Autonomous Wheelchair Securement Systems Demonstration Research Evaluation

Janet Geissler
MDOT, Office of Passenger Transportation
GeisslerJ1@michigan.gov

Mike Laidlaw
Q'STRAINT
mlaidlaw@qstraint.com

Angela Jenkins
Menlo Innovations
ajenkins@menloinnovations.com

Table of Contents

- Project Overview
  - Intro to QUANTUM
- Research Methodology
- Findings
- Recommendations

Project Overview

COVID-19 Research Demonstration Grant Program

FTA	MDOT	Project Partners
• 2020 • $10 million in grant funding • To address COVID-19 related challenges (such as social distancing)	• Was awarded a portion of these funds to install Q'STRAINT's automated wheelchair securement system on buses at various transit agencies	• 3 transit agencies participated

Research Project Overview

MDOT sought to **better understand the user experience of the Q'STRAINT QUANTUM system**, in particular the QUANTUM's:

- Ability to facilitate social distancing
- Impact in helping riders feel more secure and independent
- Initial rider adoption
- Sustainability as a long-term solution
- Effect on operational efficiency

Research Project Overview

To gather data around these themes, Michigan Department of Transportation (MDOT) Office of Passenger Transportation (OPT) partnered with Menlo Innovations High-Tech Anthropologists® to conduct **ride-along observations and interviews** with transit passengers, drivers, mechanics and stakeholders at three agencies across Michigan between 2022 and 2025.

The QUANTUM

Q’STRAINT’s innovative QUANTUM Automatic Wheelchair Securement Station (QUANTUM) was the first fully automated securement system on the market.

The system is designed to:

- Promote independence for riders using a mobility device
- Accommodate a wide range of mobility device sizes and configurations
- Improve transit agency operational efficiency

QUANTUM Walk-Thru

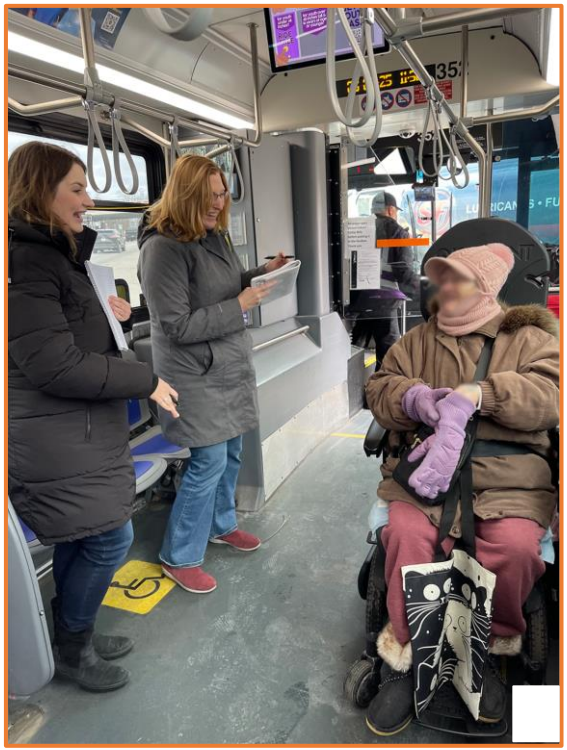
Click for Video

Research Methodology

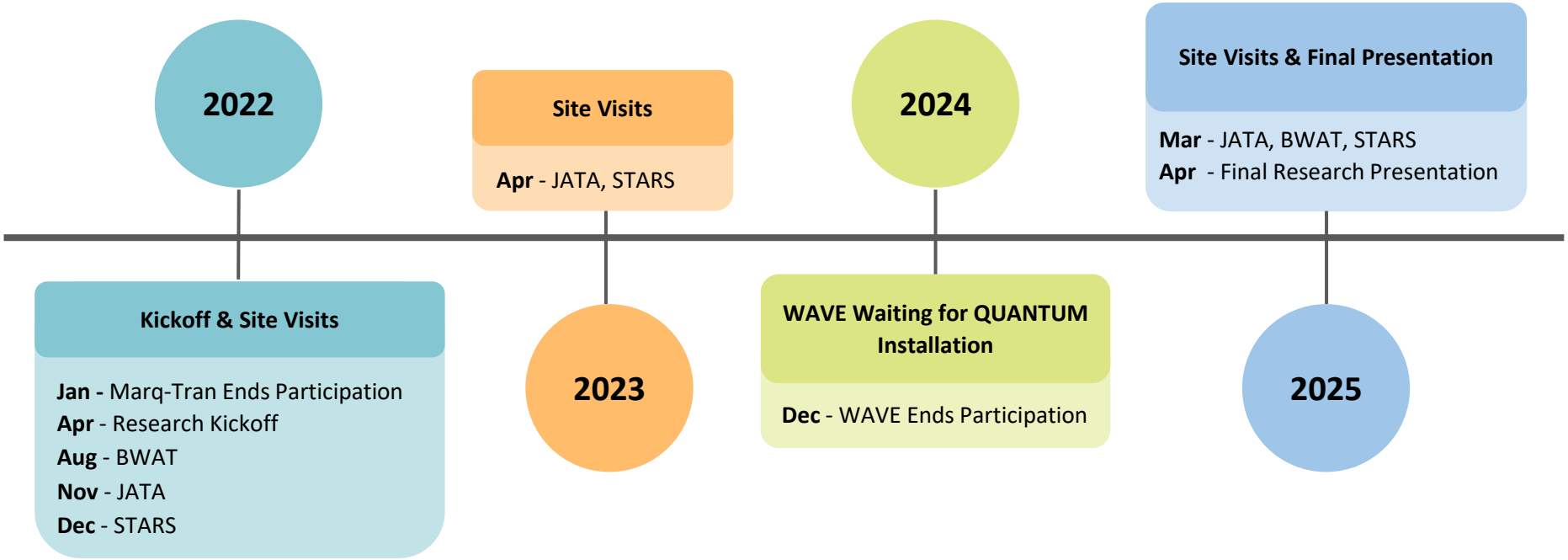
Research Methodology cont.

High-Tech Anthropologists® from Menlo Innovations conducted a qualitative study using Menlo's standard User Discovery process to evaluate the effectiveness of the QUANTUM station in achieving the pilot goals.

This human-centered approach of observations and interviews allowed for the collection of first hand behavioral data.



Research Timeline



Site Visits

Between 2022-2025 observations and interviews were conducted at the following locations:

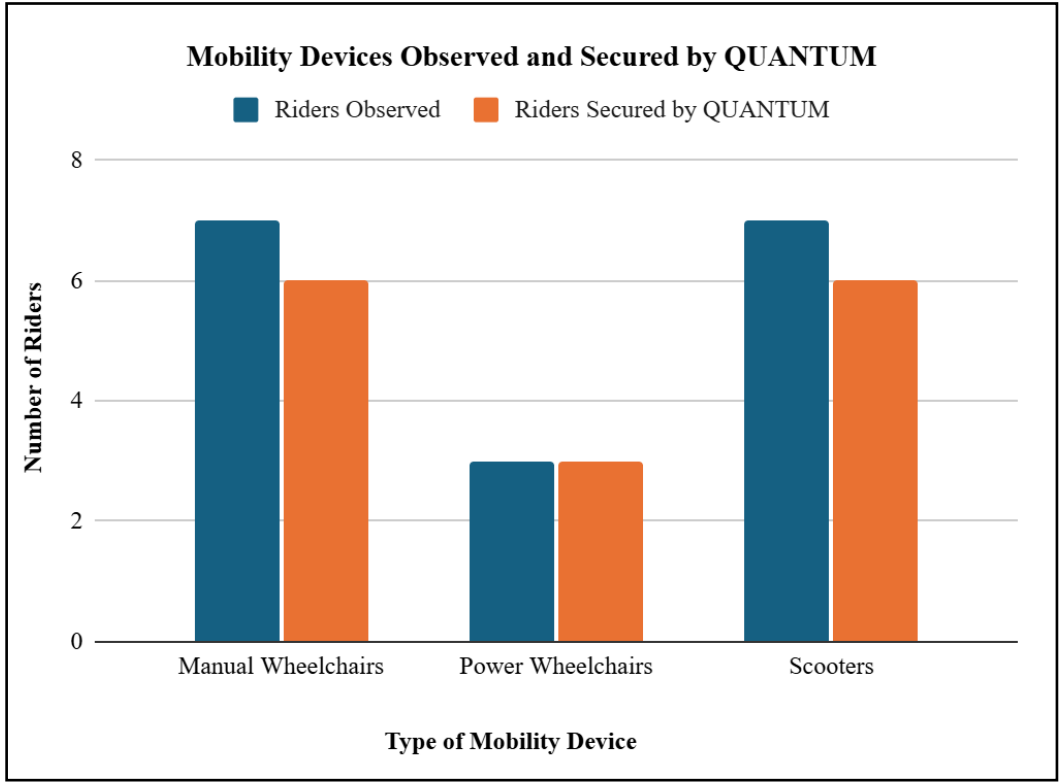
- Blue Water Transit Authority
- Jackson Area Transportation Authority
- Saginaw Transit Authority Regional Services

Site Visit Observations

Maintenance, drivers, supervisors	21
Riders with mobility devices	16
Riders with mobility devices and PCA	1
Community Members	6
Total Actual Observations	44

Mobility Devices Observed and Secured by QUANTUM

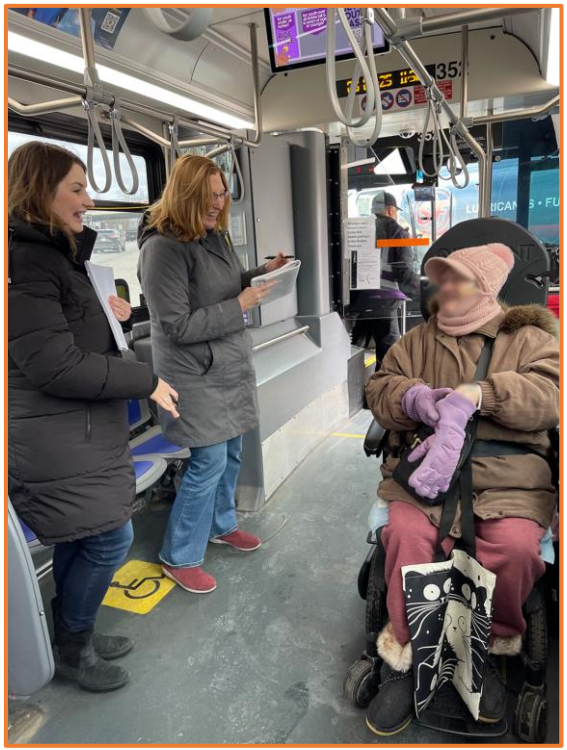
- 15 riders using a mobility device were secured by the QUANTUM
- Reasons 2 riders were not secured:
  - Broken leg in extended cast did not fit in the station
  - Scooter unable to be secured



Research Pivots

Several pivots occurred during the research phase:

- The planned opportunistic observations did not provide sufficient data for the study.
  - Pre-scheduled observations yielded more data.
- Finding riders in the planned demographic categories (i.e. traveling with a Personal Care Attendant or service animal) proved difficult.
  - This was deprioritized to move data collection forward.
- Third round of observations was delayed due to WAVE waiting for the QUANTUM to be installed.
  - The buses intended for the QUANTUM were deemed past their useful life, and WAVE discontinued their participation.
  - The funds were reallocated for a final round of observations with new riders at JATA, BWAT, and STARS.



Findings

Findings: Increased Social Distancing & Independence

The QUANTUM system is designed to enable riders using a mobility device to secure themselves with little to no support from drivers.

Because of this:

- The project successfully demonstrated that **the QUANTUM allowed riders and drivers to maintain a social distance** of six feet or more.
- **Mobility users were empowered** by the independence they felt when using the system.
- **Riders required assistance from the driver** if they were using the seatbelt.

> "I love it, it's a lot easier, it goes a lot faster and you feel more independent on it."
> - Rider (Third Site Visit)

Findings: Driver Advocacy & Normalization

The initial adoption of the QUANTUM station relied heavily on driver advocacy and the relationship between riders and drivers to overcome hesitation in using it.

- Because of driver involvement, the QUANTUM became a regular part of bus rides; by the final site visit, **intervention on the part of the driver was not needed** to encourage usage.
- The majority of riders spoke positively about the station and **used it without hesitation**.

"I don't choose [the QUANTUM], that's typically where they put me."
- Rider (First Site Visit)

Findings: Q'STRAINT Support Required

From the perspective of the transit agencies, Q'STRAINT's continued support was key to the QUANTUM system's agency-wide adoption. This support took the form of:

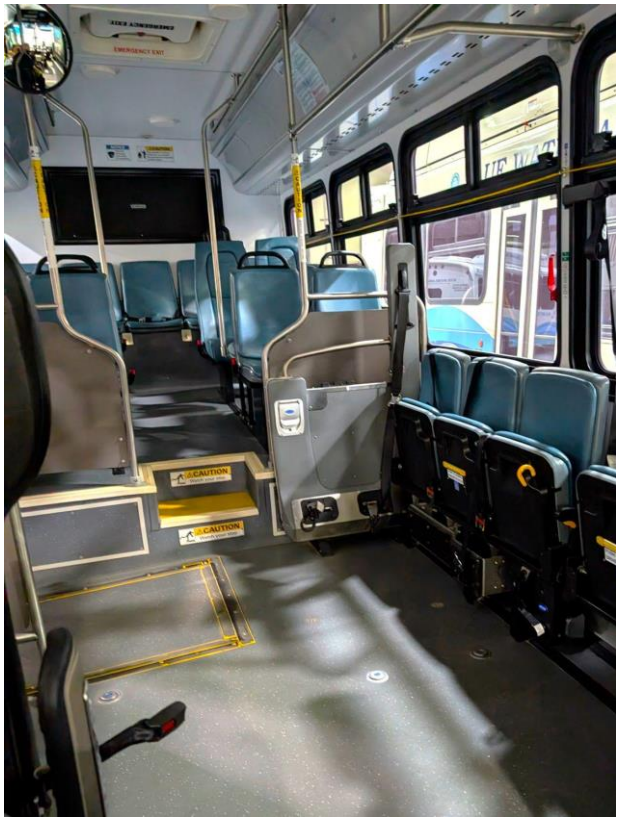
- Maintenance training so agencies could install and repair the systems in house
- Prompt customer support
- Driver training

"There are a few issues here and there, but we address them pretty easily and Q'STRAINT is very responsive [when support is needed]."
- Senior Manager of Facilities and Maintenance (Third Site Visit)

Findings: Issues Riders Faced

There were two main issues that riders spoke to:

- The rear-facing orientation of the station initially caused difficulties around:
    - Feeling nauseous
    - Not being able to see their bus stop
    - Feeling exposed in front of the other riders
- The seatbelt was in a location that was not easily reached by riders without assistance and was uncomfortable to riders to use
    - Riders reported feeling secure without it



"A couple [of riders refuse to use it, because they don't like riding backwards], but once they use it, they really like it."
- Operations Manager (First Site Visit)

"I don't like the seatbelt. It cuts across my neck."
- Rider (Third Site Visit)

Findings: Space and Mobility Device Constraints

Due to the space required for the QUANTUM, the station could not be installed on paratransit buses or sprinter vans limiting the riders to only those on fixed route buses.

Additionally, some mobility devices were not compatible with the station because of their size or configuration.

"It would be easier if they had [the QUANTUM system] on the smaller buses."
- Personal Care Attendant (Round 3 Observations)

Findings: Operational Efficiency Impacts

The QUANTUM system proved to be a faster means to secure wheelchair users than traditional systems. However, the impact of this speed on the overall efficiency of transit agencies was not evaluated as outside factors such as traffic, construction, and driver shortages influenced the bus times.

> “It’s convenient, it’s quicker. Easier for the driver.”
> - Driver (First Site Visit)

Recommendations

Recommendations for Introducing New Technology

Encourage Staff Buy-in for Successful Adoption

A key factor to the successful introduction and adoption of the QUANTUM station was driver buy-in, which started with strong training that increased driver confidence in the system. With this knowledge drivers were comfortable encouraging riders to use the system or placing them in it.

> "I know the riders better than my own co-workers."
> - Bus Driver (First Site Visit)

Leverage Pre-existing Relationships

In communities where a strong relationship between the drivers and riders existed, riders were more inclined to adopt the station. This was a prerequisite to the successful adoption of the QUANTUM.

> "If it wasn't for the bus drivers, I'd be out of luck. The bus drivers are amazing."
> - Rider (Third Site Visit)

Facilitate Partnerships with Vendors

The partnership between the transit agencies and Q'STRAINT played a part in the continued success of the QUANTUM adoption at the agency level. Training, as well as prompt customer service from Q'STRAINT fostered a strong relationship.

Note:

This evaluation represents data from 44 informants, collected at three particular points of time across three specific locations. There may be additional data from other studies that validates and/or contradicts these findings.

Thank you!

Janet Geissler
MDOT, OPT
GeisslerJ1@michigan.gov

Mike Laidlaw
Q'STRAINT
mlaidlaw@qstraint.com

Angela Jenkins
Menlo Innovations
ajenkins@menloinnovations.com