Tab 1



**TRIMESTER March/April, 2025**

**CSE6224 Software Requirements Engineering**

**PROJECT 1**

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

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# **Introduction**

## **Purpose**

The purpose of this system is to provide an accessibility-focused navigation and information platform for campus staff and students. It aims to facilitate convenient access to real-time information about campus facilities, events, and individual class schedules, thereby enhancing the campus experience and addressing the needs of users with mobility challenges.

## **Scope**

This system covers querying detailed information and real-time statuses of campus facilities, interactive campus map navigation, display of campus events and personal class schedules, as well as notification delivery. It targets all campus community members, with particular attention to users requiring accessibility accommodations.

## **Product overview**

### **Product perspective**

The system acts as a complementary digital service within the campus ecosystem, integrating with existing campus facilities management and event calendar systems. It provides a unified mobile interface supporting accessible navigation and real-time information updates.

### **Product functions**

* Query detailed information and real-time status of campus facilities such as parking lots, study rooms, and restrooms.
* Browse campus maps with clickable locations linked to Google Maps for navigation.
* View detailed information on campus events including date, time, and location.
* Access personal class schedules for enrolled students.
* Receive push notifications about facility maintenance, event changes, and class schedule updates.
* View latest news and announcements issued by the university.
* Allow users to customize notification preferences based on urgency and type

### **User characteristics**

The primary users include campus staff and students with basic smartphone proficiency, including individuals with disabilities or special accessibility requirements.

### **Limitations**

The system currently does not support offline map navigation. Real-time data depends on synchronization with campus management systems. An internet connection is required for full functionality.

## 

## **Definitions**

* **Accessibility Navigation**: Navigation designed specifically to accommodate users with mobility challenges.
* **Facility Status**: Real-time availability and condition of campus facilities.
* **Notification System**: A module that pushes important campus messages and alerts to users.
* **Push Notifications:** Automated alerts sent to user devices to inform them of important updates.
* **Kano Model:** A model to classify requirements into Must-be, Performance, and Excitement categories based on user satisfaction.

# **References**

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[8] Interviews and prototyping feedback sessions with MMU academic and administrative staff, May 2025, personal communications.

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# **Requirement**

## **Functions**

* Users shall be able to query detailed information and real-time status of campus facilities (e.g., parking availability, restrooms).
* Users shall be able to browse the campus map and click on locations to open Google Maps navigation.
* The system shall display comprehensive campus event information, including date, time, location, and details.
* Students shall be able to view their individual class schedules.
* The system shall deliver notifications regarding facility maintenance, event updates, and class schedule changes.
* Users shall be able to access the latest campus news and announcements.
* Users shall be able to customize notification preferences by type and urgency.

### **Requirements Prioritization and Classification**

#### Basic Needs

* + Navigation to campus facilities and event locations
  + Accurate, accessible maps and route guidance (including for disabled users)
  + Event integration for knowing where and when things happen
  + Clear signage (digital or physical) and basic interface usability
  + Prototyping confirmed users rely heavily on clear and accurate visual cues and map data; any inconsistencies in the prototype maps were immediately noted as confusing.

#### Performance Needs

* + Real-time updates on event changes, facility availability, and maintenance
  + Automated syncing with university systems (timetables, calendars, etc.)
  + Personalized scheduling for users (e.g., students, staff)
  + Priority reminders and alerts based on user context
  + Strongly improve satisfaction and productivity, validated by prototype interaction where users appreciated instant event updates and syncing features that reduced manual workload.
  + The prototype’s demonstration of real-time data highlighted the critical role of timely and accurate information in decision-making for both staff and students.

#### Excitement Needs

* + Indoor navigation inside complex buildings
  + AR/voice-assisted guidance
  + Customizable notification filters (urgency, type, etc.)
  + Smart suggestions: “You have 15 mins before your next event nearby”
  + Prototyping feedback emphasized that customizable notifications significantly enhance user experience by reducing alert fatigue while keeping users informed—this feature was a standout in prototype testing.
  + Interactive elements like filtering event types and setting notification urgency levels were enthusiastically received.

#### Indifferent Needs

* + General campus news unrelated to navigation/events
  + Basic reporting tools (unless directly tied to navigation problems)
  + These were ranked lower in importance during both interviews and prototype evaluation, where users focused more on actionable, time-sensitive information rather than general news.

#### **Reverse Needs**

* + Too many or irrelevant notifications (alert fatigue)
  + Invasive tracking without clear consent
  + Overcomplicated setup just to access maps/events
  + Prototyping revealed that too many notifications without filtering caused annoyance; users explicitly requested control over notification volume and type to avoid fatigue.
  + Privacy concerns around tracking were echoed, with participants urging transparent policies and opt-in consent mechanisms.

## **Performance requirements**

* The system shall respond to user queries within 3 seconds
* Notifications shall be delivered with a maximum delay of 1 minute
* System availability shall be at least 99.5% during operating hours.
* The app shall support at least 1000 concurrent users without degradation.

## **Usability requirements**

* The user interface shall be clean, intuitive, and optimized for mobile devices.
* Accessibility features such as high contrast mode and screen reader compatibility shall be supported.

## **Interface requirements**

* The system shall integrate with the campus facilities management database via a RESTful API.
* The system shall integrate with the campus event management system via a RESTful API.
* The system shall use the Google Maps API for navigation features.
* Data transmission between the app and backend services shall be secured using HTTPS and encryption.

## **Logical database requirements**

* The system shall maintain data tables for campus facilities, events, class schedules, and notifications.
* Relationships between these entities shall be logically defined to support efficient queries.

### Entity Relationship Diagram

#### *Diagram 3.1 Entity Relationship Diagram*

The Campus Accessibility Navigation System ERD outlines a user-centered design with three main roles: Student, Visitor, and Admin, all inheriting from a general User entity. Students and Visitors can plan routes, view events, and receive notifications, while Students also access class schedules. Admins manage events, update facilities, and ensure data integrity. Supporting entities include Route, which calculates and suggests paths; Event, which stores event details and accessibility impact; Facilities, which track type, status, and quantity; and Notification, which handles system messages. This structure supports efficient navigation, event awareness, and accessibility management on campus.

## **Design constraints**

* The system depends on real-time synchronization with existing campus management systems.
* The system shall be compatible with Android and iOS mobile platforms.
* The system must comply with relevant data privacy regulations (PDPA, GDPR).

## **Software system attributes**

* **Reliability**

The system shall ensure accurate and timely delivery of information and notifications.

* **Security**

The system shall protect user data privacy and prevent unauthorized access.

* **Maintainability**

The system shall be modularly designed to facilitate future updates and maintenance.

* **Privacy**

Ensure compliance with data protection laws, implement consent management and data anonymization.

* **Scalability**

Support growing number of users and data without performance loss.

## **Supporting information**

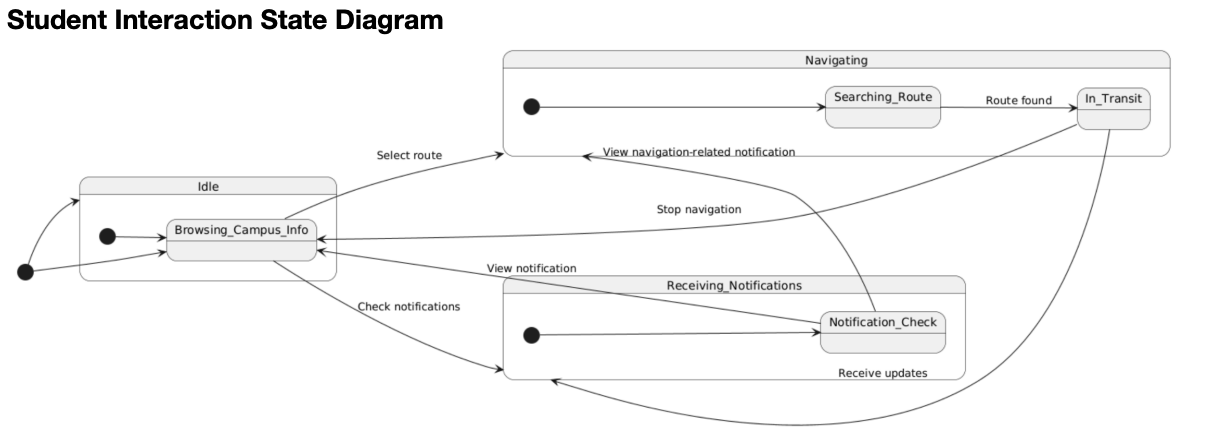
* API documentation for campus management systems integration.
* Google Maps API developer documentation

## **Behavioral Models**

### Use Case Diagram

#### *Diagram 3.2 Use Case Diagram*

### State Chart Diagram



| *Diagram 3.3 Student Interaction State Diagram* |
| --- |
| *Diagram 3.4 MMU Staff /Admin Interaction State Diagram* |
| *Diagram 3.5 System Notification State Diagram* |
| *Diagram 3.6 System Notification State Diagram* |
| **Data Synchronization State Diagram** *Diagram 3.7 Data Synchronization State Diagram* |

### Activity Diagram

| **User Journey - Requesting and Navigating a Route (with Parking and Facilities Availability)**  This diagram will reflect the user flow, including parking and facilities availability, which directly affects the route planning.   *Diagram 3.8 User journey activity diagram* |
| --- |
| **Admin Workflow - Updating Campus Data (Events, Facilities)**  This diagram will describe the administrator's process of updating the campus event and facility data in the system. *Diagram 3.9 admin workflow activity diagram* |
| **Real-Time Updates and Notifications**  This diagram represents the process of the system sending real-time updates to the users regarding campus events, maintenance updates, etc   *Diagram 3.10 Real time update and notification activity diagram* |
| **User Exiting the Navigation System**  This diagram describes what happens when the user exits the navigation system.   *Diagram 3.11 User exiting the navigation system activity diagram* |
| **System Failure/Error Handling**  This diagram outlines the process when the system encounters an error, such as failing to load campus data or calculate a route. *Diagram 3.12 system failure activity diagram* |

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# **Verification**

## **[Parallel to subsection in Section 3]**

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# **Appendices**

## **Assumptions and dependencies**

### Assumptions

* Users will have consistent and reliable internet connectivity to access real-time data and notifications.
* Campus staff and students possess a basic level of proficiency in using smartphone applications.  
  The Google Maps API and other third-party services used for navigation and mapping will remain available and supported throughout the system’s life cycle.
* Integration points with existing campus management systems (facilities and event databases) will be stable and accessible via APIs.
* Users will consent to any data collection practices in compliance with relevant data protection regulations.

### Dependencies

* The system depends on continuous synchronization with campus facilities and event management systems for up-to-date information.
* Real-time notification delivery relies on mobile platform push notification services (e.g., Android Firebase Cloud Messaging, Apple Push Notification Service).
* Compliance with applicable data privacy laws such as the Personal Data Protection Act (PDPA) and General Data Protection Regulation (GDPR) is mandatory.
* The system’s performance and availability may be affected by the campus network infrastructure and third-party API service availability.

## **Acronyms and abbreviations**

* API: Application Programming Interface
* GDPR: General Data Protection Regulation
* PDPA: Personal Data Protection Act
* WCAG: Web Content Accessibility Guidelines