

Thesis Project Portfolio

Designing an Automatic Fetch Machine

(Technical Report)

The Automatic Dog Ball Launcher and the Purpose of Unsuccessful Engineering Work

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2022

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Sociotechnical Synthesis

The Automatic Dog Ball Launcher and Separation Anxiety

In the year 2020, about 10% of US adults adopted a new pet that has only experienced living with their owner at home constantly with them due to the pandemic. However, with the return to normal life and work from home diminishing, separation anxiety will become a more prevalent problem that dogs and their owners must face. Both projects that I completed focused on this issue and how to alleviate some of the stress and anxiety that dogs with separation anxiety face. The technical project entailed creating an automatic dog ball launcher that rotates at multiple different angles and fires tennis balls at multiple launch speeds, in an attempt to provide dogs with some form of entertainment while their owners are gone for the day. However, my STS research proved that the device would not be effective at targeting this purpose, so the rest of the research sought to describe why engineers create projects that seem to fulfill no purpose, and why engineers are accepting of failure.

The technical project entailed creating a Bluetooth device that connected to a web application, which allows the user to set the machine to turn on for periods of time and launch the ball at different angles and speeds for their dog. In the demo form, the device modelled the time mechanism by running for various periods of time ranging from 5 – 15 seconds based on commands, however; the original was to allow the owner to schedule the machine to run for periods of time in the future, such as 2:00 to 3:00 pm. This was not implemented in the demo due to obvious time limitations but was the original purpose to try and alleviate separation anxiety throughout the day for dogs. When this project concluded, a fully functional launching mechanism was created that accomplished all tasks that our group intended, and this leads into

the STS project which briefly discusses the effectiveness of the device at alleviating separation anxiety.

The STS research project that was completed discussed the effectiveness of the previous technical project at solving the initial problem it was created for, and then reflects on its failure at this purpose. Additionally, it delves into why engineers are accepting of failure, and why they make projects that have little to no purpose. Pacey's framework and a failure spectrum were utilized to analyze these questions with respect to both the launcher and engineering practice. This led to the conclusions that every engineering project has a purpose, though it may not be the intended one, and failure is an inevitable occurrence that engineers know will happen no matter what. Failure will lead to engineers learning from mistakes that are made to make bigger and better products in the future that fix problems over time. Finally, I also learned that Pacey's framework provides insight into the purpose of any engineering practice, which can in turn, provide insight into how the engineering practice should be shaped and what parts should be emphasized to ensure the best product possible.

My STS projects have illustrated the importance of understanding the system as a whole when creating any project, in both school and the workforce. By understanding the purpose of the work that is being completed and the problem that is being solved, it will allow an individual to better shape the engineering process to their needs. Emphasizing gathering information from stakeholders or working towards reducing cost to make the product as cheap as possible are critical parts that will help tailor the project to its intended purpose. Moreover, if the problem is fully understood, then a solution will be produced that targets the primary cause of the problem, rather than something that is believed to be the cause, such as what was completed for our technical project. Both projects combined provide a holistic understanding to how important

understanding the purpose of the work is and understanding the importance of failure in engineering practice.