

Design and Construction of a Ferrofluid Kinetic Art Clock
(Technical Report)

A Virtue Ethics Analysis of the MIT Media Lab Open Agriculture Food Computer Project
(STS Research Paper)

An Undergraduate Thesis Portfolio

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Socio-Technical Synthesis: Mechatronic Clock and Misrepresentation in Product Development

My technical work and my STS thesis were primarily connected through their understanding and analysis of product development and the importance of the product development process. Product development covers the entire process of bringing a product to market, and while it can mean different things in different industries, both my technical work and my STS thesis focused on physical prototypes with mechanical, electrical, and computer components. My technical work focuses on the process that my group took through our own product development process, whereas my STS thesis analyzes the actions taken by another party during their product development process. Although my technical report and my STS thesis approach different aspects of product development, the constant thread running between them are the details of what makes a product development process successful.

For our technical report, my group developed a mechatronic clock that uses ferrofluid and a series of servomotors to represent each of the digits of the clock. The entirety of the design of the clock was custom built with the intention for it to be displayed in the mechanical engineering building at UVa to demonstrate to visitors and other students the type of work that is conducted in the mechanical engineering program. The technical report itself outlines the many steps that were taken in the development of this design as we went through many iterations of sketches, CAD models, and scaling up our prototypes. The goal of both this clock and the report is to expose some of the product development elements that are obfuscated by only viewing the end product of a project.

My STS research similarly explores product development, however this exploration focuses on an analysis of the MIT Media Lab Food Computer Project. This paper illuminates

another aspect of the product development process by detailing some of the ethical shortcuts that the project director and his team took in order to raise money and accelerate the development of their product. In this thesis, I claim that the team for the Food Computer Project acted unethically in many key ways that violate the expected Codes of Conduct for professional engineers. The goal of this research is to elucidate the potential pitfalls of trying to skip steps in the product development process and to present a viewpoint regarding the ethical dilemmas that can arise as an entrepreneur.

I found it to be a valuable experience to work on these two projects concurrently. Although they were clearly different projects, by working on a product development project at the same time as I was analyzing the ethics of another project, I was more inclined to think about the ethics at play in my own project. While we were not planning to market our product after constructing it, it was still important to consider how we were representing our work in our checkpoint presentations and our technical report. This concurrent working style also helped me consider more strongly the scope of our project so we would not encounter a situation where we had promised features and functionality for which we could not deliver. By contrast, I was also able to have a different understanding and analysis of the Food Computer Project since I have experience working on product development projects and could use that to help me understand the actions they took. It was an interesting thought exercise for me to consider what I would have done if I were on that project team. Overall, working on both projects concurrently has helped me have a more practical and nuanced view of product development on the whole.