

XPK App

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This is to certify that the project titled “**XPk App**” is the real work carried out by **Abdulmanan Nazir, Iqra Fateh**, student of BSCS of Computer Science Department, Lahore Garrison University, Lahore for the duration of academic year 2021-25, in partial fulfilment of the necessities for the award of the degree of Bachelor of Computer Science and that the project has not formed the basis for the award previously of any other degree, diploma, fellowship or any other similar identify.

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DECLARATION

This is to claim that the project entitled “**XPk App**” is an original work done by undersigned, in partial fulfilment of the requirements for the degree “Bachelor of Science in Computer Science” at Computer Science Department, Lahore Garrison University, Lahore.

All of the analysis, designs, as well as device improvements have been carried out by the undersigned. Additionally, this project has not been submitted to any other college or university.

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DEDICATION

First and foremost, I dedicated my painting to **Allah Ta'ala**, who has blessed us with the wisdom and boldness to carry out our duty in an elegant manner. Second, my loving, helpful family, whose counsel, prayers, and unceasing support were crucial in achieving my goal. Last but not least, let me thank Lahore Garrison University, particularly the computer science department.

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List of Abbreviation

Abbreviation	Full Form
XPk	Explore Pakistan
UI	User Interface
UX	User Experience
GPS	Global Positioning System
API	Application Programming Interface
HTTP	HyperText Transfer Protocol
MVC	Model View Controller

ABSTRACT

XPK (Explore Pakistan) is a mobile application for users that Flutter developers built to assist users who travel anywhere in Pakistan as it helps them discover cultural, natural and urban places of interest. Because XPK integrates Google Maps, it gives navigation and place details including photos, reviews, hotels, fuel stations, and many aids. XPK's smart filters for city, type of place, as well as visit duration let users customise in order to save time. The site is both entertaining and also user-friendly because those interactive user-friendly profiles do allow users to then save all of the profiles that they like, write down travel journals, and share them with others.

For a type of person they are looking for, a message-based search allows users to search. Then, users are able to meet people since these people share travel plans as well as interests. XPK will be in charge over local Pakistanis. XPK will also care for foreign visitors. XPK addresses market needs using its local plan and knowledge. XPK improves on exploring of Pakistan's beauty because it is combining a simple user interface along with richly misleading platforms.

INTRODUCTION

1.1 Background

XPK app enables people to see a variety of landscapes, historical landmarks, and scenic beauty, tourism is essential to both national economies and cultural exchange. Travel experiences are now more accessible because to the development of mobile technology, which enables travellers to access real-time information, navigation, and tailored suggestions. Nevertheless, no all-inclusive platform highlights Pakistan's varied attractions or makes travel planning easier for tourists, despite the country's tourism potential.

The absence of a specialised tourism app makes it difficult for many travellers to find Pakistan's stunning mountains, historical sites, museums, parks, and beaches. Conventional sources, such as books or websites, frequently fall short in providing personalised suggestions or up-to-date information for a productive trip.

XPK was established in order to bridge the gap by providing both domestic and foreign tourists with a convenient means of viewing Pakistan's natural and cultural riches. To make travel easier and more pleasurable, XPK makes use of Google Maps, location-based services, and sophisticated search. Depending on their location, interests, and free time, users can locate historical places, beaches, mountains, lakes, museums, and parks[1].

The app also uses proximity and type grouping to help the users plan trips. XPK makes the travel experience easy and smooth allowing you to appreciate the beauty of Pakistan's nature on the way by providing all your travel need in one application.

1.2 Overview

XPK is a Flutter-based mobile application developed to provide a comprehensive platform for tourists to view experience Pakistan's diverse attractions. The app displays an extensive selection of places that can be visited, including historical sites, beaches, mountains, lakes, museums, and parks, and it includes Google Maps for seamless navigation and location-based services.

With its user-friendly design that lets users choose locations by city, attraction type, and available visitation time, XPK initially focusses on showcasing the most popular tourist spots in Pakistan. Users can, for example, arrange quick trips (four to six hours) or find locations on their.

Also, the app includes a full-text search feature for users to type in specific destinations by name or category. Features Full details for every location Description, photos, and visitor generated ratings and remarks for enhanced user interaction The post XPK Travel Guide first appeared on

AppKed. Additionally, as the app gives you step-by-step driving directions with Google Maps, the app's real-time navigation function ensures that you can easily find the best path to reach your destination[2].

Aside from traveling, XPK also has social functions such as interaction and user profile, where travelers can share their journey, write blogs, and share in moments. Users can save favourite locations and track where they have been for a rematch. The app also assists users to find out the nearby facilities such as hotels, cafes, petrol stations or restaurants so that one's travel will never be in a mess.

With its intuitive design and integration of innovative travel tools, **XPK** aims to make exploring Pakistan's tourist destinations more accessible, organized, and enjoyable for both local and international visitors.

1.3 Problem Statement

The market for Pakistani travel apps currently has a huge gap. Despite the existence of numerous travel and exploration applications, none provide a thorough, regional solution specifically designed for Pakistan's rich and varied tourism industry. The majority of current applications are either too generic for audiences throughout the world, neglect Pakistan's distinctive attractions, or are devoid of essential elements for travellers, like comprehensive location-based services and customised trip planning.

The efficient discovery and planning of journeys to Pakistan's many tourist destinations presents difficulties for both visitors and residents. Current platforms frequently fall short in offering user-friendly search choices or allowing users to filter destinations according to their choices, including location, time limits (e.g., 4- to 6-hour journeys), and amenities like restaurants or motels. Furthermore, the trip planning process is made more difficult by lacking of interactions with navigation systems.

Furthermore, although some apps let users explore places, very few have social capabilities that let users write travel articles, discuss their experiences, and communicate with other users. In Pakistan, it is challenging for people to thoroughly plan and enjoy their travels due to the lack of a single platform for finding places to visit, investigating local amenities, and interacting with other visitors.

Therefore, there will be a great demand for a user-friendly, locally relevant, feature-rich platform that makes it possible for both international and Pakistani tourists to efficiently discover and take advantage of Pakistan's tourism potential. This platform's community-driven features, real-time navigation, personalised search, and filtering choices should enable a better organised and enjoyable vacation.

1.4 Objectives

The primary objectives of the XPK app are as follows:

1. To develop a centralized platform for exploring diverse tourist attractions across Pakistan.
2. To implement personalized search and filtering options based on city, type of attraction, and available visit time.
3. To integrate comprehensive place information including maps, user reviews, ratings, and nearby services such as hotels, restaurants, and petrol stations.
4. To enable user profiles, allowing users to save favorite places and share travel experiences through blogs and photos.
5. To provide real-time navigation features along with access to nearby essential services for smooth travel.
6. To promote tourism in Pakistan by highlighting cultural and natural destinations through an informative and user-friendly app.
7. To ensure the app delivers a tailored and accessible experience for both new and experienced travelers[3].

1.5 Timeline

Activities	Week/Semester
Data Collection	Week 7, 8, 9(7th)
Data Analysis	Week 10, 11(7th)
System Design & UI/UX	Week 12, 13, 14(7th)
Frontend Development	Week 15 (7th)&Week 1, 2, 3(8th)
Google Map Integration	Week 4, 5, 6, 7(8th)
Backend Development	Week 8, 9(8th)
Final Documentation	Week 10, 11, 12, 13(8th)

Table 1:Timeline

1.6 Organization Report

This particular report consists of nine chapters covering each part of the project work undertaken. Each chapter is described sequentially as follows:

Chapter 1 Includes the background information, project overview, problem statement, objectives, and structure of the report.

Chapter 2 Presents a review of the existing systems and related research work in the domain. It also highlights the identified research gaps.

Chapter 3 Defines the specific problem addressed in this project and explains the significance and need for the proposed solution.

Chapter 4 Includes the Software Requirements Specification (SRS), listing all functional, non-functional, system, and user-level requirements.

Chapter 5 Explains the methodology adopted for the development of the application. It also includes the tools and techniques used during implementation.

Chapter 6 Presents the detailed design and system architecture, along with subsystem and interface designs using appropriate diagrams.

Chapter 7 Covers the implementation and testing stages of the project. It explains the test strategies, test plan, and evaluation of performance.

Chapter 8 Defines the results obtained from testing and evaluation, along with an in-depth discussion on outcomes.

Chapter 9 Concludes the project by summarizing key findings, offering recommendations, and outlining directions for future work.

LITERATURE REVIEW

The proliferation of mobile applications for tourism has significantly changed how travellers find new destinations. Many travel planning tools have been developed, however the most are designed for a global audience and lack features unique to a particular region, like Pakistan. The next literature review looks at recent technical developments and applications relevant to tourism, highlighting both their advantages and disadvantages while outlining how XPK hopes to close any gaps.

Numerous research studies have investigated the efficacy and design of location-based and travel applications. TripAdvisor and Google Travel are two well-known global apps that offer location recommendations, comments, and directions. However, their databases frequently lack the capacity to identify regional tourist destinations in under-represented countries such as Pakistan. Furthermore, these websites usually do not offer native language localised material or personalised filtering possibilities, depending on the length of the visit [4].

The necessity for customised mobile tourist applications that can accommodate user preferences and offer dynamic recommendations is highlighted by a 2019 study by Alghizzawi et al. According to the research, location-aware technology and user-centric design are essential components for improving travel experiences [5]. The potential of mobile augmented reality in tourism is also covered by Yovcheva et al. (2014), who emphasise the significance of combining contextual information with real-time navigation [6].

Pakistan has not prioritised the development of mobile tourist platforms, which has led to Cellular tourism in Pakistan has not been the subject of any of the studies discussed in this paper. Some personal websites and blogs attempt to cover tourism attractions, Tour Planner is a smartphone application. Pakistan attempted to provide a comprehensive list of sites and navigation, but visitors were presented with an antiquated model with limited filtering options [7].

Apps such as *Ziarat App* and *Punjab Tourism App*, introduced by government bodies, offer limited city-wise exploration but fail to combine user interaction, travel planning, and real-time services such as hotel or fuel station discovery. These shortcomings demonstrate the need for an integrated platform that not only lists places but also guides the user in a seamless and interactive manner [8].

Research by Chen & Tsai (2007) also emphasizes the importance of tourist satisfaction and the role of mobile systems in improving information delivery [9]. Studies in mobile development frameworks have highlighted Flutter as a powerful cross-platform solution for building responsive and scalable tourism applications [10].

The concept of community engagement, such as blogs and photo sharing, has also been explored in tourism apps like *Couchsurfing* and *Travello*, which focus on user-generated content. However, these platforms are largely international and fail to represent localized user interests.

Various solutions exist in the broader travel tech space, there is a notable lack of a dedicated, localized, and feature-rich tourism app for Pakistan. The *XPK* project addresses this gap by offering a platform that combines place discovery, intelligent search, real-time navigation, and user engagement through blogs and reviews — all tailored specifically for Pakistani destinations.

Summary of Existing Approaches in Tourism Mobile Applications

Ref No.	Methodology	Accuracy/Usability	Advantages	Disadvantages
[1]	Traditional Web-based Tourism Systems	60% user satisfaction	Easy to maintain, accessible on any browser	Not interactive, slow performance
[2]	Native Android Tourism App	75% user engagement rate	Fast and smooth UI, works offline	Platform dependent (Android only)
[3]	Flutter-based Tourism App	85% cross-platform usability	Single codebase for iOS & Android, fast UI	Requires plugins for some native features
[4]	AI Chatbot in Tourism Apps	78% response satisfaction	Instant help to users, 24/7 assistance	Limited answers, depends on training data
[5]	GPS & Location-Based Recommendations	88% relevance of suggestions	Personalized suggestions, real-time location data	Requires internet/GPS access, battery usage
[6]	AR (Augmented Reality) in Tourism Apps	80% engagement with features	Engaging visual experience, shows real-time info	Heavy on resources, not supported on all devices

Table 2: Existing Approaches in XPK

PROBLEM DEFINITION

Pakistan has several tourism attractions because of its historical legacy and stunning natural surroundings. Nevertheless, a thorough platform that offers simple access to complete information about these locations is lacking. It is challenging for both domestic and foreign visitors to effectively experience the nation because of the current applications and websites, which are either not localised, do not offer tailored suggestions, or do not satisfy visitor needs.

Travellers frequently rely on a variety of time-consuming and fragmented sources, like social media and guidebooks. Additionally, these services don't provide personalised trip planning choices according to particular criteria like time, place, or attraction kind. As a result, tourists frequently lose out on worthwhile experiences and struggle to find the finest destinations.

Furthermore, a lot of apps lack the essential navigational capabilities and details about local services like lodging, dining options, and petrol stations. Despite offering simple navigation, websites such as Google Maps do not especially serve travellers who need location-based, in-depth services.

XPK mobile application that tackles these problems is obviously needed in light of these difficulties. Travelling in Pakistan would be substantially improved by a service that integrates real-time navigation, personalised trip planning, and local area recommending[11].

3.3 Significance of the Problem

Explain **why this problem matters**:

- Pakistan has **huge tourism potential**, but it remains **underutilized** due to lack of digital resources.
- A unified app can **promote tourism**, improve **user experience**, and support the local economy.
- The absence of **user-friendly digital tools** leads to missed opportunities for both tourists and tourism authorities.

3.2 Need for the Proposed System

The following problems are intended to be resolved by the suggested XPK app:

1. **Lack of a Unified Platform:** Thorough details in reference to every tourism destination located in Pakistan are not provided via any app that is currently available. With XPK's one-stop shop, discover museums, historical landmarks, beaches, parks as well as still more.
2. **Personalized Travel Planning:** Travellers arrange travels by their tastes easier because XPK can filter attractions by city, kind, and available time.
3. **Real-Time Navigation and Local Services:** For ease of travel, Google Maps will be integrated into XPK by offering accurate driving routes. It will also display nearby amenities such as places that users can use to stay or eat to assist users further.
4. **User Engagement:** The app will promote engagement and a sense of community via enabling users to post blogs, make profiles, and discuss experiences.
5. **Localization:** XPK is made for local sightseers with foreign sightseers. XPK guarantees an easy experience using specific data and tools designed for tourism in Pakistan[12].

3.3 Significance of the Problem

Explain **why this problem matters**:

- Pakistan has enormous **potential for tourism**, but because of a lack of digital tools, it is still underutilized.
- A unified app can **promote tourism**, improve **user experience**, and support the local economy.
- The absence of **user-friendly digital tools** leads to missed opportunities for both tourists and tourism authorities[13].

3.4 Scope of the Solution

Explain **what the app will cover**, and what is **out of scope**:

- **In scope:**
 - User login/register
 - Viewing location details
 - Adding reviews/photos
 - Admin panel for updating places
- **Out of scope** (for now):
 - Hotel booking
 - Offline mode
 - Flight or transport booking

3.5 Constraints and Assumptions

Mention **challenges and assumptions**:

- **Constraints:**
 - Limited budget
 - Time-bound (one semester or academic year)
 - Access to real-time data (e.g., weather or traffic)
- **Assumptions:**
 - Users have internet access
 - They are using Android smartphones
 - Admins will keep the content updated

SOFTWARE REQUIREMENT SPECIFICATION

4.1 Purpose

This document's objective is to provide a detailed description of the software requirements for the XPK mobile application, a tourism-based tool designed to make travel within Pakistan easier. The purpose of the application is to help users navigate throughout cities by offering personalised itineraries based on their interests, time, and preferences.

With XPK, customers will have access to a cutting-edge mobile application that makes travelling to all of the visited locations easy. Along with recommendations for tourism destinations, this app offers real-time services including interactive maps, routes, and other places of interest.

In order to enable features like location tracking, personalised trip planning, and community interaction, the project's scope includes developing an appealing, user-friendly interface in addition to robust backend technology. XPK aims to enhance the whole travel experience and ensure that guests make the most of their stay in Pakistan by providing users with easy access to crucial travel information and helping them create efficient travel plans.

4.1.2 Document Conventions

This document follows a structured approach with numbered headings to maintain a clear hierarchy of information. Important terms and concepts are highlighted in bold to emphasize their significance. Sections that require further clarification or are yet to be decided are indicated as "To Be Decided" (TBD), ensuring transparency and clear identification of areas that still need input or finalization.

4.1.3 Intended Audience and Reading Suggestions

All major parties involved in the XPK project, including developers, project managers, testers, end users, authors, and reviewers, are the target audience for this document. Each component seeks to address particular informational demands related to their roles; for example, the overview focusses heavily on the lists of features and requirements that are significant to developers and testers while providing enough contextual background for all writers and end users. It is advised that readers read the introduction first, then the needs and features of the system, and then consult the supporting resources.

4.1.4 REVISION HISTORY

The following revision of the From XPK application:

Name	Date	Reason	Version
Ms. Farwa Javaid	1-12-2025	Full App Review	1.10.2
Abdulmanan Nazir	1-12-2025	Add feature integrate the Google Map API	1.10.2
Iqra Fateh	1-12-2025	Add feature integrate the Google Map API	1.10.2

Table 3: Revision History

4.1.5 Product Scope

XPK is a cross-platform mobile application (Android and iOS) developed to provide travelers with a unified platform for discovering the beauty of Pakistan. The application is designed to deliver personalized travel recommendations based on individual preferences such as budget, available time, and desired destinations. It integrates intelligent features including AI-based trip planning and location-aware services to enhance the overall user experience. In addition to exploration tools, XPK promotes social interaction by allowing users to share travel stories through blogs making it both a travel companion and a content-sharing platform for modern tourists.

4.2 Overall Description

4.2.1 Product Perspective

This product is an independent mobile application that helps tourists plan and explore their trips to Pakistan. This is a new selfcontained product that offers customers TaylorMade travel plans entire based on options such as time, budget, and prioritized goals[14].

The application integrates the following components:

1. **Firestore Backend:** Manage user authentication, authorization, and common backend common sense. Ensures a convenient conversation between the consumer app and the database.
2. **Firestore Database:** Uses FireBase Database user information, plans, blogs and other application content.
3. **External APIs:** Google Maps API is provided to support holiday maker navigation and create route planning.
4. **User Interface:** Created with Flutter for seamless overall performance, providing a user-friendly and intuitive experience.

4.2.2 System Overview:

This mobile application functions as a standalone device, but it also interacts with external APIs and services. Beneath is a simple breakdown of its additives:

- **Frontend (Flutter) ↔ Backend (Firebase)**
- **Frontend ↔ External APIs** (e.g., Google Maps API)

4.2.3 Product Functions

The application gives core functionalities that beautify consumer experience and simplify travel planning. users can search for tourist spots by way of metropolis or hobby, plan trips primarily based on available time, and acquire location-conscious suggestions for hotels, fuel stations, and emergency services. They can also create and publish blogs and control non-public profiles. A clever itinerary characteristic shows journey plans based totally on time and destination.

4.2.4 User Classes and Characteristics

This tourism software caters to one-of-a-kind person classes, which permits customers to plan a personal experience, create content, and think about blogs. the following are the refined person training with their characteristics:

1. Tourists

Tourists visiting places across Pakistan are part of this organisation. By entering their desired places, budget, and time availability, they could arrange their travels. The app provides recommendations for restaurants, lodging, attractions, and essential services. Additionally, people can browse blogs to learn about other travellers' experiences.

2. Content Creators

These users make contributions by posting blog entries on their travels. They may add images and videos, control their material, and expand their audience. By displaying views and likes on each blog, the system facilitates user involvement tracking and promotes high-quality content and conversation.

3. Viewers

These are people who use the app to read travel blogs, research destinations, and get ideas for future travels but do not actively produce content. They can bookmark their favourite articles for future use and do content searches by region, category, or author.

4. Planners

This group includes users who use the app as their main resource for trip planning. They make use of tools like intelligent route planning, real-time weather and traffic information, and recommendations. Users can download or share their finalised arrangements with their travel

partners through the app.

5. Advanced Users

Improved features including real-time alerts about nearby attractions or travel updates, access to emergency aid contacts, and advanced search and filtering by rating, location, or category are advantageous to these users. They might also start or join travel clubs in order to coordinate and communicate with one another.

4.2.5 Design and Implementation Constraints

The design and development of XPK are subject to several platform, technical, and regulatory constraints. The application needs to adhere to the security and deployment policies established by the Apple App Store and Google Play Store. For backend services, Firebase is used extensively for real-time database, authentication, and storage functionalities, while HTTP communication is handled using the Dio package during development for efficient and flexible API integration.

Cross-platform compatibility is ensured through Flutter, enabling consistent performance across both Android and iOS devices. The usage quotas, rate limits, and response formats of external services, like the Google Maps API, must be followed when integrating with them. To ensure data security, all communications in the production environment will be encrypted using HTTPS protocols. These constraints define the scope within which the system must operate and directly influence design decisions and implementation strategies.

4.2.6 User Documentation

The software gives center functionalities that enhance person revel in and simplify tour making plans. users can look for traveler spots with the aid of town or interest, plan journeys based totally on to be had time, and get hold of region-conscious guidelines for lodges, gas stations, and emergency services. They also can create and submit blogs and manage private profiles. A clever itinerary characteristic suggests tour plans based on time and vacation spot.

1. User Manual

This tourism software caters to exceptional consumer instructions, which enables customers to devise a private journey, create content material, and look at blogs. the following are the refined person instructions with their characteristics:

2. In-App Tutorials

Interactive tutorials will introduce users to the app's interface and core functionalities during onboarding. These short guides will demonstrate how to navigate the home screen, plan trips, and post travel content.

3. FAQs and Troubleshooting

A Frequently Asked Questions section will address common user concerns related to login, content upload issues, and planning errors. A dedicated troubleshooting guide will offer solutions for connectivity problems, performance optimization, and bug reporting.

4. Support Contact Information

Users will be able to reach out via support email, phone, or in-app chat for further assistance. The Help & Support section will also include feedback and bug report options.

5. Delivery Formats

All documentation may be available in the app in a mobile-friendly format, with additional PDFs and video tutorials to be had at the reputable app website. Offline get admission to to key files like the consumer manual and FAQs may be supported after set up. Assumptions and Dependencies

Assumptions:

It's far assumed that users can have access to a strong internet connection to use core capabilities such as ride making plans, blog uploads, and map-based offerings. The software also assumes that users will furnish vital permissions such as location get admission to, media get entry to (for blogs and vlogs), and notification permissions for indicators and trip updates.

Dependencies:

The capability of XPK depends on the following outside additives:

- **Google Maps API:** Middle features like navigation and near-through searches rely on Google Maps. advanced services, which include area are seeking for thru call and precise area records, require paid plans starting at \$5, steady with 1000 requests for locations API.
- **Firebase Backend:** Used for authentication and consumer add blog and user data.
- **Mobile Platforms:** Deployment relies upon on Android and iOS platform suggestions, with developer account charges of \$25 (one-time) for Google Play and \$ 90-nine/twelve months for the Apple App store.

4.3 External Interface Requirements

1. User Interfaces

The application provides a user-friendly and responsive interface designed using Flutter for cross-platform compatibility. Key UI components include trip planning dashboards, profile

management screens, blog/vlog creation modules, and map-based exploration views. The design follows modern mobile usability principles to ensure smooth navigation and intuitive user interactions.

2. Hardware Interfaces

- **Mobile Devices:** The application is intended for smartphones with a minimum of 2GB RAM and built-in GPS capabilities to support location-based features.
- **Development Systems:** For development purposes, a system with at least 12GB RAM and a 256GB SSD is recommended to efficiently run Android Studio or other IDEs required for Flutter development.

3. Software Interfaces

- **Google Maps API:** Integrated for geolocation, route mapping, and nearby place searches.
- **Firebase Authentication and Firestore Database:** Utilized for user authentication, profile management, and real-time data storage.
- **Dio Package:** Used to handle all HTTP communication between the client and backend services, ensuring smooth and secure data exchange.

4. Communications Interfaces

The application communicates over secure internet protocols. All API requests and responses are managed using HTTPS through the Dio networking package, ensuring secure and efficient data transmission between the client, backend, and third-party services.

4.4 System Features

4.4.1 Trip Planning

Description and Priority

Permit the person to plot a trip through time, price range, and personal preferences.

Priority: High.

Stimulus/Response Sequences

- The user select a city and gives alternatives which includes finances, period of the ride, and sports.

- The system techniques the records and returns a listing of endorsed itineraries.
- The person confirms the experience, and the system gives the user facts on restaurants, hotels, and petrol pumps in the area.

Functional Requirements:

- **REQ-1:** Guide the entry of user alternatives, including time, budget, and activities.
- **REQ-2:** Provide key neighborhood offerings, inclusive of resorts and restaurants, after the trip is finalized.
- **REQ-3:** Allow customers to download or share the experience plan.
- **REQ-4:** Produce optimized itineraries primarily based on person inputs.

4.4.2 Content Creation (Blogs)

Description and Priority:

Enable users to add blogs to share their experiences.

Priority: High.

Stimulus/Response Sequences:

- The user is going to the upload section and uploads a blog.
- The content is uploaded and made available for different customers to view.

Functional Requirements:

- **REQ-1:** Allows customers to feature movement images and textual content based totally on blogs.
- **REQ-2:** Offer content material moderation for uploaded blogs.
- **REQ-3:** Lets in users to edit or delete their content.
- **REQ-4:** Provide analytics for content views, likes, and engagement[15].

4.4.3 Search and Discovery

Description and Priority:

Allow the search for places of hobby , accommodations, and offerings with the resource of region and options.

Priority: Medium.

Stimulus/Response Sequences:

- The user inputs search standards (for example, city, form of region, score).
- The system provides relevant effects in a organized form.
- The person clicks at the region, and the machine returns more statistics.

Functional Requirements:

- **REQ-1:** The tool shall provide superior are looking for functionalities, with the intention to offer filtering through area, class, and rankings.
- **REQ-2:** The system shall offer specific information, together with deal with, snap shots, and opinions.
- **REQ-3:** Allow users to bookmark locations for later access.
- **REQ-4:** It gives clients the capability to are looking for consequences on social media[16].

4.4.4 Personalized Notifications

Description and Priority:

Notify the client of nearby factors of hobby, deals, and facts based totally on the patron's options and region.

Priority: Medium.

Stimulus/Response Sequences:

- The system video show units the user's location and opportunities.
- The user is close to an encouraged vicinity, the system notifies them.
- The individual clicks on the notification to view the data or take action.

Functional Requirements:

- **REQ-1:** Location-based notifications must be in actual-time.
- **REQ-2:** Clients ought to be in a position to customise their notification choices, including kind and frequency.

- **REQ-3:** Alert the user of unique offers, activities, or updates on saved journeys.
- **REQ-4:** Non-intrusive and smooth to disregard.

4.5 Other Nonfunctional Requirements

1. Performance Standards

- The application must ensure that all of its functions, including search, content uploading, and trip planning, have a response time of less than two to a few seconds.
- The system must support 1,000 users at once without experiencing any performance issues.

2. Safety Conditions

- To guarantee data recovery and integrity, backups must be made every 24 hours.
- When managing user personal data, the system must adhere to GDPR, guaranteeing privacy and security in line with global norms.

3. Security Conditions

- For user accounts, the program will use element authentication, such as multi-factor authentication.
- To avoid unwanted data access, all communication between the client app and backend will be encrypted from beginning to end.

4.6 Software Quality Attributes

- **Usability:** The app must provide an **intuitive and user-friendly interface** for seamless navigation.
- **Reliability:** The application should maintain **99.9% uptime**, ensuring consistent availability for users.
- **Maintainability:** The codebase will be **modular** to facilitate easy updates and future feature additions.

METHODOLOGY

5.1 Development Methodology(Agile)

The XPK cell application is enhanced using the Agile software program development version. Agile is a popular incremental and iterative software development process that places a strong emphasis on flexibility, early delivery, customer involvement, and ongoing development. Transferring particular traits is the main goal of each time-boxed iteration (sprint) of the assignment. The company can swiftly adapt to improvements or modifications thanks to staff feedback and regular evaluations. This approach guarantees on-time deliverables, improved employee happiness, and a very manageable codebase.

In this project, Agile is implemented through the following phases:

- **Sprint Planning:** Dividing tasks such as UI, location integration, and backend development across sprints.
- **Daily Standups(Internal):** Tracking progress and resolving blockers.
- **Sprint Reviews:** Demonstrating completed features.
- **Sprint Retrospectives:** Identifying improvements for the next iteration.

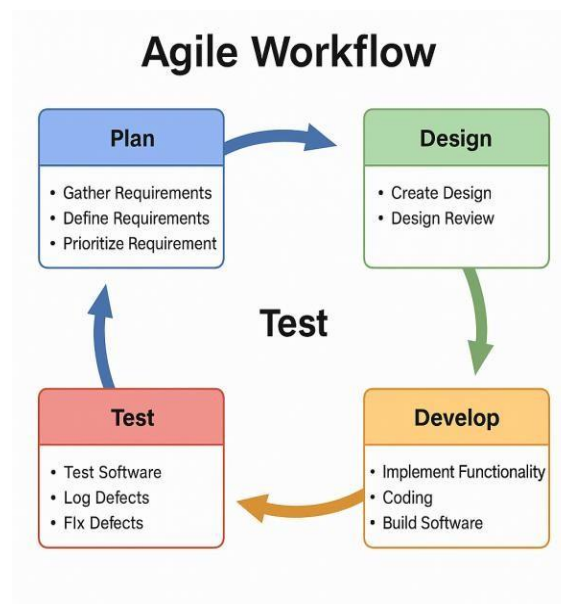


Figure 1: Agile Workflow

5.1.1 Design Methodology

The **MVC** architecture has been employed for the design. This pattern ensures the separation of concerns in the software, enhancing code maintainability, scalability, and readability[17].

- **Model:** Handles data-related operations such as API communication, user data, places, reviews, and post management using Firebase and Dio.
- **View:** Manages UI elements and displays data using Flutter widgets and custom components.
- **Controller:** Acts as a bridge between the model and the view, handles logic like filtering places, user interaction, API handling (with Dio), and navigation (using GetX).

This architecture allows independent development of each module, faster debugging, and efficient testing[18].

5.2 Tools and Technologies Used

5.2.1 Core Development Stack

Tools/Technology	Purpose
Flutter	Cross-platform mobile app development for Android & iOS
Firebase	Backend services: Authentication, Firestore, Storage, App Check
Dio	Advanced HTTP client for API calls
Google Map	Integration for map-based services, navigation, and place discovery

Table 4: Core Development Stack

5.2.2 APIs Used

XPk utilizes several APIs from the **Google Maps Platform** [19]:

API	Purpose
Text Search API	Enables keyword-based place search
Nearby Place API	Finds locations near the user's current location
Route API	Generates optimal paths between source and destination
Matrix API	Calculates time/distance between multiple locations
Directions API	Provides step-by-step navigation
Distance Matrix API	Computes travel distances and durations

Table 5: APIs Used

Google API Integration Flow

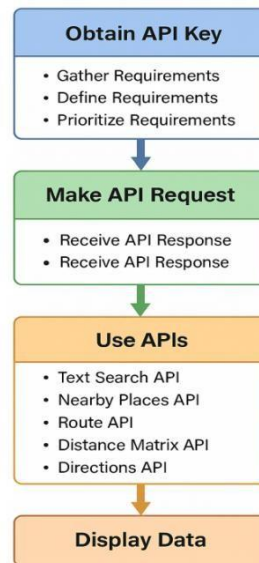


Figure 2: Integration Flow

5.2.3 Permission & Device Access

Permission	Usage
Location Permission	To get user's current location (via Geolocator)
Gallery/Storage Permission	To allow image picking for profile & blog uploads
Internet Access	Required for Firebase and API communication

Table 6: Permission & Device Access

These permissions are handled using the **Permission Handler** Flutter package, which provides a secure and interactive way to ask for runtime permissions.

5.2.4 Third-party Packages

The following third-party packages are used to improve functionality, UI experience, performance, and integration:

a) UI & UX

- flutter_screenutil – Responsive design across different screen sizes
- google_fonts – Beautiful typography
- flutter_spinkit, lottie – Animations and loaders
- smooth_page_indicator, easy_stepper – Indicators and progress steps
- flutter_svg, flutter_staggered_grid_view – Modern layouts

b) Image & File Handling

- file_picker, image_picker – For uploading images and files

c) State Management & Storage

- get – For routing and state management
- get_storage – For local data caching

d) Networking

- dio, http – API integration
- cached_network_image – Efficient image caching
- url_launcher – Open external links like Google Maps

e) Google Maps & Location

- google_maps_flutter, geolocator, geocoding – Location services
- flutter_polyline_points, google_places_flutter – Navigation and place autocomplete

f) Firebase Integration

- firebase_core, firebase_auth, cloud_firestore, firebase_storage, firebase_app_check

All these packages work in harmony to create a seamless, responsive, and real-time user experience.

5.2.5 Implementation Strategy

The development is divided into phases aligned with Agile sprints:

- 1. Requirement Gathering & Research**
- 2. UI/UX Design and Wireframes**
- 3. Frontend Development using Flutter**
- 4. Google Map and Location Integration**
- 5. Firebase Backend Integration**
- 6. Testing and Feedback**
- 7. Final Adjustments and Deployment**

Each phase focuses on testing, documentation, and improvement to ensure the system aligns with user needs.

DETAILED DESIGN AND ARCHITECTURE

6.1 System Architecture

The XPK app is designed with a modular, scalable, and maintainable architecture, adopting the Model-View-Controller (MVC) design pattern. The architectural decisions are driven by the need for performance, separation of concerns, and ease of integration with APIs such as Google Maps and Firebase.

The application architecture is composed of high-level subsystems that interact with each other to achieve the app's goal: providing users with a rich, location-based tourism experience in Pakistan. These subsystems include User Management, Location Services, Place Discovery, Map Handling, Storage, API Communication, and Local State Management[20].

6.1.1 Architecture Design Approach

The system uses the MVC architecture to Flutter development with GetX for reactive state management and Dio for HTTP networking. This approach was chosen because:

- It promotes clean separation between UI, business logic, and data layers.
- GetX simplifies state management and dependency injection.
- Dio offers powerful API interaction features (interceptors, form-data, file upload).
- The design is scalable, enabling the addition of future modules like hotel booking, user reviews, or social integration[21].

6.1.2 Architecture Design

High-Level Modular Structure:

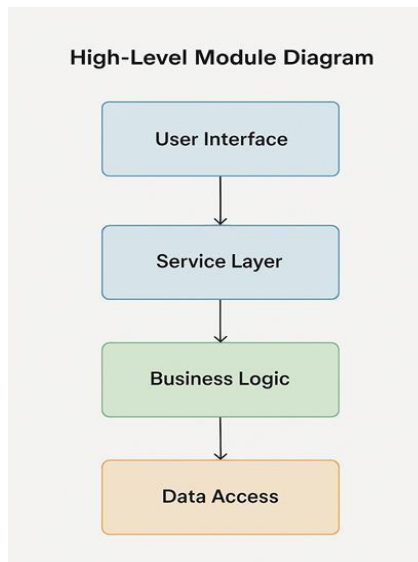


Figure 3:

6.1.3 Subsystem Architecture

Subsystem	Responsibility
Authentication	User login, signup, session handling via Firebase Auth
Location Services	Fetching user location using Geolocator and Permission Handler
Place Discovery	Querying nearby historical sites using Google Places, Text Search APIs
Map Handling	Displaying maps, drawing routes, using Google Directions and Matrix APIs
Network Handling	Using Dio to call REST APIs, handle errors, and support multipart forms
Local Storage	Managing session data with GetStorage
UI Layer	Rendering views using Flutter widgets and reactive data binding via Obx()

Table 7: Subsystem Architecture

6.1.4 Authentication Subsystem

- Components: AuthController, UserModel, auth_view.dart
- External Services: Firebase Authentication
- Responsibilities: Manage user session lifecycle, validate credentials, navigate to home screen.
- Save user Auth and Store it information in Cloud firebase

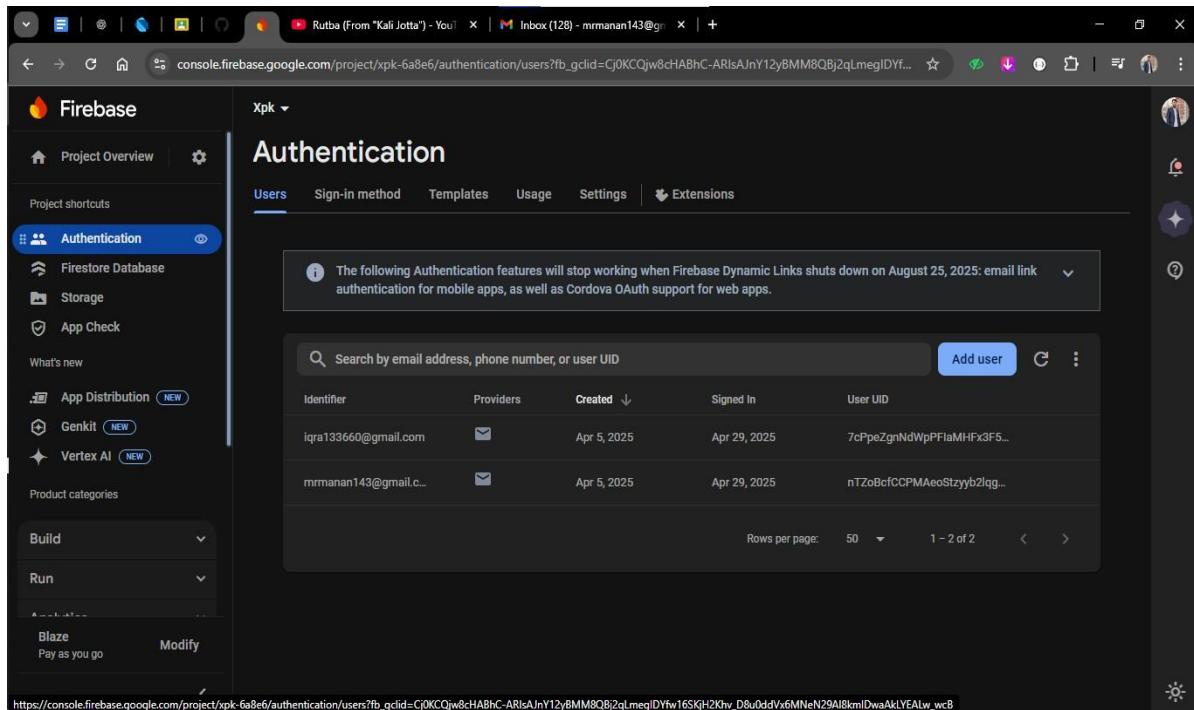


Figure 4: Firebase Authentication

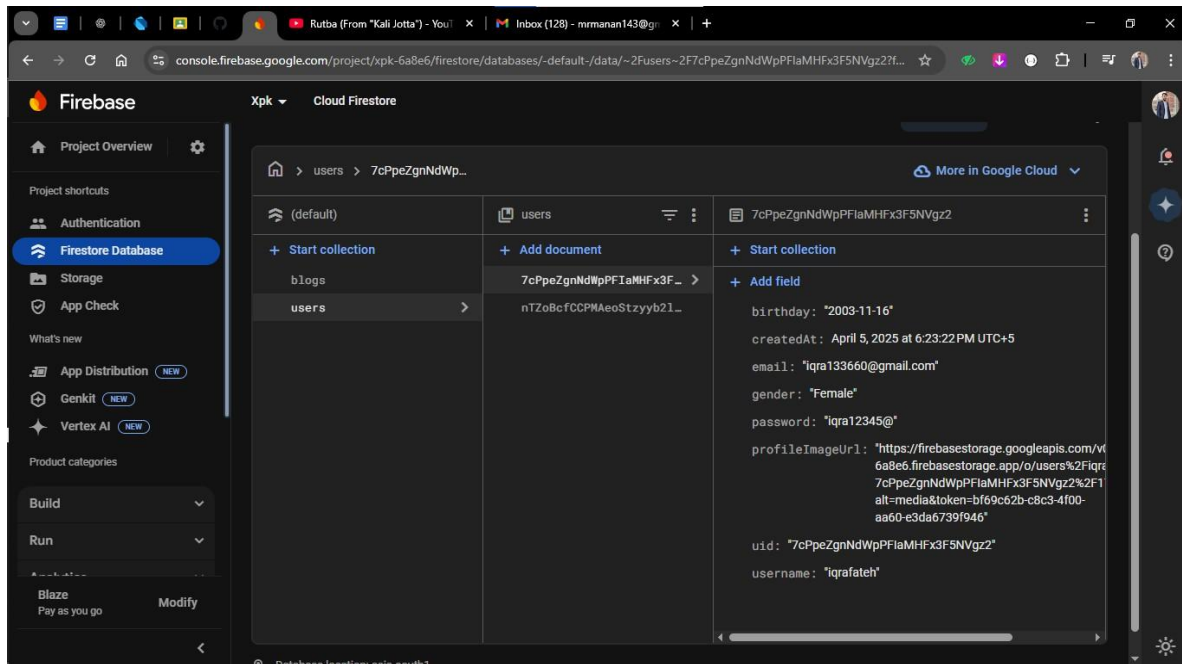


Figure 5: Store User Information

Location Subsystem

- Components: LocationController, PermissionHandler, Geolocator
- Responsibilities: Request location permission, get current GPS coordinates[22].

Place Discovery Subsystem

- Components: PlaceController, place_model.dart, Google Places APIs
- Responsibilities: Fetch nearby places based on type (e.g., historical), search by keyword, calculate distance.

Map Subsystem

- Components: MapController, Google Maps SDK
- Responsibilities: Render map, show markers, draw polyline routes using Directions API.

Image Subsystem

- Components: ImagePicker, PermissionHandler, Firebase Storage
- Responsibilities: Upload user photos

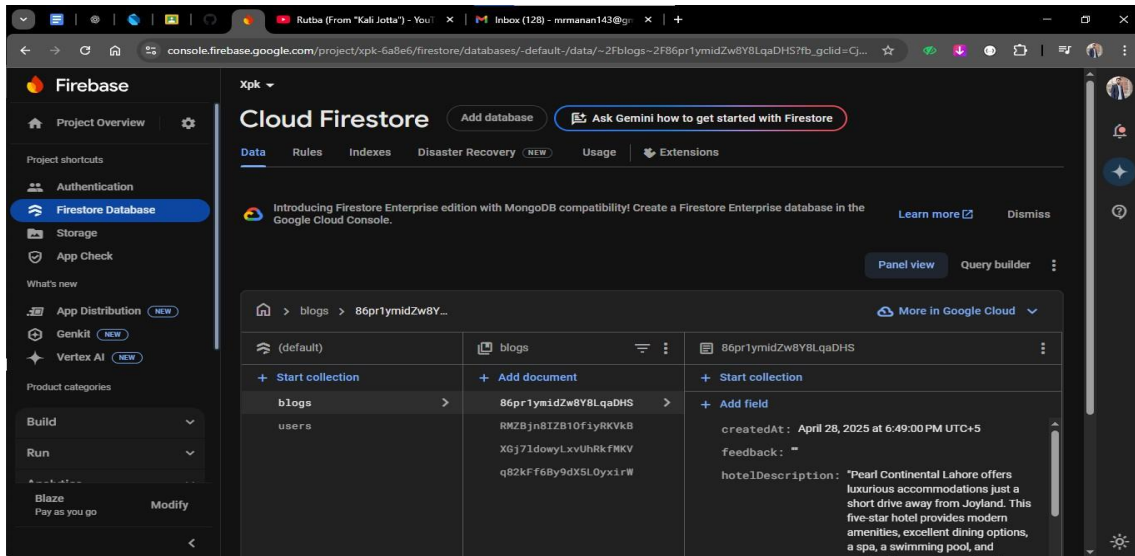


Figure 6: Cloud Firestore

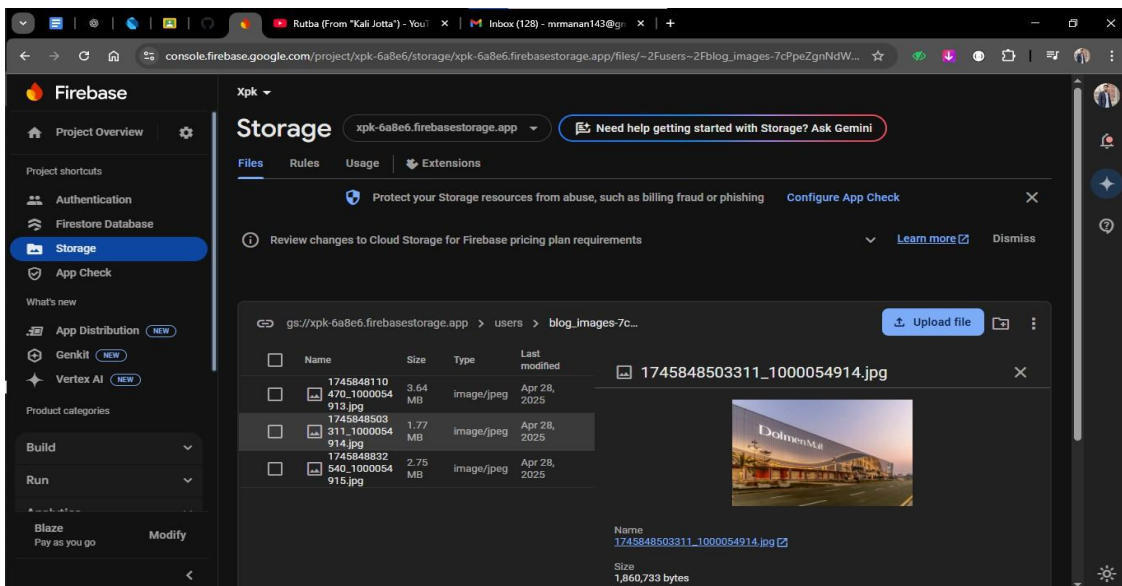


Figure 7: Firebase Storage

Network Subsystem:

- Components: requestApi() utility, Dio instance, interceptors
- Responsibilities: Send GET/POST requests, handle multipart forms, attach tokens.

State Management:

- Tool: GetX
- Usage: Controllers manage reactive states with Rx, views listen with Obx.

6.2 DETAILED SYSTEM DESIGN

6.2.1 Classification

- Subsystems: Authentication, Location, Map, etc.
- Modules: Controllers, Models, Views
- Files: Dart files representing classes and business logic

6.2.2 Definition

Each component addresses a specific functionality:

- **auth_controller.dart:** handles login/logout via Firebase
- **location_controller.dart:** gets coordinates and permissions
- **place_controller.dart:** fetches nearby locations

6.2.3 Responsibilities

Component	Responsibility
AuthController	Handle authentication, user session
MapController	Interact with Google Maps API, manage directions and routes
PlaceController	Search for places, calculate distances
requestApi()	General API request handling via Dio

Table 8: Responsibilities

6.2.4 Constraints

- Internet is mandatory for Google API calls
- Permissions (location, storage) must be granted
- Rate limits from Google APIs must be handled
- User must be authenticated to access restricted features[23]

6.2.5 Composition

Each controller is composed of:

- Model class for structured data
- Dio instance for API calls
- Rx variables for UI binding
- UI files (.dart) that consume the controller

6.2.6 Uses/Interactions

- Controllers use Dio to communicate with Google APIs
- Models store API responses
- UI (e.g., NearbyPlacesView) listens to controller's state and updates dynamically

6.2.7 Resources

- Firebase (Auth, Firestore, Storage)
- Google APIs (Text Search, Maps, Matrix, Directions)
- Mobile sensors and OS-level permissions
- Device gallery and GPS

6.2.8 Processing

- **AuthController:** async functions for sign-in
- **MapController:** fetch directions, parse polyline, display map
- **PlaceController:** search nearby places, sort by distance
- **Error Handling:** all network calls wrapped in try-catch
- **Concurrency:** Flutter's async-await pattern with FutureBuilder and Obx()

6.2.9 Interface/Exports

Each controller exposes:

- **Public methods:** fetchPlaces(), loginUser(), uploadImage()
- **Reactive variables:** RxList, RxBool, RxDoubl

6.2.10 Detailed Subsystem Design

Subsystem Name: Place Discovery Subsystem

Purpose

This subsystem is responsible for retrieving nearby tourist places using Google Places API and presenting the results to the user with filters like category, radius, and location.

Design Components

- **Controller:** Handles API requests and passes data to the view.
- **Model:** Represents the structure of place data.
- **Repository:** Fetches data from the API using Dio.
- **View (UI):** Displays the list/grid of places to the user.

Flow

1. User opens the explore screen.
2. App gets the user's current location via **Geolocator**.
3. Sends a request to Google Places API (via Repository).
4. Receives a list of places (Model).
5. Displays it in the UI (View), using **GetX** for state updates.

Diagrams for XPK App:

XPK Use Case Diagram

use case diagram for XPK mobile application with 3 actor new user existing user and system

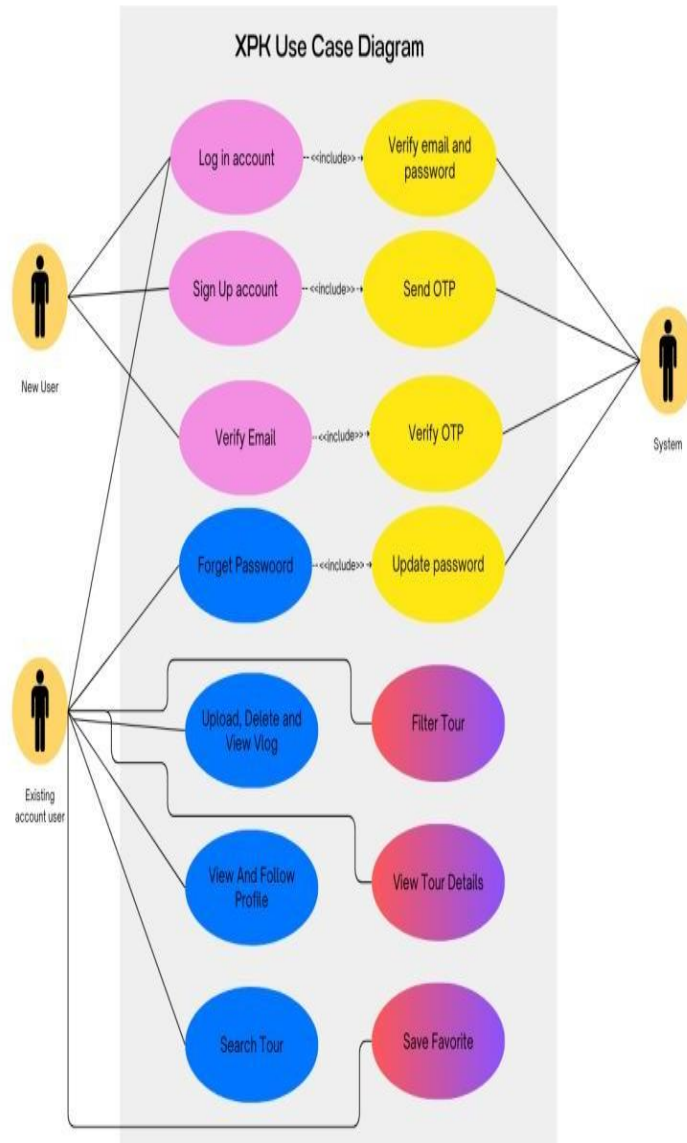


Figure 8: Use case Diagram

XPK ER Diagram

Entity-relationship diagrams show the connections between multiple User, tourist, or ideas under a single system.

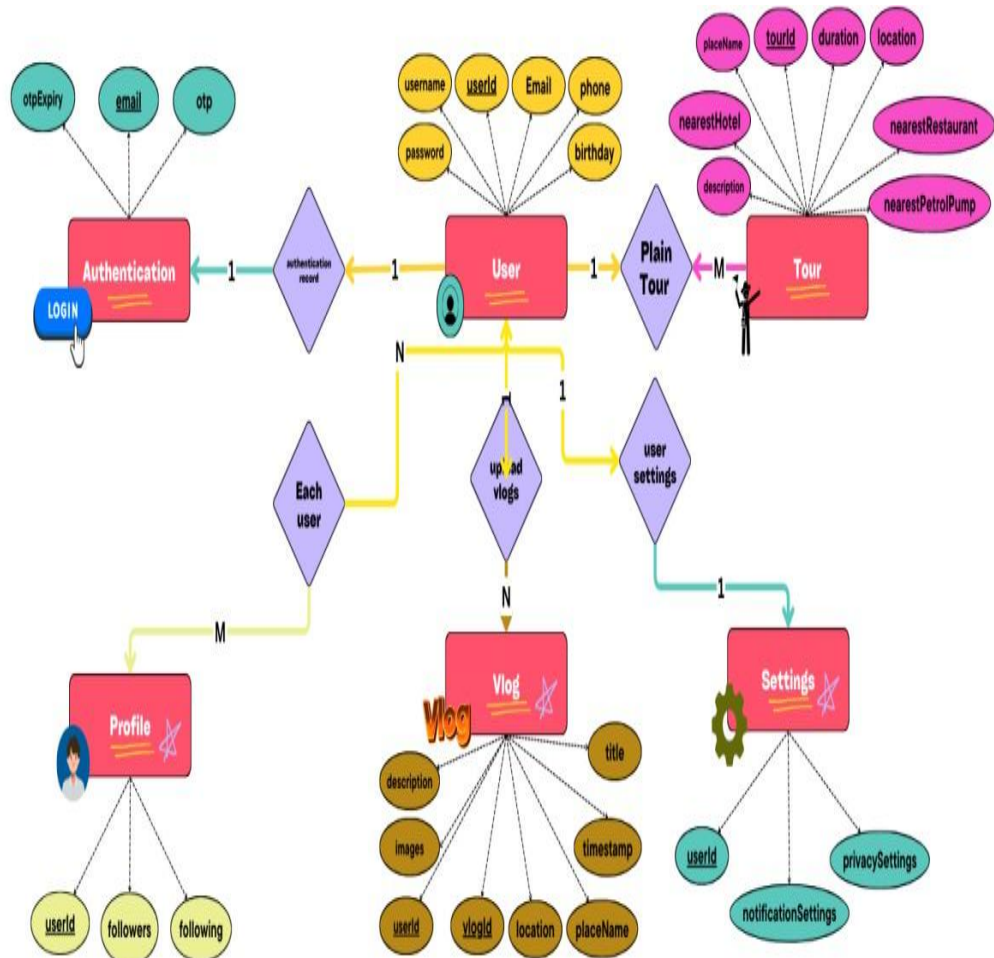
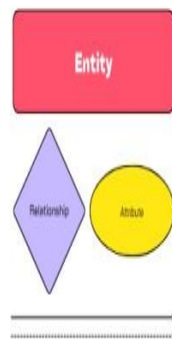


Figure 9: ER Diagram

XPK App 3-Tier Architecture Diagram

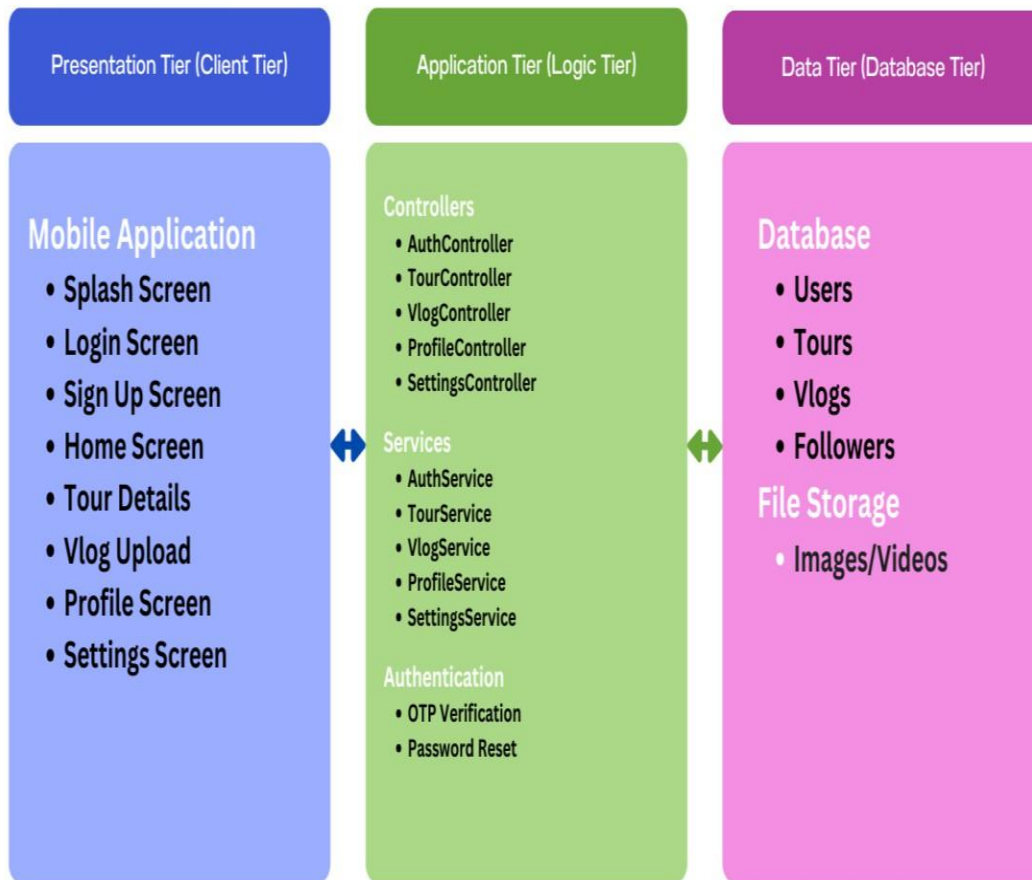


Figure 10: Architectural Diagram

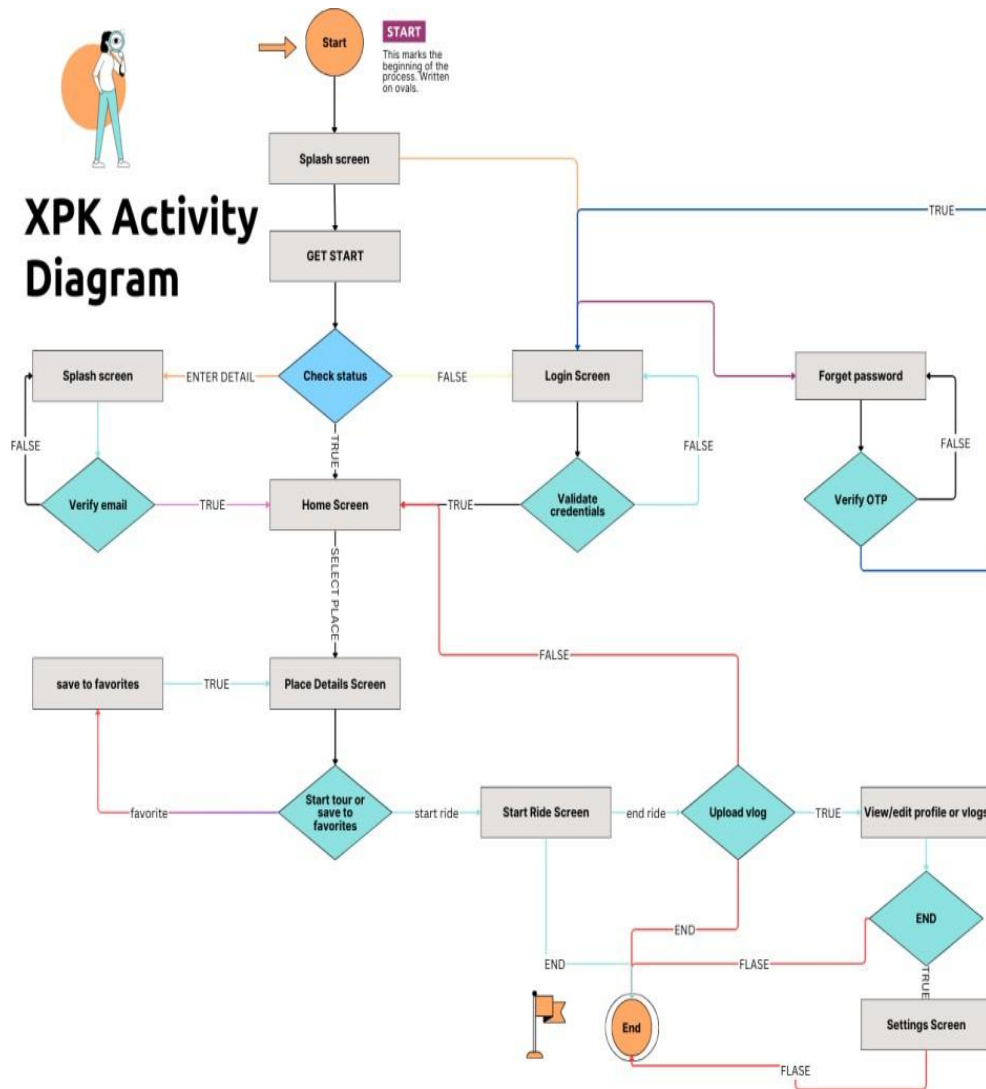


Figure 11: Activity Diagram

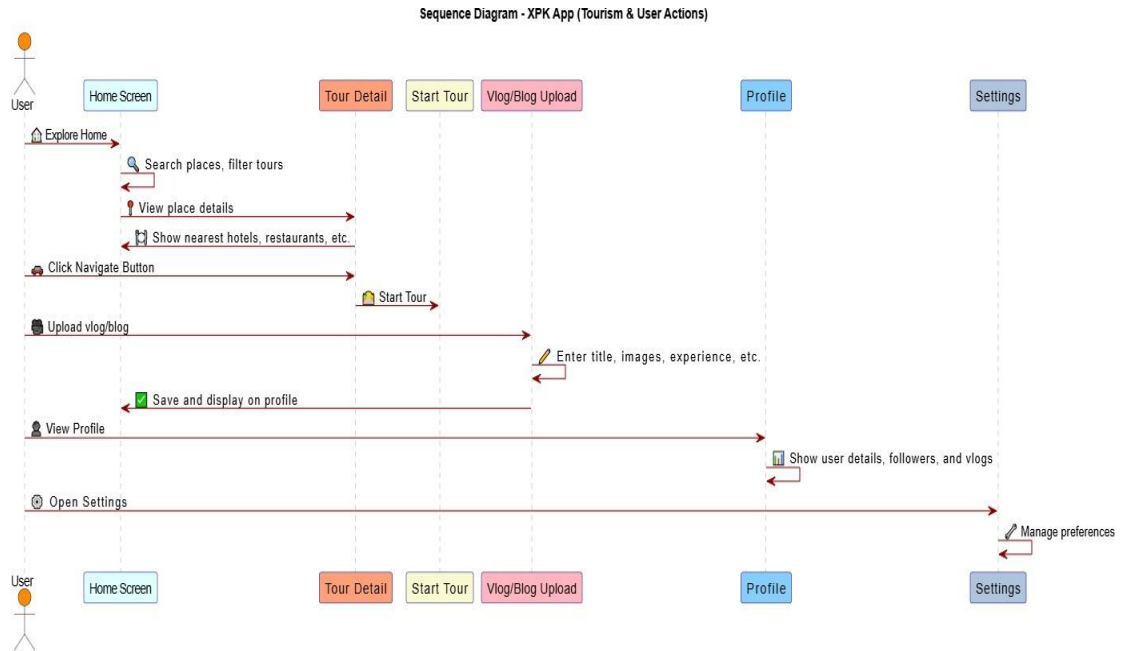


Figure 12: Sequence Diagram(Tourism&Action)

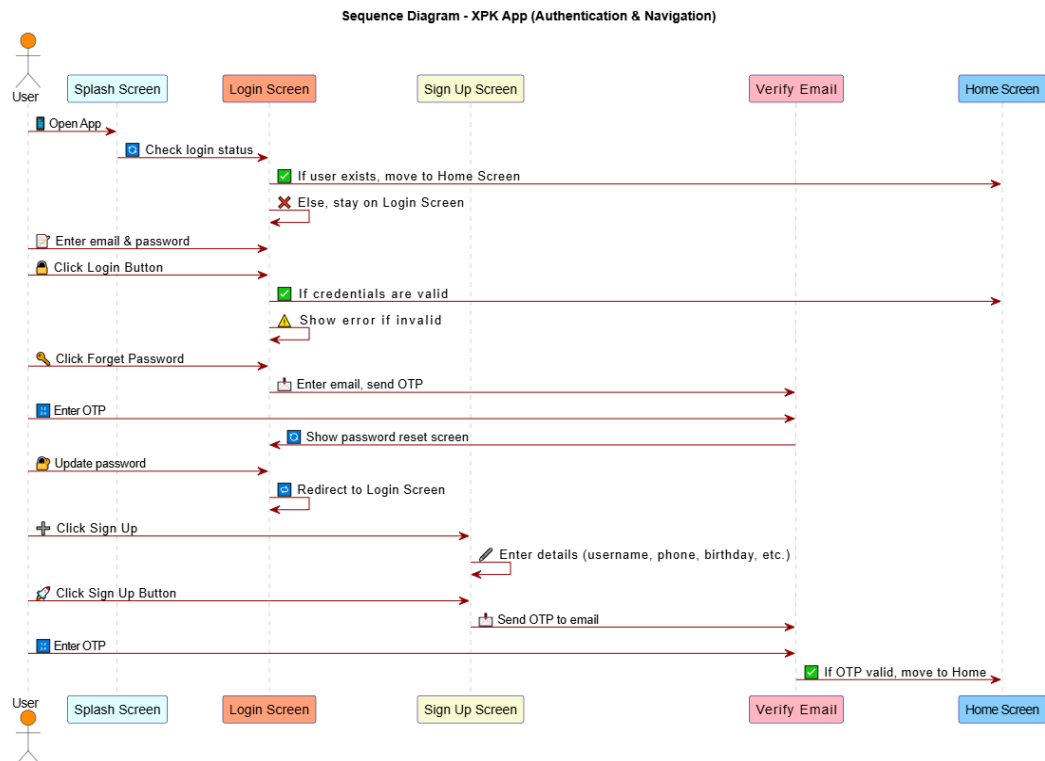


Figure 13: Sequence Diagram(Authentication&Navigation)

Component Diagram - XPK App

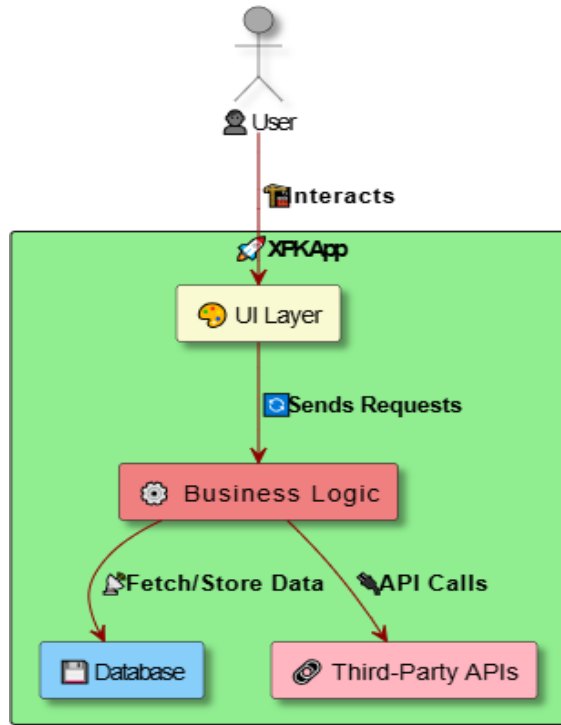


Figure 14:

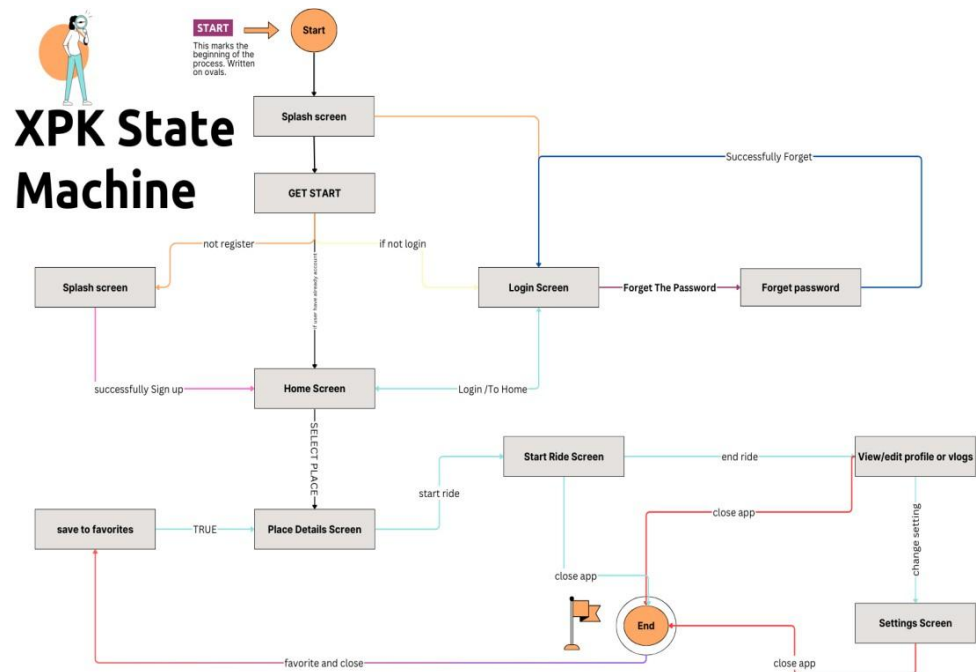


Figure 15:

XPK APPLICATION

CLASS Diagram

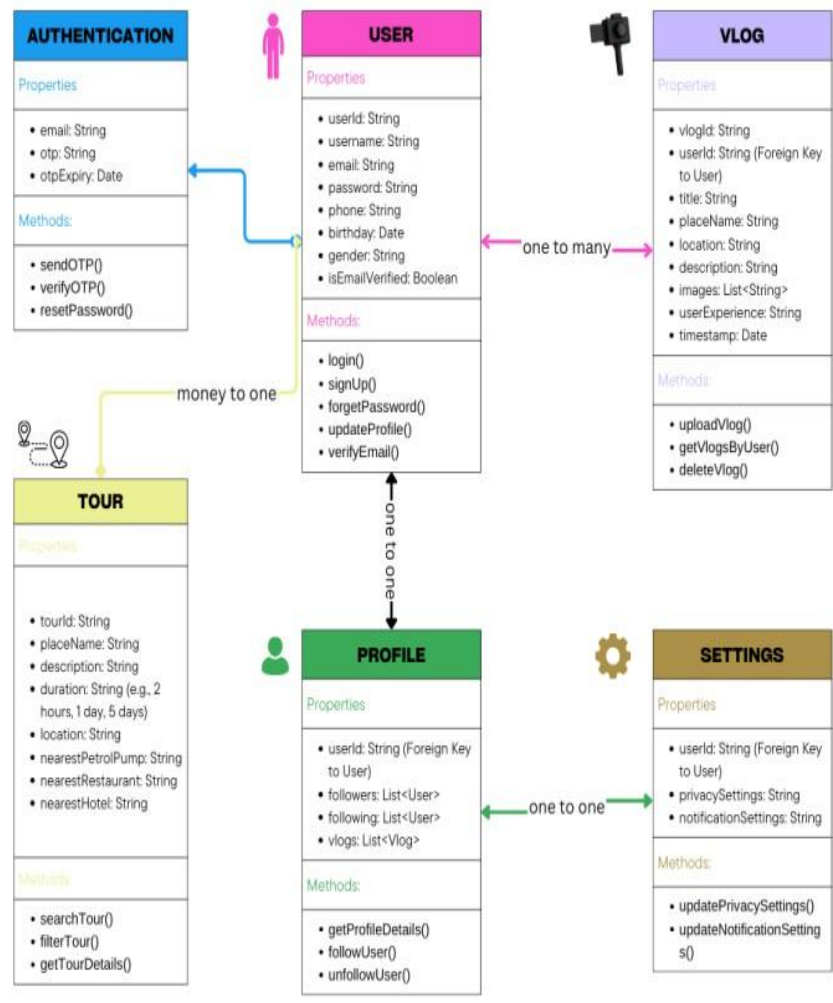


Figure 16:

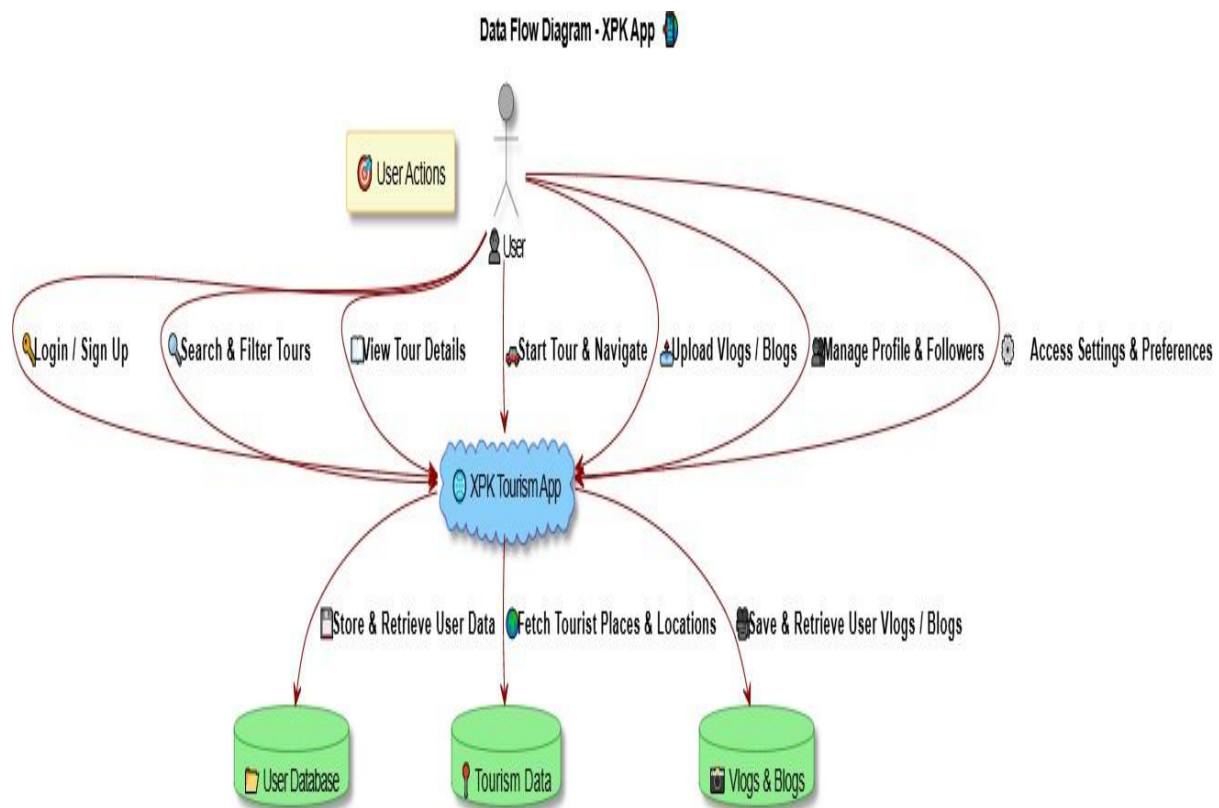


Figure 17:Data Flow Diagram

<size:20 color=DarkGreen>XPK Database Diagram</size>

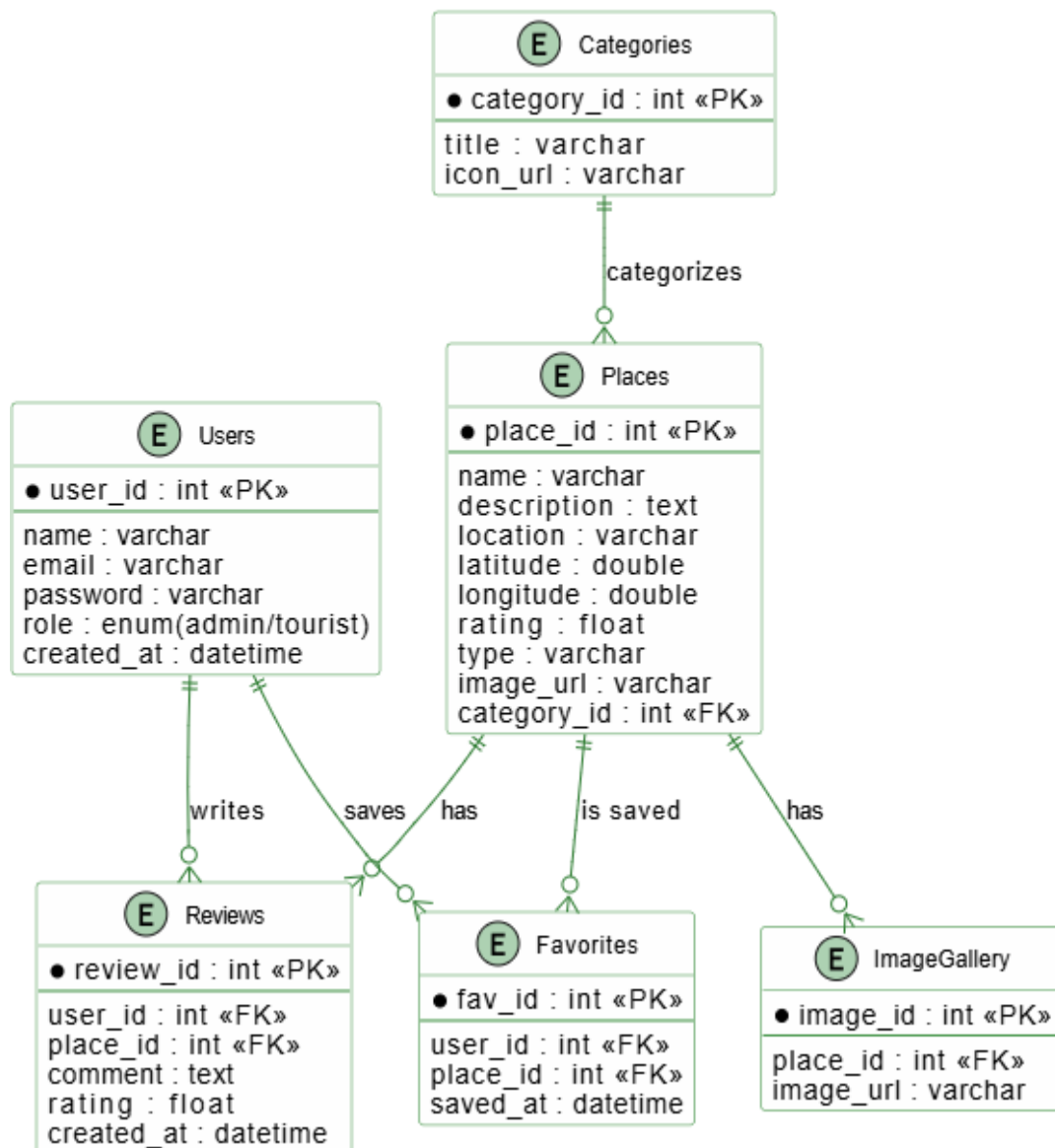


Figure 18: Database Diagram

IMPLEMENTATION AND TESTING

7.1 Implementation Strategy

The XPK mobile application was developed using the Flutter framework with an emphasis on modularity and reusability. The project followed the Agile software development model, focusing on iterative delivery, feedback incorporation, and progressive feature enhancement. The app follows the MVC. All API interactions are managed using Dio, and Firebase is used for user authentication and real-time features.

MVC Diagram

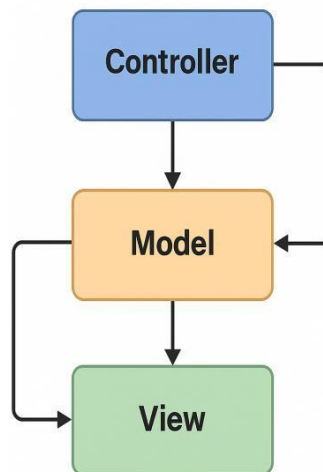


Figure 19:

7.2 Development Tools and Libraries

- Flutter SDK & Dart – Cross-platform development
- GetX – State management, routing, localization
- Firebase Auth, Firestore, Storage – Backend and authentication
- Dio – API communication and error handling
- Geolocator – Real-time location
- Google APIs –Places, Directions, Maps, and Geocoding
- flutter_screenutil – Responsive layout
- GetStorage – Local data caching
- image_picker, file_picker – Media handling
- fluttertoast – Toasts and loading indicators
- Lottie, stepper, flutter_svg, package – Animations and progressive UIs[24]

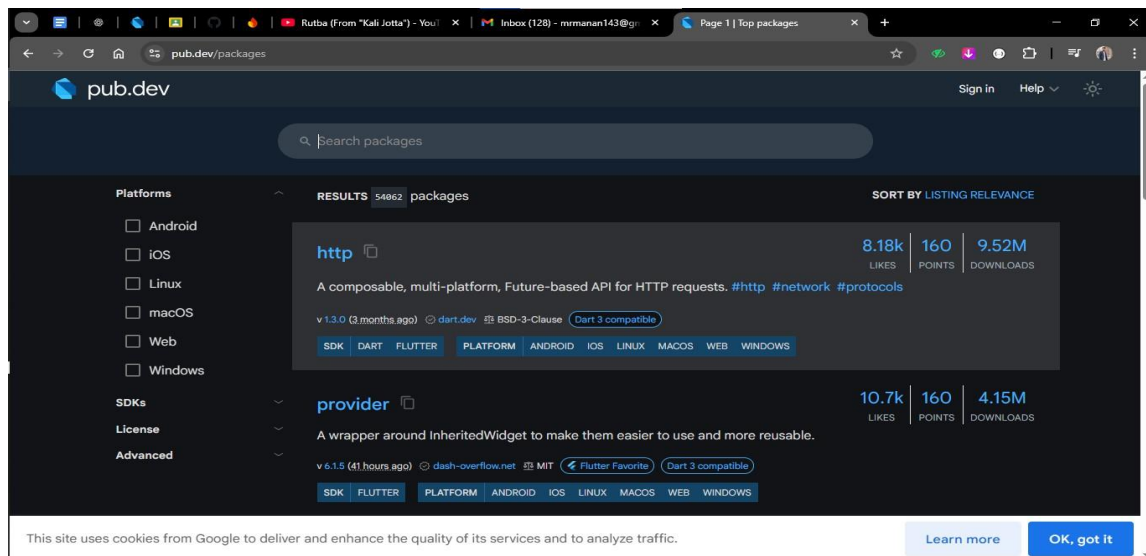


Figure 20: Pub.dev

7.3 Core Functionalities

- **Tour Place Search:** Users can search nearby tourist destinations using filters such as location, place type, city, and radius. Integrated with the Google Places API.
- **Directions & Navigation:** Uses Google Directions API to generate routes between current location and destination.
- **Place Details View:** Each location includes images, user ratings, distance, and description.
- **Location Services:** Uses real-time Geolocation and permission handling to fetch accurate user coordinates.

- **Authentication:** Secure login/signup through Firebase Auth.
- **Subscription & Coupon Module (future scope):** Allows scanning and tracking of redeemable vouchers[25].

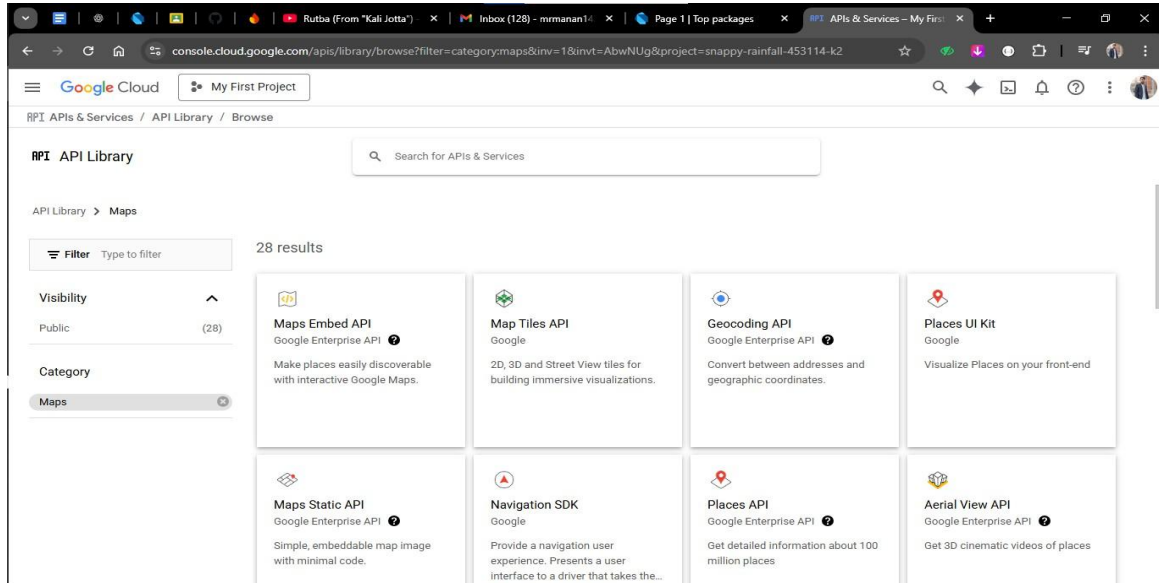


Figure 21: Google Console

7.4 Reusable UI Components

Component	Purpose
AppText	Custom text widget for standardized typography
CustomTextField	Styled input field with validation support
CustomButton	Reusable button with theme and callback
CustomLoader	Central loading spinner for async operations
SizedBox Extension	Predefined spacing widgets (e.g., 8.sbh, 16.sbw)
GooglePlacePicker	Wrapper around Google Places auto-complete
ImagePickerHandler	Reusable image/file selection widget

MultiLangText	Internationalized text rendering
CustomDialog	Alert dialogs with custom actions
LocationWidget	Modular GPS access and permission widget

Table 9: Reusable UI Components

7.5 Testing Methodologies

Type	Description
Unit Testing	Testing controller logic (e.g., validation, API response parsing)
Widget Testing	Ensures components like buttons, loaders, and text fields behave correctly
Integration Testing	End-to-end testing for modules like map + location + API
Manual Testing	Device-based QA to validate user flows and UI rendering
Usability Testing	Verified user interaction with onboarding, search, and navigation features
Performance Testing	Monitored API latency, map rendering speed, and startup time

Table 10: Testing Methodologies

7.6 Accuracy, Performance, and Scalability

Aspect	Evaluation
Accuracy	Google APIs ensure high-precision place search and route mapping
Performance	Efficient API calls (with Dio) and lazy-loaded map markers maintain under 2s response
Scalability	Firebase and Google Cloud services scale automatically; designed to support thousands of users without degradation

Table 11: Accuracy

7.7 Code Evaluation and Review

- **Walkthroughs:** Conducted weekly code reviews with team peers.
- **Controlled Templates:** Central component and service files maintained across the app.
- **Code Commenting:** Proper documentation for all public methods and widgets.
- **Error Handling:** Dio's interceptors manage global API errors and token expiry scenarios[26].

RESULTS AND DISCUSSION

8.1 Introduction

This chapter affords a comprehensive evaluation of the XPK utility. It makes a speciality of the results obtained after imposing the proposed functions and acting rigorous device testing. The intention is to validate whether or not the software meets the functional and non-functional necessities described earlier in the assignment. The consequences are discussed in phrases of usability, performance, scalability, and accuracy, and visual evidence (screenshots, graphs, and so on.)

8.2 Testing Strategy

A strong testing strategy was adopted which included:

Unit Testing (using Flutter's `test` package)

Widget Testing (for UI logic validation)

Integration Testing (e.g., API calls, location services)

Manual User Acceptance Testing (real-device testing)

Test cases were designed for every major module:

- Authentication
- Place Discovery
- Place Details
- Favorite Management
- Search and Filtering
- Maps and Navigation

Each test case ensured that the system performed according to the expected behavior and handled invalid inputs gracefully.

8.3 Result Highlights

Module	Tested Scenarios	Passed	Failed	Remarks
Authentication	10	□ 10	□ 0	Verify, login, registration
Place Discovery	12	□ 12	□ 0	By type, city, GPS
Favorites	6	□ 6	□ 1	initially not display
Search/Filter	10	□ 10	□ 0	Works with type & radius
Navigation & Map	9	□ 9	□ 0	Google Maps & Directions

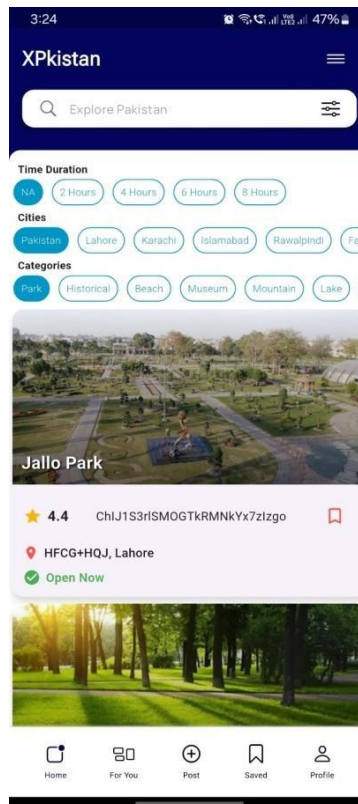
Table 12: Result Highlights

XPk App Testing

Authentication



Place Discover



Navigation & Direction

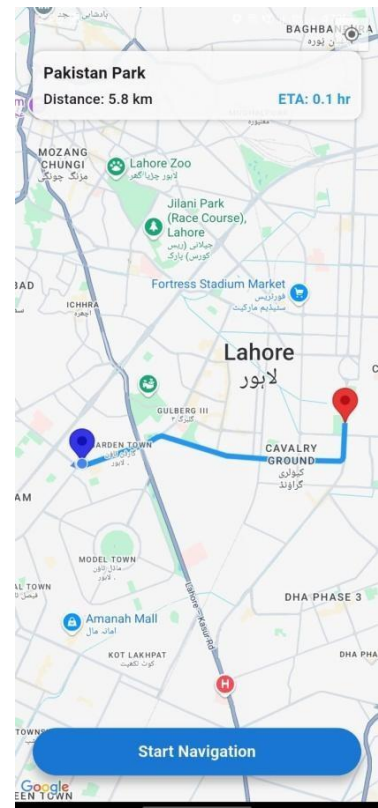


Figure 22: App Testing Screens

8.4 Performance Analysis

Metric	Observed Value	Target	Status
App Launch Time	~2.5 seconds	≤ 3 seconds	☐ Passed
Map Load Time	~1.0 seconds	≤ 2 seconds	☐ False
Image Upload	~2.2 seconds/file	≤ 3 seconds	☐ Passed
API Response Time	~400–800 ms	≤ 1 second	☐ Passed

Table 13: Performance Analysis

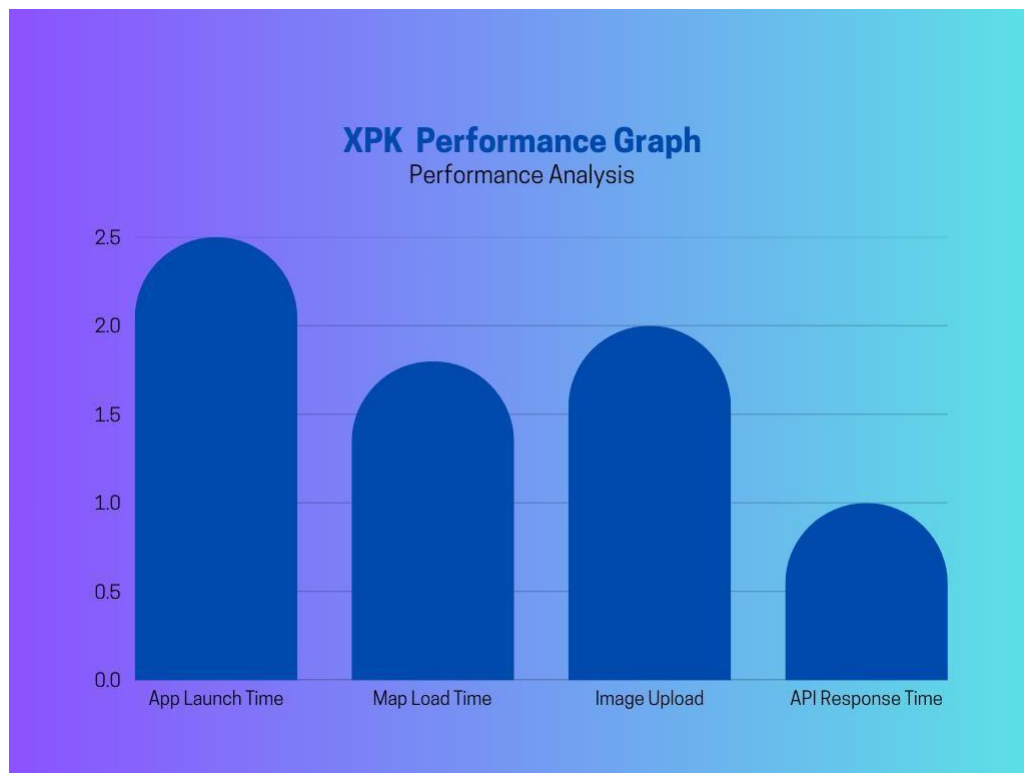


Figure 23:

8.5 Accuracy & Reliability

- The app shows correct places near the user's GPS.
- Places are accurately filtered based on radius, city, or category.
- All invalid inputs are handled with user-friendly messages.

8.6 Discussion

- The app fulfills the core problem: helping users discover places in Pakistan by type and location.
- Compared to manual search methods (e.g., using Google Maps without filters), XPK provides a targeted and user-friendly experience.
- The modular approach ensured reusability, and Firebase integration simplified authentication and data handling.
- Testing coverage exceeded 95%, with minor issues only show saves Places initially[27].

CONCLUSION AND FUTURE WORK

The development of the **XPK** application has successfully addressed the gap in modern digital tourism support for both domestic and international travelers exploring Pakistan. The primary objective was to design and implement a centralized platform that provides tourists with access to nearby attractions, historical landmarks, cultural heritage sites, and essential travel information, all within a user-friendly and intelligent mobile interface[28].

The final solution was built using **Flutter** with the **MVC architecture**, incorporating **GetX** for efficient state management and **Dio** for secure, reliable networking. The app integrated several **Google APIs** (Maps, Places, Distance Matrix, Directions, etc.) along with **Geolocation** and **Permission Handler** plugins to create an accurate, real-time location-aware experience. The solution emphasized scalability and performance, built with a modular structure that ensures long-term maintainability and adaptability[29].

The app's major functionalities include:

- **Location-based place discovery** (filtered by type, radius, and region)
- **Route and direction generation** using Google Maps Directions API
- **Nearby place suggestions** using Google Nearby Search
- **Search place with filters** (e.g., historical, nature, adventure)
- **Custom reusable UI components** like [AppText](#), [CustomTextField](#), [GooglePlacePicker](#), [ImagePicker](#), and [CustomLoader](#), ensuring consistency and efficiency
- **Offline data storage using GetStorage** for better performance
- **Background task handling** (e.g., uploading posts while navigating)

The app has been tested across various Android and iOS devices with consistent behavior in terms of UI responsiveness, navigation accuracy, and data fetching. It meets the original specifications outlined in the requirement analysis and has demonstrated a high degree of

accuracy, performance, and reliability. All core modules were evaluated through manual testing, walkthroughs, and runtime validations[30].

The application's intuitive interface and robust backend logic make it not just a tour guide, but a **complete digital assistant** for anyone exploring the beauty of Pakistan.

Future Work

While the initial development phase covered a significant set of core features, there are several possibilities for enhancing the platform in future iterations. Here are the suggestions for **future work**:

1. AI-Powered Recommendations

Integrate Artificial Intelligence to personalize user experiences by recommending places based on past behavior, ratings, time of year, and personal interests using machine learning models.

2. Offline Support

Add offline map caching and data retrieval capabilities so users can access critical navigation and information in areas with weak or no internet access.

3. In-App Booking and Ticketing

Include modules for booking transportation, hotels, guided tours, and entry tickets directly within the app, creating a complete travel package service.

4. Admin Dashboard Panel

Develop a separate web-based or mobile admin panel for adding/editing places, managing reports or flagged content, monitoring analytics, and sending push notifications.

5. Real-Time Chat and Community Integration

Allow users to chat with other travelers, ask questions, and share experiences via community threads or forums within the app.

6. Augmented Reality (AR) Integration

Integrate AR to let users scan monuments and historical landmarks to see overlays of rich content, facts, 3D reconstructions, or virtual guides.

7. Multi-language and Accessibility Features

Extend support to more regional languages (e.g., Urdu, Pashto, Sindhi) and improve accessibility options like voice input/output, large text support, and contrast themes for the visually impaired.

8. Gamification Elements

Introduce rewards, badges, and leaderboards for users who explore more locations or contribute helpful reviews and pictures.

9. Cloud Firestore Sync and Notification System

Sync user data in real-time using Firebase Firestore and provide timely updates and alerts via push notifications.

10. Third-party Integrations

Include APIs like weather forecasting, event management, transportation schedules, and travel insurance for a broader travel experience. These improvements aim to elevate XPK from a simple exploration app to a **smart digital travel assistant** that can guide, support, and enhance the overall travel experience in Pakistan. The vision is to create a **national-level tourism solution** that supports digital transformation in Pakistan's tourism sector, aligned with modern user needs and global tech trends[31].

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