

**Tesla Motors Model 3 Production  
Risk Analysis  
April 2021**

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## **Executive Summary**

Established by a group of engineers in Silicon Valley in 2003, Tesla Motors Inc. manufactures and sells high-performance electric cars with zero emissions. Elon Musk, the CEO, along with other shareholders, owns the company. Tesla began production of their first car model, the Roadster, in 2009. This was followed by the Model S sedan in 2012, the Model X SUV in 2015, the higher volume Model 3 sedan in 2017, and the Model Y in 2020.

This risk analysis focuses on the Tesla Model 3, which is the company's more affordable \$35,000 offering. Model 3 production has continued to introduce a lot of risk for the company; strict timelines, lofty production goals, and the car's low price point have posed a great number of challenges. Despite the fact that Tesla has been able to produce hundreds of thousands of units and has just recently become profitable, there are a host of risks present within the production process that this report assesses. After thorough research, the largest vulnerabilities can be grouped into three main categories: supply chain issues, product defects, and worker relations. These vulnerabilities can be exploited by unforeseen threats, but may be avoided by adopting appropriate safeguards. This report outlines the specific risks associated with each of the three problem areas and quantifies the impacts of each. Recommendations are also provided for how best to mitigate these risks going forward.

## **1. Report Scope**

Although Tesla is a company with a market cap in excess of 660B and involved in numerous sectors, such as solar roofing, enterprise battery storage, and electric charging infrastructure, this report will solely focus on risks associated with Model 3 production. While certain findings and recommendations may be applicable to other business units within the company, only processes and issues related to Model 3 production are considered. While this report cannot constitute a full risk analysis of the company as a whole, it can provide insight into the risks associated with Tesla's largest product line and help parties gain an understanding of all aspects of Tesla Model 3 production.

## **2. Methodology and Process**

### **2.1 Factors Considered**

Tesla Model 3 production has achieved the largest scale of any Tesla product to date. As a result, many of the company's largest risk areas have scaled with the proliferation of a product of such large scale. This report considers all aspects of Model 3 production and the Model 3 product line in an effort to acknowledge and mitigate risks at every level. When performing this risk analysis, the largest problem areas of Model 3 production were identified by conducting external research on Tesla business practices and the product itself. Consequently, the largest considerations in our risk assessment are the supply chain, product defects, and worker relations as they relate to Model 3 production.

## **2.2 Quantifying Risk Factor Impacts**

After thorough problem identification and analysis, risks will be quantified in a risk information matrix to summarize the likelihood and impact of discussed risks and problem areas. Likelihood and Impact will be rated as “low”, “moderate”, or “high” in nature.

## **3. Risk Analysis Results**

### **3.1 Supply Chain Risk**

An important consideration when analyzing risk associated with Model 3 production is Tesla’s supply chain. Disruptions in supply chains can result in productivity losses, delayed cash flows, impaired service, and damage to brand reputation, among others. As a result, it is imperative that a company’s supply chain is robust and difficult to compromise. A company’s supply chain is comprised of many subcomponents, including upstream inputs, distribution, manufacturing, and downstream outputs. This analysis considers various features of Tesla’s supply chain that may introduce risk, and then introduces possible recommendations for mitigating such risks.

#### **3.1.1 Reliance on Chip Manufacturers**

Cars are inherently complex products to build because of their reliance on thousands of different components and parts. A Deloitte report estimates that computer chips account for over 40% of a new car’s cost to produce because of their prevalence in driver assistance and in-car entertainment systems (Deloitte, 2019). This is especially true for Tesla’s Model 3, which is extremely reliant on electronic components because of the car’s heavy software presence. As a result, the supply chain for Model 3 is extremely reliant on the ability of semiconductor manufacturers to keep up with demand. This introduces a large amount of risk because the success of the Model 3 is contingent

on the stability of Tesla’s chip suppliers. This issue came to the forefront in 2020 and 2021 when there was a global chip shortage as a result of the coronavirus pandemic. Factory shutdowns were accompanied by a simultaneous increase in demand for electronic components as more people than ever turned to electronics in quarantine (Sweney, 2021).

Figure 1: Cost contribution of automotive electronics and semiconductor content per car



As evident in the figure above, cars are becoming increasingly reliant on semiconductors and chips. It is clear that this fact created bottlenecks and problems for Tesla during the chip shortage, whose CEO cited the shortage as causing “insane difficulties” for the company and for Model 3 production, which had to be halted for multiple days (Kay, 2021). As a result, it is important to consider the fact that Tesla does not have control over some of the most crucial parts of the Model 3 supply chain.

### 3.1.2 Battery Production

Another risk within Tesla's supply chain is battery production. Since all Tesla's, including the Model 3, are electric vehicles, production is heavily dependent on battery supply. Aside from cars produced in China, all Model 3s are outfitted with battery packs produced in Tesla's Gigafactory in Reno, Nevada. Tesla created this Gigafactory to meet its demand for batteries, especially because the Model 3 has now become the best-selling electric vehicle across the globe. Although vertically integrating battery production in this way helps optimize supply chain efficiency, it also introduces a great deal of risk because all Model 3 production is contingent on the operational success of the Gigafactory. As a result, this facility requires immense security and access control to ensure operations are not disrupted. Because all of Tesla's battery production for automotive use occurs in one building, any compromises to operations could result in huge revenue losses and product delays.

### **3.1.3 Service Parts**

Supply chain risks don't only exist for new car production. Drastic increases in global Tesla Model 3 production have increased the demand for servicing and replacement parts. Failing to procure replacement parts for its mass-produced vehicles results in massive service delays and inconsistent ownership experiences for customers. Part of these supply chain complications arise from Tesla's B2C sales model. In lieu of operating franchised dealerships, Tesla sells directly to the consumer. Although this helps streamline the sales process, it also means that Tesla is responsible for staffing and supplying its own service centers across the globe. As a result, supply chain inefficiencies have resulted in many Tesla customers waiting months for simple repairs to be completed due to parts shortages. According to the CEO, Tesla has been "very silly about where [they] store [their] parts," citing supply chain mismanagement as the primary reason for servicing delays. These risks are important because they directly inhibit revenue, drive up costs, and negatively affect owner

satisfaction and brand loyalty. These long delays also increase the amount of time a customer's car is in Tesla's possession, which consumes resources and increases risk that Tesla must take on.

## **3.2 Quality Control Risk**

### **3.2.1 Unstable Quality**

Quality control is another risk for Model 3. Consistent tweaks in the supply chain resulted in an alarming number of inconsistencies in Model 3s that rolled off the production line. Some of the biggest problems Tesla Model 3 owners have reported include shutdowns while driving, getting locked out of the car, total touchscreen failure, door, window, and trunk defects, issues with paint finish, rust, among others (Schaal, 2021). The issues with paint quality reveal the lack of standard quality inspection before the car is put into the sale. Moreover, the mass production of Model 3 causes a decrease in the quality of the car. Tesla was building Model 3s so quickly that paint wasn't drying properly, according to Elon Musk (Levin, 2021). Given that delay in the purchase could lead to a higher quality of the car, it is likely that fewer people will be inclined to try out new models when they debut. Thus, these inconsistencies could have a significant negative impact on the sales of future generations of Tesla products.

### **3.2.2 False Promotion**

Having cars manufactured internationally also increases the difficulty of the quality control process. For instance Tesla Model 3 production is distributed between Tesla's main plant in



Fremont and their recently built Gigafactory in Shanghai. The Tesla Model 3s produced in China use a new derivative of the Model 3 battery pack that makes use of LFP batteries. Although the Model 3 with the LFP battery reduces the cost by 30,00 euros, it has suffered from many charging problems. Most notably, the battery cannot be charged to 100 percent, and the charging speed consistently decreases as the charging levels increase (Hareyan 2020). The vehicles from the Chinese factory are said to be of far better quality than the California-produced ones but in reality, The LFP battery can only be charged with significantly less power than the stateside battery packs from LG Chem. This false promotion issue could leave two negative effects. For users who bought their first electric cars from Tesla, the mismatch between their expectations and the user experience would make them doubt if switching to electric cars is a wise choice. Moreover, since Model 3 with LFP batteries were produced by the Gigafactory, users might assume that products manufactured in China are of lower quality compared with other Tesla products, and thus refuse to order cars in their market.

### **3.2.3 Callbacks**

Another issue Tesla has experienced are large-scale recalls on their products. The National Highway Traffic Safety Administration asked Tesla to recall 158,716 of its electric vehicles due to safety issues (Kolodny, 2021). The recall incurs the cost of labor and material. Laborers need time to demolish or test the malfunctioned component. It also causes the loss of business. Since those workers could do other tasks such as the R&D of the new product rather than the repair, passing up a new job to repair an old job disrupts the plan and inhibits company productivity. In addition to the costs Tesla must incur to fix these issues, recalls also cause the company to suffer

from increased scrutiny. Most important, however, is the risk that these quality issues pose for Tesla consumers.

### **3.2.4 Safety Issues**

As of November 2020, Tesla is a party to over 1,000 lawsuits (Plainsite, 2020). Tesla avoided addressing safety issues with its cars and tried to cover up the problem (Robitzski, 2020). Tesla recalled most Model S and Model X vehicles in China for suspension issues which can cause the mechanism to separate and asked car owners to sign non-disclosure agreements for repairs. Moreover, other reports revealed that the windows on many Model 3 vehicles suddenly shattered when the vehicle was stationary or when driving at highway speeds. In fact, a similar issue also occurred with Model Y in October of 2020 even though Tesla had never experienced such problems on Model S or X. It is also reported that a Tesla Model 3 caught fire in a Shanghai parking garage due to battery issues (Levin 2021). These product defects pose huge safety concerns for Tesla customers and are important risks for the company if they go unaddressed. Managing product liability exposure is crucial in risk management, and defective products increase risk for both the consumer and Tesla.

### **3.2.5 Legal Liability**

Legal liabilities are another important consideration when investigating Tesla's product defects. In particular, Tesla has suffered from a lot of scrutiny about possible defects related to its Autopilot systems it includes in its cars. Autopilot is a system that allows the Model 3 to drive semi-autonomously, but has been proven unreliable in many crash scenarios. The first "Tesla Autopilot-related death" case was filed by the family of a pedestrian who lost his life after being hit by a

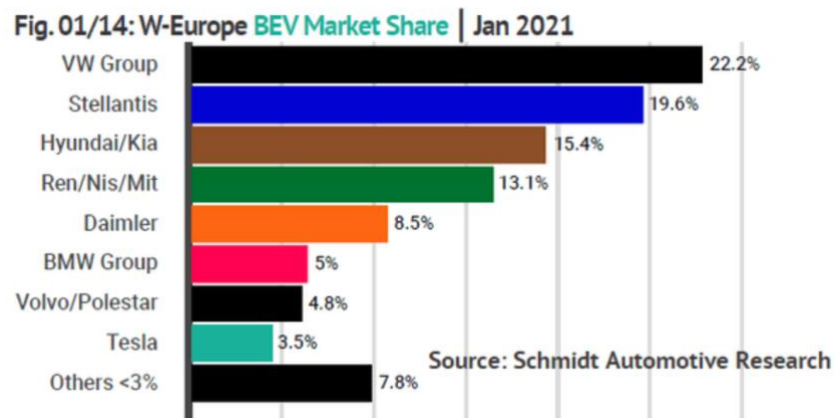
Tesla (Suber, 2020). This lawsuit is inevitable for cutting-edge technologies such as Tesla's Autopilot system and there could be more issues with the prevalence of autopilot. Since the lawsuit charges that Tesla is strictly liable for the defective design of Autopilot and failed to warn consumers of its defects, if approved, it would be one case of absolute and strict liability other than blasting, mining, etc. The degree to which Tesla should take full responsibility for the accident is another point of contention but is likely decided by the degree of driver involvement with the system.

Additionally, the National Transportation Safety Board (NTSB) recently released a report in February stating that Tesla's autopilot system was partially responsible for a deadly crash in 2018 when a man was playing a video game while driving with Tesla's autopilot engaged. However, one thing that was not determined is how much the driver relied on Tesla's self-driving system and if he was over-reliant on the car's systems.

Although there are few lawsuits against autonomous vehicles at this time, the first Tesla Autopilot-related death involving a pedestrian will not be the last, and Tesla should be prepared for the charge of "patent defect". Furthermore, if the number of accidents increases, it would intensify the safety concerns and could damage the reputation Tesla has established. Admittedly, Tesla is the first mover in the electric cars industry, it is uncertain whether Tesla could keep a sustainable sale if players such as Apple enter this field. Data shows there was a decline in Tesla's Chinese demand as domestic cars have been closing the gap. Tesla's share of monthly EV sales declined from nearly 20% to less than 10% in January 2021 (Engle, 2021). For the European market, Tesla relies on

shipping from the United States or China as they do not have manufacturing capacity on the continent. As a result, Tesla gained 3.5% of EV market share and failed to crack the Top 20.

Figure 2: BEV Market Share in Europe



### 3.3 Labor Relations Risks

Within any large company, risks associated with working conditions for its affiliates are always present. This is especially true in a supply chain environment, where the workers are plentiful and so are the risks associated with each one as they are each a walking liability. Providing optimal working conditions and meeting regulations is not only ethical, but a necessity in order for a company to function without repercussions. This section will focus on Tesla's international labor issues and the risks they took regarding workers conditions within the United States as well as externally and ways to possibly mitigate the damages.

### 3.3.1 Legal Investigations

Tesla faces legal challenges that could result in financial and reputational problems as a result of its inability to showcase how it is successfully implementing its policy to protect human rights for its workers. These issues could also have a detrimental impact on long-term value growth.

Tesla is being investigated right now for allegedly failing to disprove child labor allegations that are taking place in its international supply chain. Tesla has supply chain facilities in the Democratic Republic of Congo. These facilities are used to mine for cobalt and it is possible that unlawful child labor is taking place. According to the Investor Advocates for Social Justice, more than 60% of the world's cobalt is produced from the DRC, 20% of which is extracted by hand, mostly by children (U.S. Securities and Exchange Commission, 2020)

Figure 3: Children working the Cobalt mines of the Democratic Republic of Congo



Image from Amsterdam News

In the DRC, UNICEF reported that 40,000 children were mining cobalt, and the real figure is certainly higher (IASJ, 2020). Tesla is one of five businesses accused of unethical means of production and child labor violations in a federal class action lawsuit. According to the lawsuit, Tesla collects its cobalt from KCC. This company is one of the most unethical mining companies

in the Democratic Republic of Congo. Glencore owns and controls KCC, which supplies cobalt to Umicore. Umicore refines the cobalt before supplying it to LG Chem, which in turn provides cobalt to Tesla, which the company uses in its cobalt-containing batteries.

In June 2020, Glencore and Tesla signed a long-term contract regarding the production of cobalt despite the fact that Glencore is under scrutiny for being compromised through the means of corruption and a lack of internal affairs to prevent such matters (MyFT, 2020). Despite claims that Tesla is making regarding a reduction of the amount of cobalt being consumed by the company, 6,000 tons of the material is expected to be collected annually from a mines in the Democratic Republic of Congo that are connected to child labor.

Child labor is something that Tesla claims to not take lightly as they have a zero-tolerance policy for such matters. However, the lawsuit claims that they did not do their due diligence in inspecting the supplier that they are getting their materials from. This makes Tesla susceptible to litigation liability for being oblivious and lacking the means to communicate and track such actions within its affiliations.

### **3.3.2 Repercussions of Unethical Working Conditions**

If Tesla fails to find a solution to its child labor and other human rights accusations within its international supply chain, they risk harming their reputation and halting their supply chain production which will put them at a severe financial loss. These allegations endanger the company's public profile as a long-term enterprise (Gallagher, 2020). Unfortunately, the production of cobalt is not the only area of Tesla's raw material production that is under scrutiny.

Tesla has also been accused of utilizing child labor with mica mined in India, charcoal that they produce in Brazil for pig iron, electrical units that they manufacture in China and rubbers that they produce in a handful of other countries (IASJ, 2020).

The US Customs and Border Protection are getting more strict in enforcing the prevention of importing international goods that are produced through child or forced labor (Unknown, 2020). Tesla is on the verge of facing intense lawsuits and regulatory action for the mal-treatment of its employees and affiliates.

### **3.3.3 Response to COVID-19**

Another pressing issue that is prevalent more within the United States is Tesla's response to COVID-19. Several Tesla employees were not satisfied with the company's response to the pandemic and claimed that their lives were endangered in accordance to how the company was operating. To make the issue worse, the workers who voiced their concerns were receiving backlash and threats of repercussions by the company.

At the same time as the company backlash, the virus was spreading across the company's facilities, especially in Fremont, California. According to an internal company document from July 2020, over 130 of Tesla's employees were diagnosed positive for the virus, and roughly 1500 other workers were exposed or showed symptoms of the virus (Hicks, 2020).

Employees demanded an increase in COVID-19 testing as well as safer working conditions such as an increase in sanitizing products available and enforced social distancing. Aside from being an

ethical issue, this is also a threat to corporate stability, fines and lawsuits. Tesla investors also demanded more transparency between themselves and the company, going as far as asking the Securities and Exchange Commission in order to prepare themselves as doubts begin to emerge of Tesla's longevity due to unethical dilemmas.

### 3.4 Risk Summary

Figure 4: Risk Information Table

<b>Risk Area</b>	<b>Risk Type</b>	<b>People Impacted</b>	<b>Likelihood</b>	<b>Impact</b>
<b>Business/Industry</b>	Supply Disruption Risk	Investors, Customers	Moderate	High
<b>Market/Consumer</b>	Production Delay Risk	Investors, Customers	Moderate	Moderate
	Consumer Dissatisfaction Risk	Investors, Customers	Moderate	High
<b>Operations</b>	Labor Relations Risk	Investors, Employees, Customers	High	Moderate
	Regulatory Risks	Investors, Customers	Moderate	Low

## 4. Recommendations

### 4.1 Supply Chain Risks

There are many ways in which Tesla can improve its supply chain so that it is less fragmented and more reliable. For one, working to standardize electronic components can help make parts more widely available. Since Tesla vehicles are so dependent on chips and semiconductors, Tesla should source from more vendors so that it is less susceptible to production shortages. Ideally, Tesla could



supplement its chip supply by manufacturing some of the parts itself. This would decrease its dependency on other vendors without completely vertically integrating chip production. Doing this would likely result in the optimal balance between flexibility and efficiency.

For improving battery production, Tesla should diversify its battery manufacturing processes so that all Model 3 batteries are not produced in a single place. Tesla has already made announcements to build additional battery production facilities in other parts of the world, and that will help improve efficiency and reduce risk. Until then, Tesla should create contingency plans in the event of a Gigafactory failure to ensure battery demand can still be met.

There are many steps/precautions that Tesla can take to improve its service parts supply chain. Since many parts delays were attributed to poor logistics and unexpected demand, Tesla could use a third party logistics provider to help facilitate the delivery of necessary parts to the appropriate service centers. Additionally, Tesla should improve demand planning and prepare surpluses of parts so that they are readily available when customers need them. Much of the delays resulted from having to source parts such as bumpers from the factory while production demand was extremely high, so having a surplus of parts stored in warehouses can help Tesla be more receptive to its customers and decrease risks. Being able to properly serve its Model 3 customers will help with owner retention and allow Tesla to improve its brand image.

## **4.2 Quality Control Risks**

To ensure the quality of raw materials and components of Model 3, Tesla should set ongoing supplier checks and establish long-standing reputable relationships with suppliers. To lower the

chance of defects, Tesla should implement regular software quality assurance analysis to test if there is malfunction before the car has been sold. Also, for Tesla to have a more stabilized financial, we would recommend transferring the legal liability risk of safety issues and auto-pilot defect by signing contracts with insurance companies.

### **4.3 Labor Relations Risks**

In order to limit the loss severity to a minimum, our team suggests that Tesla removes itself from any affiliations that can be connected to child labor as soon as possible. Realistically, Tesla will not be able to stop production in these areas right away, but relocating soon will be crucial in removing Tesla from the spotlight of scrutiny. Tesla should clearly state that they were unaware of any child or forced labor, but now that it has become apparent to them, that they will be conducting their own investigations and adjust their supply chain production accordingly.

We suggest not only relocating to one area, but to have multiple supply chain facilities producing the same material, such as cobalt. Given that there would be multiple sources of production, these institutions can be of smaller size to fit the needs of consumption collectively rather than separately. This will prevent the creation of a risk as Tesla will be less reliant on one specific facility in case of a facility shutdown. These actions will be costly and time consuming, however the avoidable lawsuits and damaging reputation will pay for itself as the cost of production increases. Additionally, the facilities are long-term investments that will help the company grow in an ethical environment for years to come.

Reducing the possibility of a health hazard is vital in this situation. Given that the virus is contagious, limiting the exposure of employees to the virus will make the difference between having a functioning facility and having to shut down a facility as there are not enough healthy workers to operate it. Even if it comes at the cost of slowing production, social distancing will keep production running as well as implementing sanitization areas all across the buildings. These actions will reduce the hazard of infection as you separate the hazard from what you are protecting by space and cleanliness.

Making employees feel heard and understood is also crucial in preventing unionization and lack of production efforts. Elon Musk took down a tweet that he had sent, which had bad mouthed unionizing and threatened repercussions and this is a good step in the right direction as actions such as that tweet will only antagonize employees and grab the attention of national affiliates to ethical working conditions in a negative manner.

## **Conclusion**

There are a host of risks associated with Model 3 production. After thorough analysis, the largest problem areas were related to the supply chain, product defects, and work relations issues. Although each of these issues pose varying degrees of risk, the provided recommendations will help ensure all of them are mitigated, drastically reducing the likelihood of unforeseen complications or setbacks. With regards to the supply chain, diversifying sourcing and improving demand planning can help reduce failures and ensure that supply is able to meet consumer demand. Product defects can be reduced by ongoing supplier checks and regular software quality assurance analysis. To avoid the potential cost of lawsuits or compensation caused by the product defects, Tesla could transfer its liability risk by signing contracts with insurance companies. Labor relations risks can be mitigated by enforcing lawful and ethical work practices for Tesla itself and its affiliates. Ensuring the safety of its employees and setting strict age restrictions with affiliated companies can significantly mitigate risks and alleviate the company from unwanted lawsuits that may soil its reputation.

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