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Software Graduation Project

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Abstract

This project presents the design and development of a comprehensive taxi service management application aimed at enhancing user experience, operational efficiency, and communication between passengers, drivers, and line managers. The system introduces key features addressing user challenges and service improvements within taxi operations.

Users can monitor vehicle counts in terminals, facilitated by tracking driver locations to determine their entry or exit from terminal boundaries. Additionally, a location search function allows users to visualize their current position alongside their destination on an interactive map.

The booking system supports flexible scheduling options, including single-day, weekly, or monthly reservations, with controls for managing reservations such as cancellation, pausing, or driver rating. Notifications keep users informed about booking confirmations and driver acceptance updates. Users can also communicate with support through an integrated chat feature and manage their profile information.

Drivers can view and manage all reservations, accept or decline bookings, and maintain a calendar for daily, weekly, or monthly schedules. They also receive reservation recommendations based on their current location and have communication tools for direct conversations with line managers. Profile management and reservation status tracking further support driver operations.

Line managers benefit from features that allow monitoring and communication with individual drivers or broadcasting voice messages to all drivers. They can track driver locations, search for specific drivers, view driver performance ratings, and manage profile updates.

Additionally, the system provides line managers and administrators with detailed statistical reports to assess the quality of services provided. These insights include reservation trends, customer satisfaction ratings, driver performance metrics, and operational efficiency evaluations, enabling continuous service improvement and informed decision-making.

This application creates a seamless and efficient taxi service platform by integrating location-based tracking, reservation management, communication tools, and data-driven service quality assessments, thereby enhancing user experience and operational excellence.

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Chapter 1

Introduction

Transportation services are essential in modern urban environments, offering convenient and efficient mobility solutions. As technology evolves, the demand for smart management systems continues to grow. This project introduces a taxi service management app leveraging location tracking, reservation control, communication features, and data-driven insights. The system tracks driver locations to update terminal vehicle counts and provides map-based journey planning tools. Users can book single, weekly, or monthly reservations, manage them flexibly, and receive notifications. Drivers benefit from efficient reservation management, calendar views, and location-based recommendations. Line managers gain communication tools and performance insights to enhance service quality and operational efficiency.

1.1 Motivation

The motivation behind this project stems from the growing need to address the inefficiencies and challenges faced by both passengers and service providers in the taxi transportation industry. Users often struggle with a lack of real-time information about vehicle availability at terminals and the complexity of route planning. Drivers, on the other hand, face difficulties in managing multiple reservations and navigating through unpredictable schedules. Line managers need a comprehensive system to monitor operations, ensure timely service, and improve communication with drivers. By leveraging emerging technologies such as location tracking, real-time notifications, and data analytics, this project aims to bridge these gaps. It strives to enhance the user experience, streamline operations for drivers, and provide line managers with the tools necessary to improve service quality and efficiency. Ultimately, the motivation is to create an integrated and user-friendly solution that optimizes the entire taxi service ecosystem, benefiting both customers and service providers alike.

1.2 Aims and Objectives

The aim of this project is to develop an innovative taxi service management application that enhances the overall efficiency, user experience, and communication within the taxi service ecosystem. The primary objectives include implementing real-time tracking of drivers and updating terminal vehicle counts based on driver locations, providing a map-based location search for users to plan their journeys, and offering a flexible booking system for single, weekly, or monthly reservations. Additionally, the application will allow users to manage bookings through cancellation, pausing, and driver rating options while integrating a chat feature for communication with support. For drivers, the system will enable efficient reservation management, personalized recommendations, and communication with line managers. Line managers and administrators will have tools to monitor driver activity, evaluate performance through metrics, and improve service quality. Ultimately, the project aims to deliver a user-friendly platform that streamlines operations and enhances service delivery for both passengers and service providers.

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Chapter 2

Constraints and Earlier work

2.1 Constraints

During the development of our taxi service management application, we encountered several key challenges. One of the major issues was learning and applying specific technologies such as Flutter for the mobile app and Node.js for the backend, which were initially outside our expertise but crucial for the success of the project. We also faced technical difficulties integrating real-time GPS tracking and ensuring accurate vehicle location updates, as well as dealing with the limitations of the GPS signal in urban areas, which sometimes affected the tracking precision. Additionally, integrating Google Maps for location services, route planning, and real-time vehicle tracking posed a challenge, as it required setting up API keys and handling billing issues related to usage, including adding a credit card to access Google's services. Managing the performance of the app while handling real-time data updates, notifications, and multiple user roles (passengers, drivers, and administrators) also presented challenges, leading to occasional slowdowns and performance issues during testing. Time management was another constraint, as we had to balance the project development with our academic workload, often requiring us to prioritize tasks and work under tight deadlines. To address these issues, we sought guidance from experienced professionals in app development, conducted extensive testing to optimize performance, and dedicated additional time for research and troubleshooting, enabling us to successfully navigate the challenges and continue progressing with the development of the app.

2.2 Earlier Work

The initial work on the taxi service management application focused on defining the core features needed for passengers, drivers, and line managers. Extensive research was conducted to understand the specific needs of terminals, users, and drivers, identifying challenges such as real-time vehicle availability and communication gaps. The project began with the development of a user-friendly interface, GPS-based location tracking, and basic booking management. As it progressed, more advanced booking options and integration with Google Maps were introduced. The backend system was built to manage user authentication, reservations, and communication effectively. These efforts laid the foundation for a comprehensive system that prioritizes usability and real-time tracking. Despite challenges like API integration and performance optimization, the team addressed them through research and testing. The earlier work established a solid framework for further development.

Chapter 3

Literature Review

Our taxi service management system project is designed to address the growing challenges of urban transportation within our region, offering a fresh, comprehensive solution tailored to local needs. Unlike conventional systems, this application combines innovative features to support passengers, drivers, and terminal managers, creating a streamlined and efficient approach to managing taxi services.

Studies and market observations reveal an increasing demand for improved urban transit systems, driven by the rapid growth in commuter numbers and heightened service expectations. This demand highlights the necessity for dependable, real-time, and user-friendly transportation services. Existing taxi operations often struggle with inefficiencies such as outdated booking systems, lack of live tracking, and poor communication between users and drivers, leading to delays and frustration.

One of the primary concerns for passengers is the inability to access real-time updates on vehicle availability, estimated arrival times, and optimal routes. These gaps create uncertainty and hinder effective journey planning. Similarly, drivers and terminal managers face limitations in managing reservations, coordinating vehicle assignments, and monitoring performance, due to the absence of advanced tools like GPS tracking and communication systems.

This project seeks to address these challenges by introducing a modern, technology-driven solution. The application integrates real-time tracking, efficient booking options, and robust communication channels to improve the overall user experience. Additionally, it provides terminal managers with data-driven tools for optimizing operations, enhancing decision-making, and ensuring smoother workflows.

Through these features, the system aims to elevate the quality of taxi services in the region, ensuring they are more reliable, accessible, and efficient. By rethinking traditional methods, this project envisions transforming taxi operations into a highly organized, customer-focused service that meets the demands of modern urban life.

Chapter 4

Methodology

4.1 Non-Functional Requirements

Security:

The taxi service management application implements robust security measures to ensure the safety and privacy of user data. User authentication is secured through a system that requires users to log in using a valid email address and password. The application includes a password reset feature, which sends a secure, one-time code to the user's registered email for verification before allowing any password changes. To further protect the system, JSON Web Tokens (JWT) are utilized to handle user authentication and maintain session integrity. In addition, strong front-end validation is implemented for all input fields to prevent unauthorized access or malicious data entry. This validation ensures that only correctly formatted and verified data is submitted, minimizing vulnerabilities and potential breaches. Together, these features provide a comprehensive security framework, safeguarding sensitive user information and ensuring a reliable and secure experience for all users of the platform.

Ease-of-use:

The taxi service management application is designed to be simple and user-friendly. It features a clean interface with clear navigation, making it easy for users to book rides, manage reservations, and track vehicles. Passengers can quickly complete tasks with pre-filled data and straightforward options, while drivers and administrators benefit from intuitive tools for managing bookings and communication. The focus on simplicity ensures that all users, regardless of technical experience, can use the app effortlessly.

Usability:

The app is designed to be simple and user-friendly, allowing passengers, drivers, and administrators to easily navigate features like booking, tracking, and managing reservations with minimal effort.

4.2 Design

The design of the taxi management app focuses on creating a seamless user experience with a modern and intuitive interface. The app is divided into three main components: the passenger app, the driver app, the line manager app, and the administrative web portal. Each component is designed to meet the unique needs of its users while maintaining consistency in design and functionality.

The passenger app features a clean design for booking rides, tracking driver locations in real time, and managing reservations. The driver app includes tools to view assigned trips, track routes using GPS, and communicate with line managers. The administration portal is designed to efficiently manage operations, offering features such as driver performance monitoring and station management.

The design emphasizes simplicity, accessibility, and responsiveness to ensure a seamless experience across devices and screen sizes. Integration with Google Maps enhances the visual experience, providing real-time updates and accurate route planning for users and drivers.

4.2.1 Registration and Log In

The taxi service management application provides a secure and intuitive registration and login process tailored to meet the needs of different roles: users, drivers, and line managers. During registration, all users are required to fill in their personal details, including name, email, address, gender, and date of birth. Drivers must additionally upload their valid license number as part of the registration process. This information is then reviewed and approved by an admin to ensure that all drivers meet the required qualifications and standards. The login process is secured with JWT (JSON Web Token) authentication. Users can reset their password securely by receiving a code sent to their registered email address, ensuring account safety. This robust system ensures a seamless and secure experience for all roles within the app.

4.2.2 User Profile Management

Users have the ability to access and modify their profiles, allowing them to update personal details and change their passwords. This functionality ensures that each user has a customized and secure experience within the app.

4.2.3 Contact Support

The Contact Support feature in the app lets users easily chat with the support team for help with any issues. This provides a quick and convenient way for users to get assistance, ensuring a smooth experience and better user satisfaction.

4.2.4 Destination Based Terminal Navigation

In the app, users can search for a place, and the system will retrieve their current location. Based on the search results, the app then displays the optimal terminal for the user to reach their destination. This feature integrates real-time location data and provides users with a convenient and efficient way to plan their journey, helping them easily navigate to the most suitable terminal for their desired destination. The integration with the map ensures a seamless experience and improves the overall usability of the app.

4.2.5 Real-Time Vehicle Tracking and Crisis Detection

In the app, users can view the number of cars currently present in each line of the terminals. This feature allows users to quickly assess if there is a vehicle shortage or "car crisis" in any terminal, helping them make informed decisions. Additionally, the app provides real-time information on how long it will take for the nearest available car to arrive, ensuring that users can plan their trips more efficiently. This functionality enhances the overall user experience by offering transparency and real-time updates on vehicle availability.

4.2.6 Flexible Taxi Reservation and Scheduling

The app offers users the ability to book a taxi for either a single day or multiple days, providing flexibility to suit their needs. Users can select the exact time for their ride and enter their phone number for easy contact. Additionally, they can choose an end date for the reservation, allowing them to plan their trip with greater convenience. This feature ensures that users can tailor their taxi bookings to fit their schedules, making the process seamless and efficient.

4.2.7 Reservation Management and Driver Rating

The app provides users with an intuitive interface to manage their reservations. Users can easily pause or cancel their bookings as needed, giving them full control over their plans. Additionally, after the ride, users can rate the driver, offering feedback on their experience. This feature enhances user convenience and satisfaction, allowing them to make adjustments to their reservations and contribute to the quality of service through driver ratings.

4.2.8 Reservation and Driver Acceptance Notifications

The app keeps users informed with timely notifications. When a user books a taxi, they receive a notification confirming their reservation. Additionally, once a driver accepts the reservation, the user is notified with the details of the driver. This feature ensures that users are always updated on the status of their bookings, providing peace of mind and a smoother overall experience.

4.2.9 Terminal Rating and Feedback Management

The app allows users to rate the terminals based on their experience. After submitting a rating, users can edit or delete their feedback at any time. This feature provides users with the flexibility to update their opinions and ensures that their ratings accurately reflect their experience, contributing to the overall improvement of service quality and user engagement.

4.2.10 Driver Login

The app includes a secure login feature for drivers. During the initial signup, drivers are required to upload their license card for verification. After completing the registration, they must wait for the admin to review and approve their account. Once approved, drivers can log in to the app and access features such as managing their reservations and tracking trips. This process ensures that only verified drivers are allowed on the platform, maintaining a safe and trustworthy environment for users.

4.2.11 Profile Management

Once logged in, drivers have access to their personal profile where they can view and edit their information. This includes personal details like name, contact information, etc.

4.2.12 Driver Dashboard for Pending Reservations

On the home page, drivers can view a list of all pending reservations along with detailed information about each booking. For every reservation, the app displays key details such as the pickup and drop-off locations, start date and time, recurring status, reservation pattern (e.g., daily, weekly, or monthly), interval, and the end date for recurring rides. Drivers can review these details and choose to accept the reservation, and search for reservations using pickup, drop-off, date, or pattern for easy management. Providing an organized and efficient workflow for managing bookings.

4.2.13 Accepted Reservations Management

Drivers can easily manage their accepted reservations through a dedicated page or a calendar view. The calendar provides an overview of the number of reservations for each day, allowing drivers to quickly assess their schedule. By clicking on a specific day in the calendar, drivers are redirected to a detailed page displaying all reservations for that date. This feature offers a clear and organized way for drivers to track and manage their bookings efficiently.

4.2.14 Driver Recommendation Page

The Driver Recommendation page is designed to enhance the efficiency of drivers by providing them with reservation opportunities near their current location. Using the driver's GPS coordinates, the page fetches real-time location data and displays nearby reservations that are available for pickup. This feature allows drivers to quickly view relevant ride requests in their vicinity, helping to reduce travel time between reservations and increasing the chances of timely pickups. By offering a seamless and dynamic interface, the page ensures that drivers are presented with the most pertinent and efficient options, ultimately improving overall service quality and customer satisfaction.

4.2.15 Real-Time Voice Communication with Line Manager

The Real-Time Voice Communication feature allows drivers to directly connect with the line manager through voice calls, facilitating seamless communication while on the road. This feature enables drivers to ask questions, receive guidance, or report any issues instantly, without needing to stop or pull over. By integrating this voice functionality, the app fosters a smoother and more efficient workflow, ensuring that drivers can maintain real-time communication with their line manager for support and updates. This promotes safety, reduces misunderstandings, and helps drivers stay informed and connected at all times.

4.2.16 Line Manager Communication Features

The line manager can talk to one driver directly via voice call or send broadcast voice messages to all drivers simultaneously. Additionally, the line manager has the ability to search for a specific driver to initiate a one-on-one conversation. This feature ensures streamlined communication, enabling the line manager to provide instant updates or address individual driver needs efficiently, enhancing coordination and responsiveness within the fleet.

4.2.17 Line Manager Driver Location Tracking

The line manager can view and track the location of all drivers in real-time on a map, providing an overview of the fleet's distribution. Additionally, the line manager can search for a specific driver and view their precise location on the map. This feature allows for better fleet management, ensuring that the line manager can monitor driver positions, optimize route assignments, and respond quickly to any situation that may arise, improving overall efficiency.

4.2.18 Line Manager Driver Ratings

The line manager can view the average ratings of all drivers, along with a detailed distribution of ratings. This feature provides insights into the performance of each driver, allowing the line manager to monitor service quality and identify areas for improvement. Additionally, the line manager can access visual charts that display the ratings of drivers over time, making it easier to track trends and take informed actions to maintain high standards of service. This data-driven approach helps ensure that drivers are consistently meeting customer expectations.

4.2.19 Admin User Management

The admin has the ability to manage user roles within the system, including changing a user's role as needed. This feature allows the admin to filter users by their roles, making it easier to view and manage specific groups of users. Additionally, the admin can search for a particular user to access their profile and make necessary updates, such as changing their role. This streamlined management system ensures that user permissions are always up-to-date and that the admin can efficiently oversee user activities and access within the platform.

4.2.20 Admin Terminal Management

The admin has full control over the management of terminals, including the ability to add, delete, or edit terminal details as needed. This functionality provides the admin with the flexibility to maintain and update terminal information efficiently. Additionally, the admin can search for specific terminals, making it easy to manage a large number of terminals. This feature ensures that the admin can quickly make adjustments to terminal data, keeping the system accurate and up-to-date.

4.2.21 Admin Reporting and Analytics

The admin has access to a comprehensive reporting system that includes various charts and analytics to monitor the platform's performance. These reports provide insights into the number of reservations, categorized by status (pending, canceled, or confirmed). The admin can also view the distribution of users across different age groups, track the number of vehicles in each terminal line, and analyze role and gender distributions within the user base. These data visualizations allow the admin to make informed decisions and assess key metrics, ensuring the system operates efficiently and meets the needs of both drivers and users.

4.2.22 Admin View and Search Driver and Line

The admin can view and search for drivers and the lines they are assigned to. This feature allows the admin to easily access information about which line a driver is following and manage driver-line assignments efficiently.

4.2.23 Admin Driver Approval

The admin has the ability to accept a driver after they submit a photo of their license card. This feature ensures that only verified drivers are approved to join the platform, maintaining the integrity and safety of the service. Once the admin reviews the submitted license card photo, they can approve or reject the driver's application accordingly.

4.2.24 Admin Vehicle Management

The admin can manage vehicles within the system by adding, deleting, or editing vehicle details as needed. This feature also includes a search functionality, allowing the admin to quickly locate specific vehicles. With these capabilities, the admin can efficiently maintain accurate vehicle information, ensuring the system is up-to-date and operational.

4.2.25 Admin Line Management

The admin can manage the lines within the system by adding, deleting, searching, and updating line details as necessary. This feature allows the admin to maintain and modify line information efficiently, ensuring that the system reflects current operational requirements and providing flexibility in managing line assignments.

4.3 Implementation

4.3.22 Key Library

Server Side

MySQL: was chosen because it is a reliable and widely used database system. It efficiently stores and retrieves data, supports complex queries, and works well with Node.js, making it a great choice for managing application data.

Node.js with RESTful API: Node.js was selected for its ability to handle many requests at once, making it fast and scalable. The RESTful API allows the front-end and back-end to communicate easily, making the application simpler to maintain and expand.

Client Side:

Flutter: is an open-source framework developed by Google for building natively compiled applications for mobile, web, and desktop from a single codebase. It uses the Dart programming language and provides a rich set of pre-designed widgets, making it easier to create highly customizable and visually appealing user interfaces. Flutter allows for fast development with features like hot reload, which enables developers to instantly see changes in the app without restarting. The framework is known for its high performance, as it compiles directly to native code, ensuring that apps run smoothly on various platforms. Flutter's flexibility, speed, and extensive library support make it a great choice for building cross-platform applications efficiently.

4.4 Tools

Android Studio: is an integrated development environment (IDE) used for developing Android applications. It is the official IDE for Android development, providing all the tools needed for building, testing, and debugging Android apps. Android Studio is based on IntelliJ IDEA and offers powerful features like code completion, a rich layout editor, and a robust emulator for testing. It also supports Flutter development, allowing developers to build Android apps with Flutter using the same IDE. The environment includes a wide range of tools to optimize performance, manage project dependencies, and integrate with version control systems, making it an essential tool for efficient Android app development.

Visual Studio Code (VS Code): is a lightweight, open-source code editor developed by Microsoft. It supports a wide range of programming languages and frameworks, including Dart and Flutter, making it a popular choice for mobile app development. VS Code is known for its speed, simplicity, and extensive extension support, allowing developers to customize the editor to suit their workflow. Features like IntelliSense (code completion), debugging tools, Git integration, and integrated terminal make it an efficient tool for writing and managing code. With

its large library of extensions, VS Code enhances productivity and provides a versatile environment for both frontend and backend development.

Swagger:

Swagger was chosen for documenting the API because it provides a clear and interactive interface. It helps developers understand and test the API endpoints, making it easier to work with the back-end.

Free SQL Database Server:

A free SQL database server was used to keep costs low while still providing all the necessary features for development. It's a good solution for testing and small-scale applications before moving to a larger database if needed.

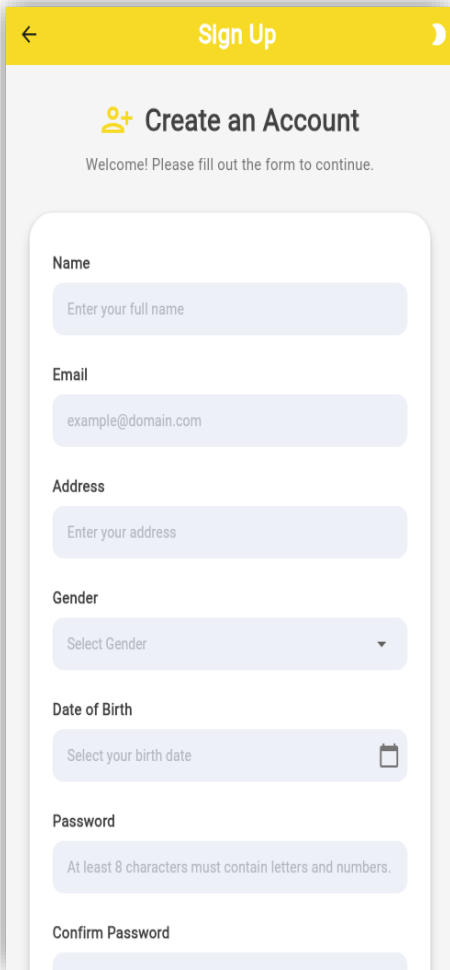
Chapter 5

Results and Analysis

The project provides a comprehensive taxi management solution, by integrating a mobile app for passengers and drivers, along with an administrative portal and a line manager interface. The passenger app allows users to easily book trips, view bookings, and search for their destination; drivers can accept trip requests, update their status, and communicate with line managers in real-time. The line manager has the ability to track drivers, manage vehicle assignments, communicate directly with individual drivers or send broadcast messages, and monitor performance through ratings and other data insights. The administration portal provides further oversight by enabling the management of users, vehicles, and stations, and generating reports based on bookings, roles, and demographics. This integrated system aims to improve taxi operations by improving route management, enhancing communication between drivers and line managers, and providing real-time vehicle tracking and management. It improves the efficiency of transportation services, enhances customer experience, and supports better decision-making for managers. Additionally, it promotes job creation and economic growth within the local technology sector.

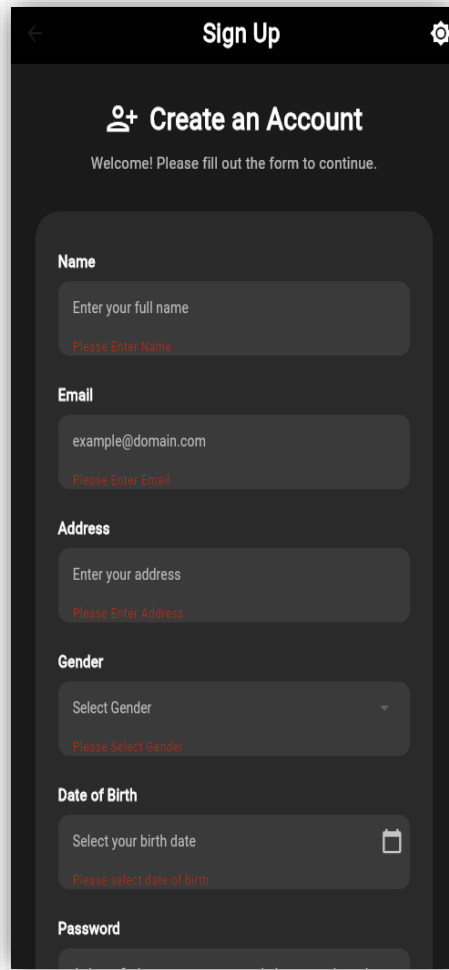
5.1 User App

5.1.1 Sign up Page



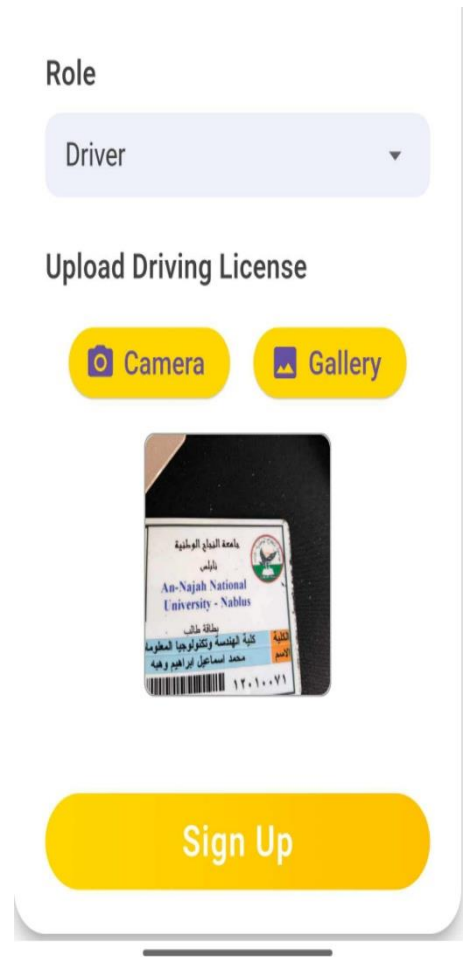
The image shows a mobile app sign-up page in light mode. At the top, there is a yellow header with a back arrow, the text "Sign Up", and a settings icon. Below the header, the page title is "Create an Account" with a plus icon and a person icon. A welcome message reads "Welcome! Please fill out the form to continue." The form consists of several fields: "Name" (text input), "Email" (text input with "example@domain.com" as a placeholder), "Address" (text input), "Gender" (dropdown menu), "Date of Birth" (calendar picker), "Password" (text input with a validation message: "At least 8 characters must contain letters and numbers."), and "Confirm Password" (text input).

Figure 5.4 Sign Up Page



The image shows the same mobile app sign-up page in dark mode. The header is black with white text. The form fields are dark gray. Red error messages are displayed below the "Name", "Email", "Address", "Gender", and "Date of Birth" fields, indicating that these fields are empty. The messages are: "Please Enter Name", "Please Enter Email", "Please Enter Address", "Please Select Gender", and "Please select date of birth".

Figure 5.5 Dark mode (Registration Empty Fields Message)



The image shows a registration card for a driver. At the top, there is a "Role" dropdown menu with "Driver" selected. Below it, there is a section titled "Upload Driving License" with two buttons: "Camera" and "Gallery". Below these buttons, there is a placeholder image of a driving license from An-Najah National University - Nablus. At the bottom of the card, there is a large yellow "Sign Up" button.

Figure 5.6 Registration Driver upload card

In the sign-up page, users can create an account by providing their email, password, address, date of birth (selectable from a calendar), role, and gender. The email and password fields include strong validation, requiring the password to be at least 8 characters long with both letters and numbers. Fields cannot be left empty. If the user selects the "Driver" role, they must upload an image of their driver's license for verification by the admin. This process ensures secure registration and proper role-based functionality within the app.

5.1.2 Sign in Page

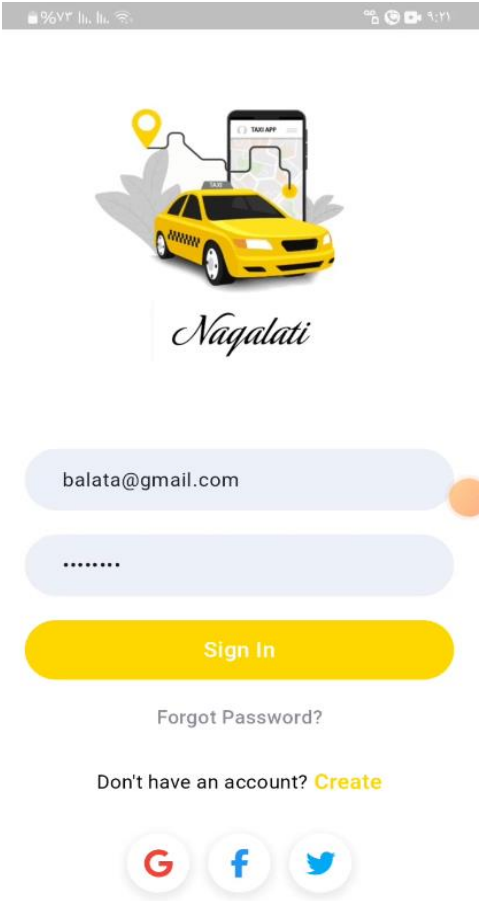


Figure 5.7 Sign in Page



Figure 5.8 Splash screen

The app starts with the splash screen for 3 seconds, and then the login page opens. Can the user log in with the email and password that they signed up with, or can they log in with Facebook or Gmail or Twitter with the email field and password having strong validation? The password should be at least 8 characters and should contain letters, and if the user doesn't have an account in the app, they can sign up by clicking the create link, and if the user forgets their password, they can reset their password by clicking the forget password link.

5.1.3 Forget Password Page

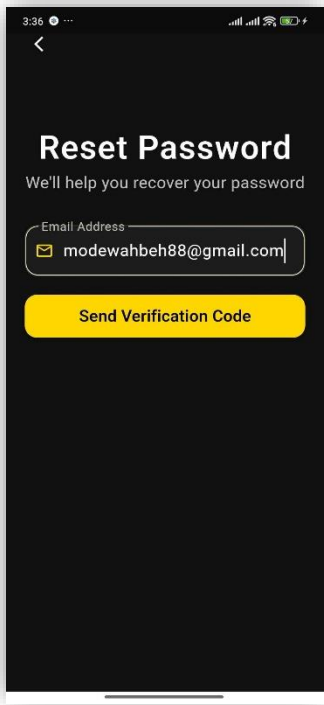


Figure 5.9 Enter Email To Reset Password Page

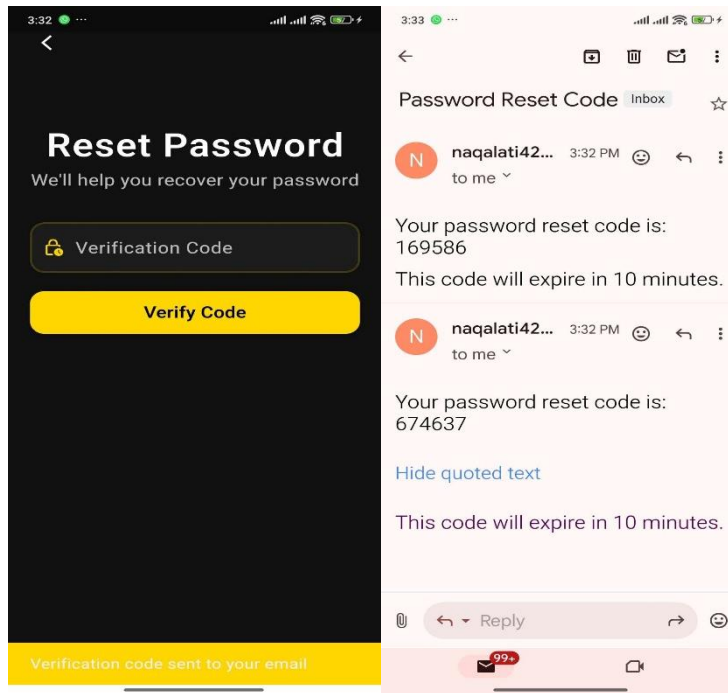


Figure 5.10 Enter Verification Code Page

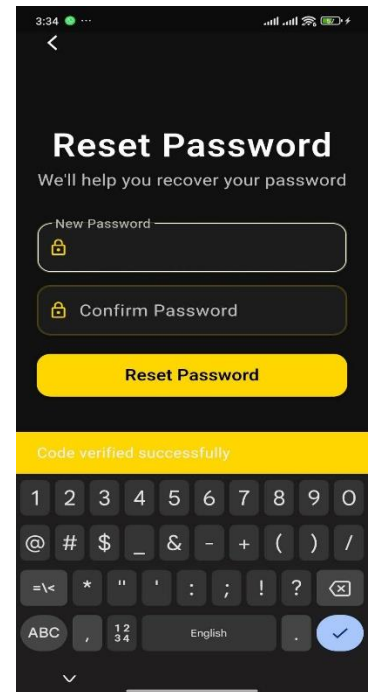


Figure 5.11 Enter New Password Page

If a user forgets their password, they can securely reset it by clicking on the "Forget Password" option on the login page. This redirects the user to the "Forget Password" page, where they are prompted to enter their registered email address. A verification code is sent to the provided email, which the user must enter within 10 minutes before it expires. Once the code is verified, the user can set a new password that meets the app's validation requirements. This process ensures a secure and straightforward way for users to regain access to their accounts.

5.1.4 Home Page

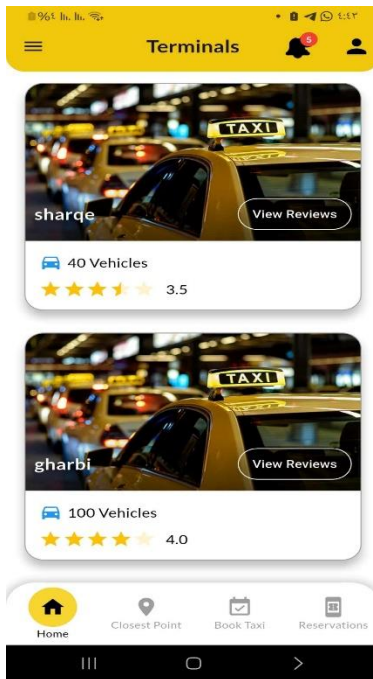


Figure 5.12 home page

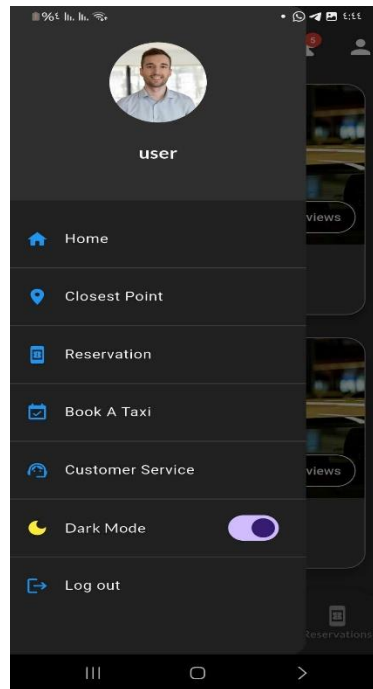


Figure 5.13 menu in the home page

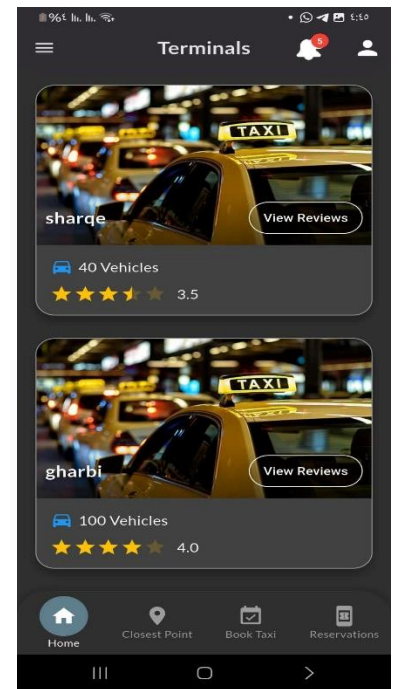


Figure 5.14 home page dark mode

The home page of the taxi service app provides users with a centralized interface to access all key features. It displays a list of terminals along with the total number of vehicles available in each terminal and allows users to view terminal reviews. The notification icon keeps users informed about updates, while the profile icon provides access to personal account details. The bottom navigation bar enables seamless switching between features such as finding the closest point, booking a taxi, and managing reservations. Additionally, the side drawer offers options to contact support, log out, and toggle dark mode, ensuring ease of use, personalization, and functionality.

5.1.5 Profile Page & Edit Profile Pages

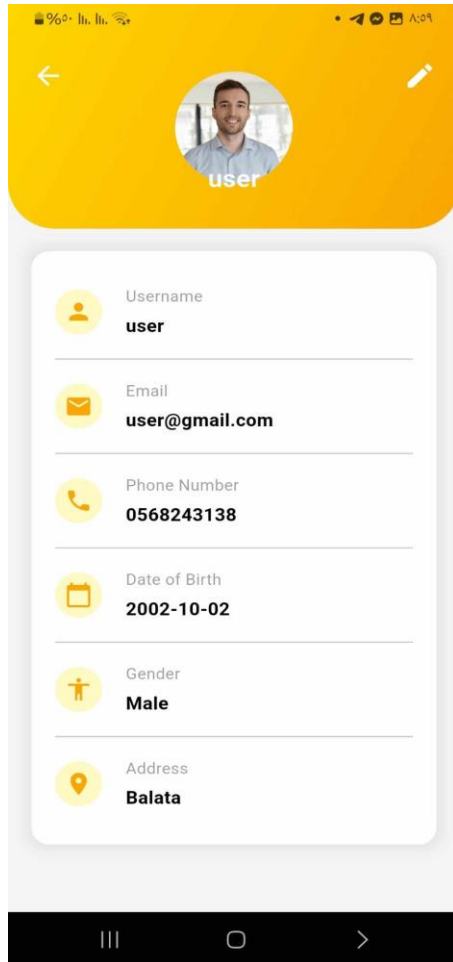


Figure 5.15 Profile Page

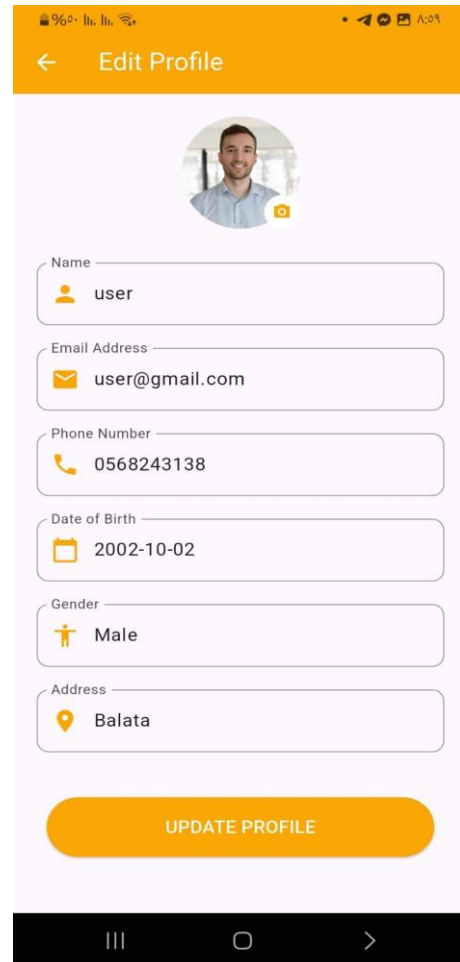


Figure 5.16 Edit Profile Page

The profile page in the app allows users to view their personal details, including their name, email address, phone number, and date of birth, gender, in a clean and organized layout. Users can easily update their information through the edit profile page, which provides editable fields for all personal details and an option to upload or change their profile picture. This feature ensures a user-friendly experience for managing personal information within the app.

5.1.6 Notification

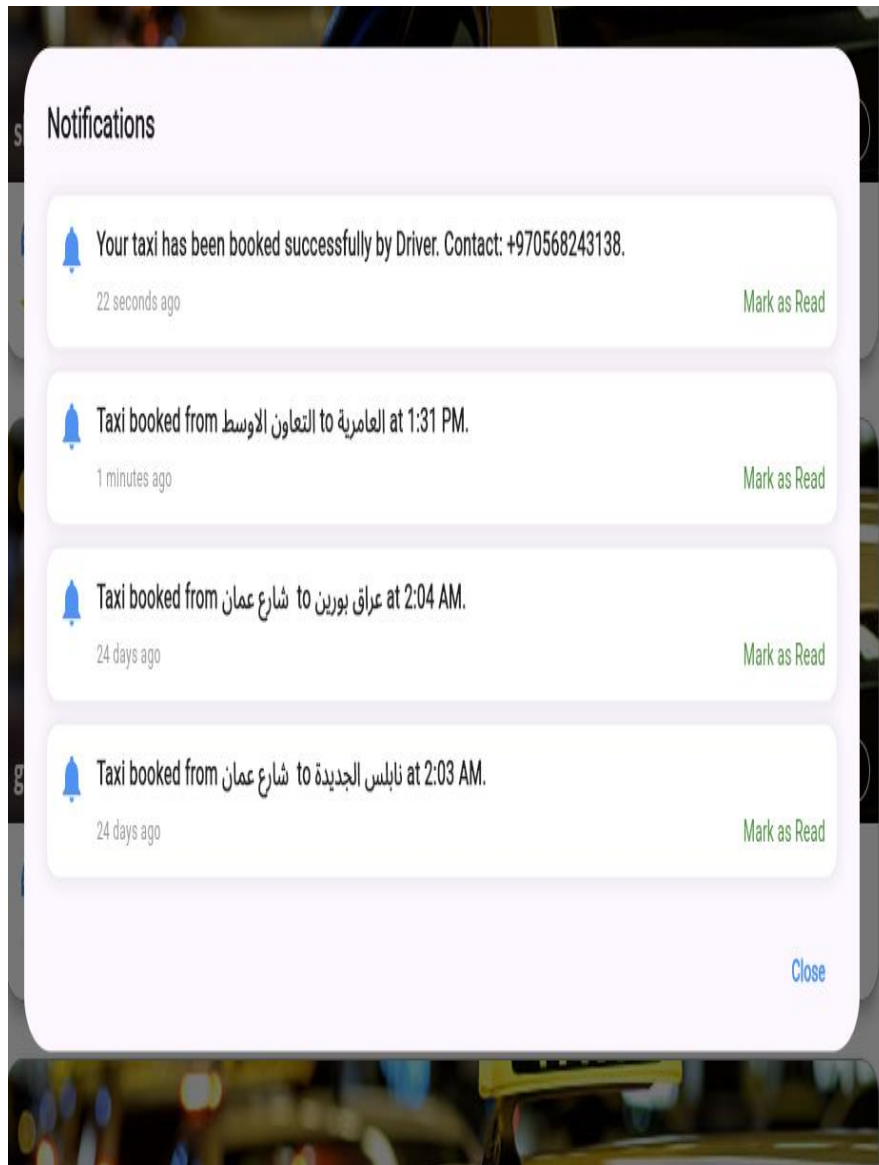


Figure 5.17 user notifications

The notification feature in the app keeps users informed about their taxi reservations. Users receive a notification when they successfully book a taxi, confirming their reservation. Additionally, they are notified when a driver accepts their reservation, providing details about the driver. This ensures users stay updated throughout the booking process, enhancing their overall experience.

5.1.7 Closest point Page

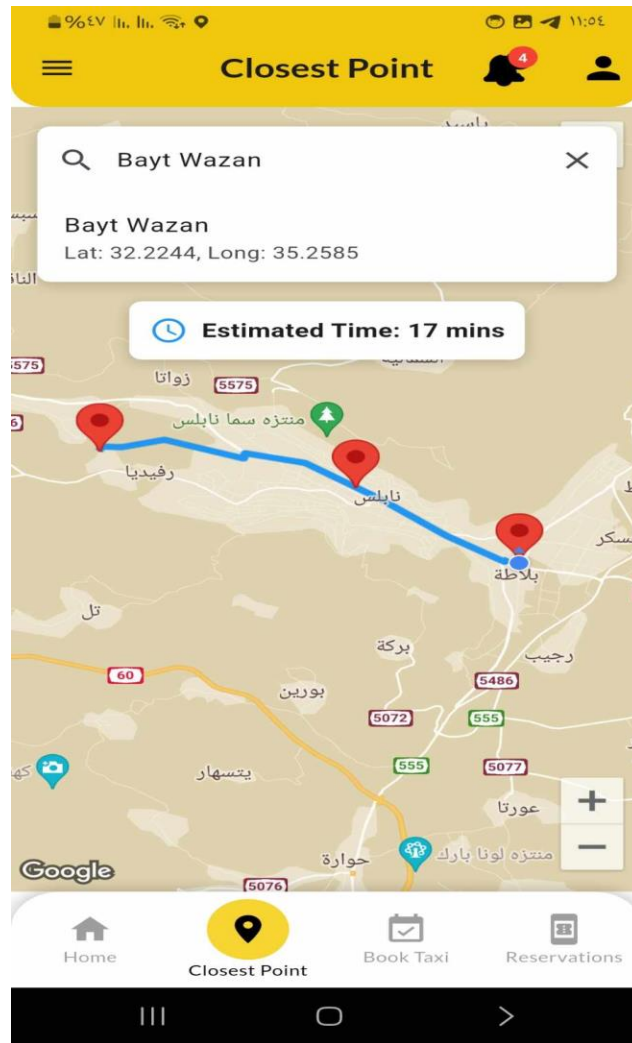


Figure 5.18 Closest Point

The closest point page allows users to search for a specific place while the app fetches their current location. The app then displays the user's current position, the recommended terminal to go to, and the final destination on a map. Additionally, it provides the estimated time for the trip, offering users a clear and convenient way to plan their journey.

5.1.8 Book a Taxi Page

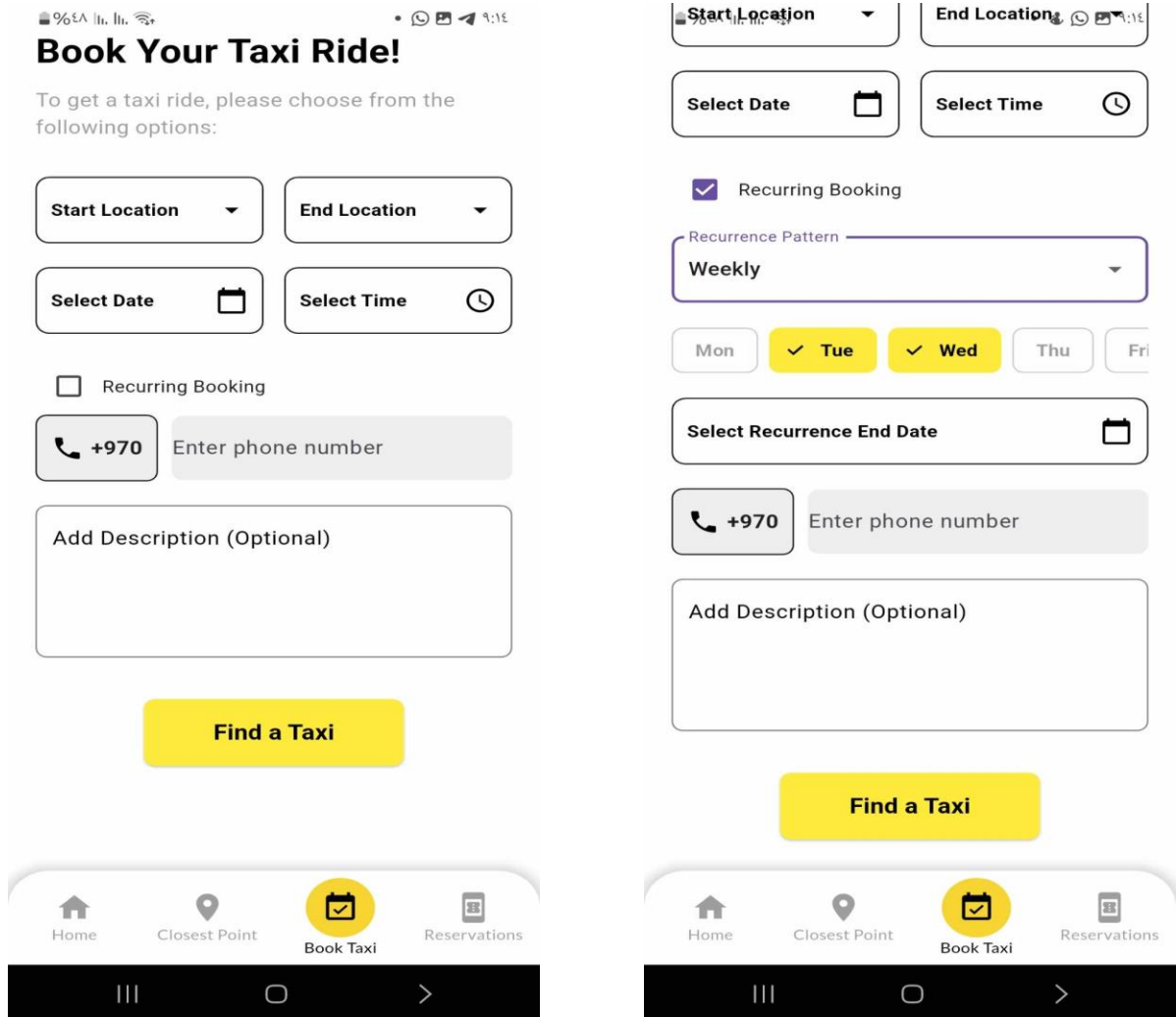


Figure 5.20 Book a Taxi Page

The "Book a Taxi" page provides users with a convenient way to schedule their rides. Users can select the start and end destinations from a predefined list, choose the reservation date, and specify whether the reservation is recurring. They can select the days for the recurrence, set the time and end date for the reservation, and choose the frequency (weekly or monthly). Additionally, users can enter their phone number and provide an optional description to include any specific details about the booking, ensuring a seamless and personalized reservation experience.

5.1.9 Station Details Page

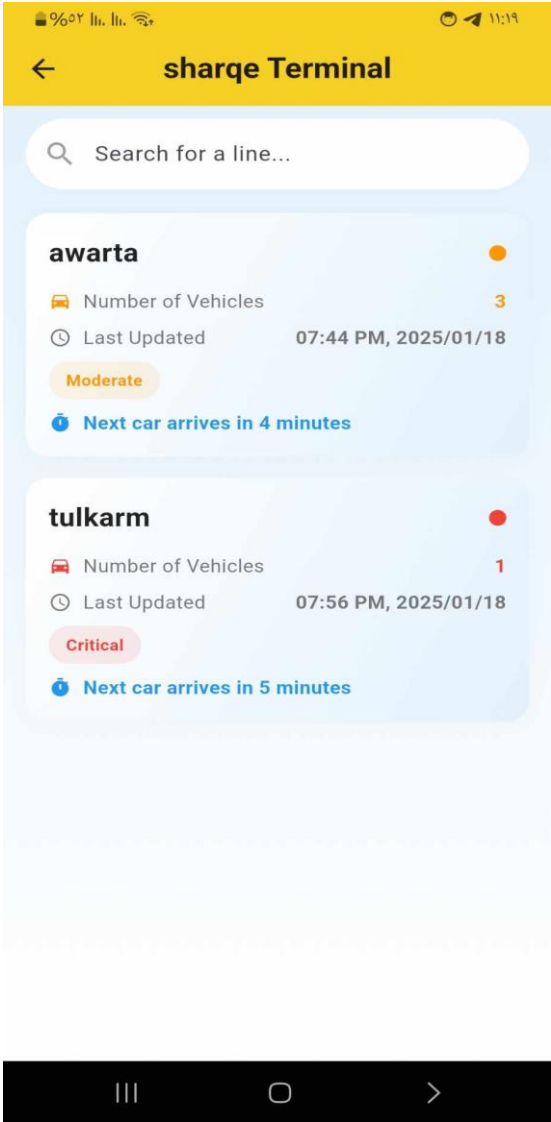


Figure 5.21 terminal Page

On the Terminal Page, users can easily search for or view individual lines, along with key details such as the number of vehicles currently in each line. The page also displays the last update, as well as the current status of each line (moderate, critical, or good). Additionally, users are provided with the estimated time of arrival for the next car to reach the line, ensuring they are informed about the current state and upcoming arrivals.

5.1.10 Reservation Page

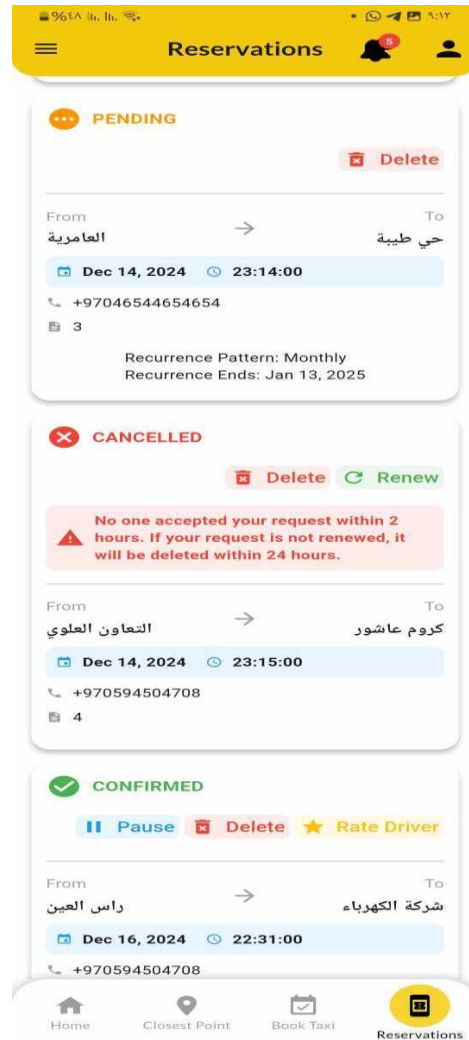


Figure 5.22 Reservation Page

On the Reservation Page, users can view all their reservations and manage them with ease. They have the option to pause, renew, cancel, or delete any reservation. Once a reservation is confirmed, users can also rate the driver based on their experience.

5.1.11 Customer Service Page

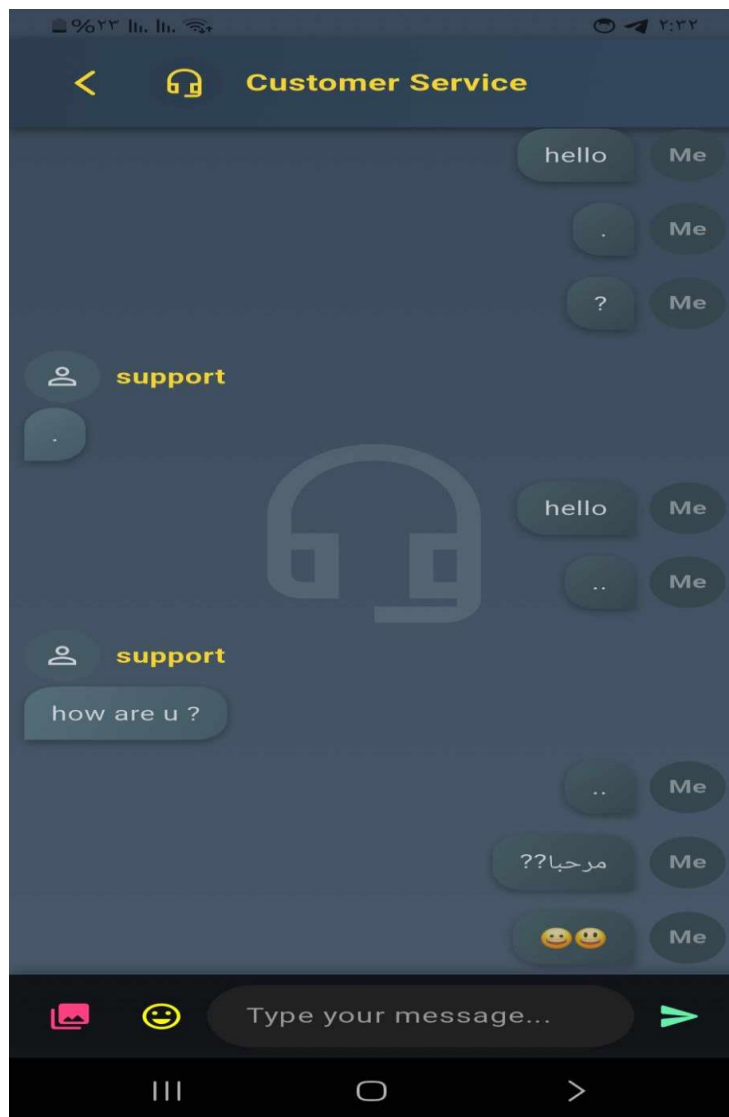


Figure 5.23 Customer Service Page

On the Customer Service page, users can communicate with customer service in real time if they encounter any issues. This feature enables users to quickly resolve problems by engaging in a direct chat, ensuring they receive timely support and assistance.

5.1.12 Driver Home Page

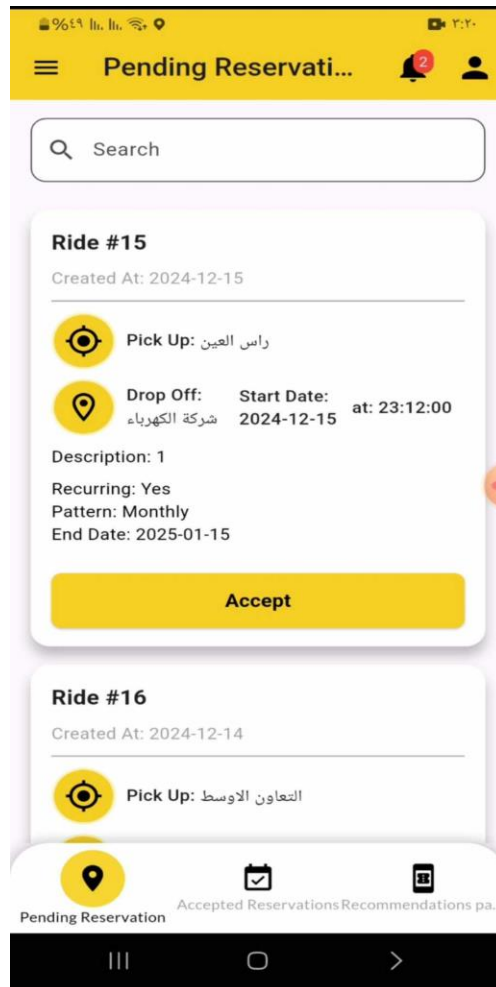


Figure 5.24 Driver Home Page

On the Driver Home Page, drivers can view all pending reservations with detailed information, search for specific reservations, and accept pending reservations. The page also includes options to check notifications, access the driver's profile, and use a bottom navigation bar to switch between viewing accepted reservations and exploring a recommendations page that displays nearby reservations tailored for the driver.

5.1.13 Accepted Reservation Page

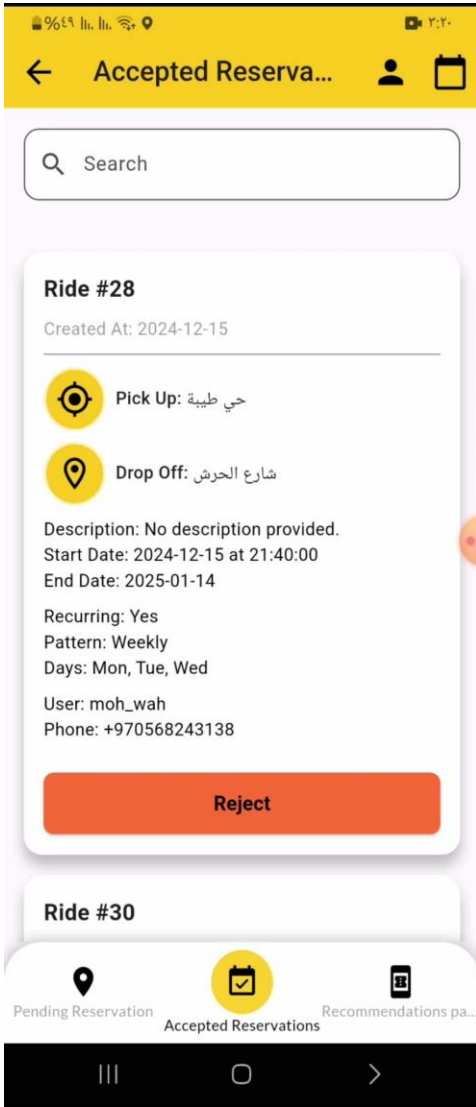


Figure 5.25 Accepted Reservation Page

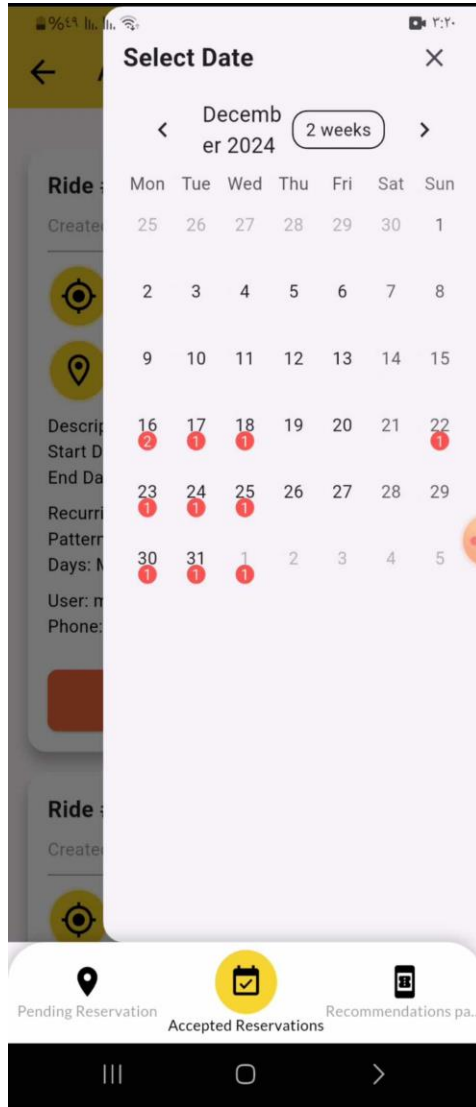


Figure 5.26 calendar to show reservations

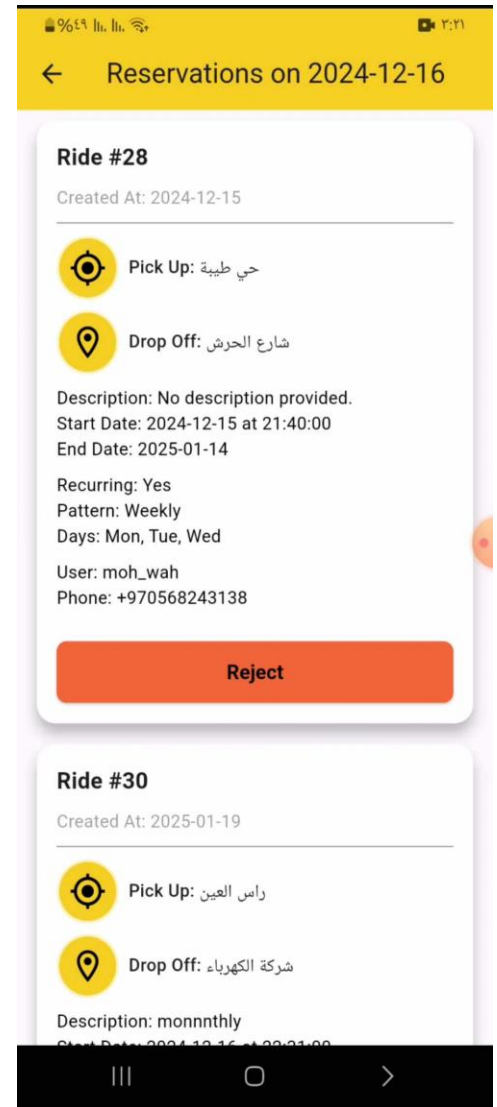


Figure 5.27 show reservations in specific day

On the Accepted Reservations Page, drivers can view all accepted reservations, cancel any reservation, and search for specific reservations. The page includes a calendar feature that displays all accepted reservations along with their dates, supporting recurring reservations. By clicking on a specific day in the calendar, the driver can view all accepted reservations scheduled for that day.

5.1.14 Recommendation page

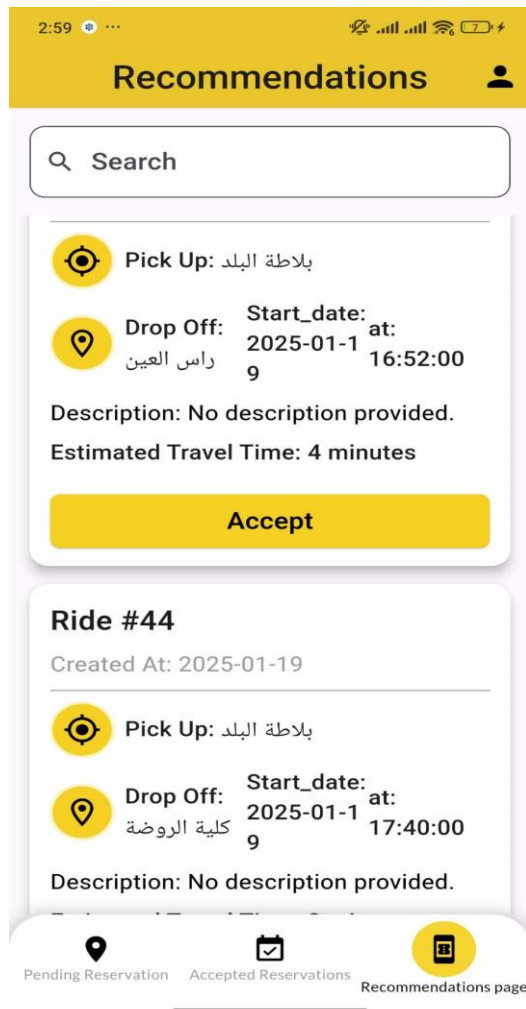


Figure 5.28 Recommendation Page

On the Recommendations Page, drivers can view reservations within a 0.5 km radius, along with the estimated time required for each reservation. The page also allows drivers to search for nearby reservations based on their end destination, making it easier to find suitable trips efficiently.

5.1.15 Driver Notification

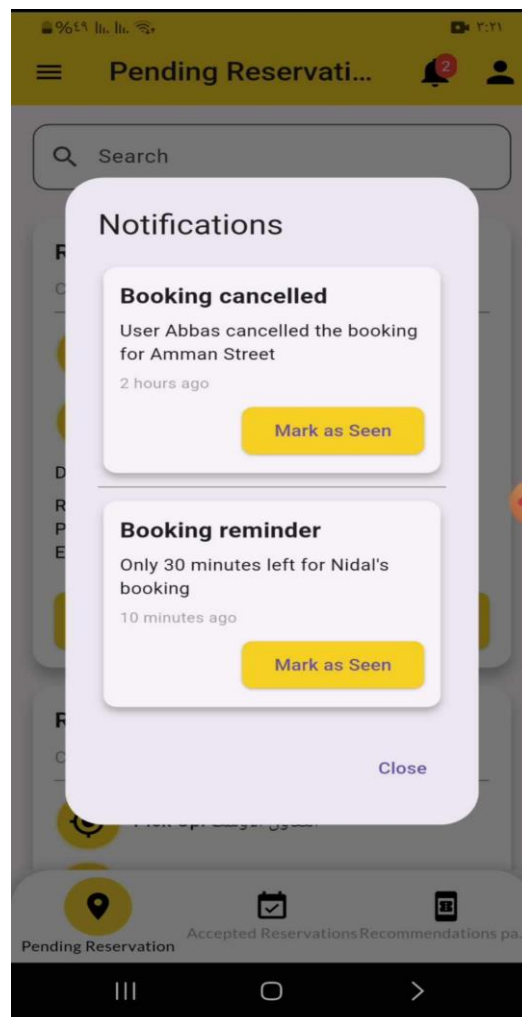


Figure 5.29 Driver Notification

The driver can view notifications that inform them if a user cancels a reservation or provide reminders before the start time of a reservation. These notifications help drivers stay updated and manage their schedules effectively.

5.1.16 Contact with Line Manger Page

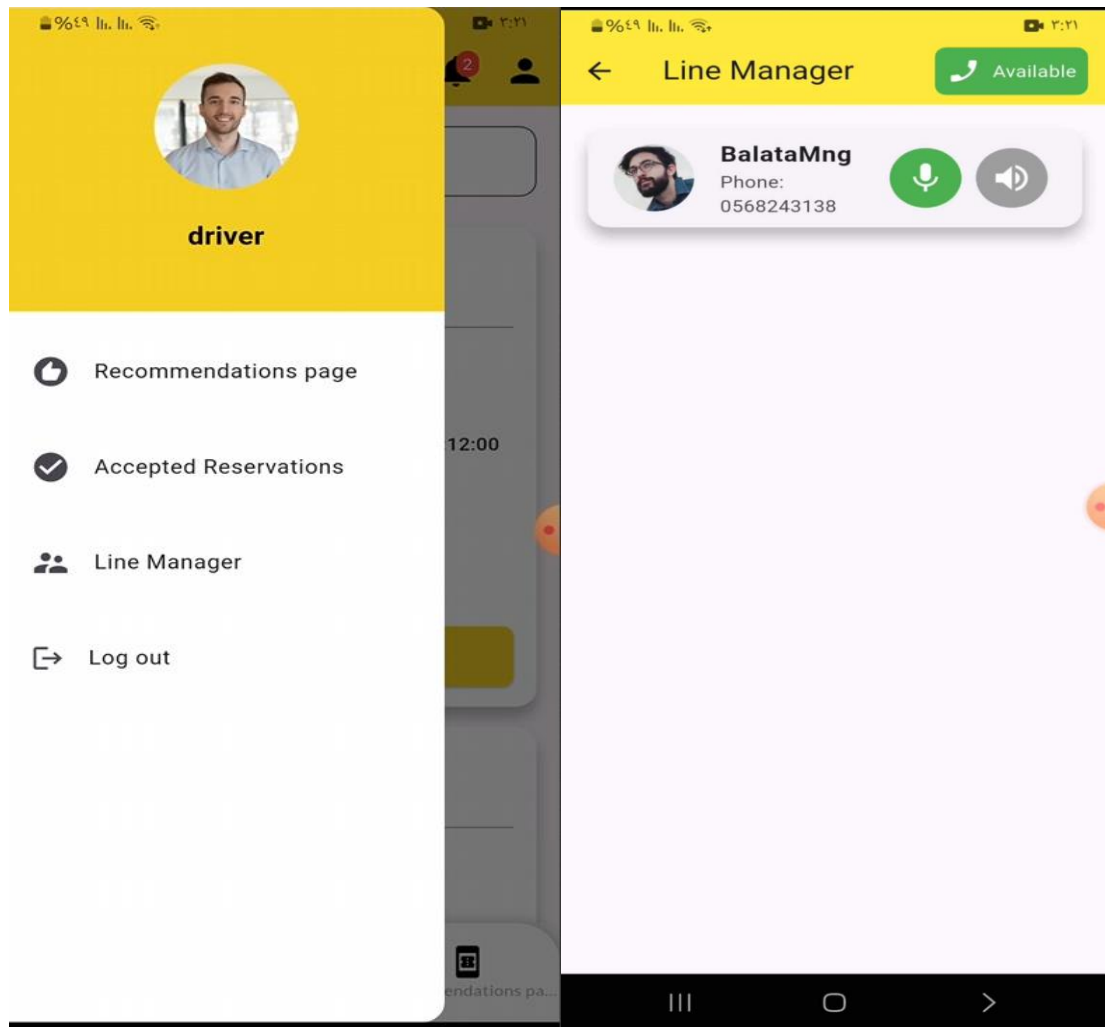


Figure 5.30 Contact with Line Manger Page

The driver can communicate with the line manager by sending real-time voice messages. There is also an availability button that allows the driver to toggle their status between available and unavailable for receiving and sending real-time voice messages.

5.2 Line manger App



Figure 5.31 Drivers on map

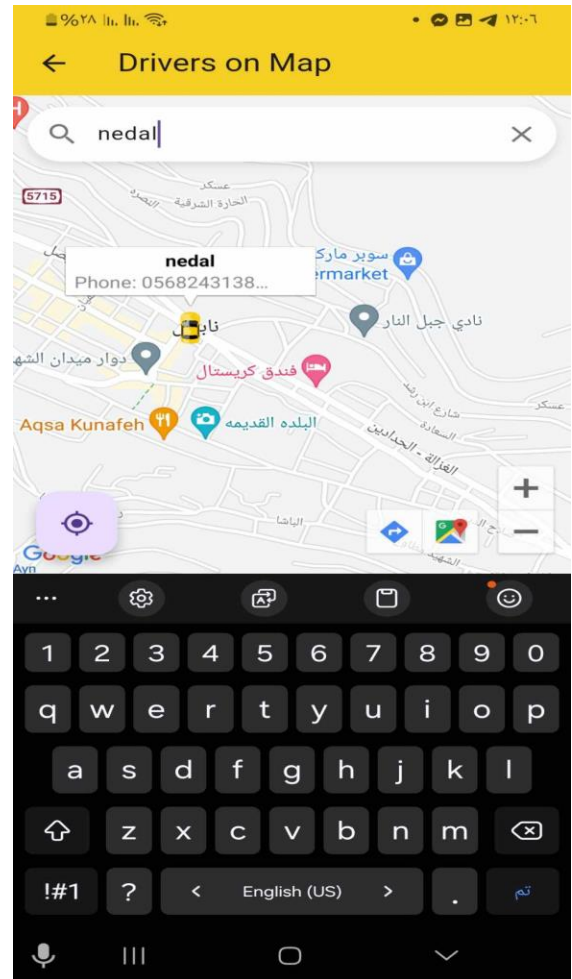


Figure 5.32 Search for a driver on the map

The line manager can view all drivers' positions on a map and search for specific drivers by name, phone number, or email to display their precise location on the map, ensuring efficient and accurate tracking.

5.2 Line manger App

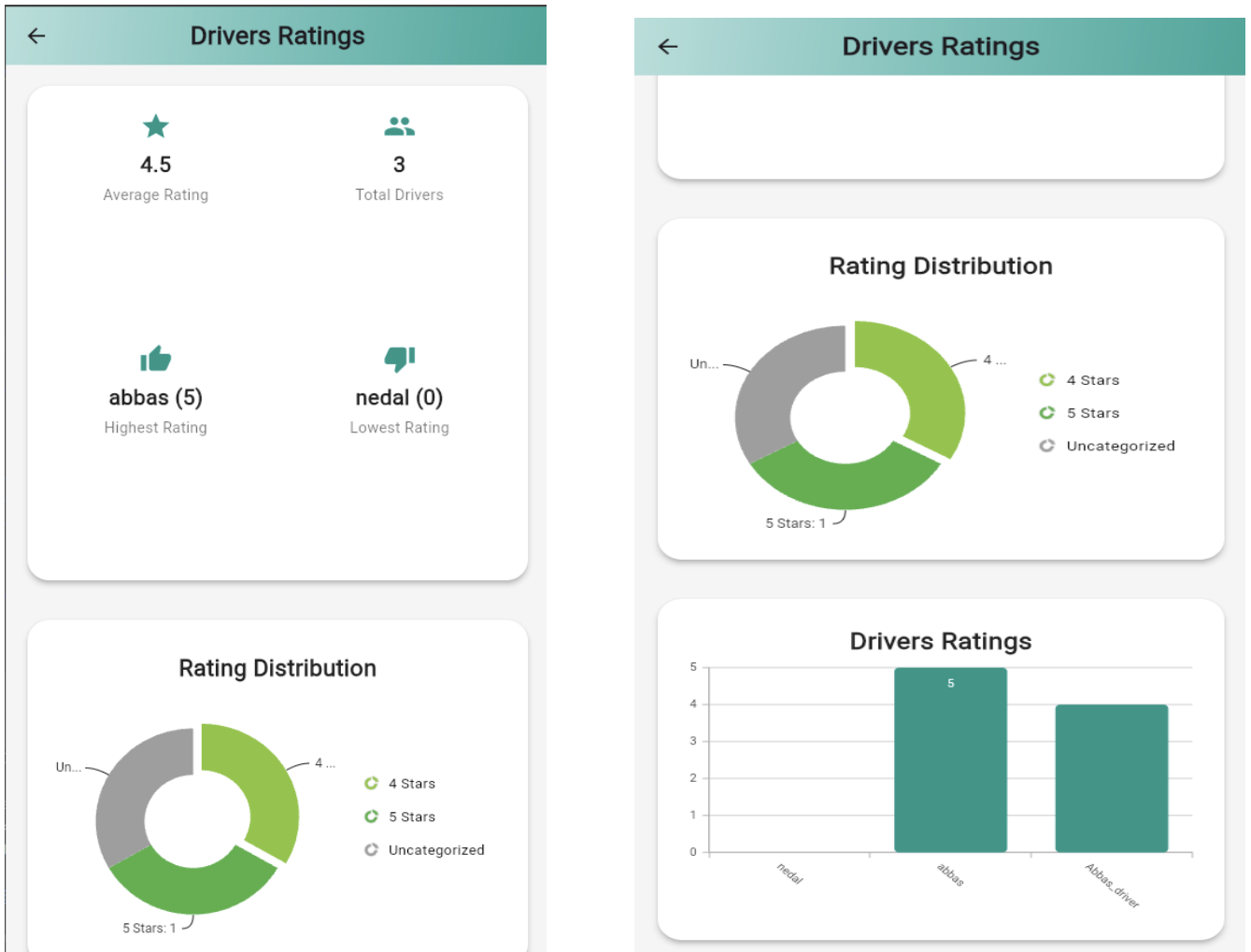


Figure 5.33 Drivers Ratings

On the Drivers Rating page, the line manager can view comprehensive statistics, including the average ratings of all drivers, the total number of drivers, the highest-rated and lowest-rated drivers, the distribution of ratings, and the individual ratings of each driver. These insights are visually represented using charts for clarity and ease of analysis.

5.2 Line manger App

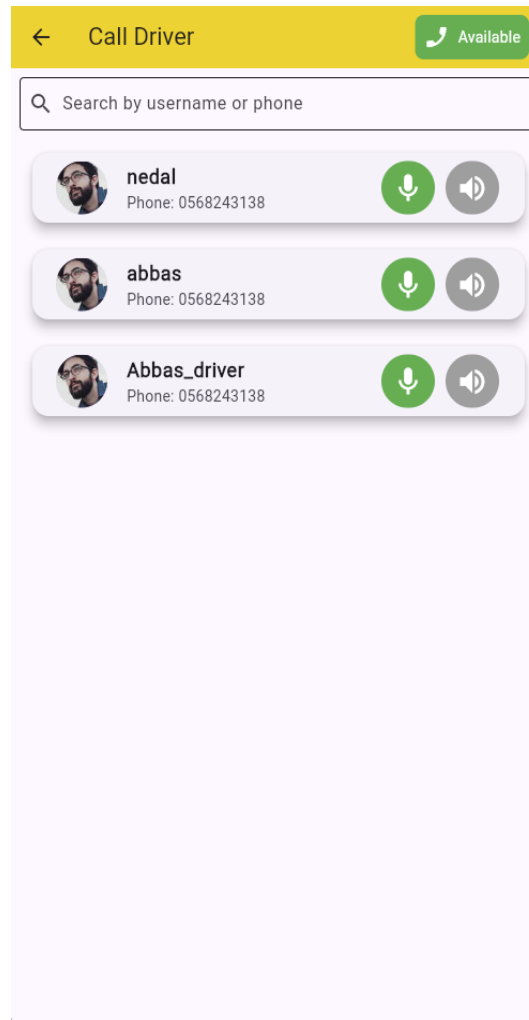


Figure 5.34 Drivers Call Page

On the Call Driver page, the line manager can communicate with a specific driver or broadcast voice messages to all drivers. They can search for a driver by name or phone number for direct communication. The page also includes an availability button, allowing the line manager to toggle their status between available and unavailable. When set to unavailable, the line manager cannot send or receive voice messages.

5.3 Admin website or app

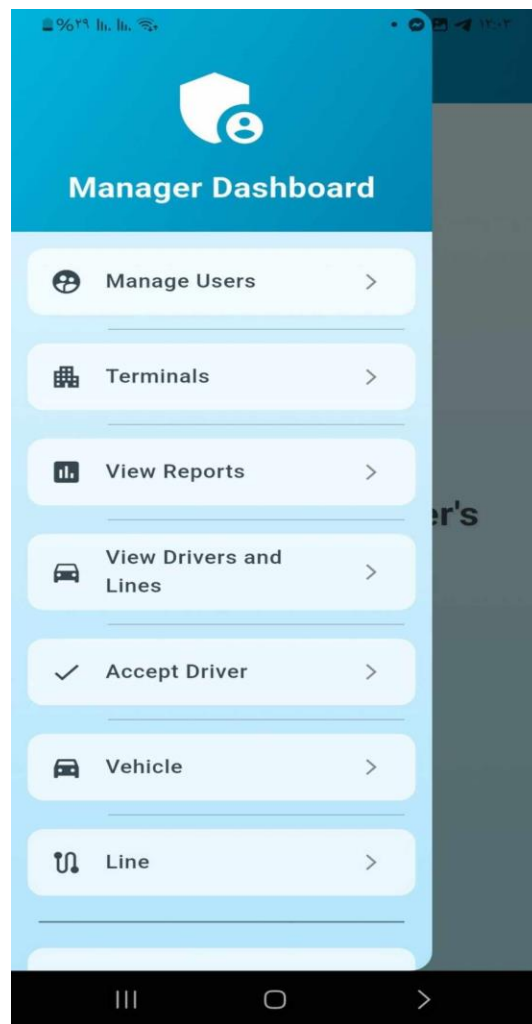


Figure 5.35 Admin Dashboard

In the Admin Dashboard, the admin can manage users by modifying their roles (driver, user, or line manager). The admin can also oversee terminals by performing actions such as adding, deleting, updating, or creating new terminals. Additionally, the dashboard provides reports and analysis features, a dedicated page for approving drivers after verifying their license card and photo, and can manage vehicles and lines efficiently.

5.3.1 manage users

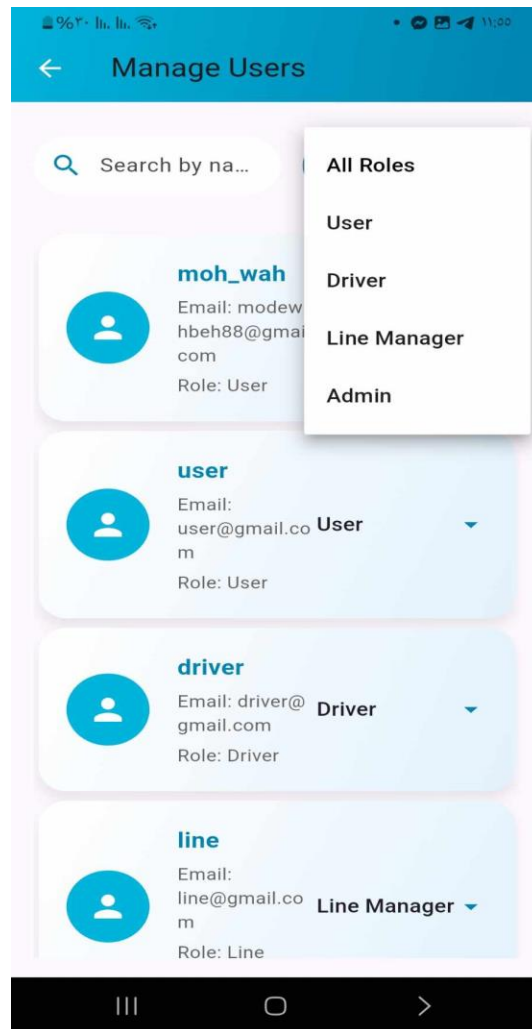


Figure 5.36 manage user role

In the manage users page the Admin can search for users, apply filters based on their roles, and modify user roles as needed, ensuring efficient user management.

5.3.2 Manage Terminals Pages

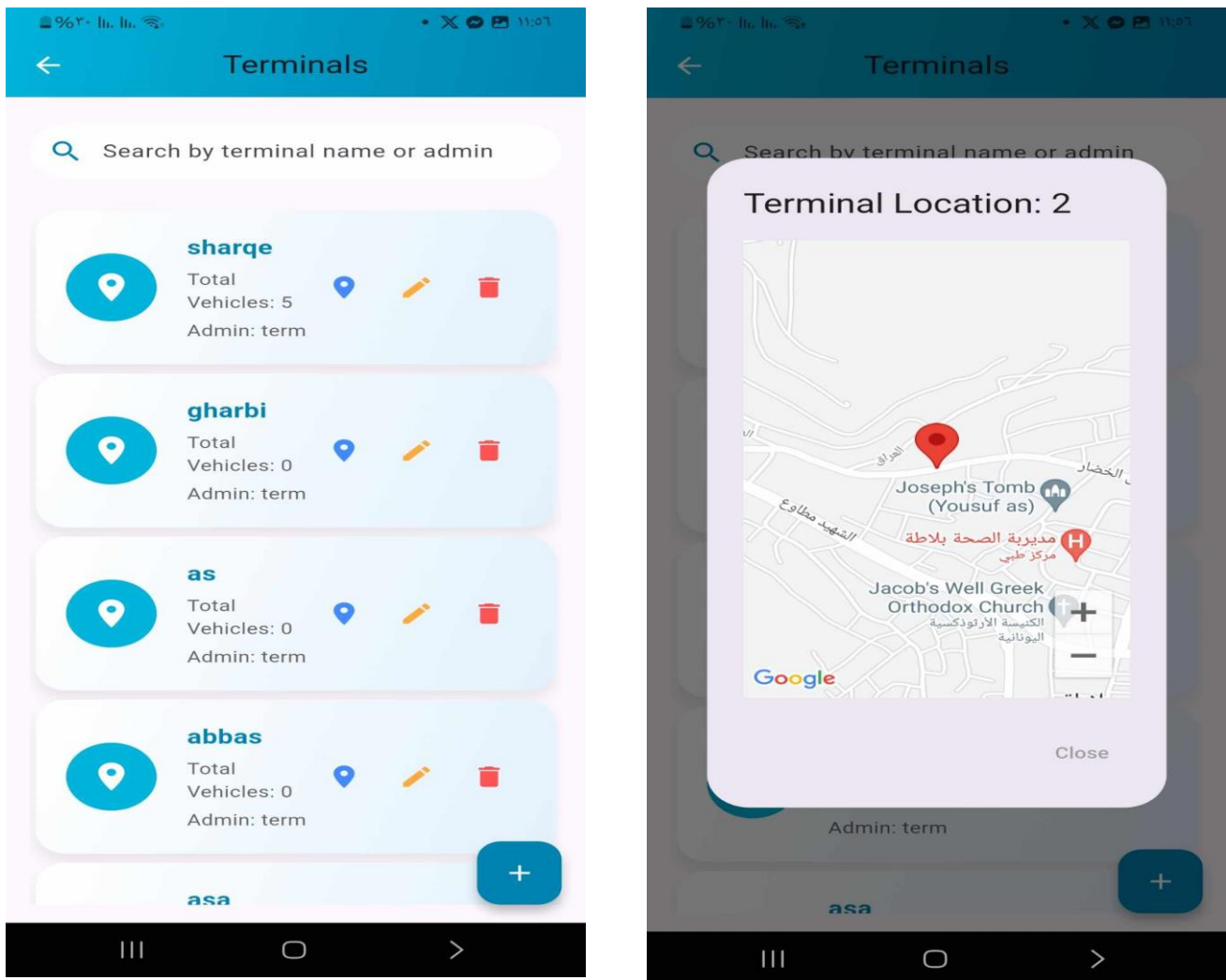


Figure 5.37 manage terminals

On the Terminals page, the admin can add new terminals, delete existing ones, update terminal locations, and search for specific terminals to perform these actions efficiently.

5.3.3 Statistics

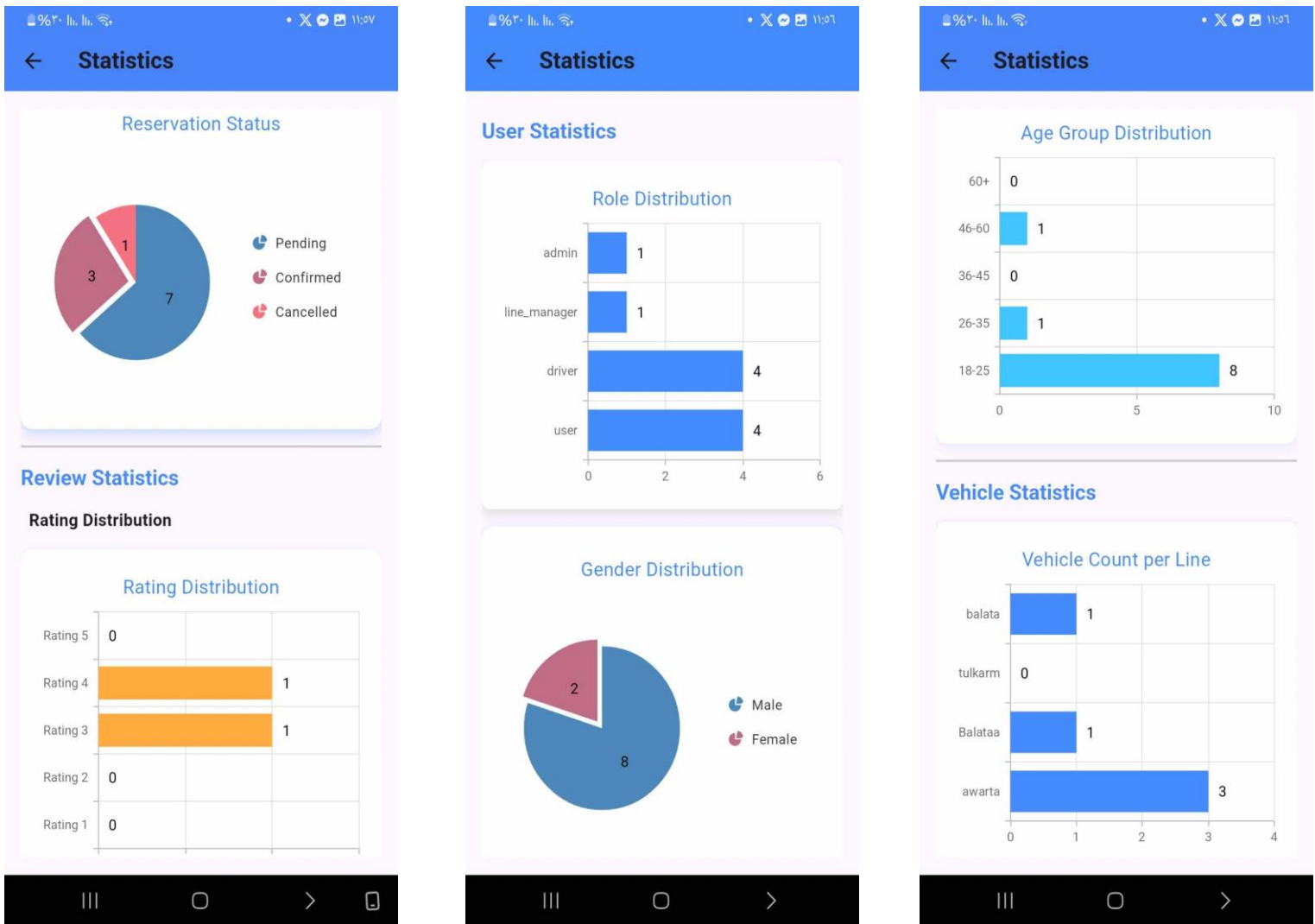


Figure 5.38 Admin statistics

On the Statistics page, the admin can view detailed analytics, including reservation statuses (canceled, confirmed, pending), rating distributions, user statistics (role distribution, gender distribution, age group distribution), and vehicle counts per line, providing a comprehensive overview of the system's performance and usage.

5.3.4 Drivers and lines

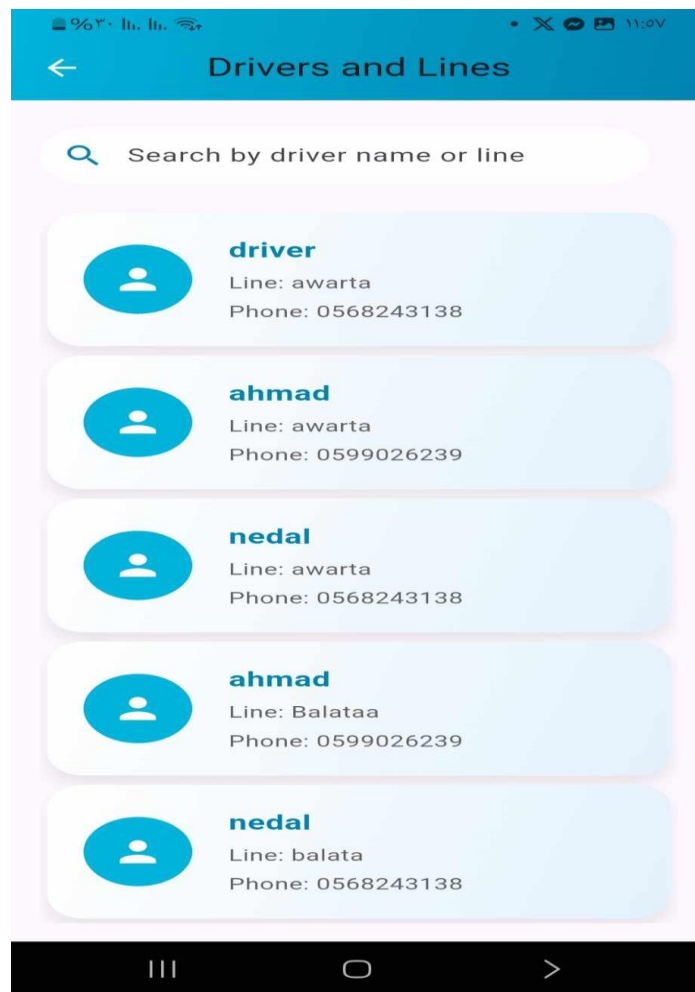


Figure 5.39 Drivers and lines page

On the Drivers and Lines page, the admin can view all drivers, the specific lines they are assigned to, and their phone numbers. The page also allows the admin to search for a driver to display these details efficiently.

5.3.5 Vehicle management Page

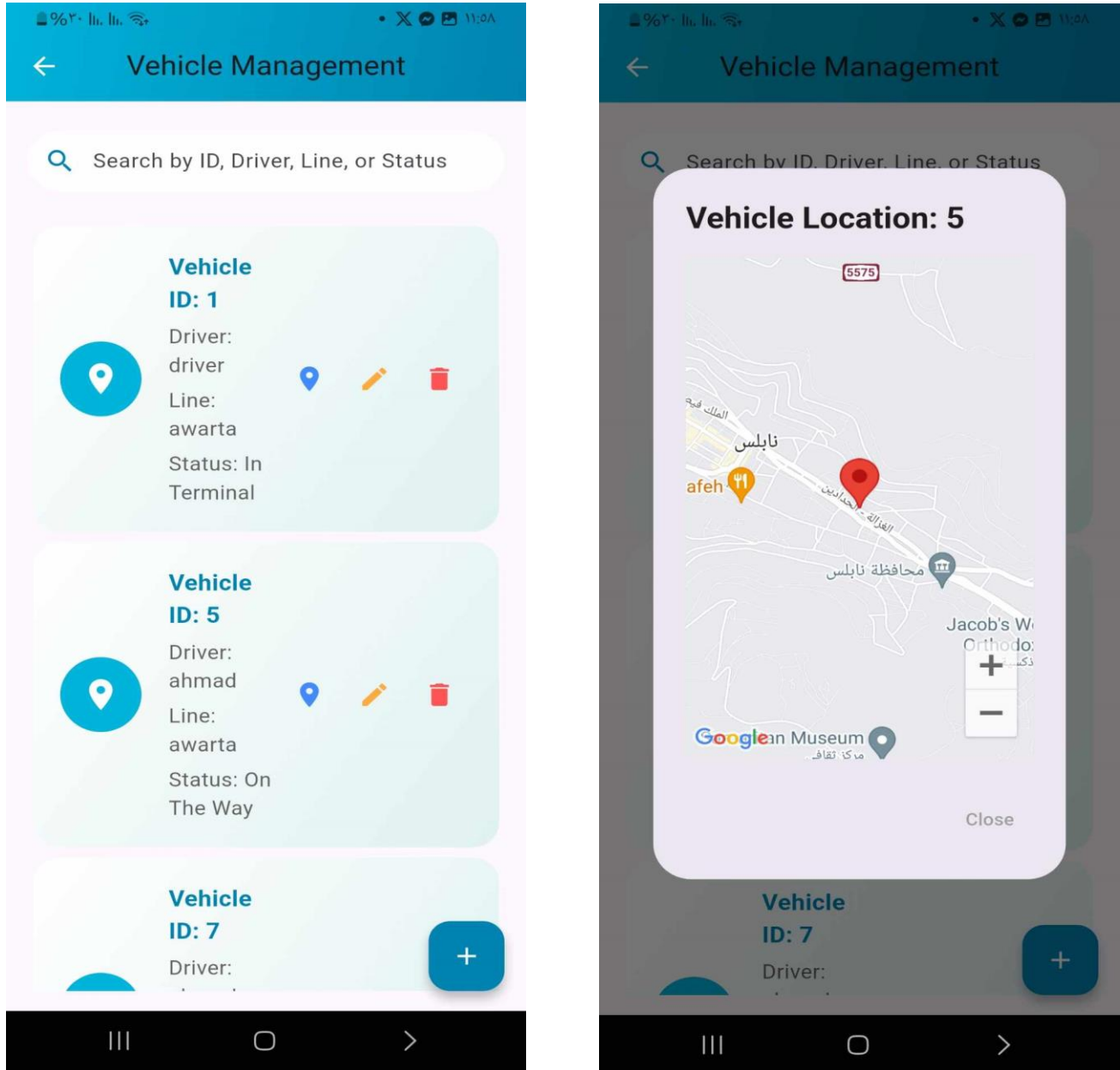


Figure 5.40 Vehicle management

On the Vehicle Management page, the admin can manage vehicles by adding, editing, or deleting them. The admin can also view vehicle locations on a map and search for vehicles by ID, assigned driver, line, or status for efficient management.

5.3.6 Line management Page

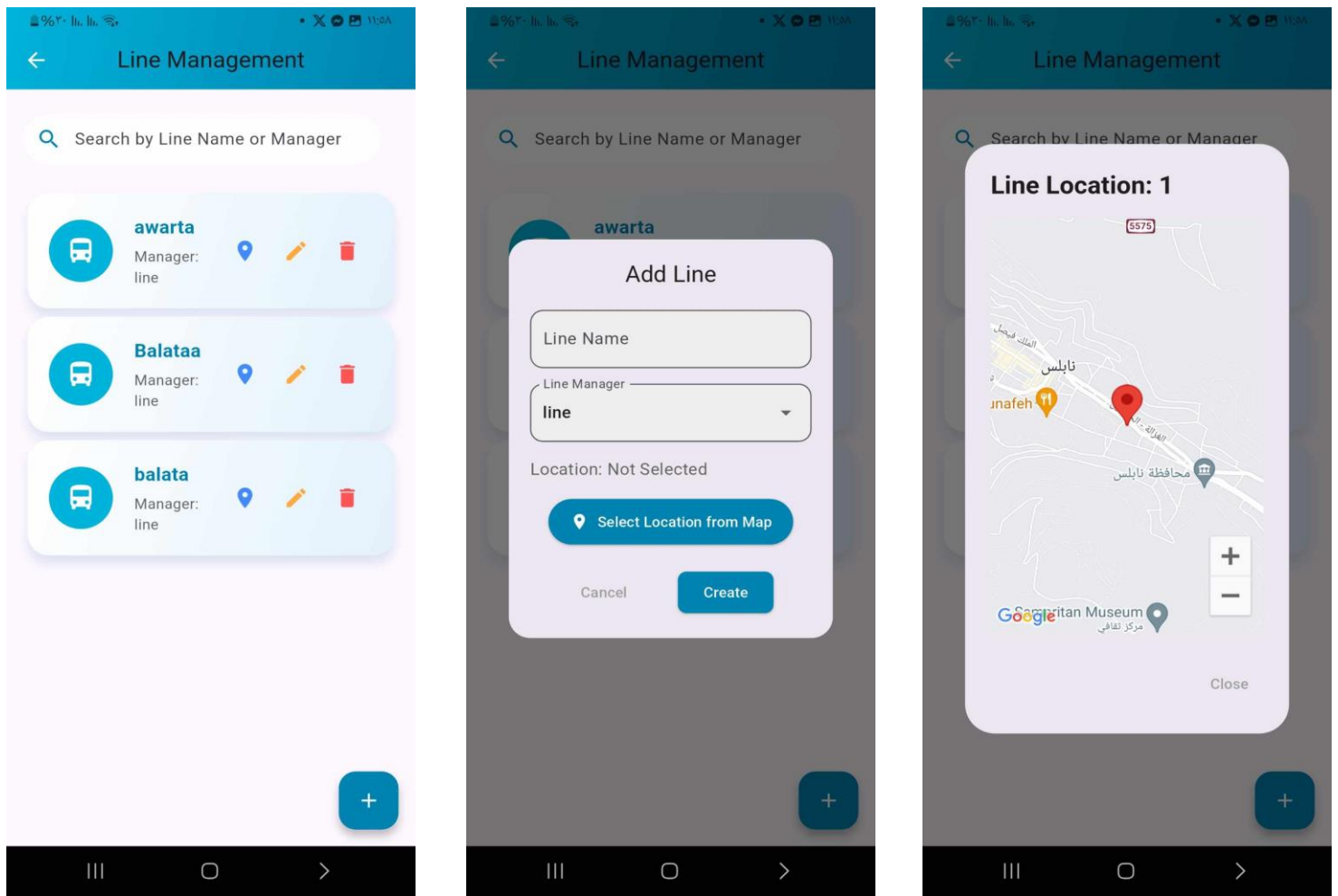


Figure 5.41 Line management

On the Line Management page, the admin can search for lines by their name or assigned manager, add or edit or delete existing lines, and view the location of each line on a map, enabling effective oversight and

Chapter 6

Results and Discussion

The taxi service management application successfully met its objectives by integrating features that enhanced user experience, operational efficiency, and communication. For users, the system provided real-time vehicle count monitoring and interactive maps, enabling effective trip planning and better awareness of terminal activity. The flexible booking system supported single-day, weekly, and monthly reservations, along with dynamic management options such as cancellation, pausing, and driver rating. Notifications for booking confirmations and driver acceptance updates ensured clear and timely communication, while the integrated chat feature allowed users to resolve queries quickly, improving trust and satisfaction. Drivers benefited from a robust reservation management system, including a calendar for scheduling and a location-based recommendation system that reduced idle time and increased trip efficiency. Communication tools, such as real-time voice messaging with line managers, strengthened coordination and streamlined operations. Line managers gained powerful tools for real-time driver tracking, performance monitoring, and communication, including the ability to send voice broadcasts and view detailed driver profiles. Statistical reports offered insights into reservation trends, customer satisfaction, and driver performance, enabling data-driven improvements and strategic planning. Despite the overall success, challenges included maintaining real-time tracking accuracy and managing communication under high server loads. These challenges can be addressed in future updates through infrastructure optimization, predictive analytics, and AI-driven features. Overall, the application significantly enhanced the efficiency and reliability of taxi operations, laying the groundwork for continued growth and innovation in the service industry.

Chapter 7

Conclusion

The taxi service management application successfully addressed the challenges of modern taxi operations by integrating innovative features that enhance user experience, operational efficiency, and communication. The system's real-time vehicle tracking, flexible reservation management, and interactive maps improved convenience and usability for passengers. Drivers benefited from tools that streamlined their workflow, including reservation recommendations and scheduling capabilities, while line managers gained better oversight through performance monitoring, driver tracking, and communication tools. Statistical insights provided actionable data for optimizing operations and improving service quality. While challenges such as maintaining real-time tracking accuracy and managing high-demand communication were encountered, they highlighted areas for future enhancement, including infrastructure optimization and predictive analytics. Overall, this application represents a significant step forward in creating a seamless, efficient, and user-centric taxi service platform, with the potential to evolve and adapt to meet future demands in the industry.

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