

15D, THE CRESCENT CROISSANTS | 2023 - 2024

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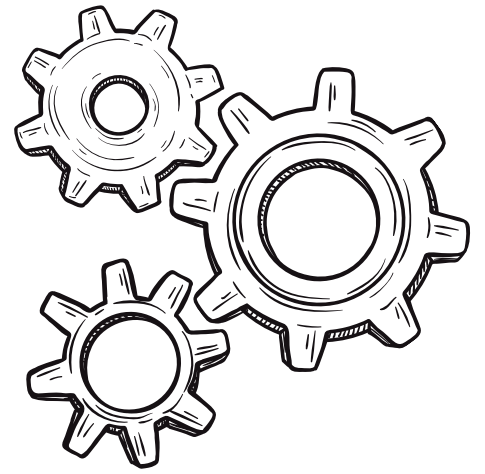
# Electric Dreams The Tesla Evolution

How the Giant of the Electric Vehicle Market Uses the Engineering Design Process



A VEX Robotics car, primarily white with black accents, is shown from a low angle in a desert environment. The car is on a paved surface, and the background features a sandy desert floor with sparse vegetation and distant mountains under a clear sky.

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# Introduction

Tesla was founded in 2003 by American entrepreneurs Martin Eberhard and Marc Tarpenning, who named the company after Serbian-American inventor Nikola Tesla, creator of the Tesla coil.

**Fun Fact:** Tesla's first car was called the Roadster which was a completely electric car invented in 2008.





# What STEM career or company did you choose, and why?

We chose the STEM company Tesla because it changed the car industry, bringing electric vehicles with ultramodern technology and morphing the world's perspective of going electric. Take the Tesla Semi, for example; it's a fully electric Class 8 semi-truck.



# **What resources did you find to learn about professionals in this career or company and how they use the engineering design process?**

We found many resources that had information about the car industry Tesla. The countless resources we looked into showed the history and how Tesla uses the engineering design process. They start the process by identifying their needs and goals. Then, they brainstorm and create concepts or ideas to use. After, they design and prototype based on the finalized designs. Also, they test and improve their creations based on customer feedback. The engineering design process is how Tesla accomplished so many goals!

# How do the professionals in this career or company apply the steps of the engineering design process?

The professionals in the car industry Tesla apply the Engineering Design Process to their craft (manufacturing electric cars) by working in steps and following the 7 stages of the Design Process.

## **Ask**

Tesla's automotive designers (the people who design car models) start by asking a question to identify the requirements and the constraints.

## **Explore**

Then, the designers explore or research the problem.

## **Plan**

The designers formulate a myriad of solutions, select the best one, and discuss their game plan or strategy.

## **Create**

Next, the automotive designers construct a prototype of the car model chosen by using the information they found through research.

## **Test**

The designers demonstrate, try out, and evaluate the prototype of the car model.

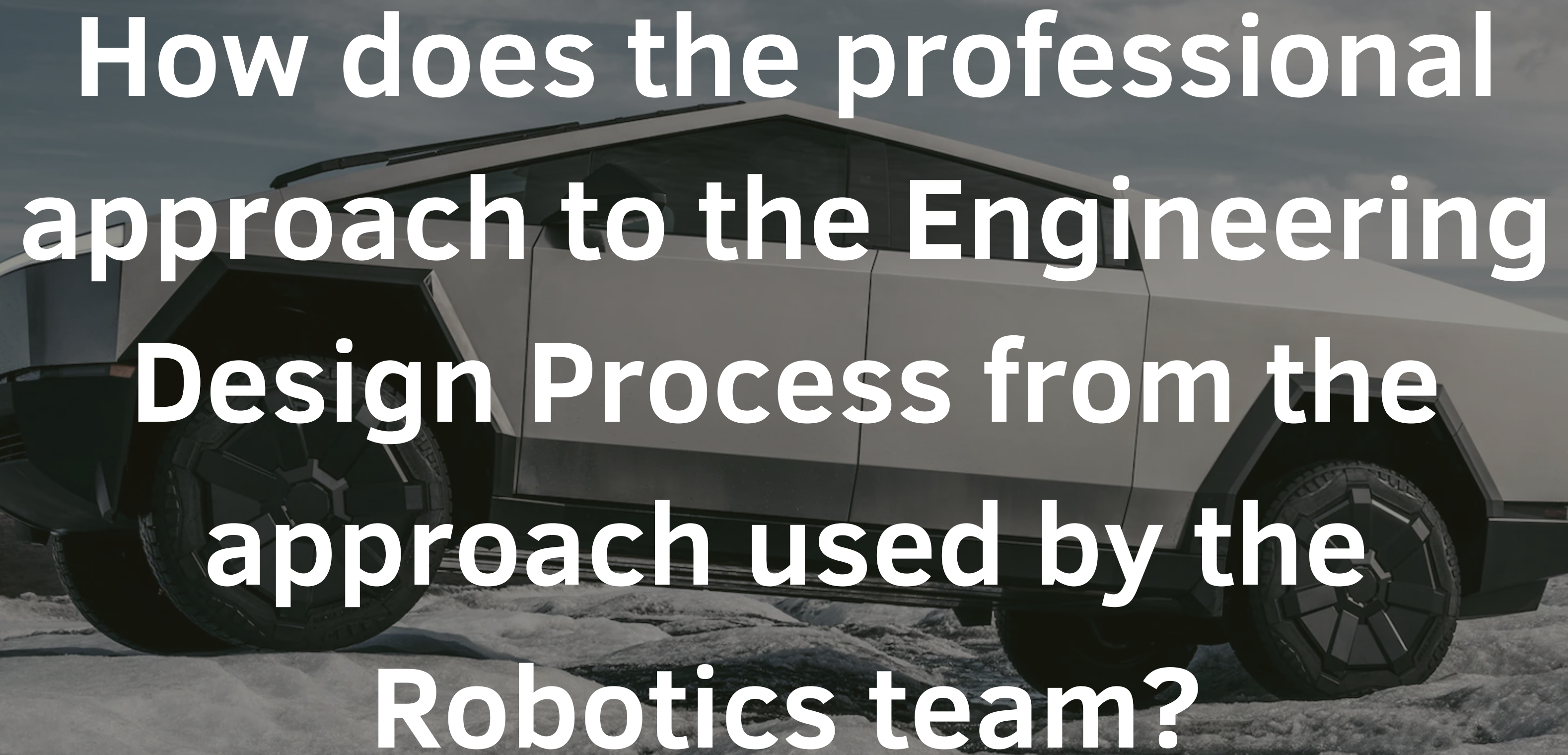
## **Improve**

The automotive designers make slight adjustments based on the evaluation results.

## **Communicate**

Finally, Tesla manufactures the car model and releases it, putting the model on the electric vehicle market.

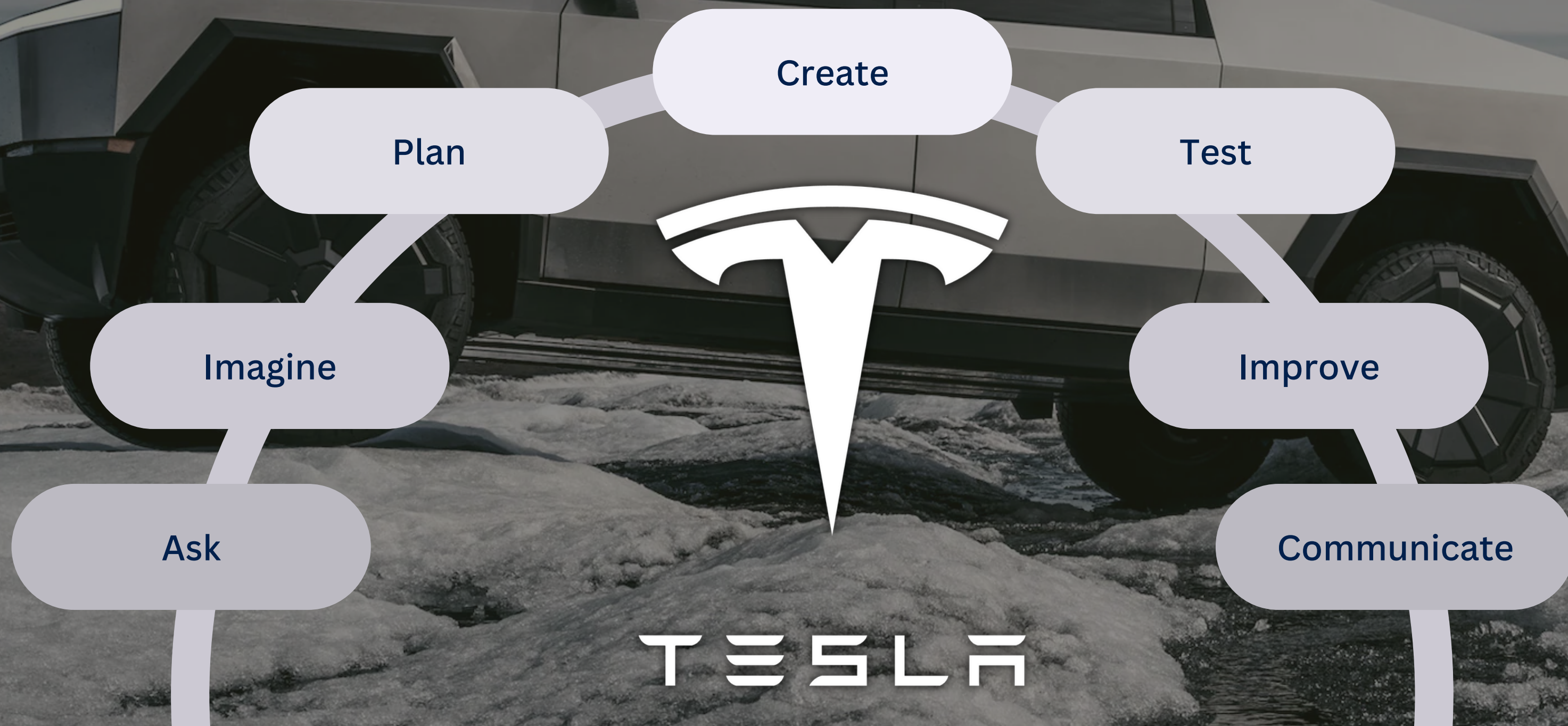


A futuristic, boxy vehicle with large, rugged wheels is shown from a side profile, parked on a rocky, uneven terrain. The vehicle has a dark, metallic finish and a high, angular roof. The background consists of a cloudy sky and distant, hazy mountains. The overall tone is dark and industrial.

**How does the professional  
approach to the Engineering  
Design Process from the  
approach used by the  
Robotics team?**



# Engineering Design Process



TESLA



# OVERVIEW

A white Tesla Cybertruck is parked on a rocky, desert-like terrain under a cloudy sky. The truck is positioned diagonally across the frame, with its front facing left. The background shows a vast, open landscape with distant mountains and a hazy horizon.

There are many similarities and differences between the professional approach and our team's approach to the engineering design process. Tesla uses iterative prototyping as their design process; it is a method of creating and testing a product in small, incremental stages. It allows them to get quick customer feedback and improve by making adjustments. However, our team's approach to the design process is to simply follow the steps. We ask questions, explore how to create our robot designs, plan/design, build our robot, test the robot, make adjustments to improve, and explain how the final model solved all the issues. For example, we made a drive-train called a raised chassis and decided it had many problems such as it was unstable and couldn't hold the robot properly. So, we went with a standard drive-train to hold the robot without any difficulty.



# ASK

## TESLA

Tesla is able to ask using the design process by finding out all their problems that they have to fix, constraints, and criteria. They must know how to make an electric car that meets every requirement they have. For example, if they want to program the Tesla to have autopilot, they must ask them what kind of items would be needed and how they program it. Also, if they would like to try to do this, they need to know what they should tell the Tesla so it will follow all the directions of the driver who will buy the car.

## TEAM 15D

On the other hand, our team see all the requirements of the robot, the field, and the game. Most of our requirements are about the robot such as the height, width, and the length limit if you're thinking about the limits of the robot to be able to enter a tournament but at each tournament they will use a different method to measure. We also had to understand the game to help us. For example, we look at how to make something to pick blocks up, score them in the goals, which way to park and how we will make it park in that way, and how to get bonus points. Some ways we thought of was organizing the blocks, getting red blocks, partial parking, knocking red blocks off pegs if we can't pick them up, getting purple and green blocks and putting them in two different goals, and just in general putting the blocks in the goals.



# IMAGINE



## TESLA

This electric car company imagines how they can help the drivers who buy the car to understand how to operate it. They had many mechanical parts they could use so the team who made the ideas were able to make a think and write about things that included things like autopilot, the frunk, dog mode, different acceleration modes, and so much more.

## TEAM 15D

Our team imagined when we thought of different designs. We looked on Youtube for videos of other builds from different teams such as Flying Cheese to gather ideas for our robot. Some ideas we found were about putting blocks in goals swiftly, getting both the purple and greens blocks, picking up red blocks, and being able to fully park in the supply zone. Also, our team checked the VEX Website to look at the different parts we are able to use to build a good robot to enter the VEX IQ tournaments. We reviewed a few old engineering books from the past years. Also, when our team was at a tournament, we saw a team in the Crescent Robotics Competition called GoGo Boba and they inspired some of our designs such as organizing, going into the supply zone to pick up blocks (c - frame), and being able to move the robot more fast than others can. The idea of moving the robot really fast was also inspired by a Crescent team, Team 15A. After all the research we have done to try to become a Worlds Champion, we started to sketch our ideas so we can begin the quickly next phase, planning.



# PLAN

## TESLA

Automotive designers at Tesla sketches drawings and schematics for new car models, revising and editing their draft until it follows the following rules:

- 1.It is functional.
- 2.It is designed in a way that is suitable for everyday life.
- 3.The public will buy the car.

## TEAM 15D

Each member of 15D drew a sketch of how they thought the robot should look like. Once we were done drawing these outlines, we shared each of our schematics with the rest of the team. In the end, we voted for which design followed the requirements and was doable for building.





# CREATE

## TESLA

Tesla uses metal cast molds to create the prototype parts of the car. This information was found on Reuters, and people who have said this are not mentioned by name because of anonymity. Every detail is meticulously accounted for in the prototype of the car model.

## TEAM 15D

Our builders (which are all of us!) started building the robot directly. Our master builder, Garrett, built the intake; Avani and Vaishnavi built the elevator.



# TEST

## TESLA

Once the prototypes are complete, they are tested under extreme heat, forward crashes, side crashes, and many other kinds of tests. They test to see if the Tesla can detect certain things like other cars, people, and animals. Both the Model 3 and the Model Y have earned 5-star crash ratings because of their rigid and strong frame.

## TEAM 15D

We test every mechanism on our robot to see if it all works. When we program, we have to test over and over and change certain things. When something doesn't work, we fix it as soon as possible. When we test things, we see exactly what the problems are. Then, we add/remove to the build or program to fix the problem, then test it again. This way, we know for sure everything works as intended.



# IMPROVE

## TESLA

The company utilizes data analysis to understand its customers' needs and preferences, optimize its production processes, and improve its product offerings.

## TEAM 15D

Our team identifies and understands the needs and requirements that are crucial for successful design. We collaborate and communicate amongst ourselves to understand what we need to improve. Effective communication and collaboration among team members is very important. Clear communication ensures that everyone is on the same page, leading to better decision-making and designs. We look at what mistakes we made in the past to see what we need to improve. We stay updated on the latest developments in VEX and continuously improve our robot. This includes staying informed about new kits, designs, and strategies to get a good score in the game.



# COMMUNICATE



## TESLA

Tesla fosters an environment that encourages open communication. This can include regular team meetings, collaborative platforms, and tools that facilitate real-time communication. Quick and efficient communication is essential for resolving issues, sharing updates, and ensuring that everyone is aligned with project goals.

## TEAM 15D

Our team uses effective communication to ensure everyone understands their roles, responsibilities, and progress of the project. We have regular meetings, keep each other updated, and have a shared understanding of our goals. We share information about design requirements, issues, our solutions, and how to improve our design.



# How has participation in VEX Robotics prepared you for a future career?

Being in VEX robotics has prepared me for a future career. VEX Robotics has been a great experience and has taught me that teamwork is the key to accomplishing goals in life. Arguing and fighting don't help you accomplish anything in life. I have learned to be patient and determined because nothing in life works on the first try. Overall, VEX IQ has taught us many lifelong lessons for my future.

-Haania

Participating in Robotics helped me prepare for my career path. This opportunity has given me many life lessons to use in the future. VEX Robotics helps me to become a problem solver in daily life because if something goes wrong, I can think of other ways to deal with the situation. It also helps me to grow my leadership skills and instead of keeping ideas to myself, I can share with the world so I can help others who are facing a problem. This experience has allowed me to work independently and work together as a team and communicate with my teammates. This is one of the greatest opportunities I ever had and I hope to never forget how much good it had done for me.

-Vaishnavi

Doing VEX Robotics has given me experience in something that could be background knowledge for my wanted career as a lawyer. Having Robotics as part of my background knowledge, I could specialize in a part of the field related to science and engineering. Corporate lawyers, also known as corporate counsel, are lawyers who have the primary responsibility of making sure the transactions of the company they work for are legal. A corporate lawyer for a STEM company, if faced with a Robotics-based case, would have background knowledge of Robotics.

-Sydney



A red Tesla Model S is shown from a low angle, focusing on the front hood and headlight. The words "Electric Dreams" are written in a stylized, glowing font on the hood. In the background, a building with large windows is visible, slightly out of focus.

# Thank You

Team 15D, The Crescent Croissants

*Electric Dreams*