

Capstone:

Element A - Identification and Justification of the Problem

Problem Statement

Americans commute using public transportation and struggle with the problem of first/last-mile transportation; which is the need to get to and from public transportation when traveling. Many companies such as Bird and Uber have developed scooters and bikes that you can rent for short trips, however, these products have many inconveniences such as low availability, low power and/or damage. When getting to a destination, being on time should not be determined by luck.



Fig 1. Public bus filled with people

Problem Statistics:

We identified this problem by looking at statistics from the American Transportation Association (APTA) and from our survey that we conducted on first/last-mile transportation.

- In 2018, Americans took 9.9 billion trips on public transportation.⁴
- Since 1997, public transportation ridership has increased by 21%—a growth rate higher than the 19% increase in U.S. population⁴
- Approximately 6,800 organizations provide public transportation in the United States⁴
- Millennials consider public transportation as the best option for digital socializing and among the best for connecting with communities⁴
- More than two-thirds of riders walk to their stop or station⁴
- People said that the average time is about 20 minutes or less to get to and from public transportation stops to their destination⁵
- The average rating of a product that could solve this problem was a 3.9 on a scale of 0-7 meaning that people were typically interested in a product like that⁵



Validation of Problem:

The APTA identifies the first/last-mile transportation problem as an official issue and many transit agencies are collaborating to solve this issue.

Consumer report of shortcomings of public rideshare - “You can’t use rideshare when you are overdrawn in your bank account.” This perspective shows the costly nature of using rental transportation.

Finally, only 8.7% of people who took our survey said that they spend 5 minutes or less getting to and from public transport and the rest said that the commute time takes longer.

Element B - Documentation and Analysis of Prior Solution Attempts

We primarily found our information from the American Public Transportation Association’s webpage. We’ve learned that cities are addressing this problem with bike or scooter rental services such as Spin, Uber, and Lime. Another solution that we’ve seen is cities creating bus paths that go directly to their metro or train services. These solutions don’t completely address the problem because the rental services often don’t have bikes or scooter available and you need to walk up to a mile to find one; the bus solution also doesn’t work because you still have to walk to the bus stop from your house or from work. Our group analyzed these solutions together.

Patent: WO2013149130A1 - 2013

Abstract -

Systems including powered skates with automatic motor control are provided. One such system includes a pair of powered skates, each including a foot platform configured to receive a foot of a rider, a plurality of wheels coupled to the foot platform, a motor coupled to at least one of the plurality of wheels, the motor configured to rotate at least one wheel, and a load sensor coupled to the foot platform and configured to sense an applied force, and a controller coupled to each of the motors and to each of the load sensors, the controller configured to



control each of the motors, using a single algorithm, based on signals received from each of the load sensors.

Fig3. a picture of electric roller skates.

Pros: fast, convenient, portable.

Cons: Very steep learning curve, unsafe, you can't "bail" by jumping out of the way since the skates are attached to your feet.

Competing Products/Services:

- Electric scooter or bike rental services (Bird, Jump, Lime, etc.)
 - \$1 start fee and about \$0.25-\$0.35 per minute in use
 - Used anytime
 - Need to find scooter or bike on map. Left around in public spaces and get in the way



Fig.4 Women using rental scooters

- Rideshare/taxi service (Uber)
 - \$2 per mile on average, is more during busy hours
 - Used anytime, but only when drivers are out and ready to drive
 - Driver comes to you
- Personal non-motorized transport (bikes, scooters)
 - One time payment
 - Used anytime and anywhere
 - Needs to be taken with owner or locked at a location



Fig5. Uber car

Element C - Presentation and Justification of Solution Design Requirements

Design Specifications in order of importance:

The most important aspects of a solution to first and last mile transportation are portability, ease of use and reliability. Current solutions don't have these features. A personal transport device that fixes this problem must be portable because that is the shortcoming of bikes. Next, this device must be easy to use to reach the largest possible consumer base and potentially bring new people into the market. Finally, customization is an important aspect of any solution because in the case of transportation, one size does not fit all. We determined all of these specifications from our own experiences and research presented in this document.

A couple benchmarks for our group's product would be is our product easy to control? Is our product safe? Is our product reliable? Can a person like Ms. Lofstedt ride on it for the first time with ease? Can our product fold up in any way?

Sources:

¹Beltz, Brian. "What Is the 'First Mile, Last Mile' Problem?" *Something About Orange*, 27 Sept. 2019, somethingaboutorange.com/first-mile-last-mile-problem/.

²"First Last/Mile Solutions." *American Public Transportation Association*, 9 Oct. 2019, www.apta.com/research-technical-resources/mobility-innovation-hub/first-last-mile-solutions/.

³"First Mile/Last Mile Transportation Strategic Plan: Richmond, CA - Official Website." *First Mile/Last Mile Transportation Strategic Plan | Richmond, CA - Official Website*, www.ci.richmond.ca.us/3485/First-MileLast-Mile-Transportation-Strat.

⁴"Public Transportation Facts." *American Public Transportation Association*, 28 Oct. 2019, www.apta.com/news-publications/public-transportation-facts/.

⁵Google Survey about First/Last Mile transportation. https://docs.google.com/spreadsheets/d/1p8hnmlPTCFfXDoLfQQxV-tsboJe7zL1t_3BB5nrD02E/edit?usp=sharing