Engineers in Action: Eswatini Suspended Bridge
(Technical Report)

An Actor-Network Theory Analysis of the Forbes Avenue Bridge Collapse and the Implications for U.S Infrastructure
(STS Research Paper)

An Undergraduate Thesis Portfolio

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Socio-Technical Synthesis: Suspended Footbridge Design

In my technical work and STS research project, I address the socio-technical challenge of determining how to design and maintain a bridge that is both structurally safe and communally accepted. My STS research paper seeks to evaluate why an established artifact, the Forbes Avenue Bridge in Pittsburgh, Pennsylvania, failed. The results of the analysis better guided the design process for the Maphoveleni footbridge in Eswatini. My technical report looks strictly at the design process for creating a footbridge whereas my STS research looks at the implications of failing to maintain bridges domestically. Although, through looking at both of these projects in parallel, I could apply the key takeaways from the Forbes Avenue bridge collapse and federal rehabilitation and funding process to my team's approach for Maphoveleni. In what follows, I discuss the bridge design technical project, the analysis performed in the STS project, as well as the advantages of working on both projects simultaneously.

In the Manzini region of Eswatini, a dangerous crossing over the Mtilane river threatens the lives of community members everyday. My team was tasked with creating a design for a suspended footbridge that permits these community members to access schools, medical care, and agricultural areas. Before designing the footbridge, my team completed a series of technical modules and collaborated with experienced structural engineers. The final deliverable, a detailed drawing set, was created for the non-profit, Engineers in Action, that is organizing the bridge build. In contrast to the entirely technical design, my STS project seeks to answer, "Why did the Forbes Avenue bridge collapse and what are the implications for U.S infrastructure?" I look at the existing artifact through the lens of actor-network theory and argue that its failure was due to the network builder, the federal government, failing to allocate sufficient funding and enforcing a

time-intensive rehabilitation process. The delayed action of the federal government, rather than solely the design itself, was crucial to the collapse of the Forbes Avenue bridge.

Working on the technical and STS projects simultaneously provided several advantages that could not be realized by doing them independently. In seeking justification for the failure of the Forbes Avenue bridge, I discovered a primary actor responsible for the outcome of the overall network. I could then apply key takeaways from this discovery such as fail safe techniques and redundancies towards my technical design for the Maphoveleni footbridge in Eswatini to ensure that it performs well. In addition, the design process that my team followed uncovered some reasoning behind why certain steps were essential to the success of the technology. The projects were mutually beneficial to each other in that I gained insight on factors of each of them from working on the other. I worked solely on the design process in my technical project while exploring the entire lifespan of a structure in the STS project. The concurrent execution of these two projects made apparent the extensive responsibility of engineers past just technical design choices.