Thesis Project Portfolio

Human Powered Vehicle

(Technical Report)

An Electrifying Future? Disruptive Technologies as a Model for Electric Vehicle Adoption

(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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Sociotechnical Synthesis

Though not explicitly related, my STS research and technical project both relate to the challenges faced in finding environmentally friendly mobility solutions. My experience driving an electric car led to my STS research topic, in which I attempted to understand why electric cars have not yet seen widespread adoption despite clear benefits in the form of a reduced carbon footprint. Likewise, my technical project sought to engineer a novel solution to these same problems by designing a human powered vehicle.

In my STS research, I investigated the obstacles involved in the widespread adoption of electric vehicles, particularly in the American market. In my research, I applied the "chasm" model typically used to describe the adoption of disruptive technologies, such as the smartphone, to the current state of the electric car market. In contrast to the continuous improvement that has driven much of the modern automobile's development, this model suggests that most failures occur when a technology moves from early adopters to the early majority, and thus this is where efforts to facilitate its adoption should be focused. In my research, I discovered that governmental policies, particularly tax credits and fleet fuel economy standards, have created small areas of wider adoption of electric vehicles, suggesting that wider application of these policies could lead to wider adoption.

In the technical portion of my thesis, I worked on a team that designed a single-seat human powered vehicle. Designed to the specifications of the Human Powered Vehicle Competition organized by the American Society of Mechanical Engineers, the design has broader implications as an environmentally friendly alternative to the automobile. Featuring user friendly side-stick steering and an adjustable pedal system, the design requires less specialized

fitting or instruction than other human powered transportation solutions. Additionally, a partial roll cage provides protection to the operator in the event of a rollover or other crash.

Completing both portions together led to a heightened appreciation for the significance of my technical project. Through my STS research, I realized that while the short distances covered in the typical car journey are well suited to electric vehicles, they are equally suited to smaller, human powered methods of transit, such as the human powered vehicle we designed. This led to an appreciation for the value of multiple compatible solutions rather than a one size fits all approach. Given the alarming rate of global environmental change, it is imperative that we reduce our environmental impact wherever possible so that future generations can enjoy the same beautiful environment that we do today.

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