



Software Product Release

LightFlight

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1. Chapter 1: Introduction

Flight reservations have become an essential aspect of modern mobility as the intersection of travel and technology has evolved. With the increased demand for affordable deals and efficient reservation management, managing airline reservations has become a prominent concern for travelers throughout the world since the process of flight reservation can be troublesome and complex and money-consuming even after reserving the flight travelers are confused about navigating through a new country, these issues are being addressed by developing a user-friendly, technologically advanced flight reservation application. Such a solution extends beyond mere convenience to improve the individual travel experience and the overall efficiency of the global travel industry.

LightFlight application will enhances connectivity, promotes tourism, and facilitates local and international business interactions through the simplification of booking processes, and add new features that enhance the travelers experience such as providing concierge services like rentals and local experiences, and finds the best deals for them.

The objective of the LightFlight application is to address common challenges faced by travelers when booking flights, such as time-consuming searches and inefficient management of reservations. By providing features like sorting options based on price, recommendations, and stops, as well as offering concierge services for post-flight needs, LightFlight aims to simplify the travel planning process and enhance the overall experience. Key functionalities include user account creation, login/logout capabilities, and a feedback system for continuous improvement. The project plan involves domain analysis, design, development, and database implementation. Additionally, the project serves as a learning opportunity for mastering new tools and methodologies like Android Studio, Git, GitHub, Jira, and agile development practices, while also gaining expertise in app testing and documentation.

In Chapter 2, we analyzed the domain of the business, mentioned the terminologies used on the interface and documentation, and general domain knowledge that is widely known by domain experts, identified our customers and users, set our domain environment, listed the tasks and procedures, identified the competing software, and recognized the similarities between the domains.

In chapter 3, we wrote our requirement engineering process that consists of: describing the system users, illustrating a use case diagram, making the product backlog, and use the definition of ready list to evaluate that our PBI is ready for development.

In chapter 4 system design is covered, we design several models for our system, including the system architecture to show the system organization style in a high level overview, the class diagram for the code structure, the data design to describe the data structure and contents with the relational schema and data dictionary, the component design for three the user stories add, delete, edit, while displaying their design details in pseudocode. Lastly, the interface design that uses it to display the application structure using navigation diagram.

Chapter 5 of LightFlight implementation covers the key steps and challenges in developing the app using Flutter. This includes domain analysis to understand user needs, requirement engineering to gather insights, and designing user interfaces and databases. The front-end focused on user-friendly interfaces, while the back-end used Firebase for secure services such as authentication and authorization. Throughout development, extensive testing and debugging ensured reliability. Challenges, such as managing the Firestore database and handling state management, were addressed by optimizing the database structure, following Firebase guidelines, and using the `setState()` function. Careful planning and execution led to the successful creation of a high-quality travel app that meets user needs and provides an exceptional experience, and we add our github and jira project link.

In Chapter 6, we ensured that the app complies with quality standards and aligns with user expectations by writing User Story Acceptance Testing, we outlined how each component is integrated to form an integrated system hierarchy in Integration Testing, and finally as a part of User Acceptance Testing, we gathered ten participants, and collected their feedback to assess the application's functionality, usability, consistency, and ability to provide all the services that were requested.

Chapter 7 concludes our report with a summary of the entire project and outlines potential future work to advance our system.

1.1. The Problem

Booking flights can be a significant problem for many travelers. It takes up a lot of time and can be frustrating. People struggle to find cheap deals, compare prices, and manage their bookings efficiently. This is made worse by the complicated Apps used for booking. For example, a family planning a vacation might spend hours looking for flights they can afford, only to find it difficult to compare prices from different airlines. This can make them feel overwhelmed, in addition to all these problems, people also must deal with after-flight services, such as finding rentals and local experiences.

1.2. The Solution

Our aim is to solve these challenges by creating an easy-to-use flight reservation app. The app simplifies the booking process, making it more accessible for users and saving them time and effort. It ensures a seamless and efficient experience for everyone.

The benefits of our app include helping users find good deals quickly and facilitating easy price comparison. It also improves booking management efficiency, allowing users to manage their bookings more effectively. Additionally, our app covers concierge services such as rentals and local experiences, ensuring a personalized, convenient, and efficient travel experience for our users.

1.3. The Product

1.3.1. Product Vision

For travelers **who** appreciate the ability to reserve an online flight ticket and manage their after-flight services, **The LightFlight** is an Android mobile application That is **designed to offer** travelers with the ability to effortlessly compare and book flights. **Unlike** other flight reservation apps like Google flight, Wego, and Wizz air, **Our Product** stands out by offering concierge services like rentals and **reservations**, ensuring a travel experience that is not only more personalized but also more convenient and efficient.

1.3.2. Product Roadmap



Figure 1: Product roadmap.

1.3.3. Objectives

- **Product (customer focus-value):**

Many travelers have trouble booking flights. It is time-consuming and frustrating. Also, it is difficult for people to find cheap deals, compare prices, and manage their bookings efficiently. The LightFlight application solves these problems and enables travelers to reserve flights at airports that suit their needs based on price, recommendations, stops. Additionally, we offer concierge services to meet their needs after the flight, such as recommending hotels, restaurants, and tourist attractions. We will also include the following features:

- Allow users to create accounts for managing flight reservations and provide convenient login/logout functionalities.
- Pre-planning and organizing the trip by determining appropriate after-flight concierge services for the traveler according to his needs (drivers, sightseeing planning, restaurant bookings and recommendations).
- Manage reservations (add, delete, edit, upgrade and view reservations).
- You can search for a flight and sort them based on: specific prices, recommended flights, and number of stops.
- Implement a feedback system to gather user suggestions for continuous improvement.

- **Project (solution focus-plan):**

To complete our project, we need to implement the fundamental activities in software processes that include the following stages:

- Domain analysis.
- collect user requirements.
- Design user interfaces.
- Develop the app and build its database.
- Test the app.

- **Learning (student focus):**

Upon the completion of our project, we will have significantly enhanced our understanding of a new IDE and various tools and methodologies, such as:

- Interact with a new IDE like Android studio.
- Understand the basics of Git, GitHub, and Jira.
- Master how to document an application process.
- Apply the agile strategy to our application development process.
- Learn how to test apps.

1.3.4. Scope

LightFlight is a flight reservation application designed to simplify the booking process for travelers, exclusively supporting the English language. The app allows users to create accounts and log in/out for efficient management of flight reservations. Travelers can search for flights based on specific criteria such as price, recommended options, and number of stops. Additionally, users can access a concierge service feature to plan post-flight activities like arranging for drivers and booking restaurants. The app facilitates reservation management, enabling users to add, delete,

edit, and view their flight bookings. Notably, LightFlight does not include flight status notifications or live customer support.

Each two weeks, we will provide some of the product's important features, so it will take two and a half months in total to deliver the product.

1.4. Scrum Team

Table 1: Scrum team.

Scrum Team	
Product Owner:	Dana Aldawood
Developers:	Dana Aldawood Aljawhara Aldhayan Duna Alabdulaziz Lama Alenzi
Scrum Master (SM):	L.Ghaida Alfayes.
Stakeholders:	L.Ghaida Alfayes.

2. Chapter 2: Domain Analysis

The airline flight industry has existed for decades, and because of social media influence, and international work opportunities the people become more interested in traveling the world and seeing other parts of it, which lead to the industry growing even more. As a result, this industry changed their traditional ways of booking flights to more modern ones. Our project domain is flight reservations business, where we create a powerful and easy-to-use app that facilitates flight reservations and after flight concierge services like rentals and local experiences. As a Traveler LightFlight is the perfect app where you can manage and find the best flight prices and after flight concierge services, to save you time and effort.

For better understanding of our domain and the expectations of our users, we gathered information from similar existing apps and websites, such as Google Flight, Wego, and Wizz Air for flight reservations, so we could have a better understanding of the rules and regulations regarding flight reservations.

2.1 Terminology

In the flight reservation domain, we expect the following unique terminologies that has special meanings, or isn't widely known, to be used in the interface, and documentation.

Terminology that appears on the interface:

- Departure: the place you want to leave from.
- Destination: the place you want to reach.
- Concierge services: the option to have after-flight services such as local experiences like sightseeing, and rentals.
- One-way: travel to the destination without returning to your departure location.
- Round-trip: Travel to the destination and go back again to your departure location.
- stops: a flight can't directly go to the destination; it has to stop at an intermediate airport.
- Multi-city: a flight that stops at multiple cities.
- Booking class: the quality of seats and services provided. There are four flight classes: economy, premium economy, business, and first class.

- Duration of trip: Expected total time of trip.
- Airline: A company that provides air transportation services

Terminology that appears on the documentation:

- APK: Android package kit
- SDK: Software development kit

2.2 General Domain Knowledge

To help us communicate better with our clients, understand our project in depth, and design an effective app that caters to people, we expect to use these facts and rules to help us in that regard.

- Flight types and categories: Understand different types of flights, including commercial, private, and chartered flights. Distinguish between short and long flights, as well as direct and connected flights.
- Airports: Recognize airports around the world and understand their importance in connecting flights, providing services, and its affecting on travel patterns.
- Booking categories and prices: Familiarity with different booking categories (e.g. economy class, business class, first class) and understanding how airlines structure their prices based on factors such as booking time, flexibility, and grade.
- Flight booking policies: The knowledge of Flight booking policies, such as identifications and travel documents, baggage allowance, special needs passengers.
- After flight concierge services: the knowledge of best local experiences and car rentals, such as local attractions, tours, and experiences, options available for transportations.
- Airline scheduling: The knowledge of how airlines schedule flights, including peak times and seasonal changes.
- Flight routes: The knowledge of the best flight routes to reduce time and satisfy travelers.

- Availability: The knowledge of available flights, seats availability which includes: seats in booking classes, location of the seat, and flight delays.

2.3 Customers and Users in the Domain

Our main domain at LightFlight is the flight reservation business, targeting travelers seeking an effortless booking experience and comprehensive after-flight concierge services. Also, we see tourism companies as potential users, as they can use our app to offer and promote their local experiences and services.

In addition to travelers and tourism companies, our domain is serviced by a network of dedicated professionals. This includes Airport staff, such as check-in and gate agents, Travel agents and corporate travel coordinators also use our platform to arrange travel for clients and employees, appreciating the integrated nature of our services.

Our customers are travel agencies that specialize in flight bookings, and airlines that will use the application to improve their reservation processes and enhance customer satisfaction on the trade side. Airlines indirectly benefit from LightFlight by increasing their bookings, by providing a user-friendly platform for travelers. Through cooperation, LightFlight ensures it serves both individual travelers and several companies in the field of aviation and travel.

2.4 The Environment

LightFlight is an Android application that has the apk file format, it will be developed specifically for the Android platform. It will be available for download on the Google Play Store, catering to Android device users. Additionally, the backend infrastructure includes servers and databases to support the efficient management of the reservation system.

2.5 Tasks and Procedures

In the field of travel booking, travelers engage in a variety of tasks to effectively plan and book their flights. Users usually access travel applications or websites, to search for available flights, view details like prices and the number of stops, compare flights, and ultimately make a reservation, view the reservation, and manage it. They might also have to book a flight by contacting a travel agent who provides recommendations based on preferences and prices. In addition, travelers can go to the airport and buy a ticket from the ticket counter.

2.6 Competing Software

In this section, we will conduct an analysis and comparison of three leading competitors in the travel reservation: Wizz Air, Wego, and Google Flight. These companies are highly recognized for their exceptional travel-related services and have established themselves as major contenders in the market. We will evaluate and differentiate each competitor based on key features. Furthermore, we will compare these features to those offered by our own app, LightFlight, presenting the findings in a comprehensive comparison table.

Table 2: Competing software

Feature	Wego	Wizz air	Google flight	lightFlight
Map exploration	no	yes	yes	no
Discount club	no	yes	no	no
Search and sort flights	yes	yes	yes	yes
Live customer support	yes	no	no	no
Concierge services based on destination	no	no	no	yes
Users Feedback	yes	yes	yes	yes
Compare prices	yes	no	yes	yes
Flight notification	no	no	yes	no

2.7 Similarities Across Domains and Organizations

Flight reservation business domain offers a combination of common and unique features that distinguish softwares from each other. Generic domain features include flight search, booking management, price comparison. And what distinguish other softwares from each other and is considered as a competitive advantage are the following features: map exploration, discount club, and flight notifications. And among all these specific features what distinguishes Lightflight is its emphasis on advanced after-flight concierge services, like offering local experiences suggestions and a wide range of rentals.

3. Chapter 3: Requirements Engineering

Requirements engineering takes a central role in LightFlight's development, ensuring that our app is customized to meet the specific needs and preferences of its users. Through interviews, questionnaires, and the user stories, we revealed important insights into user frustrations, desires such as seamless interface, customizable search filters, and integrated after-flight services, and challenges in the flight reservation process including the complexity of current online search options, difficulty in comparing prices, and struggles with after-flight services. By integrating these findings into the requirements engineering phase, we can address weaknesses, simplify the reservation process, and develop features that appeal to users. This will mitigate development risk and reduce the chances of costly rework. We will take these steps as part of requirements engineering: document the requirements, identify the users of our system, design the use diagram, and create a product backlog with its definition of ready for high-priority features. Through these steps of requirements engineering process, we can design a LightFlight to be powerful, efficient, and easy-to-use flight reservation app that understands and meets the diverse needs of its users enhancing their satisfaction and the success of our application.

To gather useful information for the development of LightFlight as part of the requirements engineering process, we used two main methods: user interviews and questionnaires. We interviewed three individuals representing diverse perspectives on flight booking, Sarah, Nora, and Mansour. The interviews lasted about 30 minutes, and each of them provided valuable information about their typical flight booking processes, challenges they face, and their desires for a flight booking app. The questions addressed various aspects, such as booking habits, frustrations while reserving online, and interest in additional services. In addition, we supplemented the information gathering process with (questionnaires that has been answered by a diverse group of eleven participants), measuring their satisfaction with current travel apps, their interest in using a new app, and their preferences for features.

Our interviews with potential users revealed a distinct preference for a digital flight booking solution that emphasizes convenience, budget-friendliness, and efficiency in comparing options across airlines. Users expressed frustration over the complexity of the current online search options and the difficulty of comparing prices and schedules, emphasizing the need for an integrated, user-friendly app. According to our interviewees, an ideal app would have a seamless user interface, easy comparison of flights, and customizable search filters, including price, number of stops, and user reviews. Additionally, there's a strong demand for after-flight services such as local experiences, rentals, all accessible within the same platform. Interviewees also highlighted the importance of enhancing the travel planning experience. They desire a single, versatile platform that not only simplifies the flight booking process with quick search and comparison features but also enriches the travel experience with a range of after-flight services and allows for user feedback to inform better travel decisions. This insight guides our development focus towards creating a software solution that meets these user needs, ensuring a satisfying and efficient travel booking journey. Through our questionnaire, the responses provided a clear insight into users' preferences and the challenges they face in the flight reservation applications. The majority (54.5%) were moderately satisfied with current travel apps, indicating suggesting a prevalent scope for improvement in the existing solutions. Also, the unanimous agreement (100%) to use an app that simplifies the flight reservation process and offers additional features confirms that there is a demand for innovative solutions in the flight reservation field. It is worth noting that many travelers find it difficult sometimes (54.4%) and

always (45.5%) to handle their after-flight services, with no negative responses, highlighting the importance of addressing the issue and finding a solution. A high percentage (90.9%) agreed that concierge services are a desirable feature, indicating a clear desire to have booking for concierge services with the flight reservation process. With 100% of respondents agreeing with the lack of flexibility of search options in current flight reservation apps, the shared sentiment among users suggests an indicator that supports the need for improved search functionality. In addition, the high level of users' preference (90.9%) for the importance of price comparison and filtering indicates the high demand for features that facilitate cost-effective decision making when planning travel. In summary, the questionnaire responses reveal that the users seek more streamlined, feature-rich, and user-friendly solutions in the flight reservation domain. The findings provide a strong foundation for designing the requirements and features of LightFlight to meet the user's preferences and requirements.

In conclusion, requirements engineering represents an integral part of the software development process, ensuring that requirements are comprehensively documented, that system users are identified, that use cases are crafted, and that product backlogs are addressed. Through the methodologies of user interviews, questionnaires, and the creation of user stories, we've successfully gathered a wealth of information.

Questionnaire result:

On a scale of 1 to 5, how satisfied are you with your current travel booking apps and services? (1 very dissatisfied, 5 very satisfied)

11 responses

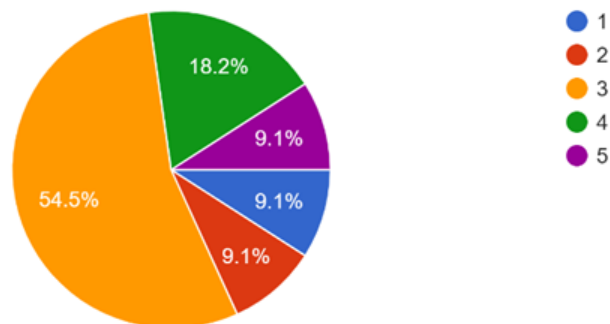


Figure 1:Satisfaction level.

Would you be interested in using an app that simplifies the flight reservation process and offers additional features?

11 responses

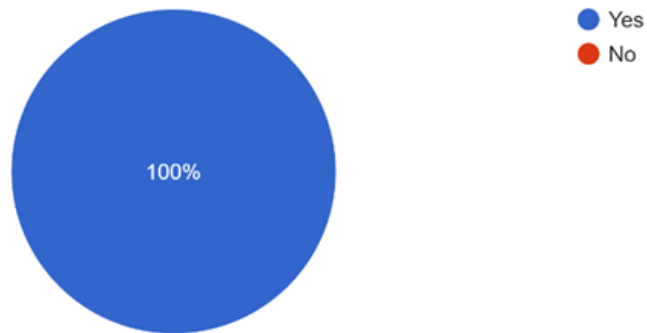


Figure 2:Interest in app.

Are you having trouble handling after-flight services?

11 responses

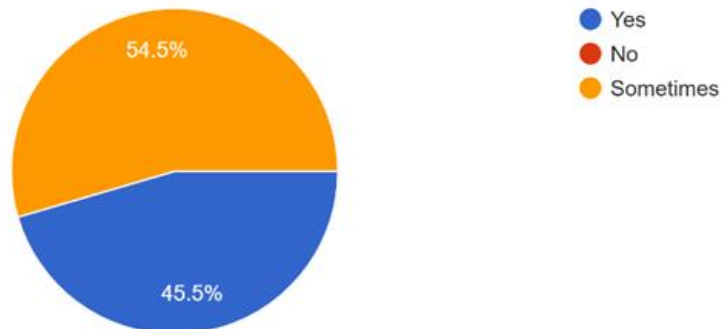


Figure 3:After-flight difficulties.

Is the ability to book concierge services (e.g., local experiences, car rental) a desired feature for you?

11 responses

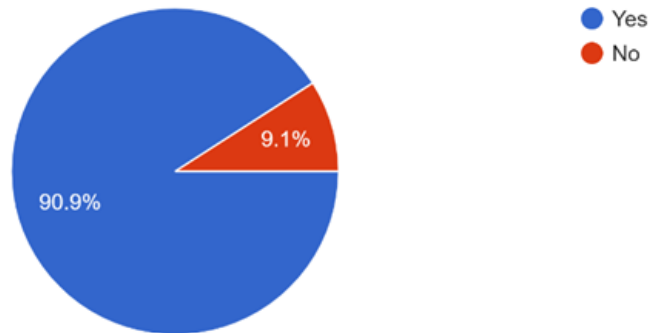


Figure 4:Booking Concierge-service

Have you found a lack of flexible search options in flight booking apps?

11 responses

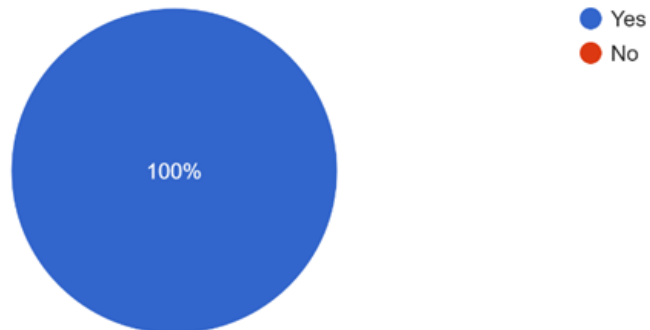


Figure 5:flexible search options.

Is price filtering and comparison a desired feature for you in a flight booking app?

11 responses

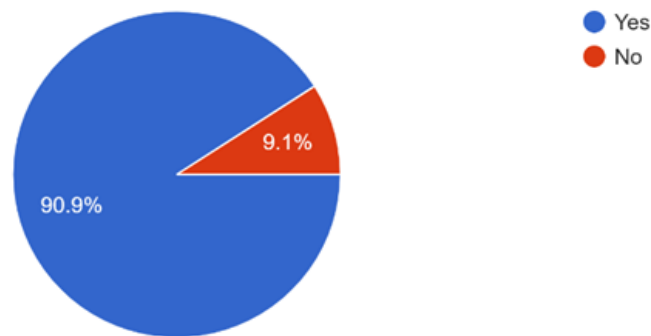


Figure 6:Filtering options.

3.1 System Users

We expect our users to be travelers that want to reserve flights or travelers who find it difficult to deal with after-flight services. It is required that they are 18 years or older, and that they have a passport or a national identification card for domestic travel. Also, they should have at least a high school education. The app accommodates both frequent travelers and those new to air travel, providing a straightforward and intuitive interface with clear instructions. Users do not need advanced technical skills, only basic familiarity with smartphones or computers.

3.2 Use Case Diagram

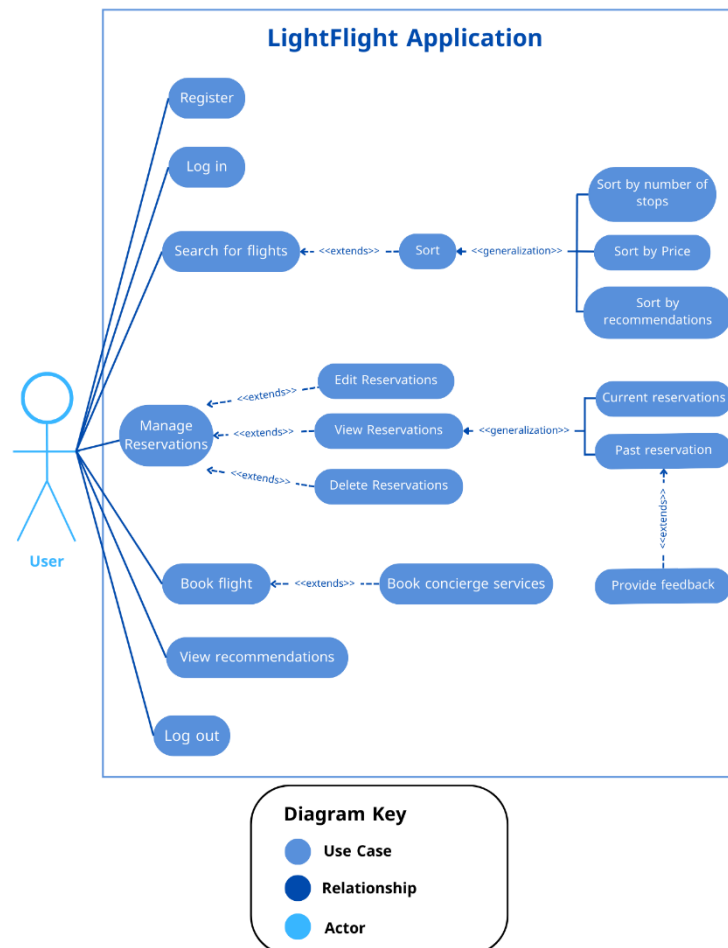


Figure 7: Use Case diagram.

3.3 Product Backlog

This section contains our product backlog, which represents a prioritized list of all the features and deliverables we will work on in this project. We will represent these items in the form of user stories, because it will help us understand the needs and motivation of the users behind each feature; which will benefit us in developing the right functionalities. User stories will also be categorized according to their size, type, and acceptance criteria.

Table 3: Product Backlog

PBI (user story)	Size (Story points)	Type (Feature, defect, technical work, knowledge acquisition)	Acceptance Criteria The conditions of satisfaction that must be met for that item to be accepted.
As a traveller, I want to be able to book a flight to my account so that I can easily keep track of my travel plans and have all my reservations in one place.	3	feature	If a user selects flight reservation option, inputs their desired destinations, dates, and class of service, then the system should display available flights and allow the user to complete a reservation, If the desired details are not available the system should display unavailable message to the user.
As a traveller, I want to have the ability to delete flight reservations from my account so that I can easily eliminate any unwanted bookings.	3	feature	If a user press "My flights" on the navigation bar, chooses "current flight", press "view flight details" button, and then presses "Delete" flight. then a confirmation prompt should appear, prompting the user to confirm or cancel the deletion process. If the user confirms the deletion by clicking "Confirm" in the confirmation prompt, Then the system should update the seats to 'available' and refund the user. If the user cancels the deletion process by clicking "Cancel" in the confirmation prompt, Then the deletion process should be aborted, and the flight reservation remains in the user's account.

As a traveller, I want to have the flexibility to edit my flight reservations so that I can easily make changes to my travel plans whenever necessary.	3	feature	If a user presses ‘My flights’ in the navigation bar, choose the current flight, press ‘View Flight’s details’, and presses “edit” icon. And makes changes to the reservation, Then the application should prompt the user to confirm the modifications before saving. If the user confirms the changes, Then the updated flight reservation should be reflected in their account, and the system should update the users’ flight details in the database and find another booking with those details. If no bookings are found with the new details, then the system should display an unavailable message. If the user cancels the editing process, Then the changes should not be saved, and the original flight reservation details should remain unchanged.
As a traveller, I want to search for flights So that I can plan and book my journey efficiently.	3	feature	If a user searches for flight reservations after entering: departure, destination, departure date, booking class. Then the system should display all matching reservations. If the desired search was not available, the system should display unavailable message to the user.
As a traveller, I want to book concierge services so that I can ensure a seamless and personalized experience for my post-flight needs.	3	feature	If the user successfully books a flight, Then the system should be presented with the option to book concierge services for their post-flight needs. If the user chooses to book concierge services, Then the application should provide a selection of available services. If the user selects a concierge service, Then the system should be prompted to provide details based on desired service. If the user confirms the booking, Then the application should process the concierge service reservation and provide a confirmation message with the details of the booked service.

			If the user cancels the booking process for concierge services, Then the system should be returned to the previous page without any concierge service reservation being made.
As a traveller, I want to sort search results based on factors like price, recommended flights, and number of stops so that I can easily compare and select the best flight options that meet my preferences.	2	feature	If a user searches for flight reservations using specific criteria like price, recommendations, or number of stops, then the system should display all matching reservations if available. If the searched reservations not available the system should inform the user
As a traveller, I want to be able to provide feedback, so that my experiences and suggestions can be considered in the ongoing improvement of the service.	2	feature	f a user press “My flights” on the navigation bar, chooses old flights, and presses the “post feedback” button and posts his feedback. The system should store the feedback on the database and display the feedback in “Reviews” page. If the user wants to cancel the feedback, then they click on the cancel button and the system will redirect the user to the previous page.
As a traveller I want to easily view my upcoming and previous flight reservations, so that I can conveniently access details about my trips.	2	feature	If a user presses ‘My flights’ in the navigation bar, choose the current or previous flights, press ‘View Flight’s details’. Then the system should get his flight details from the database and display it to the user.
As a new user, I want to be able to create an account on the LightFlight application so that I can easily manage my flight reservations and access personalized features.	2	feature	If a new user selects the option to create an account, then they should be able to enter a username, and set a secure password. If the account creation is successful, then the user details will be stored in the database and should be able to access the app. If the user encounters any errors during the registration process, Then the application should provide helpful error messages to guide the user in resolving the issues.
As a registered user, I want to log in to the LightFlight	2	feature	if the user fill the form with his username and password, and click

application, so that I can access my account and manage my flight reservations.			submit, then the system will verify the information and it is existence in the database before redirecting the user to the homepage, if the user information doesn't exists in the database, then the system will display a message to inform the user this information is not registered.
As a registered user, I want to log out of my account, so that my account remains protected.	2	feature	If a user press "My account" on the navigation bar, and presses "Log out" button, and confirms it, then the system should end the user's session. If the user cancels the confirmation, he will be directed to the previous page.
As a traveller I want to be able to view recommendations, so that I can learn from travellers experiences and make informed decisions.	1	feature	If the user clicks on the "Recommendations" from the navigation bar, Then the application should display a list of recommendations from the database based on travellers experiences.
As a user, I want the application to be accessible 99% of the time, so I can use it whenever I want.	3	feature	If the user wants to use the application at any time, Then LightFlight should be accessible 99% of the time to ensure availability, and the downtime should not exceed 1%.
As a traveller, I want the LightFlight application to prioritize ease of use so that I can book my flight within 8 minutes	2	feature	If the user starts booking a flight on LightFlight, Then the app should make it easy to finish within 8 minutes by providing clear steps and fast loading times, and the user shouldn't exceed 10 minutes to finish a booking.
As a traveller, I want the LightFlight application to display my booked flights within 10 seconds so that I can quickly check my upcoming travel plans.	2	feature	If the user accesses their booked flights on LightFlight, Then the application should display the booked flights within 10 seconds for quick access to upcoming travel plans.

3.4 Definition of ready

Table 4:Definition of Ready.

Definition of Ready	
<input type="checkbox"/>	Business value is clearly articulated
<input type="checkbox"/>	Details are sufficiently understood
<input type="checkbox"/>	Dependencies are identified; no blocking dependencies exist
<input type="checkbox"/>	Team is appropriately staffed relative to the PBI
<input type="checkbox"/>	Estimated and small enough to be completed during sprint
<input type="checkbox"/>	Acceptance criteria are clear and testable
<input type="checkbox"/>	Performance criteria, if any, are defined and testable
<input type="checkbox"/>	Team understands how to demo the completed PBI

4. Chapter 4: System Design

4.1 System Architecture

The most appropriate system architecture for LightFlight Android application is client-server architecture. This architecture divides the functionality into two main sides:

The client: An application user interface that is utilized by users to send requests to the server and receive responses over the internet.

The server: A system or software application that receives, manages, and processes requests from the clients, and sends back responses over the internet.

Through our Android application interface, users can perform the following functions: register, log in, log out, add, edit, delete, view, and search on reservations. These functions represent the requests that will be sent to the server.

Our “NoSQL” DBMS server will be responsible for implementing the business logic of our application which was written using Dart programming language, it handles the requests sent by users and perform the following functions: Storing the client’s information, authenticating the user’s credentials, retrieving, displaying, and updating the client’s reservations.

We find this system architecture the most suitable one for the following reasons:

- The separation of functionality in client-server architecture enhances the modularity of our application since changes to one component do not affect the other.
- It improves the performance of our application, in dealing with multiple requests/users by making it easier to scale out horizontally by adding more servers to handle the requests.
- It helps preserve data integrity, and consistency through centralized data management. This centralized approach not only preserves integrity and consistency but also makes it easier to maintain the data, perform backups, and add security implementations.

We found the other system architectures not suitable for our application for the following reasons:

- Layered architecture:

Although this architecture provides better modularity by separating the code into layers that can be independently modified, it lacks the scalability and performance we desire in our application [6].

- Event-driven architecture:

This system architecture may slow the responsiveness of our system since the flow of the application is determined by events -system state changes- and these certain event handlers take time to complete [6].

- Pipe and filter architecture:

Although this architecture improves modularity and is more flexible in terms of adding and removing functionality, it has limited interaction due to its sequential and linear data flow which

impacts the interactivity and responsiveness of our application. It also doesn't scale or perform well [6].

- peer-to-peer architecture:

Although this architecture scales well by distributing requests across multiple server nodes, it lacks a central server and without centralized data management, it is not easy to maintain the integrity, and consistency of the data [6].

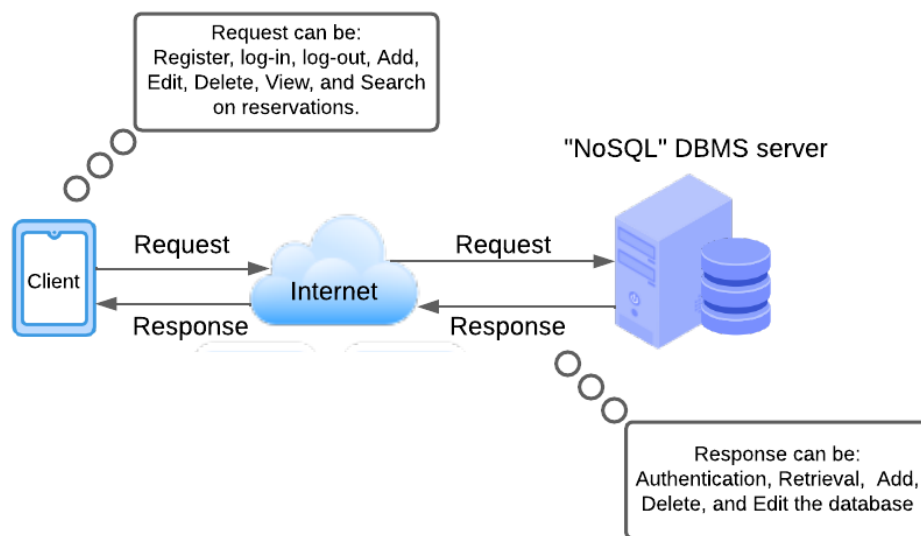


Figure 8: System Architecture

4.2 Class Diagram

In this section, we present the LightFlight class diagram, which is a crucial component of our design documentation. Class diagrams are essential in object-oriented programming as they provide a static view of the system structure, illustrating the classes, their attributes, operations, and the relationships among objects. This class diagram shows how the classes interact in our system, offering a detailed blueprint of the architecture.

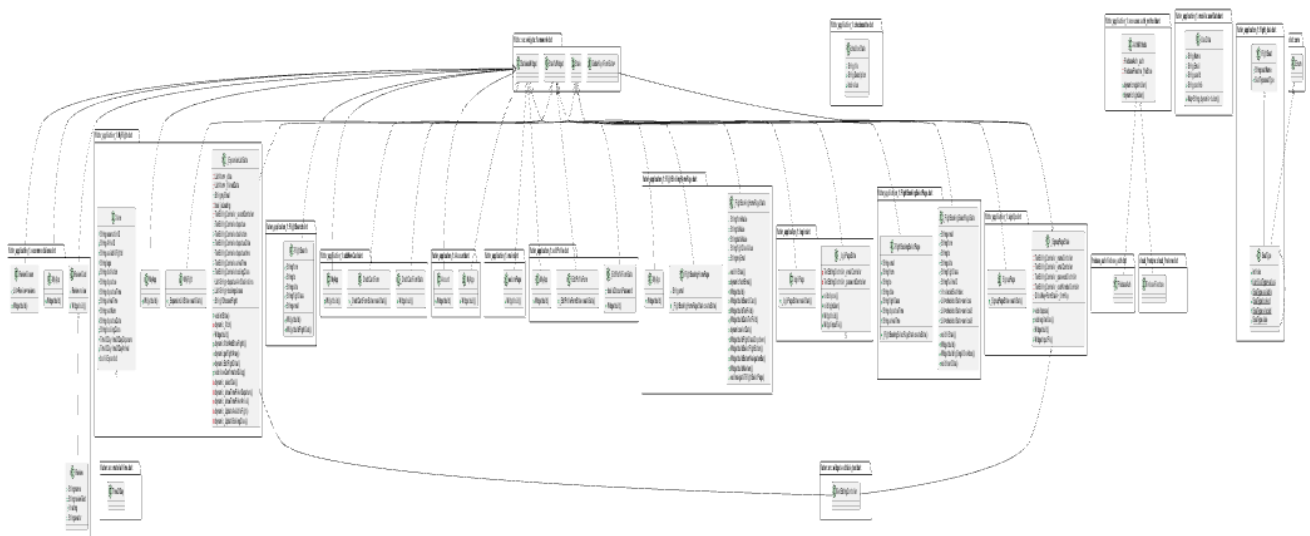


Figure 9: Class Diagram

It may be difficult to read the class diagram image; please download and zoom in for a clearer version at the provided pdf file.

[Class diagram](#)

4.3 Data Design

Data design describes to us the structure, content, and organization within the system, which will help in determining the efficiency of our database system.

4.3.1 ER Diagram:

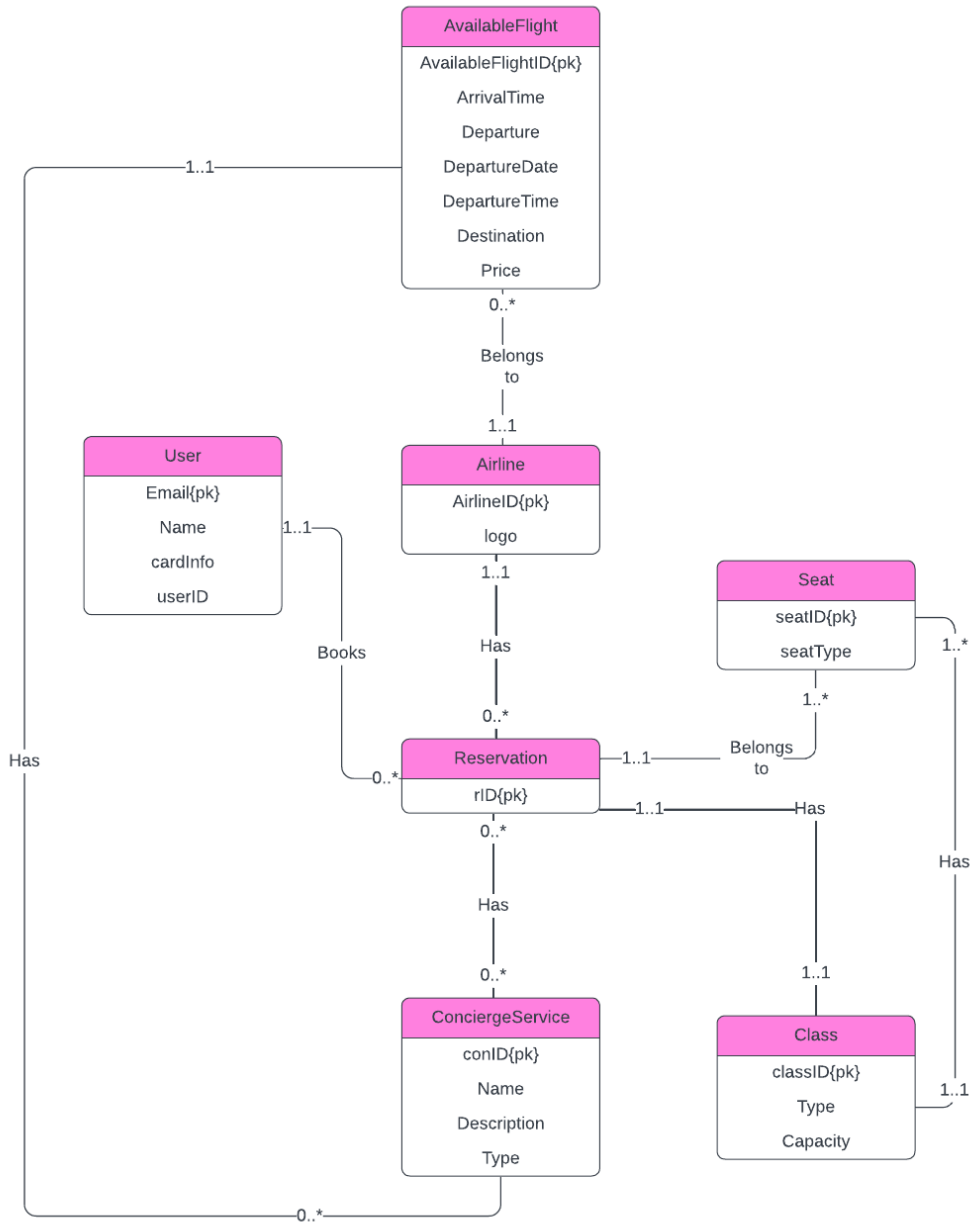


Figure 10: ER Diagram

4.3.2 Schema:

1. User (Email, Name, cardInfo, userID):

Primary key: Email

2. Airline (AirlineID, logo):

Primary key: AirlineID

3. AvailableFlight (AvailableFlightID, ArrivalTime, Departure, DepartureDate, DepartureTime, Destination, Price, FlightAirlineID):

Primary key: AvailableFlightID

Foreign key: FlightAirlineID References Airline -AirlineID-

4. Class (classID, Type, Capacity):

Primary key: classID

5. Seat (seatID, seatType, seatClassID):

Primary key: seatID

Foreign key: seatClassID References Class -classID-

6. ConciergeService (conID, Name, Description, Type, ServiceAvailableFlightID):

Primary key: conID

Foreign key: ServiceAvailableFlightID References AvailableFlight -AvailableFlightID-

7. Reservation(rID, UserEmail, resAirlineID, resClassID, resConceirgeID, resSeatID):

Primary key: rID

Foreign key: UserEmail References User-Email-

resAirline References Airline-AirlineID-

resClassID References Class-classID-

resConceirgeID References ConceirgeService -conID-

resSeatID References Seat -seatID-

4.3.3 Data Dictionary

- Data dictionary showing description of all entities:

Table5 : Data dictionary of entities.

Entity name	Description	Occurrence
User	A general term that describes any person who uses LightFlight application.	<ul style="list-style-type: none"> • A user may book many reservations.
Airline	A general term that describes the company that owns the AvailableFlight that the user will reserve.	<ul style="list-style-type: none"> • An airline may have many reservations.
AvailableFlight	A general term that represents the available airplane that the user will reserve to reach his destination.	<ul style="list-style-type: none"> • An AvailableFlight belongs to one and only one airline. • An AvailableFlight may have many concierge services.
Class	A general term that represents the quality of seats and services provided.	<ul style="list-style-type: none"> • No direct occurrence.
Seat	A general term that represents the location assigned to the user on the airplane.	<ul style="list-style-type: none"> • A seat has one and only one class. • A seat belongs to one and only one reservation.
ConciergeService	A general term that represents the after-flight concierge services suggestions, that our system provides to each flight.	<ul style="list-style-type: none"> • No direct occurrence.
Reservation	A general term that refers to our system's after-flight concierge services.	<ul style="list-style-type: none"> • A reservation may have many concierge services. • A reservation must have one and only one class.

- Data dictionary showing description of all relationships:

Table 6 : Data dictionary of relationships.

Entity name	Multiplicity	Relationship	Entity name	Multiplicity
User	1..1	Books	Reservation	0..*
Airline	1..1	Has	Reservation	0..*
AvailableFlight	0..*	Has	Airline	1..1
	1..1	Has	ConciergeService	0..*
Class	-No direct relationship-			
Seat	1..*	Has	Class	1..1
	1..*	Belongs to	Reservation	1..1
ConciergeService	-No direct relationship-			
Reservation	0..*	Has	ConciergeService	0..*
	1..1	Has	Class	1..1

- Data dictionary showing description of all attributes:

Table 7 : Data dictionary of attributes.

Entity name	Attribute	Description	Data Type	Length	Nulls	Multi-valued	Default value	Range	P K
User	Email	The user's email that uniquely identifies him	Varchar	255	N	N	N		Y
	Name	The user's name	Varchar	50	N	N	N		
	cardInfo	The user's card info	Integer	19	N	Y	N		
	userID	The user's ID created at sign up.	Varchar	255	N	N	N		
Airline	AirlineID	The Airline ID that uniquely identifies it.	Varchar	255	N	N	N		Y

	logo	The airline logo.	Image		N	N	N		
AvailableFlight	AvailableFlightID	The Available Flight ID that uniquely identifies it.	Varchar	255	N	N	N		Y
	ArrivalTime	Available Flight 's arrival time.	Time		N	N	N		
	Departure	Available Flight 's city of departure.	Varchar	30	N	N	N		
	DepartureDate	Available Flight 's date of departure.	Date		N	N	N		
	DepartureTime	Available Flight 's time of departure.	Time		N	N	N		
	Destination	Available Flight 's city of destination.	Varchar	30	N	N	N		
	Price	Available Flight 's booking price.	Decimal	20,5	N	N	N		
Class	classID	The class's ID that uniquely identifies it.	Varchar	255	N	N	N		Y
	Type	Type of class, which can be one of four values.	Varchar	20	N	N	N	"Economy", "Premium economy", "Business", "First class"	

	Capacity	The number of seats that has this class in the airplane.	Integer	4	N	N	N		
Seat	seatID	The seat's ID that uniquely identifies it.	Varchar	255	N	N	N		Y
	seatType	Type of seat, that can be one of three values.	Varchar	20	N	N	N	"Booked", "Available", "Selected"	
Reservation	rID	The reservation's ID that uniquely identifies it.	Varchar	255	N	N	N		Y
ConciergeService	conID	The concierge service's ID that uniquely identifies it.	Varchar	255	N	N	N		Y
	Name	The name of the concierge service.	Varchar	50	N	N	N		
	Description	Information about the concierge service.	Varchar	255	N	N	N		
	Type	Type of concierge service.	Varchar	20	N	N	N		

4.4 Component Design

Table 8: Component design.

Sprint number	PBI (user story)	User story tasks with effort estimates in hours					Sum of effort
2	As a traveller, I want to be able to book a flight to my account so that I can easily keep track of my travel plans and have all my reservations in one place.	Creating "Available Flight" table in LightFlights' database to save the available flights information.	Creating "Reservation" table in LightFlights' database to save the booked available flights information along with its traveler.	Creating Homepage interface which includes "Flight Booking Homepage" class that display a form for retrieving the available flights from the database based on the information that the user fills in the form.	Creating "Flight search" class that processing the user input. It will display any available flight that matching it. Otherwise, unavailable messages will display, and the user must re-search.	Creating "Flight Booking Select Homepage" class that displays a page of the flights' seats, and a pop-up page for its concierge services. Also, a "Book a Flight" button that's add the booked flight to "View flights" page and to the database if the process was successful. Otherwise, the user cannot reach this page.	14
		1	1	4	3	5	
2	As a traveller, I want to have the ability to delete flight reservations from my account so that I can easily eliminate any unwanted bookings.	Creating delete functions that will delete the reservation from the Reservation table in the database	Creating delete functions that will delete it form the list in "View flight" page and refresh the interface.	Creating a delete icon within each reservation in the "View flights" page, if the user clicks on it a confirmation message will display. if the user confirms the delete process the reservation will be deleted as the logic of the two delete functions. Otherwise, the reservation will remain in the page as well as in the database.			8
		3	3	2			

2	As a traveller, I want to have the flexibility to edit my flight reservations so that I can easily make changes to my travel plans whenever necessary.	Creating "UpdateAvailable Flight" function that make the user to be able to edit the booked flight by choosing another available flight.	Creating "UpdateBooking Class" function to edit the booking class of the booked flight.	Creating "showTimePickerArrival" and "showTimePickerDeparture" functions that display time picker to edit the departure or arrival time of the reservation.	Creating "selectDate" function to edit the departure date of the reservation.	An edit icon includes "EditFlightDetail" function that displays a dialog have all the editing fields. If the user clicks on one of the editing field the related function of this field will be called. For each editing field, a confirmation message will display. if the user confirms it, the reservation information will be updated in the "View flights" page as well as in the database.	15
		3	2	5	2	3	

- **Add a reservation.**

Classification:

Function

Definition:

The user should be able to add a new reservation by searching for matching flight information.

Construction:

Input: Departure, Destination, Departure Date, Booking class.

Pre-condition: The user must be registered.

Post-condition: The user will be redirected to the homepage, and the new reservation is added to the Reservation table in the database, also it will be displayed in View flights page, and a confirmation message will display to the user comprehend "Booking add successfully".

Pseudocode:

```

IF the user clicks on Select button
  IF field was empty
    DISPLAY "No flight available"
  ELSE
    READ Departure, Destination, DepartureDate, class
    IF matches any flights' information in AvailableFlight table
      DISPLAY the available matching flights
      IF the user clicks on Select button
        DISPLAY seats page
        IF the user clicks on Book a flight button
          Display concierge services as pop-up page
          IF the user clicks on Next button
            RETURN the user to the Homepage
            Add the selected flight to View flights page
            DISPLAY "Booking Added Successfully"
          ELSE
            IF the user clicks on the back arrow button
              RETURN the user to the seat page
            ENDIF
          ENDIF
        ELSE
          IF the user clicks on the back arrow button
            RETURN the user to the available matching flights page
          ENDIF
        ENDIF
      ELSE
        IF the user clicks on the back arrow button
          RETURN the user to the Homepage
        ENDIF
      ENDIF
    ELSE
      DISPLAY "No flight available"
    ENDIF
  ENDIF
ENDIF
ENDIF

```

Figure 11: Add pseudocode.

- **Delete a reservation.**

Classification:

Function

Definition:

The user should be able to delete their reservation in View flights page.

Construction:

Pre-condition: The user must be registered and have a flight reservation.

Post-condition: The deleted reservation is deleted from the Reservation table in the database, also it will be deleted from the list in the View flights page.

Pseudocode:

```

IF the user clicks on the delete icon
    DISPLAY confirmation message "Are you sure you want to delete this item?"
    IF the user click on Delete choice button
        DELETE the reservation from the database
        DELETE the reservation from the View flight list
        UPDATE View flight list
    ELSE
        IF the user clicks on Cancel choice button
            the reservation remain in the databas and in the View flights list
        ENDIF
    ENDIF
ENDIF

```

Figure 12: Delete pseudocode.

- **Edit a reservation.**

Classification:

Function

Definition:

The user should be able to edit their reservation in View flight page.

Construction:

Pre-condition: The user must be registered and have a flight reservation.

Post-condition: The edited reservations' information will be updated in the Reservation table in the database, also it will be updated in View flights page.

Pseudocode:

```

IF the user clicks on edit icon
    DISPLAY edit flight dialog
    IF the user clicks on edit booked flight field
        DISPLAY all the available flights dialog
        IF the user clicks on one of the available flights
            DISPLAY confirmation message "Are you sure you want to change the flight?"
            IF the user click on Yes choice button
                UPDATE the Reservation table in the database
                UPDATE the reservation in the View flight list
            ELSE
                IF the user click on No choice button
                    the reservation remain in the databas and in the View flights list without any changes
                ENDIF
            ENDIF
        ELSE
            IF the user clicks on any place out of the available flights dialog
                return to edit flight dialog
            ENDIF
        ENDIF
    ENDIF

    IF the user clicks on booking class field
        DISPLAY the booking classes dialog
        IF the user clicks on one of the booking classes
            DISPLAY confirmation message "Are you sure you want to change the flight?"
            IF the user click on Yes choice button
                UPDATE the Reservation table in the database
                UPDATE the reservation in the View flight list
            ELSE
                IF the user click on No choice button
                    the reservation remain in the databas and in the View flights list without any changes
                ENDIF
            ENDIF
        ELSE
            IF the user clicks on any place out of the booking classes dialog
                return to edit flight dialog
            ENDIF
        ENDIF
    ENDIF

    IF the user clicks on depature date field
        DISPLAY the date picker dialog
        IF the user choose a new depature date
            DISPLAY confirmation message "Are you sure you want to change the flight?"
            IF the user click on Yes choice button
                UPDATE the Reservation table in the database
                UPDATE the reservation in the View flight list
            ELSE
                IF the user click on No choice button
                    the reservation remain in the databas and in the View flights list without any changes
                ENDIF
            ENDIF
        ELSE
            IF the user clicks on any place out of the date picker dialog
                return to edit flight dialog
            ENDIF
        ENDIF
    ENDIF

    IF the user clicks on depature time field
        DISPLAY the timer picker dialog
        IF the user choose a new depature time
            DISPLAY confirmation message "Are you sure you want to change the flight?"
            IF the user click on Yes choice button
                UPDATE the Reservation table in the database
                UPDATE the reservation in the View flight list
            ELSE
                IF the user click on No choice button
                    the reservation remain in the databas and in the View flights list without any changes
                ENDIF
            ENDIF
        ELSE
            IF the user clicks on any place out of the timer picker dialog
                return to edit flight dialog
            ENDIF
        ENDIF
    ENDIF

    IF the user clicks on arrival time field
        DISPLAY the time picker dialog
        IF the user choose a new arrival time
            DISPLAY confirmation message "Are you sure you want to change the flight?"
            IF the user click on Yes choice button
                UPDATE the Reservation table in the database
                UPDATE the reservation in the View flight list
            ELSE
                IF the user click on No choice button
                    the reservation remain in the databas and in the View flights list without any changes
                ENDIF
            ENDIF
        ELSE
            IF the user clicks on any place out of the time picker dialog
                return to edit flight dialog
            ENDIF
        ENDIF
    ENDIF

    IF the user clicks on close button
        close the dialog
    ENDIF
ENDIF

```

Figure 13: Edit pseudocode.

4.5 Interface Design

- **navigation diagram**

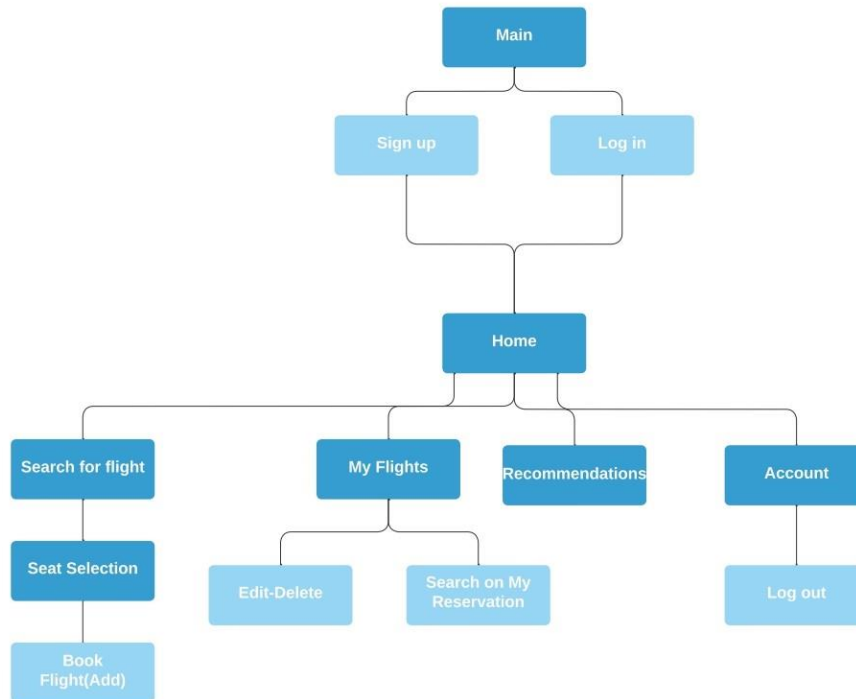


Figure 14: Interface Design

- **UX Guidelines implemented for each interface:**

1. Simple and Visually Appealing Interface
2. High Feedback and Interaction
3. Consistency and Uniformity
4. Flexibility and Efficiency of use.
5. Error prevention.

• User interfaces

1. Main Page



Figure 15: Main Page interface.

Table 9: User interface description #1.

#	Description
1	Signup button that navigates the user to the Signup page
2	Login button that navigates the user to the Login page

2. Sign up page (if the user click on #1)

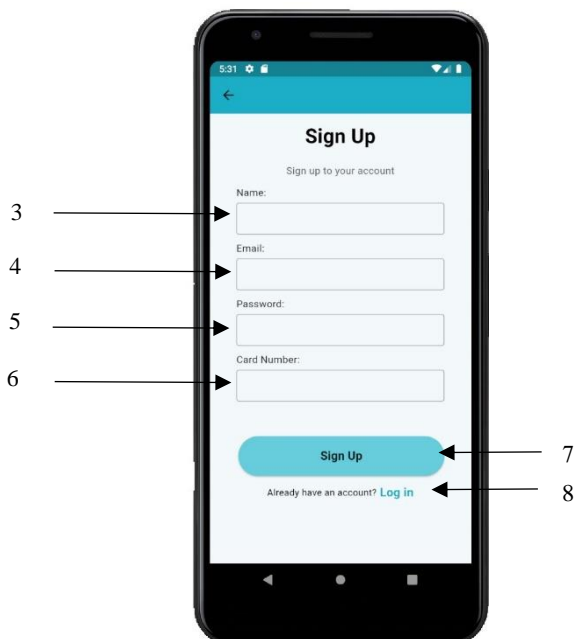


Figure 16: Sign up interface.

Table 10: User interface description #2.

#	Description
3	The name field is used to enter a person's full name.
4	The email field is a mandatory input where the user needs to enter a valid email address to register as new user and enter to Homepage
5	The password field is a mandatory input that requires to register as new user and enter to Homepage
6	The card number field is an optional input where you can enter the number associated with a payment card
7	Signup button that navigates the user to the Homepage when all required field entered.
8	Log in button that navigates the user to the Login page if already have an account

Table 11: User interface description #3.

3.Login page (if the user click on #2)

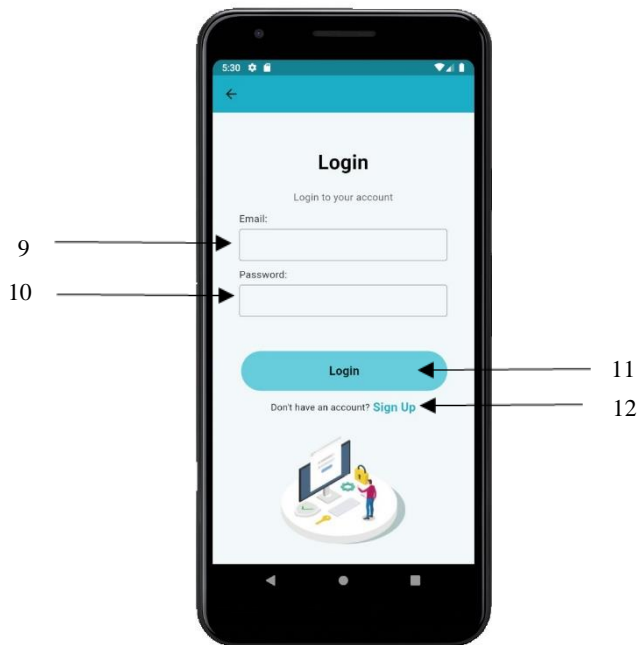


Figure 17: Log in interface.

#	Description
9	The email field is a required input where users must enter a valid email address to log in and access the homepage.
10	The Password field is a required input where users must enter a valid email address to log in and access the homepage.
11	Login button that navigates the user to the Homepage when all required field correctly entered.
12	Sign Up button that directs the user to the Signup page if the user doesn't have an existing account.

4.Home Page (if the user Signup-login successfully)

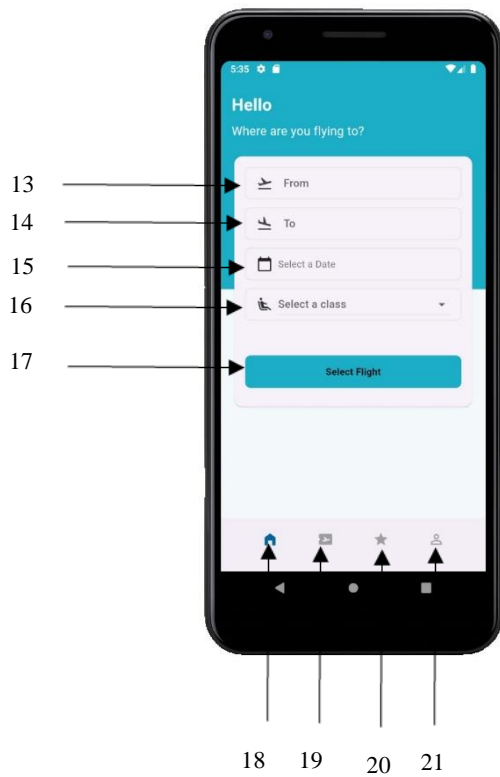


Figure 18: Home Page interface#1.

Table 12: User interface description #4.

#	Description
13	The From field, departure location for the flight. Users can enter a city
14	The To field, destination location for the flight. Users can enter a city
15	The date of travel for the flight. Users can select a date from a calendar picker.
16	The class of travel for the flight, the options is (First class-Economy- Premium Economy -Business)
17	Select Flight Button direct the user to Search Result page so the user finds results based on the input criteria.
18	Home button to direct the user to 'Home page' where the user can search and book flights.
19	My Flights button directs the user to the 'My Flights' page, where the user can view and manage reserved flights.
20	Recommendations button directs the user to 'Recommendations' page that displays feedback and reviews from other users
21	Account button direct the user to 'Account' page that allows the user to see their account details and, as well as option for log out.

4.1 Search Result page (if the user enters the flight information filed and click Select Flight #17)

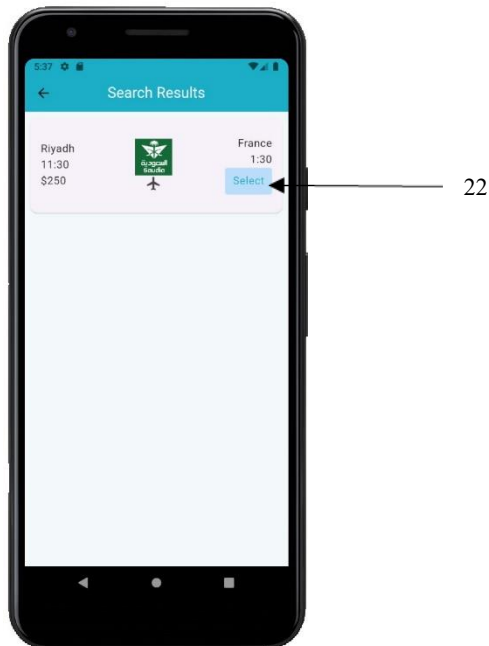


Table 13: User interface description #5.

#	Description
22	The 'Select' button enables the user to pick a flight from the search results and navigate to the seat selection page.

Figure 19: Search result interface.

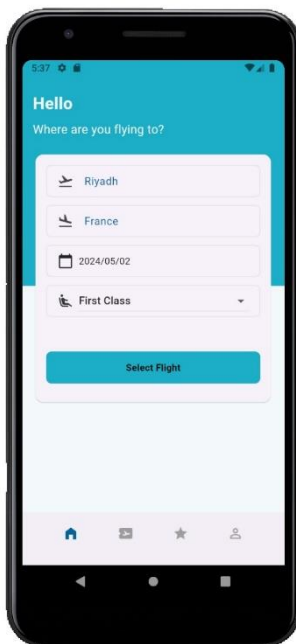


Figure 20: Home Page interface.

4.2 Seat Selection page (if the user selects a flight #22)



Figure 21: Seat Selection interface.

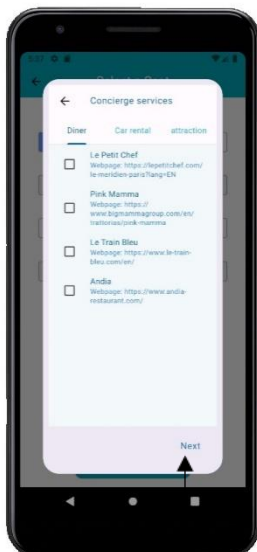


Figure 22: concierge services interface.

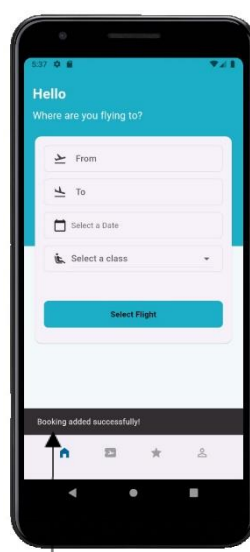


Figure 23: Home Page interface #3

Table 14: User interface description #6.

#	Description
23	The 'Book Flight' button starts the booking process and prompts a pop-up window offering concierge services.
24	The 'Next' button books the flight and directs the user back to the home page.
25	The confirmation message appears after booking added successfully

5. My Flights page (if the user click on #19)

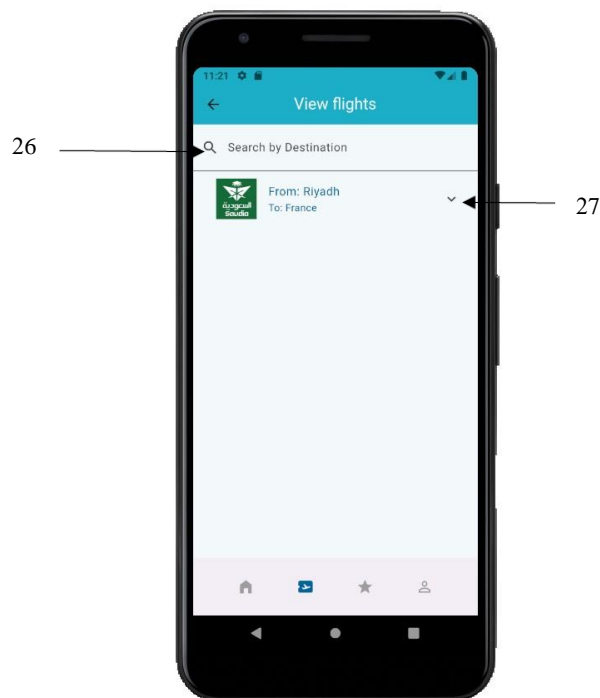


Figure 24: My Flights interface #1.

Table 15: User interface description #7.

#	Description
26	The 'Search by Destination' field lets the user search for reservations based on the destination of the flight.
27	The arrow expands to display flight details, allowing the user to edit or delete the booking.

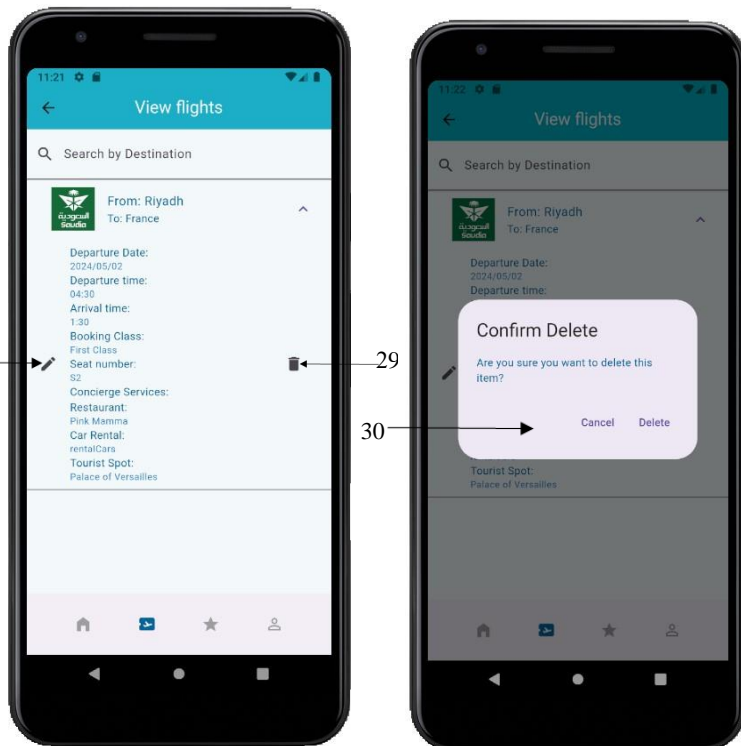


Figure 25: My Flights interface #2.

Figure 26: Delete confirmation message.

Table 16: User interface description #8.

#	Description
28	The 'Pen' button allows the user to edit flight information or change to another flight
29	The 'Trash' button deletes the reservation
30	The confirmation message for deletion prompts the user to confirm whether they want to delete the reservation.

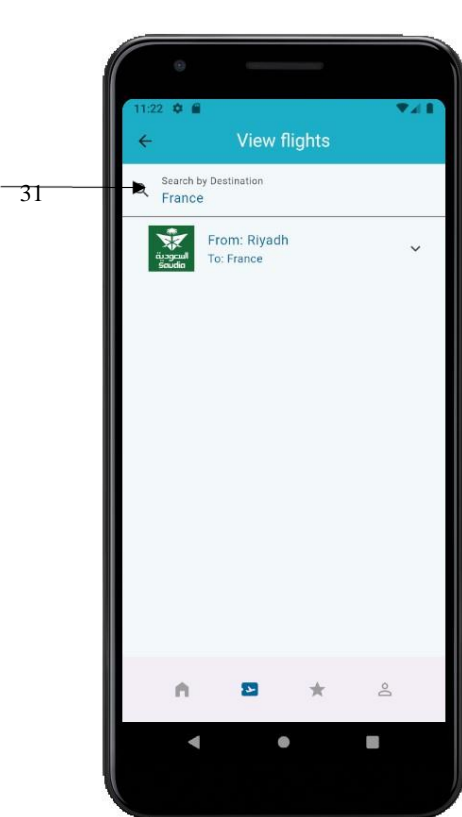


Figure 27: Search on My Flights interface

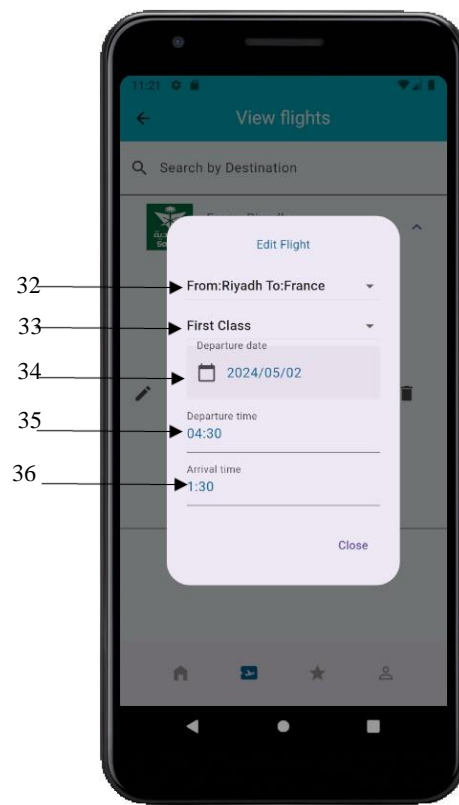


Figure 28: Edit interface.

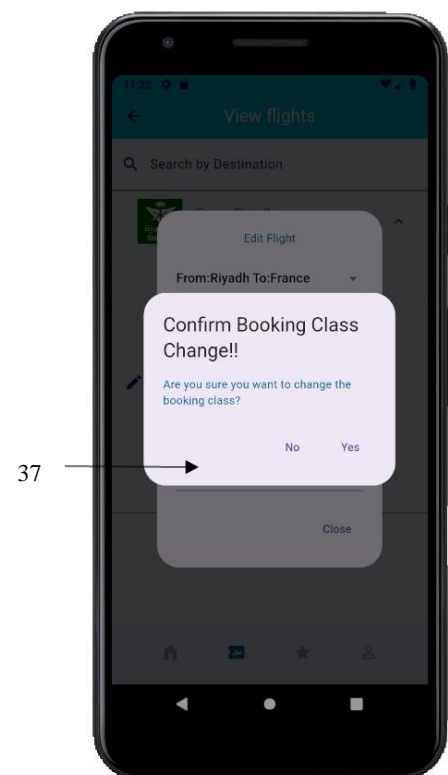


Figure 29: Edit confirmation message.

Table 17: User interface description #9.

#	Description
31	After the user searches for a reservation by destination, the results will display based on their search criteria.
32	After the user click in pen button in #28 The user can change to another flight based on available options in database (Riyadh to France – Kuwait to Paris -Riyadh to London and Dubai to Cairo).
33	After the user click in pen button in #28, The user can change the class of travel for the flight, the options are (First class-Economy-Premium Economy -Business)
34	After the user click in pen button in #28, The user can change the departure date.
35	After the user click in pen button in #28, The user can change the departure time.
36	The user can change the arrival time.
37	The confirmation message for editing asks the user to confirm the changes

6.Reccomendation page (if the user clicks on #20)

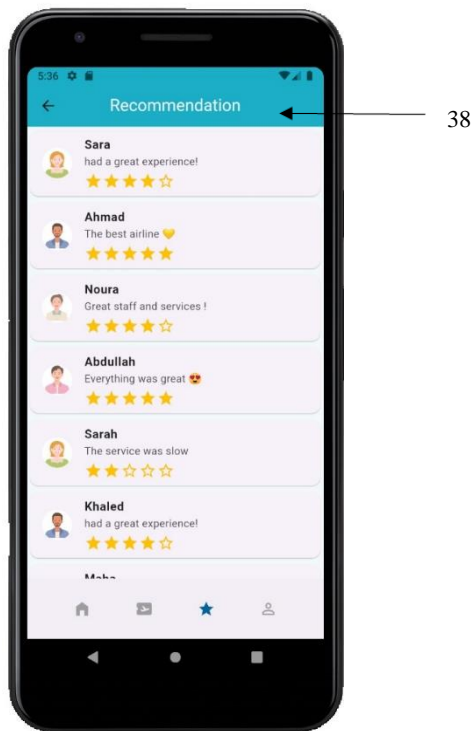


Table 18: User interface description #10.

#	Description
38	'Recommendations' page that displays feedback and reviews from other users.

Figure 30: Recommendation interface.

7.Account page (if the user clicks on #21)

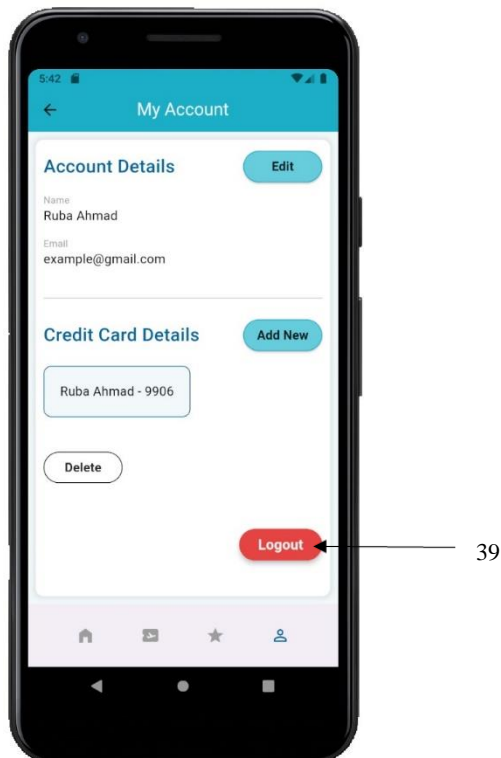


Table 19: User interface description #11.

#	Description
39	The 'Log Out' button logs the user out of their account.

Figure 31: Account interface

Error Message:

-Sign up without filling the required fields

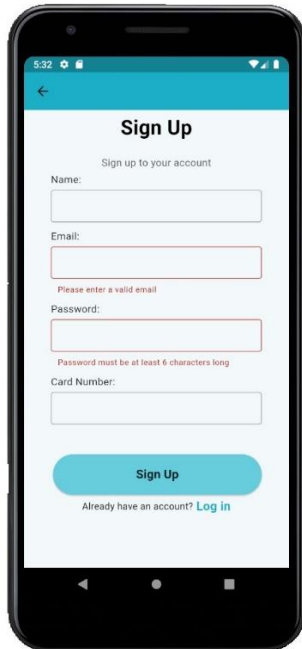


Figure 32: Enter valid input error message.

-Sign up with credentials already used

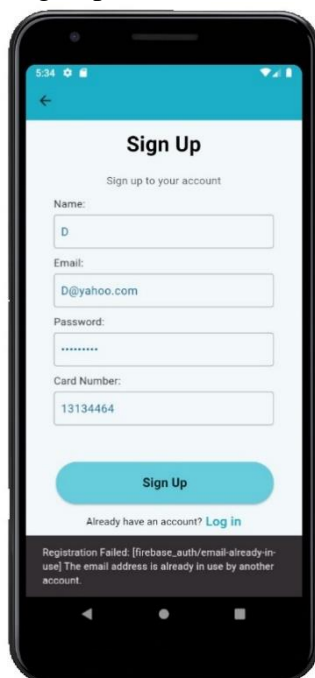


Figure 33: Used Credentials error message.

-Sign up with invalid email format

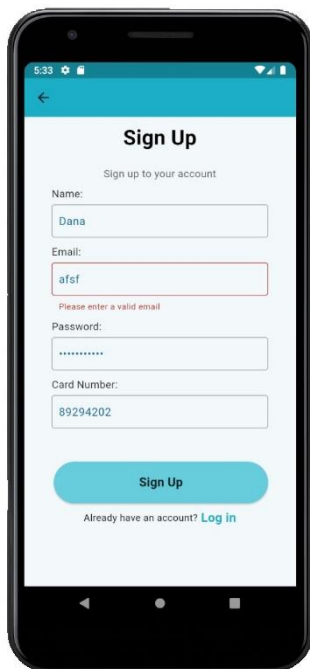


Figure 34: Invalid Email error message.

-Log in without filling the required fields

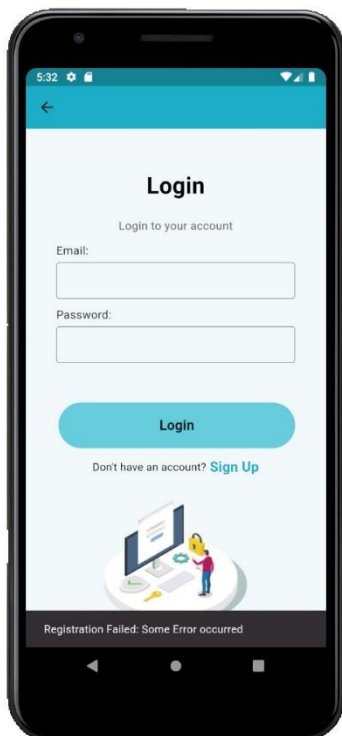


Figure 35: Not filled Log in fields.

-Login with invalid credential

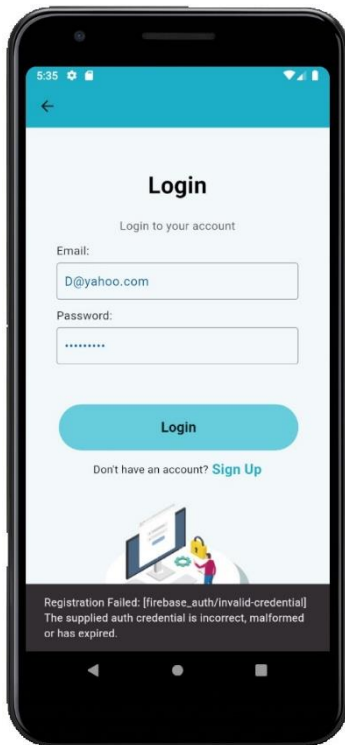


Figure 36: Invalid credentials Log in error message.

5. Chapter 5: Implementation

Flutter development of LightFlight involves several major steps and challenging parts of the code. In this section, the key implementation steps and procedures will be discussed.

LightFlight has been implemented in several major steps and procedures, including:

1) Domain Analysis:

The first step was to get a deep understanding of the domain for which we planned to develop software related to it. This includes understanding our domain and the expectations of our users by collecting information from similar applications and websites, so we can better understand the rules and regulations pertaining to this domain.

2) Requirement engineering:

With a deep understanding of the domain, we gathered user requirements by conducting interviews, questionnaires, and user stories that revealed important insights into users' frustrations and desires, as well as technical requirements.

3) Designing user interfaces and database:

During this stage, we designed LightFlight interfaces using flutter, which include various screens and features that the users will interact with.

4) Development:

This phase involves building the application, including its front-end and back-end components:

- Developing the Front-end:

LightFlight's front-end was developed using the Flutter framework, which included creating screens, forms, and components that users interact with. During this process, a user-friendly interface was designed to ensure seamless and intuitive functionality.

- Developing the Back end:

Our next step in the development of LightFlight was to construct the backend, leveraging the capabilities of Flutter and Firebase for the backend services such as user authentication and authorization. This phase was key to ensuring secure and efficient functionality.

5) Testing:

Throughout the development process, we conducted extensive testing and debugging for both the front-end and back-end of the application, such as user acceptance testing and user stories acceptance testing, integration testing to ensure it meets user requirements.

LightFlight implementation involved multiple challenges, which required thoughtful solutions and adaptations. Here are some of the major challenges we encountered and how we overcame them:

1) Implementing and managing database:

Ensuring that LightFlight interacts efficiently and securely with a Firestore database, while properly configured within the Flutter framework, presented several challenges. To address these effectively, we began by optimizing the database structure. We organized data into collections and documents that aligned closely with the app's operational needs. Following that, we followed Firebase's guidelines to integrate database with Flutter. This integration involved adding specific Firebase packages to our Flutter project and configuring dependencies to ensure smooth communication between the app and the database. We thoroughly debugged this setup to resolve any issues that emerged during the integration phase.

2) State management in flutter:

In the development of LightFlight, managing state within our Flutter application presented a significant challenge due to its critical role in determining the app's behavior and appearance in response to user interactions. When users navigate through different screens, make bookings, or modify their travel plans, state management is crucial to ensuring the app responds accurately and efficiently. To address these challenges, we explored state management solutions and decided to implement a widget managed state using the `setState()` function.

In conclusion, the implementation of LightFlight using the Flutter framework involved multiple steps and presented several challenges that were effectively addressed. The process began with a thorough domain analysis, followed by requirement engineering to gather clear and actionable user insights. Following that, a user-friendly interface was designed, and both the front-end and back-end components were developed using Flutter and Firebase, providing a seamless and secure user experience.

Challenges like efficient state management and secure database interactions were overcome by adopting best practices in database structuring and implementing effective state management solutions.

By carefully planning and executing each phase of development, from design to testing, LightFlight was transformed into a high-quality, reliable travel application that meets user needs and delivers an exceptional user experience.

GitHub repository: <https://github.com/Daanna8/LightFlight.git>

Jira project(an invite has been sent to -aghaida@ksu.edu.sa- to accesses Jira, check issues section please): <https://2024-it320-m10-3.atlassian.net/browse/IT>

6. Chapter 6: Testing

6.1 User Story Acceptance Testing

As part of the software development cycle for LightFlight, the User Story Acceptance Testing process is essential, as it ensures that the app complies with quality standards and aligns with user expectations. By examining the app from the viewpoint of the users, we can detect and resolve any issues or bugs that might compromise their experience.

We evaluated all the acceptance criteria specified in our user stories through test actions, including functionalities like sign-up, log-in, adding and deleting, logging out, as well as viewing and editing reservations.

Initially, we outlined the user stories to be tested and then carried out these tests through test actions with real users from our intended demographic in a calm setting to help enhance their focus. As part of the testing, we monitored the users to ensure that they met the acceptance criteria.

Table 20: User Story Acceptance Testing.

Sprint Number	User story	Acceptance criteria	Test action(s)	Pass ?	Comments
2	As a traveller, I want to be able to book a flight to my account so that, I can easily keep track of my travel plans and have all my reservations in one place.	If a user selects flight reservation option, inputs their desired destinations, dates, and class of service, then the system should display available flights and allow the user to complete a reservation, If the desired details are not available the system should display unavailable message to the user.	<ol style="list-style-type: none"> Opening the homepage displays the “select flight” form. Verifying all required fields(departure,destination, date, class) are present in the “select flight” form. Filling all required fields(departure,destination, date, class) in the “select flight” form Verifying that the available flights are displayed. 	Yes	

			<ol style="list-style-type: none"> Clicking on the select button from the list of available flights will display options to complete the reservation. Verifying that after completing the reservation Info, a book flight button can be pressed. Clicking on book flight button Verify that the booked Flight will appear in the “my flight” page Verifying if flights are unavailable a message “unavailable” will be displayed 		
2	As a traveller, I want to have the ability to delete flight reservations from my account so that I can easily eliminate any unwanted bookings.	<p>If a user press “My flights” on the navigation bar, chooses “current flight”, press “view flight details” button, and then presses “Delete” flight. then a confirmation prompt should appear, prompting the user to confirm or cancel the deletion process.</p> <p>If the user confirms the deletion by</p>	<ol style="list-style-type: none"> Pressing “My flights” page on the navigation bar to display the reserved flights. Expanding the reservation to see the delete button Clicking on the delete button Verifying that a prompt message appears on the screen that has two options: ‘confirm’ and ‘cancel’ the deletion . 	Yes	

		<p>clicking "Confirm" in the confirmation prompt, Then the system should update the seats to 'available' and refund the user.</p> <p>If the user cancels the deletion process by clicking "Cancel" in the confirmation prompt, Then the deletion process should be aborted, and the flight reservation remains in the user's account.</p>	<p>5. Click the 'cancel' option in the prompt message.</p> <p>6. Verify that the deletion process should be aborted, and the prompt message disappears, and the flight reservation remains in the user's account and in the database.</p> <p>7. Click the 'confirm' option in the prompt message.</p> <p>8. Verify that the deletion process continues, and the prompt message disappears, and the flight reservation is removed from the user's account and in the database.</p>		
2	As a traveller, I want to have the flexibility to edit my flight reservations so that I can easily make changes to my travel plans whenever necessary.	<p>If a user presses 'My flights' in the navigation bar, press 'View Flight's details', and presses "edit" icon. And makes changes to the reservation, Then the application should prompt the user to confirm the modifications before saving.</p> <p>If the user confirms the changes, Then the updated flight reservation should</p>	<p>1. Pressing "My flights" page on the navigation bar to display the reserved flights.</p> <p>2. Expanding the required reservation to see the edit button.</p> <p>3. Clicking on the edit icon to modify the reservation details.</p> <p>4. Verifying that a window will appear to make the required changes.</p>	Yes	

	<p>be reflected in their account, and the system should update the users' flight details in the database and find another booking with those details.</p> <p>If no bookings are found with the new details, then the system should display an unavailable message. If the user cancels the editing process, Then the changes should not be saved, and the original flight reservation details should remain unchanged.</p>	<ol style="list-style-type: none"> 5. Verifying that a prompt message appears on the screen that has two options: 'confirm' and 'cancel' the changes. 6. Click the 'confirm' option in the prompt message. 7. Verifying that when the system find bookings with those details the changes will be reflected , if not a 'not available message' will be displayed. 8. Verify that the prompt message disappears, and the updated flight reservation is reflected in the user's account and in the database. 9. Click the 'cancel' option in the prompt message. 10. Verify that the edit process should be aborted, and the prompt message disappears, and the flight reservation remains unchanged in the user's account and in the database. 		
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2	As a traveller, I want to search for flights So that I can plan and book my journey efficiently.	<p>If a user searches for flight reservations after entering departure, destination, departure date, booking class. Then the system should display all matching reservations.</p> <p>If the desired search was not available, the system should display unavailable messages to the user.</p>	<ol style="list-style-type: none"> 1. Opening the homepage will display the ‘select flight’ form. 2. Verifying all required fields (departure, destination, date, class) are present in the ‘select flight’ form. 3. Filling all required fields (departure, destination, date, class) in the ‘select flight’ form. 4. Verifying that the available flights based on the user search are displayed. 5. Verifying if desired flight was not available, the system displays ‘unavailable message’ to the user. 	Yes	
2	As a traveller I want to easily view my upcoming and previous	If a user presses ‘My flights’ in the navigation bar, press ‘View Flight’s details. Then the system should get	<ol style="list-style-type: none"> 1. Pressing “My flights” page on the navigation bar. 	Yes	

	flight reservations, so that I can conveniently access details about my trips.	his flight details from the database and display it to the user.	<ol style="list-style-type: none"> 2. Verify that the list of reserved flights is displayed in “My flights” page. 3. Expanding the reservation to see the details. 4. Verify that the flight details are viewed (airline, date, departure, destination, time, seat). 		
2	As a new user, I want to be able to create an account on the LightFlight application so that I can easily manage my flight reservations and access personalized features.	<p>If a new user selects the option to create an account, then they should be able to enter a username, and set a secure password. If the account creation is successful, then the user details will be stored in the database and should be able to access the app.</p> <p>If the user encounters any errors during the registration process, Then the application should provide helpful error messages to guide the user in resolving the issues.</p>	<ol style="list-style-type: none"> 1. Open “Sign-Up” page. 2. Verify that a sign-up form with all the required info (name, email, password, card number) is displayed. 3. Fill in the sign up with all the required and correct format info (name, email, password, card number) and click sign up button. 4. Verify that a confirmation message appears on the screen indicating that the registration was successful and redirects the user to the home page. 	Yes	

			<ol style="list-style-type: none"> Fill the sign up with incorrect format info (name, email, password, card number) and click sign up button. Verify that if the user encounters any errors during the registration process, Then the application provide helpful error messages to guide the user in resolving the issues. 		
2	As a registered user, I want to log in to the LightFlight application, so that I can access my account.	if the user fill the form with his username and password, and click submit, then the system will verify the information and it is existence in the database before redirecting the user to the homepage, if the user information doesn't exist in the database, then the system will display a message to inform the user this information is not registered.	<ol style="list-style-type: none"> Open "Log-In" page. Verify that a log in form with all the required info (email, password) is displayed. Fill the log in form with email and password that is not registered yet and click log in button. Verify that a message appears on the screen indicating that the user has not registered yet. Fill the log in form with email and password that is 	Yes	

			<p>registered in the database and click log in button.</p> <p>6. Verify that the user will be directed to the home page.</p>		
2	<p>As a registered user, I want to log out of my account, so that my account remains protected.</p>	<p>If a user press “My account” on the navigation bar, and presses “Logout” button, and confirms it, then the system should end the user’s session.</p> <p>If the user cancels the confirmation, he will be directed to the previous page.</p>	<ol style="list-style-type: none"> 1. Open “My account” page from the navigation bar. 2. Click the “logout” button. 3. Verify that a pop-up message appears on the screen that has two options: ‘Confirm’ and ‘cancel’. 4. click ‘cancel’. 5. verify that the pop-up message disappears, and the user remains in their account. 6. Click the “logout” button 7. click “confirm” 8. verify that the pop-up message disappears, and the user is logged out from his account and no longer has access. 	Yes	



6.2 Integration Testing

The integration hierarchy outlines how each component is integrated to form an integrated system, this hierarchy guides the integration testing process, and our process is illustrated in the following model:

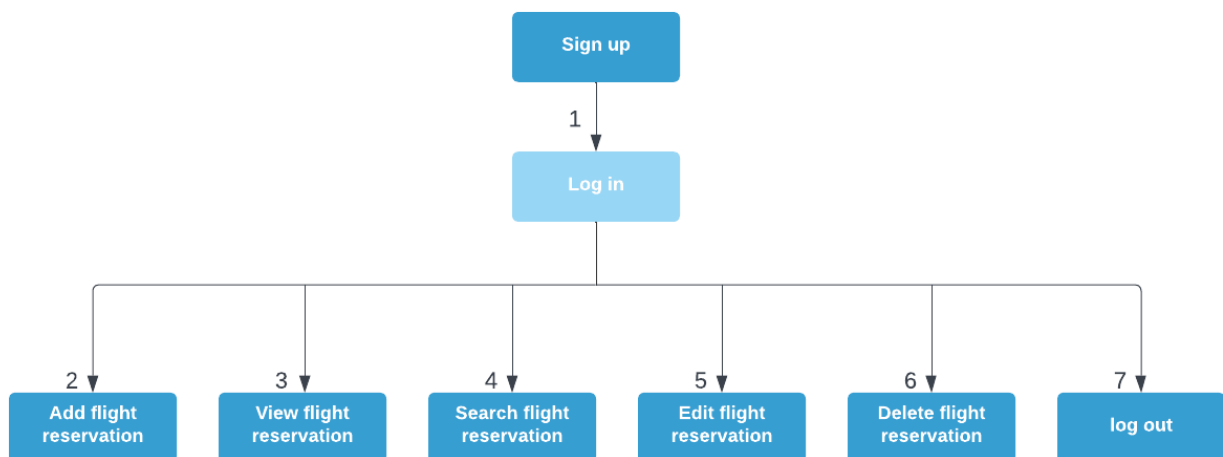


Figure 37: Integration hierarchy model.

Table 21: Integration Testing.

System components	New component	Test case	Pass?	Comments
<ul style="list-style-type: none"> Sign up in the system. 	Log in the system	<ol style="list-style-type: none"> A user has signed up successfully to the application. The signed up user logged in successfully to the application. 	Yes	
<ul style="list-style-type: none"> Sign up in the system. Log in the system. 	Add flight reservation	<ol style="list-style-type: none"> A user has signed up successfully to the application. The signed up user logged in successfully to the application. The logged in user added a new flight reservation to the application, from the Home page. 	Yes	
<ul style="list-style-type: none"> Sign up in the system. Log in the system. Add flight reservation. 	View flight reservation	<ol style="list-style-type: none"> A user has signed up successfully to the application. The signed up user logged in successfully to the application. The logged in user added a new flight reservation to the application, from the Home page. The logged in user viewed the flights he added in the application, from my flights page. 	Yes	
<ul style="list-style-type: none"> Sign up in the system. Log in the system. Add flight reservation. View flight reservation 	Search flight reservation	<ol style="list-style-type: none"> A user has signed up successfully to the application. The signed up user logged in successfully to the application. The logged in user added a new flight reservation to the 	Yes	

		<p>application, from the Home page.</p> <p>4. The logged in user viewed the flights he added in the application, from my flights page.</p> <p>5. The logged in user searched on the flights he added to the application, from my flights page.</p>		
<ul style="list-style-type: none"> • Sign up in the system. • Log in the system. • Add flight reservation. • View flight reservation • Search flight reservation. 	Edit flight reservation	<p>1. A user has signed up successfully to the application.</p> <p>2. The signed up user logged in successfully to the application.</p> <p>3. The logged in user added a new flight reservation to the application, from the Home page.</p> <p>4. The logged in user viewed the flights he added in the application, from my flights page.</p> <p>5. The logged in user searched on the flights he added to the application, from my flights page.</p> <p>6. The logged in user edited the details of the flight he added in the application, from my flights page.</p>	Yes	
<ul style="list-style-type: none"> • Sign up in the system. • Log in the system. • Add flight reservation. • View flight reservation 	Delete flight reservation	<p>1. A user has signed up successfully to the application.</p> <p>2. The signed up user logged in successfully to the application.</p> <p>3. The logged in user added a new flight reservation to the</p>	Yes	

<ul style="list-style-type: none"> • Search flight reservation. • Edit flight reservation 		<p>application, from the Home page.</p> <ol style="list-style-type: none"> 4. The logged in user viewed the flights he added in the application, from my flights page. 5. The logged in user searched on the flights he added to the application, from my flights page. 6. The logged in user edited the details of the flight he added in the application, from my flights page. 7. The logged in user deleted a flight that he added previously in the application, from my flights page. 		
<ul style="list-style-type: none"> • Sign up in the system. • Log in the system. • Add flight reservation. • View flight reservation • Search flight reservation. • Edit flight reservation. • Delete Flight reservation. 	Log out of the system	<ol style="list-style-type: none"> 1. A user has signed up successfully to the application. 2. The signed up user logged in successfully to the application. 3. The logged in user added a new flight reservation to the application, from the Home page. 4. The logged in user viewed the flights he added in the application, from my flights page. 5. The logged in user searched on the flights he added to the application, from my flights page. 6. The logged in user edited the details of the flight he added in the application, from my flights page. 	Yes	

		<p>7. The logged in user deleted a flight that he added previously in the application, from my flights page.</p> <p>8. The logged-in user logged out of the system successfully and returned to the main page.</p>		
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6.3 User Acceptance Testing

To perform the test, we gathered ten participants who met the characteristics of our end users, including being at least eighteen years old, having experience with apps and knowledge in our domain. Initially, we gave them three minutes to look around and become familiar with the app. Furthermore, we asked them to carry out through scenario covering every function of the app, beginning with sign-up and continuing through flight searching, booking a flight, view reservation, reservation editing, reservation deletion, logging out, and finally, logging back in. Using a questionnaire, we gathered their feedback to assess the application's functionality, usability, consistency, and ability to provide all the services that were requested. The application will be enhanced with the findings. The information gathered will be utilized to enhance the program, fix any problems that surface.

6.3.1 Demographics of participants

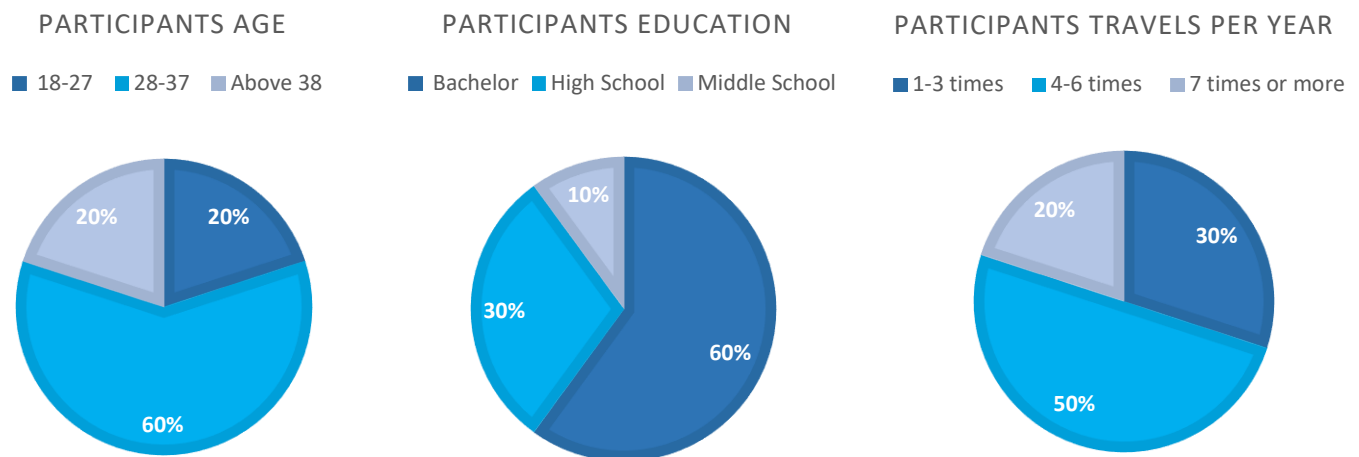


Figure 38: Participants age.

Figure 39: Participants education.

Figure 40: Participants travel per year.

6.3.2 Questionnaire

- **Questionnaire Questions**

1. I did not face any difficulties in the booking process.
2. It was easy to Navigate between the different interfaces of the app.
3. It was easy to find all the information that I need.
4. I find all the features that I need in flight reservation app.
5. The interfaces are consistent and understandable.

• Questionnaire Answers

I DID NOT FACE ANY DIFFICULTIES IN THE BOOKING PROCESS.

■ Yes ■ No

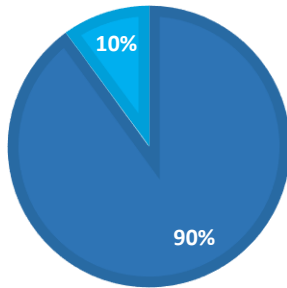


Figure 41: Difficulties in booking.

IT WAS EASY TO NAVIGATE BETWEEN THE DIFFERENT INTERFACES OF THE APP.

■ Yes ■ No

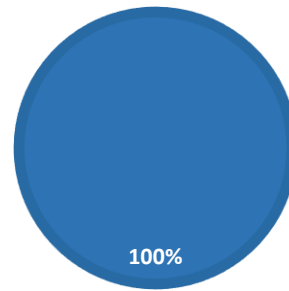


Figure 42: Ease of navigation.

IT WAS EASY TO FIND ALL THE INFORMATION THAT I NEED.

■ Yes ■ No

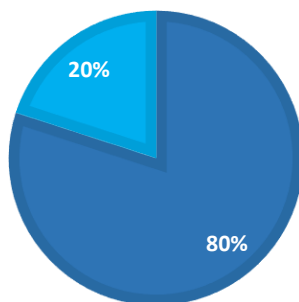


Figure 43: Ease of information finding.

I FIND ALL THE FEATURES THAT I NEED IN FLIGHT RESERVATION APP.

■ Yes ■ No

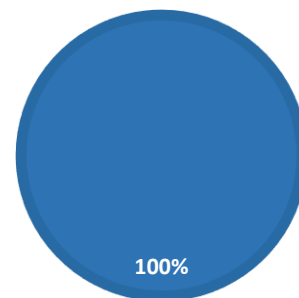


Figure 44: Features satisfaction.

THE INTERFACES ARE
CONSISTENT AND
UNDERSTANDABLE.

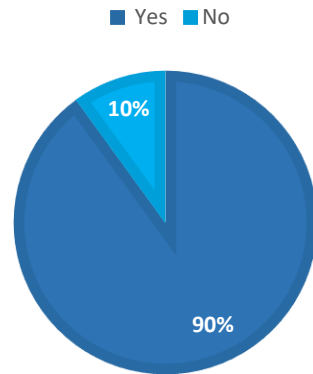


Figure 45: Consistency of interfaces.

7. Chapter 7: Conclusion and Future Work

7.1 Conclusion

LightFlight, our flight booking application developed using Agile methodology, has proven to be an efficient and effective solution for travelers. The iterative and collaborative nature of Agile enabled us to create a user-friendly app with advanced features that cater to the ever-evolving needs of our users.

The agile approach allowed us to be adaptable, to changing requirements and customer feedback in time. We followed a process that involved defining software specifications by gathering requirements and understanding business and domain needs, designing and developing using Flutter and validating through testing. This approach enabled us to deliver a high-quality product within a time frame by breaking down the project into tasks and utilizing sprints to concentrate on delivering each feature effectively.

The Agile approach also fostered strong communication and teamwork among our development team. Regular meetings such as stand-ups and sprint reviews facilitated open discussions, feedback exchange, and prompt issue resolution. This close collaboration not only improved the quality of the app but also ensured it matched users' expectations and requirements.

LightFlight simplifies flight reservations for users with its intuitive features. Users can easily search for flights based on their preferences such as destination and travel dates. The app provides up-to-date details on flight availability, prices, and airline choices, empowering users to make informed decisions. Additionally, the streamlined booking process enables users to quickly and efficiently book their flights. Once a booking is made, users have the flexibility to edit or delete their reservations directly within the app. This level of control over their bookings ensures a hassle-free experience and gives users the confidence to manage their travel plans with ease.

In conclusion, LightFlight has effectively leveraged Agile principles to develop a flight booking application that prioritizes user satisfaction and offers a seamless, personalized journey. By embracing Agile methodology, we have crafted a product that is adaptable to change, promotes collaboration, and ultimately caters to the needs of today's travelers.

7.2 Future Work

Looking ahead to the future of the LightFlight app, our goal is to enhance the user experience by introducing features that will make flight searches and bookings more convenient and efficient. One exciting addition is the option to sort search results based on criteria, like recommendations, airline and more. This feature will help users easily find flights that match their preferences streamlining the booking process for an experience.

Additionally, we are planning to add a "favorite flights" feature that allows users to save flights they are interested in for reference. This function enables travelers to revisit saved flights for hassle free bookings at their convenience offering more flexibility and customization in the booking process. It can also be handy for comparing flight.

Moreover, we're considering integrating trip management tools into the app to help users organize their travel plans seamlessly. These tools may include tracking, reminders for flights within the app interface.

We aim to enhance the travel experience, with our app, LightFlight to become a tool, for travelers during their trips. Our goal is to improve and grow LightFlights features to meet the changing demands of today's travelers. By prioritizing user options and incorporating cutting edge technology we strive to keep LightFlight at the forefront for booking flights offering a tailored journey every step of the way.

8. References

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Appendix A: Interview

- Interview Question:

- 1.Can you describe your typical process for booking a flight?
- 2.Is an app for making flight reservations something you'd be interested in using?
- 3.When booking flights online, what aspects do you find most frustrating or challenging?
- 4.What are the main challenges or frustrations you face when organizing activities and services for your trips?
- 5.When planning a trip, how do you typically search for and compare flights? Are there any specific search criteria that are important to you?
- 6.Would you be interested in additional after flight services such as local experiences and rentals through the same app?
- 7.What features would make you choose one flight booking app over another?

- Interviews' Transcriptions:

Table 22: Interview transcript #1.

Online interview (1)	
Interviewee: Sara	Interviewer: Duna
Location/ Medium: phone call	Appointment Date: 28 Feb Start Time: 10:00 AM End Time : 10:30AM
Objectives: <ul style="list-style-type: none"> To have insights about what people usually do to book a flight. To understand and collect information about what challenges people while booking their flights. 	Reminders: The interviewee had previously used apps to book flights.
Agenda: Introduction Background in project Overview of interview Topics to be covered Permission to Record Question1 Question2 Question3 Question4 Question5 Question6 Question7 Summary of major points Questions from interviewee Closing	Approximate time: 2min 4min 2min 1min 26sec 3min 1min 3min 1min 1min 1min 2min 2min 3min 1min
General Observations: During the interview, the interviewee showed excitement and interest about answering our questions and sharing her experience.	
Topic not covered, unsolved issues: Unfortunately, we couldn't discuss the details of the app and its functions due to time constraint.	

Table 23: Interview #1.

Online interview (1)	
Interviewee: Sara	Date: 28 Feb
Questions:	Answers and Notes:
Q1: Can you describe your typical process for booking a flight?	<p>My typical process for booking a flight begins with deciding on the destination, the dates of travel, and my budget. I tend to prioritize convenience and budget, so I invest time searching through various travel apps and comparison sites to find the best prices available. This can be quite time-consuming and sometimes stressful.</p> <p>Observations: The interviewee tends to prioritize convenience and good deals.</p>
Q2: Is an app for making flight reservations something you'd be interested in using?	<p>I am definitely interested in using an app for making flight reservations. The convenience of booking a flight online is preferable to me than going to the airport, which can be a significant waste of time.</p> <p>Observations: The interviewee prefers online booking.</p>
Q3: When booking flights online, what aspects do you find most frustrating or challenging?	<p>The most frustrating aspect of booking flights online is the challenge of finding the best flight prices and efficiently comparing them. It can be overwhelming to go through the various apps, deals, and schedules from different airlines and booking platforms.</p> <p>Observations: The interviewee appeared to have some challenges in finding the best prices and comparing them.</p>
Q4: What are the main challenges or frustrations you face when organizing activities and services for your trips?	<p>Sometimes I don't really know the best places to go as a tourist, and the trusted rentals companies can be difficult.</p> <p>Observations: It seems that the interviewee has difficulty in finding after flight services.</p>

<p>Q5: When planning a trip, how do you typically search for and compare flights? Are there any specific search criteria that are important to you?</p>	<p>Typically, I search for the best prices, It will be helpful if there is a search criterion according to recommendations and reviews.</p> <p>Observations: The interviewee brought up some specific criteria that would be helpful. While searching</p>
<p>Q6: Would you be interested in additional after flight services such as local experiences and rentals through the same app?</p>	<p>I would certainly be interested in having access to additional services such as local experiences and rentals through the same app I use for flight booking.</p> <p>Observations: The interviewee was very supportive and enthusiastic about the idea.</p>
<p>Q7: What features would make you choose one flight booking app over another?</p>	<p>The ability to search and compare different flight bookings will also be helpful if there's concierge services that are tied to my reservation.</p> <p>Observations: The interviewee brought up some features that would make her use one app over the other.</p>

Table 24: Interview transcript #2.

Online interview (2)	
Interviewee: Noura	Interviewer: Dana
Location/ Medium: phone call	Appointment Date: 27 Feb Start Time: 4:00 PM End Time : 4:27:10 PM
Objectives: <ul style="list-style-type: none"> • Understand the typical process and pain points of users when booking flights. • Assess the level of interest in using a flight reservation app. • Identify frustrations and challenges faced during online flight bookings. 	Reminders: The interviewee has experience with booking flights and is open to using a flight reservation app
Agenda: Introduction Background in project Overview of interview Topics to be covered Permission to Record Question1 Question2 Question3 Question4 Question5 Question6 Question7 Summary of major points Questions from interviewee Closing	Approximate time: 2min 4min 2min 1min 26sec 3min 1min 3min 1min 1min 1min 2min 2min 3min 1min
General Observations: During the interview, the interviewee was actively engaged and showed enthusiasm and understanding throughout the interview, providing thoughtful responses to each question.	
Topic not covered, unsolved issues: We didn't have enough time to discuss the specific features and functionality of the application with the interviewee.	

Table 25: Interview #2.

Online interview (2)	
Interviewee: Noura	Date: 27 Feb
Questions:	Answers and Notes:
Q1: Can you describe your typical process for booking a flight?	<p>My typical process for booking a flight usually involves searching for flights online through various websites or apps. Once I find suitable options, I compare prices, schedules, and airline reputations before making a reservation.</p> <p>Observations: Interviewee values thorough research, price comparison, and airline reputation when booking flights.</p>
Q2: Is an app for making flight reservations something you'd be interested in using?	<p>Yes, definitely! An app for making flight reservations would be incredibly convenient for me. It would streamline the booking process and save me time and effort.</p> <p>Observations: Interviewee highly interested in a convenient flight reservation app for time-saving.</p>
Q3: When booking flights online, what aspects do you find most frustrating or challenging?	<p>The most challenging aspects of booking flights online include complex search options, and difficulty in comparing prices across different airlines.</p> <p>Observations: Interviewee finds complex search and price comparison frustrating when booking flights online.</p>
Q4: What are the main challenges or frustrations you face when organizing activities and services for your trips?	<p>The main challenges I face when organizing activities and services for my trips include finding reliable vendors, coordinating schedules, and ensuring everything aligns with my travel plans. It can be overwhelming to juggle activities bookings and flight reservations.</p> <p>Observations: Interviewee faces challenges in organizing activities, needs comprehensive trip management.</p>
Q5: When planning a trip, how do you typically search for and compare flights? Are there any specific search criteria that are important to you?	<p>When planning a trip, I typically search for and compare flights online using various apps. Specific search criteria important to me include price, recommended flight, and others.</p>

	<p>Observations: Interviewee uses multiple apps, considers price and recommended flights when planning trips.</p>
<p>Q6: Would you be interested in additional after flight services such as local experiences and rentals through the same app?</p>	<p>Yes, I would definitely be interested in additional after-flight services through the same app. It would make planning and enjoying my trip much more convenient and seamless.</p> <p>Observations: Interviewee needs on accessing additional post-flight services through the same app for convenience.</p>
<p>Q7: What features would make you choose one flight booking app over another?</p>	<p>The features that would make me choose one flight booking app over another include a user-friendly interface, customizable search options, Additionally, having additional services like scheduling activities for after flight, restaurant booking, and the ability to see other travelers opinions about their trip experiences would greatly enhance the overall user experience, especially for post-flight services.</p> <p>Observations: interviewee needs user-friendly interface, customizable search, and additional services in flight booking apps.</p>

Table 26: Interview transcript #3.

face to face interview (3)	
Interviewee: Mansour	Interviewer: Aljawhara
Location/ Medium: interviewee's house/ face to face interview	Appointment Date: 28 Feb Start Time: 5:26PM End Time: 5:54PM
Objectives: <ul style="list-style-type: none"> To have knowledge about the different ways people book tickets. To know what the challenges people face while booking their flights. To see if people are interested in booking flights through an application. 	Reminders: The interviewee had never used an app to book flights.
Agenda: Introduction Background in project Overview of interview Topics to be covered Permission to Record Question1 Question2 Question3 Question4 Question5 Question6 Question7 Summary of major points Questions from interviewee Closing	Approximate time: 2min 4min 2min 1min 26sec 3min 1min 3min 1min 1min 1min 2min 2min 3min 1min
General Observations: The interviewee showed interest about the features offered in our application during the brief introduction of the project.	
Topic not covered, unsolved issues: We couldn't discuss the details of the app, only a brief introduction and mention of the features; due to the time constraints.	

Table 27: Interview #3.

face to face interview (3)	
Interviewee: Mansour	Date: 28 Feb
Questions:	Answers and Notes:
Q1: Can you describe your typical process for booking a flight?	<p>Before websites, we go to the airport ticket center, the ticket center hears your requirements, and sees a ticket that suits your need, sometimes there isn't an appropriate flight for you, so you have to come back another day and that's troublesome because airports are faraway. These ticket centers also recommend hotels that suit your needs and show you pictures for you. But now I book Online, since it's easier, I Go to multiple websites, and choose the appropriate airline, and types of tickets, after choosing, if the websites offer car rentals, and hotel reservations as well, I book from there, if not I search for hotels and cars to rent.</p> <p>Observations: The interviewee had a long experience of flight reservations, he used both outdated and new ways of flight reservations, and he prefers online booking more</p>
Q2: Is an app for making flight reservations something you'd be interested in using?	<p>I usually book from websites, but if there is a great application that has advantageous features over these websites, I will absolutely download it.</p> <p>Observations: The interviewee is open to try new useful apps for flight bookings.</p>
Q3: When booking flights online, what aspects do you find most frustrating or challenging?	<p>Not finding a ticket with a good price. I book earlier to find a good deal, it's usually cheaper to book earlier than the scheduled date, but sometimes it's an urgent trip so I can't do that. Websites also have poor returns policies, most don't refund, and some put points back in your account as a refund instead of giving you money back. In these cases, ticket centers are usually better on the refund side, so I prefer to book through them when a trip is likely to be canceled.</p> <p>Observations: The interviewee values price, and so is most of the travelers, so adding a functionality to compare ticket prices is going to be beneficial to the travelers.</p>
Q4: What are the main challenges or frustrations you face when organizing activities and services for your trips?	<p>I usually don't face many challenges aside from renting cars, if I don't book a car beforehand, it's troublesome and hard to find an appropriate one in the country I'm going to. And for restaurants and tourism spots, I ask my friends for recommendations, or look on google.</p>

	<p>Observations: From the interviewee perspective, renting cars is the hardest after-flight service to find.</p>
<p>Q5: When planning a trip, how do you typically search for and compare flights? Are there any specific search criteria that are important to you?</p>	<p>I entered multiple websites and compared the tickets. The most important aspect is the price and number of stops for me.</p> <p>Observations: Websites have poor ticket comparison. The interviewee has also mentioned good criteria to sort flights which are: price, and number of stops.</p>
<p>Q6: Would you be interested in additional after flight services such as local experiences and rentals through the same app?</p>	<p>If I have an emergency/unplanned trip I would be interested in this feature, but if I have time, I look for recommendations on google, or ask for some recommendations.</p> <p>Observations: Busy travelers will most likely be interested in concierge-services.</p>
<p>Q7: What features would make you choose one flight booking app over another?</p>	<p>Feedback and filter search, I always read the feedback about food quality, and safety and then decide which airline to book, because I really value the feedback. And I am always looking for a fast trip with fewer stops and a good price, so having filter search is important for me.</p> <p>Observations: Feedback and filter search are important features to have in a flight booking application.</p>

Appendix B: Questionnaire

- Questionnaire Questions:

1. On a scale of 1 to 5, how satisfied are you with your current travel booking apps and services? (1 very dissatisfied, 5 very satisfied)
1
2
3
4
5
2. Would you be interested in using an app that simplifies the flight reservation process and offers additional features?
Yes
No
3. Are you having trouble handling after-flight services?
Yes
No
Sometimes
4. Is the ability to book concierge services (e.g., local experiences, car rental) a desired feature for you?
Yes
No
5. Have you found a lack of flexible search options in flight booking apps?
Yes
No
6. Is price filtering and comparison a desired feature for you in a flight booking app?
Yes
No

On a scale of 1 to 5, how satisfied are you with your current travel booking apps and services? (1 very dissatisfied, 5 very satisfied)
11 responses

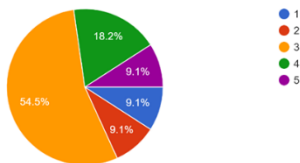


Figure 46: travel app satisfaction.

Would you be interested in using an app that simplifies the flight reservation process and offers additional features?
11 responses

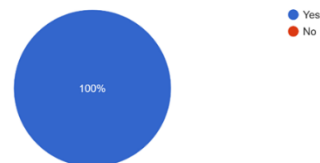


Figure 47: Interest in new app.

Are you having trouble handling after-flight services?
11 responses

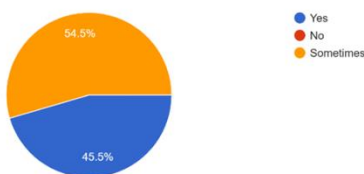


Figure 48: After-flight issues.

Is the ability to book concierge services (e.g., local experiences, car rental) a desired feature for you?
11 responses

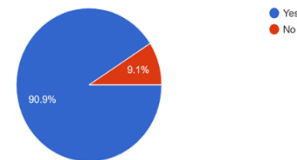


Figure 49: interest in concierge services.

Have you found a lack of flexible search options in flight booking apps?
11 responses

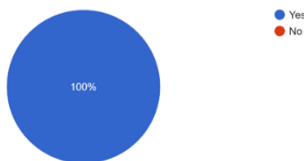


Figure 50: flexible search.

Is price filtering and comparison a desired feature for you in a flight booking app?
11 responses

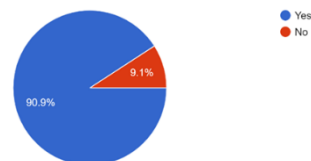


Figure 51: price filtering.

- Link to the Questionnaire individual responses:
https://docs.google.com/spreadsheets/d/13_RZvqGe4YjwjH-iVcR_1M1pGgswuNhMC_5W3Er-Y4g/edit?usp=sharing

Appendix C: Jira

Backlog

IT-1 As a traveller, I want to be able to book a flight to my account so that I can easily keep track of my travel plans and have all my reservations in ...	TO DO	3	
IT-2 As a traveller, I want to have the ability to delete flight reservations from my account so that I can easily eliminate any unwanted bookings.	TO DO	3	
IT-3 As a traveller, I want to have the flexibility to edit my flight reservations so that I can easily make changes to my travel plans whenever necessary.	TO DO	3	
IT-4 As a traveller, I want to search for flights So that I can plan and book my journey efficiently.	TO DO	3	
IT-5 As a traveller, I want to book concierge services so that I can ensure a seamless and personalized experience for my post-flight needs.	TO DO	3	
IT-6 As a traveller, I want to sort search results based on factors like price, recommended flights, and number of stops so that I can easily compare a...	TO DO	2	
IT-7 As a traveller, I want to be able to provide feedback, so that my experiences and suggestions can be considered in the ongoing improvement o...	TO DO	2	
IT-8 As a traveller I want to easily view my upcoming and previous flight reservations, so that I can conveniently access details about my trips.	TO DO	2	
IT-9 As a new user, I want to be able to create an account on the LightFlight application so that I can easily manage my flight reservations and acce...	TO DO	2	
IT-10 As a registered user, I want to log in to the LightFlight application, so that I can access my account and manage my flight reservations.	TO DO	2	
IT-11 As a registered user, I want to log out of my account, so that my account remains protected.	TO DO	2	
IT-12 As a traveller I want to be able to view recommendations, so that I can learn from travellers experiences and make informed decisions.	TO DO	1	
IT-13 As a user, I want the application to be accessible 99% of the time, so I can use it whenever I want.	TO DO	3	
IT-14 As a traveller, I want the LightFlight application to prioritize ease of use so that I can book my flight within 8 minutes.	TO DO	2	
IT-15 As a traveller, I want the LightFlight application to display my booked flights within 10 seconds so that I can quickly check my upcoming trave...	TO DO	2	

Figure 52: Jira backlog.

Jira

2024-IT320-Mon10-3
Software project

PLANNING
Timeline
Backlog
Board
Calendar
List
Issues
Add view
DEVELOPMENT
Code
Project pages
External Share
Add shortcut
Project settings

Projects / 2024-IT320-Mon10-3

Backlog

IT Sprint 1	3 issues	0	0	7	Start sprint
IT-6 As a traveller, I want to book concierge services so that I can ensure a seamless and personalized ...	DONE	3			
IT-6 As a traveller, I want to sort search results based on factors like price, recommended flights, and ...	DONE	2			
IT-7 As a traveller, I want to be able to provide feedback, so that my experiences and suggestions can ...	DONE	2			
+ Create issue					
IT Sprint 2	12 issues	0	0	28	Start sprint
IT-1 As a traveller, I want to be able to book a flight to my account so that I can easily keep track of my ...	DONE	3			
IT-2 As a traveller, I want to have the ability to delete flight reservations from my account so that I can ...	DONE	3			
IT-3 As a traveller, I want to have the flexibility to edit my flight reservations so that I can easily make c...	DONE	3			
IT-4 As a traveller, I want to search for flights So that I can plan and book my journey efficiently.	DONE	3			
IT-8 As a traveller I want to easily view my upcoming and previous flight reservations, so that I can con...	DONE	2			
IT-9 As a new user, I want to be able to create an account on the LightFlight application so that I can e...	DONE	2			
IT-10 As a registered user, I want to log in to the LightFlight application, so that I can access my accou...	DONE	2			
IT-11 As a registered user, I want to log out of my account, so that my account remains protected.	DONE	2			
IT-12 As a traveller I want to be able to view recommendations, so that I can learn from travellers exper...	DONE	1			

Figure 53: Jira

Jira Your work Projects Filters Dashboards Teams Apps Create

2024-IT320-Mon10-3 Software project

PLANNING Timeline Backlog Board Calendar NEW List Issues Add view DEVELOPMENT Code Project pages External Share Add shortcut Project settings

Projects / 2024-IT320-Mon10-3 Backlog

3 Issues | Estimate: 0

IT Sprint 2 Add dates (12 Issues) 0 0 28 Start sprint

IT-1 As a traveller, I want to be able to book a flight to my account so that I can easily keep track of my ...	DONE	3	
IT-2 As a traveller, I want to have the ability to delete flight reservations from my account so that I can ...	DONE	3	
IT-3 As a traveller, I want to have the flexibility to edit my flight reservations so that I can easily make c...	DONE	3	
IT-4 As a traveller, I want to search for flights So that I can plan and book my journey efficiently.	DONE	3	
IT-5 As a traveller I want to easily view my upcoming and previous flight reservations, so that I can con...	DONE	2	
IT-6 As a new user, I want to be able to create an account on the LightFlight application so that I can e...	DONE	2	
IT-10 As a registered user, I want to log in to the LightFlight application, so that I can access my accou...	DONE	2	
IT-11 As a registered user, I want to log out of my account, so that my account remains protected.	DONE	2	
IT-12 As a traveller I want to be able to view recommendations, so that I can learn from travellers exper...	DONE	1	
IT-13 As a user, I want the application to be accessible 99% of the time, so I can use it whenever I want.	DONE	3	
IT-14 As a traveller, I want the LightFlight application to prioritize ease of use so that I can book my flig...	DONE	2	
IT-15 As a traveller, I want the LightFlight application to display my booked flights within 10 seconds so...	DONE	2	

Untitled 2

Figure 54: Jira