U.S. Department of Transportation

COMPLETE TRIP

ITS4US

Buffalo, NY
Phase 1 Performance Measurement and Evaluation Support Plan Webinar

November 9, 2021

Agenda

- **Purpose of this Webinar**
  - To share the submitted Performance Measurement Plan from Buffalo with the stakeholders of the project and ITS4US community
- **Webinar Content**
  - Complete Trip – ITS4US Deployment Program Overview (*Elina Zlotchenko*)
  - Site Orientation & Deployment Concept Overview (*R. Jones & N. Urena Serulle)*
  - Performance Measurement and Evaluation Support Plan (*M. Bradley & J. Zmud*)
  - Stakeholder Q&A
  - How to Stay Connected (*Elina Zlotchenko*)
- **Webinar Protocol**
  - Please mute your phone during the entire webinar
  - You are welcome to ask questions via chatbox at the Q&A Section
  - The webinar recording and the presentation material will be posted on the ITS4US website

Program Overview

Elina Zlotchenko, Site COR

Program Overview

- A USDOT Multimodal Deployment effort, led by ITS JPO and supported by OST, FHWA and FTA
- Supports multiple large-scale replicable deployments to address the challenges of planning and executing all segments of a complete trip

Vision

*Innovative and integrated **complete trip deployments** to support seamless travel for all users across **all modes**, regardless of **location, income, or disability***

The Complete Trip Concept

Complete Trip: An individual's ability to go from origin to destination reliably, spontaneously, confidently, independently, safely, and efficiently without gaps in the travel chain.

Program Goals

Spur high-impact integrated Complete Trip deployments nationwide

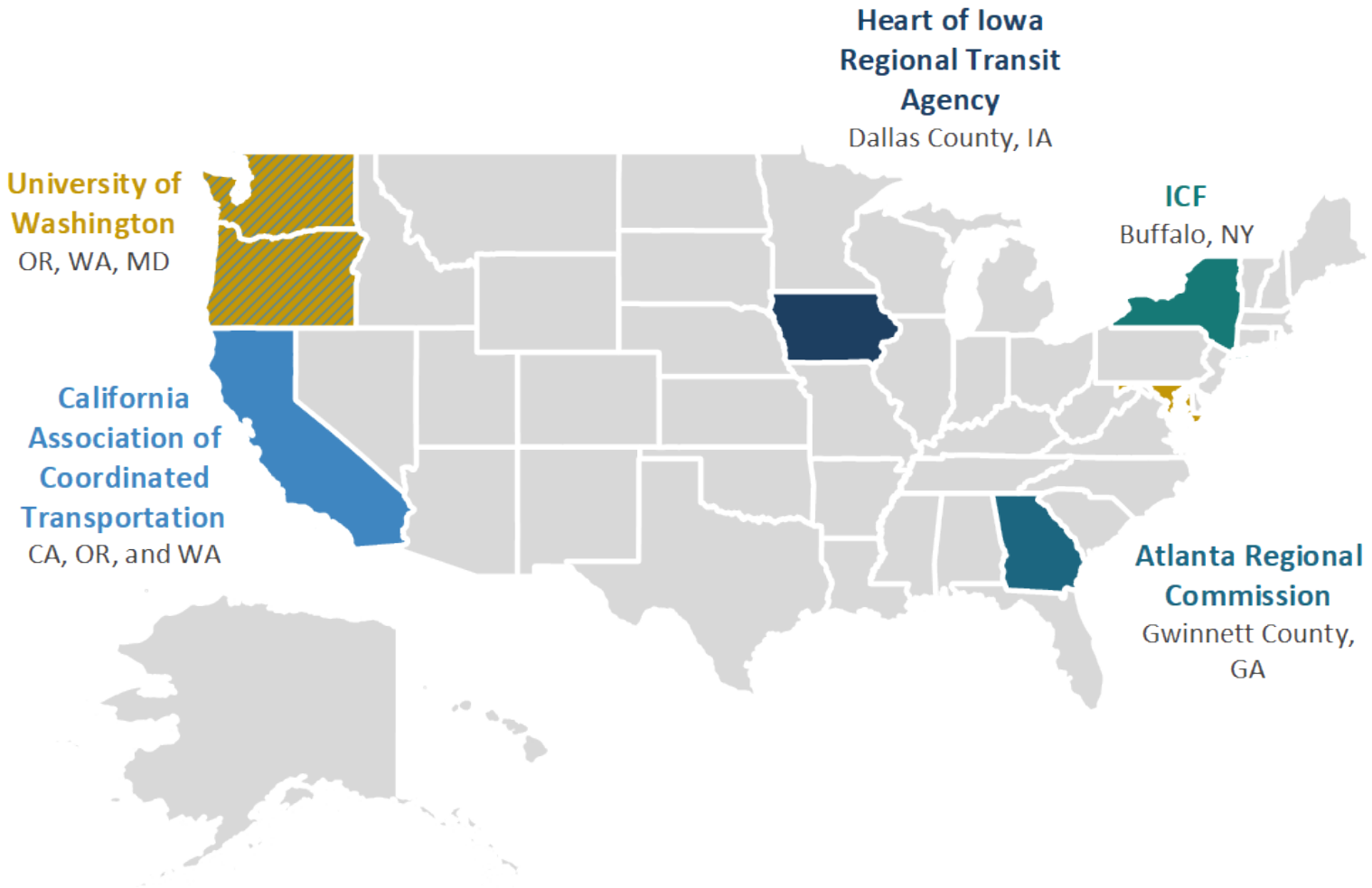
Identify needs and challenges by populations

Develop and deploy mobility solutions that meet user needs

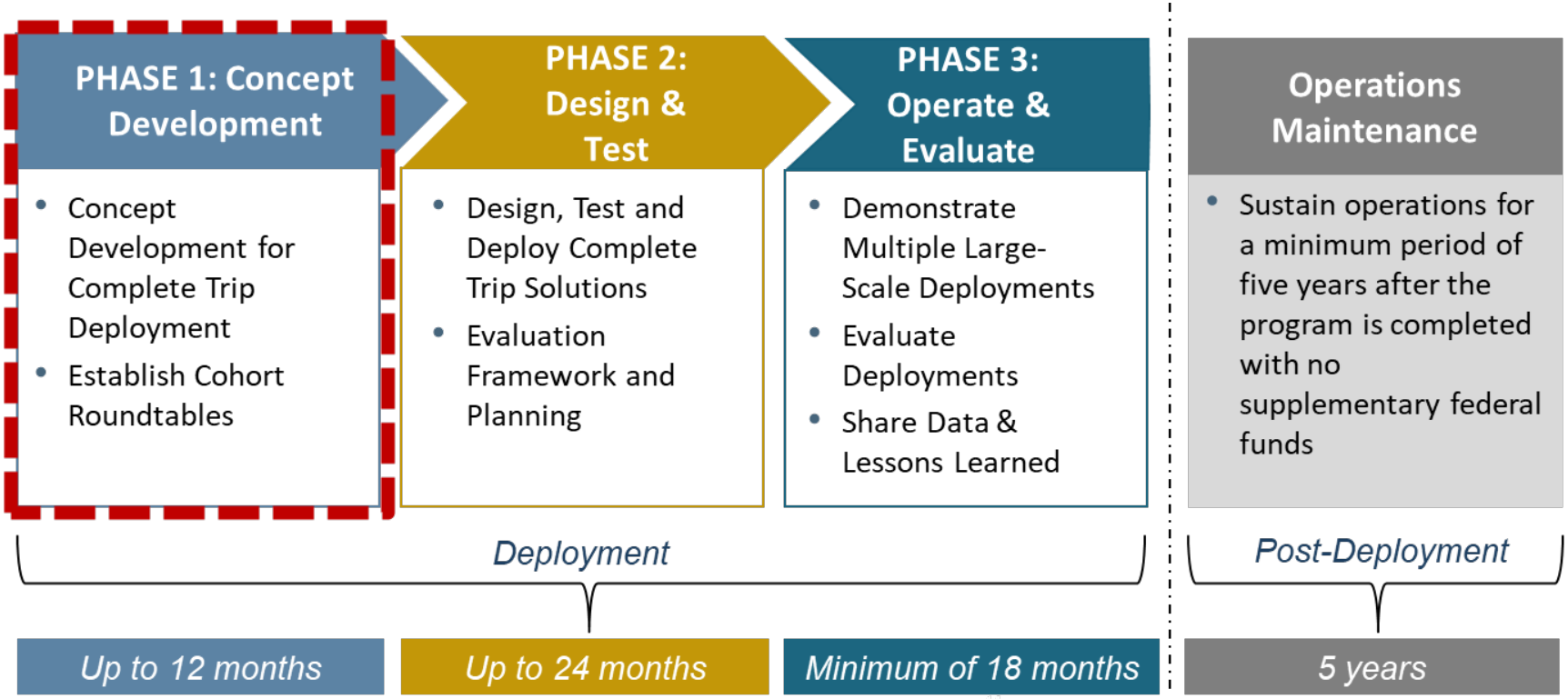
Measure impact of integrated deployments

Identify replicable solutions and disseminate lessons learned

Complete Trip Phase 1 Awardees



Deployment Phases



Buffalo ITS4US Deployment Overview

Robert Jones, NFTA
Nayel Urena Serulle, ICF

The Location

- Buffalo Niagara Medical Campus
- 120-acre campus
- Adjacent to downtown and Main St.
- 9 million sq. ft.
- 8 member institutions
- 150+ private companies
- Social, technology incubator
- Transportation innovation lab

More than 16,000 people work or study at the BNMC and more than 1.5 million visit each year for health care and other services, generating significant transportation demand for the area, its visitors, and its employees.

Enabling access to jobs, health care services at partner agencies that **directly address populations of interest's desire of complete trip capabilities made BNMC a compelling location.**

Target Users

Target Users	Populations of Interest
Persons with Disability (PWD) ▪ Mobility ▪ Vision ▪ Cognitive ▪ Hearing	Patients, Visitors and Workers at BNMC Partner agencies
Low Income	Residents of Fruit Belt, Masten Park and across Buffalo using BNMC services, transit facilities and healthcare
Older Adults	
Low English Proficiency (LEP)	

Mobility Issues and Challenges

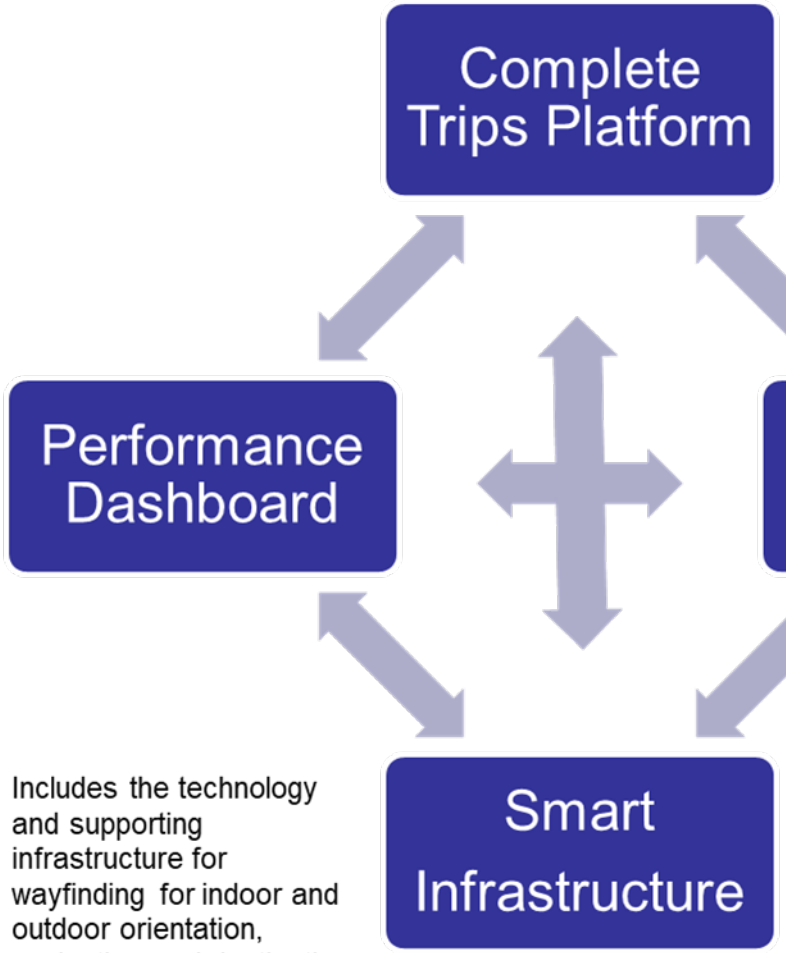
Issues

- **Low transit use**. Need to support and grow efficient and accessible transit trips, especially for employees and visitors to BNMC
- **Continuous, consistent inclusive infrastructure**. Increase ability of employees and travelers with disabilities to make multimodal connections, navigate the area, and get from their home to the destination
- **Safety and intersection crossings**. Improve safety around key intersections with significant use by travelers with disabilities

Challenges

- Aging infrastructure (sidewalks, bus shelters, intersections)
- Incomplete, disjointed or missing information to support travelers with disabilities
- Winter weather
- Lack of accessible pedestrian signals
- Lack of flexible transit options for neighborhood connectivity
- Overall low levels of transit use to access campus

Proposed Concept



Integrated trip planning function for travelers.

Measures and presents the performance of the system.

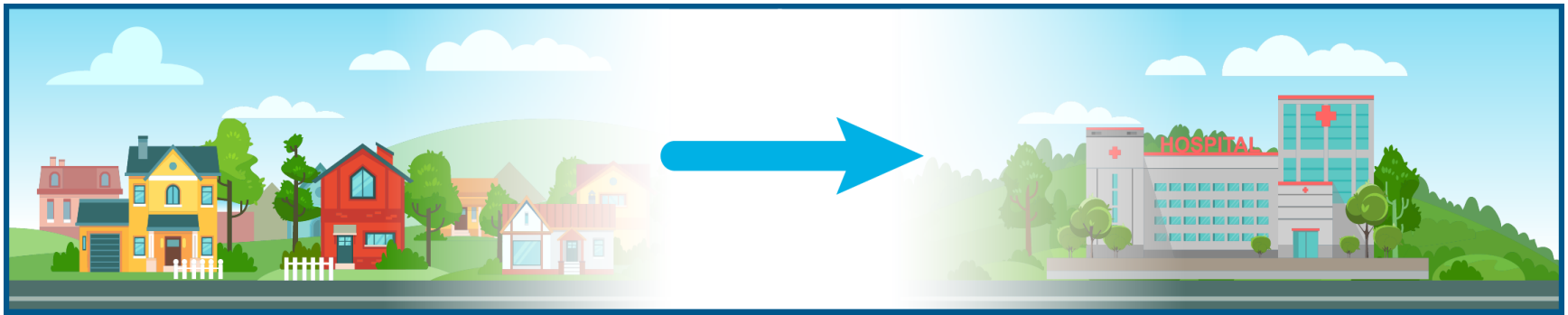
Shuttle system provides fixed and on-demand transit services within a specified zone of operations. Includes a combination of vehicle types and services.

Includes the technology and supporting infrastructure for wayfinding for indoor and outdoor orientation, navigation and destination confirmation.

Performance Measurement Plan Overview

Mark Bradley, RSG

A Complete Trip Scenario from a Traveler's Perspective



Integrated through a multimodal accessible travel planning app

Pre-Trip Planning

- Turn by Turn guidance to bus or rail stop focusing access
- Availability of various transportation services
  - *Bus, Rail, Paratransit*

Transit to Campus

- App-enabled Location tracking, alerts, access preferences (voice, text, haptic alerts) and real-time arrival information
- App includes paths through stations, stops and buildings (elevators, stairs, walkways, escalators)

Within and Around Campus

- Hail accessible self-Driving Shuttle (through app)
- Universal design & pedestrian safety applications at high-traffic intersections around campus
- Outdoor wayfinding, sidewalk improvement for pedestrians

Inside Building

- Paths through partner buildings for visually impaired

Measurement Approach

Key Data Sources – User-provided and system-provided data

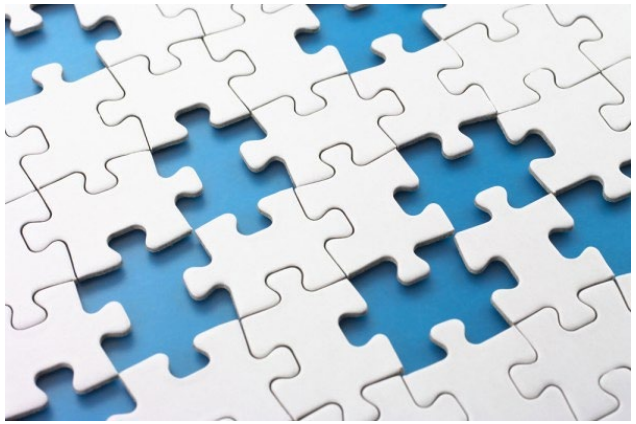
- **Data from the CTP App** (preferences, bookings, planned trips, made trips, use of smart infrastructure)
- **Data from User Surveys** (self-reported behavior and perceptions, both baseline and post-deployment)
- **Shuttle Reservations Management Data** (times, locations, costs, etc.)
- **Shuttle Trip Operations Data** (passenger pick-ups and drop-offs, incidents, etc.)
- **Smart Pedestrian Signal Activation Data** (time, location, CTP user ID)
- **External Data (**weather, other transit, BNMC facilities, road closures, etc.)

Key Types of Analyses

- **Periodic calculation of top-level Performance Measure metrics**
- **Deeper segmented analysis by user type** (type of disability, income group, age group, staff vs. visitors vs. caregivers, etc.)
- **Deeper analysis by technology type** (human-driven vs. self-driving shuttle, etc.)
- **Analysis of effects of various background/external factors** (weather, etc.)

Desired Changes from User Needs Assessment

- Consistent, continuous door-to-door trips to, from and in the BNMC area
- Online and offline ways to receive real time information on services and infrastructure usability and accessibility
- Trip paths that are safe, accessible, and compatible with defined preferences and capabilities
- Integrated, flexible, demand-responsive, end-to-end transit options for the community



PM #1: Improved ability of the CTP users to make satisfactory Complete Trips in the study area

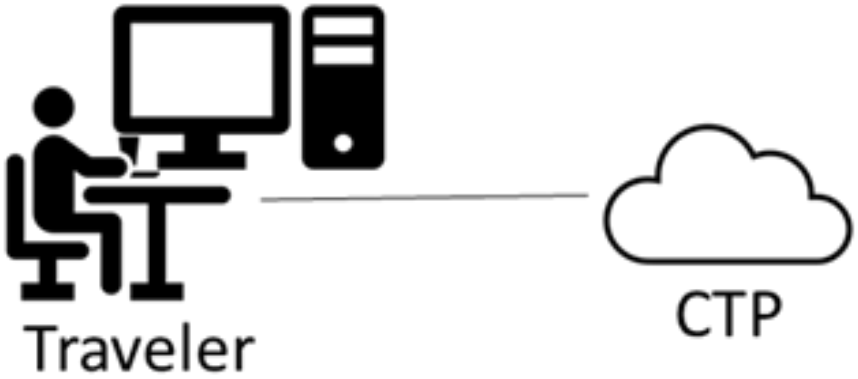
System user ratings in baseline vs. post-deployment surveys to measure changes for trips to/from/within the BNMC:

- How **accessible door-to-door travel** is.
- The **adequacy and usefulness of real-time information** to assist travel.
- How **safe door-to-door travel paths** are, including **level, slip-resistant paths**.
- The **ability to make end-to-end trips using integrated transit services**.

PM #2: Usefulness of the CTP registration and trip preferences processes

System user ratings from post-deployment surveys:

- The **ease of the registration process**
- The **usefulness of providing preferences** to get trip options that satisfy those preferences.



PM #3: Usefulness of the CTP trip planning, booking and reporting processes

CTP system user data:

- The fraction of trips planned in the CTP that are **carried out using the app**
- The fraction of CTP users who **book on-demand transit trips**
- The fraction of CTP users who **report incidents or travel conditions**

System user ratings from post-deployment surveys:

- The **ease of planning a door-to-door trip route**
- The **satisfaction with the specific route options provided**
- The **convenience of booking on-demand transit trips**
- The **ease of reporting incidents or travel conditions**

PM #4: Improved ability to find destinations efficiently using the CTP wayfinding functionality

All measured **separately for outdoor and indoor** navigation functions.

CTP system user data:

- The fraction of CTP users who **elect to receive wayfinding notifications**

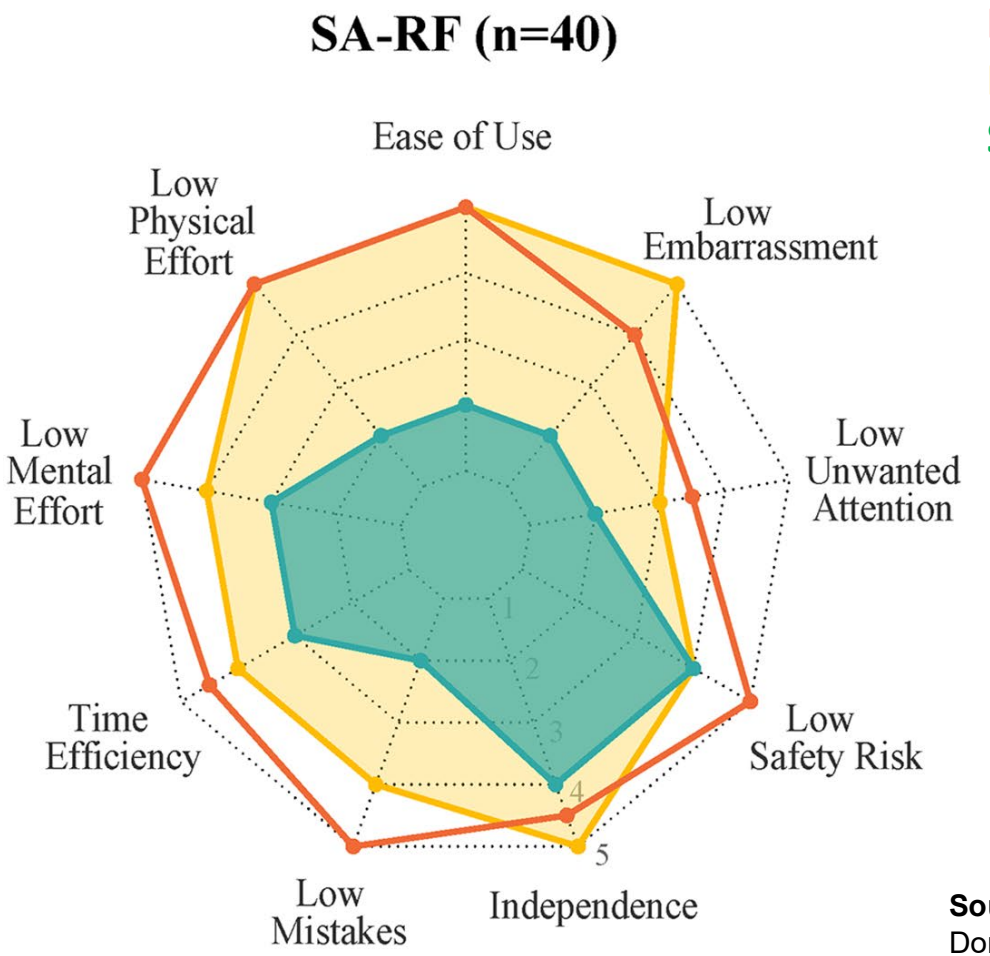
Post-deployment survey data:

- Self-reported **frequency of using the wayfinding notifications**
- Ratings of **various aspects of the user experience of wayfinding** using customized RAPUUD method

Baseline and post-deployment survey data:

- Change in the ability to use navigation to **reach trip destinations on time**

Rapid Assessment of Product Usability & Universal Design (RAPUUD): Example for Transit Wheelchair Lift Design



MWC = manual wheelchair

PWC = power wheelchair

SC = scooter

MWC (n=14)

PWC (n=19)

SC (n=7)

1 = Strongly Disagree

2 = Somewhat Disagree

3 = Neutral

4 = Somewhat Agree

5 = Strongly Agree

Source:: Choi,Jimin, Jordana L. Maisel, Brittany Perez, Don Nguyen,and Victor Paquet (2021). "User Experiences with Two New Wheelchair Securement Systems in Large Accessible Transit Vehicles". **Transportation Research Record** 2021, Vol. 2675(2) 150–161.

PM #5: Improved ability to cross specific intersections safely using CTP smart-signal functionality

CTP system user data:

- The fraction of CTP users who cross at the relevant intersections who **use the smart signal remote activation functionality**

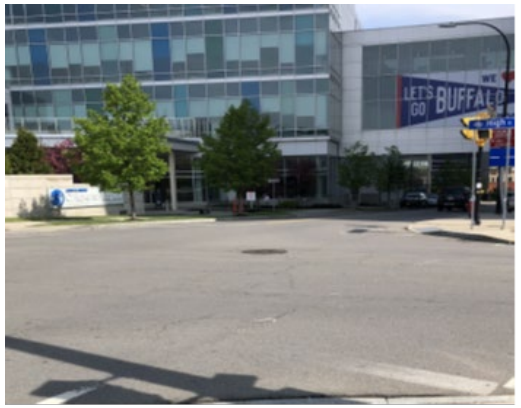
Post-deployment survey data:

- Self-reported **frequency of using the remote activation function**
- Ratings of **various aspects of the user experience of using the smart signals** using customized RAPUUD method

Baseline and post-deployment survey data:

- Change in the **perceived safety of crossing the intersections**

Main & Best



Ellicott & High

PM #6: Provision of an efficient, reliable and safe new on-demand transit community shuttle (CS) system

CTP system user data and Shuttle Operations data:

- The **on-time performance** of the on-demand shuttle system
- The **cost efficiency** of the on-demand shuttle system (cost per person-trip)
- Fraction of trips by PAL-eligible CTP users made via the **new service instead of regular PAL services**

Post-deployment survey data:

- Ratings of **various aspects of the user experience of using the human-driven and self-driving shuttles** using customized RAPUUD method

Baseline and post-deployment survey data:

- Change in the **reliability of reaching destinations on time** via transit
- Change in the overall **frequency of using transit services** (including connecting NFTA rail and bus services)

Confounding Factors

***FACTOR*: Need to account for external influences:**

- Weather (particularly in winter)
- Construction projects (particularly Middle Main St.)
- Background trends in traffic and visitation, etc.

***MITIGATION*: Compile continuous data on these factors and relate it to the outcomes in analysis.**

***FACTOR* : Need to relate a sample of limited size to the larger target population.**

***MITIGATION* : Use weighting (carefully). Adjust for any other known biases.**

***FACTOR* : Need to recruit sufficient users in all the target population groups**

***MITIGATION* : Use extensive, targeted community outreach. Provide incentives for (continued) participation.**

Data Collection, Sharing and Reporting Plan

Johanna Zmud, RSG

Evaluation Design

Pre/Post Outcome Study

- Quantifies how participants' outcomes change over the course of deployment, from baseline (pre-) to post-deployment
- Logic models present hypotheses about how outcomes might change
- Differences in outcomes from baseline to post represent individual change
- Aggregating differences across all project participants quantifies how outcomes changed on average

Default Comparison Group

- Recruitment strategies will identify BNMC workers and visitors and neighborhood residents who may not use the deployed technologies

Without a counterfactual, we cannot disentangle change in outcomes caused by the deployment from naturally occurring outcome changes

Data Collection

Phase 2: System Design & Test

- Recruit 100 target participants
  - 25 travelers with disabilities
  - 25 older adults
  - 25 low-income
  - 25 limited-English proficient
- Initial data samples for testing
  - Recruitment screening
  - Baseline user survey
  - Post-deployment user survey
  - CTP user data
  - Shuttle & other operations data
- PMs by end of Phase 2

Up to 24 months

Phase 3: System Operation & Evaluation

- Recruit up to 500 target participants
  - 200 travelers with disabilities
  - 100 older adults
  - 100 low-income
  - 100 limited-English proficient
- Recruitment up to 6 months into Phase 3
- Baseline user survey prior to using technology
- Post-deployment user surveys (3 waves)
- Continuous data collection from system components
- PMs monthly

Minimum 18 months

Deployment

Recruitment Strategies

Convenience sampling

- Intercept screening interviews at entrances to the BNMC campus
- Captures BNMC workers and visitors
- Possibly intercept users of “smart signal” intersections

Voluntary response sampling

- Door hangers in the Fruit Belt, Masten Park, and Allentown neighborhoods
- Employ some level of “snowball” sampling
- Capture people who live in nearby neighborhood to the BNMC

Targeted outreach

- Community-based organizations
- NFTA paratransit (PAL) database
- IDEA Center’s database of participants from past studies

Analysis Design

Pre vs. Post Change

- Baseline and post-deployment measures (3 waves)
- Match pre- and post-survey data for each individual
- Calculate percentages, means and standard deviations
- Compare against PM targets

System Usage and Perceptions

- Post-deployment measures (3 waves)
- Match survey data to CTP and other systems data for each individual
- Calculate percentages, means and standard deviations
- Compare against PM targets
- Analysis by subgroups of interest

Data Quality

Survey data quality checks

- Raw data for significant anomalies (i.e., missing data or inappropriate answers)
- Descriptive statistics (i.e., frequencies, mean, median, mode)
- Cross tabulations by significant variables (population sub-group, transit type, shuttle type), weighted and unweighted

Operations data quality checks

- Matching IDs/references for consistency, time and location
- Checking data for anomalies

Data Sharing Framework

Data stored in their appropriate data storage systems

- Survey data and operational data reside in their appropriate subsystem data store
- Datasets needed to derive PMs and metrics will be stored in a Dashboard

Metadata files associated with each dataset

Datasets, metadata and data catalogs published for role-based access

Data anonymized or aggregated for the appropriate permission level prior to being transformed for its assigned data store

Performance Reporting

- Web-based interface for the PMD, providing on-screen tabular results that can saved as HTML documents
- Option to generate a "Composite Summary Report" an HTML document with a summary across all the metrics of all PMs

Main Selection Screen

Select Performance Measurement Type
CTP Overall Satisfaction Summary
CTP Registration and Preferences
CTP Trip Planning and Booking
CTP Indoor and Outdoor Wayfinding
CTP Smart Signal Activation
Shuttle and Transit Operations
Generate Composite Summary Report

Customized Reports

Time Scale of Analysis
Select a specific month
Show values month by month
Show change versus baseline
Show change between months
Breakout by User Type
None (all users)
By type of disability
By income level
By age group
By residence area
By BNMC visitor type

Concept of Performance Dashboard for PM #6

The table below is an example report for shuttle and transit operations. It lists a target percentage alongside values by month.

User Type = All users	Target	May	June	July
% of CS trips that arrive at boarding stop within 5 min of schedule	>90%	87%	91%	92%
% of CS trips that arrive at alighting stop within 5 min of schedule	>90%	82%	87%	89%
Cost efficiency of CS service in terms of $ per passenger-trip	<$20	$22	$19	$19
Increase in rating of using transit to arrive at the destination on time	>0.4	0.5%	0.4%	0.5%
Increase in total use of transit in the study area in trips/person-mo	>1.0	1.1	1.0	1.1
% of trips by Pal-eligible users in the study area made by CS	>25%	19%	23%	27%
Average user rating of CS service:	**Target**	**May**	**June**	**July**
Convenience	>3.0	3.4	n/a	3.5
Affordability	>3.0	3.1	n/a	3.1
Assessment of CS Service Usability and Design:	**Target**	**May**	**June**	**July**
High ease of use	>3.0	2.8	n/a	3.0
High independence	>3.0	3.8	n/a	3.6
Low safety risk	>3.0	2.7	n/a	2.9
Low risk of user mistakes	>3.0	3.7	n/a	3.4
High efficiency of time use	>3.0	4.1	n/a	3.9
Low physical effort required	>3.0	3.1	n/a	3.2
Low mental effort required	>3.0	3.9	n/a	3.7
Low level of unwanted attention	>3.0	4.1	n/a	4.2
Low risk of embarrassment	>3.0	3.9	n/a	3.7

Next Steps

Johanna Zmud, RSG

Next Steps

- Human subjects protection protocol submitted to UB Institutional Review Board
  - IRB review-required changes to protocol (and instruments)
  - Task 8 deliverable finalized and submitted
- PMESP updated to reflect IRB-required changes
- Initial participant recruitment starts early in Phase 2
- Data collection pilot testing with recruited participants
- As data is available, the PMESP implemented and tested
- Engagement with Independent Evaluation

Stakeholder Q&A

- Please keep your phone muted
- Please use chat box to ask questions
- Questions will be answered in the order in which they were received

Stay Connected

For more information please contact:

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https://its.dot.gov/its4us/