Thesis Project Portfolio

Provably Clean: A Formal Analysis of Hand Hygiene During Anesthesiology Induction

(Technical Report)

Digitizing Freight Forwarding in Ecuador: A Transformational Blueprint

(STS Research Paper)

An Undergraduate Thesis

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Executive Summary

In the processes of writing my Capstone project and my STS research project, we identify similarities in the motivations and execution of these papers. The capstone research project focuses on improving safety processes within the anesthesia induction procedures, while my STS research paper focuses on identifying factors in digitally transforming the freight brokerage industry in Ecuador. While the STS paper dives into the freight transportation industry, focusing on a sociotechnical exploration into how a digital transformation can improve efficiencies in Ecuador's trucking industry, the Capstone project undertakes a technical exploration into the healthcare domain, focusing on the improvement of the anesthesia induction procedure to decrease the risk of infection. Even though these papers focus on two different industries, the motivation is similar: improving processes with the use of technology. One focuses on improving the anesthesia induction process with technological procedures such as modeling and step analyzing, while the STS paper focuses on improving the process of shipping and delivering goods through technological platforms. These projects contribute to a broader understanding of society and systems that could be improved if technology is applied into them.

This paper outlines a detailed study on improving hand hygiene during the process of anesthesia induction at the UVA Hospital. It involves observational research in the UVA Hospital and other locations to study the anesthesia induction procedures, followed by modeling the steps of the process to find specific steps of the procedure that could impact the hand hygiene and increase the risk of infection of patients. Employing modeling through PRISM, the team made significant advances by identifying steps that if skipped, could impact the cleanliness of the whole environment, and eventually increase the risk of Hospital-Acquired Infections (HAIs). The findings in this research underscore the importance of having strict rules in the procedures of hand hygiene, especially during anesthesia induction processes. This project highlights the important role of technology and constant communication in improving healthcare practices.

The STS Research paper focuses on evaluating the factors impacting the implementation of a digital freight transportation tool in Ecuador. It analyzes sociotechnical systems, market challenges, and the potential for a technological application into this market to improve efficiency, transparency, and safety. This paper incorporates documentary research diving into different research papers done into the topic, specific examples of successful startups in the industry, and then implements auto-ethnography to evaluate how the country has specific characteristics that are unique and should be considered when doing this project. This project concludes suggesting that there are many factors to consider when applying technological solutions like a digital platform for freight brokerage, in Ecuador, but that it is important to keep on doing research and obtain more information about the industry.

Engaging in these projects showcased that regardless of how distinct industries are, technology can always be used to study and potentially improve processes. The capstone project focused on healthcare and improving hand hygiene protocols during anesthesia induction, and the STS paper dove into technological appliances into the freight transportation industry. I have gained a deeper understanding between the technological advancements and the need to consider society when using technology, highlighting responsible innovation.