Balancing Innovation with Production – Tesla Trek Case Report

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Challenge #3: Balancing Innovation with Production

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Tesla, a multibillion-dollar company worth about $495 billion is one of the world's largest electric vehicles (EV) seller, selling up 1.8 million Tesla cars per year (Kolodny, 2024). In addition, Tesla's more known model 3 EV is the world's best-selling plug-in electric cars making tesla one of the world's most valuable companies in terms of market capitalization (Shahan, 2021). Despite their achievements Tesla finds it challenging to keep up with the world's demands of their EV line-up. As the consumer demand is growing much faster than the production rates, some buyers had to wait up to 1 year to receive their car (Misoyannis, 2022). Team Shock investigated ways to improve production rates, while keeping up innovation and Tesla's EV line-up thriving rates. Firstly, Team Shock broke down Tesla's massive Gigafactory locations and studies where Tesla can establish its next hub to most benefit from consumer sales. In addition, Team Shock investigated Tesla's supply chain and recommends further adjustments and improvements to the supply chain. Not to mention, Team Shock discussed lithium battery alternatives as well as future shipping deck projects to boost Tesla's production rates.

Gigafactories Locations, Product Line and Alternatives

Tesla's Gigafactories are some of the world's most advanced factories. Tesla's main factory, Giga Nevada, is predicted to produce around 500,00 tesla cars per year upon its completion (Cutherbson, 2015). Originating from the word '*Giga'*, meaning a billion. Elon Musk, the founder of tesla, hopes to satisfy the company's production needs by opening multiple Gigafactories world-wide (Baker,2023). Currently, Tesla has eight Gigafactories located all over the world, including the USA, China, Germany, and Mexico (Akgunduz,2022).

Despite these factories, Tesla still faces issues with the high demand of tesla and a production rate that can simply not keep up with the populations demands. Hence, Team

Shock suggests that tesla considers other production options, as their Gigafactories, while impressive, require a large amount of time to be produced, and costs can reach up to $10 billion (Shakir,2022). Team Shock advises that Tesla investigate increasing production rates in the Middle East, which currently does not have any Tesla Gigafactories in the area. We believe that the Middle east is a great place to invest in, as studies have shown that the thriving EV consumer market of the Middle East is projected to reach $7.56 billion by 2028, which is a 283% increase from today's EV markets cost (Deloitte, 2023). Instead of establishing a ninth Gigafactory in the Middle East, Team Shock looks into other alternatives, such as contract manufacturing and modular production facilities.

Firstly, contract manufacturing is a business concept where a company hires another company or a preexisting factory to produce its products. In our case, that would be contract manufacturing with EV companies in the middle east. Nevertheless, there has not been a better time to contract manufacture with EV companies at the Middle East, as some of the worlds most renowned EV manufactures have recently established their presence in the middle east, such as Chinese EV maker NIO and Chinese EV startup Human Horizon (Deloitee,2023). Moreover, the US EV manufacturer company Lucid has recently opened its first overseas manufacturing company in Saudia Arabia. Led by former Tesla executive Peter Rawlinson (Roberts, 2023), Team Shock highly recommends Tesla to build relations with manufacturing team Lucid and start a local contract manufacturing deal in the Middle East. Even though a contract manufacturing deal may not produce as many EV cars as a tesla Gigafactory can, a contract manufacturing deal means that Tesla can start production of their cars as soon as the deal has been established without the need for the long waiting time of building its own Gigafactory. Nonetheless, a contract manufacturing deal can eliminate all production costs of a Gigafactory and the long process that takes to receive permits to build in a certain strip of land.

Secondly, Team Shock recommends that Tesla builds modular production facilities in the Middle East instead of building large scale Gigafactories which can cost up to $10 billion as mentioned earlier. Furthermore, the concept of building modular production facilities is to take advantage of the current boom of the EV market in the Middle East, as a modular factory would take much less time to establish itself with a much lower cost. In addition, the current state of the Middle East is supportive of investing in building new manufacturing facilities, as Bandar Alkhorayef, the Industry and Minerals Minister of Saudi Arabia, said: “With our great location, access to different markets (and natural resources), as well as our most important asset — our people and our talent — we can be a serious player in attracting investments in manufacturing.” (Dcunha, 2023). Moreover, establishing these modular factories means that Tesla can create a manufacturing hub in the Middle East, which can eventually be improved and transformed into Gigafactories by funds supported by the consumer sales that the modular factories gain in the Middle East. In short, Team Shock believes that the Middle East is a great area to invest in, without the need to create a new Gigafactory, as that comes with many problems.

Tesla’s Supply Chain Strategy Pros and Cons

Tesla's Supply Chain Strategy is an essential reason behind the company’s success. The company has implemented a multitude of strategies to ensure the competitiveness and cost-effectiveness of its supply chain. Firstly, Tesla's supply chain heavily relies on automation. This is because utilizing automated processes can drastically enhance efficiency and reduce costs, ensuring that each part meets the company's rigorous standards. Secondly, Tesla closely collaborates with suppliers to secure quality parts at competitive prices, sourcing components globally to maintain its strict benchmarks. In addition, Tesla places a substantial amount of importance on logistics, as the company operates its delivery service for timely and secure transportation of parts and products. Another key factor to Tesla’s

successful model is its environmental sustainability since it is dedicated to minimizing its environmental impact across production processes and the supply chain. Tesla does so using its Environmental, Social, and Governance (ESG) program, promoting responsible sourcing, waste reduction, and renewable energy adoption. To illustrate, the water withdrawal intensity in Tesla's vehicle manufacturing is 1.80 m3/vehicle, which is far less than many of Tesla's competitors. Even in Tesla's largest Gigafactory, the Texas Gigafactory, the water withdrawal intensity is 2.78 m3/vehicle. In comparison, the water withdrawal intensity in vehicles for Mercedes-Benz, Ford, and Toyota are 2.91, 3.75, and 4.12, respectively (Khan, 2023). Evidently, this efficient and innovative supply chain management approach is a massive reason Tesla it the world's most valuable automaker (Statista, 2023).

There are, however, considerable issues that Tesla's system faces. Due to the fact that Tesla depends on automated models for managing inventory and processing orders, they are highly susceptible to having weaknesses in their quality control. Also, Tesla's reliance on a complex system of partners leaves it vulnerable to disruptions in logistics. Lastly, metals that are crucial to the development of EV batteries and other parts are experiencing a sharp rise in demand. For example, demand for lithium is estimated to reach 3,825 metric tonnes by 2035, while the demand in 2024 is 1,072 metric tonnes (Garside, 2022), thus Tesla may not be able to cope with changes in customer demands. To address these challenges, Tesla can implement a comprehensive strategy that includes regular proactive maintenance schedules as well as software and hardware updates for its automated systems. For instance, Tesla can switch to smarter AI-based robots with sensors that can respond to unpredictable environments, which would allow for more reliance on robots in the supply chain. On average, there are over six hundred robots per Tesla Gigafactory (Lambert, 2023), and reliance on smarter machinery would allow that number to grow largely. Additionally, Tesla can conduct thorough quality assurance checks at critical stages of the supply chain,

leveraging advanced technologies like AI-powered inspection systems for accuracy and efficiency. This can be achieved with deep learning classifiers coupled with computer vision algorithms designed to accept or reject certain manufactured products. Moreover, Tesla can leverage advanced analytics for route optimization, thereby optimizing transportation routes, reducing transit times, improving delivery reliability, and minimizing logistical disruptions. Another tool that can be of important use is that of smart contracts, which are blockchain-based contracts that do not require third-party authentication and could consume less valuable time and expenses than traditional contracts. As a result, investing in AI can help mitigate Tesla's resource constraints by reducing reliance on manual labour, and enhancing operational efficiency and productivity.

Possible Solutions: Establishing Ports and/or Shipping Decks.

As is evident, Tesla's supply chain model relies heavily on their ability to ship parts quickly and efficaciously from suppliers to their factories. A neoteric solution to this problem is the construction of shipping berths (quay) at existing ports solely dedicated to Tesla enterprise which would ensure timely deliveries of the necessary components at a considerable minimal cost. As stated by Carlin Gerbich in "Construction Work Middle East", China Harbour was successful in building the Jeddah Islamic Port at the Red Sea Gateway Terminal for 500 million US dollars. The new terminal and three berths with a combined capacity of 1.5 TEUs and 400km2 storage areas have been a welcome relief for the busy Saudi port. Hence, new mini seaports like the aforementioned port in Jeddah or separate quays designated for Tesla at existing ports can be built in 12 cities, namely Fremont, California; Sparks, Nevada; Berlin, Germany; Shanghai, China; Austin, Texas; and Buffalo, New York *(6 cities where the Tesla Gigafactories are located)* as well as Ningbo-Zhoushan, Shenzhen in China, Oslo in Norway, Hamburg and Frankfurt in Germany and Grangemouth

in UK {As China and Europe as a whole are the seconds and the third largest consumer of Tesla vehicles, (Tesla Sales By Country, 2024).

Therefore, these berths permanently allocated to Tesla can save over 400 million USD annually which the company pays for loading and unloading to the seaports. Moreover, these quays would save a significant amount of time as Tesla will not be required to take permission for shipping berths which in turn amplifies automobile deliveries.

Alternatives to Traditional EV Batteries

Tesla faces critical supply chain challenges related to its dependence on China for 40% of its lithium battery supply (Nikkei, 2023). This reliance uncovered Tesla to geopolitical dangers amid US-China pressures for worldwide dominance. A breakdown within the supply chain may disturb Tesla's generation, ruining its ability to procure batteries essential for EV manufacturing. Another issue with lithium-ion batteries is that their production involves environmentally unfriendly processes, including the extraction of lithium, cobalt, and nickel, mostly in developing countries lacking ethical mining practices (Sharma, 2023). These practices contribute to greenhouse gas emissions and environmental degradation, highlighting the importance of sustainable alternatives.

Team Shock suggests that Tesla utilize Solid-state batteries, which is the transition from a liquid electrolyte to a solid material known as solid electrolyte that helps the lithium ions move quickly. Solid-state batteries provide enhanced safety, energy density, and charging abilities in contrast to conventional lithium-ion batteries. Electric vehicle manufacturers like Honda and technology giants like Samsung SDI are actively pursuing the commercialization of solid-state batteries, signalling a potential breakthrough in battery technology.

Conclusion

In conclusion, Tesla faces several challenges with its supply chain strategy, as well as with the materials used to develop EV batteries. To address the issue of demand overtaking production capacity, Tesla should consider building new Gigafactories in locations where market demand is increasing significantly. This strategic expansion can help meet consumer needs more effectively. Next, integrating AI into EV production can optimize manufacturing efficiency, thus enabling Tesla to overcome its production challenges and continue to innovate in the EV industry. Furthermore, exploring alternatives to lithium-ion batteries can enhance safety and sustainability while reducing supply chain disruptions associated with lithium sourcing. Finally, developing a private shipping deck for Tesla can greatly improve logistics and reduce delivery times, all while alleviating customer wait times.

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