

**Thesis Project Portfolio**

**Pedestrian and Bicyclist Safety and Comfort on Water Street**

(Technical Report)

**Learning from Personal Rapid Transit Failures to Implement Safer and Healthier  
Transportation Infrastructure**

(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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## **Table of Contents**

Sociotechnical Synthesis

Pedestrian and Bicyclist Safety and Comfort on Water Street

Learning from Personal Rapid Transit Failures to Implement Safer and Healthier Transportation Infrastructure

Prospectus

## **Sociotechnical Synthesis**

In engineering school, we are introduced to an immense number of problems and issues since we are for the first time seeing the world through an engineer's perspective. Engineers are problem-solvers, but what problems we wish to solve is not easy to decipher. In my time at the University of Virginia I have found that I wish to solve problems in transportation. It may be more accurate to say "in my time sitting in traffic," but my studies have certainly shaped me and my career goals. Needless to say, my Capstone Project, Research Paper, and Thesis all deal with issues in transportation. Through a year long study in STS, I have been able to better understand how people and objects interact. My Research Paper and Thesis both seek to address the same issues: roadway safety, the lack of bicycle and pedestrian options, and financial efficiency, and together they provide some exiting solutions to the problems facing transportation engineers.

My Research Paper takes an extended look at the unsuccessful experiment of Personal Rapid Transit (PRT). In *Aramis: Or the Love of Technology*, French sociologist Bruno Latour, in a unique writing style, examines the failed Parisienne public transit system in order to describe Actor Network Theory (ANT). This theory contextualizes the efforts of the engineers and decision-makers as the creators of technology, and maintains that while technology can have an effect on humans, it is by no means inevitable and cannot create itself. Holding the professionals behind PRT accountable and exposing the flaws in their work process, it is easier to see how worldwide the seemingly innovative transportation technology failed. There is one working PRT system in Morgantown West Virginia, and I study the mystery behind its success in my STS Research Paper. By looking at these case studies in combination with a large body of work from STS and industry scholars, some solutions to the roadway problems presented themselves.

For my Thesis, I discussed how my Capstone team planned on solving the roadway safety, health, and finance problems that are plaguing our country and world. As described in the Technical Report, this involved using Virtual Reality (VR) technology to receive user input in the CAD drafting process. I again touched on the work of Latour, specifically his article “Where are the Missing Masses?” to describe how critical it is for us to implement VR in the correct way. My research went further into understanding the effects VR has on a person in the simulated environment, and how we can set up a user testing plan that effects the experience in a positive manner. Unfortunately, due to the COVID-19 pandemic we were not able to test users, but we still made great strides in research on bicycle and pedestrian safety improvements.

My understanding of the field of transportation engineering has been enhanced by studying concepts of STS. All three of these projects tie together through an STS lens. Individuals make decisions, and it is the job of transportation planners and designers to predict these decisions in order to build functional pieces of infrastructure. To build such structures it takes many individuals to come together in an efficient and organized way. By studying the ways in which individuals interact with technological devices as well as with each other, I have discovered some better methods for engineering practice. This year I drafted CAD plans for an improved Water Street in Downtown Charlottesville complete with bike lanes. In my Research Paper I found that organizations could practice interactive innovation, systems engineering principles, and different bid methods to produce better infrastructure. And finally, in my Thesis I developed ways to properly test new infrastructure designs in VR. With these solutions in mind, I will enter the workforce prepared to make our roads safer, promote healthy transportation options, and to produce the necessary infrastructure in a cost-efficient way.