Revitalizing Wayfinding in the School of Engineering at the University of Virginia

Analysis of Urban Electric Scooter and Bike Integration and the Impacts on Accessibility for the Disabled Community

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

Disability refers to a condition or function judged to be impaired relative to the standard of an individual or a group. The concept of disability is shaped by societal constructs and perceptions. Societies, both historically and presently, have been inherently designed for those that are considered able-bodied. This has created a world where disabled people are given unequal opportunities and more hardships. These unequal opportunities include the opportunity to be able to navigate spaces freely and unhindered.

Ableism encapsulates the idea that there is discrimination against people with disabilities stemming from the belief that typical abilities are superior. Ableism is often overlooked, especially in the development of science and technology, even though it has large impacts on those that are discriminated. Those who create the technology can shape it to fit their agenda, in the case of ableism, the creators are able to shape it to be best fit for those who fit societies standards for ability.(Winner, 1980) Ableism is so engrained in society that it is even more than just discrimination based on ability, but it also overlooks the other qualities in disabled people based on their ability. This idea is used in society by different social groups to "justify their elevated level of rights and status." (Wolbring, 2008, p.253)

Disability is far from just being a condition of limitation, instead it embodies a diverse spectrum of experiences and perspectives to enrich our understanding of the world. Celebrating disability means that we as people should recognize and value the diversity that they bring to the world and the contributions that they give to our communities. In celebrating disability and creating equal opportunities for all, regardless of ability, we are creating a world with inclusivity at the forefront. (Garland-Thomson, 2017)

The environment surrounding people is a contributor to their disability. (Gray, Gould, & Bickenbach, 2003) The environment in which a disabled individual navigates can either mitigate or magnify the challenges which they face. When a building is not built with inclusivity in mind, it amplifies the challenges faced and effectively makes a person more disabled within the environment. This highlights that disability is not necessarily a characteristic of a person, but it can be the interaction between the abilities of a person and the abilities of the environment.

Wayfinding refers to the systems or methods designed to guide people through a physical environment. Effective wayfinding will enhance an individual's understanding of space as well as their experience within space. This encompasses the way that people orient themselves within space and the ability to navigate from point A to a desired point B. For disabled individuals, proper and well-integrated wayfinding systems can be the difference between a smooth, confident navigation and one that is both scary and difficult.

For our technical project, my capstone group will be working alongside the University of Virginia to improve wayfinding around the School of Engineering and Applied Sciences. This process will involve data collection and ideally a working app in the end. For my STS research project, I will be analyzing the integration of electric vehicles, bikes and scooters specifically, in urban areas. I will research the way that these vehicles impact disabled persons ability to move around in urban areas, which already present a plethora of challenges due to the close-knit environment and the density of people within. It will be interesting to see if the technical project about wayfinding around UVA will give some insight into the STS project, especially if electric scooter and bike parking areas could be integrated into the application.

Technical Research Project

UVA's topography, lacking signage, and constant construction present a challenge for individuals with mobility disabilities. Wayfinding is more than just simply following a directional route– it is an essential skill that is interconnected with independence, quality of life, mental health, and economic prosperity (Parker et al., 2021, p. 1). To create an accessible campus that exceeds ADA standards for students, faculty, staff, and visitors, the System Engineering department's goal is to create an app that will provide information about accessibility features and guide people with mobility disabilities along accessible routes. Our goal is to improve the current campus' accessibility and increase the ease with which candidates with mobility disabilities navigate grounds by providing a comprehensive wayfinding resource. However, to build an application that would accomplish these goals, we need to designate what features we want to include and map the location of these features and routes. Therefore, our capstone project will focus on two parts within building this application, divided as follows: Firstly, collecting information about what barriers and features current students, faculty, and staff with mobility disabilities would like to be informed of when traveling around campus to fit everyone's accessibility needs. Using crowdsourcing to get an idea of what barriers still exist in the engineering school will be a very helpful way to understand the accessibility needs of the users in the system. (Qin et al., 2016) Second, designing a process to collect information about the existing accessibility features and barriers of designated spaces, and how that information can be used to design and improve current accessibility around grounds.

We will use research that we have gathered from other schools, such as George Mason, and their analysis of the wayfinding that they have implemented at their university. (Qin et al., 2016) We intend to build upon the existing efforts and methodologies developed by Geospatial

Engineering Services. One of our initial steps, following in-depth literature research, involves collaborating with Barbra Zunder, M.A., the director of UVA's Student Disability Access Center (SDAC) to conduct a survey on the specific barriers and features that those with mobility disabilities at UVA would like to have information about. When designing for people with disabilities, it is essential that we think ahead and go beyond ADA accessibility standards to be more inclusive of individuals. ADA simply provides a baseline for accessibility, but there is no guarantee that it covers all aspects of accessibility. Additionally, accessibility requirements are always changing; striving for higher and better accessibility can improve overall user experience and attempt to innovate in anticipation of future changes in accessibility requirements and such.

Since we have a limited timeframe and will only be working on this project until late April or early May, we have decided to place some limitations on this project. We have chosen to focus on individuals with mobility disabilities and to incorporate both indoor and outdoor environments, examining the different barriers within each. We also want to focus our mapping process on the buildings within the Engineering School, given our greater familiarity with these infrastructures. However, we hope that the work we do within the Engineering School's buildings can be expanded throughout the UVA campus in the future. In addition to SDAC and the UVA Engineering School, we will also be working very closely with the UVA Provost Office, UVA Geospatial Engineering Services, and Facilities Management at UVA moving forward. We hope that our research about barriers and features can be incorporated into future construction projects to create a user-friendly, inclusive, and accessible campus.

STS Project

An estimated one in six humans on Earth experience significant disability. (World Health Organization, 2023) These disabilities can be apparent to the human eye on the surface, or they can occur in a way that is not apparent. In many ways, those who experience disability are outcast by society and they are not presented with the same opportunities as those with standard abilities according to society. Seven percent of Americans experience difficulties with walking and navigating buildings. (Leppert & Schaeffer, 2023) When areas designed navigating on foot are constructed, society has overlooked those who do not have the standard ability to navigate these areas. There are many barriers that cause mobility disabled persons to struggle in their navigation of the area. One that I am curious about researching is the integration of electric scooters and bikes in urban areas, and their effect on navigation.

These electric vehicles are celebrated for their eco-friendly abilities and convenience for many. Often the vehicles are carelessly left on sidewalks, in front of entrances, in a way that they can hinder the size of the path of navigation. For individuals who have a more limited range of movement, this can cause them to have to turn around and take another route. A technology in this case that is widely thought of as an improvement to society an innovation, like the electric scooters and bikes, can be a regression for the navigation of mobility disabled persons. I want to analyze the extent that this technology hinders movement for those that have mobility disabilities.

In an assessment of the compliance of scooter parking in Portland, Oregon, the findings showed that many users failed to comply with parking regulations. (Hemphill et al., 2022) The implementation of parking regulations and penalties saw an increase in compliance, but there are still many users that are not compliant with the new implementation. For navigation to not be

disrupted and for electric scooters to exist together in urban areas, such as Portland, the regulatory systems in place must be created in such a way that free navigation is at the forefront of policy. Engaging with the community to gather feedback on the regulations and the concerns they have could help contribute to better adherence to the regulations. Expanding the data set to see what other big cities have done to help mitigate the concerns with these scooters and evaluating what has worked and what has not will lead to a better solution.

In a study published in Norway, there was a survey conducted for members of the Norwegian Association of Disabled (NAD) about their experience with electric scooters in urban areas. A significant portion of the survey respondents said that electric scooters are an obstacle to them in day-to-day navigation. The respondents also said that when interacting with electric scooter riders or parked electric scooters they were more likely to avoid an area or drop a trip altogether. (Karlsen, Weyde, Nielsen, & Dale, 2023) Based on the responses from the members of the NAD, electric scooters add extra challenges for them in urban areas, which already contain many pre-existing challenges.

Research Question and Methods

How has the increasing prevalence of electric bikes and scooters in urban areas impacted the mobility and accessibility experiences of those with physical disabilities?

To answer this question, I must use methods which analyze the scope of this project. To conduct my research, I will be using the Social Construction of Technology framework, also known as SCOT. This framework highlights the importance of societal impacts on technology instead of the other way around. We must look at the way that different social groups interact with technology and the impacts that the technology creates. (Pinch & Bjiker, 1984) In applying

this framework I will be able to see the intricate relationships and influence that the stakeholders have on the technology. The use of crowdsourcing to evaluate the current state of the subject from the viewpoint of all the different stakeholders will contribute to a better understanding of the issues.

Conclusion

My capstone group, made up of four Systems Engineering majors, will be collecting data on the variables that are imperative to wayfinding for those with mobility disabilities. We will then use that data to create an application that will improve the experience of wayfinding for people with mobility disability. For my personal STS research problem, I will be compiling an analysis of the state of electric scooters and bikes in urban areas and evaluating their impact on the disabled community. The scope for our technical project is the School of Engineering and Applied Sciences physical infrastructure at the University of Virginia, so this application will improve the wayfinding for students, faculty, and visitors with disabilities trying to navigate the engineering school. I hope that people could read my STS research project and realize that actions that you choose can have a large effect on those around you. These two projects will address a step in making this world around us a more accessible and inclusive place for everyone regardless of ability. “Working toward an accessible future is everyone’s responsibility.” (The World Bank, 2019)

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