Team 74177W

Apple Engineering Design Process

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Participants

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Why Apple? For this online research a comp process and com the design proc

For this online challenge, we chose to research a company's engineering design process and compare it to how we use the design process. We chose Apple since it is one of the world's most successful and innovative businesses. Apple has enhanced our technology use with products like the iPhone and Apple TV. We wanted to figure out how Apple designs such incredible devices and how VEX is helping us prepare to be outstanding engineers.

Apple Vs 74177W

Using our research and an interview with a Platform Architect from Apple, we will compare Apple's design process to 74177W's.

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The First step in Apple's design process empathizes with customers. Apple designs products with its customers in mind. They could interview or shadow their customers to gather information to understand what the consumers want. Senior Managers start by thinking about what the customer wants based on the results of interviews or shadowing. Apple also welcomes any inside ideas and has no judgemental opinions.



ASK <u>74177W</u>

We start by analyzing the challenge and the rule book and brainstorming ideas on how to design our robot to get as many points as possible. We look at past designs from other teams at our school and research designs online. We find different mechanisms that we can use to get points on the field.



Source: content.vexrobotics.com/

The way to score points in the Slapshot challenge is to gather the disks and somehow shoot them into the goal point zones. **Our goal** is to create an arm mechanism long and strong enough to pull down the dispenser, create a spinner to get the disks out of the purple dispenser. In addition we, want to create a kicker function that shoots the disks that were collected in a funnel into the contact zones. Lastly, we need to add a scissor lift to touch the other side of the contact zones in the endgame.

Imagine 74177W

Apple redefines and focuses the questions based on the results from the first stage. In this next stage, they elaborate more on defining important objectives, decisions, challenges, and pain points. Apple also starts to think about what parts they will need and how they will work when used to create the upcoming project. The team then begins discussing the new product idea and making initial sketches.



The entire team designs a robot that they think will perform the best on the field. After everyone has finished their sketch, we discuss what parts of each robot we like the best. Like apple, we then make the initial design of our robot, using the mechanisms we voted on and our online resources as inspiration.



Plan <u>74177W</u>

During the design process, Apple brainstorms and comes up with different and creative ideas. Brainstorming involves sharing ideas, respecting each other's ideas, diverging/convergent, and prioritizing. The process allows a maximum amount of creative thinking and acceptance of different pictures. To plan out, Apple researches possible improvements, and the new item must be tried with other solutions.



After designing our initial sketches, we gathered the builders' pieces and planned how to build the mechanisms for the robot. Like Apple, we make sure to respect everyone's ideas and try different ideas for designs







Create

<u>74177W</u>

Apple starts to create a prototype; this can be done through mockups, storyboards, and quick iterations. The design team designs the prototype using "10 to 3 to 1". This method gives the design team creative freedom for the prototype, and they create ten concepts for the product. They narrow these concepts down to three and then select one design for the product. During this process, the design team explains how the test model will work and get feedback from their peers. Next, the design team begins to discuss creating a test model.



Jonathan Ive shows the iMac wireframe After thoroughly designing our robot, we build the drivetrain and the mechanisms. Like Apple, we start with prototypes of our components built on the base of our robot until we can test them with a controller.



Prototype Drivetrain



Prototype Arm

Improve

<u>74177W</u>

Once the beta model has been entirely made, Apple tests its ideas with the original user group and uses the feedback to improve the design. Suppose any problems are found after the model has been tested. In that case, the EPM (Engineering Product Manager) and the GSM (Global Supply Manager) send it back to the Apple campus for the issues to be reviewed by the executives to get their feedback. This process can repeat many times; it usually takes 4-6 weeks to make the new model. Our team uses this same process after our robot prototype is finished. Once it is finished, our drivers test the mechanisms to see how well they work on the field. If something did not work as intended, they would send it back to the builders to inspect and fix it. This process is repeated throughout the entire season and is crucial for perfecting our robot.



Current design of drive train



Documentation 74177W

The Apple New Product Process (ANPP) is a detailed document that the development team uses when they begin work. This document lays out the entire design process of the product and uses elaborate detail. It also mentions who will work on each stage of development and when each step will be completed. Apple also uses a document called the "Rules of the Road" to document every vital product development milestone. It also mentions directly responsible individuals (DRI) responsible for certain milestones in product development.



Although our teams' document may not be as thorough as Apple's ANPP (Apple New Product Process), we have our own documentation. We use our teams' online notebook to record any time we add or change something about our robot or its code. We also use it to document our CAD projects throughout the year.

Group: Adam, Bala, Faris	
Description of work accomplished	Progress Sketches or Pictures
Problem: We tested the funnel and noticed that the white beam didn't stop and control all of the disks that were falling. Solution: To fix this, we added a purple beam on top of it which acted as a barrier and prevented disks not to fly all over the place.	



How VEX me will benefit our futures

<u>Teamwork</u>

Throughout the entire season, you will be working with a team of up to ten people. You will get to know each other through the competition season and will grow together through VEX. This prepares young children for the teams they will work with in their future careers.

Learn New Skills

In Vex, you will learn important new skills for your robotics career. These include building, programming, documentation, etc. These skills prepare kids for a future career in engineering by teaching students the fundamentals of robotics.

Documentation

While competing, Vex teaches you how to create a thorough document explaining your design process throughout the season. This prepares students for future careers where they will need to document their entire process.

Credits & Citations

Website citations -

https://www.interaction-design.org

https://www.designorate.com

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https://thenextweb.com

Interview citations -

Strietz, Jamie, Platform architect, Karsyn Hefley, 11/11/22

Image citations -

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