Title: Career Readiness Challenge - Google

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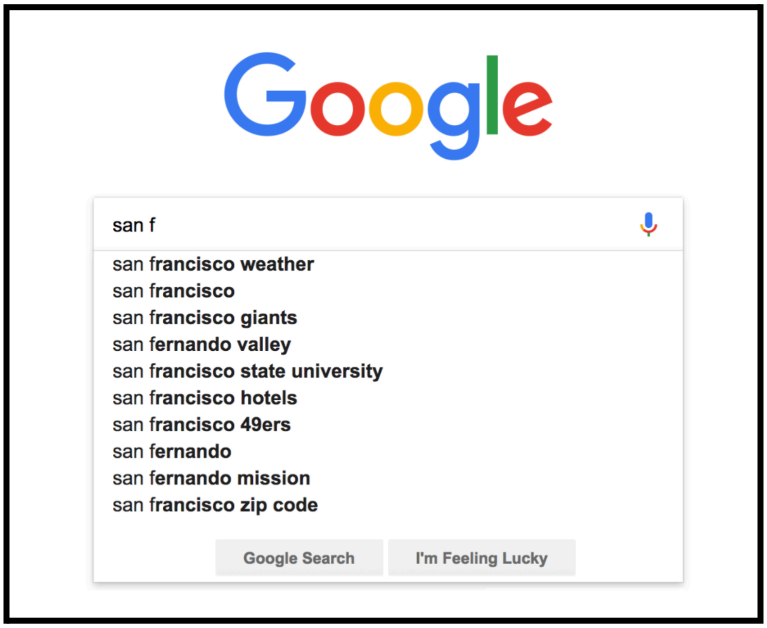
Why we chose Google

Google is not a company that you immediately think of as using engineering design processes (unlike other companies such as Nasa, SpaceX, Siemens, etc.). When someone mentions Google, you first think “Oh Google the search engine”, *not* “Google has meticulously used engineering design processes through both software engineering and mechanical engineering amongst others”.



Google is such a famous and well-known company due to its large scale and widespread consumer base. Consequently, it has so many employees that many of the current Google employees probably took part in VEX robotics in the past and many people currently doing VEX will go on to work at Google.

Furthermore, another reason we chose Google is its usefulness in our everyday lives such that we can see the impact of the design processes themselves (for instance, I am currently using Google to write this on Google Docs, which was first released in 2006 - 6 years after the company was founded - as a software design update).

We also know of Google’s significant and impactful sponsorship of VEX robotics. We appreciate Google's role in advancing STEM initiatives and providing valuable resources to the VEX community. Through this choice, we hope to showcase the real-world connections between industry leaders like Google and the VEX robotics competition, emphasizing the collaborative efforts that drive progress in robotics education.

Overall, we chose google because of all the reasons above and most importantly, its unique design process, which we have applied to our own robot.

Google’s engineering process and how it relates to ours

Google applies the engineering design process in six well-defined phases: Understand, Define, Sketch, Decide, Prototype, and Validate. These steps are used to understand the problem and develop effective solutions. Additionally, Google tailors its design model to meet the distinct needs of various teams, such as Google X, Google Ventures, Ads & Commerce, and Corp Eng.

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As our small robotics team has no distinct departments, unlike Google, we do not need to change the design model.

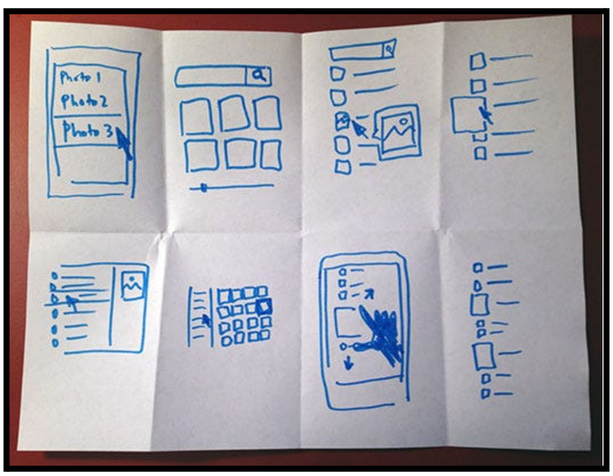
Understand = unpacking the problem and creating a shared knowledge base, utilizing techniques like "How Might We" exercises and user interviews.

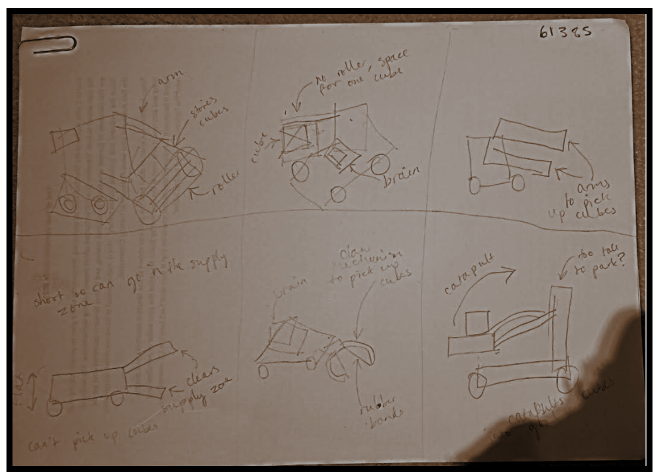
This can be compared to the step in our design process where we watch the game introduction video, read the game manual, and brainstorm initial ideas. We also anticipate challenges like block handling or navigating the supply zone bar.

Define = aligns on principles, scopes out the ideal user journey, and establishes success metrics.

While in Google, the user is the general public, in our design process there is more emphasis on internal user experience considerations. We also use this step to set goals e.g. we will finish building our robot by December, we will go to our first competition by January, etc.

Sketch = focuses on generating a broad range of ideas, employing techniques like Crazy-8 sketching.





Left: example of Crazy-8 sketching. Right: our own robot design ideas. We use this step in our robot design process, sketching many different possible robot designs with different functions. The sketches are rough without intricate details, using a broad range of ideas. This helps us identify possibilities for our final design which is useful for building the optimal robot.

Decide = involves voting and selecting the most promising concepts.

We employed a decision-making process similar to Google, selecting our robot's components—4-wheel drive base, lifting 4-bar mechanism (over catapult), and the choice to avoid the supply zone—by weighing their advantages and disadvantages to choose the most promising options.

Prototype = brings chosen ideas to life, creating tangible representations through various methods.

Before building our robot, we prototyped the arm of our robot (the most important part as it scores most points) by building a small scale model to check it worked. This meant we could fix errors that came up, such as changing the gear ratio for more torque and adding rubber bands.

Validate = prototypes are put in front of users to gather feedback, informing decisions on whether to proceed or refine.

Both our team and Google tested prototypes in this way. Before adding the arm onto the drivebase, we drove our robot to check it would be fast enough. After completing the validation stage, we either went backwards to designing when there was a problem, or forwards to the completion of the robot.

Overall, there are more similarities than differences between our design process and Google's, including the similarities of identifying goals, sketching, and prototyping.

How VEX Robotics prepares students for a future career

VEX Robotics prepares students for a future career by providing them with hands-on experience in engineering design processes that are applicable in various careers or companies (like Google).

The structured approach of a design process gives students problem-solving skills, critical thinking, and the ability to develop effective solutions – skills highly valued in the professional world.

Students also gain collaboration and teamwork skills, crucial for future careers.

VEX Robotics also encourages students to consider user needs, a skill that is valuable in fields such as product design, software development, and customer-oriented roles.

When the students set goals for their robot-building process, this mirrors the goal-setting practices in professional settings. Learning to set realistic and achievable goals, along with managing time effectively, prepares students for the careers of project management and meeting deadlines in the future.

In summary, VEX Robotics prepares students for a future career by instilling technical skills, fostering collaboration and teamwork, design thinking, and providing hands-on experience in the application of engineering principles – all of which are key attributes for success in the professional world.

Sources

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