
Project Plan

COSC 75: Software Engineering II

UniQuest : University Life Gamify Platform

Entermediates

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Document Change Control

This section provides control for the development and distribution of revisions to the Project Charter up to the point of approval. The Project Charter does not change throughout the project life cycle, but rather is developed at the beginning of the project (immediately following project initiation approval, and in the earliest stages of project planning). The Project Charter provides an ongoing reference for all project stakeholders. The table below includes the revision number (defined within your Documentation Plan Outline), the date of update/issue, the author responsible for the changes, and a brief description of the context and/or scope of the changes in that revision.

Revision Number	Date of Issue	Author(s)	Brief Description of Change
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Disclaimer

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Abstract

University life, especially for freshmen, can often feel overwhelming due to the challenges of navigating a new environment, managing academic requirements, and balancing social interactions. Older students, on the other hand, face ongoing struggles such as workload management, organization involvement, and career preparation.

To address this problem, the proposed project, **UniQuest**, is a gamified mobile application that transforms everyday campus tasks into interactive quests. The system integrates a quest-based task manager, a tips-and-tricks unlockable system, achievement badges, leaderboards, and an interactive campus map. Its primary objective is to guide students through academic and campus life requirements in a fun, engaging, and rewarding way while encouraging participation, productivity, and confidence.

This project will be developed within the institutional context of Cavite State University (CvSU), particularly focusing on Computer Science students, though the app is designed to benefit all year levels.

The assessment scheme will be based on usability testing, functionality checks, and user feedback from both freshmen and upperclassmen, ensuring the application is effective, engaging, and scalable.

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I. The Problem Domain

1.1 Statement of the Problem

Students face a variety of obstacles when they first enroll in and continue their university education. Navigating the campus, juggling multiple enrollment requirements, and adjusting to a new academic culture are all challenges for freshmen. Elderly students, on the other hand, frequently struggle with meeting deadlines, juggling extracurricular activities, getting ready for research or internships, and remaining involved in campus life.

There isn't a centralized, gamified digital system in place right now to help students with these difficulties. The majority rely on ineffective and hard-to-follow methods like paper handouts, static schedules, peer advice, or dispersed online announcements. Students suffer from misunderstandings, missing assignments, and decreased engagement as a result.

The need for a gamified system that tackles both new student orientation and ongoing student engagement across different year levels is highlighted by the absence of a cohesive and interactive solution.

1.2 Background and Rationale

The project was initiated by observing institutional gaps in student support and task management. While the university provides standard orientations, academic calendars, and announcements, these resources are often fragmented and unengaging.

Additionally:

- Freshmen lack a guided, interactive way to explore the campus and complete requirements.
- Returning students still need tools for workload tracking, campus navigation, and career development.
- Current digital resources (e.g., Facebook announcements, printed schedules) are static and not personalized.

The rationale of the project is to reframe university life as a game-like experience through UniQuest. By gamifying everyday academic and campus tasks, the system addresses both the functional need (guidance and reminders) and the motivational gap (engagement and rewards).

1.3 Objectives

General Objective:

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To design and develop a gamified mobile application that enhances student engagement and productivity by transforming academic and campus life tasks into interactive quests.

Specific Objectives:

1. To create a quest system for academic, extracurricular, and personal student tasks.
2. To integrate the university map via API for easier campus navigation.
3. To provide unlockable tips, tricks, and resources that guide students at all year levels.
4. To implement achievement badges and leaderboards that motivate student participation.
5. To ensure the system is scalable, user-friendly, and secure through iterative development and testing.
6. To evaluate the effectiveness of the application through usability testing and student feedback.
7. To provide administrative tools for quest management and student engagement monitoring (future development).

1.4 Significance and Scope of the Project

Significance:

- **Students (Freshmen & Upperclassmen):** Gain structured, fun, and supportive tools for campus life and academics.
- **University Administration & Organizations:** Benefit from increased student participation, engagement, and retention.
- **Discipline/Area of Interest:** Demonstrates the potential of gamification in education, contributing to the field of educational technology.

Scope:

The UniQuest project aims to develop a gamified mobile application that enhances student engagement by transforming daily academic and campus activities into interactive quests and challenges. The system promotes motivation, collaboration, and healthy competition among students while helping them track academic progress in a fun and organized way. It will also provide university administrators with tools to manage quests, monitor engagement, and encourage student participation.

Key Components:

- **Gamified Student Life** – Converts everyday academic and campus tasks into quests and interactive challenges.
- **Achievement & Rewards System** – Allows students to earn badges, XP that can be used for unlocking in-game items and customization.

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- **Interactive Campus Map** – Integrates an API-based university map to help students navigate key campus locations and quest areas.
- **Social & Competitive Features** – Includes leaderboards, daily challenges, and batchmate competitions to encourage interaction and friendly rivalry.
- **Customization with Cosmetics** – Lets players spend earned in-game currency to personalize avatars, themes, and quest trackers for a unique experience.

Out of Scope:

- **Third-Party System Integration** – Integration with academic or administrative systems outside the university's existing infrastructure will not be included.
- **Web-Based Version** – The project will focus solely on the mobile application; no web version will be developed in this phase.
- **Hardware-Dependent Features** – Functions requiring physical devices, such as NFC-based attendance or ID scanning, are excluded.
- **Server Hosting and Maintenance** – Ongoing hosting, maintenance, and technical support beyond initial deployment are not part of this phase.
- **Long-Term Content Management** – Continuous quest creation and in-app content updates after launch will not be covered.
- **Third-Party API Licensing** – Paid or external API services not originally included in the project plan are excluded.
- **Cross-Institution Expansion** – Multi-university or inter-campus integration will not be implemented during the initial release.

Limitations:

- Dependent on availability of the university map API.
- Initial deployment targeted at Computer Science students as pilot users.
- Limited to mobile platforms (Android and iOS) for initial phase.

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II. Project Organization

2.1 External Interfaces

The UniQuest project is developed under the auspices of the Computer Science Student Organization (CSSO) of Cavite State University - Don Severino De Las Alas Campus for Academic Year 2025-2026.

The organizational hierarchy relevant to the project includes:

Executive Leadership:

- **President: Sahara Clear C. Nedia**
 - Overall supervision and strategic direction of all organizational projects
 - Final approval authority for project initiatives and resource allocation
- **VP for Operations and Academic Affairs: Carlos Joseph Dela Cruz Eudela**
 - Direct oversight of academic-related projects including UniQuest
 - Coordination between technical teams and academic stakeholders
 - Quality assurance and compliance with institutional standards

Supporting Officers:

- **VP for Internal Affairs: Khim Raphael O. Tabar**
 - Internal coordination and team management support
- **VP for External Affairs: Jovan Wayne B. Andrade**
 - External stakeholder communication and partnership coordination
- **VP for Records and Documentation: Joshelle D. Delos Reyes**
 - Project documentation oversight and archival management
- **VP for Finance and Budget Management: Christine Anne C. Alcantara**
 - Budget allocation and financial resource management
- **VP for Public Relations and Information: Samuel Antonio F. Oracion**

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- Communication strategy and information dissemination

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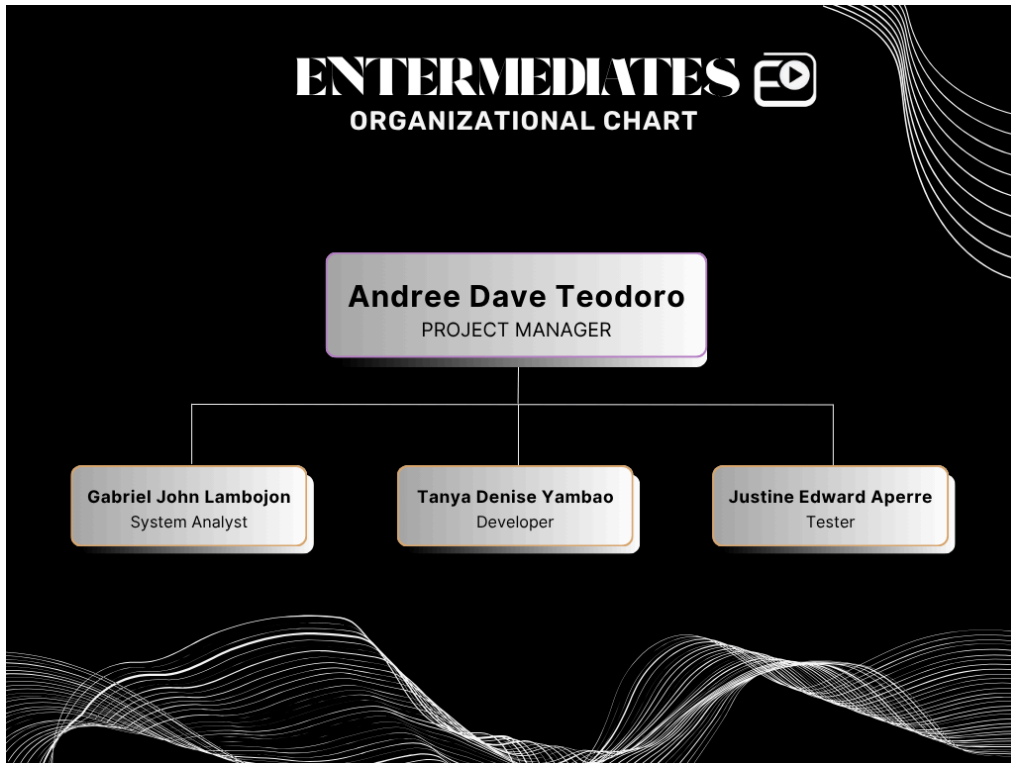


2.2 Internal Structure

The project team consists of members assigned to specific roles to ensure efficient development and management of UniQuest.

- **Project Manager:** Oversees the project, manages schedules, and ensures deliverables are met.
- **System Analyst:** Gathers requirements from the client and translates them into system features.
- **Developers/Programmers:** Responsible for coding, integration, and implementation of the application.
- **Tester/QA Specialist:** Conducts system testing, bug identification, and ensures quality output.
- **Documentation Specialist:** Prepares reports, documents, and final deliverables.

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Hierarchy Chart – Internal Structure:

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2.3 Roles and Responsibilities

Activity	Nature	Supporting Processes	Responsible Person/Team
Project Management	Oversight and coordination	Scheduling, monitoring progress, resource allocation	Project Manager
Requirement Analysis	Gathering needs from client/org	Interviews, surveys, meetings, data gathering	System Analyst
System Development	Designing and coding the UniQuest app	Frontend and backend programming, API integration	Developers
Testing/Quality Check	Ensuring system stability and performance	Unit testing, integration testing, bug fixing	QA/Testers
Documentation	Recording project outputs and progress	Reports, manuals, documentation of design and testing	Documentation Specialist
Admin Support (Future)	Quest management and engagement monitoring	Creating quests, viewing analytics, event oversight	Faculty/Staff

2.4 Deliverables

The project's overall solution is the **UniQuest mobile application**, designed to gamify campus life and assist students in task management, navigation, and engagement. The key deliverables are:

1. **Functional Prototype of UniQuest** – Core features implemented, including quest system, tips unlockables, achievement badges, leaderboards, and interactive map.
2. **System Documentation** – Includes requirement specifications, design documents, and testing reports.
3. **User Guide/Manual** – A concise guide for students and org representatives on how to use the app.

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4. **Administrator Guide** (Future) – Documentation for faculty and staff managing quests and monitoring engagement.
 5. **Final Project Report** – Comprehensive report detailing project development, outcomes, and evaluations.
 6. **Presentation/Demo** – Live demonstration of the application to client and supervising faculty.
 7. **Source Code and Technical Documentation** – Code repository with inline documentation for maintenance by the UniQuest team.
-

III. Review of Existing Alternatives

3.1 Habitica

Habitica is a productivity and habit-building app that transforms everyday goals into a fun, role-playing game. It helps users stay motivated by turning tasks, habits, and to-do lists into challenges that reward them with experience points, gold, and other in-game items when completed. The app features customizable avatars, quests, and community guilds where users can collaborate and stay accountable.

Key Strengths:

- RPG-style gamification encourages habit formation
- Community guilds foster accountability and motivation
- Simplistic design with beautiful pixelated animations
- Comprehensive reward system with XP and cosmetics

Application to UniQuest: UniQuest gamifies college life through RPG-style presentation and a reward system much like Habitica. UniQuest differs from Habitica in terms of its habit-building focus and classification of quests, since UniQuest will focus more on academic activities and other university quests users might be interested in doing, hence the name.

3.2 LifeUp

LifeUp is a highly customizable gamified task and habit-building app that transforms everyday tasks into interactive missions that award users with experience points, achievements, and virtual rewards upon completion. The app allows users to set custom tasks, track progress, and earn level-ups. It blends productivity with a light role-play game experience.

Key Strengths:

- Minimalist but colorful interface

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- Flexible, custom task configuration
- Emphasis on intrinsic motivation

Application to UniQuest: LifeUp serves as inspiration for integrating gamification with meaningful progression systems. While LifeUp focuses on individual growth across all life domains, UniQuest adapts this approach to academic and campus life, making it more community-driven and academically focused.

3.3 Habit Rabbit

Habit Rabbit is a cute and creative habit-tracking app that turns productivity into something fun and rewarding. Users take care of a virtual rabbit that grows happier as they complete their daily habits. This makes building routines feel less like a chore and more like a game.

Key Strengths:

- Emotionally engaging design encourages motivation
- Simplistic and approachable interface
- Pet-based motivation system

Limitations:

- No teamwork or collaboration tools
- Limited for group projects or professional environments

Application to UniQuest: Habit Rabbit shows how gamified elements can make users more motivated to reach their goals. While Habit Rabbit helps individuals stay consistent with daily habits, UniQuest applies the same idea to school life—turning academic tasks and campus activities into engaging challenges.

3.4 Bitrix24

Bitrix24 is a productivity and project management platform mainly designed for corporate settings. It focuses on improving organizational workflow through advanced task tracking, communication, and project coordination features. Its business-oriented approach makes it an effective tool for companies aiming to boost efficiency and teamwork.

Key Strengths:

- Advanced task management and collaboration tools
- Strong team coordination features

Limitations:

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- Lacks gamification features
- Complex interface unsuitable for students
- Work-centric motivation system

Application to UniQuest: Bitrix24 provides valuable insight into structured task organization and team collaboration that can be adapted in a student-friendly way. While Bitrix24 focuses on corporate productivity, UniQuest applies similar task management principles but enhances them with gamified features and achievements.

3.5 Overall Summary

Feature / App	Habitica	LifeUp	Habit Rabbit	Bitrix24	UniQuest
Gamification	✓ RPG style	✓ Achievement based	✓ Pet-based rewards	✗ None	✓ Student quests, badges
Task Management	✓ Habits & dailies	✓ Custom tasks	✓ Daily habit tracker	✓ Advanced project management	✓ Academic & campus tasks
Community / Collaboration	✓ Guilds/parties	✗ Limited	✗ None	✓ Strong (corporate teams)	✓ Student orgs, peer quests
Campus Relevance	✗ Generic habits	✗ General growth	✗ Personal focus	✗ Corporate focus	✓ Tailored to campus/student life
Ease of Use for Students	✓ Simple	✓ Moderate	✓ Very simple	✗ Complex	✓ Student-friendly
Motivation System	✓ XP & rewards	✓ Level-up	✓ Pet care motivation	✗ Work-centric	✓ Achievements, leaderboards

Based on the comparison above, UniQuest distinguishes itself by combining gamified productivity and collaborative functionality specifically tailored for the student environment. UniQuest offers a balanced blend of motivation, usability, and community-driven productivity that directly aligns with the student experience.

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IV. Approach to be Taken

4.1 Theoretical Framework / Methods to be Used

The development of *UniQuest* will follow the **Agile Software Development Methodology**, particularly **Scrum**, due to its iterative and incremental nature. Agile is suitable for projects that require frequent feedback and adaptation, especially in addressing the evolving needs of students and organizations.

The project will adopt the following approaches:

- **Requirement Gathering & Analysis:** Conduct interviews and surveys with the Client (CSSO) and target users (freshmen students).
- **Prototyping:** Develop low-fidelity and high-fidelity prototypes to visualize user flows and design.
- **Incremental Development:** Break down features (quests, map integration, badges, customization) into sprints for faster delivery and refinement.
- **Testing & Feedback:** Regularly test components with the Client and selected users to ensure usability and relevance.
- **Deployment & Maintenance:** Provide a functioning prototype/system for evaluation and maintain updates as necessary.

4.2 Rationale for the Framework / Methods

The use of Agile–Scrum is justified because:

- The project requires continuous collaboration with a student organization as the client.
- Student-related needs may change over the course of development, requiring flexibility.
- Iterative sprints allow the team to deliver working features early (e.g., task quests, achievement badges, leaderboards) rather than waiting for full system completion.
- Frequent evaluations ensure that the system is aligned with student life and campus requirements, avoiding wasted development time.
- Agile encourages user feedback integration, which is essential since the app's success depends on student engagement.

4.3 Technologies to be Considered or Used

The UniQuest application will be developed using **FlutterFlow**, a visual low-code platform built on **Flutter** (Google's cross-platform framework) for building responsive mobile applications.

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FlutterFlow enables rapid UI development through visual design while maintaining the power of native Flutter code.

Frontend & UI:

- **FlutterFlow** – Visual app builder for rapid UI/UX development
- **Flutter Framework** – Auto-generated native code for iOS and Android
- **Dart Language** – Programming language used by Flutter (auto-generated from FlutterFlow)
- **Custom Code Blocks** – Option to add Dart code for complex logic

Backend & Database:

- **Supabase** – Backend-as-a-service providing:
 - Supabase Authentication for secure user login and session management
 - PostgreSQL Database for structured data storage
 - Supabase Storage for media assets (icons, badges, avatars)
 - Supabase Real-time Services for live data synchronization
 - Supabase Edge Functions for backend business logic

API & Third-Party Services:

- **Google Maps API** or **Mapbox SDK** – For interactive campus map integration and location-based quests

Development Tools:

- **Visual Studio Code** – Code editor for development
- **Figma** – For creating visual prototypes, wireframes, and graphical elements before integration into FlutterFlow
- **GitHub** – For code version control and team collaboration
- **Postman** – For API testing and validation
- **Android Emulator / iOS Simulator** – For testing and debugging

Testing & Deployment:

- **Flutter SDK** with built-in testing frameworks
- **Firebase Cloud Messaging** (optional) – For future push notification features

Why These Technologies:

- **FlutterFlow + Flutter:** Cross-platform compatibility (iOS and Android), rapid development, code generation, scalability

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- **Supabase:** Open-source, PostgreSQL reliability, real-time capabilities, cost-effective, strong mobile integration
- **Google Maps/Mapbox:** Well-documented, accurate location services, campus integration capability

These technologies were chosen for their:

- Cross-platform compatibility (iOS and Android)
- Scalability and real-time data capabilities
- Strong support for mobile-first development
- Cost-efficiency and open-source advantages
- Ease of integration and maintenance by the development team

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V. System Design

5.1 Requirements

Functional Requirements

User Authentication & Profile:

1. The system **shall allow users** (students) to register and log in using their university email or credentials.
2. The system **shall display** user profiles with avatar customization, level, and XP balance.

Quest Management: 3. The system **shall display** available quests with objectives, descriptions, and location details. 4. The system **shall allow users** to accept, track progress, and complete quests. 5. The system **shall update quest status** in real-time upon completion. 6. The system **shall award XP and badges** for completed quests.

Achievement & Rewards System: 7. The system **shall record and display** user performance (XP, badges, progress). 8. The system **shall display** a leaderboard of top users by XP, badges, or completion rates. 9. The system **shall allow users** to view and share achievements within the UniQuest community.

Interactive Campus Map: 10. The system **shall render a dynamic map view** using the integrated Map API (Google Maps/Mapbox). 11. The system **shall query the map_markers table** in Supabase to display active quest locations as pins. 12. The system **shall allow users** to tap on map markers to view quest details and navigation info.

Customization & In-Game Currency: 13. The system **shall allow users** to purchase cosmetics (avatars, themes, quest trackers) using earned XP. 14. The system **shall store user-selected cosmetics** and apply them to the user interface. 15. The system **shall deduct in-game currency** (XP/Coins) upon cosmetic purchase.

Notifications & Updates: 16. The system **shall notify users** about new quests, deadlines, and achievements through in-app alerts. 17. The system **shall display temporary pop-up messages** (toast notifications) confirming successful actions. 18. The system **shall show visual error alerts** if an action cannot be completed (e.g., "GPS location not found").

Social & Competitive Features: 19. The system **shall support batch/departments-based competitions** with tracking and rankings. 20. The system **shall generate individual and group leaderboards** for friendly rivalry and motivation.

Administrative Features (Future Development): 21. The system **shall provide an admin dashboard** for faculty and staff to manage quests. 22. The system **shall allow admins** to view

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user engagement statistics and participation trends. 23. The system **shall support quest creation and content management** by authorized personnel.

Design Requirements

1. The system **shall use a consistent and minimalist UI design** for clarity and accessibility.
2. The system **shall be mobile-first**, optimized for Android and iOS.
3. The system **shall implement a gamified interface**, including progress bars, icons, and color-coded quest indicators.
4. The system **shall display featured quests, achievements, and events** in a visually engaging layout.
5. The system **shall have responsive design** ensuring compatibility across mobile devices and future web browsers.
6. The system **shall comply with Web Content Accessibility Guidelines (WCAG 2.1)** for inclusivity.

Security Requirements

1. The system **shall use Supabase Authentication** for secure user login and session management.
2. The system **shall encrypt user credentials** using secure hashing algorithms.
3. The system **shall restrict access** to administrative functions using role-based access control.
4. The system **shall protect against SQL injection, cross-site scripting (XSS), and data tampering**.
5. All data in transit **shall be encrypted using HTTPS (TLS 1.2 or later)**.
6. The system **shall comply with the Data Privacy Act of 2012** (Republic Act No. 10173) of the Philippines.

Safety Requirements

1. The system **shall maintain data backups** in Supabase's secure storage to prevent data loss.
2. The system **shall ensure user privacy** in compliance with GDPR principles and local data protection regulations.
3. The system **shall prevent accidental data deletion** by requiring confirmation dialogs for critical actions.

Performance Requirements

1. The system **shall load the home screen within 3 seconds** under normal network conditions.
2. The system **shall support at least 1,000 concurrent users** without significant delay.
3. The system **shall have at least 99% uptime** during peak academic seasons.
4. The system **shall provide real-time synchronization** of data between users and the Supabase backend.

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5. Supabase database **shall efficiently handle CRUD operations** and real-time updates.

5.2 Resources

Resource Type	Description / Specification
Hardware	Android and iOS mobile devices for testing; development PCs with at least 8GB RAM; cloud infrastructure via Supabase
Software Tools	FlutterFlow, Flutter SDK, Node.js, PostgreSQL, Supabase, Visual Studio Code, Figma
Version Control	GitHub repository for source code management and team collaboration
Design Tools	Figma (UI/UX design, wireframes, prototypes), Lucidchart (ERD and system diagrams)
Backend / Database	Supabase (PostgreSQL, Authentication, Storage, Real-time Services, Edge Functions)
APIs	Google Maps API or Mapbox SDK (campus map integration), Supabase REST API
Testing Tools	Postman (API testing), Android Emulator, iOS Simulator, Flutter testing frameworks
Documentation	Markdown files, Google Docs, SRS document, Project Plan, Technical Documentation

5.3 System Overview

UniQuest is designed as a mobile-first educational and productivity application that gamifies student life for both freshmen and upper-year students. Its architecture integrates FlutterFlow (for frontend development) and Supabase (for backend services), ensuring scalability, maintainability, and cross-platform usability.

The system converts academic and campus activities into quests, rewards users with badges, achievements, and leaderboard rankings, and provides helpful resources and tips. The high-level design follows a **three-tier layered architecture** that separates concerns between presentation, business logic, and data storage.

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5.4 System Architecture

Overview

UniQuest follows a **three-tier layered architecture** specifically designed for FlutterFlow development with Supabase backend, ensuring scalability, maintainability, and real-time data synchronization across the application.

Layer 1: Presentation Layer (FlutterFlow UI)

Responsibility: Handle all user-facing components and interactions

Components:

- **Pages:** Individual screens representing different parts of the application (Login, Dashboard, Quests, Map, Profile, Leaderboard, Admin Panel)
- **Widgets:** Reusable UI components (buttons, cards, progress bars, badges, forms)
- **Navigation:** Page routing and screen transitions
- **UI State Management:** Component-level state for dynamic UI rendering
- **Design System:** Consistent styling, colors, typography, spacing, and animations applied across the app

Technology Stack:

- **FlutterFlow:** Visual builder for constructing responsive, pixel-perfect UI
- **Flutter Widgets:** Native Flutter components auto-generated from FlutterFlow design
- **Custom Code Blocks:** Allow developers to add Dart code for complex UI logic when needed

Key Screens Built in FlutterFlow:

1. **Authentication Screens** – Login, Sign-up, Password reset (connected to Supabase Auth)
2. **Dashboard** – Home screen showing user stats, active quests, XP, badges
3. **Quest Management** – View, accept, track, and complete quests
4. **Campus Map** – Interactive map showing quest markers and locations
5. **Profile & Customization** – User profile, avatar customization, cosmetics shop
6. **Leaderboards** – Global and batch-based rankings
7. **Admin Dashboard (Future)** – Quest creation, engagement analytics, user management

Layer 2: Business Logic Layer (FlutterFlow Action Flows & Services)

Responsibility: Handle application logic, state management, and data transformations

Components:

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- **State Management:** App-level and page-level variables for storing dynamic data (user info, quest progress, XP, leaderboard data)
- **Action Flows:** Visual workflows in FlutterFlow that define how the app responds to user events (button clicks, form submissions, data updates)
- **Custom Code Blocks:** Dart code for complex business logic not easily handled by visual components
- **Data Services:** Custom modules that handle business rules like XP calculation, badge assignment, leaderboard sorting
- **Event Handlers:** Respond to user interactions (button taps, list item selections, map marker clicks)
- **Form Validation:** Validate user inputs before sending data to the backend

Key Action Flow Examples:

- Accept Quest → Validate user eligibility → Update local state → Call Supabase to record quest_progress
- Complete Quest → Call Supabase to mark quest as complete → Award XP → Update leaderboard → Display success notification
- Purchase Cosmetic → Deduct XP → Call Supabase to update user_cosmetics table → Re-render UI with new cosmetics

Data Binding:

- FlutterFlow pages are bound to Supabase data sources, automatically pulling and displaying real-time data
- When Supabase data changes, subscriptions trigger automatic UI updates (real-time synchronization)

Layer 3: Data Layer (Supabase Backend)

Responsibility: Store, retrieve, manage, and synchronize application data

3.1 Authentication Service

- **Supabase Authentication** handles secure user login/signup
- Supports email-password authentication with optional future extensions (OAuth, SSO)
- Manages session tokens and user identity verification
- Role-based access control (RBAC) for admin vs. student users
- Automatic token refresh and secure storage on client

3.2 PostgreSQL Database

Core Tables:

- **users** - User profiles (id, email, username, avatar_id, level, total_xp, created_at)
- **quests** - Quest definitions (id, title, description, xp_reward, location, difficulty, category)

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- **quest_progress** - User quest completion records (id, user_id, quest_id, status, progress_percentage, completed_at)
- **achievements** - Badge/achievement definitions (id, name, description, icon_url, xp_threshold)
- **user_achievements** - User achievement records (id, user_id, achievement_id, unlocked_at)
- **cosmetics** - Cosmetic items catalog (id, name, type, xp_cost, image_url)
- **user_cosmetics** - User cosmetic purchases (id, user_id, cosmetic_id, equipped, purchased_at)
- **map_markers** - Campus locations and quest areas (id, latitude, longitude, location_name, description, quest_id)
- **leaderboard** - Cached leaderboard data for performance (id, user_id, rank, total_xp, total_badges, updated_at)

3.3 Realtime Subscriptions

- Enables live updates to leaderboards when users earn XP
- Live notifications when new quests are added
- Real-time synchronization of user achievements across devices
- WebSocket-based connection for instant data push from server to client

3.4 Cloud Storage

- Stores media assets: user avatars, achievement badge icons, cosmetic item images
- Campus map tiles and overlay assets
- Backup and versioning of user-generated content

3.5 Edge Functions (Serverless Backend Logic)

- Calculate XP awards when quests are completed
- Trigger badge unlock conditions when thresholds are met
- Update leaderboard rankings
- Send push notifications
- Generate engagement reports for admin dashboard
- Handle complex business rules not executed on the client

Example Edge Function: Quest Completion Handler

On quest marked complete:

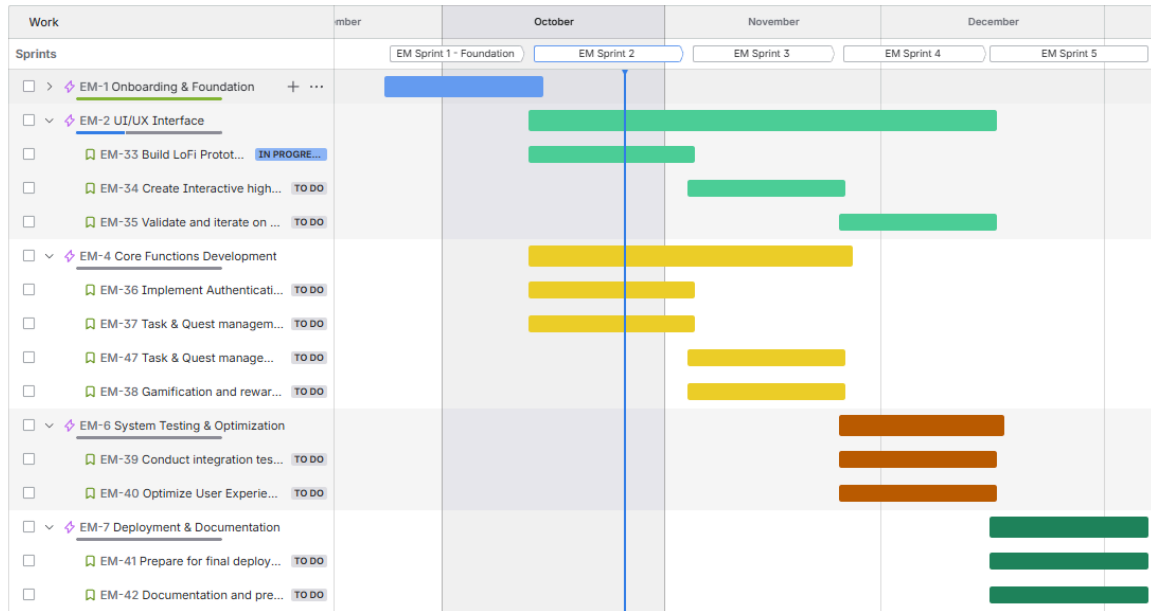
1. Validate quest completion conditions
2. Award XP to user
3. Check badge unlock thresholds

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4. Update user_achievements if badges earned
5. Trigger leaderboard recalculation
6. Send notification to user

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VI. Project Timeline



6.1 Gantt Chart

The Gantt chart illustrates the overall timeline and sprint distribution of the EnterMediates Project using an Agile–Scrum approach. The project is divided into five sprints, each focusing on specific deliverables to ensure iterative progress and flexibility.

The chart shows overlapping tasks that reflect concurrent work among UI/UX, core functions, and testing teams. It promotes collaboration and continuous integration throughout the development cycle.

Sprint Overview:

- **Sprint 1: Foundation** (September – Early October)
 - Focuses on project initiation, defining scope, and establishing design and data foundations
 - Deliverables: Project Charter, Requirement Analysis, Database Schema, Design System
- **Sprint 2: UI/UX Interface** (October – December)
 - Involves creating low-fidelity and high-fidelity prototypes and iterating based on feedback
 - Deliverables: Wireframes, Interactive Prototypes, Design Guidelines, Stakeholder Feedback Incorporated

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- **Sprint 3: Core Functions Development** (November – December)
 - Handles backend and frontend development for core functionalities: authentication, quest management, gamification, map integration
 - Deliverables: Working Backend, API Endpoints, Frontend Components, Quest Management System, Leaderboard Module
- **Sprint 4: System Testing & Optimization** (December)
 - Covers system integration testing, performance optimization, and bug fixes
 - Deliverables: Test Reports, Performance Metrics, Optimized Code, User Feedback Compilation
- **Sprint 5: Deployment & Documentation** (Late December – January)
 - Final sprint for system deployment, documentation completion, and presentation preparation
 - Deliverables: Production-Ready App, Complete Documentation, User Manuals, Administrator Guide, Final Presentation

The Agile Gantt layout allows task dependencies to overlap. It shows how design, development, and testing occur in iterative cycles rather than a traditional linear (waterfall) flow. This hybrid scheduling ensures adaptability while maintaining structured milestones.

6.2 Work Breakdown Structure (WBS)

The Work Breakdown Structure (WBS) breaks down the project into manageable components aligned with each sprint. It defines the Epics, User Stories, and Tasks that guide development and progress tracking.

Level	WBS Code	Task Name	Description	Sprint
1	EM	EnterMediates Project	Overall system development lifecycle following Agile methodology	---
2	EM-1	Onboarding & Foundation	Define scope, objectives, and establish core foundations	Sprint 1

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Level	WBS Code	Task Name	Description	Sprint
3	EM-1.1	Define Project Scope and Objectives	Identify goals, system requirements, and project success criteria	Sprint 1
3	EM-1.2	Establish Design and Data Foundations	Set up UI guidelines, database structure, Supabase schema, and design systems	Sprint 1
2	EM-2	UI/UX Interface Design	Develop and iterate user interface design and experience	Sprint 2
3	EM-2.1	Build Low-Fidelity Prototype	Create early wireframes and screen flows for major modules in Figma	Sprint 2
3	EM-2.2	Create High-Fidelity Prototype	Build interactive prototypes in FlutterFlow simulating actual user experience	Sprint 2
3	EM-2.3	Validate and Iterate on UI	Conduct stakeholder reviews and integrate feedback into design	Sprint 2
2	EM-3	Core Functions Development	Implement main application logic and features	Sprint 3

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Level	WBS Code	Task Name	Description	Sprint
3	EM-3.1	Implement Authentication & User Profile	Build login, signup, and profile management modules using Supabase	Sprint 3
3	EM-3.2	Task & Quest Management System (Basic)	Develop a working quest system prototype with database integration	Sprint 3
3	EM-3.3	Task & Quest Management (Complete)	Finalize the quest and task modules with full Supabase database integration	Sprint 3
3	EM-3.4	Gamification & Reward Logic	Add reward systems, XP calculations, and badge unlock mechanics	Sprint 3
3	EM-3.5	Interactive Campus Map Integration	Integrate Map API, render quest pins, and implement marker interactions	Sprint 3
3	EM-3.6	Leaderboard & Social Features	Develop leaderboards, achievement displays, and social competition features	Sprint 3
2	EM-4	System Testing & Optimization	Ensure stability, functionality,	Sprint 4

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Level	WBS Code	Task Name	Description	Sprint
			and usability of the system	
3	EM-4.1	Conduct Integration Testing	Test cross-module functionality, API integration, and data synchronization	Sprint 4
3	EM-4.2	Performance & Usability Testing	Test load handling, response times, and user experience flows	Sprint 4
3	EM-4.3	Optimize User Experience	Improve UI flow, fix bugs, enhance responsiveness, and refine animations	Sprint 4
2	EM-5	Deployment & Documentation	Finalize and release the project with proper documentation	Sprint 5
3	EM-5.1	Prepare for Final Deployment	Conduct final packaging, build release versions, and test on real devices	Sprint 5
3	EM-5.2	Complete System Documentation	Finalize technical documentation, API documentation, and code comments	Sprint 5

Level	WBS Code	Task Name	Description	Sprint
3	EM-5.3	Prepare User & Admin Manuals	Compile user guides, administrator guides, and quick reference materials	Sprint 5
3	EM-5.4	Final Presentation & Demo	Prepare and conduct final presentation to stakeholders and faculty	Sprint 5

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