Thesis Project Portfolio

Human Computer Interaction: How Website Developers Improve User Experience

(Technical Report)

The Struggle for Safe Convenient Micromobility in Washington, D.C.

(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

Jared Arthur Dutt

Spring, 2024

Department of Computer Science

Table of Contents

Executive Summary

In the age of rapid technological advancement, user centered design is essential for successful systems. This portfolio documents the research and results of two related projects concerning user satisfaction and design in both the transportation industry and software development answering the question: How do system designers and system users improve user experience? The technical research project dives into specific Human Computer Interaction (HCI) principles involved in user facing software design and the science, technology, and society (STS) research project investigates the methods and motivations of micromobility transportation advocates in their push for safer infrastructure. Both projects are tied together in their examination of user centered and its success measured by user experience. For the technical project, the capstone paper is a culmination of all work and research into the most effective HCI principles in application and web design. For the STS project, the final deliverable is a paper detailing results for the relevant research question: How do micromobility proponents in the D.C. area advocate for safer transportation conditions?

Every day, companies with great products and services lose out on potential customers due to poor web design choices. To effectively communicate goals and meet user needs, I propose integrating the principles of Human Computer Interaction into the web development process and testing user satisfaction throughout. Web developers should be relatively familiar with main HCI ideas, which should be integrated into Computer Science curriculums. Any website under development should continuously test user satisfaction to ensure the design choices are positively impacting efficiency and effectiveness. Through these improvements in the design process, companies may find a return on their initial investments in development. More satisfied users are more likely to return to the site and make additional purchases or

generate more advertising revenue. In the future, the HMI design process could be automated to reduce cost and time spent in the development phase. New methods for testing user satisfaction can also be explored to ensure the website's design is effective before it is released.

Amidst the rapidly changing climate and increasing environmental awareness, people are looking for alternative, sustainable transportation options instead of cars. For some, the vastly growing micromobility solutions are the answer. Micromobility's share in the transportation sector has steadily expanded in large cities, presenting new infrastructure problems. Specifically in the metropolitan area of Washington D.C., infrastructure plans including protected bike lanes are controversial and opposed by groups of motorists. As a minority transportation group how do micromobility proponents in the D.C. area advocate for safer transportation conditions? The STS section of this thesis explores the various groups involved in these conflicts and characterizes each based on their relationships with one another. The Actor Network Theory framework is utilized to define these relationships and discuss effective strategies for motivating safer conditions for micromobility. The goal of this research paper is to contribute to the field of STS by reinforcing the notion that our transportation system should be engineered to serve our society through sustainability and accessibility.

Researching both the technical software aspects of user design along with the micromobility transportation system provides a holistic user design approach. Engineers responsible for creating these systems need to work with these principles in mind, while practicing smart user design decisions. Overall, the most important aspect of the design process is consulting with the actual users involved in that system. Both the technical and sociotechnical research examines systems that lack real user incorporation in their design, characterizing their downfalls and potential solutions. Embracing user-centered design principles equips engineers

with the ability to create solutions that are not only innovative but profoundly resonant with the users they serve. This approach not only enhances user satisfaction and engagement but also fosters a better interaction between human and machine, encouraging engineers to build systems that best serve their intended users.