**Thesis Project Portfolio** 

## Redesign of the University of Virginia's Emergency Department Waiting Room Layout to Optimize Patient Flow and Increase Satisfaction

(Technical Report)

**Cripping Environmental Justice: Disabled Opposition to Plastic Bans** 

(STS Research Paper)

An Undergraduate Thesis

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### Natalie Dahlquist

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#### **Executive Summary**

#### Introduction

The following portfolio contains two projects, a capstone and sociotechnical research that both work to answer the question of: How can disabled people's health and quality of life be improved? My capstone project is working to improve the efficiency of the UVA Health emergency department by redesigning the waiting room, and doing so will help improve disabled people's medical care and medical outcomes. My sociotechnical research paper is investigating how disabled people are working to improve their own lives through online advocacy; they are working to ensure access to straws, a necessary medical aid.

#### **Capstone Summary**

Increasing demands on emergency departments (EDs) due to rising patient volumes and operational inefficiencies necessitate innovative solutions to enhance patient flow and satisfaction. Data from UVA Health reveals substantial ED crowding, with a 12% increase in ED visits between 2022 and 2023, and a 25% increase from 2021 to 2023. To address these challenges, a simulated redesign of the waiting room at the University of Virginia (UVA) ED was completed to improve space utilization and streamline patient movement. Current designs, characterized by repeated patient returns to the waiting area, create congestion and hinder the perception of progress in care. This redesign aims to expand available space and create "progression areas" where patients can be effectively managed post-triage, reducing returns to the main lobby and thereby minimizing congestion.

Utilizing FlexSim HC simulation software, both the current and proposed layouts are modeled to forecast key operational metrics. Validation was conducted by comparing simulation outcomes with UVA Health data on patient wait times, bed utilization, and throughput, ensuring the reliability of the proposed improvements. While the new waiting room is farther from the

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Patient in Triage (PIT) area, thus increasing patient travel time and the average total triage time by 2%, the variances of the arrival-to-roomed, arrival-to-triage, and triage-to-roomed times decreased by 57%, 83%, and 67% respectively. Additionally, the time taken to bring trauma patients from registration to a trauma bay decreased by 30%. Reducing the variance of wait times will increase patient satisfaction by eliminating the tail of unexpectedly long wait times. Reducing the variance enhances the reliability of wait time estimates, making actual experiences more aligned with expectations. Further research will focus on implementation challenges, including staff adaptation and continuous real-time assessment of operational performance.

#### Sociotechnical Thesis Summary

This research examines the intersection of disability rights advocacy and environmental policy in the context of single-use plastic bans in the United States. As environmental movements increasingly call for the reduction or elimination of single-use plastics, concerns have emerged regarding the disproportionate impact such policies may have on individuals with disabilities. The central research question is: How are disability advocates in the United States pushing back against single-use plastic bans? This question is explored using the Social Construction of Technology (SCOT) framework, which allows for the analysis of how different social groups, in this case, disability advocates, shape and influence technological and policy decisions. This framework is used to investigate the role of social groups in shaping the acceptance and design of environmental policies.

Findings reveal that disability advocates are pushing for greater flexibility in the design and implementation of plastic bans, such as exemptions for essential plastic items or the development of accessible alternatives. It highlights the importance of including diverse perspectives in policy development. The significance of this research lies in its contribution to

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the field of Science, Technology, and Society (STS) by emphasizing the need for more inclusive policy-making processes that account for the needs of all individuals, especially those in marginalized groups. Additionally, it offers insights into how engineering and technology-driven policies can be designed to ensure broader accessibility and fairness.

#### Conclusion

Working on both projects at the same time gave me valuable insight into the unintended impacts of policy decisions. While working on my capstone project, I saw how seemingly simple decisions like where to place the ED waiting room could have an impact on patients' outcomes. My sociotechnical research highlighted how environmental policies have had unintended negative consequences on disabled people and their quality of life. Additionally, I was able to apply some of the research I did into the models of disability for my sociotechnical research to my capstone project. I highlighted the patient experience and drew attention to how disabled patients may move through the space differently or have unique needs.