Thesis Project Portfolio

Next Generation Inventory Management: Modernizing the FAA's Technological Systems

(Technical Report)

The Role of Aviation Accidents in Shaping the FAA's Outlook on Technology

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Thesis

Introduction

My Capstone project and STS research project converged on a similar overarching problem: the Federal Aviation Administration's (FAA) struggles with technological modernization. Throughout its history as an organization, the FAA has had a sluggish pace in updating their own technology, resulting in a technological infrastructure that has been widely criticized for being outdated. Both projects were developed to address this overarching issue, tackling the issue in separate manners with one providing a direct technical solution while the other provided a thorough exploration into the social factors that affect it. The technical component of my work involved designing and implementing a full-stack web application to modernize a component of the FAA's outdated inventory management system, enhancing both its functionality and efficiency. This endeavor updated a part of the FAA's technological infrastructure, thereby providing a purely technical solution to help alleviate the broader issue. To further expand on my technical solution, my STS research explored the social and historical aspects that have contributed to theoverarching issue, highlighting how FAA's conservative stance towards technological adoption has been shaped by the responses to aviation disasters. The combination of these two approaches provides insight into how technical solutions to the FAA's current technological struggles may benefit from being grounded in a social understanding of how these issues came to be.

Capstone Project

The Capstone report outlines the modernization of an FAA inventory management system through the development of a custom-built full-stack web application which replaced an outdated Microsoft Access interface. The technical project was undertaken as part of the FAA's wider NextGen initiative, a program to enhance the safety and efficiency of the U.S. National Airspace through technological modernization. The project addressed significant inefficiencies in the previous system, such as a dated user interface and cumbersome workflow processes. The new application, which utilizes ReactJS for front-end development and Java for back-end operations, provides a user-friendly, responsive user interface and more efficient backend processes. This has led to improved operational workflow and reduced the risk of cost overruns. The modernization project not only boosts the FAA's current operational efficiency, but also sets a foundation for future technological advancements to expand on the initial project.

STS Research Paper

The STS research paper examines the FAA's conservative approach to technological adoption, highlighting how aviation disasters have significantly shaped the agency's cautious stance on technology. The FAA's historical and ongoing reluctance to integrate advanced technologies is deeply rooted in the societal and legislative reactions to high-profile aviation accidents. These events amplify public fear and mistrust towards, pressure Congress to enforce stricter safety regulations, and reinforces a skeptical towards technology within the FAA. All of these factors combined together have resulted in constraining the FAA's technological progress. Furthermore, the study goes on to emphasize how the FAA is uniquely more mistrusting of

technology due to the volume and nature of aviation accidents in the U.S. which serve to amplify all of the aforementioned sociotechnical factors contributing to the issue. Analysis utilizes the Social Construction of Technology (SCOT) framework to examine the complex interplay between the FAA's slow pace of technological development and the societal factors that influence the issue. The study concludes by suggesting that a nuanced understanding of these dynamics is crucial for properly addressing the FAA's challenges in adopting new technologies.

Conclusion

Working simultaneously on the technical Capstone project and the STS research paper provided unique perspectives on both projects. The STS investigation into the social and historical factors shaping the FAA's approach to technology provided enlightening context to the challenges I faced during the technical project, offering me a deeper understanding of why certain technological advancements I wanted to implement were resisted or delayed. It also allowed me to look back on my technical project with more complex perspectives on some of the outdated technology I used during the project, challenging some of the narrow-minded views I had previously held. When doing research for my STS project, the technical project served as a motivator for exploring the FAA's technological issues in an in-depth manner. While working on the technical project, I had often run into frustrations using the outdated technology of the FAA; looking back on these frustrations gave me personal reasons to remain invested and vigorous while doing my research. This process of working on both projects simultaneously not only enriched my experiences with both, but also gave me a deeper understanding and appreciation of how social factors are embedded within technology. Navigating future technical pursuits with

this perspective in mind will enhance my experience of technical work itself as well as providing me with a basis of understanding for how technology is affected by complex social dynamics.