Enhancing Accessibility in the NYC Ferry Transportation technology

Improving Usability for People with Visual Impairments

Identified Technology

Technology Focus

NYC Ferry Kiosk App

Objective

Redesign for improved accessibility for users with **visual** impairments.

Scope and Goals

The specific focus is to improve the service's digital interface for accessibility by:

- Identifying current limitations in interface design and functionality for people with visual impairments.
- Improving accessibility of ticket purchasing, route information, and overall app usability.

The target audience are the users with **visual impairments** .
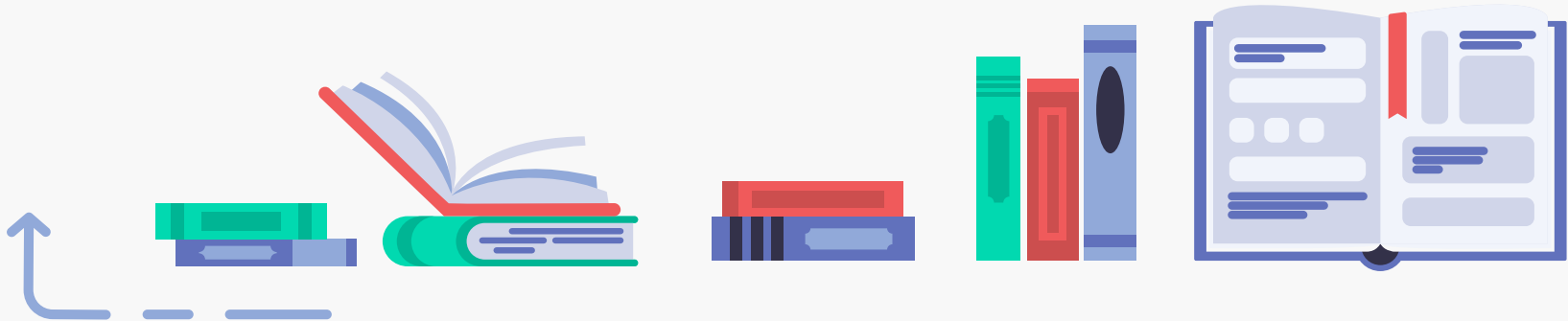
Primary issues observed

Absence of On-Screen Magnification

No Screen Reader Functionality

Lack of Voice Command Support

Insufficient Feedback Mechanisms

Primary issues observed cont…

Inability to Customize User Experience

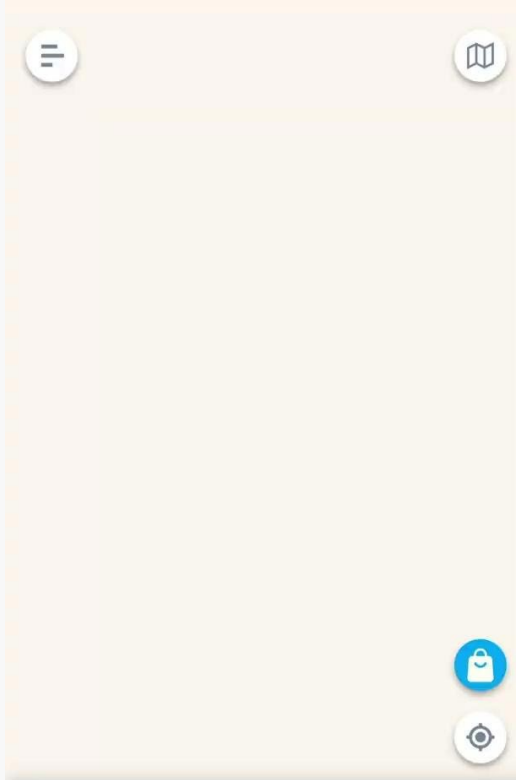**Inaccessible Color Scheme**

Poorly Labeled Controls

No "Help" Feature Available

6:58 65°

Where are you going?

Search destination

Buy Tickets   **Schedules**
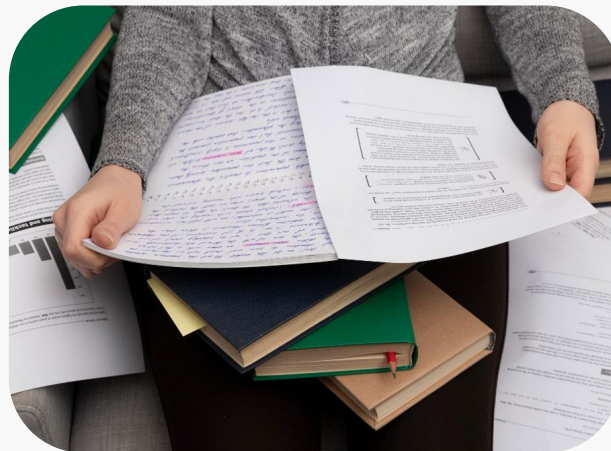
Audit of existing design

Home Page Clarity
The home page presents too many options at once, overwhelming users, especially those with cognitive impairments. A simpler, task-oriented layout would improve navigation.

Map Icon and Access
The map icon isn't intuitive for all users, particularly those with cognitive or visual impairments. Making the map more visible and clearly labeled would improve access.

Memorization of Routes
Switching between maps and schedules requires users to memorize routes. A side-by-side view or route suggestions could ease this cognitive load.

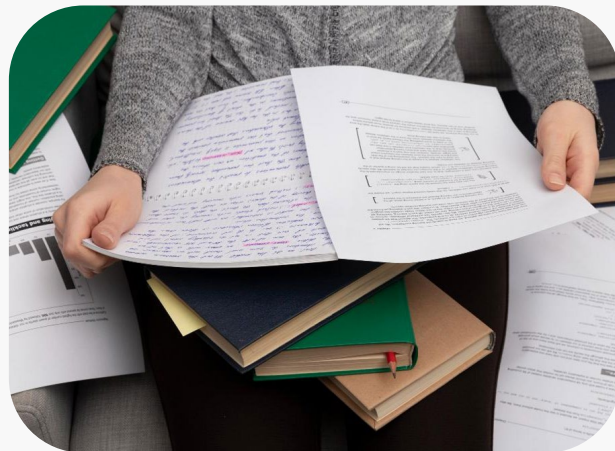# Audit of existing design

No Built-in Accessibility Settings
The app lacks internal accessibility settings (e.g., screen readers, high contrast). These should be integrated to ensure inclusivity.

Map Navigation Challenges
The global zoom feature makes it hard to refocus on NYC. Limiting zoom to relevant areas and improving the 'current location' feature would help.

Overlapping Icons
Ferry stop icons often overlap, confusing users. Better spacing or a list view would enhance usability for visually impaired users.

# Audit of existing design

Store Cart Expansion Problem

The cart expands too much, blocking access to other features. Limiting its size to a scrollable window would solve this issue.

Lack of Sound Alerts

Sound alerts for key actions (like ticket purchases or disruptions) would help visually impaired users navigate the app more effectively.

Information Overload on Launch

Too much information is shown at once upon opening the app. A simplified, focused layout prioritizing key tasks would reduce cognitive load.
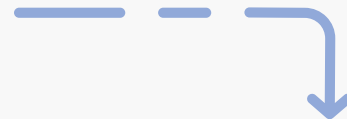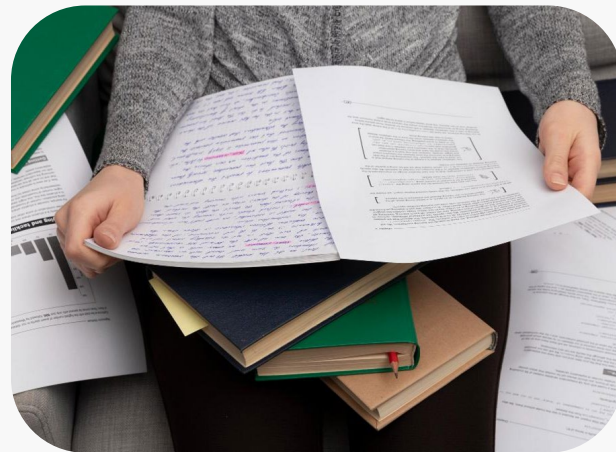
Research on the technology

Overview

The NYC Ferry app supports ticket purchasing, route navigation, and scheduling for the NYC Ferry service in New York City.

Research Objective

The objective is to assess the accessibility of the NYC Ferry app for users with visual impairments, with the help of literature and accessibility standards.

Analysis of similar technology

Washington State Ferries

It has an interactive map that shows accessible terminals and routes, along with information on accessible amenities at each terminal.

Transit

It offers dark mode and other contrast settings, improving readability for users with visual impairments.

Analysis of similar technology

Citymapper

It has voice-guided navigation for visually impaired users, with frequent audio updates on location and route progress.

Sydney Ferries

It allows users to adjust text sizes for better readability and includes compatibility with screen readers.

Most important relevant studies

Paper	Description
Public Transport Accessibility for People with Disabilities: Protocol for a Scoping Review by Mwaka et al. (2023)	Highlights public transport accessibility issues for various disabilities, and discusses the need for universal design principles in transport technology.
Transportation Research Part A: Policy and Practice by Goggin and Newell (2021)	Discusses the lack of adequate design considerations for accessibility in mobile apps, citing issues such as poor screen reader compatibility and lack of audio cues.

Most important relevant studies

Paper	Description
NYC Ferry– 2023 Survey Results	This survey evaluates customer demographics, travel patterns, and motivations among NYC Ferry riders, providing insights into rider satisfaction, accessibility, and suggested improvements for NYC's waterborne transit system.
Public Policy Objectives and Urban Transit Case of Passenger Ferries in the New York City Region by Vilain et al (2012)	Discusses the public policy objectives surrounding passenger ferries in the NYC region. It explores the benefits of ferry services for commuters, and the potential external advantages like reduced congestion etc.

Most important relevant studies

Paper	Description
A Literature Review of Public Transport System Accessibility by Himanshu et al. (2022)	Emphasizes the lack of seamless door-to-door access in public transport systems and suggests enhancing network integration for improved accessibility.
The Local Socio-Economic Impact of Improved Waterborne Public Transportation: The Case of the New York City Ferry Service by by Schreurs et al. (2023)	Examines how improved ferry access affects low-income residents, with concerns about gentrification and displacement due to enhanced transport links.

Accessibility Guidelines

Americans with Disabilities Act (ADA)

Title III: cannot discriminate based on disability in publicly accommodating services

Web Content Accessibility Guidelines (WCAG)

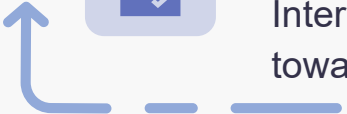Defines principles Perceivable, Operable, Understandable, and Robust for applications to adhere to

Relevant Regulations:

- WCAG 1.4.3 (Color Contrast)
- WCAG 3.1.1 (Readable Text)
- WCAG 3.2.3 (Consistent Navigations)

ISO 9241: Ergonomics of Human   -System Interaction

International standard utilized in design of interactive systems towards increased accessibility

Accessibility Concerns

We noted the following accessibility concerns from the literature :

- Limited physical accessibility at ferry landings and onboard accommodations, particularly for those with visual, auditory, or physical disabilities.
- App limitations include the absence of screen readers and auditory cues, which are critical for visually impaired users.
- Based on literature and feedback, users with disabilities report difficulty using the ferry service due to inadequate accessibility features.
- Public feedback highlights a need for more comprehensive ADA (Americans with Disabilities Act) compliance in both the app and physical infrastructure.

Research summary,

The NYC Ferry service needs significant improvements to appropriately meet ADA standards and improve accessibility for users with disabilities, especially users with visual impairments.
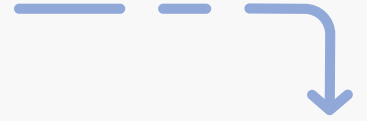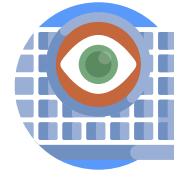
Specific App redesign

Customizable Text and colour contrast

To allow easier distinguishing of features.

Audio and Haptic Feedback

To improve overall accessibility for visually impaired users.

Audio -guided app navigation

To offer in -app guidance for visually impaired users

On Ferry Accessible Route options

Directions for users while on the ferry.

Redesign 1: Improving Visual Accessibility of the App Interface

Gap: Current interface lacks sufficient visual accessibility for users with low vision or color blindness (e.g., small fonts, low contrast, inaccessible colors).
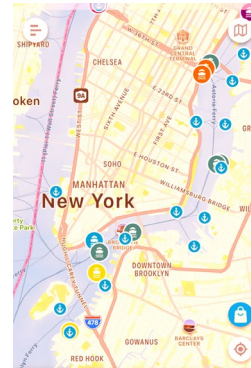
Proposed Redesign

- High-contrast color schemes
- Customizable text sizes
- Clear icons & labels : Straightforward icons with text descriptions

Goal: Improve visual accessibility, enabling users to adjust font size, contrast, and colors based on their individual abilities.
Guidelines : WCAG & ADA compliance.

High Contrast

Magnification

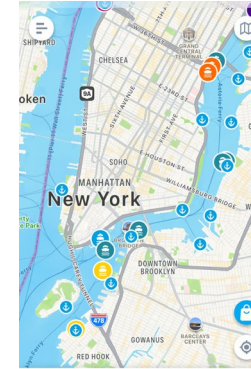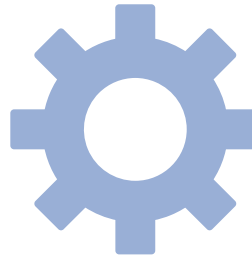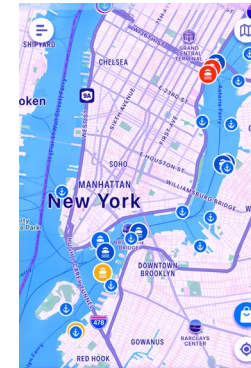New Palettes

Redesign 2: Auditory features

Gap: Lack of auditory and haptic feedback limits app usability for visually impaired users.

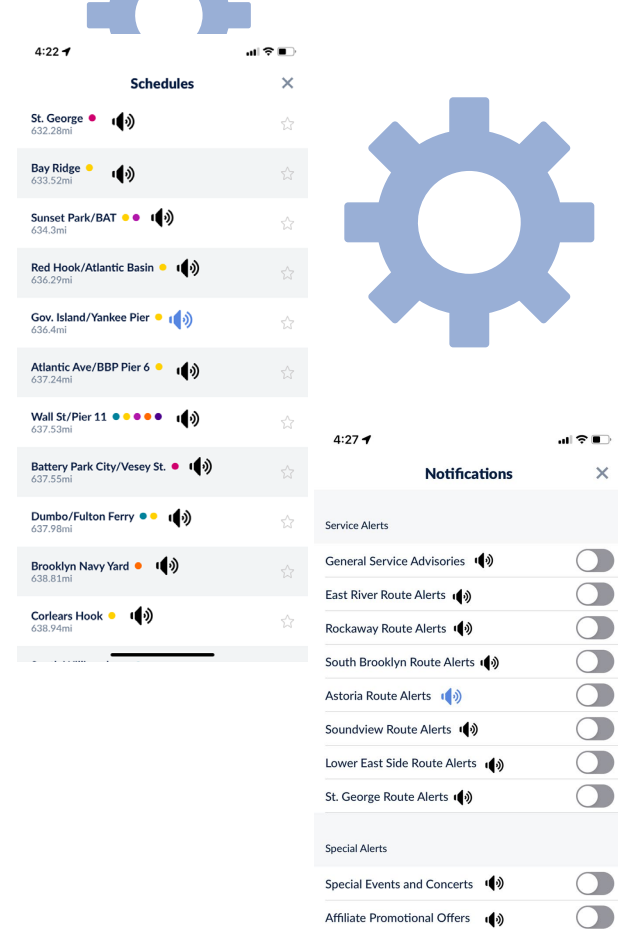## Proposed Redesign

- **Auditory cues:** Add voice guidance for actions like selecting ferry times, purchasing tickets, and checking routes.
- **Haptic feedback:** Introduce vibration responses for key interactions (e.g., button taps, bookings, notifications).
- **Enhanced notifications:** Provide important updates (e.g., delays, boarding alerts) through both audio and haptic notifications.

Goal: Improve accessibility for visually impaired users by leveraging their auditory abilities

Guidelines : WCAG & ADA compliance.

# Redesign 3: Location -Based Assistance for Ferry Terminals

Gap: Users with mobility or sensory impairments face challenges navigating ferry terminals without location -based assistance.

Proposed Redesign

- **GPS-enabled indoor navigation** : Provide step-by-step directions to key areas like boarding points and restrooms.
- **Real-time location notifications**   : Use geolocation to send alerts as users approach critical locations (e.g., boarding gates).
- **Interactive terminal maps**   : Offer maps with accessible routes for better pre-planning.
- **Virtual ferry assistant**   : Enable a virtual assistant for navigation support via text or voice commands.

Goal: Improve independent navigation for users with mobility and sensory impairments so that the system adjusts to the user's physical abilities.

Guidelines : ADA, WCAG, location-based services.
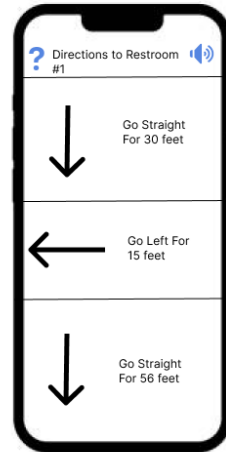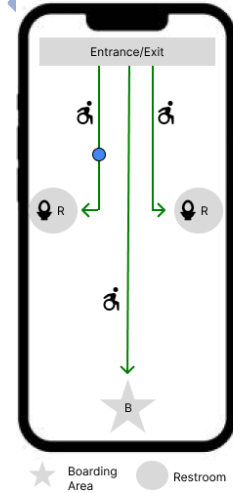
# Redesign 4: Simplified Navigation and Layout for Cognitive Accessibility

Gap: Complex navigation makes booking difficult for users with cognitive impairments.

Proposed Redesign

- **Streamline Navigation:** Introduce a "Quick Book" option for faster, easier booking.
- **Clear Instructions:** Simple, step-by-step prompts guide users through booking.
- **Reduce Distractions:** Minimize unnecessary icons and text for a cleaner layout.
- **Error Prevention:** Clear error messages and undo options to prevent confusion.

Goal: Enhance usability for users with visual impairment by introducing a more refined app experience

Guidelines : Nielsen's Usability Heuristics, WCAG, and User-Centered Design principles.
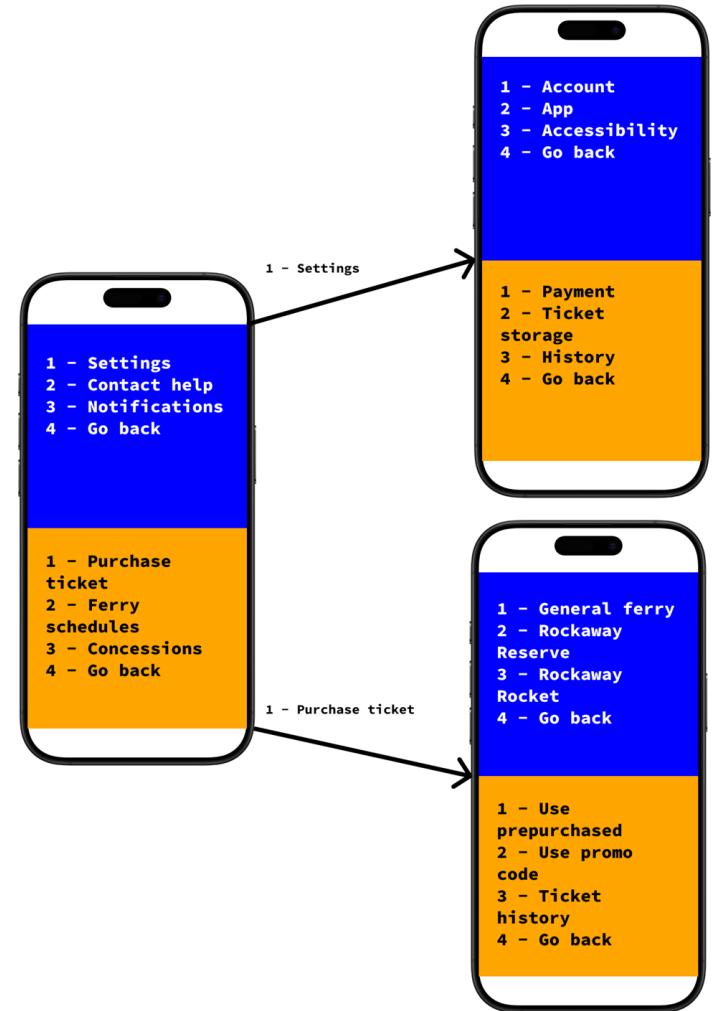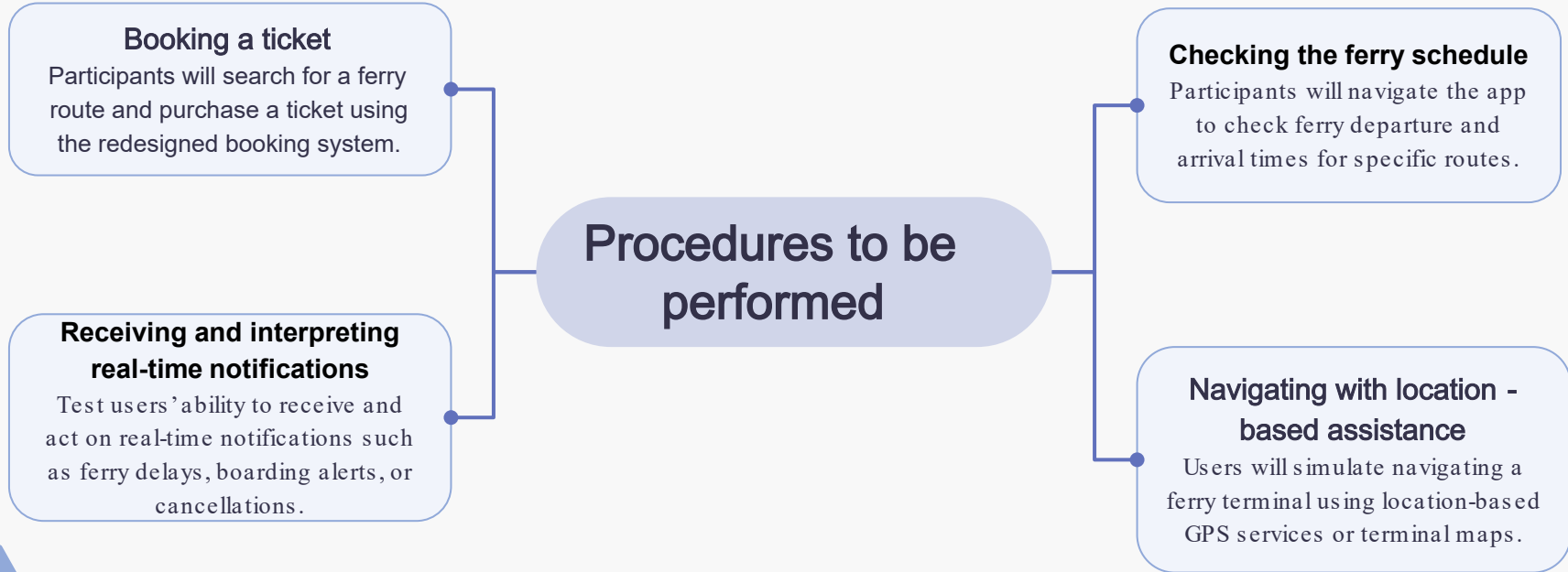
Usability testing strategy

This usability testing strategy aims to evaluate the effectiveness of our NYC Ferry app redesign. We will test with **diverse participants** such as people with visual impairments, people with cognitive impairments, wheelchair users etc.

Objective
- **Evaluate the accessibility and usability of redesigned features** (e.g., visual accessibility, auditory/haptic feedback, simplified navigation).
- **Ensure users of different abilities can independently use** the app's core features, such as ticket booking, checking ferry schedules, and receiving notifications.
- **Identify potential usability challenges** and improve user experience based on feedback.

Specific evaluation process

Procedures to be performed

Booking a ticket
Participants will search for a ferry route and purchase a ticket using the redesigned booking system.

Receiving and interpreting real-time notifications
Test users' ability to receive and act on real-time notifications such as ferry delays, boarding alerts, or cancellations.

Checking the ferry schedule
Participants will navigate the app to check ferry departure and arrival times for specific routes.

Navigating with location - based assistance
Users will simulate navigating a ferry terminal using location-based GPS services or terminal maps.

Data collection and evaluation metrics

Task Completion Rate

The percentage of tasks completed successfully without assistance.

Task Completion time

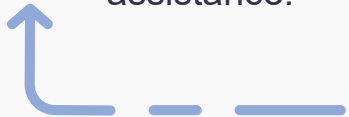Time taken by users to complete each task successfully.

User Satisfaction

Survey data on the satisfaction and accessibility of the redesigned features.

System Usability Scale (SUS)

Questionnaire data to get feedback on overall usability and ease of use.

Data analysis

We will combine qualitative and quantitative data analysis methodologies to:

- **Identify common challenges** with using the redesigned app.
- **Compare task completion times** by analyzing the average time taken to complete tasks.
- **Measure satisfaction** by assessing overall user satisfaction.

Thank you!

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