# Lab 2 – Itiner-Ease Software Requirements Specification

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# 1 Introduction

Travel planning has evolved into an increasingly complex process. While travelers have access to abundant digital resources, this availability often results in decision fatigue, inefficiency, and uncoordinated group experiences. Current applications tend to provide generic, one-size-fits-all itineraries that fail to adapt to environmental factors such as weather, closures, or real-time changes in traveler intent. In group contexts, differing preferences, budget restrictions, and scheduling constraints further complicate planning.

Itiner-Ease seeks to address these issues by providing an intelligent, adaptive system for itinerary generation and management. Using artificial intelligence and verified local expert input, the system produces personalized recommendations that evolve dynamically with contextual data. Through an integrated web platform, users can collaborate on shared itineraries, refine them collaboratively, and rely on data-driven updates that maintain relevance and flexibility.

This document establishes the technical foundation for the Itiner-Ease prototype. It defines its architectural context, major system functions, and operational constraints, serving as a developer-oriented reference for implementation, testing, and verification of the web-based application.

## 1.1 Purpose

This Software Requirements Specification (SRS) defines the technical and functional parameters for the Itiner-Ease prototype, developed by Team Copper for Old Dominion University's CS 410/411W senior workforce development sequence. Its purpose is to describe the software's structure and expected behavior from an implementation perspective. The document outlines the requirements necessary for developers, testers, and system maintainers to

construct, integrate, and evaluate the application effectively. It serves as a living technical reference to guide system development through the design, prototype, and deployment stages.

### 1.2 Scope

Itiner-Ease is a web-based itinerary generation and travel management platform designed to simplify the trip-planning process through intelligent automation and community collaboration. The application uses AI-powered recommendation algorithms and verified local expert insights to produce customized itineraries that reflect user preferences, budgets, and real-time travel conditions. Users can create, share, and revise itineraries collaboratively, allowing for seamless coordination among individuals or groups.

The system operates as a responsive web platform implemented in Laravel using PHP and supported by a SQLite relational database. The front end is built with standard web technologies, including HTML, CSS, and JavaScript, while the administrative dashboard and content management interface are provided through the Filament PHP framework. Artificial-intelligence-driven recommendations are generated through integrations with OpenAI and refined using TensorFlow, Scikit-Learn, and PyTorch.

The Itiner-Ease prototype emphasizes personalization, adaptability, and integration rather than full commercial functionality. It demonstrates itinerary creation, expert collaboration, and group coordination but does not include direct payment handling, hotel or flight bookings, or large-scale data hosting. The prototype represents the foundation for a scalable, production-ready application while maintaining feasibility within academic development constraints.

### 1.3 Definitions, Acronyms, and Abbreviations

**AI Recommendations**: Automated suggestions generated by artificial intelligence to personalize itineraries.

**API**: Application Programming Interface, defines communication rules between software systems.

**Dynamic Itinerary Support**: Automatic modification of travel plans based on changing conditions (e.g., weather, closures).

**Explorer Rewards**: Point-based reward system for user engagement and reviews.

**Firebase**: Cloud database and backend service used for authentication and real-time data.

**Group Profile**: A collection of merged traveler profiles used to create joint itineraries.

**Itinerary Creation Interface**: The front-end component where travelers build and view itineraries.

**Local Expert**: Verified user who provides itinerary recommendations or guided experiences.

**MFCD**: Major Functional Component Diagram.

**Node.js**: JavaScript runtime used for back-end execution.

**React Native**: Cross-platform framework for mobile app development.

**REST API**: Representational State Transfer interface used for exchanging data between client and server.

**Traveler**: Primary end-user who creates itineraries and consumes recommendations.

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**1.5 Overview**

This SRS defines the structure and purpose of the Itiner-Ease prototype. Section 2 provides a comprehensive overview of the system's context, design perspective, and user environment, followed by explanations of its major functions, constraints, and assumptions. The document serves as a blueprint for the technical implementation of the application and the integration of its AI-driven itinerary generation features.

# 2 Overall Description

This section provides a comprehensive description of the Itiner-Ease prototype, outlining the system's overall structure, operating environment, and the relationships between its major components. It explains how the application integrates user-facing and backend systems through a layered architecture, defines its functional context, and clarifies the boundaries of the prototype implementation. The description also identifies system constraints, external dependencies, and underlying assumptions that affect development and deployment. This information gives developers a complete understanding of the software's operational framework prior to detailed specification of requirements.

## 2.1 Product Perspective

Itiner-Ease is structured as a modular, web-based application developed using the Laravel PHP framework and supported by a SQLite database. The platform follows a traditional three-layer design consisting of presentation, application, and data tiers. The presentation layer includes all user-facing interfaces built with HTML, CSS, and JavaScript, allowing travelers, local experts, and businesses to access the system through any modern web browser. The administrative interface is developed using Filament, providing developers and administrators with tools to manage users, itineraries, and business listings efficiently.

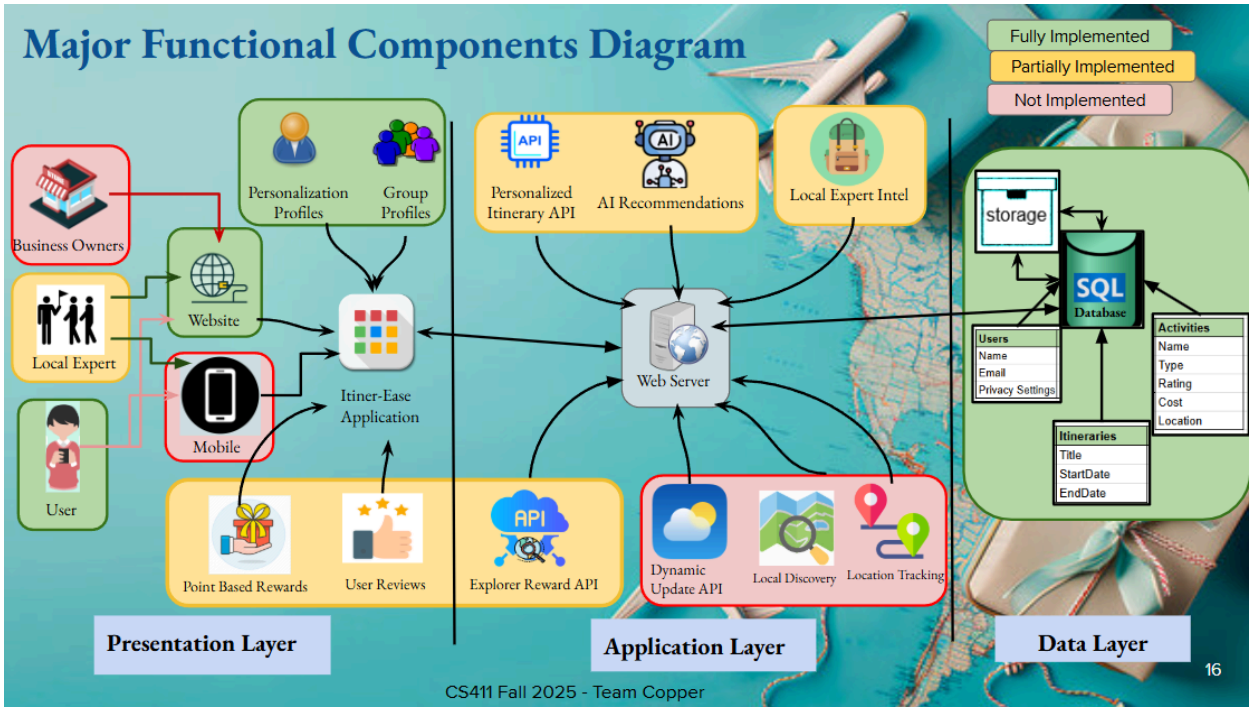
The application layer contains the system's primary logic and workflow control. Within this layer, Laravel orchestrates routing, request handling, and API interactions. The AI recommendation engine—powered by integrations with OpenAI, TensorFlow, and Scikit-Learn—generates and refines itinerary suggestions using stored user preferences and

clustering algorithms. This layer also manages dynamic updates, local expert verification, and group collaboration features.

The data layer ensures reliable information management using SQLite for structured data storage and Laravel's Eloquent ORM for query abstraction. External services such as Google Maps, OpenAI, and third-party weather APIs provide data essential to itinerary creation and updates. The system is hosted on a DigitalOcean virtual server and managed through Docker containers for environment consistency. This layered approach promotes scalability, maintainability, and clear separation of concerns.

Overall, Itiner-Ease functions as a web-based intelligent travel companion that merges AI automation with verified human insight, ensuring that itineraries remain adaptive, data-driven, and contextually accurate.

**Figure 1 – ItinerEase Prototype Major Functional Component Diagram**



**2.2 Product Functions**

The ItinerEase prototype delivers a range of interconnected features, each developed to a level consistent with the goals and constraints of an academic proof of concept. Core functions such as user registration and authentication are fully implemented, enabling travelers, local experts, and businesses to securely access the system under distinct role-based permissions. Profile preference management is also complete, allowing users to record essential travel information such as interests, budgets, allergies, and goals, all of which feed directly into the application's AI recommendation engine. This recommendation system, powered by machine-learning frameworks, is likewise fully implemented and capable of generating personalized itineraries based on learned similarities between user inputs and stored travel data. Local expert integration has been realized through text-based recommendations, permitting verified guides to review or refine traveler itineraries, while the built-in reward system awards points for participation and reviews. The review system itself is functional, giving users the ability to submit ratings and comments for destinations or experiences. Together, these completed components form the operational backbone of ItinerEase and demonstrate its viability as an adaptive, collaborative travel-planning platform.

Some features have been developed only in partial form due to the prototype's technical and temporal constraints. Group itinerary creation currently supports small collaborative sessions involving two to three users rather than large travel groups; expanding this capability would require more robust real-time synchronization and database concurrency handling. Dynamic updates are similarly limited, as they rely on simulated data rather than live API feeds. Implementing true dynamic responsiveness to weather, closures, or crowd levels would demand continuous third-party integration and real-time data orchestration that exceed the project's

current scope. The business portal is also partially realized, providing basic profile management functionality but excluding advanced promotional tools or analytics dashboards, which would require more extensive data infrastructure. These partial implementations still validate the functional logic of each feature while keeping the system lightweight and maintainable within the boundaries of academic feasibility.

Other features have been intentionally excluded from the prototype. Payment processing has been simulated to avoid legal and security complications associated with real financial transactions. Flight and hotel booking integrations were omitted because they require partnerships with external vendors and complex API management beyond the project's resources. Likewise, social-sharing capabilities were deferred to later iterations, as their inclusion would necessitate OAuth authentication, privacy moderation, and additional maintenance unrelated to the prototype's demonstration of intelligent itinerary generation. These exclusions ensure that development effort remains focused on validating the system's core AI-driven, user-collaborative model while keeping implementation manageable and secure.

**Table 1 – ItinerEase Feature Description and Prototype Implementation**

| Feature | Description | Prototype Implementation |
|---|---|---|
| **User Registration & Authentication** | Create and manage accounts; store traveler, expert, and business roles. | Fully Implemented |
| **Profile Preferences** | Record user interests, budget, allergies, and travel goals. | Fully Implemented |
| **AI Recommendations** | Generate personalized itineraries using similarity clustering and learned preferences. | Fully Implemented |
| **Group Itinerary Creation** | Merge multiple user profiles and support group voting on activities. | Partially Implemented (limited to 2–3 users in prototype) |
| **Dynamic Updates** | Modify itineraries automatically in response to weather or crowding data. | Partially Implemented (simulated data) |
| **Local Expert Integration** | Allow travelers to request itinerary review or custom guidance from verified locals. | Fully Implemented (for text-based recommendations) |

| | | |
|---|---|---|
| **Reward System** | Users earn points for leaving reviews and can redeem discounts. | Fully Implemented |
| **Business Portal** | Businesses register, list events or promotions, and view analytics. | Partially Implemented (basic profile management only) |
| **Review System** | Travelers submit ratings and comments for destinations. | Fully Implemented |
| **Payment Processing** | Handles financial transactions through PayPal. | Eliminated (simulated only) |
| **Flight / Hotel Booking** | Integrate external booking systems. | Eliminated |
| **Social Sharing** | Publicly share itineraries to social networks. | Eliminated |

### 2.3 User Characteristics

Four primary user roles define the system's operational ecosystem: travelers, local experts, business owners, and administrators. Travelers represent the core user group, generally possessing basic web literacy and using the system to plan, customize, and review itineraries. Local experts have moderate technical proficiency and provide verified insight or professional guidance to enhance traveler itineraries. Business owners maintain moderate digital competency, using their access to manage promotional listings and analytics related to user interactions. Administrators and developers require advanced technical expertise, as they oversee system maintenance, database management, and content verification.

All users interact with the system through standard browsers and must have internet connectivity. While most travelers operate at a novice technical level, the design ensures usability through a clean, responsive interface with minimal complexity.

**Table 2 – ItinerEase User Characteristics**

| User Role | Description / Skill Level | Typical Usage Scenario |
|---|---|---|
| **Traveler** | Casual mobile user; minimal technical expertise. | Uses AI itinerary builder to plan trips and discover new attractions. |
| **Local Expert** | Verified guide familiar with local culture; moderate technical skill. | Logs in to review traveler itineraries, add suggestions, and earn rewards. |
| **Business Owner** | Small business operator with moderate computer literacy. | Updates business profile and participates in rewards and promotion programs. |
| **Administrator / Developer** | Maintains application, database, and verification systems. | Manages user data integrity and system maintenance tasks. |

**2.4 Constraints**

The Itiner-Ease prototype operates within several practical and technical limitations. Because it relies on live API integrations for mapping, recommendations, and environmental data, uninterrupted internet access is required for full functionality. The current deployment environment, hosted through DigitalOcean and configured via Docker, restricts the number of simultaneous users and available compute resources. SQLite is suitable for small-scale operation but lacks the capacity for high-concurrency enterprise scenarios, which may limit prototype scalability.

AI recommendations depend on data availability and accuracy from external APIs such as Google Maps and OpenAI, meaning delays or errors in these services can affect response times. System security follows Laravel's authentication framework but depends on proper encryption and adherence to PHP best practices. Privacy compliance is maintained by restricting data collection to essential information. The prototype omits real financial transactions to avoid legal complexity, simulating payments when necessary for testing purposes. These constraints collectively define the boundaries of reliable system performance while preserving the integrity and intent of the Itiner-Ease prototype.

**2.5 Assumptions and Dependencies**

The design and operation of Itiner-Ease rely on several assumptions regarding user behavior, system availability, and third-party services. It is assumed that users will provide accurate personal and preference information and will grant the necessary device permissions for location services. The accuracy of itinerary generation depends on this data, as well as on the availability of external APIs such as Google Maps, Yelp, Foursquare, and Apple Weather. The system assumes that these services will remain operational and accessible under standard rate-limit conditions.

The prototype depends on the continued availability of Firebase and MySQL for data persistence and on the ODU-hosted virtual machine for deployment. It also assumes moderate network latency within the expected usage range of fewer than fifty concurrent users. Local expert verification is performed manually in the current prototype stage, and future versions may automate this process once reliability is established.

In summary, the proper functioning of Itiner-Ease is contingent upon the stability of its third-party integrations, consistent internet connectivity, and accurate user input. Any disruption in these dependencies may temporarily limit functionality but does not compromise the integrity of the overall system design.