

# The Design of Screams

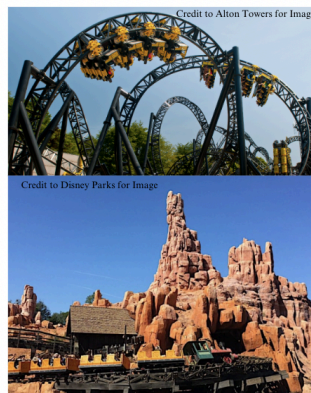
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The anticipation is palpable, as the cart reaches its first apex. As the cart slowly tips into its inevitable path, the roar of screams is deafening. The engineering team stands by and turns to each other, smiling and nodding. Their latest creation, a family thrill coaster, has come to life at 60 mph with a g-force of 3.5 g's. This is the life blood of a roller coaster. Their mission is to continue pushing the frontiers of roller coaster design for families and thrill seekers alike. The engineering design process is critical to the success of our roller coaster team. Their goal of creating amusement rides that are both innovative and safe is only as strong as the foundation of the process supporting the creation.

Roller coaster designers need the engineering design process not only to create a creation costing up to 500 million dollars like the recently created Guardians of the Galaxy: Cosmic Rewind. [1] For roller coaster creation, the engineering process encompasses the necessary step-by-step ideations that allows for both a clear structure and the flexibility of creativity. The first step in the process is defining the need. [2] Although broadly, the answer would be “to create a roller coaster,” there is so much thought that needs to go into this foundational question. Designers need to know fundamental information like the intended user, possible design materials, cart design, lifts, and track layout options. [3] The answers to these questions can result in vastly different coasters – from the Boomerang Design of Déjà vu at Magic Mountain in Valencia, California to El Toro at Great Adventure in Jackson Township, New Jersey. In Vex IQ,

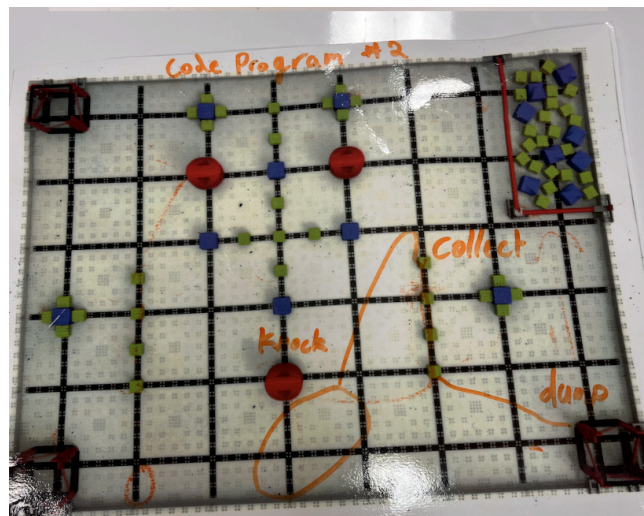


Credit to Alton Towers for Image  
Credit to Disney Parks for Image  
Disney's family coaster "Big Thunder Mountain" compared to Alton Tower's "The Smiler". While both roller coasters, these two creations are vastly different in materials, cost, and design.

robotics teams define their goals by the challenge and specifications established by VEX. It is within the confines of these standards that we are able to appreciate our task at hand.

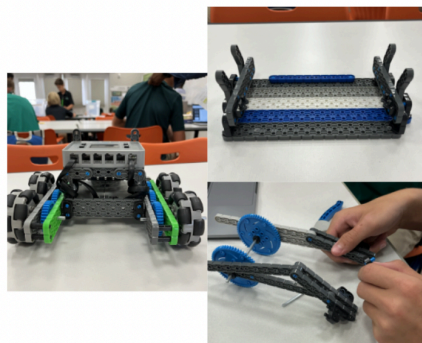
Steps two and three of the design process encapsulates the ability of the creators to, first, define the “problem” and then brainstorm possible solutions. [4] Now that our coaster team

understands the scope of their project, it is during these next pivotal steps that ideas begin to take shape for our future thrill ride. Vekoma Rides Manufacturing uses this aspect of the process to implement their top priorities of safety and innovation. [5] For example, if the team determines that they want to use a catapult-launch lift design, they would have to research which of the six types of launch systems would work best with their idea. [6] This is one of dozens of aspects they will need to consider when brainstorming. While this aspect of our design was more limited in options due to VEX's requirements and specifications, our innovation came into play, as we struggled to overcome obstacles while collaborating to design an effective robot that could achieve our objective.

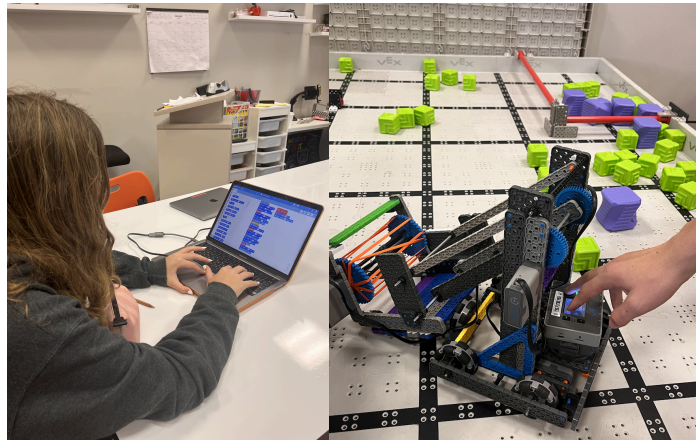


We brainstormed what we wanted our robot to accomplish and created a design which would achieve our goals

Prototyping roller-coasters is the fourth step of our design process and to me, the most exciting. From a team mindset and a building process comes a tangible physical model of what can be. It is here where, after designing draft models of their coaster, PGAV Destinations presents a 3D version of their latest innovation, so park owners have the ability to “ride the ride.” [7] Our prototypes were actually drafts of our actual robot that were ultimately integrated into our competition bot. They are a history of our thought evolution during our planning process.



During testing and iterating, the final phase of the process, safety comes to the forefront, as every precaution needs to be checked and double checked before a roller coaster can open to its awaiting audience. At the end of this phase, it is where the world meets a whole new vision in roller-coasters, as when Bolliger & Mabillard introduced the SurfCoaster at SeaWorld Orlando. [8] This step of the process is where our team checks and rechecks our robot's ability to function as needed. While not as exciting as the entry of the roller coaster, it is a moment of pride and excitement for the team.



We checked and tested our code to ensure it would perform as intended during competition.

Roller coasters have thrilled patrons for hundreds of years, yet the design process gives coaster engineers the blueprint to continue to re-invent the definition of excitement for riders. The VEX Robotics competition has put the potential of our academic power to use in a practical setting. What started as a passion for robotics and a few discussions about creating the most “fun” functional robots to accomplish our task, the engineering decision process transformed our interest from idea to creation. VEX is a unique opportunity to harness the energy of our creativity to the structure of a challenge and produce not only a functioning, autonomous robot but also a deeper understanding of the process behind innovation. It has helped our team understand and appreciate that in the very real world of design, creative transformation only becomes a working reality through the very rigorous process of diligence, drafting, error, and re-design.

Footnotes:

[1]

[https://disneydose.com/you-wont-believe-the-costs-of-the-top-most-expensive-disney-rides-ever-built/#“Guardians\\_of\\_the\\_Galaxy\\_Cosmic\\_Rewind”\\_–\\_EPCOT\\_Estimated\\_COST\\_500\\_million](https://disneydose.com/you-wont-believe-the-costs-of-the-top-most-expensive-disney-rides-ever-built/#“Guardians_of_the_Galaxy_Cosmic_Rewind”_–_EPCOT_Estimated_COST_500_million)

[2] <https://utilitiesone.com/the-importance-of-understanding-the-5-steps-of-engineering-design-process-for-a-successful-project>  
(<https://utilitiesone.com/the-importance-of-understanding-the-5-steps-of-engineering-design-process-for-a-successful-project>)

[3]

<https://attractionsmagazine.com/how-are-roller-coasters-built-infographic/#:~:text=When%20building%20a%20roller%20coaster,the%20Superman%20Ride%20of%20Steel>

(<https://attractionsmagazine.com/how-are-roller-coasters-built-infographic/#:~:text=When%20building%20a%20roller%20coaster,the%20Superman%20Ride%20of%20Steel>)

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[4]

<https://utilitiesone.com/the-importance-of-understanding-the-5-steps-of-engineering-design-process-for-a-successful-project#anchor-1>

(<https://utilitiesone.com/the-importance-of-understanding-the-5-steps-of-engineering-design-process-for-a-successful-project#anchor-1>)

[5]

<https://www.vekoma.com>

[6]

<https://www.bigrentz.com/blog/how-roller-coasters-built>

[7] <https://matadornetwork.com/read/roller-coaster-design-process/>

[8] <https://seaworld.com/orlando/blog/pipeline-the-surf-coaster/>