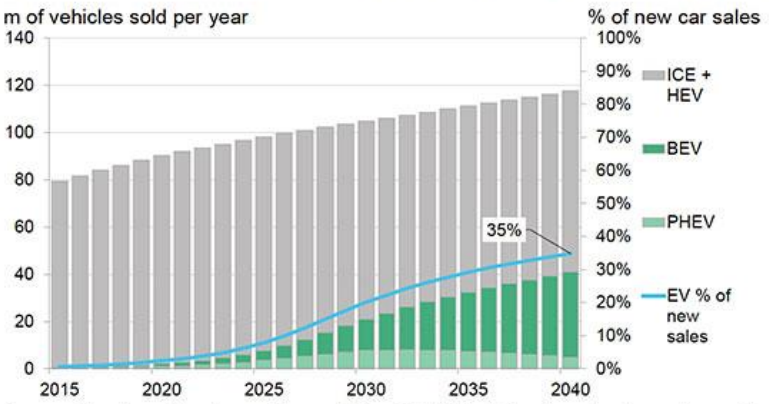
Tesla's operations are concentrated in the US, Europe, and Asia where corruption is not seen to be a significant factor in Tesla's operations.

Economic Factors

1. Stage of business cycle

Tesla's initial sales occurred during the worst worldwide recession in modern times. Since then, Tesla sales have increased steadily, even though there are signs of a new economic slowdown. The all-electric vehicle market however, is still very much on an upward trajectory. As the chart below shows sales are expected to increase to greater than 30% of the overall market by 2040.

Figure 1: Global LDV and EV yearly sales, 2015 – 2040 (m vehicles sold per year, %)



Source: Bloomberg New Energy Finance Note: ICE+HEV = internal combustion engine and hybrid vehicles, BEV = battery electric vehicles, PHEV = plug-in hybrid electric vehicles.

Figure 3: Global Electric Vehicle yearly sales

2. Inflation

The U.S. inflation rate has remained mostly stable at below 3%, and is expected to stay low for the near future (US Inflation Rate, 2017). The low inflation rates will have a positive effect on Tesla's sales as they release their lower priced models.

3. Labor costs

During 2016, labor costs have risen at a rate of 2.2 percent. This represents normal growth and should not pose a challenge to Tesla's future growth.

4. Impact of globalization

Tesla has worldwide operations and has sales and service centers throughout North America, China, Southeast Asia, Western Europe, and Australia.

5. Likely changes in economic environment

Low inflation rates and stable labor costs along with increased demand should provide favorable conditions for Tesla's growth. Recent political changes in the United States could however produce trade barriers that could negatively affect Tesla's foreign sales.

Social Factors

1. Increasing focus on reduced carbon

Society is placing greater value on reducing the environmental impact petroleum burning vehicles have. According to Bloomberg, "the sale of electric vehicles will hit 41 million by 2040, representing 35% of new light duty vehicle sales. This would be almost 90 times the equivalent figure for 2015" (MacDonald, 2016).

2. Increasing preference for utilizing green energy

In addition to society wanting to reduce carbon emissions, society is starting to intentionally seek out products that utilize green energy. According to a study performed by University of Berkeley, the public is willing to pay a premium for energy that provides a reduction in air emissions. (Murakami, Ida, Tanaka, & Friedman, 2014).

3. Income Distribution

In the markets that Tesla focuses on, the income distribution is skewed towards the older generations. These generations have the necessary disposable income to pay the upfront premium to purchase an electric vehicle. Since income distribution is skewed towards the population that is interested in electric vehicles and has the disposable income available, this will be a benefit to Tesla. The market that they are primarily selling to is increasing which should mean their revenues will similarly increase.

4. Society's attitude

Society tends to judge each other on the types of car they drive. Owning an electric vehicle provides the owner with an elevated social status (Autospies, 2008). Currently society looks favorably at people that own electric cars. Presently this factor is an advantage to Tesla.

Technological Factors

1. Changes in Technology

Technology throughout society is constantly changing, especially with regards to transportation. Over the last couple years, vehicle automation has experienced dramatic developments. Similarly, battery technology has been consistently improving over the last several years. These changes have allowed the electric vehicle industry to make safer, more environmentally friendly, and less expensive vehicles. According to the Brookings Institution, there are 5 battery innovations that will help electric cars to be less expensive and have a better range (West, 2015):

1. Lithium-ion batteries
2. Solid state batteries
3. Aluminum-ion batteries
4. Lithium-sulfur batteries
5. Metal-air batteries

This factor will represent a challenge for Tesla. Since technology is constantly shifting and improving, it is impossible for a company to remain on the cutting edge. Currently Tesla is considered a top innovator, however it is possible that one day another company will be technologically superior to Tesla.

2. Life cycle and speed of technological obsolescence

One of the challenges that electric vehicles face is the rapid speed of technological obsolescence. Because the electric vehicle industry's dependence on technology, an electric vehicle can quickly become outdated since it will not incorporate the newest available technology. Elon Musk explained this issue recently by stating, "Tesla will never stop innovating. People are buying the wrong car if they expect this. There will be major revs every 12 to 18 months. If we (Tesla) applied resources to doing super complex retrofits, our pace of innovation would drop dramatically." (Musk, Elon Musk @elonmusk, 2017) Tesla's approach to this is unique. They are not concerned about keeping their products "future proof." Instead they are focusing their efforts on remaining innovative and on the fore-front of the electric vehicle technology. This approach may not be sustainable. Once Tesla becomes large enough, they may not remain at the front of the innovative curve.

3. Interest in vehicle automation

The public is conflicted over the concept of vehicle automation. This conflict may provide challenges for electrical vehicles as well as gas powered vehicles. The public wants autonomous vehicles "to minimize causalities in situations of extreme danger." (Bonnefon, Shariff, & Rahwan, 2016) However, they want their vehicles to protect them at all costs, which can potentially cause a conflict. (Driverless cars: Who gets protected? Study shows public deploys inconsistent ethics on safety issue, 2016) This conflict will be a challenge for vehicle manufacturers to provide programming that performs correctly. Vehicle automation, specifically, is a challenge for Tesla. Tesla has been at the fore-front of the vehicle automation technology. They will need to remain flexible while the public and regulatory agencies determine the correct path for the automation programming philosophy.

4. Generational changes in attitudes towards technology

Electric vehicles are becoming more popular for many reasons. Based on a report by the Department of Energy, there are several population segments that are more likely to buy an electric vehicle for their next purchase. (Singer, 2016) According to a recent survey the generation born "between 1982 and 1993 are more interested in hybrids and electric cars than they are in traditional, gas powered automobiles. (Tuttle, 2012) The changing in generational attitudes is an advantage for Tesla. They are considered the market leader by the younger generations. Even though they were not

"first to market," their products have been so revolutionary that an entire generation considers Tesla to be the leader in the electric vehicle industry.

Analysis of the External Environment - Porter's Five Forces

A Five Forces analysis is used to evaluate the profit potential for the electric vehicle industry. Porters five forces are detailed in his book *Competitive Strategy: Techniques for Analyzing Industries and Competitors.* These five forces "determines the ultimate profit potential in the industry, where profit potential is measured in terms of long run return on invested capital." (Porter M. , 1998) A summary of our team's assessment of the Porters five forces on this market is given below.

1. Threat of substitute products

Currently the leading zero emissions technologies for vehicle are electric vehicles are lithium ion battery power, and hydrogen fuel cell technology. Hydrogen fuel cell technology may be a significant threat to Tesla's current electric vehicle (EV) designs in the future.

2. Threat of new entrants

Tesla occupies a niche in the EV market. The Tesla S is considered a high-tech luxury vehicle, and currently dominates the luxury EV market. Audi, BMW, Cadillac, Porsche, as well as other luxury manufacturers have hybrid models that could compete in the same market but currently Tesla is the only zero emissions model.

3. Intensity of rivalry among existing players

As Tesla seeks to expand their market share they are attempting to move into the low-cost or standard cost vehicle market where Tesla will face major competition from the major automobile manufacturers. Most notably GM, Ford, and Nissan offer a high level of competition in these markets. Tesla will likely experience greater difficulty in the low cost EV market.

4. Bargaining power of suppliers

Like all automobile manufacturers, Tesla is heavily dependent on a variety of suppliers. The diverse nature of the suppliers lessens Tesla's dependence on any one particular supplier. Tesla has also purchased some parts suppliers which could be repeated as future needs arise. The increased demand

for Tesla vehicles has generated a windfall for their suppliers as well. For these reasons the bargaining power of Tesla's suppliers is not seen as a threat to the company.

5. Bargaining power of Buyers

Tesla's highest selling vehicle, the Model S, occupies the luxury sedan market. In this market Tesla is highly competitive, because its price is lower than many of its competitors. Also governmental incentives puts Tesla is in a stronger position by reducing their final price to the customer.

Based on Porter's Five Forces analysis, Tesla appears to be in a very good market position. Tesla remains in a dominant position of its portion of the market. They are acquiring suppliers, and maintaining a good relationship with their current suppliers and customers. The area Tesla faces a potential problem is with the development of hydrogen fuel cells. If there is a major breakthrough in the production of hydrogen fuel cells, the technology could seriously affect EV sales. Tesla should place itself in a position to incorporate and take advantage of any major breakthroughs in hydrogen fuel cell production.

Analysis of the External Environment – Competitor Analysis

A Competitor analysis is an examination of a competitors strengths and weaknesses along with their corporate strategies, methods. "There are four diagnostic components to a competitor analysis future goals, current strategy, assumptions, and capabilities" (Porter M. , 1998).

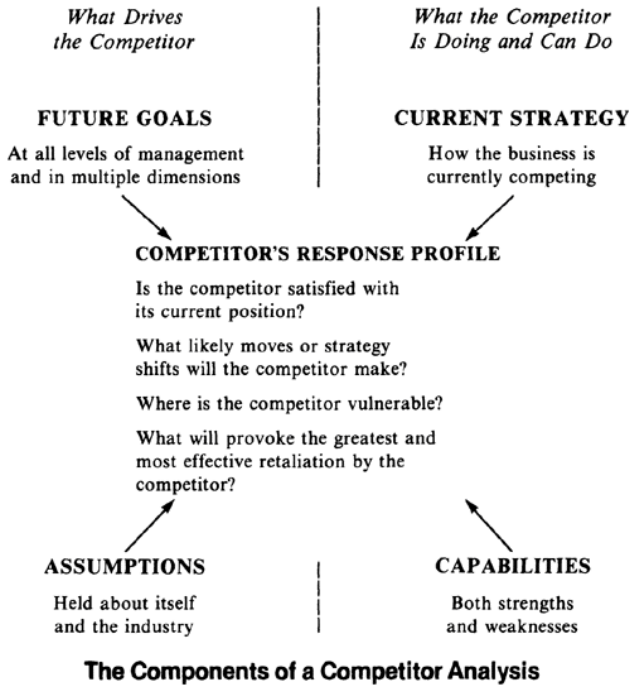


Figure 4:From Competitive Strategy: Techniques for Analyzing Industries and Competitors (p. 49), Porter

We have identified the Tesla's strongest competitors for their Model 3 offering are Ford, GM, Honda, and Toyota. Therefore, we have chosen these corporations as the subjects of this analysis. The following sections document the Future Goals, Current Strategy, Capabilities, and the Assumptions for Tesla's competitors.

<u>Future Goals:</u>

Ford:

- Top 5 company in sales and to maintain greater than 10% of global market share.
- Balanced regional and segment profits.
- Have operating margins of greater than 8%.
- To be in the top Quartile in shareholder returns.

GM:

- Earn customers for life
- Lead in technology and innovation

- Grow the corporate brands
- Drive core efficiencies (operational, material and logistic).

Honda:

- Advancement of a six-region operational structure.
- Continuous development of unique and challenging products delivering them globally.

Toyota:

- Toyota intends to contribute to the realization of a future mobility society through pioneering technologies, products and businesses
- Toyota intends to reinforce true competitiveness in order to grow as steadily as a tree adding annual growth rings.
- The development and promotion of next-generation vehicles including hybrid vehicles and fuel cell vehicles, efficient production utilizing efficient production methods.

<u>Corporate Strategy:</u>

Ford:

"Our strategy has one foot in today and one foot in tomorrow – encompassing our core business as an automaker and new opportunities in mobility." (Ford Motor Company, 2017)

GM:

"We are here to earn customers for life. Our purpose shapes how we invest in our brands around the world to inspire passion and loyalty. It drives us to translate breakthrough technologies into vehicles and experiences that people love." (General Motors, 2017)

Honda:

To deliver attractive products and services that are uniquely Honda and bring joy to customers worldwide across all its business domains of motorcycles, automobiles, and power products. Honda intends to promote a range of initiatives aiming to be a "company that society wants to exist." (Honda Motor Co., 2017)

Toyota:

"We're always looking for ways to improve our operations, always challenging ourselves to innovate, always looking to collaborate, always improving each day in everything we do." (Toyota Motor Sales USA, 2016)

Capabilities:

An examination of Tesla's competitor's strengths and weaknesses is shown in the table below.

Table 6 - Strengths and Weakness for Tesla competitors

Company	Strengths	Weaknesses
Ford	✓ Strong Engineering and R&D Capabilities ✓ Award Winning Ford has received awards for design and safety. ✓ Perceived financially stable and did not receive a Government Bailout.	❖ Poor Cash Flows ❖ Sluggish Performance in All Region ❖ High turnover in corporate management.
GM	✓ Extensive Global Presence ✓ Growing Business in Emerging Markets ✓ Held in high regard by customers	❖ Declining Market Share ❖ Product Mix is skewed toward SUVs and Trucks ❖ High Costs and Liabilities
Honda	✓ One of the leaders in sales of automobiles, motorcycles and other power driven products. ✓ Strong financial performance ✓ Strong R&D capabilities ✓ High quality products, and customer satisfaction rating	❖ Honda automobiles are more costly compared to other manufacturers ❖ In recent years Honda has made several recalls
Toyota	✓ Diversification Strategy ✓ Market leading position ✓ Wide geographical presence ✓ Production System	❖ Limited liquidity position ❖ Product recalls

Assumptions:

Taken directly from the corporate websites this is a listing of the companies' self-perceptions.

Ford:

"People working together as a lean, global enterprise to make people's lives better through automotive and mobility leadership." (Ford Motor Company, 2017)

GM:

"They are a global automotive company united by one purpose, to earn customers for life." (General Motors, 2017)

Honda:

"Maintaining a global viewpoint, we are dedicated to supplying products of the highest quality, yet at a reasonable price for worldwide customer satisfaction." (Honda Motor Company, 2017)

Toyota:

"We create vehicles by listening and responding to you. Why? Because it's our belief that our cars should do more than help you go places on the road, they should also help you go places in life." (Toyota Motor Sales USA, 2016)

Analysis:

Tesla's competitors all seem to be concentrating on a few areas in their business strategies they are;

- Customer satisfaction and retention
- Increasing Global presence
- Technological innovation

None of the companies seem satisfied with their current status and they are all actively seeking to improve on their market share.

Tesla is in a particularly good position to compete with these companies in Customer satisfaction, and technological innovation, these are hallmarks of the Tesla brand. By tailoring an advertising campaign that highlights these virtues Tesla could possibly make inroads into their competitions customer base. This tactic was successfully employed by Japanese automakers in the 1980s.

Tesla is particularly vulnerable to retaliation from these competitor in the form of a protracted price war. All of Tesla's competitors can afford to sustain losses in one particular aspect of their business while maintaining profitability in others. They can mount a price war on comparable products to those Tesla produces. It happened with the independent automakers in the United States in the late 1950s and 1960s culminating in the collapse of AMC in the 1985. As Tesla enters the low-cost vehicle market they should develop contingencies for this reaction from their competitors.

Major Issues/Problems

Four problems that could potentially become major issues were identified as the following:

Problem 1. Tesla's dependence on its CEO, and the risks associated with an organizational structure heavily dependent on certain individuals.
Problem 2. Tesla has overextended itself by branching into other ventures such as solar city.
Problem 3. Tesla has not shown that they will be able to make the transition from an innovative company to a manufacturing company.
Problem 4. Tesla is seeking to challenge major automakers instead of focusing on their market niche.

In order to analyze the importance of each problem and to decide which ones should be pursued in a solution, each team member ranked the problems, giving the highest rating to the problem they felt was the most urgent. The results of that ranking can be seen in the table below.

Table 7 - NGT Results

	Weights				
	Anthony	Blaine	Greg	Yiming	Totals
Problem 1	3	2	3	4	**12**
Problem 2	4	1	1	1	7
Problem 3	1	3	4	3	**11**
Problem 4	2	4	2	2	10

As shown in the table above the group chose:

Problem 1- Tesla's dependence on its CEO, and the risks associated with an organizational structure heavily dependent on certain individuals.

Problem 2-Tesla has not shown that they will be able to make the transition from an innovative company to a manufacturing company.

Problem 1

Tesla's dependence on its CEO, and the risks associated with an organizational structure heavily dependent on certain individuals.

Through our analysis of Tesla's organization, we have found several sub-problems with the way the organization operates, they are listed below.

1. Tesla has an unbalanced corporate board composition. Over half of Tesla's outstanding shares are held by 13 individuals and three investment firms. Elon Musk himself owns 26.5% of the outstanding shares, and the together the other 12 collectively own 1.2% (Ausick, 2016). Therefore, Musk has full control over board member selection.

   Effects:

   - As documented in the organizational analysis section, most of the board most of the board members have a financial background. Based on this observation, we see the board is unbalanced. Large corporations should have diverse leadership to remain competitive. The lack of diversity on corporate board would lead to an unbalanced of strategic focus, which could cause the company to lose the competitive growth in a long business run.

2. Tesla relies heavily on its CEO Elon Musk, he has a great many direct reports. There are several problems with this dependence on a single individual.

   Effects:

   - Something can happen to the CEO it can have a serious detrimental effect on the company.
   - The size of the company becomes too large for one person to effectively manage.
   - The talents and capabilities of other individuals may not be fully utilized because of the centralized focus of the company.

- Instructions are slow to disseminate throughout the company which could affect production design changes etc.

3. Tesla has a Flat horizontal organizational structure which does not work well for 30,000+ employees. Flat horizontal organization has been noticed to be one kind of efficient structures for small size and/or start-up company. The streamlined hierarchy decrease the bureaucratic management, which encourages the ideas could come from bottom to up. Tesla has been experiencing typical start-up growth phases, in which the flat horizontal organizational structure leaves its mark up to now.

   Effects:

   - The flat structure could potentially discourage employees ambition for career promotion, which increases the turn-over rate consequently.
   - When company grows, employees will need more career promotion channels. If career development cannot be realized, employee dissatisfaction will ensue and it could potentially lead the increase of attrition rate.

4. HR Policies and company culture are excessively influenced by innovation requirement. HR Policy and company culture are always serving for the company innovation as major task. HR has not sufficiently focused on the support structures necessary to sustain a rapidly growing company.

   Effects:

   - Tesla's HR recruiting policy emphasized waiting for the right person. This policy could lead to the slow backfill especially for the senior positions, which are crucial to the company business. It may be necessary to actively pursue the "right" person for the job.
   - Tesla prefers to find people from non-automobile background but with highly developed problem solving skills. This sounds like a good idea but it also posts the risks of future uncertainty if an employee finds themselves in jobs that are not the right fit.
   - Tesla bonus system and promotions are determined using a 1 – 5 scale as other companies but the two highest ratings only belong to those who have done something

significant innovative. Under this criteria employees who are involved with manufacturing or other operations may be excluded from the higher level promotions.

Analysis:

Tesla's competitors all seem to be concentrating on a few areas in their business strategies they are;

- Customer satisfaction and retention
- Increasing Global presence
- Technological innovation

None of the companies seem satisfied with their current status and they are all actively seeking to improve on their market share.

Tesla is in a particularly good position to compete with these companies in Customer satisfaction, and technological innovation, these are hallmarks of the Tesla brand. By tailoring an advertising campaign that highlights these virtues Tesla could possibly make inroads into their competitions customer base. This tactic was successfully employed by Japanese automakers in the 1980s.

Tesla is particularly vulnerable to retaliation from these competitor in the form of a protracted price war. All of Tesla's competitors can afford to sustain losses in one particular aspect of their business while maintaining profitability in others. They can mount a price war on comparable products to those Tesla produces. It happened with the independent automakers in the United States in the late 1950s and 1960s culminating in the collapse of AMC in the 1985. As Tesla enters the low-cost vehicle market they should develop contingencies for this reaction from their competitors.

Strategic Alternative Recommendation (SARS) Analysis

Recommendation 1:

- Adding President Position Under Elon Musk and transit Elon Musk's focus on P&I only.

- Beneath President (*new* position) Layer, divide to different management business units including Sales, Finance, Customer Support (*new position*), Operation (*new COO position*), Human Resource, Technology and Global IT.
- Under each Business Unit line, it divides by function realms as well as regions.
- The Technology line led by CTO dotted line reporting to Elon Musk for P&I purpose

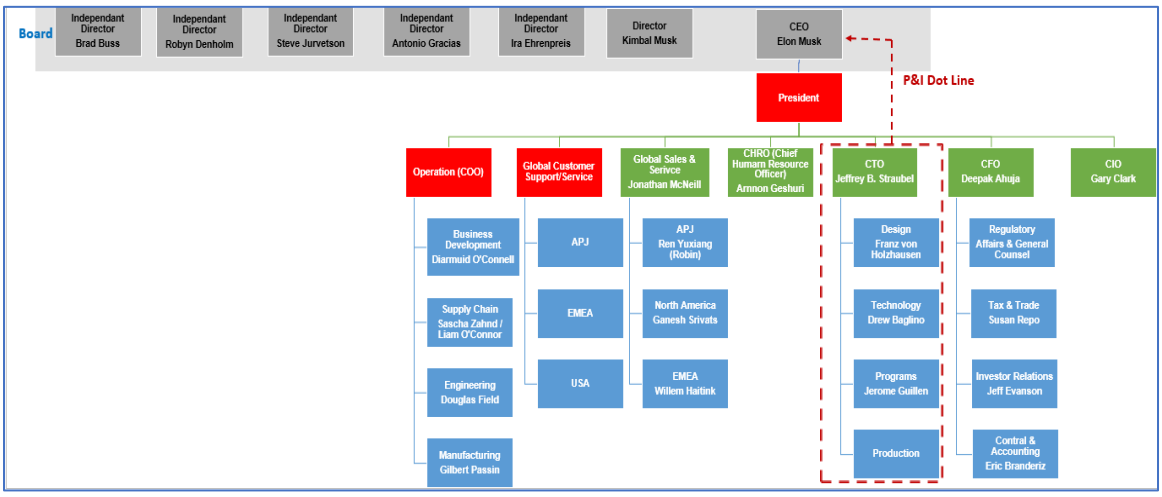


Figure 5:Strategic Alternative Recommendation 1 Diagram

Recommendation 2:

Switch to a Matrixed Organizational structure.

A Matrixed organizational structure is "an organizational structure that facilitates the horizontal flow of skills and information. It is used mainly in the management of large projects or product development processes, drawing employees from different functional disciplines for assignment to a team without removing them from their respective positions". (Business Dictionary, 2017) An organizational chart of a matrixed organization is shown below.

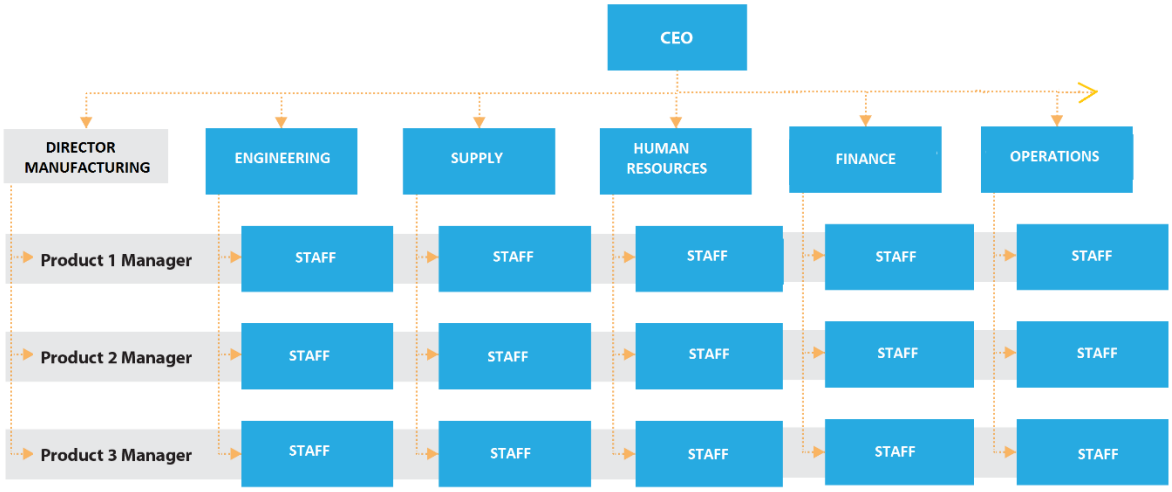


Figure 6 - Strategic Alternative Recommendation 2 Diagram

Tradeoff analysis

Each of the alternative recommendations come along the pros and cons as expected. Following table indicate the highlighted facts. These comparisons and the weighted comparison below provide a tradeoff analysis of the 2 suggested solutions.

Recommendation 1:

Table 8 - Problem 1, Solution 1 Pros and Cons

Alt No.	Pros	Cons
1	CEO focuses and keeps straight influence with long time technology innovation partner CTO to continue working on the Product and Innovation side New President leads the corporate business, operations, revenue and margins. New President's direct reporting are in charge on their own functions and deliver the outcomes accordingly. 3 New Positions including President role, which does not import lots hiring efforts	New President still hold 1:1 relationship with existing CEO, which requires the strong business vision and strategy to collaborate with CEO. Otherwise, it could not change the CEO's influence over all and this, the presidential layer would be of no value. It will be challenging to find the right person on this President position. This new role would lead existing senior VPs who have been working with the company for some time. How to excerpt influence properly and lead them would be another challenge.

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Recommendation 2:

Table 9 - Problem 1, Solution 2 Pros and Cons

Alt No.	Pros	Cons
2	✓ Resource Coordination "The matrix structure allows supervisors to focus on their areas of expertise. Functional supervisors focus on hiring, training and managing employees in their field, while project supervisors can focus on achieving the goals of their specific projects or products." (Guzman) ✓ Specialization By allowing employees to specialize in their functional areas they can focus on their field of expertise. They are able to achieve greater output. Rather than spending a large portion of their time spreading their efforts among tasks they are not as effective at doing. ✓ Breadth of Skill Employees from different functional areas work together in the different product areas with exposes them to a variety of skills broadening their skill sets. It also provides direct access to the end product and provides a better understanding of the manufacturing process. ✓ Communication A matrix structure for enhanced and smoother communication between people in different functional groups. Collaboration becomes easier and teams are better equipped to work on complex projects. ✓ Flexibility The matrix structure allows for greater sharing of personnel among new projects since people are no permanently assigned to one area. (Guzman)	❖ Stress Additional stress is placed upon employees, the stress of adapting to new teams, working on products, and changing responsibilities. ❖ Conflict There is an inevitable competition for company resources. There is also the are also conflicts that can arise in the leadership structure, as employees are members of the functional group and the product team. ❖ Inefficiency Inefficiency is a product of conflict between managers. It is possible that an employee can have conflicting policies and procedures from different managers. ❖ Cost Members of cross functional teams often have a more diverse skill set, therefore hiring employees to fill these types of positions is often more costly. The project managers must also have the ability to work varying types of projects and therefore an increase salary demand can be expected by them as well (Nordymeyer).

A comparison to the current hierarchal structure employed at Tesla and Alternative 1 and 2 is displayed in the table below it contains an evaluation of a variety of criteria pertaining to problem 1.

Table 10 - Problem 1 Solution Evaluation

	Weight	**Tesla Hierarchal**	**Alternative 1**	**Alternative 2**
Something can happen to an individual it can have a serious detrimental effect on the company.	10	10	5	5
The size of the company becomes too large for one person to effectively manage.	10	9	3	3
The talents and capabilities of other individuals may not be fully utilized because of the centralized focus of the company.	10	6	3	3
Instructions are slow to disseminate throughout the company which could affect production design changes etc.	10	8	3	3
Ease and speed of implementation	10	0	7	5
Totals	**50**	**33**	**21**	**19**

We see that a Matrixed structure has an opportunity to reduce Tesla's dependence on their upper management and sets up an infrastructure that will develop talent. Tesla would then be more robust and better able to handle losing key personnel. The Matrixed model is made for expansion therefore as Tesla grows there will be less disruptions. Communication is one of the hallmarks of the Matrixed organization and should be greatly improved by changing to a Matrixed organization.

Problem 2

Tesla has not shown that they will be able to make the transition from an innovative company to a manufacturing company.

Tesla was founded in 2003 by a group of engineers with high aspirations. From the very beginning of the company, Tesla's primary intent was to "accelerate the world's transition to sustainable energy." (Tesla, n.d.) Tesla decided to achieve this goal by introducing an all-electric vehicle that would

compete with vehicles powered by fossil fuels. With this approach, Tesla was immediately defined as an innovative company which developed cutting-edge technology for their own use.

Tesla entered the automobile manufacturing industry with the Roadster. They built and sold around 2,400 Roadsters. Tesla leveraged their success with the Roadster and increased their manufacturing capacity. With this increased capacity, Tesla then produced the Model S and X which also sold well. Tesla has built and sold around 180,000 of the Model S and X as of the end of 2016. Again, Tesla leveraged their success with these two models in order to again increase their capacity. With this additional capacity, Tesla intends to build up to 500,000 vehicles a year.

Although Tesla has been in business since 2003, it is not yet profitable, except for a few isolated quarters. Up until now, the overarching plan for the company has been to build a reputation with high-end models, then introduce less expensive, higher volume models that would turn a profit.

Tesla may find it difficult to compete in this market segment now that they are competing in the low priced sedan segment and with a much larger supply. With more vehicles available, Tesla will need to expand their target markets. Because of these potential economic challenges and the challenges associated with having such large manufacturing capacity, Tesla will need to focus on manufacturing efficiencies and reducing costs. This transition from an innovative focused company to a manufacturing company will be tough since innovation is so engrained in the Tesla culture.

<u>Recommendation 1</u>

An example of a company that was built on innovation, but has also been successful in producing physical products profitably is W.L. Gore. They have been in business since 1958, but they are still considered to be an innovative company that continues to come up with new products and markets for their products. In addition, they have been on Fortune's list of 100 best companies to work for since 1998 (Roberts 2015). One of the major things that they have put into place is whenever a group gets to a maximum number of members, around 100 – 150, the groups are split. This is because as long as a group is below a certain size, almost everyone knows each other, but once it goes beyond that then each person only gets to know a much smaller number of people from their inner group. By doing this, Tesla could ensure that everyone in the group is involved with every part of what is being done.

Recommendation 2

In order for Tesla to have a successful transition to being a company that is focused primarily on manufacturing, Tesla should consider spinning off their innovation team into a separate company and mold Tesla into a manufacturing company. This would allow each company to focus on what they're good at. Elon Musk could be on the Board of each company or hold an executive position, but the operational positions would be filled by people that have applicable experience.

Tradeoff analysis

As with problem 1 each of the alternative recommendations for problem 2 come along the pros and cons as expected. Following tables indicate the highlighted facts. These comparisons and the weighted comparison below provide a tradeoff analysis of the 2 suggested solutions.

Recommendation 1:

Table 11 - Problem 2, Solution 1 Pros and Cons

Alt No.	Pros	Cons
1	✓ By having a better understanding of the manufacturing process, other groups will be able to know when a new feature or material they are proposing is compatible with the current process, or if it will be significant change ✓ A greater level of unity between the different areas of the company would develop.3 New Positions including President role, which does not import lots hiring efforts ✓ In addition to reducing the time needed to implement new materials and processes into the manufacturing line, an improved level of communication could allow Tesla to give more realistic estimates of when new models are able to be released. ✓ By having more people cycle through the manufacturing environment, there is a greater opportunity for more creative ideas for improvements to be suggested.	❖ Employees who are otherwise bold with their willingness to make changes and try new things may feel too constrained to stay within the existing manufacturing structure. ❖ By having employees spending time learning about manufacturing, they are not doing the job that they normally do for that period of time. This is an additional cost where Tesla will be paying them to not produce any output. ❖ Manufacturing could be slowed down by having to accommodate new hires who need to have things explained to them. ❖ By having inexperienced people in manufacturing areas, there is a chance for elevated rates of injury.

Recommendation 2

Table 12 - Problem 2, Solution 2 Pros and Cons

Alt No.	Pros	Cons
1	✓ Each company would focus on their strengths ✓ Innovative Tesla could provide services to other companies that need help innovating. ✓ Because the companies are separate but have the same leadership, priorities can be established that will strengthen each company. ✓ Different pay scales can be incorporated in the different companies. Tesla Manufacturing can be union while Innovative Tesla won't have to be union. ✓ Each company would have their own mission statement that allows them to focus on the right things.	❖ Communication challenge across company lines ❖ Unhealthy competition between the companies ❖ Inefficiencies with implementing changes since the improvements will be provided by a different company. ❖ Tesla Manufacturing will suffer the stigma of not being innovative. ❖ Duplication of roles increasing indirect costs (accounting, HR, IT, etc.) ❖ Finding enough qualified people to staff both companies.

A comparison to the current hierarchal structure employed at Tesla and Alternative 1 and 2 is displayed in the table below it contains an evaluation of a variety of criteria pertaining to problem 2.

Table 13 - Problem 2 Solution Evaluation

	Weight	**Alternative 1**	**Alternative 2**
Speed of implementation	8	5	8
Cost of implementation	8	7	4
Effect on Tesla culture	10	10	6
How much will it actually improve getting cars to production	10	8	9
Totals	**36**	**30**	**27**

The analysis shows that by requiring employees to have experience in manufacturing would enhance the company culture, and overall it wouldn't be a very expensive way to go about solving the problem. Since it depends on cycling large numbers of employees through a period of learning, it will take a while to see results, and it is not a sure thing that it will solve the problems. On the other hand,

splitting the company into two could be done relatively quickly, and since the manufacturing company would be more focused, it is more likely to be effective. It could have a negative effect on the culture of both new companies, and it will be very expensive to implement since each company would then require much of the administrative costs of running on their own going forward.

Implementation

In order to decide which recommendation should be implemented, both the problems and the subsequent solutions have to be considered when analyzing the following:

- Problem 1 Alternative 1 – Adding President Position Under Elon Musk
- Problem 1 Alternative 2 – Switch to a Matrixed Organizational structure
- Problem 2 Alternative 1 – Form manufacturing sub-groups
- Problem 2 Alternative 2 – Split Tesla into Manufacturing and Design Companies

Table 14 - Solution Evaluation and Selection

	Weight	Problem 1 Alternative 1	Problem 1 Alternative 1	Problem 2 Alternative 1	Problem 2 Alternative 2
Significance of Problem	10	9.75	9.25	9.25	9
Cost of Implementation	10	7.25	6.25	7.5	5
Effectiveness	10	7.25	7	7.5	8.5
Effect on Culture	10	7.75	7.5	8.75	7.5
Speed of Implementation	10	7.5	6.5	5	7.25
Total	50	39.5	36.5	38	37.25

Each member of the team was asked to rate the problem-alternative combinations based on five criteria. The ratings were then averaged and totaled. Based on this, the best alternative to pursue at this time is to add a president position under Elon Musk. The implementation of this solution will be examined further in this report.

Recommendations and Implementation Plan

Based on the SAR (Strategic Alternatives Review) analysis, we decided the following two problems as most critical ones to Tesla Motors continuous and sustainable development.

- Tesla has demonstrated high dependence on its CEO, and the risks are associated with an organizational structure heavily dependent on certain individuals.
- Tesla has not shown that they will be able to make the transition from an innovative company to a manufacturing company.

Per the previous problem assessment, alternative recommendation pros and cons comparison, trade-off analysis, and optimal solution alternative selection, we decided to propose the followings to each problem.

- Adding President Position Under Elon Musk and transit Elon Musk's focus on P&I only.
- Spinning off Tesla Motor's innovation team into a separate company and mold Tesla into a manufacturing company.

After further evaluating the correlation on the selected solution to each of the problems, we would like to propose the following solution to TESLA Motors so that better compatibility, completeness and supportiveness of the recommendation could be achieved. Meanwhile, the corresponding implementation would limit the drastic and instable factors to the lowest for the company.

- TESLA Motors hire a president in charge of manufacturing, and assign the innovation function to existing CEO Elon Musk (proposed reorganization chart attached below).

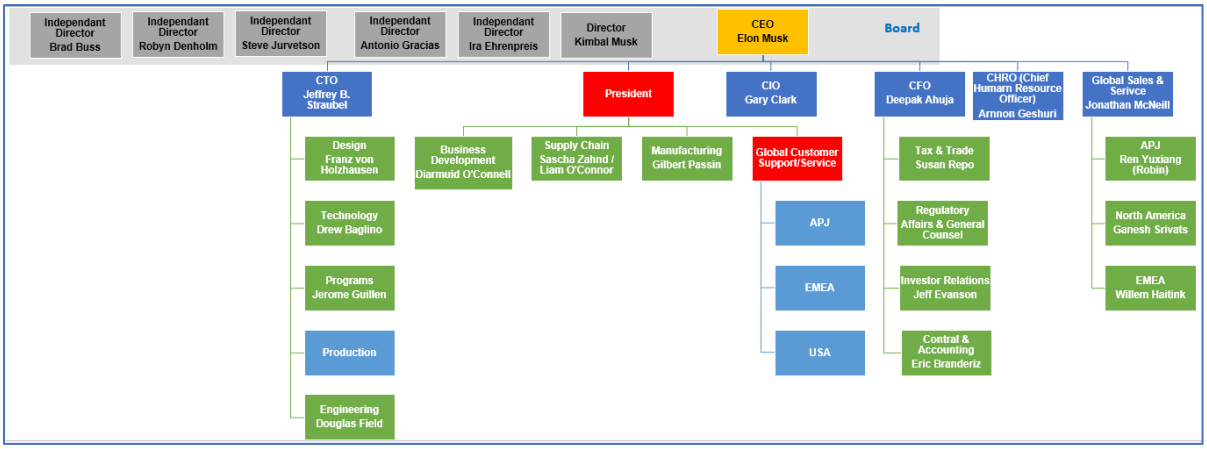

Figure 7:Recommendation Organization Chart

According to the proposed organization chart, we would highlight that the new President would focus on the vehicle manufacturing where the company weakness has been exposed to its mass

production. The existing CEO Elon Musk would directly lead the product innovation and engineering, which can further strengthen the innovation power with the long-term partnership between CEO and CTO JB Straubel.

Short-run recommendations:

- Short-run targets in the 0 to 6 months' timeframe.
- Hire the President position.
- Align the business lines of manufacturing and its supply chain management to the president's direct reporting
- Consolidate the product innovation business units and assign these divisions to the CTO's direct reporting line.

Implementation Action plans:

1. Kick off the talent hunting and recruitment process for the new president position. The candidate is better to embrace the executive experience with vehicle manufacturing.
    - (*ETA: 0-2 month*)
2. Workshop on the new organization overview with existing tier1 managers and begin to define the two major focuses. Set the charter and deliverables of each focus.
    - (*ETA: 0-2 month / in-parallel with step1*)
3. Consolidate the product and innovation (P&I) line with CTO. Move the Design, Technology, Programs, Production and Engineering to CTO's direct reporting. CEO transit the major focus to the P&I.
    - *(ETA: within 2 month after step 2*).
4. With the absence of the new president, current CEO takes the acting role of the manufacturing. Consolidate the supply chain, manufacturing and business development in this manufacturing focused business line.
    - (*ETA: within 2 month after step 2)*

5. Each business area of Manufacturing and P&I line reviews its own focus, set actions based on the defined charters, and re-shape the current business modules with business unit.
    - (*ETA: within 2 months after step3/4 setup*).
6. CIO, CHRO, CFO business lines review the existing process and cross line functions, adapt work flows for the new shaped manufacturing and P&I units and guarantee the best support for the new organization.
    - (*ETA: within 2 months after step3/4 setup*).

Long-run recommendations:

- Long-run targets from 6+ month timeframe.
- CEO phase out the manufacturing when new president is ready and transition is completed.
- Add Global Support business unit to the manufacturing line and direct report to the new president.
- Consider extend the executive board with more function diversity including Sales and Financial.

Implementation Action plans:

1. Open the position of global support head to enforce the Tesla service lifecycle quality, which would be the good feedback channel to the product. Since the customer service requires more on the manufacturing engineering, put this function initially in the president's scope would be better.
    - (*ETA: 0-2 months*)
2. Extend the workshop to tier2 and tier3 managers on the new organization, define the charter and deliverables of each business unit
    - (*ETA: 0-2 months*)
3. Setup the cross-business unit collaboration on major business processes and operations. For example, joint processes for customer supporting, R&D lifecycle definition, sales strategy

collaboration etc. Each business line clears the goal and objectives under the guidelines of corporate mission statement.

- *(ETA: 0-3 months)*

4. Estimate on the headcounts and budgets gap based on the new organizational framework, complete the reviewing with board and financial controlling, and decide the final numbers and actions.

    - (*ETA: within 1 month after step3 completion*)

5. Based on the short-run achievements, objectives, and goals push down to each business unit branches.

    - (*ETA: within 1 month after short term actions are completed*)

6. Each business unit line reviews its own tasks and missions, re-evaluate its global operation model, and adjust the business focuses accordingly. For example, sales business line reshapes its USA, APJ, and EMEA management team to better implement the new orientations.

    - (*ETA: within 2 months after step2 is completed*)

7. With the new global project (Model 3 release), each business line refines the goals and objectives for better outcome based on the problem observation, root cause analysis, strategic review, and solution deliveries. The ultimate outcome of this step is to achieve the best running model for this global corporation.

    - (*ETA: within 2 months after step6 is completed*)

8. Adopted with the optimal leadership and business mode, each business unit should explore more improvement room to further adapt the better corporation strategy to ensure the sustainable and reliable business increase with its long-standing innovation strength in the industry.

    - (*ETA: beginning after step7*)

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9. With the maturing of the global organization which emphasized the focuses on P&I and Manufacturing, Tesla Motors could consider to extend the existing executive board for more function diversity. Global Sales could be lined up to the board area so that the profit and margin management could be further strengthened and improved when mass production issue was addressed.

    - *(ETA: beginning from 1 year since implementation start)*

Appendix A – Strategic Analysis of the Company and Business

Vision / Mission

According to their website, "Tesla's mission is to accelerate the world's transition to sustainable energy". Since the founding of the company they have focused entirely on only building fully-electric cars, rather than hybrids as an interim technology like other manufacturers have done. This mission is evident in other endeavors that Tesla has undertaken. One recent major development is they have acquired SolarCity in a deal worth approximately $2 billion in 2016 (Muoio, 2016). According to Tesla "The acquisition of SolarCity will create the world's only integrated sustainable energy company, from energy generation to storage to transportation" (Tesla, 2016). Since a significant portion of electricity is produced from non-sustainable sources, switching to solar power allows a Tesla car to operate in a much more sustainable way. They have also introduced the Powerwall and Powerpack, both of which can store energy in large battery packs. By pairing this with a solar panel system, sustainable energy can be used even when solar power is not being generated.

In addition to their efforts to combine electric vehicles with a solar power source for their charging at the home, they have also worked to build the greater infrastructure needed to popularize all electric vehicles to a level where they common in the mainstream. One of those steps was to build a network of 5,100 "Superchargers" at 800 charging locations. Since the chargers must be available in order for customers to be confident enough to buy and travel with an electric vehicle, Tesla took building the network on themselves instead of relying on a third party model like the way gasoline is currently sold.

Finally, they have allowed other companies to use their patented technology as long as it is for use in electric vehicles. From their 2015 annual report: "Additionally, consistent with our mission to accelerate the advent of sustainable transport, we announced a patent policy in which we irrevocably pledged that we will not initiate a lawsuit against any party for infringing our patents through activity relating to electric vehicles or related equipment for so long as such party is acting in good faith." This seems to be counterintuitive to share technology that cost them so much money to develop. However, when looking at electric cars competing against the existing structure of gasoline internal combustion vehicles, it will benefit Tesla to increase the overall market acceptance for electric vehicles. Between November 2015 and November 2016, 130,000 plug-in hybrid and battery electric vehicles were sold (Bhuiyan, 2016). Although this is as high as sales of electric cars has ever been, this is a small fraction of

the 17.55 million cars that were sold in the US in 2016 (Associated Press, 2017). Even if competitors use Tesla's technology, there is so much market share to be taken from internal combustion vehicles that it is a distant concern.

Goals / Objectives

The goals of Tesla have expanded greatly from the beginning of the company in 2003. At that time, the goal was to build the Tesla Roadster with most manufacturing performed by third parties. In fact, the original business proposal talked about a "fab-less" car company that required no factory (Baer, 2014). This relatively modest goal of designing an electric sports car and having most of it made by others has grown significantly since then. In the most recent quarterly report, Tesla stated that their goal is to produce 500,000 cars a year in their factory by 2018 (Tesla, Form 10-Q, 2016). In addition to this level of auto production, they are building what they call the Gigafactory in Nevada which will produce enough batteries to total 35 gigawatt-hours of storage capacity annually. The Gigafactory is currently building some battery packs, but battery cell production is expected to begin by the end of 2017 and will continue to ramp up production until operating at full capacity in 2020 (Tesla, n.d.). A second Gigafactory is planned for Europe that will build both batteries and vehicles.

Many of these ambitious goals have been a result of Elon Musk's desire to build the company into a major player in the auto industry rather than a niche player or selling out to another automaker. After his involvement with PayPal he believed that the investors had sold out too early, and that it could have been an even larger business if it stayed independent. The original CEO, Martin Eberhard was operating under the assumption that they could build electric cars without having to do much of the production work in-house. It was under his leadership that they formulated the plan to have Lotus provide a modified Elise sports car that Tesla would build into an electric car. As a major investor, Musk pushed to have more and more of the car customized, including a carbon fiber body and heavily modified doors. When costs spiraled out of control, Eberhard was replaced with Michael Marks. Marks was able to bring the process under control, but he was working towards packaging Tesla into something that another automaker would buy as an electric car division. Marks was replaced by Ze'ev Drori who was able to bring the Roadster to market before Musk himself took over in 2008 (Vance, 2015).

Tesla very recently changed their name from Tesla Motors, Inc to simply Tesla, Inc. This reflects the expansion of their goals in recent years from building a single sports car, to a full product line including:

- The Model S, Model X which are currently in production and shipping.
- The Model 3 which is entering production in 2017.
- The Powerwall and Powerpack energy storage systems
- Solar Roof solar panel roofing tiles
- SolarCity as a subsidiary of Tesla

Strategy / Business Model

New technologies are prohibitively expensive before production is optimized and efficiencies of scale can be taken advantage of. Tesla is purposely entering the market with high performance models so they can sell to early adopters who are willing to pay extra to have the newest technology When the EV technology is perfected in these models, then they can more effectively move to mass-market models.

By expanding their goals to include all forms of sustainable energy, Tesla has become a much more complex company. Most of the auto industry has moved to outsourcing much of their design work, come out with new models every year, and depend on service to be a major source of revenue. Tesla builds and controls their own software and other aspects of design, so they can react and make changes without having to coordinate it with an entire network of suppliers. Since their vehicles are so computerized, they will often send out software updates that fix problems and add features to existing cars. By not having model years, Tesla improves their cars as they build them rather than waiting until the next year and unveiling all of the features at once. Finally, they have avoided the dealership model of selling and repairing cars. They sell their cars directly to consumers through factory showrooms or online orders. Since there are far fewer mechanical components, the service centers aren't run as a profit source (Vance, 2015).

Even components like the battery cells are designed and controlled by Tesla. When the Roadster was built, they used standard lithium-ion cells such as those used in laptop computers. Although the

same cylindrical "2170 cell" form factor is used now, Tesla and their partner Panasonic have improved the chemistry to a proprietary design that has superior charging and cooling properties. By having tighter control over their battery pack design, a Tesla Model S can be charged to 150 miles of range in 20 minutes while it would take 8 hours for a Nissan Leaf to reach 80 miles (Vance, 2015). This level of control will increase when the Gigafactory is fully online and producing all of their battery cells and packs.

Tesla plans continued growth by starting production of the mass-market Model 3 in 2017. With a selling price of $35,000 before federal tax incentives, the Model 3 Tesla's first model with cost friendly to the mainstream car consumer. Approximately 400,000 Model 3 cars have been pre-ordered, which represents an entire year's worth of production. To scale up production at Tesla's Fremont, California plant, they acquired the German automation company Grohmann Engineering to increase automation in their production process (Golson J. , 2016).

As a new market trend, Musk is also pushing Tesla's ventures into self-driving car technology. Current Tesla cars, include hardware that will enable them to be fully self-driving once the software exists to allow them to do so. Over-the-air software updates upgrade the car with this new software and increase the number of functions they can perform autonomously as the technology develops. There is a plan for a self-driving Tesla to drive itself from Los Angeles to New York City by the end of 2017 as a demonstration (Muoio, 2016).

Tesla said it expects SolarCity to increase their revenue by over $1 billion in 2017. This will net Tesla over 500 million in cash over the next three years. Tesla's first major solar product post-merger will be its solar roof. By printing the tiles using a process called hydrographic coloring, the solar panels will better match the appearance of a traditional roof. The Tesla division that is currently developing the solar roof is also developing glass that include heating elements to keep the panels clear of snow. It is also possible that future car models will feature a solar roof using the same technology which will allow the vehicles to recharge while they are away from a charger. A Tesla and Panasonic joint venture in Buffalo, New York will product solar photovoltaic (PV) cells for SolarCity. These cells will be used for both the solar roof and traditional solar panels. Production of the PV modules is scheduled to start in summer 2017, and will increase to 1 Gigawatt of modules being manufactured by 2019 (Muoio, 2016).

Their new Powerwall 2 battery pack will cost $5,500 and stores 14 kWh of energy. This is double the capacity of the Powerwall 1 that came before it. The inverter is also included with the $5,500 price, which was not the true with the Powerwall 2. Tesla will sell Powerwall 2 in its vehicle showrooms locations, allowing them to take advantage of the geographic coverage of their existing retail, and giving them the opportunity to sell the entire generation, charging, and mobility package at one time (Muoio, 2016). In addition, the Powerpack 2 is their battery pack offering to the commercial sector.

Management Characteristics

The management style of Tesla is overwhelmingly dominated by the personality of Elon Musk. Although he was not involved with Tesla from the very start of the company, he has been a major investor from almost the beginning. He has also been the driving force at each point in which the company decided on which direction it wanted to go. As a result, the company is managed in some ways as a tech startup, and in other ways as a vertically integrated manufacturer more typical of companies founded early in the 20th century or before. By including new features such as large touchscreens, autopilot, and over-the-air updates, a Tesla car is similar to a tech product such a smartphone. Since they are independent of existing automakers they are not burdened with traditions and expectations of that industry. Additionally, Musk has been personally involved with improving details of the vehicles that would normally be considered good enough by other manufacturers. When the Roadster was being made, a great deal of delay and expense was added because he insisted that the doors be redesigned to be easier to get into (Baer, 2014). In the same way, the Model X features the unique "falcon doors" that improve the accessibility to the back seats of the SUV model in order for parents to place their children in the vehicle (Vance, 2015). These are only two examples of hundreds of such changes, but they are items that a normal car manufacturer would just leave as-is in order to avoid delays or because their existing supply chain didn't allow for alternative door mechanisms.

By developing their own batteries, battery factory, purchasing SolarCity, and moving into home solar products, Tesla is being managed more like a vertically integrated company. In this case, rather than simply integrating the components of their product, they are becoming involved in each step of making and providing sustainable energy to customers.

Despite being known as a company that many engineers are excited to work at, it has been a difficult, high pressure company as well. At multiple stages of the company's history there have been

times when they were at the brink of bankruptcy. When they were at these critical times, Musk expected total dedication to the company. There is even a story of Musk sending an email to an employee saying he was "extremely disappointed" that he took off work to be at the birth of his child (Vance, 2015).

Appendix B – SWOT Analysis

Strengths

- CEO, Elon Musk, who is ambitious about growing Tesla into a large player in the auto and clean energy industries. Although a CEO can not make a company succeed on their own, they do set the culture and expectations that allow for success. Especially in the tech industry, many companies are built with the goal of eventually selling to a larger firm. He brings one of Tesla's most important strengths, its innovative sprit. Its design thinking is very much like Apple, in which the same platform is used by different modules. For different models of Tesla electric vehicles, they share the same powertrain platform, just like Apple devices use same iOS system. Behind this simplicity, there is sophisticated research and development lifecycles. In their relatively short history Tesla has made profound development on battery and electric powertrain technology. This makes Tesla the technology leader in electric vehicles. In addition to their own vehicles, they have sold powertrain components to third parties.

- 89% of employees reported that they feel the work they do makes the world a better place (Snyder, 2016). Since the company requires many engineers and other skilled workers, it is important that they can attract and keep quality talent.

- Tesla has the capability to do much of their production in-house, and they are adding additional capabilities to do more in the future. They are currently building their Model S and X, and are tooling up for the Model 3 at their Fremont, California factory. This is the site of the former New United Motor Manufacturing, Inc. (NUMMI) plant, which was a joint venture of General Motors and Toyota (Langfitt, 2015). They are also are building their $5 billion Gigafactory which is already producing battery packs, and will eventually manufacture the battery cells themselves.

- Within the past two years, Model S vehicle sales have grown about 50% annually. Meanwhile, Tesla successfully launched a dual motor all-wheel drive version of Model S. This same all-wheel drive technology has also been used in Model X.

Weaknesses

- 70% of employees reported that their job is "fairly" or "extremely stressful" (Snyder, 2016). Even if the job is considered rewarding by employees, the high stress may eventually take a toll on the workforce and lead to departures.

- Tesla has only had two profitable quarters in its history so far (Higgins, 2016). While it is common for a company to need time to start turning a profit, it is still a weakness until they are able to get past this phase of growth. The biggest question will be if they can start making a profit once they start selling the Model 3, since that is meant to be their first mainstream, high volume car.

- Workers at the Fremont plant have expressed a desire to join the UAW union recently (Hull, 2017). It is yet to be seen how much support that view has, and how much any possible demands would cost Tesla, but it is an uncertainty going forward, and brings into question the level of employee satisfaction.

- Tesla's longest range is still just over 300 miles on a full charge. This is less, but not dramatically less than a comparable car on a full tank of gas. For example, a 2017 Chevy Impala will go approximately 400 miles on a full tank, using its reported combined fuel economy to calculate. According to the charging estimator tool on their website, a Model S will take about 1 hour and 15 minutes to fully charge from driving 300 miles at a supercharger. On a very long road trip, this adds a degree of planning that is not required with a gasoline powered car. A road trip is possible with a Tesla, but drivers will likely want to plan charging to coincide with meals or other breaks so they are not sitting for over an hour waiting. This consideration will continue to prevent some from purchasing electric vehicles.

Opportunities

- Concern for environmental impact is high despite recent low oil prices, and customers are willing to consider purchasing an electric vehicle. In the span of 2015 to 2016, the percentage of Americans willing to consider an electric vehicle rose from 31 to 36%, with 50% of 18 – 34 year-olds responding that they would purchase one. Since the younger generation in general is more concerned about the environment, this means that Tesla's potential market will grow as that demographic ages and purchases more cars.

- In order to succeed in the areas of both electric vehicles, solar power, and energy storage, Tesla's future is tied to battery technology. At the new Gigafactory, Tesla and Panasonic have begun to produce lithium-ion battery cells. They are building them in the industry standard 2170 cylindrical form, but with their own proprietary chemistry that we developed by both companies

together. In the long run this will allow Tesla to supply cells to any other company using that form factor. The battery cells are used to make packs that go into the cars as well as the Powerwall and Powerpack energy storage devices. Once the Gigafactory is running at full capacity they will likely want to supply many other companies with cells since the capacity is said to be equal to that of the entire world in 2013.

- By acquiring SolarCity, Tesla is making an effort to be vertically integrated from electrical production from PV panels, to storing that energy in power packs, and then using it to charge their EVS. SolarCity increased revenue in the second and third quarters of 2016, and they expected that trend to continue for the rest of the year. In Tesla's statements, they said that SolarCity could possibly add more than half a billion dollars in cash to Tesla's balance sheet over the next 3 years. If Tesla is able to effectively integrate SolarCity into the company they will be able to realize other efficiencies.

- The price of oil is much more volatile than the price of electricity, so although oil is inexpensive now, it can potentially jump in price at any time. When that happens, electric vehicles will have an even greater economic advantage than they do now while oil prices are low.

- The market penetration of home solar panels was forecast to grow at a fast pace, with residential installations already at 1.1 million homes (Fischer & Mountz, 2016). Home energy generation represents a unique opportunity for electric vehicles to grow at the same time. Tesla has recognized this and acquired SolarCity last year. Once a family has committed to installing solar power at their house, especially in conjunction with a Tesla PowerWall, the economic, convenience, and environmental benefits all simultaneously increase.

Threats

- Oil prices continue to be low, which diminishes the economic advantage of an electric vehicle. Most people expect oil to increase again in the future, and even at a low price, fuel is still a significant expense for many. Despite this, there is not as urgent of a push as when US gasoline was above $4 a gallon. Since no one can predict if or when oil will go that high again, Tesla is at the mercy of market forces they can not control that make a significant difference in their customer appeal. This will be especially significant when the Model 3 is released. With a price range of $70,000 - $130,000 for the Model S, and $75,000 - $137,000 for the Model X, currently

the price of fuel is not likely a significant issue for customers. When the Model 3 is released to a more mainstream customer base, they will be much more sensitive to potential fuel savings.

- A significant threat is competition from other established automobile manufacturers such as Chevy and Nissan. Nissan produces the Leaf, which starts at only $30,000, but only has a range of around 100 miles. Chevy has released the Volt, which is not fully electric, but can run for about 50 miles before its gasoline engine turns on to charge the batteries. Neither of these has made a large impact in the market, but Chevy is now releasing the Bolt, which has a range and price similar to the Model 3. Even though traditional car companies have not put a high priority on electric vehicles, they have the resources to quickly catch up if they make the decision to do so.
- The other threat would be the potential issue existing in Tesla's supply chain. Panasonic is the only supplier of cells for Tesla's lithium-ion battery and they experienced difficulty in meeting the increasing demand of volume manufacturing. Since the EV market is still in its early stages, there is not as robust of a supply chain as is in place for internal combustion engine powered cars. These problems could extend to other unique components found in Tesla cars.
- The Trump Administration has taken a notably anti-environment stance, and will likely work to eliminate incentives for electric vehicles and solar panels. This will slow Tesla's ability to increase their market share to the point where they no longer need those incentives. Additionally, if the government chooses to increase subsidies to oil and gas or the increasingly obsolete coal industry, this will also harm the economic advantage of Tesla's products.

Appendix C – Value Chain Analysis

A Value Chain Analysis is used to determine the ways in which Tesla creates value for their customers. Tesla is primarily a manufacturer, they take raw material and create a product. The value chain analysis looks at the various activities and processes that convert the inputs for a product into an output that has value. In simple terms, "How do you change business inputs into business outputs in such a a way that they have a greater value than the original cost of creating those outputs?" (Mind Tools Editorial Team, n.d.) This value created by Tesla is the profit margin. Harvard Business School professor, Michael Porter, breaks the value chain into two different activities, Primary Activities and Support Activities. (Porter M. E., 1998)

Primary Activities are the activities that are directly involved in the creation of a product. In Tesla's case, primary activities include (Mind Tools Editorial Team, n.d.):

a) Inbound logistics – this activity involves receiving, storing, and transporting the raw materials that Tesla needs to build their products.

b) Operations – this activity includes all of the activities that Tesla goes through to create their products, such as the assembly lines.

c) Outbound logistics – this activity includes the distribution methods and networks that Tesla utilizes to get their products to their customers.

d) Sales and Marketing – this activity includes the methods that Tesla uses to convince their customers to buy their products.

e) Service – this activity includes the systems that Tesla uses to maintain and support their products after the products have been purchased.

Support Activities are the activities that provide support to the primary activities. Support activities are not actively involved in the creation of value, but are the activities that allow the primary activities to work correctly. In Tesla's case, the support activities are (Mind Tools Editorial Team, n.d.):

a) Procurement – this activity includes the processes that Tesla goes through to purchase the raw materials it uses to create its products. This activity includes the actual purchasing process, vendor selection, and price negotiation.

b) Human Resource management – this activity involves the hiring, training, and retaining of personnel that Tesla needs to build their products.

c) Technological development – this activity includes maintaining Tesla's current technology as well as the research and development for improving their current products and developing new products.

d) Internal Systems – this activity includes all of the back office support that a corporation needs to function, such as accounting, safety, legal, and general management.

Below is a figure that Porter developed showing the interaction and relationship between Primary and Support Activities.

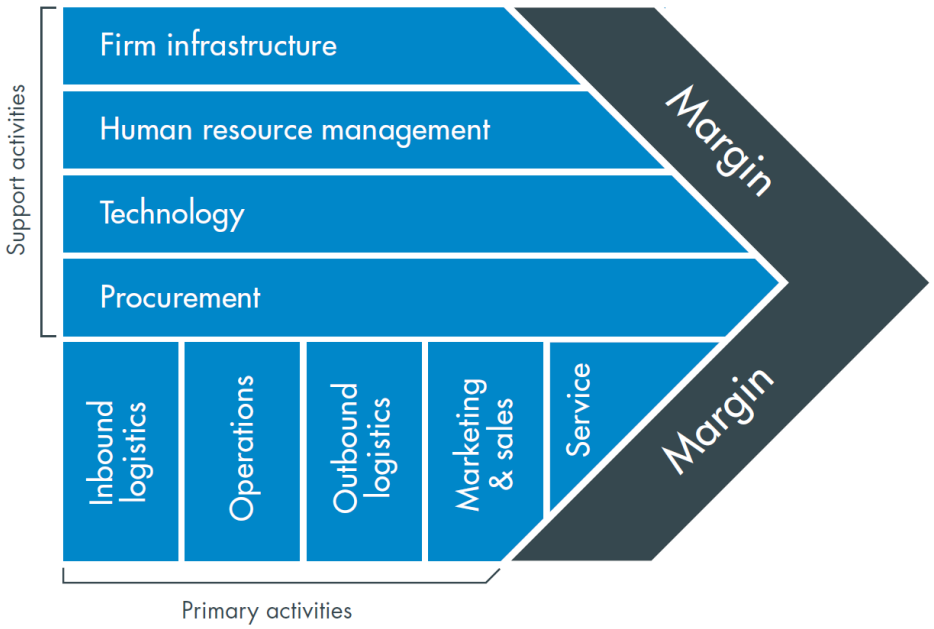


Figure C-1: Porter's Generic Value Chain

There are three steps involved with analyzing Tesla's value chain, based on Porter's methods (Chartered Global Management Accountant, 2013)

a) Separate the organization's operations into primary and support activities

b) Identify the activities critical to customer satisfaction and market success

Separate Tesla's Operations into Primary and Support Activities

Tesla's core business is the manufacturing of their electric vehicles. Because of this, there is a relatively distinct delineation between their primary and support activities.

Primary Activities

Inbound Logistics: One thing that sets Tesla apart is that they manufacture and keep the key components in house. This allows them to control the delivery of the components and closely monitor the quality. For instance they brought the powertrain manufacturing back in-house. (Bowman, 2010) This decision had several benefits. It did not allow other companies to learn the process of making electric vehicles, the Tesla engineers did not have to spend time overseas training people how to manufacture the necessary components, and in the long run it actually cost less.

Operations: Tesla owns and operates their own manufacturing facility in Fremont, California. They purchased the facility in 2010 and have continued to improve it over the last 7 years, with major renovations in 2010 and 2014. The Tesla Factory contains over "5.3 million square feet of manufacturing and office space and is considered one of the most advanced automotive factories in the world" (Tesla, n.d.). The Tesla Factory can assemble around 500,000 vehicles per year and based on comments from Elon Musk, the Tesla CEO, Tesla has plans to double their production by 2020. (Lambert, Tesla's Fremont factory could manufacture up to 1 million vehicles per year, says Musk, May)

Outbound Logistics: Tesla distributes their electric cars directly to consumers rather than use the typical dealership model that other car companies use. This unique approach allows Tesla to regulate the process, ensure the quality, and avoid paying a "middle man." As of 2016, Tesla has 96 showrooms. However they have plans to double that number by the end of 2017 in order to deliver the pre-ordered Tesla Model 3s. (Hareyan, 2016) When Tesla provided 7 reasons to the Federal Trade Commission when they were trying to convince the FTC to allow them to not utilize the dealership system (Fehrenbacher, 2016):

1) Go to the customer – by having smaller stores, Tesla can build their showrooms in town where their customers live and work.

2) No inventory – Tesla business model doesn't rely on moving cars as quickly as possible like the traditional car dealerships. Tesla does not typically have much inventory on the showroom floor since they do not ship the customer's cars until they are ready. Tesla customers are willing to wait several months to receive their vehicle.

3) Education process – Tesla's customers do not go to the showroom to get the lowest price, they are trying to learn about the Tesla technology. The Tesla salesforce are able to spend time with customers explaining the various innovations and technology.

4) Different business model – Tesla does not make most of its money from selling add-ons or warranties. Tesla's business model is that they make their profit from selling their cars. This is in contrast to the traditional car dealership. Because of this difference, there is not an advantage to having dealerships.

5) Advertising – Tesla does not do traditional advertising. They do their own marketing. Traditional dealerships rely on the car companies to help with the advertising.

6) Dealers won't make money – By selling direct to their customers, Tesla is able to cut out the middle man and either pass that savings on to the customer or keep that savings as additional profit.

7) Gas conflict of interest – Since Tesla is advocating using electric vehicles over gas powered vehicles, they feel that dealerships will not be good advocates of buying electric vehicles. The majority of dealerships sell gas powered vehicles, so there would be a conflict of interest.

Marketing & Sales: Tesla does not spend money on marketing and sales like a typical automobile manufacturer. In fact they spend $0 on marketing. (Gray, 2016) Instead Tesla utilizes different methods to win over customers. They have convinced a large portion of the population that Tesla cars are unique. These people become extremely strong and passionate advocates. The Tesla CEO is extremely charismatic and frequently participates in interviews and movie cameos. Their "under the radar" marketing has caused them to have more orders than they can build.

Service: In addition to owning their own showrooms, Tesla also owns their own service centers. As with most things, by keeping the service within Tesla, Tesla is able to reduce costs and monitor the quality. Tesla builds and provides free charging stations and also provides a decent warranty.

<u>Support Activities</u>

Procurement: Tesla manufactures key components in house which allows them to control the costs and quality as well as the schedule. For the outsourced components, Tesla forms strategic

partnerships. Tesla's most well-known strategic partnership is with Panasonic. Tesla announced that Panasonic would provide automotive grade battery cells in 2011. (Tesla, 2011) This partnership has been successful for both Panasonic and Tesla. Panasonic recently announced that it is trying to add additional components to the agreement such as collaborating on sensor development for Tesla's self-driving system. (Etherington, 2017)

Human Resource Management: Tesla is not considered a great company to work for. Per PayScale, Tesla is known for providing a lot of meaning, a lot of stress, and not very much pay (see below figure). (Autoblog, 2016)

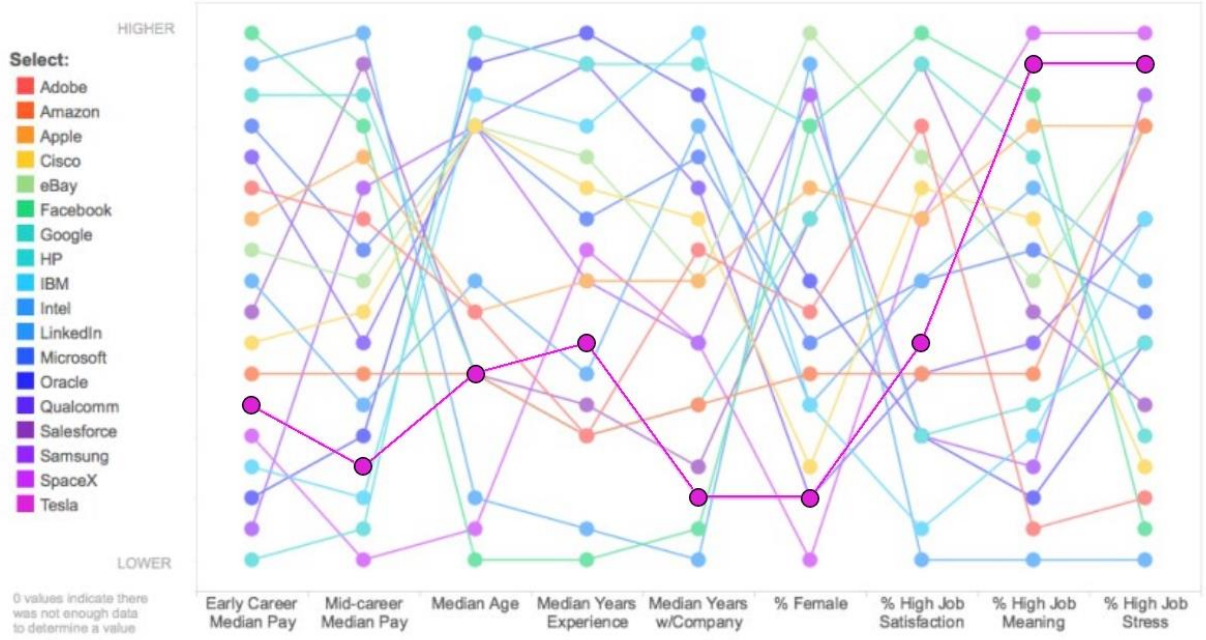


Figure C-2: Payscale survey of job satisfaction for technology companies

Elon Musk acknowledges that Tesla is challenging to work for. According to one of his Twitter posts, "SpaceX & Tesla comp[ensation] is same or better than other companies. Big diff[erence] is that we don't outsource manufacturing, retail sales, or service." (Musk, @elonmusk, 2016)

Technological Development: Technological development is one of Tesla's most important activities. Tesla is constantly innovating and creating which is one of the driving forces for what draws customers to Tesla. One of the areas that Tesla is considered a leading innovator is in battery and

charging technology. Their innovation in these areas allows them to make batteries cheaper and recharging quicker. (Bullis, 2013)

Internal Systems: The organization chart for Tesla is extremely horizontal. Elon Musk is at the top of the org chart with 10 managers reporting directly to him. These 10 managers are responsible for 20 departments. (Tesla, 2017) See organization chart below:

Figure C-3 - Organization Chart

Tesla works at keeping their internal systems in-house and limits the amount of work that is outsourced. Elon Musk keeps tight control over the company allowing him to control costs and quality.

Identify the Activities Critical to Customer Satisfaction and Market Success

Tesla's most important activities are the technological development and the marketing and sales. These two activities are inter-related. Another aspect that is important to Tesla's success is their focus on keeping as many activities in-house as possible.

Tesla has created a somewhat false market which has driven demand to outpace supply. By limiting the production of their vehicles, there is a sense of scarcity which drives demand. Additionally, because Elon Musk is charismatic and personable, their customers have developed a sense of ownership in the company. Tesla's continued innovation and passionate customer base allows the company to succeed without putting much effort in marketing. The strength of Tesla is their ability generate excitement within their customer base, control costs and quality by keeping their activities in-house, and by continuing to be on the cutting edge of technology.

Appendix D – Porters Five Forces

Porters five forces are detailed in his book *Competitive Strategy: Techniques for Analyzing Industries and Competitors.* These five forces "determines the ultimate profit potential in the industry, where profit potential is measured in terms of long run return on invested capital." (Porter M. , 1998). The industry that Tesla is in is the automobile industry and specifically the Electric Vehicle (EV) market. Our team's assessment of the Porters five forces on this market is given below.

Threat of substitute products

Currently the leading zero emissions technologies for vehicle are electric vehicles are lithium ion battery power, and hydrogen fuel cell technology. Lithium production was 34,000 tons in 2014, which is expected to increase approximately 14% per year through 2030. With estimated global reserves of economically extractable lithium are 9.9 million tons, increased production costs will likely be incurred in the future.

Conversely there are currently a variety of initiatives focused on reducing the cost of hydrogen production. Hydrogen is the most abundant element in the universe and supplies are virtually unlimited. One could expect Hydrogen fuel cell to be a significant threat to Tesla's current EV designs in the future.

Threat of new entrants

Tesla occupies a niche in the EV market. The Tesla S is both a high-tech luxury vehicle, and it dominates the luxury EV market. Audi, BMW, Cadillac and Porsche all have hybrid models that could compete in the same market but currently Tesla is the only zero emissions model. Tesla's dominance of the market, the construction of the Gigafactory, and Tesla's dedication to research and development it should maintain the leading position in the luxury EV market.

Intensity of rivalry among existing players

As Tesla seeks to expand their market share they are attempting to move into the low-cost or standard cost vehicle market Tesla will face major competition from the major automobile manufacturers. Most notably GM, Ford, and Nissan offer a high level of competition in these markets. The Gigafactory will help Tesla compete with companies, however, their competitors as noted in the article *The Chevy Volt's $89,000 production cost: A waste of money?*, have shown a willingness to invest heavily to become major participants in the market. Tesla will likely experience great difficulty in the low cost EV market.

Bargaining power of suppliers

Like all automobile manufacturers Tesla is heavily dependent on a variety of suppliers. The diverse nature of the suppliers lessens Tesla's dependence on any one particular supplier. A partial list is given in the article *Who are Tesla's (TSLA) main suppliers?* They include AGC Automotive, Brembo, Fisher Dynamics, Inteva Products, Modine Manufacturing Co., Sika, Stabilus, ZF Lenksysteme. (Maverick, 2015). Tesla's suppliers are called "enthusiastic" and are partially responsible for Tesla's success according to Paul Lienert and Alexandria Sage of Reuters (2016). Tesla has also purchased some parts suppliers which could likely be repeated as future needs arise. The increased demand for Tesla vehicles has generated a windfall for their suppliers as well. For these reasons the bargaining power of Tesla's suppliers are not seen as a threat to the company.

Bargaining power of Buyers

Tesla's highest selling vehicle the Model S occupies the luxury sedan market and in that market Tesla is highly competitive, because its price that is lower than many of its peers. The luxury car market is not normally considered the market bargaining is made. Tesla's buyer demographic is from all age groups, and even buyers with under $50,000 in income purchase Tesla vehicles. (LeBeau, 2013). Therefore, there cannot be any targeting by groups. Also with governmental incentives Tesla is in a stronger position when negotiating with customers. Tesla also has buy-back programs, free software updates, free internet access, and other standard features. All of these incentives preclude the need to bargain with customers.

In reviewing the Porter's Five Forces one can see that Tesla is in a very good market position. Tesla remains in a dominant position of its portion of the market; they are acquiring suppliers, and maintain a good relationship with their suppliers and customers. The area Tesla faces a potential problem is with the development hydrogen fuel cells. If there is a major breakthrough in the production of hydrogen gas the technology could seriously affect EV sales. Tesla should place itself in a position to incorporate and take advantage of any major breakthroughs in hydrogen production.

Appendix E – Political, Economic, Social, and Technological (PEST) Analysis

A PEST analysis is used to evaluate the current and future Political, Economic, Social, and Technological environment, to determine the possible consequences and impacts to a company or corporate entity. The PEST also provides data that can be used by the company to formulate strategic decisions that affect future operations. The PEST discusses the various macro factors that a corporation should take into account when making strategic and corporate decisions. A variety of these factor as they pertain to Tesla are discussed below.

Political factors

The Political Factors in the PEST Analysis include the political issues that may affect Tesla's performance. The Political Factors can assist Tesla with defining the various regulations and issues in the different regions that Tesla markets their products. These factors range from taxation policy to import regulations.

Taxation policy

Tesla's products have benefitted from a variety of government incentives both in the United States and abroad. The Federal government has provided a $7,500 tax credit for Tesla vehicles model years from 2008 until the present. (Chereb, 2014) In addition to the Federal government incentives, many states offer additional rebates. Most European countries also have incentives along with China, India, and Japan and South Korea.

The Tesla Corporation also enjoys tax incentives from Nevada. Nevada has agreed to tax incentives of $3.5 billion before June 2034 (Tesla annual report 2015). The Economic Development Authority of Western Nevada, has also granted Foreign Trade Zone status to Tesla's Gigafactory in Nevada. (U.S. Department of Commerce, 2016)

Regulations

Electric vehicles are subject to all of the rules and regulations that other motor vehicles are subject to. This has been advantageous to the Tesla Corporation since they have acquired credits under the

Environmental Protection Agency's (EPA) national greenhouse gas (GHG) emission standards. Tesla has entered into a contract to sell these credits to another automobile manufacturer. Tesla has also agreed to sell credits under the National Highway Traffic Safety Administration's (NHTSA) Corporate Average

Fuel Economy (CAFE) with another automobile manufacturer.

Recent development in autonomous, or in the case of Tesla, auto-piloted vehicles have necessitated standards for vehicle to vehicle communications. One of the standards that is being developed and will be required for the industry is the Federal Motor Vehicle Safety Standards, V2V Communications. A final rule is anticipated to be issued in 2019, that will allow a phase-in period until 2021, and all vehicles subject to that final rule would be required to comply by 2023.

In addition to these standards, compliance is also required for the NIST FIPS 200, *Minimum Security Requirements For Federal Information And Information Systems*. This standard sets minimum levels of security for cyber intrusions into the vehicles systems. Tesla is one the innovators in these fields and should not be in danger of noncompliance with the new standards.

Governmental stability

Tesla operates and is manufactured in countries that have long term stable governments. Sixty five percent of Tesla's sales are in the US, China and Norway. The majority of the remaining sales are in Europe and Asia. Governmental instability has not been a factor in Tesla's sales or operations.

Unemployment policy

In the United States, there are standard percentages for the Employers portion of unemployment insurance, the individual states set these rates. California and Nevada the two states Tesla has centered its manufacturing operations in, the Employers contribution for these states are shown in the chart below.

Table E-1: Source: United States Department of Labor Employment and Training Administration

2015			
STATE	TAXABLE WAGE BASE ($)	TAXABLE WAGES %	TOTAL WAGES %
California	7,000	4.88	0.73
Nevada	27,800	2.05	1.15

Levels of corruption

Tesla's operations are concentrated in the US, Europe, and Asia where corruption is not seen to be a significant factor in Tesla's operations.

Economic Factors

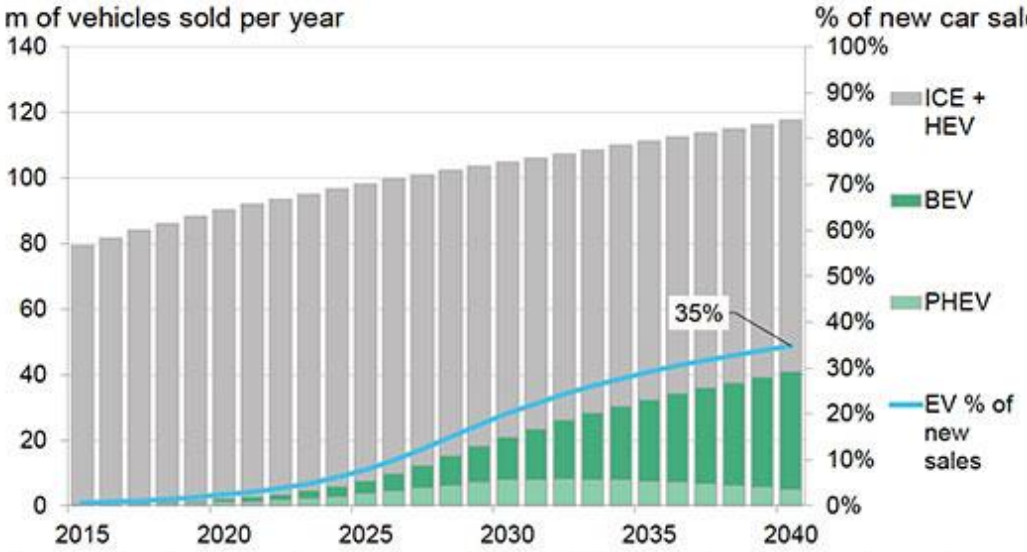
The Economic Factors in the PEST Analysis include the economic issues that may affect Tesla's performance. The Economic Factors can assist Tesla with navigating the various markets and assist with increasing their profitability. These factors range from inflation to labor costs.

Stage of business cycle

Tesla's initial sales occurred during the worst worldwide recession in modern times. Since then, Tesla sales have increased steadily, although there are signs of an economic slowdown. However the all-electric vehicle market is still very much on an upward trajectory.

As the chart below shows sales are expected to increase to greater than 30% of the overall market by 2040.

Figure 1: Global LDV and EV yearly sales, 2015 – 2040 (m vehicles sold per year, %)



Source: Bloomberg New Energy Finance Note: ICE+HEV = internal combustion engine and hybrid vehicles, BEV = battery electric vehicles, PHEV = plug-in hybrid electric vehicles.

Figure E-1: Global Electric Vehicle yearly sales

Inflation

The graph below shows the inflation rate over the previous ten years. (Historical Inflation Rates: 1914-2017, 2017) With the exception of the recession and the artificial boom that proceeded it, the inflation rate has remained mostly stable at below 3%. (US Inflation Rate, 2017)

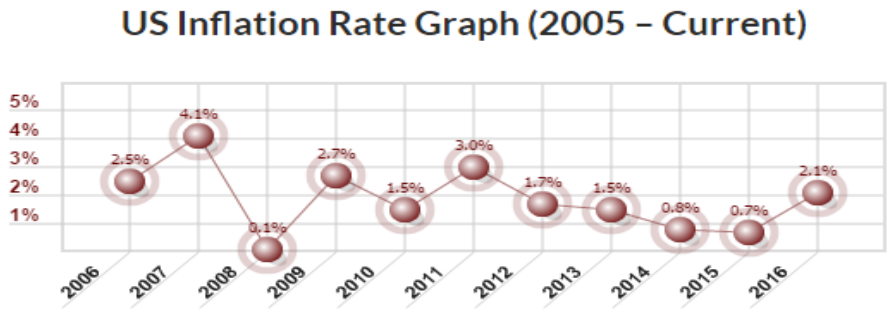


Figure E-2: US Inflation Rate (http://uninflation.org/us-inflation-rate/)

According to the Congressional Budget Office (CBO) the inflation rate should remain flat through 2019 and then see only a slight increase through 2023. (Congress of the United States - Congressional Budget Office, 2013) The inflation rate does not pose a significant risk to Tesla operations or sales now or in the near future according to the CBO. The lower interest rates will have a positive effect on Tesla's sales as they release their lower priced models.

Labor costs

During 2016 labor costs have risen at a rate of 2.2 percent as the chat below shows.

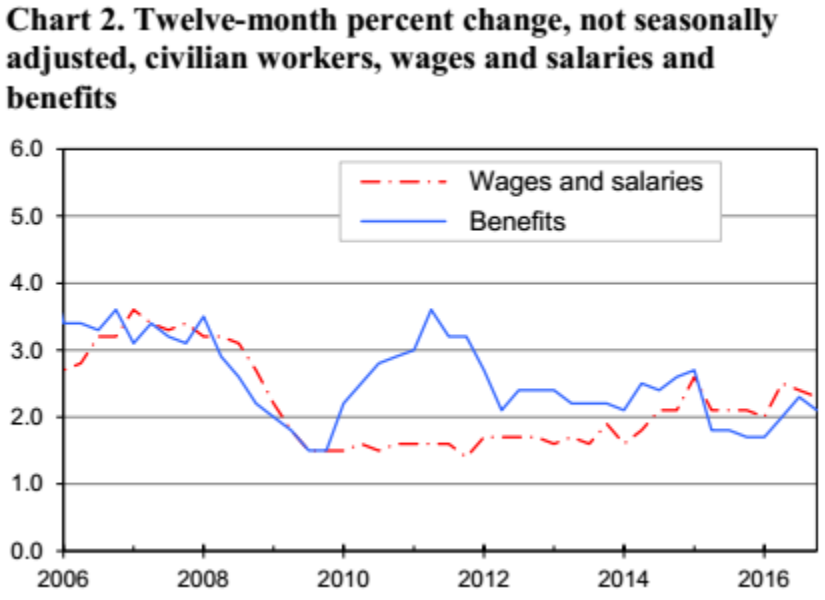


Figure E-3: From Bureau of Labor Statistics Employment Cost Index 2016

When taken in context one will notice that labor closely correlates to changes in the inflation rate. This represents normal growth and should not pose a challenge to Tesla's future growth.

Impact of globalization

Tesla has worldwide operations and has sales and service centers throughout the North America, China, Southeast Asia, Western Europe, and Australia. Tesla has reaped the rewards of globalization and in fact 2014 was the first year Tesla international sales were greater than United States sales. In the current political climate Globalization is a boon to Tesla. (Ohnsman, 2014)

Likely changes in economic environment

Low inflation rates and stable labor costs along with increased demand should provide favorable conditions for Tesla's growth. Recent political changes in the United States could however produce trade barriers that could negatively affect Tesla's foreign sales. Jan Hatzius Chief economist at Goldman Sachs states "Our expectations for economic policy under the Trump administration and under unified Republican control… are that there will be tax reform coupled with some fiscal easing and also some increase in infrastructure spending. And we do expect that to provide a positive impulse to economic growth." (Goldman Sachs Research, 2017)

Social Factors

The Social Factors in the PEST Analysis include the socio-economic market environment that may affect Tesla's performance. The Social Factors can assist Tesla with determining their target market's needs and help determine what will make them make a purchase. These factors range from income distribution to the shift towards environmental concern.

Increasing focus on reduced carbon

Society is placing greater value on reducing the environmental impact petroleum burning vehicles have. Over the last 15 or so years, electrical vehicles have become more popular. According to Bloomberg, "the sale of electric vehicles will hit 41 million by 2040, representing 35% of new light duty vehicle sales. This would be almost 90 times the equivalent figure for 2015." (MacDonald, 2016) Below is a chart showing the anticipated growth of electric car sales. This increased interest in reducing society's carbon footprint will be a benefit to Tesla since they primarily utilize and support technology and solutions that reduce carbon emissions.

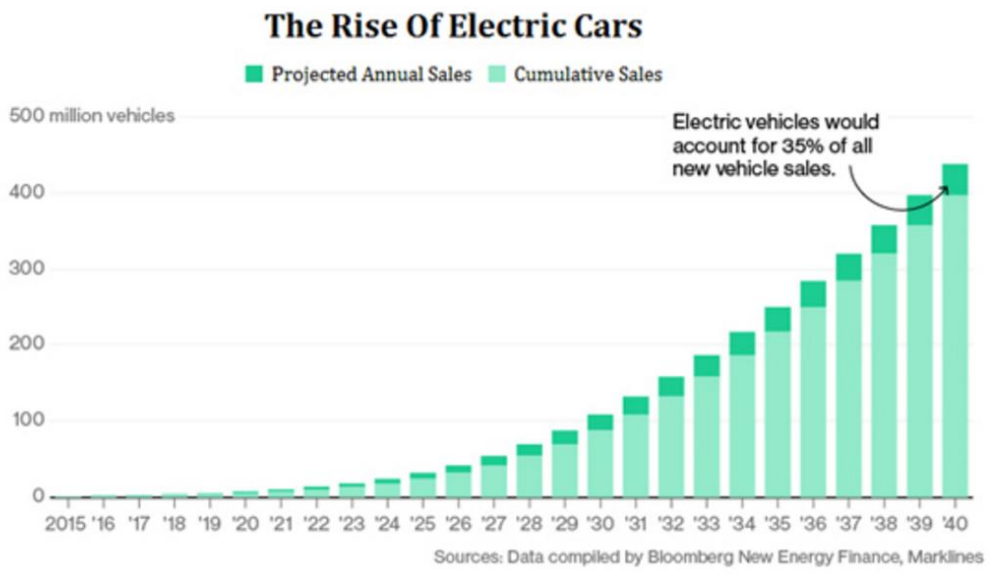


Figure E-4: Global Electric Vehicle yearly sales

Society's pressure to reduce carbon emissions from vehicles has caused world governments to enact legislation to limit the amount of CO2 emitted. For instance, EU legislation that by 2021 the average emission level of new cars must be 95 grams of CO2 per kilometer. (European Commission, n.d.)

Increasing preference for utilizing green energy

In addition to society wanting to reduce carbon emissions, society is starting to intentionally source out products that utilize green energy. According to a study performed by University of Berkeley, the public is willing to pay a premium for energy that provides a reduction in air emissions. (Murakami, Ida, Tanaka, & Friedman, 2014) Society's increased interest in utilizing green energy will be a benefit to Tesla since Tesla focuses on technology that is more environmentally friendly.

Income Distribution

In the markets that Tesla focuses on, the income distribution is skewed towards the older generations. These generations have the necessary disposable income to pay the upfront premium to purchase an electric vehicle. In the long run, electric vehicles may be cheaper to operate than a gas powered vehicle, however the initial cost for an electric vehicle is higher. According to Marianne Lavelle, the initial price to purchase a similar electric car could be as much as 44% higher than its gas equivalent. (Lavelle, 2012) Since income distribution is skewed towards the population that is interested

in electric vehicles and has the disposable income available, this will be a benefit to Tesla. The market that they are primarily selling to is increasing which should mean their revenues will increase.

Society's attitude

Society has a tendency to judge each other on the types of car they drive. Owning an electric vehicle provides the owner with an elevated social status. (Autospies, 2008) This factor can shift throughout the years. Currently society looks favorably at people that own electric cars. However, it is possible that in the future, society will look more favorably on people that do not own electric cars. Presently this factor is an advantage to Tesla.

Technological Factors

The Technological Factors in the PEST Analysis include the technological concepts in the market environment that may affect Tesla's performance. These factors impact how Tesla delivers it's products to the marketplace. The effect of these technological factors can be either positive or negative. These factors range from research and development to speed of technological obsolescence.

Changes in Technology

Technology throughout society is constantly changing, especially with regards to transportation. Over the last couple years, vehicle automation has experienced dramatic developments. Similarly, battery technology has been consistently improving over the last several years. These changes have allowed the electric vehicle industry to make safer, more environmentally friendly, and less expensive vehicles. According to the Brookings Institution, there are 5 battery innovations that will help electric cars to be less expensive and have a better range (West, 2015):

a. Lithium-ion batteries
b. Solid state batteries
c. Aluminum-ion batteries
d. Lithium-sulfur batteries
e. Metal-air batteries

This factor will represent a challenge for Tesla. Since technology is constantly shifting and improving, it is impossible for a company to remain on the cutting edge. Currently Tesla is considered a

top innovator, however it is possible that one day another company will be technologically superior to Tesla.

Life cycle and speed of technological obsolescence

One of the challenges that electric vehicles face is the rapid speed of technological obsolescence. Because the electric vehicle industry's dependence on technology, an electric vehicle can quickly become outdated since it will not incorporate the newest available technology. Elon Musk explained this issue recently by stating, "Tesla will never stop innovating. People are buying the wrong car if they expect this. There will be major revs every 12 to 18 months. If we (Tesla) applied resources to doing super complex retrofits, our pace of innovation would drop dramatically." (Musk, Elon Musk @elonmusk, 2017) Tesla's approach to this is unique. They are not concerned about keeping their products "future proof." Instead they are focusing their efforts on remaining innovative and on the fore-front of the electric vehicle technology. This approach may not be sustainable. Once Tesla becomes large enough, they may not remain at the front of the innovative curve.

Interest in vehicle automation

The public is conflicted over the concept of vehicle automation. This conflict may provide challenges for electrical vehicles as well as gas powered vehicles. The public wants autonomous vehicles "to minimize causalities in situations of extreme danger." (Bonnefon, Shariff, & Rahwan, 2016) However, they want their vehicles to protect them at all costs, which can potentially cause a conflict. (Driverless cars: Who gets protected? Study shows public deploys inconsistent ethics on safety issue, 2016) This conflict will be a challenge for vehicle manufacturers to provide programming that performs correctly. Vehicle automation, specifically, is a challenge for Tesla. Tesla has been at the fore-front of the vehicle automation technology. They will need to remain flexible while the public and regulatory agencies determine the correct path for the automation programming philosophy.

Generational changes in attitudes towards technology

Electric vehicles are becoming more popular for many reasons. Based on a report by the Department of Energy, there are several population segments that are more likely to buy an electric vehicle for their next purchase. (Singer, 2016) According to a recent survey the generation born "between 1982 and 1993 are more interested in hybrids and electric cars than they are in traditional, gas powered automobiles. (Tuttle, 2012) The changing in generational attitudes is an advantage for Tesla. They are considered the market leader by the younger generations. Even though they were not

"first to market," their products have been so revolutionary that an entire generation considers Tesla to be the leader in the electric vehicle industry.

Analysis:

In order to form a better understanding of the information obtained during the PEST analysis we made use of the DEMATEL (Decision Making Trial and Evaluation Laboratory) process. (Kockalikova & Kashi, 2014) The DAMATEL is a multi-criteria decision making tool used in evaluation of the information gathered during the PEST process. The DAMATEL graphically identifies causal links in the different criteria used in the PEST analysis.

The first step of the process is attaching weights to the various categories and criteria found during the PEST analysis. The weights are derived by the significance attached to them by Tesla in their 2015 financial report to the SEC. Consideration is also given to significance to future operations as determined by the PEST analysis. The table below shows the weights and the weighting factors we have attached to them.

Table E-2 - Tesla's Local and Global Weighting Factors

PEST Factor	Factor Weight	Criteria	Criteria Weights	Global Weights
Political Factors	0.3	Taxation policy	0.3	0.09
		Regulations	0.4	0.12
		Governmental stability	0.199	0.0597
		Unemployment policy	0.1	0.03
		Levels of corruption	0.001	0
Economic Factors	0.2	Stage of business cycle	0.01	0.002
		Inflation	0.15	0.03
		Labor costs	0.3	0.06
		Impact of globalization	0.2	0.04
		Likely changes in economic environment	0.34	0.068
Social Factors	0.2	Increasing focus on reduced carbon	0.2	0.04
		Increasing preference for utilizing green energy	0.2	0.04
		Income Distribution	0.4	0.08
		Society's attitude	0.2	0.04

Technological Factors	0.3	Changes in Technology	0.4	0.12
		Life cycle and speed of technological obsolescence	0.25	0.075
		Interest in vehicle automation	0.15	0.045
		Generational changes in attitudes towards technology	0.2	0.06

An examination of the different criteria follows.

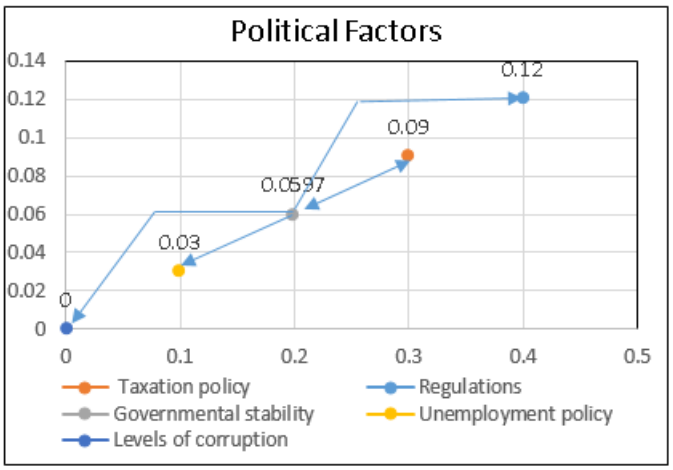


Figure E-5 - Political Factors

The political factors for any government are driven by the government's stability and ethical system. However, the interplay between these factors in the case of Tesla is different from what is considered conventional. The governments whose jurisdiction Tesla operates under, do not have notable corruption and are stable. Tesla has influenced tax policy as noted in the PEST analysis. Shifting and competing regulations from the different countries are seen as the most significant political risk.

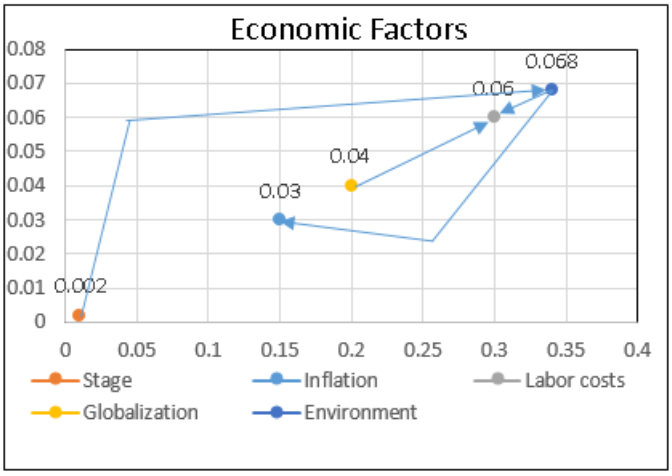


Figure E-6 - Economic Factors

Although Globalization has a positive influence on Tesla's finances. Current political realities and the uncertainty they represent tend to make changes to the economic environment less predictable therefore it has the most influence over the economic factors. It is also a driver for labor costs which is seen as the second most significant challenge for Tesla in the future.

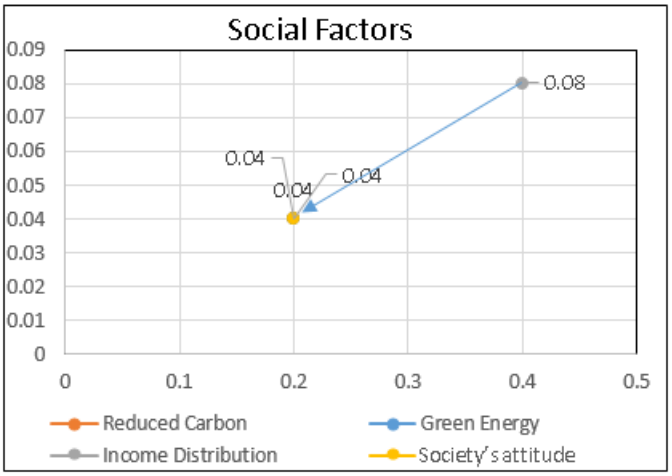


Figure E-7 - Social Factors

Of the social factors that have the most effect on Tesla sales in the United States (currently Tesla's largest market), income distribution is the most dominant. Tesla's vehicles remain prohibitively expensive, even with rebates and incentives. The positive impact they have on the environment can be outweighed by the cost. As noted in the PEST analysis however, as the income distribution shifts, greater numbers of ecology conscious individuals will purchase electric vehicles.

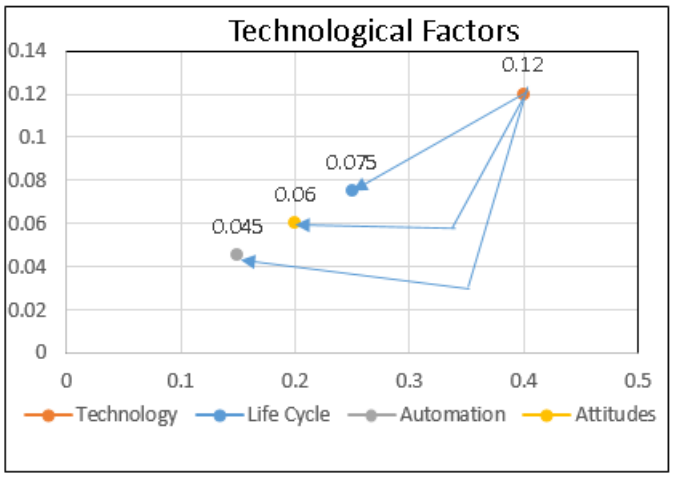


Figure E-8 - Technological Factors

As indicated in the chart above changes in technology influence all of the technological factors identified in the PEST analysis. It is imperative that Tesla remains at the forefront of technological changes in battery technology so they can maintain a competitive edge.

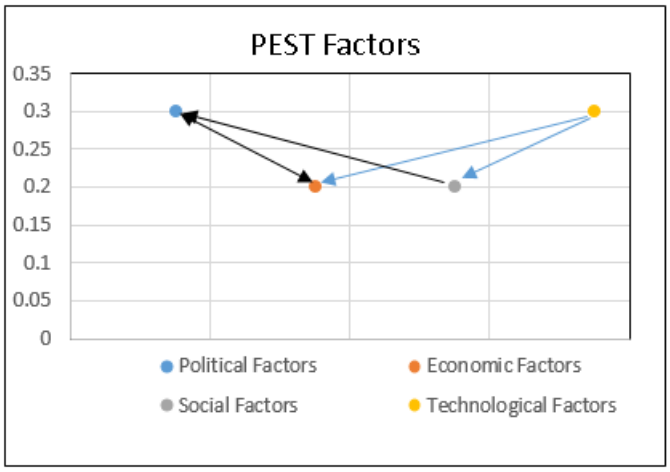


Figure E-9 - PEST Factors

As is shown in the chart above, technological factors are drivers for the remaining PEST factors. Improvements to the technological sector will have the greatest impact on Tesla's improvement. Economic factors will affect political factors which has a reciprocal effect denoted by the double arrow and should be consider the second most influential.

Appendix F – Research and Engineering Functional Analysis

Research

To differentiate itself from conventional automakers, Tesla Motors has successfully established an image as a leading cutting-edge innovation company. From its founding, Tesla has had engineers in key leadership positions, and is currently run by Elon Musk who has overarching goals of developing technologies that will ensure the long-term survival of the human race. To sustain this industrial high mark, the main function of Tesla Motors Research and Development serves a central role in pioneering new products that increase buyer value.

Elon Musk, Tesla's co-founder and CEO described his master plan simply as 'Build sports car; Use that money to build an affordable car; Use *that* money to build an even more affordable car; While doing above, also provide zero emission electric power generation options' (Musk, 2006). To realize this promise, "Tesla would plow all free cash flow back into R&D to drive down the costs and bring the follow up products to market as quickly as possible." Until now, it is exactly what the company has been doing and on this track, huge amount of money and efforts has been invested on its research and development. In fact, during some years the total R&D spending exceeded the company's losses for the year (Pressman, 2016). If their goal was to simply turn a profit in the short term, they could simply cut back on expenses including R&D. By allotting their resources in this way, they are setting the stage for a future where the company is the dominant player in an expanded EV market.

Research and development (R&D) expenses as a percentage of a company's total revenue is a good metric to gain insight into a company's research and engineering strategy. It consists of items such as of salaries of employees in engineering and research, supply chain, quality, as well as manufacturing engineering. In addition to salaries it includes the cost of prototypes, contracted services and equipment. Most of these areas do not directly add to the company's bottom line, and it may take several years before the benefits are realized. By this metric, Tesla is outperforming traditional automakers by a multiple of 2.7 – 4.6.

Figure F-1 - Tesla's R&D Intensity vs. Other Automakers (Pressman 2016)

Based on Tesla's 2016 annual report for Securities and Exchange Commission filing, R&D expenses increased $116.5 million, or 16%, to $834.4 million during 2016 compared with 2015. Beyond that, R&D increased by $253.2 million, or 54% from 2014 to 2015. According to the same report, the 2016 increase was mostly due to the 15% increased employee headcount as well as some stock benefits to new and existing employees. The 2015 increase was due to added expenses developing the Model X, and improving the Model S (Tesla Motors, Inc., 2017).

The table below illustrates a deeper look into the historic annual report data. Numbers for the R&D employee compensation indicate that Tesla keeps steady pace on expanding the Research and Development headcount. Stock compensation is a way corporations use stock options to reward employees. Therefore, through the number increase for this category, it demonstrates the determination and efforts Tesla put into the R&D employee encouragement program. Since it is stock-based, the company has also tied the benefit to the future success of their R&D efforts. The amount spent as a percentage of total revenue peaked in 2015, and was at the lowest in those three years in 2016. However, the total dollar amount increased each year. Most of the amount of $50.9 million increase of year 2014 as well as the $20.1 million increase of year 2015 all went to Model X, dual motor powertrain and right-hand drive Model S engineering, design and testing activities. Since Tesla is a young company with a much smaller lineup of cars compared to traditional automakers, this fluctuation is to be expected as activity increases before a new model launch. Since their revenues are much

smaller, these changes will have a larger effect on the percentage spent. The fact that all of these R&D rates are significantly higher than those listed in the table reflects Tesla's R&D strength on its new products continuous optimization and improvement. Looking again at the year 2016, to further expand the area of solar cell technology, $11.0 million related to SolarCity was spent.

Table F-1 – Tesla R&D Expenses

Year	Fiscal Year 2016	Fiscal Year 2015	Fiscal Year 2014
R&D Total Expense	$834.4 million	$717.9 million	$464.7 million
New Model Development Materials	- $25.9 million	+ $93.9 million	+ $60.7 million
R&D Employee Compensation	+ $78.2 million	+ $75.9 million	+ $85.3 million
Facilities (plus depreciation costs)	-	+ $30.6 million	+ $4.1 million
New model engineering, design and testing activities	+ $11.0 million	+ $20.1 million	+ $50.9 million
Stock-based compensation expense	+ $65.0 million	+ $22.8 million	+ $28.1 million

Research and Development Expenses

(Dollars in thousands)	Year Ended December 31, 2016	2015	2014	Change 2016 vs. 2015 $	Change 2016 vs. 2015 %	Change 2015 vs. 2014 $	Change 2015 vs. 2014 %
Research and development	$ 834,408	$ 717,900	$ 464,700	116,508	16%	253,200	54%
As a percentage of revenues	11.9%	17.7%	14.5%				

Figure F-2 - Captured from 2016 Annual Report - R&D Expenses

Meanwhile, if we look at the quarterly expense analysis chart below, we could conclude that from the year 2014 to 2106, the money used on Tesla Research and Development still increased quarter by quarter although the ratio of increase was not so sharp in 2016 compared to overall year 2014.

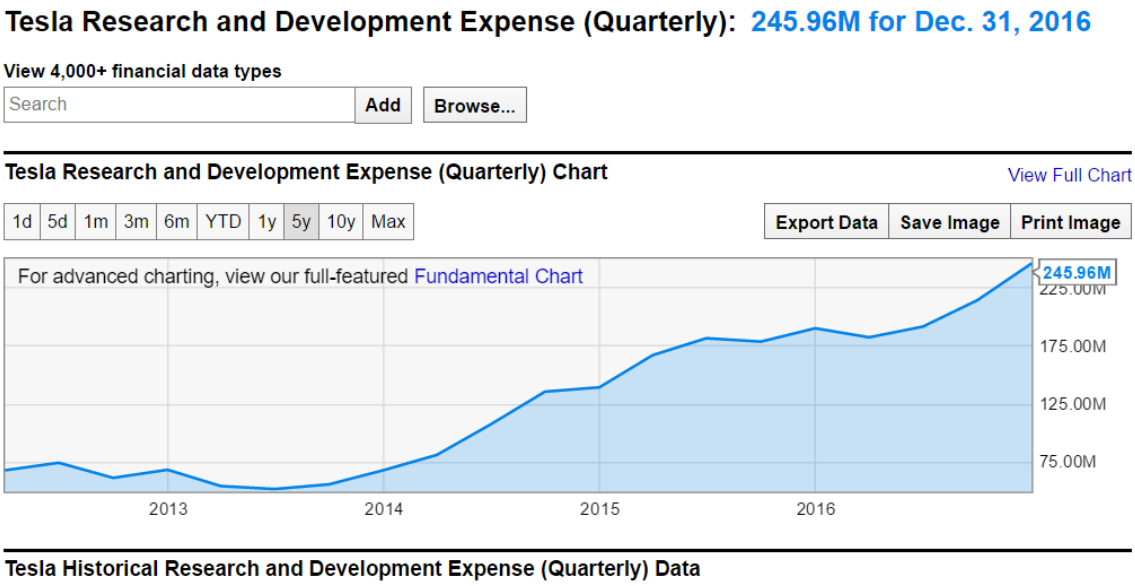


Figure F-3 - Tesla R&D Quarterly Expense Diagram from https://ycharts.com/companies/TSLA/r_and_d_expense

In most traditional companies, intellectual property is carefully guarded and fiercely defended. Despite its large investments in new technology, Tesla has made some unique decisions to work with competitors, and to allow them to have access to their patents. One major initiative was to sell their electric drive powertrains to other automakers for them to use in their EVs. Two examples of this were to Daimler for their Smart Fortwo and to Toyota for their RAV 4 EV. By cooperating, Tesla was able to sell powertrains that they had capacity to build beyond the number they needed to fulfill the orders for their own car models. Since Tesla has not yet turned a profit, these additional sales would be a great benefit to keep their production busy while their own models built in popularity. In turn, Daimler and Toyota were able to source EV drivetrains that were more expensive per unit, but cheaper than an in-house developed system when R&D expenses were accounted for. This allowed those companies to test entering the EV market without the risk of going through a full R&D cycle. Beyond that, it also allowed them to reach certain mandated fuel efficiency and alternative energy goals without having to invest as many resources (Cheong, Song, & Hu, 2016).

On the supply side, Tesla has built partnerships with their vendors, most notably with Panasonic, the supplier of their Lithium Ion battery cells. While many companies are willing to make partnerships with their suppliers, this arraignment goes beyond normal pricing and supply terms. The two companies have worked together to develop new battery chemistries for the Li-Ion cells. They are also working

together to make batteries at the new Gigafactory in Nevada. Many companies strive to reduce dependence on a specific supplier in order to not have their material supply disrupted due to circumstances beyond their control. This independence is often at the expense of having to settle for products and materials that are standard in the industry. By closely partnering with Panasonic, Tesla has made the choice to be dependent on them, but they are able to combine their R&D efforts with them in order to make battery chemistries that are unavailable to other EV makers. They are also able to work with people who have far more expertise in batteries while still having the exclusive use of those new technologies.

Finally, as a result of the extensive R&D that Tesla undertakes, they have a great deal of intellectual property, including many patents. Rather than using their patents to prevent other companies from entering the EV market, or keeping them at a disadvantage compared to Tesla, they have decided that increasing the total EV market is more of an advantage. This is especially risky in the auto industry because it is populated by large, established players who would be able to copy a new technology to quickly catch up once the market begins to take off. Tesla is taking a calculated risk by sharing the result of its research by betting that an overall increase in the size of the EV market will be more beneficial to them than the increased competition will be detrimental.

In conclusion, product research and development is one of the most resource intensive growth strategies. By using this strategy, Tesla Motors grows by developing new products that generate new sales in the future. In addition to the normal challenges that any automaker experiences in developing new products, Tesla also strives to develop technologies that have minimal environmental impact, both at the vehicle and at power generation (Rowland, 2017). By putting a heavy emphasis on R&D, Tesla is sacrificing short-term profit for a much larger long-term potential.

Engineering

Engineering function focuses on the technical execution and delivery of the technology developed by R&D. Within the Tesla organization, engineering can be divided into the three main product lines; vehicles, energy storage, and solar energy systems.

<u>Vehicles</u>

"Tesla Motors' core competencies are powertrain engineering, vehicle engineering, innovative manufacturing and energy storage" (Tesla Motors, Inc., 2015). This is a far cry from when the company

began. Then vehicle engineering was a much simpler engineering task, with the chassis and body coming from Lotus and drivetrain technology from AC Propulsion. During the development of the Roadster, Tesla began its journey to a full-fledged automaker, with the engineering required to support this level of manufacturing. By developing a powertrain that can be reused in all of their vehicles, they are able to save engineering resources and maintain flexibility in manufacturing.

As the company has developed, the engineering team soon realized that the reason why there hadn't been a new American automotive company successfully started since Chrysler was the extreme complexity involved in engineering a car. One of the major changes that Elon Musk brought to the company as he took a greater role in its day to day control was to push the engineering team to consider every detail of the cars when they were designing them.

One example was when the Roadster was being developed, a two-speed transmission was considered, and the engineers assumed that they would easily be able to order one. When they began to test, they found that they lasted around 2000 miles in their test vehicles (Vance, 2015). This was only one of hundreds of issues they discovered when they designed their first car. Although the day-to-day workings of the engineering team are held secret, it is known that Tesla prefers to hire younger engineers who may be less experienced, but are more enthusiastic and less expensive. As a trade-off, they may have had a steeper learning curve compared to if they had enticed experienced automotive engineers from their companies. The leadership of Elon Musk pushing them to continue despite their setbacks was a key to their success in completing the Roadster, as well as introducing the Model S and X.

Energy Storage

When Tesla added the Powerwall to its portfolio it first didn't seem like it matched with its main product. As time has passed, the business reason for this has been made apparent. Now in light of their acquisition of Solar City, their business is electric power from solar generation, to storage, to use in a vehicle. In addition, it is an additional market for the battery cells they are producing in partnership with Panasonic at the Gigafactory. From an engineering standpoint, it is can be a clever solution to an EVs largest cost, the battery pack. In an EV, space and weight are at a premium, so batteries must be as energy dense as possible. In a home energy storage application, both of these restrictions are greatly eased. By developing stationary energy storage, the engineers have helped give older batteries that are too low in capacity for an EV another use. Once batteries have reached the end of their useful life in an EV because of normal degradation from use, they are ben reused in a Powerwall. Although this reuse

has not yet been implemented, it has been discussed extensively in the EV and stationary power storage industry and it seems inevitable.

Appendix G – Tesla Financial Analysis

The key financial data for Tesla corporation include the Liquidity Ratios, Operational efficiency ratios, Financial Leverage Ratios, Profitability Ratios, and Dividend Policy Ratios each of these ratios provide insight into the financial health of a company. The data used in this analysis was taken from the 2015 SEC filings for each of these companies and nasdaq.com.

Liquidity Ratios

Liquidity Ratios provide an indication of company's ability to pay its short-term debts and the margin of safety under which the company operates with regard its financial obligations. The key liquidity metrics are the Current Ratio, Quick Ratio, and the Cash Ratio.

Key Liquidity Ratios:

Current Ratio = Current Assets / Current Liabilities

Quick Ratio = (Current Assets – Inventory) / Current Liabilities

Cash Ratio = (Cash + Marketable Securities) / Current Liabilities

The Current Ratio is primarily a measure of solvency; however, a company's current assets should be greater than or equal to its current liabilities to consider liquid. The Quick Ratio excludes inventory in the calculation and provides a more accurate picture of liquidity since selling inventory can be time consuming. The most conservative of the liquidity ratios, the Cash Ratio measures a company's ability to immediately pay off its debts. (Essays, UK, 2013)

The table shown below provides a comparison of the Liquidity Ratios for Tesla and some of its competitors.

Table G-1 - Key Liquidity Ratios

Key Liquidity Ratios	Ford	GM	Honda	TSLA	Toyota	Peer Median	Best in Class
Current Ratio	120%	89%	114%	107%	113%	113%	120%
Quick Ratio	110%	73%	90%	72%	100%	90%	110%
Cash Ratio	43%	29%	32%	60%	34%	34%	60%

It is informative to note that Tesla is in one standard deviation from the mean of the Current Ratio and the Quick Ratio and is in the strongest apparent position for the Cash Ratio. This data shows that Tesla is Solvent and in a good position to quickly settle its financial obligations.

Operational Efficiency Ratios

These ratios provide insight into the asset management at the company there are often referred to as "asset turnover or asset management ratios". (Essays, UK, 2013)

Operational Efficiency Ratios:

Receivables Turnover = Annual Credit Sales / Trade Receivables

Payables Turnover = Annual Credit Purchases / Trade Payables

Inventory Turnover = Cost of Goods Sold / Average Inventory

Receivables Turnover is a measure of how quickly a company collects the receivables due from its sales.

The Paybles turnover, is a measure of how quickly a company pays for its purchases throughout the year. A company could incur interest and penalties that which could adversely affect its profit.

Inventory Turnover measures how efficiently a company can sell its product, excess inventory is . harmful to to the company's bottom line. Each of these ratios can be expressed in days with the formula 365 days / Ratio.

The table shown below provides a comparison of the Operational Efficiency Ratios for Tesla and some of its competitors. Note that total revenue was used in these calculations for Annual credit sales and Cost of goods sold, and Annual Credit Purchases was replaced by Cost of Sales.

Table G-2 Operational Efficiency Ratios

Operational Efficiency Ratios	Ford	GM	Honda	TSLA	Toyota	Peer Median	Best in Class
Turnover	0.39	8.44	2.64	23.95	1.95	2.64	23.95
Debtor Days	929	43	138	15	187	138	15
Payables Turnover	1.757	7.801	11.434	0.021	27.303	6.119	27.303
Creditor Days	207.71	46.79	31.92	17376.53	13.37	59.65	13.37
Inventory Turnover	4.28213	11.06917	8.83534	3.16631	13.29099	8.83534	13.29099
Inventory Days	85.24	32.97	41.31	115.28	27.46	41.31	27.46

The creditor days are skewed because Tesla has a very low (by comparison) cost of sales. Tesla also does well in collecting on debts owed to the company. Where Tesla has some problems are with inventory turnover it is the slowest of all of its competitors and more than 2 standard deviations from the mean.

Financial Leverage Ratios

The financial leverage ratios are used to examine a company's long term solvency. Each offer insight into the ability of a company to pay its future debts.

Financial Leverage Ratios:

Debt Ratio = Total Debt / Total Assets

Debt-to-Equity Ratio = Total Debt / Total Equity

Interest Coverage = Earnings Before Interest and Taxation / Interest Charges

The Debt Ratio "can be interpreted as the portion of a company's assets that are financed by debt. " (Investopedia Staff, 2006, November 08) Therefore companies want this ratio as low as possible but if revenue streams are stable higher percentages are acceptable. The Debt to Equity Ratio is a measure of debt to the amount of stock the company has issued and it is indicative of how well the company's debt is covered by stock it has issued along with the value of all the companies tangible and unleveraged assets. "Capital-intensive industries such as auto manufacturing tend to have a debt/equity ratio above 2". (Investopedia Staff, 2006, November 08) As the name implies the Interest Coverage Ratio is a measure of how well a company can pay its outstanding interest. Interest coverage is an indicator of risk and if it is below 2.5 it is a warning sign for the company.

The table below shows a comparison of Tesla's Financial Leverage Ratios to it peers.

Table G-3 - Financial Leverage Ratios

Financial Leverage Ratios	Ford	GM	Honda	TSLA	Toyota	Peer Median	Best in Class
Debt Ratio	0.602	0.251	0.625	0.428	0.386	0.428	0.251
Debt-to-Equity Ratio	4.724	0.485	0.533	3.179	1.092	1.092	0.485
Interest Coverage	4.18	60.75	679.36	69.29	24.53	60.75	679.36

Looking at the data in the table we see that Tesla compares well with its peers in Financial Leverage Ratios. There are no apparent issues with Tesla and the amount of leverage it had accrued at the end of 2015.

Profitability Ratios

Profitability Ratios provide an assessment of a company's ability to generate profit from its assets. (Essays, UK, 2013) Improvement in these ratios over a previous period or relative to the companies peers are a indication that a company is doing well.

Profitability Ratios:

Gross Profit Margin = (Total Revenue - Cost of Goods Sold) / Total Revenue

Net Profit Margin = (Net Profit After Taxes) / Total Revenue

Return on Assets = Net Income After Taxes / Total Assets

Return on Equity = Net Income After Taxes / Shareholder Equity

Gross Profit Margin examines the protion of total revene that can be attributed to before tax profits. All companies attempt to maximize profit is a measure of how well a company is meeting this goal. Similar to the Gross Profit Margin the Net Profit Margin is measure of profit but it take into account al operations cost and taxes. Return on assets provides a measure of performance, it measure a company's profitability based on the amount of asset it has, or how much profit is generated by the assets it possesses. The Return on Equity measures the amount that equity holders gain or lose for their share of equity in the company as income increases relative to their portion they see gains.

The following table shows a comparison of these Profitability Ratios between Tesla and its peers.

Table G-4 - Profitability Ratios

Profitability Ratios	Ford	GM	Honda	TSLA	Toyota	Peer Median	Best in Class
Gross Profit Margin	-2.482	0.158	0.904	0.995	0.245	0.245	0.995
Net Profit Margin	0.207	0.063	0.000	-0.220	0.081	0.063	0.207
Return on Assets	0.033	0.123	0.000	-0.110	0.049	0.033	0.123
Return on Equity	0.257	0.238	0.000	-0.816	0.138	0.138	0.257

Reviewing the data we see that Tesla has a serious problem generating a profit. Even though Tesla is generating a better a greater amount of money relative to the cost of its products; the cost of operations and taxes and other liabilities force a negative net profit. There is a disconnect that needs to be addressed. The negative profit of course leads to a negative ROA and ROE, one caveat is that even though Tesla has not shown a profit the stock price has increased steadily which attracts equity holder and could allow them to realize earnings through stock sales.

Dividend Policy Ratios

These ratios relate to the amount of dividends that are paid to stockholders although the amount paid is sometimes thought to be irrelevant some stock rely on the dividends as a source of income and could move to different stocks if they are not paid. Taken in conjunction with the other financial ratios they can indicate the level of reinvestment the company is making.

<u>Dividend Policy Ratios:</u>

Dividend Yield = Dividends Per Share / Share Price

Payout Ratio = Dividends Per Share / Earnings Per Share

The Dividend Yield Ratio can be thought of as an indicator of the maturity of the company. Mature companies seek to satisfy its stock holders by offering larger dividends, while growing companies tend to reinvest earning at a greater rate in order to build company. The Payout Ratio is

more indicative of a company's financial health because it shows the portion of the earnings that are reinvested an indicator of the company's future health.

The table below shows a comparison Dividend Policy Ratios for Tesla to its peers.

Table G-5 - Dividend Policy Ratios

Dividend Policy Ratios	Ford	GM	Honda	TSLA	Toyota	Peer Median	Best in Class
Dividend Yield	0.037	0.037	0.023	0.000	0.013	0.023	0.037
Payout Ratio	0.323	0.226	0.313	0.000	1.500	0.313	1.500

Tesla has not given a dividend which does not negatively reflect on Tesla, the business is growing in a relatively new field therefore one would expect that earnings be reinvested in the company.

Conclusions:

Tesla was operating on a solid footing in 2015. The loses they incurred can be attributed to their growth and investment looking at their history to that point we can see a improvement in some areas. Subsequent investments have taken their toll on the company's profitability. Telsa's future rests on their ability to produce and sell their Model 3 in a cost effective, and profitable manner.

Appendix H – Tesla Marketing Functional Analysis

The purpose of marketing is to put the correct product in front of the right person at the right price and at the right time. In order to be successful, every company needs to have a comprehensive and accurate approach to marketing. Otherwise you end up with a product with sales that languish such as New Coke and the Ford Edsel. Two methods to analyze a Tesla's marketing strategy is to identify the customer segmentation and to review the marketing mix.

Customer Segmentation

Customer segmentation is a concept that allows companies to categorize their customers into groups with similar characteristics such as geographic, demographic, behavioral, and psychographic.

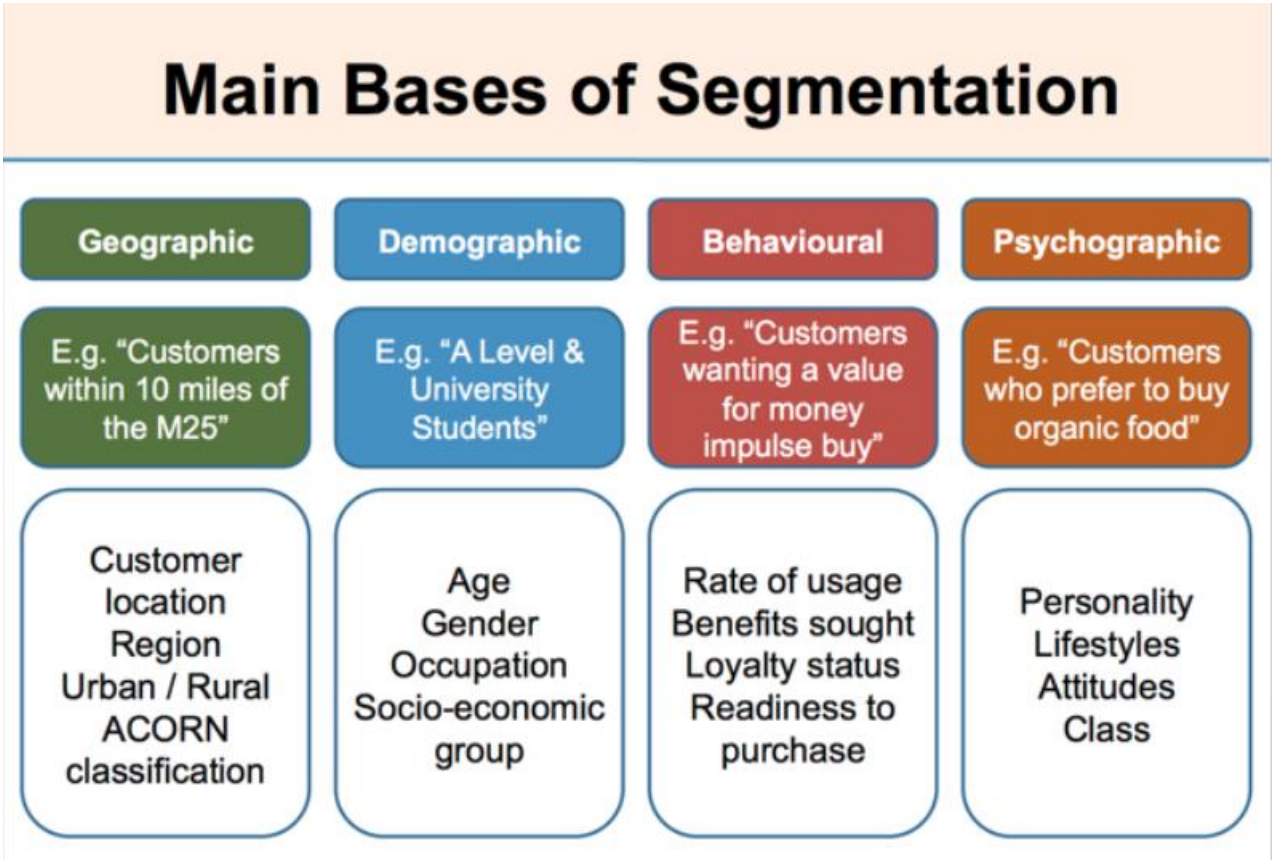


Figure H-1 – Segmentation (Riley)

Tesla has segmented the market into several different groups. Based on how they wanted to grow the company, they specifically targeted each group with a different product offering. In fact, Elon

Musk outlines their "Master Plan" on the Tesla website. (Musk, Master Plan, Part Deux, 2016) Combining Part 1 and Part 2, the Tesla Master Plan is:

1. Create a low volume sportscar, which would necessarily be expensive
2. Use that money to develop a medium volume car at a lower price
3. Use *that* money to create an affordable, high volume car
4. Provide solar power
5. Create stunning solar roofs with seamlessly integrated battery storage
6. Expand the electric vehicle product line to address all major segments
7. Develop a self-driving capability that is 10x safer than manual via massive fleet learning
8. Enable your car to make money for you when you aren't using it

So far Tesla has completed items 1, 2, 4, and 5. They will complete item 3 by the end of 2017/beginning of 2018 with the Model 3. And from all appearances they are tackling the remaining 3 items.

Elon Musk talks about the different segments that Tesla has divided their marketing strategy into:

1. Premium sedans
2. Low cost sedans
3. Compact SUVs
4. Pickup trucks
5. Heavy duty trucks
6. High passenger-density urban transports

The first segment that Tesla targeted was the upper class business executive who were looking for a high-end luxury car with sport car performance. In addition the targeted audience had to be somewhat environmentally conscious and an early technology adapter. In 2006, the product that Tesla

produced for this target audience was the Roadster. The Roadster was introduced as a luxury all-electric sports car. It was priced competitively with other 2 seater luxury sports cars but not necessarily with luxury sedans. The Roadster achieved limited success, and sold 2,400 units. Although the Roadster did not provide a huge economic boon for Tesla, it allowed Tesla to learn how to be a manufacturer. Tesla utilized the knowledge and revenue from the Roadster to address the next segment.

The second segment that Tesla targeted was the successful business executive and entrepreneur, which had expendable income and again were early technology adopters. Rather than develop a sports car, Tesla produced a luxury sedan for this segment with the Model X and Model S. This product represents the second step to Elon Musk's Master Plan. They are less expensive than the Roadster and Tesla has manufactured many more than the Roadster. As of the beginning of 2016, Tesla has sold over 100,000 Model S and Model X vehicles. (Cobb, 2015)

The third segment that Tesla is currently targeting are environmentally-conscious middle class working adults who are in the market for an entry level luxury car. This segment corresponds to the third step in the Master Plan. The product that Tesla will introduce for this segment is the Model 3. In general, the Model 3 has been received with a great deal of enthusiasm. In fact Tesla sold nearly 400,000 pre-orders for the Model 3, causing the Model 3 to be sold out through mid-2018. (Heisler, 2016)

Products have not been introduced by Tesla to address the remaining segments that Elon Musk has identified. The compact SUV and pickup trucks will target the remaining consumer segments. And the heavy duty trucks and the mass transit vehicles will be geared towards the commercial and government industries. With this portfolio of different products, Tesla will have covered the vast majority of the automobile markets.

Marketing Mix

Marketing Mix is typically defined through the use of the 4 P's of marketing: Price, Product, Promotion, and Place. By utilizing marketing mix a company can ensure that they are introducing the correct product to the correct person at the right price and time. By defining the 4 P's a company can develop and execute an effective marketing campaign. The marketing mix "has been proven as a major factor in the success of a product once it is well understood and used." (The Marketing Mix, n.d.)

Figure H-2 - Marketing Mix (Martin, 2014)

The marketing mix is comprised of four interdependent components that must work together and be aligned. The customer is the central focus of the marketing mix. It is important that the company builds the four components sot that they lead to a satisfied and loyal customer.

Product

The product component means that Tesla should build an electric vehicle that meets their customer's demands or they should make their electric vehicles so compelling that their customers believe that they need it. This component defines what product is being sold and what differentiates Tesla's product from their competitors.

Specifically Tesla offers three main types of products. Perhaps their best known product is their electric vehicles, which is the prime focus of this analysis document. Their other products include energy storage such as their Powerwall and their batteries. They also produce an energy generation product called the Solar Roof. Additionally, they produce electric vehicle components which other car manufacturers use.

Regarding the electric vehicle product line, Tesla offers four different automobiles, the Roadster (2008), the Model S (2012), the Model X (2015) and the Model 3 (~2018). (Tesla, n.d.) These products are all electric vehicles. Tesla competes in two different markets, the all-electric vehicle market and the

luxury car market. Tesla's competition in the all-electric market is the Chinese BYD e6, the Nissan Leaf and the Chevrolet Bolt. Tesla, Nissan, and Chevrolet are the only companies at this point that have an automobile that are all-electric with a range of at least 200 miles with a true international exposure. (Winton, 2016)

In the luxury sedan market, Tesla has quite a few competitors namely the Mercedes S class and CLS class, the BMW 6 and 7 series, the Audi A7 and A8, the Lexus LS, the Porsche Panamera, the Maserati Ghibli and Quattroporte, and the Jaguar XJ. The below chart illustrates Tesla's success in this market.

U.S. Large Luxury Sedans

MODEL	Q3 2016	Q3 2015	% Change	% of Total
Tesla Model S	9,156	5,756	59%	32%
Mercedes-Benz S-Class	4,921	5,414	-9%	17%
BMW 7-Series	3,634	1,140	219%	13%
Mercedes-Benz CLS-Class	1,983	1,815	9%	7%
Maserati Ghibli	1,541	NA	NA	5%
Audi A7	1,532	2,132	-28%	5%
Lexus LS	1,235	1,569	-21%	4%
Porsche Panamera	1,143	1,393	-18%	4%
BMW 6-Series	1,096	834	31%	4%
Audi A8	1,010	1,300	-22%	4%
Jaguar XJ	903	1,064	-15%	3%
Maserati Quattroporte	702	NA	NA	2%
Total	**28,856**	**22,417**	**29%**	**100%**

Table H-1 - U.S. Luxury Sedan Sales (Heisler, 2016)

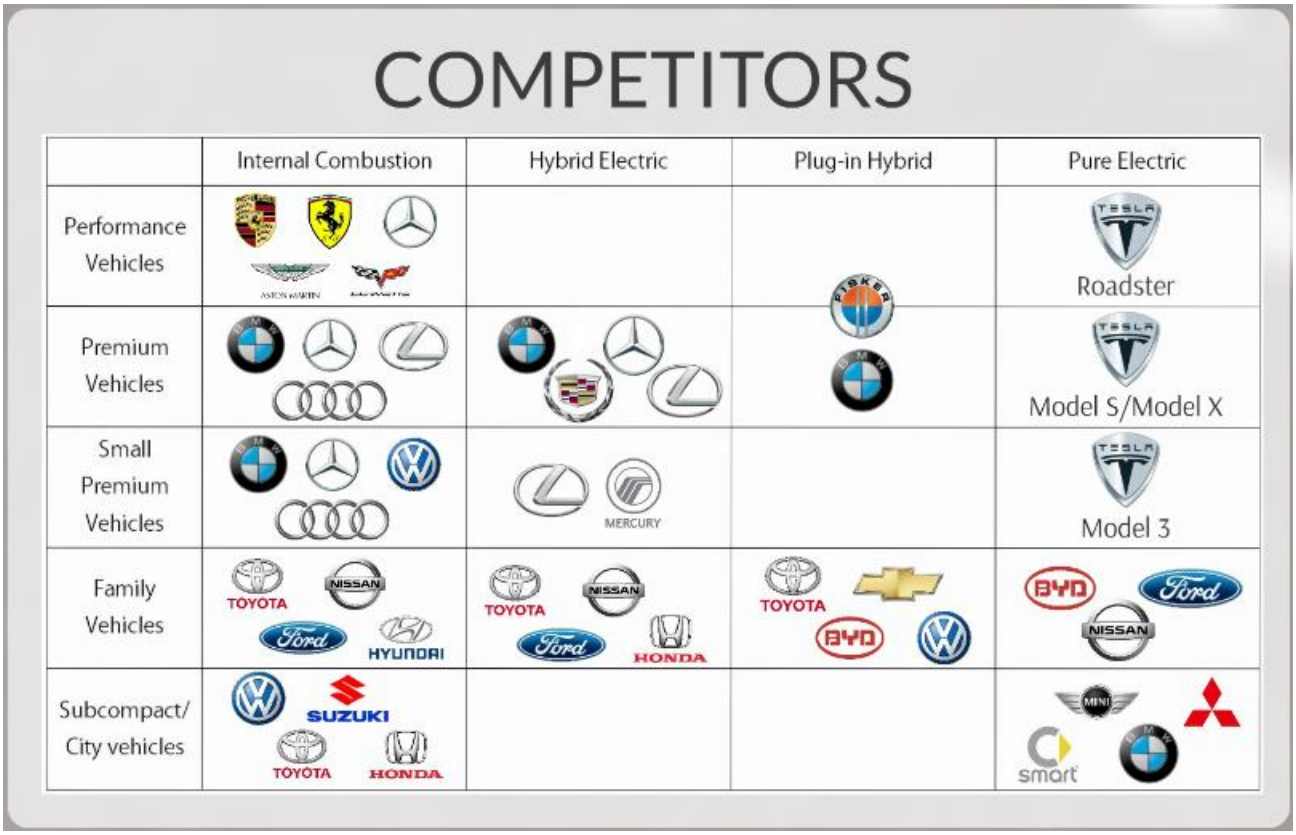


Figure H-3 - Tesla Competitors (Tokareva, 2015)

Price

The price component is where Tesla determines what their customers will pay for an electric vehicle. The price will be dependent on the manufacturing costs, other indirect expenses, the perceived value by the customers, and the price of Tesla's competition. For the purposes of this analysis, the Model S, Model X and the unreleased Model 3 will be evaluated.

The price for a Model S can vary quite a bit depending on which packages are chosen. The base model cost is $83,200. This model comes with a 60kWh motor, 19" wheels, standard interior, and enhanced autopilot. The most expensive configuration for the Model S costs $163,100. This configuration includes a 100 kWh motor, 21" wheels, a premium interior, and full self-driving capabilities.

The price for a Model X can also vary quite a bit depending on the vehicles configuration. The base model cost is $101,250. This model comes with a 75 kWh motor, 20" wheels, premium interior,

and enhanced autopilot. The most expensive configuration for the Model X costs $165,000. This configuration includes a 100kWh motor, 22" wheels, premium interior, and full self-driving capabilities.

The pricing information for the Model 3 has not been fully released. At this point Tesla has revealed that the pricing starts at $35,000. Pricing for different configurations has not been released at this point.

In general, Tesla uses a premium pricing strategy, meaning that they choose to use high price points because their products are unique and their customers attribute a high value to the electric vehicles. Additionally, Tesla leverages their advanced technology and attractive styling to justify their high price points.

Promotion

The promotion component refers to the amount of effort Tesla puts into advertising, promotions, and public relations. This component helps provide the rationale for the price of electric vehicles to Tesla's customers.

Tesla has a unique approach to the promotion component compared to other car manufacturers. Tesla does not rely on the common media advertising or the dealership business model. Instead, Tesla focuses on viral marketing, a strong online social media presence, and direct sales. Their primary target audience has an income greater than $100,000, is a car enthusiast, interested in technology, and environmentally concerned.

Tesla currently does not utilize advertising, nor does it pay an advertising agency. Tesla has determined that to effectively reach their target audience it is more important to have a strong internet presence and build a loyal fan base. Tesla utilizes Elon Musk's charisma, to drive a large web following. Tesla and Musk actively use social media outlets, such as Twitter and Facebook to keep everyone informed about the Tesla activities.

Tesla does not actively try to sell cars like the other large automobile manufacturers. Instead, they believe that people will naturally buy their vehicles once they understand the Tesla vehicles benefits. Tesla uses their direct sales stores as an educational forum rather than a sales forum. They teach potential customers how the Tesla vehicles work and why they are better than their competitors.

Place

The place component defines where the electric vehicles are sold and how they are delivered to the market. The place does not need to be a physical location, but it can also refer to product placement in entertainment or in social media.

Another unique aspect of Tesla is where they sell their vehicles and how they deliver them to their customers. Tesla does not use a dealership network like the other automobile manufacturers. Instead they utilize their own direct sales stores that are located in high traffic areas. By cutting out the middlemen in the sales process, Tesla believes it can reduce costs and control the quality of the sales process.

Customers are able to order and customize their vehicles on the Tesla website and then pick up their vehicles at the Tesla stores. The traditional vehicle manufacturers are fighting the concept of direct sales and have successfully defended the dealership model in several states. However, Tesla is starting to make progress in convincing state legislatures that they should be allowed to sell direct to consumers. (Baddour, 2016)

Summary

Like everything within their business, Tesla approaches their marketing strategy uniquely. One of the most interesting aspect of Tesla is their ability to innovate and create new technologies. This innovative concept permeates the entire company, including the marketing strategy. Tesla has very deliberately and accurately followed their Master Plan that they published with regards to market segmentation. Tesla identified specific market segments that they wanted to target and then developed specific products for those segments. They leveraged their success with their early products to provide the seed money for their subsequent products.

With regards to their marketing mix, Tesla has chosen their products very deliberately so that they can cover their specific target audience. If one combines their current product offerings with their anticipated products, Tesla is building a wide enough range of products to achieve their goal of reducing reliance on fossil fuels worldwide.

Tesla has specifically priced their early products to be relatively exclusive knowing that they would eventually be able to build a car that was more moderately priced. This exclusivity attracted

specific customers that were willing to accept the higher pricing. The premium pricing concept is relatively rare among Tesla's competitors, however it is proving successful for Tesla's business model.

Tesla's unique approach to promotions has appealed to a lot of consumers. By focusing on direct sales and social medial viral marketing, Tesla appeals to the specific audience that they want to target. The target audience for Tesla vehicles are usually tech savvy and early adopters. By utilizing viral internet marketing, Tesla is able to introduce their technology and products directly to their potential customers.

Tesla has bucked the popular concept of marketing their electric vehicles through the dealership model. Tesla has successfully figured out a way to sell directly to their customers and deliver their products through company owned stores. This allows Tesla to reduce costs and control the selling process by cutting out the middleman.

Appendix I – Tesla Organization and Human Resources

Tesla Motors, imaged as innovation company in the Silicon Valley, still keeps its horizontal organization structure. It's always the preferable structure most start-up companies choose. In this flat organization, there are few middle managers that get between executives and the staff on the ground. This specific structure provides the large distribution of function units on the same level but it creates open talking relationship between the employees and the senior management level. That is also the reason that start-up companies look forward to it and bubble of ideas from baseline could possibly rise up to the executive level.

Over half of Tesla's outstanding shares are held by 13 individuals and three investment firms. Elon Musk himself owns 26.5% of the outstanding shares, and the together the other 12 collectively own 1.2%. (Ausick, 2016). As the chairman and board of director, CEO of the company as well as product architect, Musk has been using his control on company strategic plan, visions, technological decisions and management. Of course, he led the company's financing efforts, and therefore has been able to decide who would be included on the board. He brought his brother, Kimbal Musk, into the company as a director in 2004. After going through the company survival phase, the company needs scale out and market requires the board strength on multiple facets including financing, strategy and operations. New board members have been added to bring expertise in different areas such as material science and finance.

As we can understand from the Tesla's organization chart below, it demonstrated three obvious features, global centralization hierarchy, functional structure and minimal regional divisions.

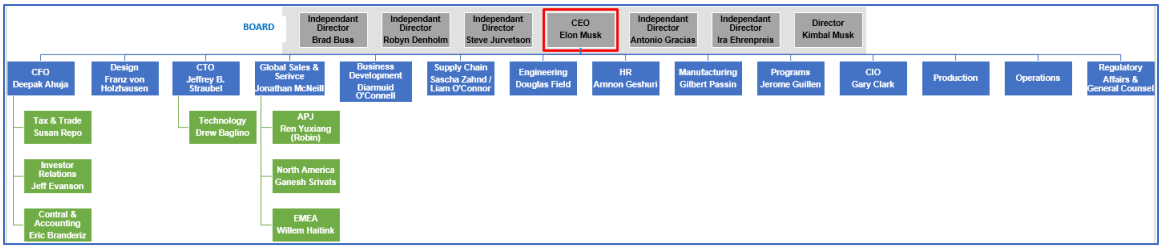


Figure I-1 - Tesla Organization Chart

First of all, the company CEO, Elon Musk, directly leads all functional presidents and officers who are in charge of the domestic and international operations. His direct reporting team consists of Chief Financial Officer Deepak Ahuja (Tesla announced on its earnings call that CFO Jason Wheeler has

decided to leave the company in April 2017), Chief Technology Officer JB Straubel, Global Sales and Services President Jon McNeill, Chief Designer Executive Franz von Holzhausen, Business Development Sr. Vice President Diarmuid O'Connell, Chief Information Officer Gary Clark, Engineering Sr. Vice President Douglas Field, Manufacturing Vice President Gilbert Passin, Programs Vice President Jarome Guillen, Global Supply Chain Management Vice Presidents Sascha Zahnd and Liam O'Connor, Human Resource Vice President Arnnon Geshuri, VP of Regulatory Affairs & General Counsel, VP of Productions, as well as VP of Operations. Below this are the tier 1 managers, who have their own regional leads respectively for each function group.

Therefore, the CEO of the company has a large group of direct reports, which becomes Tesla's significant characteristic in its corporate structure. This Global Hierarchy feature is found in companies were they aim to maintain strict control of their operations by the highest executive level. In this case it is where Elon Musk has tremendous power and influence to over all of Tesla. With this global centralization hierarchy, the head of each office is at Tesla's central headquarters, where they directly control all operations. Rather than allowing decisions to be made regionally, actions are dictated from the central office.

To this point, there comes two big problems. One problem is that the current global centralization defeats from the purpose of running a flat organization. The assumption behind a flat organization is that experienced workers will be more effective when they are directly engaged in making decisions for the business. When Tesla started, they were a startup and this was the most effective way of operating. However, with a global centralization hierarchy, the decision making is dictated from top to bottom. Another problem that has presented itself more recently is that the company has grown to a critical size and tends to become more complex and hierarchical, which leads to an expanded structure, with more levels and departments. When a company reaches this point, a flat organization structure simply is not as effective as when the company was smaller. As they continue to grow, the leadership should change the structure so that more decisions can be made at the location or department that is dealing with the problem. They can still work to keep the decision-making process streamlined with excessive bureaucracy, but they have moved past a point where a very flat organization can be effective.

Nevertheless, Tesla's organizational structure set belongs to the type of functional organization. This is generally considered to be the most effective at producing a standard product at high volumes

while reducing costs. In a functional organization, employees are organized by the type of job that they perform. Rather than putting people together based on the particular project they are working on, they are always organized primarily by the function they are performing. So in the case of Tesla, regardless of what model they are working on, all engineers would be part of the same group. Coordination and management is more centralized in a structure such as this. This can lead to greater efficiency since you have people who are better equipped to deal with those details taking care of them, feeing the specialized experts to work on what they are knowledgeable about. In Tesla's organization chart, we notice it is vertically lined up with these specific functions.

Last but not least, the Tesla's corporate structure also reflects minimal focus on regional divisions. A emphasis on setting up strong regional divisions usually indicate a company's intent to scale the business globally. In the current setup of Tesla organization, the divisions in Tesla's automotive business are mainly focusing on United States. That is not to say that Tesla is ignoring the global market. In the past two years, Tesla has filled the North American, APJ and EMEA roles by hiring former Burberry executive Ganesh Srivats as Vice-President for North America Sales, Ren Yuxiang as Vice-President for Asia-Pacific, and Willem Haitink, O'Neil CEO and former long-time Nike executive, to lead sales in Europe, the Middle East and Africa (EMEA) (Lambert, Tesla hires O'Neil CEO and former Nike exec to lead operations in Europe, Middle East and Africa, 2016). Although this indicates that Tesla has ambitions to extend their market to other regions, the main focus, including engineering, researching and development is still based out of the United States.

TESLA MOTORS HUMAN RESOURCE STRATEGY

Since Tesla is experiencing fast-paced growth, their human resource department must also be capable of filling positions quickly. Tesla must set its compensation at a level that is competitive with other companies in both the automotive and tech space so they can attract the best workers. This has been especially critical in the past years as the best technical workers have become scarce and companies are forced to compete on salary and benefits. Also, Tesla works to improve the quality and effectiveness of their workers by allowing them to undergo continued training, especially in leadership (Thompson, 2017). For example, they have put into place internal leadership development programs that are meant to strengthen the structure as a whole. (Meyer, 2017)

According to Boryana Dineva, Head of HRIS, Operations and Data Analytics, the company has grown almost 1700% since her arrival in 2011. (Kazmierczak, 2015). Even when they have an urgent need for a specific talent, Tesla's HR hiring policy is to build a strong foundation through the hiring of high-quality talent. First, they emphasize that each hiring decision should be given careful consideration and they should wait until they are able to hire the right person. Among high executive positions, the head positions of operations, production, and regulations remain open. Although it may be detrimental in the short-term, it would be worse in the long run to fill the positions poorly. Secondly, Tesla HR changes their strategy when they are hiring in a different country so they match the practices that are found locally, and they adjust the process depending on the position they are filling. Thirdly, the existing referral program is an effective, reliable and important recruiting channel to get the right talent. The existing top talent screen candidates for their fit with company culture and find the talents they would like to be with as the team players. The company then rewards their top talent in return for bringing a referral to Tesla. HR has found that certain areas are simple to analyze employee performance using data; such as sales and manufacturing. In the case of departments like IT, HR, and legal, it is more difficult to do. They work directly with those departments to develop metrics that allow for that type of analysis to be performed.

As an important role to create and support the rapid growing innovation company, HR plays key roles to create and support Tesla's unique organizational culture. Generally speaking, its culture includes six main features:

Hire Problem Solvers: There aren't many employees at Tesla who have worked at other auto companies. They are selected for their ability to solve problems, especially when they don't have all the information at hand. Interviews include questioning what problems the applicant has already solved, and getting into specific detail on how they did it.

Reward Innovation: The Tesla bonus system and promotions are determined using a 1 – 5 scale. According to Elon Musk, "You don't get the two highest ratings, unless you have done something innovative. It has to be significant in the case of phenomenal, something that makes the company better or the product better."

Do the Impossible: Many components of the cars, plus systems in the company have been built from scratch by in-house teams where most other companies would not attempt to take on those types of

projects themselves. When Musk hired Jay Vijayan as CIO, he was tasked with rebuilding all of the software used to run Tesla in three months with a budget a fraction of that normally needed for a company that size. Although he doubted if it was possible, he was able to complete the job in four months. It has needed improvements along the way, but it gives them a level of information and control that would not have been possible otherwise.

Stay Flexible: Tesla's cars are able to be updated over-the-air as the factory makes improvements. The internal organization is also set up so that mistakes can be learned from, and changes be made quickly. While other car makes are reluctant to change the setup of their factory floor, Tesla's production areas are in a constant state of change and improvement.

Move Fast: Employees are put into small teams that allow them to communicate and work quickly as they work through the challenges of building their cars. When different groups need to work together, they are put together rather than having to communicate through a large organizational structure. The Model S was designed with 3 designers rather than the traditional 10 – 12 who worked directly with the engineers. By eliminating the difficulties in communication they are able to not only work faster, but come up with a better finished product.

Complete Dedication: Although in many ways Tesla seems to be a good place to work because of the high quality of products they are building, and the reported sense that they are doing something significant. This comes at a cost of a required high dedication of time and energy to the job. Musk has been known to look down on employees complaints that they are not able to spend time with their families. It may be possible to keep up this pace while Tesla is growing and the work is exciting and new, but this may prove difficult to maintain as years go on. (Dyer, Gregersen, & Furr, 2015)

Appendix J – Competitor Analysis

A Competitor analysis is an examination of a competitors strengths and weaknesses along with their corporate strategies, methods . "There are four diagnostic components to a competitor analysis future goals, current strategy, assumptions, and capabilities" (Porter M. , 1998).

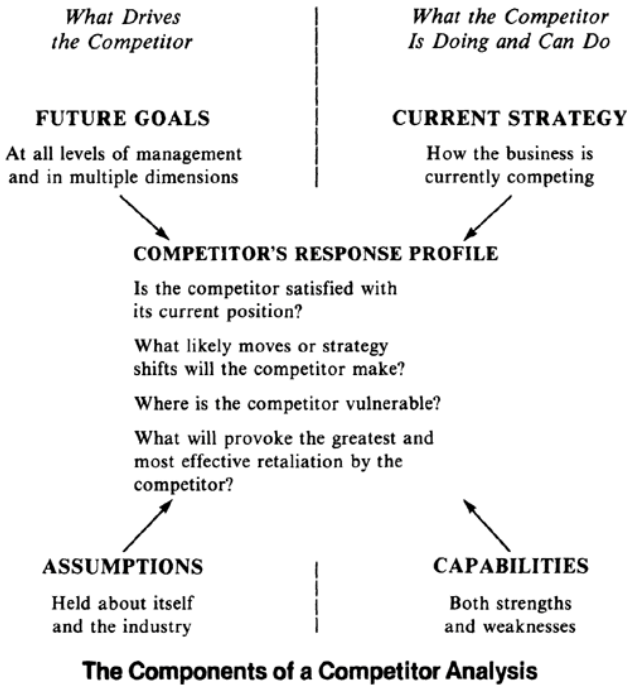


Figure J-1 - From Competitive Strategy: Techniques for Analyzing Industries and Competitors (p. 49), Porter

We have identified the Tesla's strongest competitors for their Model 3 offering are Ford, GM, Honda, and Toyota. Therefore, we have chosen these corporations as the subjects of this analysis. The following sections document the Future Goals, Current Strategy, Capabilities, and the Assumptions for Tesla's competitors.

Future Goals:

Ford:

- Top 5 company in sales and to maintain greater than 10% of global market share.
- Balanced regional and segment profits.
- Have operating margins of greater than 8%.

- To be in the top Quartile in shareholder returns.

GM:

- Earn customers for life
- Lead in technology and innovation
- Grow the corporate brands
- Drive core efficiencies (operational, material and logistic).

Honda:

- Advancement of a six-region operational structure.
- Continuous development of unique and challenging products delivering them globally.

Toyota:

- Toyota intends to contribute to the realization of a future mobility society through pioneering technologies, products and businesses
- Toyota intends to reinforce true competitiveness in order to grow as steadily as a tree adding annual growth rings.
- The development and promotion of next-generation vehicles including hybrid vehicles and fuel cell vehicles, efficient production utilizing efficient production methods.

<u>Corporate Strategy:</u>

Ford:

"Our strategy has one foot in today and one foot in tomorrow – encompassing our core business as an automaker and new opportunities in mobility." (Ford Motor Company, 2017)

GM:

"We are here to earn customers for life. Our purpose shapes how we invest in our brands around the world to inspire passion and loyalty. It drives us to translate breakthrough technologies into vehicles and experiences that people love." (General Motors, 2017)

Honda:

To deliver attractive products and services that are uniquely Honda and bring joy to customers worldwide across all its business domains of motorcycles, automobiles, and power products. Honda intends to promote a range of initiatives aiming to be a "company that society wants to exist." (Honda Motor Company, 2017)

Toyota:

"We're always looking for ways to improve our operations, always challenging ourselves to innovate, always looking to collaborate, always improving each day in everything we do." (Toyota Motor Sales USA, 2016)

Capabilities:

An examination of Tesla's competitor's strengths and weaknesses is shown in the table below.

Table J-1 - Competitor Strengths and Weaknesses

Company	Strengths	Weaknesses
Ford	✓ Strong Engineering and R&D Capabilities ✓ Award Winning Ford has received awards for design and safety. ✓ Perceived financially stable and did not receive a Government Bailout.	❖ Poor Cash Flows ❖ Sluggish Performance in All Region ❖ High turnover in corporate management.
GM	✓ Extensive Global Presence ✓ Growing Business in Emerging Markets ✓ Held in high regard by customers	❖ Declining Market Share ❖ Product Mix is skewed toward SUVs and Trucks ❖ High Costs and Liabilities
Honda	✓ One of the leaders in sales of automobiles, motorcycles and other power driven products. ✓ Strong financial performance ✓ Strong R&D capabilities	❖ Honda automobiles are more costly compared to other manufacturers ❖ In recent years Honda has made several recalls

	✓ High quality products, and customer satisfaction rating	
Toyota	✓ Diversification Strategy ✓ Market leading position ✓ Wide geographical presence ✓ Production System	❖ Limited liquidity position ❖ Product recalls

Assumptions:

Taken directly from the corporate websites this is a listing of the companies' self-perceptions.

Ford:

"People working together as a lean, global enterprise to make people's lives better through automotive and mobility leadership." (Ford Motor Company, 2017)

GM:

"They are a global automotive company united by one purpose, to earn customers for life." (General Motors, 2017)

Honda:

"Maintaining a global viewpoint, we are dedicated to supplying products of the highest quality, yet at a reasonable price for worldwide customer satisfaction." (Honda Motor Company, 2017)

Toyota:

"We create vehicles by listening and responding to you. Why? Because it's our belief that our cars should do more than help you go places on the road, they should also help you go places in life." (Toyota Motor Sales USA, 2016)

Analysis:

Tesla's competitors all seem to be concentrating on a few areas in their business strategies they are;

- Customer satisfaction and retention
- Increasing Global presence

- Technological innovation

None of the companies seem satisfied with their current status and they are all actively seeking to improve on their market share.

Tesla is in a particularly good position to compete with these companies in Customer satisfaction, and technological innovation, these are hallmarks of the Tesla brand. By tailoring an advertising campaign that highlights these virtues Tesla could possibly make inroads into their competitions customer base. This tactic was successfully employed by Japanese automakers in the 1980s.

Tesla is particularly vulnerable to retaliation from these competitor in the form of a protracted price war. All of Tesla's competitors can afford to sustain losses in one particular aspect of their business while maintaining profitability in others. They can mount a price war on comparable products to those Tesla produces. It happened with the independent automakers in the United States in the late 1950s and 1960s culminating in the collapse of AMC in the 1985. As Tesla enters the low-cost vehicle market they should develop contingencies for this reaction from their competitors.

Appendix K – Tesla Major Issue/Problem Identification and SAR Analysis

Major Issues/Problems

Team 3 utilized the nominal group technique to choose the problems that we wanted to address in this section of our project. During our analysis, several issues came to the forefront, they are:

Problem 1**.** Tesla's dependence on its CEO, and the risks associated with an organizational structure heavily dependent on certain individuals.

Problem 2**.** Tesla has overextended itself by branching into other ventures such as solar city.

Problem 3. Tesla has not shown that they will be able to make the transition from an innovative company to a manufacturing company.

Problem 4**.** Tesla is seeking to challenge major automakers instead of focusing on their market niche.

Table K-1 - Weight of Issues/Problems

	Weights				
	Anthony	Blaine	Greg	Yiming	Totals
Problem 1	3	2	3	4	**12**
Problem 2	4	1	1	1	7
Problem 3	1	3	4	3	**11**
Problem 4	2	4	2	2	10

As shown in the table above our group chose:

Problem 1 - Tesla's dependence on its CEO, and the risks associated with an organizational structure heavily dependent on certain individuals.

Problem 2 - Tesla has not shown that they will be able to make the transition from an innovative company to a manufacturing company.

Problem 1

Definition of Problem

Tesla's dependence on its CEO, and the risks associated with an organizational structure heavily dependent on certain individuals.

Through our analysis of Tesla's organization, we have found several sub-problems with the way the organization operates, they are listed below.

1. Tesla has an unbalanced corporate board composition. Over half of Tesla's outstanding shares are held by 13 individuals and three investment firms. Elon Musk himself owns 26.5% of the outstanding shares, and the together the other 12 collectively own 1.2%. (Ausick, 2016). Therefore, Musk has full control over board member selection.

   Effects:

   As documented in the organizational analysis section, most of the board members have a financial background. Based on this observation, we believe the board is unbalanced. Large corporations should have diverse leadership in order to remain competitive. The lack of diversity on the Tesla corporate board would lead to unbalanced strategic focus, which could cause the company to lose the competitive strength in the long run.

2. Tesla relies heavily on its CEO Elon Musk, he has many direct reports. There are several problems with this dependence on a single individual.
   Effects:

   Something can happen to the CEO which would have a serious detrimental effect on the company. The size of the company has become too large for one person to effectively manage. The talents and capabilities of the other individuals within the company may not be fully utilized because of the centralized leadership focus of the company. Instructions are slow to disseminate throughout the company which could affect production design changes etc.

3. Tesla has a flat horizontal organizational structure which does not work well for 30,000+ employees. Flat horizontal organization have been determined to be an efficient structure for small size and/or start-up companies. The streamlined hierarchy decreases the bureaucratic management, which encourages the ideas to come from bottom to top.

   Effects:
   The flat structure could potentially discourage employees ambition for career promotion, which increases the turn-over rate consequently. When Tesla continues to grow, employees will need more career promotion channels. If career development cannot be realized,

employee dissatisfaction will ensue and it could potentially lead the increase of attrition rate.

4. HR Policies and company culture are excessively influenced by innovation requirements. HR Policy and company culture defines Tesla's innovation as major component. HR has not sufficiently focused on the support structures needed to sustain a rapidly growing company.

   Effects:

   Tesla's HR recruiting policy emphasizes waiting for the right person. This policy could lead to slow backfill of positions, especially for the senior positions, which are crucial to the company business. It may be necessary to actively pursue the "right" person for the job. Tesla prefers to find people from non-automobile background but with highly developed problem solving skills. This sounds like a good idea but it also posts the risk of future uncertainty if an employee finds themselves in jobs that are not the right fit. Tesla's bonus system and promotions are determined using a 1 – 5 scale as other companies but the two highest ratings only belong to those who have done something significantly innovative. Under this criteria employees who are involved with manufacturing or other operations may be excluded from the higher level promotions and compensation.

Strategic Alternative Recommendations

Recommendation 1:

- Adding a President position under Elon Musk and transition Elon Musk's focus on Produce & Innovation (P&I) only.
- Beneath the President (new position) build a new Layer, divide the different management business units including Sales, Finance, Customer Support (new position), Operation (new COO position), Human Resource, Technology and Global IT.
- Under each Business Unit line, divide by functional realms as well as regions.
- The Technology line led by CTO dotted line reporting to Elon Musk for P&I purpose

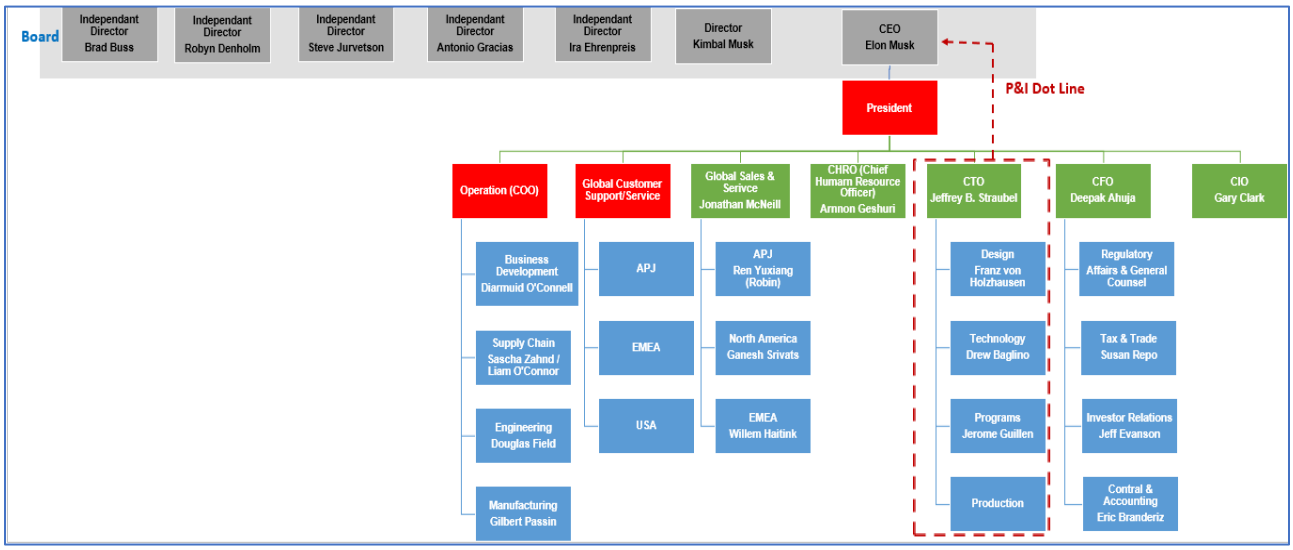


Figure K-1 - Strategic Alternative Recommendation 1

Recommendation 2:

Switch to a Matrixed Organizational structure.

A Matrixed organizational structure is "an organizational structure that facilitates the horizontal flow of skills and information. It is used mainly in the management of large projects or product development processes, drawing employees from different functional disciplines for assignment to a team without removing them from their respective positions". (Business Dictionary, 2017) An organizational chart of a matrixed organization is shown below.

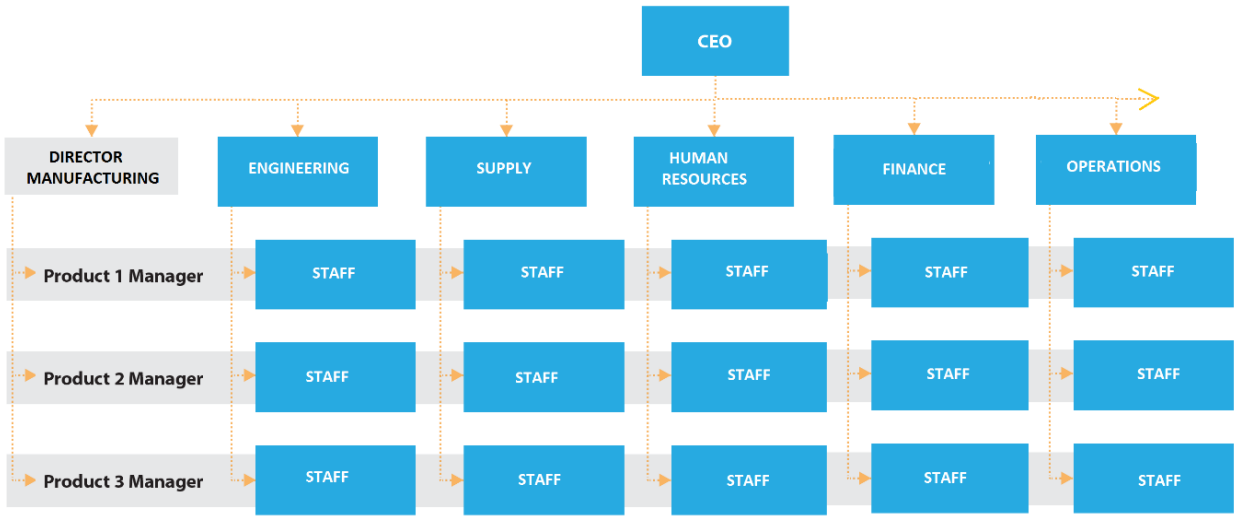


Figure K-2 - Strategic Alternative Recommendation 2

Tradeoff Analysis

Each of the alternative recommendations include pros and cons, as expected. The following table shows the applicable pros and cons. These comparisons and the weighted comparison below provide a tradeoff analysis of the 2 recommended solutions.

Table K2 - Pro and Con Analysis of Recommendations for Problem 1

Recommendation	Pros	Cons
1	✓ CEO focuses and keeps straight influence with long time technology innovation partner CTO to continue working on the Product and Innovation side ✓ New President leads the corporate business, operations, revenue and margins divisions. ✓ New President's direct reports are in charge of their own functions and deliver the outcomes accordingly. ✓ 3 New Positions including President role, which does not cause lots of hiring efforts	❖ New President still holds 1:1 relationship with existing CEO, which requires the strong business vision and strategy to collaborate with CEO. Otherwise, it could not change the CEO's influence over all and this, the presidential layer would be of no value. ❖ It will be challenging to find the right person on this President position. ❖ This new role would lead existing senior VPs who have been working with the company for some time. ❖ How to exert influence properly and lead them would be another challenge.
2	✓ Resource Coordination "The matrix structure allows supervisors to focus on their	❖ Stress: Additional stress is placed upon employees, the stress of adapting to new

	areas of expertise. Functional supervisors focus on hiring, training and managing employees in their field, while project supervisors can focus on achieving the goals of their specific projects or products." (Guzman) ✓ Specialization By allowing employees to specialize in their functional areas they can focus on their field of expertise. They are able to achieve greater output. Rather than spending a large portion of their time spreading their efforts among tasks they are not as effective at doing. ✓ Breadth of Skill Employees from different functional areas work together in the different product areas with exposes them to a variety of skills broadening their skill sets. It also provides direct access to the end product and provides a better understanding of the manufacturing process. ✓ Communication A matrix structure for enhanced and smoother communication between people in different functional groups. Collaboration becomes easier and teams are better equipped to work on complex projects. ✓ Flexibility The matrix structure allows for greater sharing of personnel among new projects since people are no permanently assigned to one area. (Guzman)	teams, working on products, and changing responsibilities. ❖ Conflict: There is an inevitable competition for company resources. There are also conflicts that can arise in the leadership structure, as employees are members of the functional group and the product team. ❖ Inefficiency: Inefficiency is a product of conflict between managers. It is possible that an employee can have conflicting policies and procedures from different managers. ❖ Cost: Members of cross functional teams often have a more diverse skill set, therefore hiring employees to fill these types of positions is often more costly. The project managers must also have the ability to work varying types of projects and therefore an increase salary demand can be expected by them as well.(Nordymeyer)

A comparison of the current hierarchal structure employed at Tesla and Recommendation 1 and 2 is displayed in the table below it contains an evaluation of a variety of criteria pertaining to problem 1.

Table K-3 – Comparison of Recommendations

	Weight	**Tesla Hierarchal**	**Recommendation 1**	**Recommendation 2**
Something can happen to an individual it can have a serious detrimental effect on the company.	10	10	5	5
The size of the company becomes too large for one person to effectively manage.	10	9	3	3
The talents and capabilities of other individuals may not be fully utilized because of the centralized focus of the company.	10	6	3	3
Instructions are slow to disseminate throughout the company which could affect production design changes etc.	10	8	3	3
Ease and speed of implementation	10	0	7	5
Totals	**50**	**33**	**21**	**19**

We see that a Matrixed structure has an opportunity to reduce Tesla's dependence on their upper management and sets up an infrastructure that will develop talent. Tesla would then be more robust and better able to handle losing key personnel. The Matrixed model is made for expansion therefore as Tesla grows there will be less disruptions. Communication is one of the hallmarks of the Matrixed organization and should be greatly improved by changing to a Matrixed organization.

Problem 2

Definition of Problem

Tesla has not shown that they will be able to make the transition from an innovative company to a manufacturing company.

Tesla was founded in 2003 by a group of engineers with high aspirations. From the very beginning of the company, Tesla's primary intent was to "accelerate the world's transition to sustainable energy." (Tesla, n.d.) Tesla decided to achieve this goal by introducing an all-electric vehicle that would compete with vehicles powered by fossil fuels. With this approach, Tesla was immediately defined as an innovative company which developed cutting-edge technology for their own use.

Tesla entered the automobile manufacturing industry with the Roadster. They built and sold around 2,400 Roadsters. Tesla leveraged their success with the Roadster and increased their manufacturing capacity. With this increased capacity, Tesla then produced the Model S and X which also sold well. Tesla has built and sold around 180,000 of the Model S and X as of the end of 2016. Again, Tesla leveraged their success with these two models in order to again increase their capacity. With this additional capacity, Tesla intends to build up to 500,000 vehicles a year.

Although Tesla has been in business since 2003, it is not yet profitable, except for a few isolated quarters. Up until now, the overarching plan for the company has been to build a reputation with high-end models, then introduce less expensive, higher volume models that would turn a profit.

Tesla may find it difficult to compete in this market segment now that they are competing in the low priced sedan segment and with a much larger supply. With more vehicles available, Tesla will need to expand their target markets. Because of these potential economic challenges and the challenges associated with having such large manufacturing capacity, Tesla will need to focus on manufacturing efficiencies and reducing costs. This transition from an innovative focused company to a manufacturing company will be tough since innovation is so engrained in the Tesla culture.

Strategic Alternative Recommendations

Recommendation 1

An example of a company that was built on innovation, but has also been successful in producing physical products profitably is W.L. Gore. They have been in business since 1958, but they are still considered to be an innovative company that continues to come up with new products and markets for their products. In addition, they have been on Fortune's list of 100 best companies to work for since 1998 (Roberts 2015). One of the major things that they have put into place is whenever a group gets to a maximum number of members, around 100 – 150, the groups are split. This is because as long as a

group is below a certain size, almost everyone knows each other, but once it goes beyond that then each person only gets to know a much smaller number of people from their inner group. By doing this, Tesla could ensure that everyone in the group is involved with every part of what is being done.

Recommendation 2

In order for Tesla to have a successful transition to being a company that is focused primarily on manufacturing, Tesla should consider spinning off their innovation team into a separate company and mold Tesla into a manufacturing company. This would allow each company to focus on what they're good at. Elon Musk could be on the Board of each company or hold an executive position, but the operational positions would be filled by people that have applicable experience.

Tradeoff Analysis

As with problem 1 each of the alternative recommendations for problem 2 come along pros and cons as expected. The following table shows the applicable pros and cons. These comparisons and the weighted comparison below provide a tradeoff analysis of the 2 recommended solutions.

Table K-4 - Pro and Con Analysis of Recommendations for Problem 2

Recommendation	Pros	Cons
1	✓ By having a better understanding of the manufacturing process, other groups will be able to know when a new feature or material they are proposing is compatible with the current process, or if it will be significant change ✓ A greater level of unity between the different areas of the company would develop ✓ In addition to reducing the time needed to implement new materials and processes into the manufacturing line, an improved level of communication could allow Tesla to give more realistic estimates of when new models are able to be released.	❖ Employees who are otherwise bold with their willingness to make changes and try new things may feel too constrained to stay within the existing manufacturing structure. ❖ By having employees spending time learning about manufacturing, they are not doing the job that they normally do for that period of time. This is an additional cost where Tesla will be paying them to not produce any output. ❖ Manufacturing could be slowed down by having to accommodate new hires who need to have things explained to them. ❖ By having inexperienced people in manufacturing areas, there is a chance for elevated rates of injury.

	✓ By having more people cycle through the manufacturing environment, there is a greater opportunity for more creative ideas for improvements to be suggested.	
2	✓ Each company would focus on their strengths ✓ Innovative Tesla could provide services to other companies that need help innovating. ✓ Because the companies are separate but have the same leadership, priorities can be established that will strengthen each company. ✓ Different pay scales can be incorporated in the different companies. Tesla Manufacturing can be union while Innovative Tesla won't have to be union. ✓ Each company would have their own mission statement that allows them to focus on the right things.	• Communication challenge across company lines • Unhealthy competition between the companies • Inefficiencies with implementing changes since the improvements will be provided by a different company. • Tesla Manufacturing will suffer the stigma of not being innovative. • Duplication of roles increasing indirect costs (accounting, HR, IT, etc.) • Finding enough qualified people to staff both companies.

A comparison of the current hierarchal structure employed at Tesla and Recommendation 1 and 2 is displayed in the table below it contains an evaluation of a variety of criteria pertaining to problem 2.

Table K-5 -Comparison of Recommendations

	Weight	**Recommendation 1**	**Recommendation 2**
Speed of implementation	8	5	8
Cost of implementation	8	7	4
Effect on Tesla culture	10	10	6
How much will it actually improve getting cars to production	10	8	9
Totals	**36**	**30**	**27**

The analysis shows that by requiring employees to have experience in manufacturing would enhance the company culture, and overall it wouldn't be a very expensive way to go about solving the problem. Since it depends on cycling large numbers of employees through a period of learning, it will take a while to see results, and it is not a sure thing that it will solve the problems. On the other hand, splitting the company into two could be done relatively quickly, and since the manufacturing company would be more focused, it is more likely to be effective. It could have a negative effect on the culture of both new companies, and it will be very expensive to implement since each company would then require much of the administrative costs of running on their own going forward.

Implementation

In order to decide which recommendation should be implemented, both the problems and the subsequent solutions have to be considered when analyzing the following:

- Problem 1 Alternative 1 – Adding President position under Elon Musk
- Problem 1 Alternative 2 – Switch to a Matrixed Organizational structure
- Problem 2 Alternative 1 – Form manufacturing sub-groups
- Problem 2 Alternative 2 – Split Tesla into manufacturing and design companies

Table K-6 - Recommendation Analysis

	Weight	Problem 1 Rec. 1	Problem 1 Rec. 2	Problem 2 Rec. 1	Problem 2 Rec. 2
Significance of Problem	10	9.75	9.25	9.25	9
Cost of Implementation	10	7.25	6.25	7.5	5
Effectiveness	10	7.25	7	7.5	8.5
Effect on Culture	10	7.75	7.5	8.75	7.5
Speed of Implementation	10	7.5	6.5	5	7.25
Totals	50	39.5	36.5	38	37.25

Each member of the team was asked to rate the problem-alternative combinations based on five criteria. The ratings were then averaged and totaled. Based on this, the best alternative to pursue at this time is to add a president position under Elon Musk. The implementation of this solution will be examined further in this report.

Appendix L – Recommendations/Implementation Plan

Recommendations and Implementation Plan

Based on the SAR (Strategic Alternatives Review) analysis, we decided the following two problems as most critical ones to Tesla Motors continuous and sustainable development.

- Tesla has demonstrated high dependence on its CEO, and the risks are associated with an organizational structure heavily dependent on certain individuals.
- Tesla has not shown that they will be able to make the transition from an innovative company to a manufacturing company.

Per the previous problem assessment, alternative recommendation pros and cons comparison, trade-off analysis, and optimal solution alternative selection, we decided to propose the followings to each problem.

- Adding President Position Under Elon Musk and transit Elon Musk's focus on P&I only.
- Spinning off Tesla Motor's innovation team into a separate company and mold Tesla into a manufacturing company.

After further evaluating the correlation on the selected solution to each of the problems, we would like to propose the following solution to TESLA Motors so that better compatibility, completeness and supportiveness of the recommendation could be achieved. Meanwhile, the corresponding implementation would limit the drastic and instable factors to the lowest for the company.

- TESLA Motors hire a president in charge of manufacturing, and assign the innovation function to existing CEO Elon Musk (proposed reorganization chart attached below).

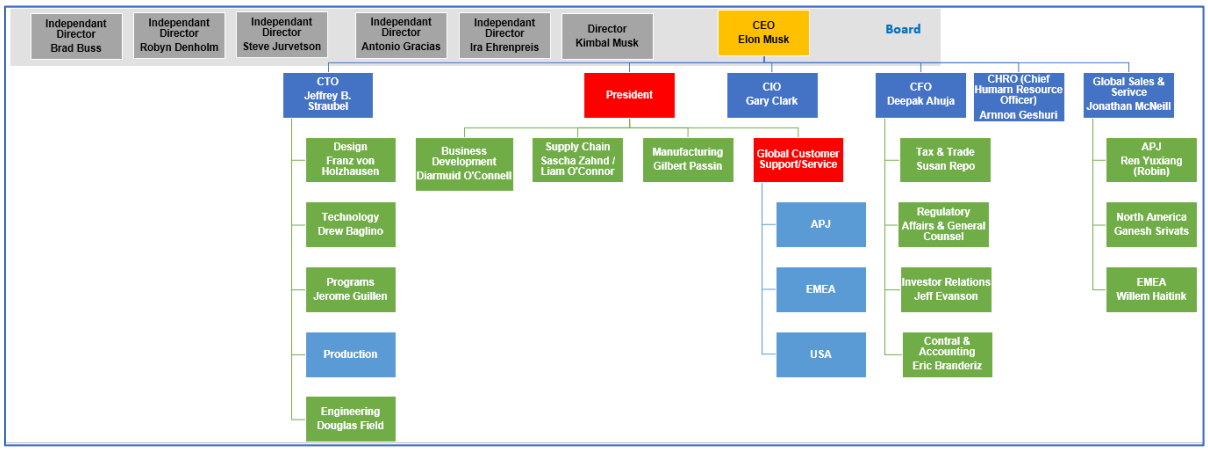


Figure L-1 - Recommended Organization Chart

According to the proposed organization chart, we would highlight that the new President would focus on the vehicle manufacturing where the company weakness has been exposed to its mass production. The existing CEO Elon Musk would directly lead the product innovation and engineering, which can further strengthen the innovation power with the long-term partnership between CEO and CTO JB Straubel.

<u>Short-run recommendations:</u>

- Short-run targets in the 0 to 6 months' timeframe.
- Hire the President position.
- Align the business lines of manufacturing and its supply chain management to the president's direct reporting
- Consolidate the product innovation business units and assign these divisions to the CTO's direct reporting line.

<u>Implementation Action plans:</u>

1. Kick off the talent hunting and recruitment process for the new president position. The candidate is better to embrace the executive experience with vehicle manufacturing.
    - (*ETA: 0-2 month*)
2. Workshop on the new organization overview with existing tier1 managers and begin to define the two major focuses. Set the charter and deliverables of each focus.

   a. (*ETA: 0-2 month / in-parallel with step1*)

3. Consolidate the product and innovation (P&I) line with CTO. Move the Design, Technology, Programs, Production and Engineering to CTO's direct reporting. CEO transit the major focus to the P&I.

   a. *(ETA: within 2 month after step 2*).

4. With the absence of the new president, current CEO takes the acting role of the manufacturing. Consolidate the supply chain, manufacturing and business development in this manufacturing focused business line.

   a. (*ETA: within 2 month after step 2)*

5. Each business area of Manufacturing and P&I line reviews its own focus, set actions based on the defined charters, and re-shape the current business modules with business unit.

   a. (*ETA: within 2 months after step3/4 setup*).

6. CIO, CHRO, CFO business lines review the existing process and cross line functions, adapt work flows for the new shaped manufacturing and P&I units and guarantee the best support for the new organization.

   a. (*ETA: within 2 months after step3/4 setup*).

<u>Long-run recommendations:</u>

- Long-run targets from 6+ month timeframe.
- CEO phase out the manufacturing when new president is ready and transition is completed.
- Add Global Support business unit to the manufacturing line and direct report to the new president.
- Consider extend the executive board with more function diversity including Sales and Financial.

Gregory D'Elia, Blaine Joseph
Yiming Wang, Anthony Wilkes

Implementation Action plans:

1. Open the position of global support head to enforce the Tesla service lifecycle quality, which would be the good feedback channel to the product. Since the customer service requires more on the manufacturing engineering, put this function initially in the president's scope would be better.
    - (*ETA: 0-2 months*)
2. Extend the workshop to tier2 and tier3 managers on the new organization, define the charter and deliverables of each business unit
    a. (*ETA: 0-2 months*)
3. Setup the cross-business unit collaboration on major business processes and operations. For example, joint processes for customer supporting, R&D lifecycle definition, sales strategy collaboration etc. Each business line clears the goal and objectives under the guidelines of corporate mission statement.
    a. *(ETA: 0-3 months)*
4. Estimate on the headcounts and budgets gap based on the new organizational framework, complete the reviewing with board and financial controlling, and decide the final numbers and actions.
    a. (*ETA: within 1 month after step3 completion*)
5. Based on the short-run achievements, objectives, and goals push down to each business unit branches.
    a. (*ETA: within 1 month after short term actions are completed*)
6. Each business unit line reviews its own tasks and missions, re-evaluate its global operation model, and adjust the business focuses accordingly. For example, sales business line reshapes its USA, APJ, and EMEA management team to better implement the new orientations.
    a. (*ETA: within 2 months after step2 is completed*)

7. With the new global project (Model 3 release), each business line refines the goals and objectives for better outcome based on the problem observation, root cause analysis, strategic review, and solution deliveries. The ultimate outcome of this step is to achieve the best running model for this global corporation.
    a. (*ETA: within 2 months after step6 is completed*)
8. Adopted with the optimal leadership and business mode, each business unit should explore more improvement room to further adapt the better corporation strategy to ensure the sustainable and reliable business increase with its long-standing innovation strength in the industry.
    a. (*ETA: beginning after step7*)
9. With the maturing of the global organization which emphasized the focuses on P&I and Manufacturing, Tesla Motors could consider to extend the existing executive board for more function diversity. Global Sales could be lined up to the board area so that the profit and margin management could be further strengthened and improved when mass production issue was addressed.
    a. (ETA: beginning from 1 year since implementation start)

<u>Long-run recommendations:</u>

- Long-run targets from 6+ month timeframe.
- CEO phase out the manufacturing when new president is ready and transition is completed.
- Add Global Support business unit to the manufacturing line and direct report to the new president.
- Consider extend the executive board with more function diversity including Sales and Financial.

<u>Implementation Action plans:</u>

Open the position of global support head to enforce the Tesla service lifecycle quality, which would be the good feedback channel to the product. Since the customer service requires more on the manufacturing engineering, put this function initially in the president's scope would be better.

b. (*ETA: 0-2 months*)

Extend the workshop to tier2 and tier3 managers on the new organization, define the charter and deliverables of each business unit

c. (*ETA: 0-2 months*)

Setup the cross-business unit collaboration on major business processes and operations. For example, joint processes for customer supporting, R&D lifecycle definition, sales strategy collaboration etc. Each business line clears the goal and objectives under the guidelines of corporate mission statement.

d. *(ETA: 0-3 months)*

Estimate on the headcounts and budgets gap based on the new organizational framework, complete the reviewing with board and financial controlling, and decide the final numbers and actions.

e. (*ETA: within 1 month after step3 completion*)

Based on the short-run achievements, objectives, and goals push down to each business unit branches.

f. (*ETA: within 1 month after short term actions are completed*)

Each business unit line reviews its own tasks and missions, re-evaluate its global operation model, and adjust the business focuses accordingly. For example, sales business line reshapes its USA, APJ, and EMEA management team to better implement the new orientations.

g. (*ETA: within 2 months after step2 is completed*)

With the new global project (Model 3 release), each business line refines the goals and objectives for better outcome based on the problem observation, root cause analysis, strategic review, and solution deliveries. The ultimate outcome of this step is to achieve the best running model for this global corporation.

h. (*ETA: within 2 months after step6 is completed*)

Adopted with the optimal leadership and business mode, each business unit should explore more improvement room to further adapt the better corporation strategy to ensure the sustainable and reliable business increase with its long-standing innovation strength in the industry.

i. (*ETA: beginning after step7*)

With the maturing of the global organization which emphasized the focuses on P&I and Manufacturing, Tesla Motors could consider to extend the existing executive board for more function diversity. Global Sales could be lined up to the board area so that the profit and margin management could be further strengthened and improved when mass production issue was addressed.

j. (ETA: beginning from 1 year since implementation start)

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