

**CSE6224 Software Requirements Engineer**

**System Documentation**

**for**

**Campus Accessibility Navigation System with Facilities and Event Integration**

**TT3L**

**GROUP 1**

**Prepared by:**

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# Elicitation Execution

## 

1. **Techniques**
   1. **Techniques 1: Interview**

**Objective:** Gather user feedback from students, staff, and visitors on expected features and usability for the MMUAccess system.

**Participants:** 22 respondents (from different faculties and accessibility backgrounds)

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| --- | --- | --- | --- |
| **Interview Questions** | **Feature** | **Insight Gained** | **Kano Category** |
| 1. Do you think an app that finds accessible routes is necessary? | Route Accessibility | Users consider this essential for daily navigation | Must-Have |
| 2. Would real-time updates about elevator status help you? | Real-Time Alerts | Elevators & blocked paths are common pain points | Performance |
| 3. Would suggestions for nearby restrooms or ramps help? | Accessibility POI Suggestions | Adds convenience and confidence in navigating campus. | Delighter |
| 4. Would you use screen reader or voice navigation? | Accessibility Tools | Some users rely on assistive tech, especially visually impaired | Must-Have |
| 5. Would route time estimation (for wheelchair/walking) be useful? | Travel Time Estimation | Most users want optimized timing info | Performance |
| 6. Would multi-language support help you or others? | Language Options | Multilingual environment—Bahasa & English were top picks | Must-Have |
| 7. What feature would make this app exciting for you? | Custom Feature Suggestions | Smart voice commands, vibrational alerts, and restroom alerts were suggested. | Delighter |

**Outcomes:**

|  |  |  |
| --- | --- | --- |
| **Feature** | **Kano Category** | **Justification** |
| Route optimization avoiding stairs | Must-Have | Users with mobility needs find this critical. |
| Real-time updates (construction, elevator) | Performance | Increases trust and reliability |
| Screen reader & voice command compatibility | Must-Have | Supports inclusive access |
| Suggesting accessible toilets/elevators nearby | Delighter | Unexpected, but highly useful |
| Time estimation for selected routes | Performance | Users want efficiency |
| Multi-language support | Must-Have | Diverse language needs from international/local students |
| Custom alerts (vibration/voice) | Delighter | |  | | --- | |  |  |  | | --- | | Increases accessibility and engagement | |

* 1. **Techniques 2: Observation**

## Article 1

**Title:** Exploring the role of configurational accessibility of alleyways on facilitating wayfinding transportation within the organic street network systems

**Authors:** Ahmad Al-Radaideh, Akram Alkouz, Ahmad Awajan

**Publisher**: Elsevier – *Computers in Industry*

**Link**: <https://www.sciencedirect.com/science/article/pii/S0967070X24002464>

### Objective:

The primary objective of this study is to develop a smartphone-based navigation system that addresses the specific needs of individuals with mobility impairments. Unlike conventional navigation apps that overlook accessibility barriers, this system aims to provide safe and reliable route guidance by considering physical obstacles such as stairs, steep inclines, and inaccessible entrances. The goal is to promote greater independence and ease of movement for users in both indoor and outdoor campus and urban environments.

### Methodology:

The navigation system is built on top of OpenStreetMap (OSM), which is enhanced with detailed accessibility data including information on ramps, elevators, and path widths. A mobile application was developed to display real-time navigation, utilizing smartphone sensors to detect obstacles and allowing users to provide feedback on accessibility issues. This feedback mechanism helps keep route information current. The system underwent usability testing with participants who have mobility impairments, ensuring that its design and functionality were evaluated and improved based on real user experiences.

### Findings:

The system improved navigation for users with mobility impairments by providing more accurate and accessible routes than standard apps. Real-time updates and user feedback helped adapt routes to changing conditions like blocked paths. Usability testing showed high user satisfaction, especially with the app’s simplicity, clear guidance, and focus on accessibility.

## Article 2

**Title:** Accessibility Mapping and Navigation for People with Disabilities: A Review

**Authors:** Taha Khan, Shamsi Iqbal, Edward Cutrell

**Publisher**: IEEE Access

**Link**: <https://ieeexplore.ieee.org/document/8870570>

### Objective:

### This paper's goal is to evaluate the effectiveness of accessibility-focused navigation systems in addressing the needs of users with disabilities by critically analysing their current status. It aims to pinpoint the main difficulties people with vision, movement, and other impairments encounter when utilising the current digital navigation aids to navigate physical locations. The study also seeks to provide a thorough set of design guidelines for the creation of navigation systems that prioritise accessibility and are more accurate, inclusive, and real-time. The authors hope to close the gap between general-purpose navigation tools and the unique requirements of users with accessibility requirements by assessing current technology.

### Methodology:

### The authors carried out a thorough assessment of the literature and a technological analysis of both academic research prototypes for accessible navigation and commercially available programs like Google Maps and Apple Maps. They evaluated each system according to a number of factors, such as the accuracy of the route, the degree of environmental information, such as the availability of tactile paving, ramps, or lifts, the ability to update in real time, and the incorporation of user feedback. A comparison methodology for assessing how well these systems support individuals with various disabilities was also included in the study. The utilisation of crowdsourcing data, sensor input from wearable technology like smartphones, and participatory design—in which impaired users actively participate in testing and development—were all taken into account in this paradigm.

### Findings:

The study emphasises the variety of approaches to accessible navigation while pointing out that there are frequently insufficient universal design strategies. It highlights how crucial it is to take user demands into account during the design and assessment stages in order to maximise the efficiency of wayfinding devices.

## Article 3

**Title:** Routes to a building or a room suited to the specific needs of users

**Authors:** Stéphanie Jean-Daubias, Thierry Excoffier, Otman Azziz

**Publisher**: Cornell University

**Link**: <https://arxiv.org/abs/2406.14923>

### Objective: The objective of the study was to develop and evaluate *OPALE*, a mobile application designed to enhance navigation and accessibility on the Claude Bernard Lyon 1 University campuses. The app aimed to help users, especially those with physical or cognitive disabilities, by providing customized routes to buildings and specific rooms that meet their accessibility needs. By doing so, the project intended to improve inclusivity and ease of access to the university’s practical, cultural, and scientific facilities.

### Methodology: The researchers employed a user-centered design approach, beginning with the geolocation of various Points of Interest (POIs) on campus. They implemented features that allow the application to generate tailored itineraries based on users' specific mobility requirements. A significant emphasis was placed on solving indoor navigation challenges, guiding users from building entrances to exact room locations. The development process was iterative, involving user feedback and testing to continuously refine and optimize the application’s usability and functionality.

### Findings: The findings demonstrated that personalized route generation substantially improved the navigation experience for users with disabilities. The system's ability to guide users through complex indoor environments, such as from the entrance to a specific classroom, addressed a major accessibility barrier. User feedback indicated higher satisfaction levels and reduced confusion while navigating campus spaces. The study confirmed that a user-focused, context-aware navigation tool could significantly enhance accessibility and user independence in university settings

**Observation Technique Tables**

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| --- | --- | --- | --- | --- | --- |
| **Article Title** | **Observation Type** | **Observation Context** | **Tools/Tech Used** | **Parameters Observed** | **Findings/Outcomes** |
| Exploring the role of configurational accessibility of alleyways on facilitating wayfinding transportation within the organic street network systems | **Field Observation with Usability Testing** | **Navigation of individuals with mobility impairments in urban and campus environments** | **Mobile app built on OSM, smartphone sensors, feedback module** | **Route accessibility, obstacle detection, real-time updates, user feedback** | **Improved route accuracy and satisfaction; real-time feedback helped users avoid inaccessible paths; app effectively supported mobility-impaired users.** |
| Accessibility Mapping and Navigation for People with Disabilities: A Review | **Comparative Review and System Analysis** | **Use of mainstream and specialized navigation systems by users with disabilities** | **Evaluation of academic and commercial apps (e.g., Google Maps, Apple Maps)** | **Route accuracy, real-time updates, user-centered design, environmental data inclusion** | **Existing apps lack universal design; participatory design and detailed accessibility features are crucial for inclusive navigation systems.** |
| Routes to a building or a room suited to the specific needs of users | **Usability Testing and User-Centered Observation** | **Indoor navigation within a university campus (Claude Bernard Lyon 1)** | **OPALE mobile app, campus POI geolocation system** | **Indoor navigation ease, accessibility personalization, user satisfaction** | **Personalized navigation significantly reduced confusion; enhanced access to rooms/buildings; user-centered design improved effectiveness and satisfaction.** |

**Key Observation**

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| --- | --- | --- |
| **Aspect** | **Common Trend Across Articles** | **Kano Category** |
| **Accessible Routing** | |  | | --- | | **All systems emphasized the need to generate routes that consider obstacles like stairs, slopes, and inaccessible entries.** |  |  | | --- | |  | | **Must-Be** |
| |  | | --- | | **Real-time Updates** |  |  | | --- | |  | | |  | | --- | | **Articles 1 and 2 highlighted the benefit of providing live updates (e.g., blocked paths, construction) through feedback mechanisms or sensor inputs.** |  |  | | --- | |  | | **One-Dimensional** |
| |  | | --- | | **User Feedback Integration** |  |  | | --- | |  | | |  | | --- | | **All articles support mechanisms for users to report accessibility issues or provide feedback for route improvement.** |  |  | | --- | |  | | **Attractive** |
| |  | | --- | | **Indoor Navigation Support** |  |  | | --- | |  | | |  | | --- | | **Articles 1 and 3 addressed the challenge of navigating inside buildings, showing the importance of this feature for full route assistance.** |  |  | | --- | |  | | **Attractive** |
| |  | | --- | | **User-centered/Participatory Design** |  |  | | --- | |  | | |  | | --- | | **All three studies utilized or recommended user-centered approaches, including involving people with disabilities in testing or design.** |  |  | | --- | |  | | **One-Dimensional** |
| |  | | --- | | **Device and Platform Compatibility** |  |  | | --- | |  | | |  | | --- | | **Focus on mobile-first or mobile-friendly apps was common, ensuring access through smartphones and tablets (Articles 1 and 3).** |  |  | | --- | |  | | **Must-be** |
| |  | | --- | | **Customizable Navigation Preferences** |  |  | | --- | |  | | |  | | --- | | **Articles 2 and 3 emphasized personalized routes tailored to user-specific impairments (mobility, cognitive, etc.), enhancing usability and experience.** |  |  | | --- | |  | | **Attractive** |
| |  | | --- | | **Integration with Existing Systems** |  |  | | --- | |  | | |  | | --- | | **While not the central focus, Article 3 noted interaction with university infrastructure, aligning with MMUAccess's goal of integrating with campus calendars and facility data.** |  |  | | --- | |  | | **One-Dimensional** |

* 1. **Techniques 3: Brainstorming**

**Questions:**

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| **Prompt (Question)** | **Goal** |
| What are the most common challenges faced by users with disabilities on campus? | To identify real-world pain points that MMUAccess should solve. |
| How can we make the system usable for users with visual, auditory, or motor impairments? | To explore inclusive design strategies for diverse accessibility needs. |
| What information should be displayed in real-time for effective navigation? | To determine the most helpful dynamic data for users (e.g., path blockages, event updates). |
| How can we ensure users trust the accessibility information shown on the app? | To generate ideas for data validation, feedback loops, or admin oversight. |
| How can MMUAccess integrate seamlessly with the university’s existing systems? | To identify integration points like the event calendar or facility management tools. |
| What features would make users want to use MMUAccess daily? | To brainstorm value-added functionalities that increase engagement and usefulness. |
| How should the interface adapt for different user types (e.g., admin vs. visitor)? | To consider role-based interfaces and access permissions. |
| How can we keep the navigation data updated with minimal admin effort? | To generate solutions such as crowdsourced updates, sensors, or automation. |
| What should happen if a route becomes inaccessible mid-navigation? | To explore real-time rerouting, alerts, and user choices for detours. |
| How do we make the system easy to use for users with low digital literacy? | To brainstorm UI/UX simplifications and assistive onboarding features. |

**Outcomes:**

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| --- | --- | --- |
| **Outcome (Idea)** | **Kano Category** | **Notes** |
| Real-time rerouting when a path becomes blocked | Performance | Enhances user satisfaction significantly as expectations increase with real-time updates. |
| Voice-guided navigation for visually impaired users | Must-Have | Crucial for accessibility; users expect this as a basic function. |
| Feedback option to report obstacles or update data | Performance | Encourages community contributions and improves data accuracy. |
| Integration with MMU’s event calendar | Must-Have | Essential for the core function of guiding users to accessible events. |
| Offline campus map with basic accessibility info | Attractive | Not always expected, but adds significant value when internet is unavailable. |
| Accessibility scoring for routes (e.g., flatness, shade, safety) | Attractive | Delights users by allowing them to choose the most comfortable route. |
| Role-based interfaces (e.g., admin, student, guest) | Must-Have | Necessary for content control and access management. |
| Simple UI with large buttons and high contrast mode | Must-Have | Supports users with visual or motor impairments; foundational usability element. |
| Gamification (e.g., reward badges for reporting updates) | Indifferent/Attractive | Could boost engagement but is not necessary for core functionality. |
| Automatic data syncing with campus facility updates | One-Dimensional | Improves system efficiency and reliability; reduces need for manual updates. |