



SideQuest: Life is a Quest

System Analysis And Design Document

Course: IT370 Advanced Programming

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Contents

1	Introduction	4
1.1	Purpose of the Document	4
1.2	Scope of the Application	4
1.3	Definitions, Acronyms, and Abbreviations	4
1.4	References	4
2	Overall Description	4
2.1	Product Overview	4
2.2	Product Perspective	5
2.3	User Personas	5
2.4	Operating Environment	5
2.5	Constraints and Dependencies	5
3	System Features	5
3.1	User Account Management	5
3.2	Onboarding & Preference Collection	6
3.3	AI-Based Preference Interpretation	6
3.4	Quest Generation System	6
3.5	Location-Based Recommendation Engine	6
3.6	Gamification System	6
3.7	User Activity Tracking & Learning	7
3.8	News & Discovery Module	7
3.9	Notification System	7
3.10	User Settings	7
4	Detailed Functional Requirements	7
4.1	User Account Management	7
4.2	Onboarding Flow	8
4.3	Preference Input & Editing	8
4.4	AI Text Analysis & Keyword Extraction	8
4.5	Quest Creation & Assignment	8
4.6	Quest Interaction (Accept / Skip / Complete)	8
4.7	Location Tracking & Place Suggestions	8
4.8	XP System & Progression Logic	9
4.9	Behavior Learning & Personalization	9
4.10	News Feed Functionality	9
4.11	Notifications & Reminders	9
4.12	UI/UX Behavior	9

5	External Interface Requirements	9
5.1	User Interface (UI Requirements)	9
5.2	Hardware Interfaces	10
5.3	Software Interfaces	10
5.4	Communication Interfaces	10
6	Non-Functional Requirements	10
6.1	Performance	10
6.2	Security	10
6.3	Privacy	11
6.4	Usability	11
6.5	Reliability and Availability	11
6.6	Scalability and Maintainability	11
7	Data Requirements	11
7.1	Data Models Overview	11
7.2	User Data	12
7.3	Preference Data	12
7.4	Quest Data	12
7.5	Activity and History Data	12
7.6	Location Data	13
7.7	AI Processing Data	13
8	Use Cases	13
8.1	Actors	13
8.2	Use Case Diagram	13
8.3	Use Case Overview	14
8.4	Detailed Use Case: Receive and Complete a Quest	14
9	System Behavior and Logic	15
9.1	Quest Recommendation Logic	15
9.2	Preference Scoring System (Star Model)	16
9.3	Learning Algorithm Behavior	16
9.4	Gamification Logic	16
9.5	Quest Diversity and Adaptation Logic	16
9.6	Context Awareness Logic	16
9.7	Notification Decision Logic	16
10	Constraints, Risks and Future Enhancements	17
10.1	Technical Constraints	17
10.2	Privacy and Ethical Considerations	17
10.3	Potential Risks	17
10.4	Future Enhancements	17

11 Appendices	17
11.1 Class Diagram	17
11.2 User Interfaces	19
11.2.1 Splash Screen	19
11.2.2 Main Screen	19
11.2.3 Map Interface	20
11.2.4 Quest Generation	21
11.2.5 History Log	22
11.2.6 User Profile	23
11.2.7 Login	24
11.2.8 Sign Up	25

1 Introduction

1.1 Purpose of the Document

This document defines the functional requirements of the mobile application *SideQuest: Life is a Quest*. It specifies the system's expected behavior, features, and interactions from both user and system perspectives.

It serves as a reference for development, design, and evaluation, ensuring alignment between the application concept and its implementation.

1.2 Scope of the Application

SideQuest: Life is a Quest is an Android mobile application that transforms daily routines into personalized, quest-based experiences.

Users create accounts, define preferences, and provide free-text descriptions. These inputs are analyzed using AI techniques to generate personalized activities (“quests”). The system also leverages location-based services to suggest nearby places such as cafés, gyms, and parks, along with lifestyle activities like learning or social engagement.

A gamification layer rewards users with experience points (XP) and tracks progress. The system adapts over time by learning from user interactions.

This project focuses on core features, including onboarding, preference analysis, quest generation, and activity tracking.

1.3 Definitions, Acronyms, and Abbreviations

- **AI:** Artificial Intelligence used for analyzing user input and generating recommendations.
- **Quest:** A personalized task or activity suggested to the user.
- **XP:** Experience points earned by completing quests.
- **Onboarding:** Initial process of collecting user preferences and information.
- **LBS:** Location-Based Services used for contextual recommendations.

1.4 References

- Android Developers Documentation: <https://developer.android.com>
- Sommerville, I. *Software Engineering*, 10th Edition.

2 Overall Description

2.1 Product Overview

SideQuest: Life is a Quest enhances daily life by transforming routine activities into personalized quests using AI, location-based services, and gamification.

Users receive tailored recommendations based on preferences, behavior, and location. The system encourages exploration, productivity, and lifestyle improvement through a game-inspired interface.

2.2 Product Perspective

The application operates as a standalone Android system integrated with external services such as GPS, place recommendation APIs, and AI processing tools.

Its architecture consists of:

- **Presentation Layer:** User interface and interaction
- **Application Logic Layer:** Quest generation and system logic
- **Data Layer:** User and activity data management
- **Integration Layer:** External APIs and services

2.3 User Personas

- **Explorer:** Seeks new places and experiences
- **Self-Improver:** Focuses on habits and productivity
- **Casual User:** Looks for simple, occasional suggestions

2.4 Operating Environment

The application runs on Android devices and requires:

- Internet connectivity
- GPS access

2.5 Constraints and Dependencies

- Android platform limitation
- Dependence on external APIs
- Mobile resource constraints (battery, memory)

The system assumes users provide accurate data and allow location access.

3 System Features

3.1 User Account Management

This module handles user registration, authentication, and profile management.

- User registration using email and password
- Secure login and authentication
- Profile creation and editing
- Storage of user data and activity history

3.2 Onboarding & Preference Collection

This module collects initial user data for personalization.

- Selection of interests (e.g., food, sports, hobbies, education)
- Free-text user description
- Star-based preference ratings

3.3 AI-Based Preference Interpretation

This module analyzes user input to extract meaningful insights.

- Keyword extraction from text input
- Identification of implicit interests
- Mapping to predefined categories
- Generation of weighted preference scores

3.4 Quest Generation System

This module generates personalized quests.

- Activities such as visiting places, habits, or new experiences
- Based on user preferences, location, and history
- Adjustable frequency (daily or weekly)

3.5 Location-Based Recommendation Engine

This module provides context-aware suggestions using location data.

- User location retrieval via GPS
- Identification of nearby points of interest
- Matching locations with user preferences

3.6 Gamification System

This module increases engagement through game elements.

- XP awarded for completed quests
- Progress tracking and leveling
- Optional achievements (future enhancement)

3.7 User Activity Tracking & Learning

This module tracks behavior and improves personalization.

- Monitoring completed and skipped quests
- Tracking engagement frequency
- Updating preference scores dynamically

3.8 News & Discovery Module

This module provides dynamic and relevant content.

- Local events and activities
- Trending places and experiences
- Content aligned with user interests

3.9 Notification System

This module manages user notifications.

- Quest reminders
- New quest alerts
- Nearby opportunity notifications

3.10 User Settings

This module allows customization of the user experience.

- Preference editing
- Quest frequency settings
- Notification control
- Privacy and location settings

4 Detailed Functional Requirements

4.1 User Account Management

- The system shall allow users to register using an email and password.
- The system shall validate input data (e.g., email format, password strength).
- The system shall allow secure login and logout.
- The system shall maintain authenticated sessions.
- The system shall store and allow editing of user profile data.

4.2 Onboarding Flow

- The system shall guide users through onboarding upon first login.
- The system shall present predefined categories (e.g., food, sports, hobbies).
- The system shall allow selection and rating of preferences.
- The system shall provide a free-text input field.
- The system shall store onboarding data for further processing.

4.3 Preference Input & Editing

- The system shall allow users to modify preferences and ratings.
- The system shall allow adding or removing interests.
- The system shall persist updates upon confirmation or in real time.

4.4 AI Text Analysis & Keyword Extraction

- The system shall analyze user-provided text input.
- The system shall extract keywords and map them to categories.
- The system shall assign weighted scores to inferred preferences.
- The system shall combine explicit and inferred preferences.

4.5 Quest Creation & Assignment

- The system shall generate personalized quests.
- The system shall consider user preferences, location, and history.
- The system shall allow users to define quest frequency.
- The system shall ensure quests are feasible and context-aware.

4.6 Quest Interaction (Accept / Skip / Complete)

- The system shall display available quests.
- The system shall allow users to accept, skip, or complete quests.
- The system shall record interactions and update quest status.

4.7 Location Tracking & Place Suggestions

- The system shall request permission to access location data.
- The system shall retrieve the user's location via GPS.
- The system shall identify nearby points of interest.
- The system shall integrate location-based suggestions into quests.

4.8 XP System & Progression Logic

- The system shall award XP for completed quests.
- The system shall maintain cumulative XP and user levels.
- The system shall update and display progress.

4.9 Behavior Learning & Personalization

- The system shall track user interactions with quests.
- The system shall adjust preference scores dynamically.
- The system shall refine future recommendations.

4.10 News Feed Functionality

- The system shall display a personalized news feed.
- The system shall include local events and trending activities.
- The system shall update content periodically.

4.11 Notifications & Reminders

- The system shall send notifications for new and pending quests.
- The system shall notify users of relevant nearby opportunities.
- The system shall allow users to control notification settings.

4.12 UI/UX Behavior

- The system shall provide a game-like interface.
- The system shall display progress and feedback (e.g., XP gained).
- The system shall ensure consistent navigation and design.

5 External Interface Requirements

5.1 User Interface (UI Requirements)

The application shall provide an intuitive, game-inspired interface suitable for mobile devices.

- Clean and user-friendly layout with consistent color scheme
- Structured presentation of quests (e.g., cards or panels)
- Clear navigation between main sections (quests, profile, news, settings)

- Interactive elements such as buttons, icons, and progress indicators
- Immediate visual feedback (e.g., XP gain, quest completion)
- Readability and accessibility across different screen sizes

5.2 Hardware Interfaces

- Use of GPS for location detection
- Use of network hardware (Wi-Fi/mobile data) for connectivity
- Optional use of local storage for caching data
- Efficient operation within device constraints (battery, memory, CPU)

5.3 Software Interfaces

- Integration with location and mapping APIs
- Use of AI/NLP services for text analysis
- Connection to backend or cloud databases
- Compliance with Android platform standards

5.4 Communication Interfaces

- Communication via secure protocols (HTTPS)
- Data exchange using standard formats (e.g., JSON)
- Handling of network latency and connectivity issues
- Synchronization between device and remote servers

6 Non-Functional Requirements

6.1 Performance

- The system shall respond to user interactions within an acceptable time (typically < 2 seconds).
- The system shall load content and handle API requests efficiently.
- The system shall minimize resource usage, including battery consumption.

6.2 Security

- The system shall ensure secure authentication and prevent unauthorized access.
- The system shall protect data using encryption and secure communication (HTTPS).

6.3 Privacy

- The system shall request user consent before accessing personal data (e.g., location).
- The system shall allow users to manage privacy settings.
- The system shall store only necessary data and avoid unauthorized sharing.

6.4 Usability

- The system shall provide an intuitive and consistent interface.
- The system shall minimize steps required for key actions.
- The system shall provide clear onboarding guidance.

6.5 Reliability and Availability

- The system shall operate reliably and handle errors gracefully.
- The system shall be available under normal conditions, subject to network access.
- The system shall recover from failures with minimal data loss.

6.6 Scalability and Maintainability

- The system shall support increasing users and data without major performance loss.
- The system shall be modular and support future enhancements.
- The system shall follow standard practices for maintainability and testing.

7 Data Requirements

7.1 Data Models Overview

The system uses structured data models to manage user data, preferences, quests, and interactions for personalization and system functionality.

Main entities:

- User
- Preference
- Quest
- Activity History
- Location Data

7.2 User Data

Represents the core user profile.

- User ID
- Email
- Password (securely stored)
- Profile information (optional)
- Registration date

7.3 Preference Data

Represents user interests and priorities.

- Preference categories (e.g., food, sports, hobbies)
- User-selected interests
- Star-based ratings
- AI-inferred preferences

7.4 Quest Data

Represents system-generated activities.

- Quest ID
- Title and description
- Category (e.g., exploration, learning, social)
- Difficulty (optional)
- Location (optional)
- XP reward
- Status (available, accepted, completed, skipped)

7.5 Activity and History Data

Tracks user interactions.

- Completed and skipped quests
- Interaction timestamps
- Usage frequency

7.6 Location Data

Provides context-aware recommendations.

- Geographic coordinates (latitude, longitude)
- Nearby points of interest
- Optional location history

7.7 AI Processing Data

Supports personalization and learning.

- Extracted keywords
- Preference weights and scores
- Behavioral patterns

8 Use Cases

8.1 Actors

Primary Actor:

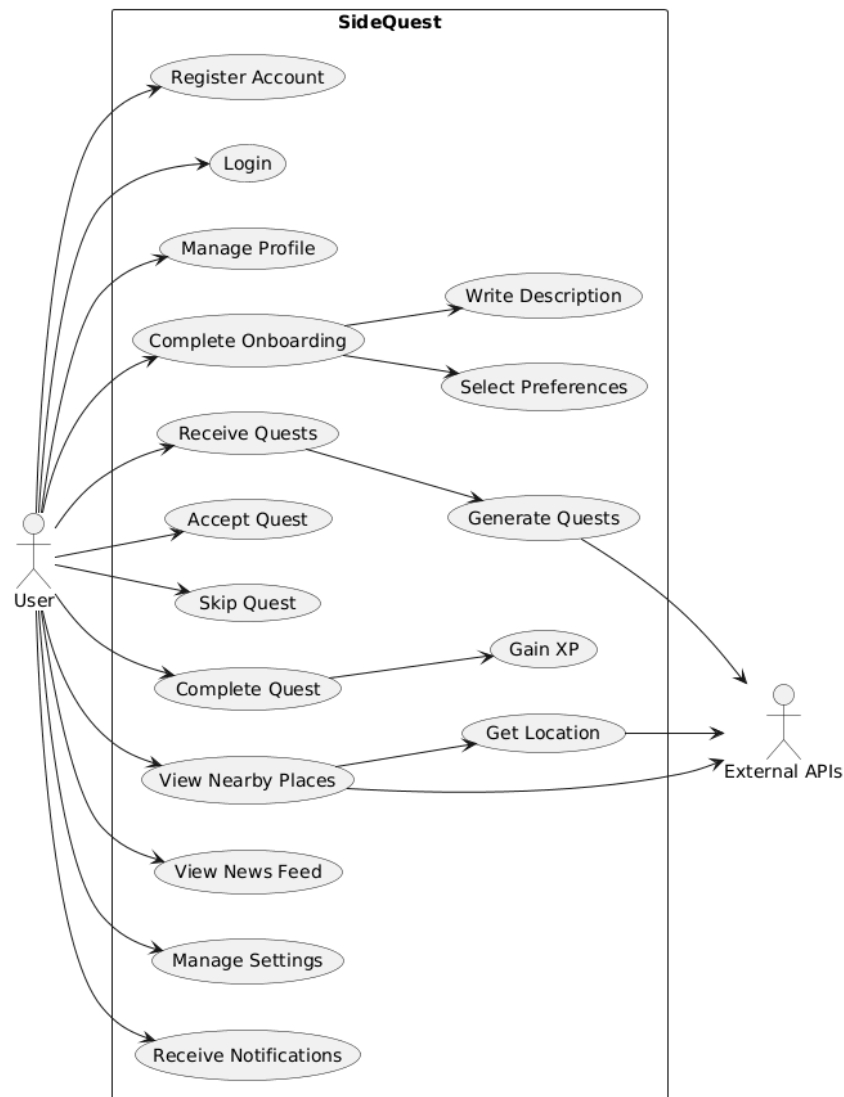
- User: Interacts with the system to receive and complete quests.

Secondary Actors:

- External APIs: Provide location data, place recommendations, and AI processing.

8.2 Use Case Diagram

The following diagram illustrates system interactions:



8.3 Use Case Overview

- Register and login
- Manage profile and preferences
- Complete onboarding
- Receive, accept, skip, and complete quests
- Gain XP and track progress
- View nearby places and news feed
- Manage settings and notifications

8.4 Detailed Use Case: Receive and Complete a Quest

Actor: User

Description: The system generates personalized quests and allows the user to interact with them until completion.

Preconditions:

- User is authenticated
- Onboarding is completed

Postconditions:

- Quest is marked as completed
- XP is awarded
- User history and preferences are updated

Main Flow:

1. System generates personalized quests
2. System displays quests
3. User selects and accepts a quest
4. User performs the activity
5. User marks the quest as completed
6. System awards XP and updates data

Alternative Flows:

- **A1: Skip quest** — system records the action
- **A2: Quest expires** — marked as expired if not completed
- **A3: No location** — system provides non-location-based quests

9 System Behavior and Logic

9.1 Quest Recommendation Logic

The system generates personalized and context-aware quests using the following process:

1. Collect user data (preferences, location, history)
2. Assign weights to preferences (explicit and inferred)
3. Retrieve relevant activities from internal data or APIs
4. Filter activities based on feasibility (e.g., distance, time)
5. Rank quests by relevance and diversity
6. Select quests based on user-defined frequency

9.2 Preference Scoring System (Star Model)

- Preferences are rated on a star-based scale (e.g., 1–5)
- Explicit ratings are combined with AI-inferred scores
- Weighted averages are computed and normalized

9.3 Learning Algorithm Behavior

- Completed quests increase related preference weights
- Skipped quests decrease their relevance
- Frequently selected categories are prioritized
- Preference scores are updated dynamically over time

9.4 Gamification Logic

- Users earn XP for completing quests
- XP contributes to level progression
- Quest rewards vary by difficulty and type

9.5 Quest Diversity and Adaptation Logic

- Repetition of similar quests is limited
- Occasional exploratory quests are introduced
- Balance is maintained between familiar and new activities

9.6 Context Awareness Logic

- Recommendations adapt to time of day
- Location and proximity are considered
- Weekday and weekend behavior is taken into account

9.7 Notification Decision Logic

- Notifications are triggered for new or pending quests
- User preferences are respected
- Notification frequency is controlled to avoid overload

10 Constraints, Risks and Future Enhancements

10.1 Technical Constraints

- Application limited to Android platform (initial version)
- Mobile device constraints (battery, memory, processing power)
- Dependence on external APIs (latency and availability risks)

10.2 Privacy and Ethical Considerations

- Use of sensitive data (location, preferences)
- Risk of privacy violations if data is mishandled
- Ethical responsibility in influencing user behavior

10.3 Potential Risks

- **Low engagement:** Irrelevant or repetitive recommendations
- **Inaccurate AI:** Poor interpretation of user input
- **API failures:** Disruption of core features
- **Privacy concerns:** User reluctance to share data
- **Over-gamification:** Reduced authenticity of experience

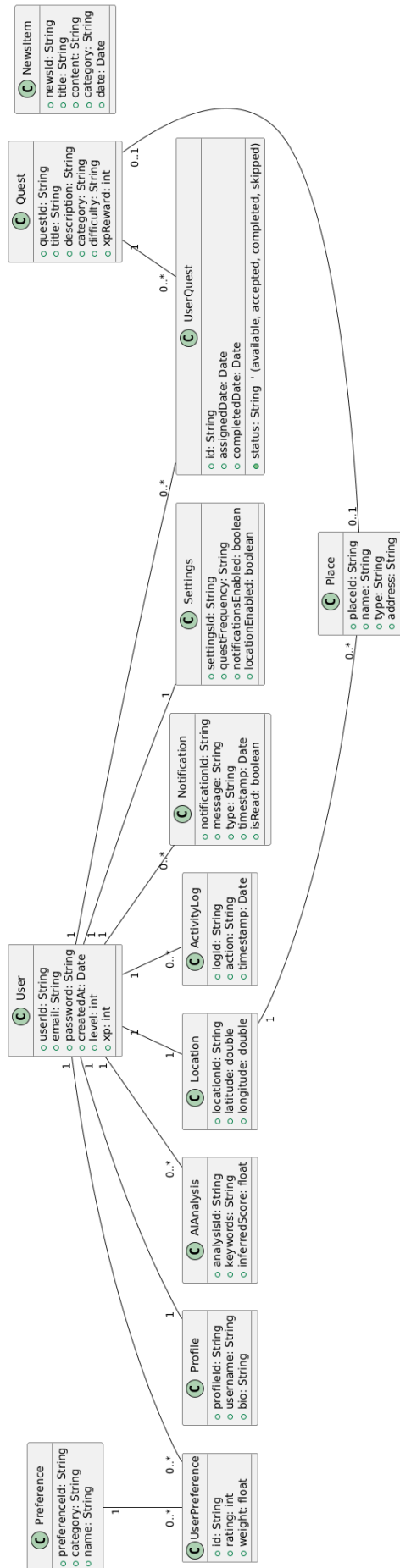
10.4 Future Enhancements

- **Social features:** Friends, shared quests, leaderboards
- **Advanced AI:** Improved personalization and behavioral analysis
- **Quest campaigns:** Multi-step and themed experiences
- **Cross-platform:** iOS, web, and wearable integration

11 Appendices

11.1 Class Diagram

The following diagram represents the system's core entities and relationships.



11.2 User Interfaces

This section presents the main user interfaces of the **SideQuest** mobile application. Each screen reflects a specific functionality of the system and contributes to the overall user experience.

11.2.1 Splash Screen

The splash screen is the entry point of the application. It provides branding and initializes essential resources before navigating to the main interface.

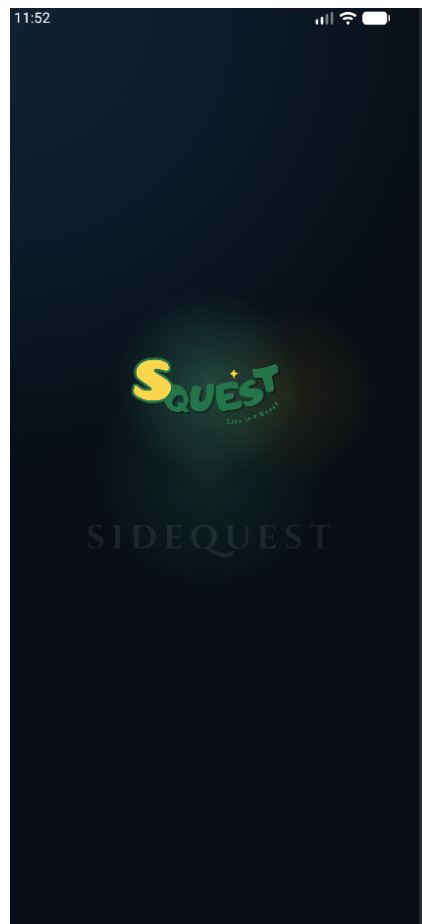


Figure 11.1: Splash Screen

11.2.2 Main Screen

The main screen serves as the central dashboard of the application. It displays active quests, progress, and quick access to core functionalities.

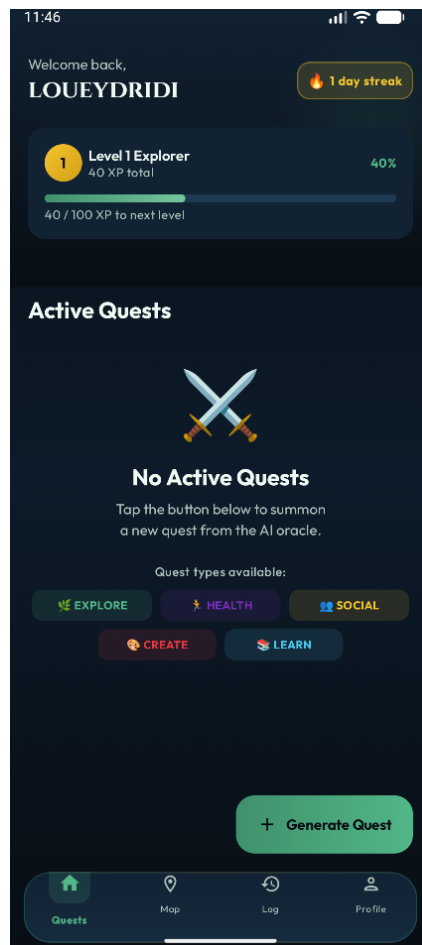


Figure 11.2: Main Screen

11.2.3 Map Interface

The map interface integrates geolocation features, allowing users to visualize nearby quests and interact with location-based triggers.

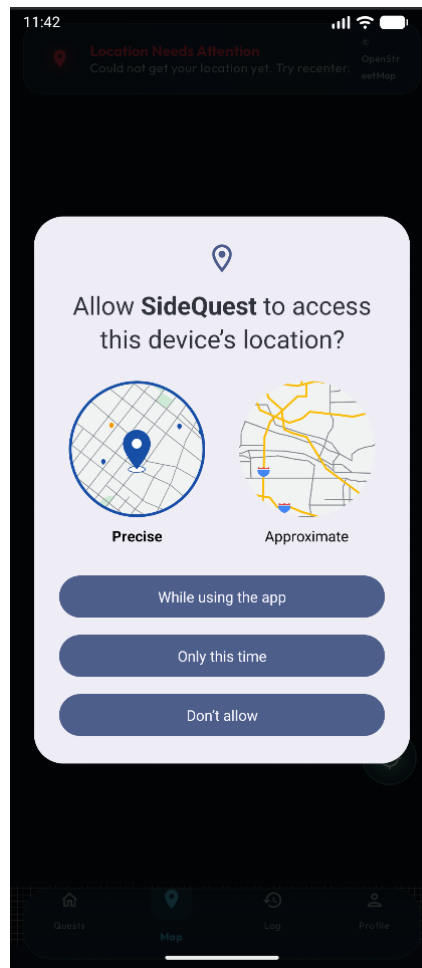


Figure 11.3: Map Interface

11.2.4 Quest Generation

This interface allows users to generate new quests dynamically using AI. The system adapts quests based on user context and preferences.

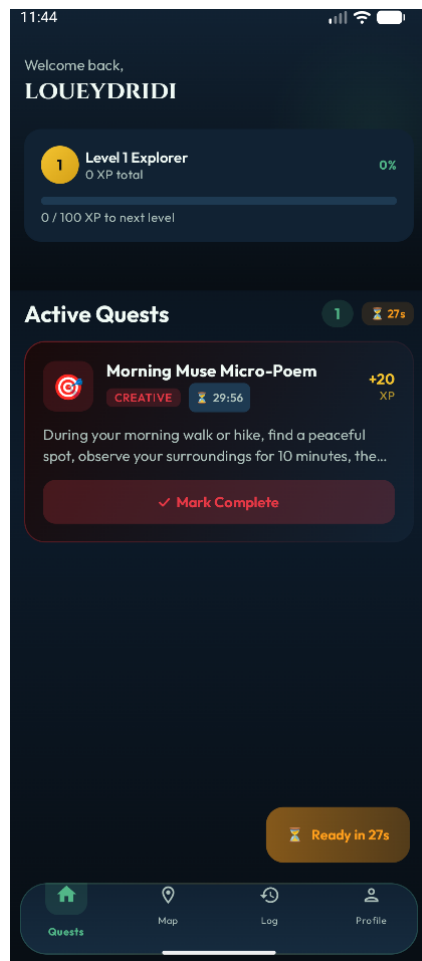


Figure 11.4: Quest Generation Interface

11.2.5 History Log

The history log provides a record of completed quests, enabling users to track their activity and progression over time.

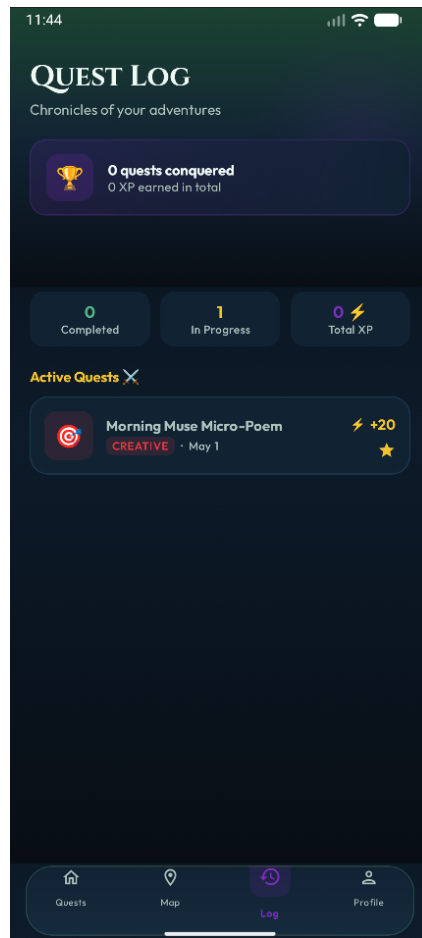


Figure 11.5: History Log

11.2.6 User Profile

The profile screen displays user information, statistics, and achievements, offering a personalized view of the user's journey.

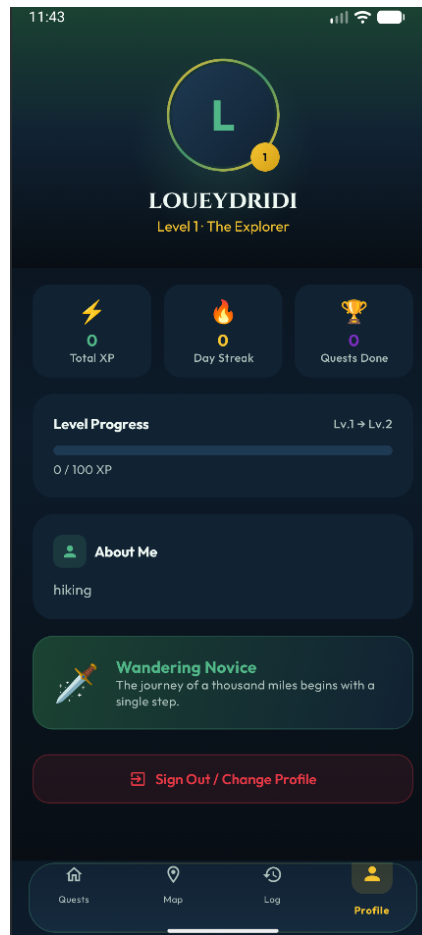


Figure 11.6: User Profile

11.2.7 Login

The login interface allows existing users to securely access their accounts using their credentials.

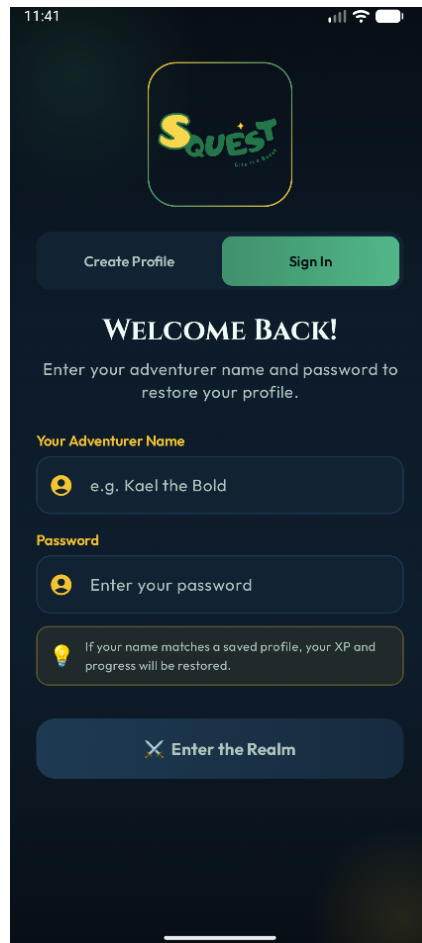


Figure 11.7: Login Interface

11.2.8 Sign Up

The sign-up interface enables new users to create an account and start using the application.

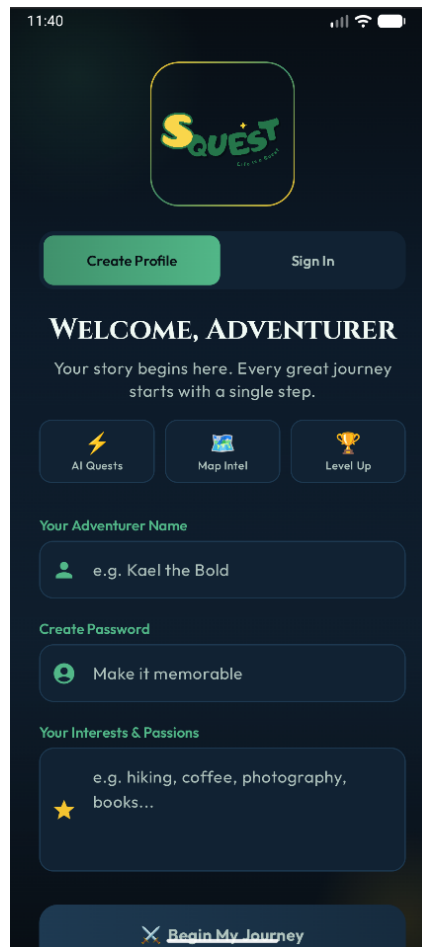


Figure 11.8: Sign Up Interface